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by

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All errors are my own responsibility.

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ABSTRACT

This study provides evidence of a direct relationship between inside spreads and insider trading activity that is stronger when there are fewer market makers or more concentrated market maker market share. No evidence is found of a relationship between quote size at the inside and insider trading. The results are consistent with the Stoll (1978) hypothesis that inside quotes will be more responsive to informed trading risk under less competitive market making conditions. However, the results do not indicate that quote size is more responsive than spread to informed trading risk as predicted by DuPont (2000).

Insider trading is arguably one of the more potent proxies for informed trading risk. Nevertheless, while market microstructure theory predicts a positive relationship between bid-ask spreads and informed trading risk, empirical evidence on the spread-insider trading relationship is mixed. For example, Cornell and Sirri (1992), Kini and Mian (1995), Chakravarty and McConnell (1997), and Garfinkel and Nimalendran (2003) find no evidence of a positive relationship between spreads and insider ownership or trading activity, while Chiang and Venkatesh (1988) and Chung and Charoenwong (1998) do.

Part of the explanation for these puzzling results can be found in recent theoretical developments. Kavajecz (1996) and Dupont (2000) develop models of market maker spread and depth setting under asymmetric information. The ability of the market maker to alter bid or ask quote size rather than spread in response to increases in informed trading risk may weaken the spread-insider trading relationship. Moreover, Dupont (2000) shows that equilibrium depth is proportionately more sensitive than spread to changes in levels of information asymmetry. Empirical evidence of a relationship between quote size and insider trading is provided by Fishe

and Robe (2001), who find no change in Nasdaq quoted (or effective) spreads on illegal insider buying days, but detect a 3-19 percent reduction in aggregate ask size.

Another possible explanation for these conflicting findings is that market characteristics affect the degree to which market makers respond to insider trading-based asymmetric information risk. Although information asymmetry lies at the heart of informed trading risk models of the bid-ask spread, it is left to empirical researchers to determine and investigate the sources of information asymmetry affecting spreads. Many empirical studies focus on time variations in spreads surrounding information events expected to resolve information asymmetries. Cross-sectional studies can reveal market characteristics that affect the relationship between spreads and risk from information asymmetry-motivated trading.

The Stoll (1978) hypothesis says that a specialist system allows easier identification of informed traders than a multiple market maker system. Moreover, according to Benston and Hagerman (1974), the number of market makers for a stock is likely to affect the degree of asymmetric information that market makers face since this risk can be shared via market maker inventory adjustments. Thus, the magnitude or significance of the spread-insider trading relationship may be lessened under a multiple market maker system in which both awareness of the presence of insiders and risk from trading with insiders is reduced. The fact that insiders often trade using multiple orders over multiple days indicates that informed trading risk is spread out over multiple market makers.

This study investigates whether reported insider trades affect bid-ask spreads more or less than inside bid or ask quote sizes. This study also investigates whether market maker competition affects the relationship between inside quotes and insider trading. Inside bid and ask quotes are used since informed trading risk is borne by market makers at the inside.

As expected, this study finds a stronger spread-insider trading relationship under less competitive market making conditions. Contrary to theory, this study finds that market makers

alter inside spread rather than quote size in response to insider trading risk. In any case, the economic impact of insider trading on spreads is shown to be small.

The rest of this paper is organized as follows. Section I investigates the relationship between insider trading risk and Nasdaq quotes at the inside. Section II discusses the results. Section III concludes.

Section I

This section documents the relationship between inside bid-ask spreads and inside bid and ask quote size and reported insider purchasing activity under the influence of market maker competition. The main questions addressed are whether inside quotes have a stronger relationship with insider trading risk under conditions of lesser market maker competition and whether inside quote sizes have a stronger relationship with insider trading risk than do inside spreads. This section also examines changes in the number of trades and price levels and variability on insider purchasing days as compared to non-insider purchasing days.

A. Data and Summary Statistics

The sample includes all companies with timely reported insider open market purchases *only* of shares of Nasdaq National Market ordinary common stocks. Insider sales are excluded since these trades are just as likely to be motivated by the need for liquidity as because of superior inside information (see Lakonishok and Lee, 2001).[1] Also, only a few insider sales during the time period of investigation fall below the 500 share/$10,000 Form 144 reporting requirement. Insiders selling restricted shares above these amounts must submit a Form 144 to the SEC, Nasdaq, and the broker with which the insider places the trade simultaneously with placing the trade. Given the timing of the Form 144 reporting requirement as well as the lack of information

[1] Preliminary results were insignificant when insider sales were included in the sample.

on which trades in the sample are in restricted shares, it is impossible to categorize the insider sales in the sample as publicly revealed or not.

Limiting the scope of investigation to timely reported insider trades allows for a high degree of confidence in the completeness of the data set used. The exclusion of late-reported or unreported insider trades, which arguably may be more informative, will generate noise in the results.[2] However, including late-reported trades would require daily updating of the data set as new information became available, and it would never be known if all of the late-reported trades had been reported yet. Unreported trades are usually unobservable, and when information is available, the data is usually incomplete.

This study also excludes any companies with reported insider trades that are not entirely composed of open market purchases of non-derivative securities during the month of July 1998. The trades that form the basis for exclusion include all option transactions, bona fide gifts, acquisitions pursuant to reinvestment of dividends or interest, acquisitions or dispositions by will or laws of descent or distribution, small acquisitions under Rule 16a-6, deposits into or withdrawals from voting trusts, transfers pursuant to a qualified domestic relations order, dispositions pursuant to a tender of shares in a change of control transaction, and other unspecified acquisitions or dispositions not classified as open market.

There are two important reasons for the exclusions. One reason is that many of these excluded transactions are more likely to be liquidity trades than informed trades, and this study wishes to investigate the spread-insider trading relationship under the assumption that insider trading is a proxy for informed trading. A second reason for excluding companies with these other types of transactions is that the data is usually incomplete. The exclusion of stocks with these transactions ignores the impact of derivative holdings and liquidity trading on the trading strategies of insiders and the informed risk assessments made by market makers.

[2] The SEC requires insiders to report trades via Form 4 within 10 days after the month in which the trades take place.

This study also excludes trades reported by persons who are large shareholders (holding at least 10 percent of the company's stock), but not managers or directors. This is because large shareholders (typically mutual funds) are not likely to possess inside information to the extent of directors or managers (for example, see Henriksson, 1984).

The year 1998 is chosen for the time period of investigation because it is the most recent year for which complete data exists as of the start of this investigation. The month of July is chosen because it is a month in which total trading volume and insider trading volume are approximately average for the year. Only one time period is studied because the data collection process is time-consuming, requiring that data on insider trades be manually entered into an electronic file. It should also be noted that 1998 follows the Securities and Exchange Commission (SEC) reforms made to Nasdaq in early 1997 to improve competitiveness among market makers. Weston (2000) finds that the combined adverse selection/inventory cost component of Nasdaq spreads has increased since the SEC reforms.

Daily data on all market maker trades and quotes is obtained from NASTRAQ. Monthly data on market maker market share is provided by Nasdaq. Daily data on closing price, high and low trading price of the day, and number of shares outstanding comes from CRSP. Daily data on insider trades comes from the monthly SEC *Official Summary of Securities Transactions and Holdings*. All companies with insider trades consisting solely of open market purchases on actively-traded Nasdaq National Market ordinary common stocks that took place in July, 1998 and that the SEC received Form 4s for by August 10, 1998 are included.[3] The Form 4 filings include several details of each insider trade, including the number of shares bought, the price at which they are bought, and the insider's name and role in the corporation.

Of the 3,286 companies reporting insider securities transactions and holdings, 287 report open market purchases and sales only of actively-traded Nasdaq NM ordinary commons stocks

[3] This corresponds to all relevant trades listed in the SEC *Official Summary of Securities Transactions and Holdings* Volume 64, Numbers 6-7.

during July, 1998.[4] Of these, 26 are eliminated because the trades are made solely by shareholders holding ten percent or more of the stock, 37 are eliminated because of missing or incorrect data (for example, Sunday transaction date), 80 are eliminated because they involve open market insider sales, and four are eliminated because the dollar volume of insider trading reported exceeds the dollar volume of total trading reported for that stock for that day.[5] This leaves a final sample of 140 stocks experiencing only open market insider purchases.

Descriptive statistics for the full sample of 140 observations are presented in Table I. The difference between the mean and median values of duration-weighted inside spreads and depth, closing prices, and number of trades suggests skewness from the larger firms in the sample. This is confirmed by the difference in the mean and median values of market value of equity. The diversity in the number of market makers, market maker market share concentration, and percentage of dollar trading volume accounted for by insiders increases the likelihood of successfully identifying empirical relationships suggested by a priori theory.

B. Insider Trading and Nasdaq Quotes

Spread is modeled via multiple regression as follows (see Ellis, Michaely, and O'Hara, 2002):

$$LSPREAD = \alpha_0 + \alpha_1 LPRICE + \alpha_2 LNTRADES + \alpha_3 LTSIZE + \alpha_4 LPVAR + \alpha_5 LMM + \alpha_6 LCONC + \alpha_7 LINSIDER + \varepsilon$$

The model uses the natural logarithm of each variable. SPREAD = $\{\sum_t$ DSPREAD$\}/t$, where daily spread DSPREAD = $\sum_k$ (D/L) x {(inside ask – inside bid)/[(inside ask + inside bid)/2]}, where D = duration of inside quote k in seconds and L = number of seconds in the trading day; PRICE = $\{\sum_t$closing price$\}/t$; NTRADES = $\{\sum_t$number of trades$\}/t$; TSIZE = $\{\sum_t$average trade size$\}/t$; PVAR = $\{\sum_t$ DPVAR$\}/t$, where DPVAR = (highest trade price of the day – lowest trade

[4] Companies also reporting transactions in other months are included in the sample.
[5] It appears that in some cases insider trades occurring over several days are reported as occurring on one date on the Form 4 report.

price of the day) / (highest trade price of the day + lowest trade price of the day)/2]; MM = {$\sum_t$ number of market makers}/t); CONC = $(1 - p_i)/[(n - 1) \times p_i]$, where $p_i = \sum_{i=1 \text{ - } n} P_i^2$ across all market makers, n = number of market makers, and P_i = percentage market share (see Klock and McCormick, 1999); and INSIDER = {$\sum_t \Sigma_T$ dollar volume of shares traded by insiders/t}/ {$\sum_t$ dollar volume of shares traded}/t. t = number of insider trading days during the 22 trading days of July, 1998, varies by firm between one and 16. T = number of insider transactions, varies by firm between one and eight purchases and one and five sales. Duration-weighted inside bid and ask quote sizes (LBIDSIZE and LASKSIZE) are modeled using the same independent variables.

LPRICE, LNTRADES, and LTSIZE control for spread or depth changes associated with changes in market maker inventory-holding and order-processing costs. LSPREAD, LBIDSIZE, and LASKSIZE are expected to have a negative relationship with LPRICE since the closing price of the stock is a proxy for the market maker's fixed ordering costs. LSPREAD (LBIDSIZE and LASKSIZE) is expected to have a negative (positive) relationship with LNTRADES and LTSIZE since the market maker's inventory holding period, and hence inventory-holding costs, decline with increases in trading. LSPREAD (LBIDSIZE and LASKSIZE) is expected to have a positive (negative) relationship with PVAR since price volatility is a proxy for the price risk a market maker assumes in taking a position. LSPREAD (LBIDSIZE and LASKSIZE) is expected to have a negative (positive) relationship with LMM since the number of market makers is a proxy for market maker competition. LSPREAD (LBIDSIZE and LASKSIZE) is expected to have a positive (negative) relationship with LCONC since the Herfindahl index of market maker market share is a measure of the contestability of the market in spreads.

Contemporaneous data on insider trades is used since this study investigates the spread-insider trading relationship before public release of information on the insider trades. Insider trading will have an impact on spreads even if market makers cannot distinguish insider from

non-insider trades according to the Kyle (1985) model. Moreover, Givoly and Palmon (1985) provide evidence that the majority of returns to insiders from trading results from information revealed through the trading itself rather than public disclosure of the insider trading.

Given the model of the spread-insider trading relationship, a one-tailed Student's t-test is used to test the hypothesis that there is a positive (negative) relationship between LSPREAD (LBIDSIZE and LASKSIZE) and LINSIDER ($\alpha_7 > 0$). H_1 is tested for the full sample as well as subsamples divided by median number of market makers and median market maker market share concentration as measured by the Herfindahl index.

The results for the full sample and subsamples divided by median number of market makers and median market maker market share concentration are shown in Table II. For the full sample, LSPREAD is directly related to LINSIDER at a one percent level of significance, while LBIDSIZE and LASKSIZE have insignificant relationships with LINSIDER. For both subsamples divided by the median number of market makers, LSPREAD is directly related to LINSIDER at a five percent level of significance. However, the coefficient on LINSIDER is 54 percent higher for the subsample in which the number of market makers is less than the median of 13. For the subsample of stocks with market maker market share concentrations greater than or equal to the median of 2,404, LSPREAD has a direct relationship with LINSIDER that is significant at a one percent level. For less concentrated market maker market share, LSPREAD has a direct relationship with LINSIDER that is significant at a 10 percent level. For the more concentrated market maker market share subsample, the coefficient on LINSIDER is 74 percent higher than that for the less concentrated subsample.

C. Effects of Firm Size

To confirm that the results found in the previous section are not due to differences in firm size rather than differences in market maker competition (smaller firms, ceteris paribus, can be expected to have fewer market makers and more concentrated market maker market shares),

the model is also estimated for subsamples divided by median market value of equity, MVE = {$\sum_t$ shares outstanding $\times$ closing price}/t. Seyhun (1988) provides evidence that insiders at small firms are more likely than insiders at large firms to trade based on firm-specific information. This result implies that informed trading risk should be larger for small firms than for large firms, and therefore, that spread should be negatively related to firm size.

Table III presents the results. These results show that the earlier results reported on the impact of market maker competition on the spread-insider trading relationship are not spurious. Firms with smaller market values of equity have insignificant spread-insider trading relationships, while firms with larger market values of equity have a direct spread-insider trading relationship that is significant at a one percent level. Note that MVE and MM have a correlation of 0.39 that is significant at a one percent level, while MVE and CONC have a correlation of $-$ 0.19 that is significant at a five percent level.

D. Effects of Insider Trading on Number of Trades and Price Level and Variability

Cornell and Sirri (1992) and Chung and Charoenwong (1998) find that spreads narrow on insider trading days because of a larger concurrent increase in non-insider trading. An explanation offered by Chung and Charoenwong (1998) is that insiders choose high liquidity trading periods in order to mask their informed trades. However, the detailed daily transactions data used by Cornell and Sirri (1992) provides evidence that increased non-insider trading volume follows, rather than leads, insider trading activity. The authors postulate that bid-ask spreads do not widen in response to insider trading because the increased market liquidity allows market makers to better match trades between insiders and noise traders rather than bear the risk of being on the wrong side of an informed trade. This explanation is supported by the Cohen, Maier, Schwartz, and Whitcomb (1981) model of order strategies by traders, which shows that as trading volume increases, the number of limit orders increases, allowing market

makers to better match trades. As a result, increased trading volume leads to a drop in both informed trading risk and inventory costs.

To investigate whether changes in inside spread can be related to changes in inventory costs and price risk on insider trading days relative to non-insider trading days, the following model is estimated:

$$L\Delta SPREAD = \alpha_0 + \alpha_1 L\Delta PRICE + \alpha_2 L\Delta NTRADES + \alpha_3 L\Delta PVAR + \varepsilon$$

The model uses the natural logarithm of each variable. $\Delta SPREAD = \{\sum_{ti} DSPREAD\}/t_i - \{\sum_{tn} DSPREAD\}/t_n$, where t_i denotes each trading day in July, 1998 when a reported insider open market purchase takes place and t_n denotes each trading day in July, 1998 when no reported insider open market purchases take place. Similarly, $\Delta PRICE = \{\sum_{ti}$closing price$\}/t_i - \{\sum_{tn}$closing price$\}/t_n$; $\Delta NTRADES = \{\sum_{ti}$number of trades$\}/t_i - \{\sum_{tn}$number of trades$\}/t_n$; and $\Delta PVAR = \{\sum_{ti} PVAR\}/t_i - \{\sum_{tn} PVAR\}/t_n$.

The results are shown in Table IV. The difference in spreads on insider trading days is inversely (directly) related to differences in the number of trades (price variability) on insider trading days at a one percent level of significance using a two-tailed Student's t-test. However, the effect of the increase in the number of trades is greater than the effect of the increase in price variability as demonstrated by the 25 percent larger coefficient on $L\Delta NTRADES$. These results would appear to be consistent with the findings of Cornell and Sirri (1992) and Chung and Charoenwong (1998). However, a comparison of means tests shows that only price variability is significantly different on insider trading days from non-insider trading days during July, 1998. Price variability is 23 percent higher on insider trading days at a five percent level of significance.

II. Discussion

Here, the relationship between inside spreads and insider trading risk documented in the previous section is related to theories of quote response to sources of informed trading risk. This section also discusses the relationship between changes in spread and changes in price variability and number of trades on insider purchasing days noted in this and earlier studies.

A. Quote Response to Insider Trading Risk

Theoretical models of the bid-ask spread predict a direct relationship between bid-ask spreads and the degree of informed trading risk faced by market makers, but vary in the way informed trading risk is measured. Glosten and Milgrom (1985) predict that the bid-ask spread will widen as the ratio of informed to uninformed traders increases, while Easley and O'Hara (1987) say that what matters is the fraction of trades that come from informed traders. In Copeland and Galai (1983), the market maker bases his bid and ask quotes on his estimate of the probability of encountering an informed trader as measured, for example, by percentage insider ownership. This study's results are consistent with the Easley and O'Hara (1987) model since the proxy used for informed trading risk from insiders is a measure of insider trading activity.

More recent theoretical developments by Kavacejz (1996) and DuPont (2000) account for possible changes in both bid-ask spreads and bid and ask quote size in response to informed trading risk. Both models allow for the possibility that a market maker can either increase quoted spread or reduce quote size in response to increases in informed trading risk. Moreover, DuPont (2000) demonstrates that quote size should change proportionately more than quoted spread to a given change in informed trading risk. This study does not provide evidence supporting the DuPont (2000) theory that market makers alter quote size proportionately more than spread in response to informed trading risk.

Stoll (1978) suggests that insiders may be able to mask their informed trades more easily in a multiple market maker system than a monopolistic system. Fishe and Robe (2001) provide evidence that this is true for the relationship between inside ask quote size and informed trading

risk from insider purchases. Specifically, the authors find greater reductions in quote size for NYSE stocks than Nasdaq stocks. Their results suggest that the monopolistic market structure of the NYSE allows dealers to more readily detect informed trading. The results presented in this paper further suggest when there are fewer market makers or more concentrated market maker market share, market makers can more readily detect informed trading.

B. Empirical Observations on the Effect of Insider Trading on the Determinants of Spread

The comparison of mean inside bid-ask spreads on insider trading days versus non-insider trading days shows that, contrary to the findings of Cornell and Sirri (1992) and Chung and Charoenwong (1998), inside bid-ask spreads are not significantly different on insider trading days. Nevertheless, the results of the model of spread changes associated with changes in the number of trades and price level and variability on insider trading days provides some indication that insider trading affects spreads via changes in the costs of market making. The model suggests that the increase in informed trading risk from insider trading activities is somewhat offset by the decrease in market making costs, leaving spreads unchanged.

III. Conclusion

The evidence presented in this paper indicates that Nasdaq market makers alter equilibrium inside bid-ask spreads in response to informed trading risk from reported insider purchases. The relationship is stronger when there is less market maker competition. The evidence is consistent with theoretical developments showing that market maker competition decreases market maker awareness of informed trading activity. There is no evidence that market makers alter inside quote depth in response to insider trading-based informed trading risk.

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Table I

Summary Statistics of Insider Trading and Components of Nasdaq Inside Spreads

Medians, means, standard deviations, minimums, and maximums of duration-weighted inside spreads and inside bid and ask quote sizes; closing prices; number of trades; average trade size; price variability; number of market makers; Herfindahl index of market maker market shares; market value of equity, and percentage dollar trading volume by insiders. All variables are the natural logarithm of averages of all insider purchasing days in July, 1998. The statistics are reported for the full sample of 140 observations, which includes all Nasdaq National Market ordinary common shares with reported net open market purchases only by insiders during the month of July, 1998.

Variable	N	Median	Mean	Std. Dev.	Minimum	Maximum
SPREAD	140	2.15%	2.87%	2.70%	0.33%	22.24%
ASKSIZE	140	691	839	646	50	4617
BIDSIZE	140	959	1068	532	100	3403
PRICE	140	$11.69	$14.91	$12.47	$0.69	$56.84
NTRADES	140	31	80	121	2	527
TSIZE	140	1120	1281	769	171	4834
PVAR	140	4.77%	6.19%	5.12%	0.39%	33.82%
MM	140	13	14	7	2	49
CONC	140	2404	2597	1248	463	7519
MVE ($millions)	140	$105	$347	$827	$4	$7,271
INSIDER	140	6.04%	14.58%	20.58%	0.03%	100.00%

Table II

The Inside Quote-Insider Trading Risk Relationship Under Market Maker Competition

Regressions of duration-weighted inside bid-ask spreads (LSPREAD) and inside bid and ask quote size (LBIDSIZE and LASKSIZE) for Nasdaq National Market ordinary common stocks on closing price (LPRICE), number of trades (LNTRADES), average trade size (LTSIZE), price variability (LPVAR), number of market makers (LMM), Herfindahl index of market maker market shares (LCONC), and percentage dollar trading volume by insiders (LINSIDER). All variables are the natural logarithm of averages of all net insider purchasing days in July, 1998. The table compares the regression coefficients for the full sample to those of subsamples divided by median number of market makers and median Herfindahl index of market maker market shares. t-statistics are in parentheses. Using a one-tailed t-test, statistical significance at the 1%, 5%, and 10% levels is denoted by ***, **, and *, respectively.

Sample	Full	MM ≥ Median	MM < Median	CONC ≥ Median	CONC < Median
Number of obs	N = 140	N = 73	N = 67	N = 70	N = 70
Model	**Panel A: LSPREAD**				
Adjusted R^2	86.00%	84.80%	83.94%	85.75%	83.64%
Intercept	1.925***	2.174***	1.565***	2.680***	1.314***
	(4.86)	(3.73)	(2.53)	(4.63)	(2.18)
LPRICE	–0.180***	–0.200***	–0.173***	–0.182***	–0.183***
	(4.56)	(4.24)	(2.69)	(3.43)	(3.13)
LNTRADES	–0.342***	–0.294***	–0.414***	–0.294***	–0.341***
	(8.61)	(6.34)	(5.29)	(4.34)	(6.12)
LTSIZE	0.016	0.023	0.058	–0.077	0.067
	(0.35)	(0.38)	(0.78)	(1.09)	(0.97)
LPVAR	0.583***	0.458***	0.670***	0.602***	0.565***
	(12.86)	(8.22)	(9.36)	(10.11)	(8.15)
LMM	–0.145**	–0.254**	–0.054	–0.163*	–0.159*
	(1.78)	(1.90)	(0.36)	(1.39)	(1.32)
LCONC	0.011	0.006	0.043	0.190	–0.119
	(0.21)	(0.10)	(0.51)	(1.28)	(1.24)
LINSIDER	0.053***	0.039**	0.060**	0.066***	0.038*
	(3.19)	(1.84)	(2.26)	(2.97)	(1.52)
Model	**Panel B: LASKSIZE**				
Adjusted R^2	14.81%	14.81%	14.81%	14.81%	14.81%
Intercept	6.812***	6.812***	6.812***	6.812***	6.812***
	(8.59)	(8.59)	(8.59)	(8.59)	(8.59)
LPRICE	–0.320***	–0.320***	–0.320***	–0.320***	–0.320***
	(4.03)	(4.03)	(4.03)	(4.03)	(4.03)
LNTRADES	0.147**	0.147**	0.147**	0.147**	0.147**
	(1.85)	(1.85)	(1.85)	(1.85)	(1.85)
LTSIZE	0.100	0.100	0.100	0.100	0.100
	(1.06)	(1.06)	(1.06)	(1.06)	(1.06)
LPVAR	–0.171**	–0.171**	–0.171**	–0.171**	–0.171**
	(1.88)	(1.88)	(1.88)	(1.88)	(1.88)
LMM	–0.234	–0.234	–0.234	–0.234	–0.234
	(1.42)	(1.42)	(1.42)	(1.42)	(1.42)
LCONC	–0.019	–0.019	–0.019	–0.019	–0.019
	(0.17)	(0.17)	(0.17)	(0.17)	(0.17)
LINSIDER	–0.021	–0.021	–0.021	–0.021	–0.021
	(0.64)	(0.64)	(0.64)	(0.64)	(0.64)

Table II (con't.)

The Inside Quote-Insider Trading Risk Relationship Under Market Maker Competition

Regressions of duration-weighted inside bid-ask spreads (LSPREAD) and inside bid and ask quote size (LBIDSIZE and LASKSIZE) for Nasdaq National Market ordinary common stocks on closing price (LPRICE), number of trades (LNTRADES), average trade size (LTSIZE), price variability (LPVAR), number of market makers (LMM), Herfindahl index of market maker market shares (LCONC), and percentage dollar trading volume by insiders (LINSIDER). All variables are the natural logarithm of averages of all net insider purchasing days in July, 1998. The table compares the regression coefficients for the full sample to those of subsamples divided by median number of market makers and median Herfindahl index of market maker market shares. t-statistics are in parentheses. Using a one-tailed t-test, statistical significance at the 1%, 5%, and 10% levels is denoted by ***, **, and *, respectively.

Sample Number of obs	Full N = 140	MM ≥ Median N = 73	MM < Median N = 67	CONC ≥ Median N = 70	CONC < Median N = 70
Model	**Panel C: LBIDSIZE**				
Adjusted R^2	19.44%	19.44%	19.44%	19.44%	19.44%
Intercept	6.653***	6.653***	6.653***	6.653***	6.653***
	(10.73)	(10.73)	(10.73)	(10.73)	(10.73)
LPRICE	–0.264***	–0.264***	–0.264***	–0.264***	–0.264***
	(4.26)	(4.26)	(4.26)	(4.26)	(4.26)
LNTRADES	0.110**	0.110**	0.110**	0.110**	0.110**
	(1.77)	(1.77)	(1.77)	(1.77)	(1.77)
LTSIZE	0.149**	0.149**	0.149**	0.149**	0.149**
	(2.01)	(2.01)	(2.01)	(2.01)	(2.01)
LPVAR	–0.251***	–0.251***	–0.251***	–0.251***	–0.251***
	(3.54)	(3.54)	(3.54)	(3.54)	(3.54)
LMM	–0.099	–0.099	–0.099	–0.099	–0.099
	(0.78)	(0.78)	(0.78)	(0.78)	(0.78)
LCONC	–0.016	–0.016	–0.016	–0.016	–0.016
	(0.19)	(0.19)	(0.19)	(0.19)	(0.19)
LINSIDER	<–0.000	<–0.000	<–0.000	<–0.000	<–0.000
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)

Table III

The Inside Quote-Insider Trading Risk Relationship for Small and Large Firms

Regressions of duration-weighted inside spreads (LSPREAD) and inside bid and ask size (LBIDSIZE and LASKSIZE) for Nasdaq National Market ordinary common stocks on closing price (LPRICE), number of trades (LNTRADES), average trade size (LTSIZE), price variability (LPVAR), number of market makers (LMM), Herfindahl index of market maker market shares (LCONC), and percentage dollar trading volume by insiders (LINSIDER). All variables are the natural logarithm of averages of all insider purchasing days in July, 1998. The table compares the regression coefficients for the full sample to those of subsamples divided by median market value of equity. t-statistics are in parentheses. Using a one-tailed t-test, statistical significance at the 1%, 5%, and 10% levels is denoted by ***, **, and *, respectively.

Sample Number of obs	Full N = 140	MVE ≥ Median N = 70	MVE < Median N = 70
Model		**Panel A: LSPREAD**	
Adjusted R^2	86.00%	74.93%	80.48%
Intercept	1.925***	1.787***	2.062***
	(4.86)	(2.98)	(3.23)
LPRICE	−0.180***	−0.213***	−0.177***
	(4.56)	(3.11)	(2.65)
LNTRADES	−0.342***	−0.375***	−0.316***
	(8.61)	(6.71)	(5.23)
LTSIZE	0.016	0.012	0.040
	(0.35)	(0.19)	(0.53)
LPVAR	0.583***	0.586***	0.575***
	(12.86)	(9.08)	(8.02)
LMM	−0.145**	−0.017	−0.294***
	(1.78)	(0.14)	(2.55)
LCONC	0.011	−0.046	0.082
	(0.21)	(0.54)	(1.05)
LINSIDER	0.053***	0.063***	0.025
	(3.19)	(3.00)	(0.76)
Model		**Panel B: LASKSIZE**	
Adjusted R^2	14.81%	13.60%	11.85%
Intercept	6.812***	6.199***	7.557***
	(8.59)	(5.17)	(6.10)
LPRICE	−0.320***	−0.237**	−0.336***
	(4.03)	(1.73)	(2.59)
LNTRADES	0.147**	0.273***	0.002
	(1.85)	(2.45)	(0.02)
LTSIZE	0.100	0.217*	−0.115
	(1.06)	(1.65)	(0.78)
LPVAR	−0.171**	−0.294**	−0.082
	(1.88)	(2.28)	(0.59)
LMM	−0.234	−0.498	0.161
	(1.42)	(2.02)	(0.72)
LCONC	−0.019	0.045	−0.137
	(0.17)	(0.27)	(0.90)
LINSIDER	−0.021	−0.018	−0.031
	(0.64)	(0.43)	(0.48)

Table III (con't.)

The Inside Quote-Insider Trading Risk Relationship for Small and Large Firms

Regressions of duration-weighted inside spreads (LSPREAD) and inside bid and ask size (LBIDSIZE and LASKSIZE) for Nasdaq National Market ordinary common stocks on closing price (LPRICE), number of trades (LNTRADES), average trade size (LTSIZE), price variability (LPVAR), number of market makers (LMM), Herfindahl index of market maker market shares (LCONC), and percentage dollar trading volume by insiders (LINSIDER). All variables are the natural logarithm of averages of all insider purchasing days in July, 1998. The table compares the regression coefficients for the full sample to those of subsamples divided by median market value of equity. t-statistics are in parentheses. Using a one-tailed t-test, statistical significance at the 1%, 5%, and 10% levels is denoted by ***, **, and *, respectively.

Sample Number of obs	Full N = 140	MVE ≥ Median N = 70	MVE < Median N = 70
Model	**Panel C: LBIDSIZE**		
Adjusted R^2	19.44%	6.48%	24.31%
Intercept	6.653***	5.982***	7.522***
	(10.73)	(6.62)	(7.14)
LPRICE	–0.264***	–0.153*	–0.379***
	(4.26)	(1.49)	(3.44)
LNTRADES	0.110**	0.063	0.189**
	(1.77)	(0.75)	(1.91)
LTSIZE	0.149**	0.188**	0.075
	(2.01)	(1.89)	(0.60)
LPVAR	–0.251***	–0.165**	–0.389***
	(3.54)	(1.70)	(3.29)
LMM	–0.099	–0.030	–0.171
	(0.78)	(0.16)	(0.90)
LCONC	–0.016	0.035	–0.059
	(0.19)	(0.28)	(0.46)
LINSIDER	<–0.000	–0.010	0.015
	(0.01)	(0.34)	(0.28)

Table IV

Differences in Closing Price, Average Number of Trades, and Price Variability Between Insider Trading and Non-Insider Purchasing Days

Regressions of differences in duration-weighted average inside spreads (L∆SPREAD) and inside bid and ask size (L∆BIDSIZE and L∆ASKSIZE) on differences in average closing price (L∆PRICE), number of trades (L∆NTRADES), and price variability (L∆PVAR) on reported insider purchasing days as compared to days of no reported insider purchases. t-statistics are in parentheses. Using a two-tailed t-test, statistical significance at the 1%, 5%, and 10% levels is denoted by ***, **, and *, respectively.

Model Number of obs	L∆SPREAD N = 139	L∆ASKSIZE N = 139	L∆BIDSIZE N = 139
Adjusted R^2	8.83%	4.66%	1.09%
Intercept	–0.484** (2.24)	5.353*** (27.59)	4.920*** (21.79)
L∆PRICE	–0.037 (0.59)	–0.142*** (2.51)	–0.131** (1.99)
L∆NTRADES	–0.232*** (3.33)	–0.074 (1.18)	0.013 (0.19)
L∆PVAR	0.186*** (2.69)	0.024 (0.39)	–0.037 (0.52)