INSIDER TRADING AT THE TURN OF THE CENTURY: TWO ESSAYS

A Dissertation

by

SEMIH TARTAROGLU

Submitted to the Office of Graduate Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

December 2008

Major Subject: Finance

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Approved by:

Chair of Committee,	Ekkehart Boehmer
Committee Members,	Anwer Ahmed
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ABSTRACT

Insider Trading at the Turn of the Century: Two Essays. (December 2008)

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Insider trading may convey information to the market and promote accurate pricing of stocks. In this dissertation, I investigate insider trading at the turn of the century.

In the first essay, I investigate insider trading activity in technology stocks during the high price - high volatility period of the late 1990s. I document that insiders of technology firms were heavy sellers during the ten month pre-peak period in which stock prices more than doubled. The technology stocks that were sold by insiders more extensively in the pre-peak period had lower returns in the post-peak period. I furthermore investigate the relation between the net order flows (buyer initiated minus seller initiated trades) and abnormal insider trading activity. I document that the net order flow is positively related to abnormal insider trading activity. However, this positive relation becomes weaker in the peak period; which implies less price discovery through insider trading during the rise of technology stock prices.

In the second essay, I document that disclosure requirements significantly affect insider trading behavior. The Sarbanes-Oxley Act of 2002 requires expedited and on-line

disclosure of insider transactions. This increase in the visibility of insider trading reduces informational advantage of insiders and increases the likelihood of facing legal sanctions for insiders. I document that insider purchases significantly declined after the Sarbanes-Oxley Act. In addition, the incidences of insider purchases (sales) prior to positive (negative) earnings surprises declined after the Act. Finally, I document that the earnings announcements become more informative after the Act, which is consistent with less price discovery through insider trading prior to earnings announcements. However, the evidence that the decline in insider trading contributes to more informative earnings announcements is pronounced for insider purchases but not for insider sales.

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CHAPTER I

INTRODUCTION

Insider trading may convey information to the market and promote accurate pricing of stocks. In this dissertation, I investigate two special issues on insider trading at the turn of the century. The title of the first essay is *"Insider Trading During the Technology Bubble"*, the title of the second essay is *"Insider Trading and Earnings Surprises: The Case of Expedited Disclosure of Insider Transactions"*.

I.1 Insider Trading During the Technology Bubble

The NASDAQ index reached its highest level in March 2000 but by the end of that year half of the returns gained over the previous two years were wiped out. This run-up in technology stock prices preceding the precipitous decline is commonly called the technology bubble[1]. In this study, I investigate insider trading during this special period.

Recent studies question whether the trading behavior of various market participants was different during this special period. Brunnermeier and Nagel (2004) show that hedge funds were buying during the price run-up but they were also successful avoiding the downturn[2]. Two studies (Griffin, Harris and Topaloglu (2005), Dass, Massa and Patgiri (2008)) show that institutional investors were herding during this period.

This dissertation follows the style of Journal of Financial Economics.

[1] Earlier studies suggest that the dramatic rise and fall of technology stock prices is difficult to justify with fundamentals (e.g., Shiller (2000), Ofek and Richardson (2002), Lamont and Thaler (2003). Pastor and Veronesi (2006) show that the high prices and high volatilities can be generated in a rational model. DeMarzo, Kaniel and Kremer (2008) show that financial bubbles can emerge due to rational investors' relative wealth concerns.

[2] These findings are consistent with models in Abreu and Brunnermeier (2003) and De Long et al. (1990) which suggest that sophisticated investors might rationally ride price bubbles.

These studies suggest that hedge funds' and institutional investors' trading activity contributed to the rise of technology stock prices. Complementing these studies, I address two questions on insider trading activity during this special period. Specifically, I question how insiders traded during the rise of technology stock prices and whether or not insider trading activity affected the trading behavior of other investors.

Insiders, with superior information, generally are referred to as informed traders. The vast amount of literature on insider trading implies that insider trading activity helps to keep prices close to the fundamentals.[3] In the seminal paper of Kyle (1985) market makers try to infer the information of insiders from their trading activity. In this study, I limit the definition of insiders to the top management of firms (CEO, Chair, President, Officers and Board of Directors)[4]. I first investigate insider trading activity around price peaks and then I examine the relation between insider activity and net order flow (buyer initiated-seller initiated trades).

Technology stocks are research intensive and subject to large information asymmetry[5]. Moreover, the late 1990s were characterized by technological changes such as the internet, wireless communications, and advances in pharmaceutical industry. Insiders of tech-stocks are likely to interpret the effects of technological changes on their firms' cash flows better and faster than an average investor. Hence, aggregate insider

[3] Earlier studies such as Jaffe (1974), Seyhun (1986) and Rozeff and Zaman (1988), Lakonishok and Lee (2001) document that insiders can predict abnormal future stock price changes and their transactions earn abnormal profits. Purnanandam and Seyhun (2007) document that outsiders may profit from mimicking insider transactions.

[4] According to SEC rules, individuals or institutions that own more than 10% of a firm are also classified as insider.

[5] Aboody and Lev (2000) document that transactions of insiders at firms with intensive research and development activity earns larger abnormal returns compared to those of insiders at firms with no research and development activity.

trading activity at technology stocks should be a signal about fundamentals. I document heavy sales of technology stock insiders in the ten months prior to the price peaks in which the prices more than doubled.

Recent studies (Chordia, Roll and Subrahmanyam (2002) and Chordia and Subrahmanyam (2004)) show that net order flow is positively related to stock returns. Boehmer and Wu (2007) show that net order flow from different trader types play different roles in price formation. Earlier studies (i.e., Givoly and Palmon (1985), Meulbroek (1992), Cornell and Sirri (1992) and Chakvarty and McConnell (1997)) document that insider trading facilitates rapid price discovery. Consistent with microstructure theories, the abnormal insider trading activity may be a signal of private information. When insiders trade excessively, other market participants may realize existence of an informed trader and insiders' information will be incorporated to the prices. To the extent other market participants follow the insiders there will be net order flow in the same direction of insider trading activity.

I investigate the relation between abnormal insider trading activity and net order flow on a sample of 1,345 stocks from January 1996 to August 2002. I measure abnormal insider trading as the difference between net insider trading (purchases minus sales scaled by firms' outstanding shares) and its time series mean. I document that net order flow is positively related to abnormal insider trading. More interestingly, this relation was economically and statistically weaker prior to the price peaks.

Meulbroek (2000) argues that managers of internet firms have an incentive to sell their share holdings because of the high volatility of these stocks. Hence, insider sales

may be driven by their portfolio rebalancing needs that are exacerbated by rising prices and high volatilities during this period. I document that the sales of technology stock insiders in the pre-peak period were large even after controlling for portfolio rebalancing needs (price run-up and volatility) of insiders.

I also investigate the relation between insider trading activity before the peak and the returns after the peak. If insider trading was only driven by portfolio rebalancing needs (a naïve contrarian strategy), then there should be no relation between insider trading in the pre-peak period and the returns in the post peak period. If insider trading contained information, then their trading activity in the pre-peak period should predict price declines after the peaks. I show that technology stocks that were sold extensively by insiders in the pre-peak period earned larger negative returns during the correction period. Hence, the large tech-insider selling in the pre-peak period contained information.

I also investigate the relation between the post peak returns and lagged abnormal tech-insider trading activity in the pre-peak period. I document that even the abnormal sales in the tenth month prior to the peaks predict the cross section of price declines after the peaks. This evidence suggests that it took markets many months to incorporate negative information from tech-insider trading.

In a recent study, Marin and Oliver (2007), document that insiders sell many months (up to 12 months) before a large monthly price drop, but insiders buy only one month before a large monthly price jump. In this study, I specifically investigate insider trading during the technology bubble in which other sophisticated investors' trading

contributed to the rising prices. I document that tech-insiders were heavy sellers up to ten months before the price peaks. The evidence in this essay and in Marin and Oliver (2007) implies that insider sales contain information.

There are two studies that investigate the behavior of insiders at internet IPOs. Schultz and Zaman (2001) argue that the motivation behind internet IPOs was "to grab market share" rather than "to issue overpriced stocks". Ofek and Richardson (2003) attribute the burst of the bubble to IPO lock up expirations and associated insider selling[6]. In contrast to these studies, I investigate insider trading in stocks that are already listed on exchanges. The findings in this essay complement Ofek and Richardson (2003) by showing that insiders of technology stocks that are already listed at exchanges were sellers many months before the peaks.

The overall evidence of this essay suggests that the markets ignored (or failed to recognize) the negative information from tech-insider trading during this period. The findings of this study are important within the limits to arbitrage literature that recognizes different factors (i.e. short sale constraints, synchronization risk or behavioral factors) to explain price bubbles. Complementing this strand of literature, this essay highlights another missing factor during the bubbles. The information from insider trading that facilitates faster price discovery and that helps to keep prices close to the fundamentals is not fully and timely incorporated to prices during the bubble periods.

[6] Battalio and Shultz (2006) show that short sale constraints are not enough to explain the "bubble". Recent working paper by Schultz (2007) argues that increased supply of shares do not explain the burst of the bubble.

I.2 Insider Trading and Earnings Surprises: The Case of Expedited Disclosure of Insider Transactions

Insider trading is heavily regulated in the US. Insiders who trade on private information face a trade-off between their benefits (profit from trading) and their costs (level of legal sanctions and probability of facing legal sanctions). The Sarbanes-Oxley Act of 2002 requires expedited and on-line disclosure of insider transactions and makes insider trading more visible.[7] However, the Act not only decreases the informational advantage of an insider but also increases the likelihood of facing legal sanctions of an insider. As a consequence, the Sarbanes-Oxley Act is likely to deter insider trading and the price discovery through insider trading.

Prior literature investigates the effectiveness of federal regulations that increased legal sanctions on insider trading during the 1980s.[8] Seyhun (1992) documents that changes in insider trading regulations in the 1980s did not deter insider trading. Garfinkel (1997) shows that increased legal sanctions deterred insider trading prior to earnings announcements. In this study, I investigate how the Sarbanes-Oxley Act affected insider trading; in particular I explore whether expedited disclosure requirements affects insider trading behavior around earnings announcements.[9]

Insider trading may convey information to the market and promote accurate pricing of stocks. Consistent with this view, Roulstone (2006) shows that insiders'

[7] See Section II for a summary on insider trading disclosure requirements changed by the Act.
[8] The Insider Trading Sanctions Act (ITSA) of 1984 provides up to three times the insiders' illegal profits in civil penalties and a ten-fold increase in criminal penalties. The Insider Trading and Securities Fraud Act (ITSFEA) of 1989 increases maximum penalties to $1 million and 10 years of prison and holds top management responsible for failure to comply with regulation by any employee of the firm.
[9] Theoretical models presented by Grossman and Stiglitz (1980), Huddart et al. (2001), Mendelson and Tunca (2004) suggest that disclosure requirements affect informed insider trading.

decisions to trade are influenced by future earnings announcement returns and insider trades are negatively related to market reactions to earnings announcements. The Sarbanes-Oxley Act requires expedited disclosure of insider transactions and hence the Act is likely to deter insider trading on price relevant information. This should imply that the positive relation between insider trading and future earnings surprises is weaker after the Act. More importantly, the price discovery through insider trading should shift to other sources such as financial reports or earnings announcements. Hence, earnings announcements should become more informative after the Act.

I consider a four year period before and after the enactment of Sarbanes-Oxley in 2002 and examine a sample of more than 10,000 quarterly earnings announcements. I investigate open market transactions by the top management of firms (CEO, Chair, President, Officers and Board of Directors) around these quarterly earnings announcements.[10] I show that the Sarbanes-Oxley Act has a significant impact on insider trading behavior. In particular, I find that insider transactions which are likely to be based on information declined after the Act. I document that earnings announcements become more informative after the Act which is consistent with less price discovery through informed trading prior to earnings announcements. However, I find little evidence that the decline in insider trading contributed to more informative earnings announcements after the Act.

[10] According to SEC rules, individuals or institutions that own more than 10% of a firm are also classified as insider. I limit the definition of insiders to top management since they are the decision makers of the firms.

The evidence that the Act affected informed insider trading is based on two sets of results. First, I assume that certain insider trades are more likely to be based on private information. Then, I formally investigate the net insider trading activity and earnings surprises.

Insiders receive shares of their company through their compensation packages and they typically have undiversified portfolios. Hence, insider sales may be driven by their information advantage or their liquidity needs. Insider purchases are more likely to be driven by their information given their undiversified portfolios. I document that Sarbanes-Oxley Act did not deter insider sales but insider purchases declined significantly after the Act.

Moreover, I investigate pre-announcement and post-announcement informed trading by stratifying the data around positive and negative earnings surprises. The obvious examples of pre-announcement informed trading are insider purchases before positive earnings surprises and insider sales before negative earnings surprises. I document that the incidences of insider purchases (sales) prior to positive (negative) earnings surprises declined after the Act.

The examples of post-announcement informed trading are insider purchases after negative news and insider sales after positive news. Insiders may defer their purchases (sales) until after upcoming negative (positive) earnings surprises and profit from price movements after the release of negative or positive news. It is more difficult to argue that these transactions are solely insiders' deferred transactions to exploit the price movements after the announcements. Hence, the likelihood of legal sanctions on post-

announcement informed trades are lower. I show that the incidences of insider purchases after negative earnings surprises declined after the Act. But the decline in incidences of insider purchases after negative surprises is less than the decline in incidences of pre-announcement purchases. On the other hand, I find that the incidences of insider sales following positive earnings announcements increased after the Act. These findings suggest that the Act did not deter informed post-announcement trading.

As an alternative test of the Sarbanes-Oxley Act's effects on information based trading, I examine the relation between insider trading activity and the magnitude of earnings surprises before and after the Act. I find that insider trading is not significantly related to the magnitude of upcoming earnings surprises neither before nor after the Act. On the other hand, I find that insiders increased their tendency to trade against just announced earnings information after the Act. The relation between net insider trading activity and recent earnings surprises becomes significantly more negative after the Act. These results suggest that insiders increased their relative emphasis on post-event versus pre-event informed trading, after the Act.

Finally, I examine the informativeness of earnings announcements before and after the Act. I find that the earnings response coefficient is larger after the Act, consistent with less informed trading and price discovery prior to earnings announcements. [11] However, I find little evidence that decline in informed trading contributed to more informative earnings announcements. Prior to the Act, insider purchase transactions are negatively related to price reactions of earnings

[11] The earnings response coefficient is the coefficient of earnings surprise in a regression of market price reaction around announcement days on earnings surprise.

announcements, consistent with the view that insider purchases cause price discovery before earnings announcements (the more insiders purchase prior to earnings announcement, the less price reaction to earnings announcement). And the negative relation between insider purchases and price reactions is reversed after the Act. However, the tests that utilize net insider trading activity or insider sales yield statistically insignificant results.

The affects of Sarbanes-Oxley Act on insider trading and the relation between insider trading and earning surprise have policy implications. The Act was passed in response to corporate scandals around the turn of the century and it is subject to revisions. Actually, the U.S. General Accounting Office (GAO) has requested systematic empirical evidence pertaining to the Act. Moreover, recently the Act has been criticized for being too restrictive and costly for US corporations and capital markets.[12]

[12] Zhang (2007) shows that the Act and its provisions have imposed significant net costs on firms. Engel et al. (2007) point to unintended consequences of the Act by documenting an increase in going-private decisions following the Act.

CHAPTER II

INSIDER TRADING DURING THE TECHNOLOGY BUBBLE

This chapter is organized as follows. The Section II.1 describes the data and sample, Section II.2. explains the methodology and discusses the empirical results, Section IV includes the robustness tests.

II.1 Data and Sample

In this study, I use data from four different sources. I get insider trading data from Thomson Financial Network (TFN). I use data from the Center for Research in Security prices (CRSP) for stock returns and the CRSP/Compustat merged database for accounting data. I use NYSE Trades and Automated Quotations (TAQ) database for the transactions and quote data. I merge insider trading data from TFN with daily CRSP data using historical CUSIP numbers. The sample includes firms with common stocks (share code 10 and 11) that trade at the New York Stock Exchange (NYSE), at the American Stock Exchange (AMEX), and at the National Association of Securities Dealers Automated Quotation System (NASDAQ). I follow Lakonishok and Lee (2001) to filter insider trading data for inconsistencies between TFN and CRSP.[13] I investigate only open-market transactions by top management (CEOs, chairman of board, CFOs, directors, officers, and executives).

[13] Due to erroneous reporting of insider transactions, I delete the following insider transactions: (i) the transactions with missing prices and number of shares; (ii)the transactions with price which is not within twenty percent range of daily CRSP price; (iii) the transactions in which number of shares an insider trades is larger than twenty percent of firms' outstanding shares; (iv) the transactions less than 100 shares; (iv) the transactions in which number of shares traded is larger than CRSP daily share volume; and (v) the transactions which are duplicates.

During this period many technology firms had either no earnings or negative earnings. Hence, commonly used price to fundamental ratios (i.e., Price/Earnings) can not differentiate between a distressed old economy firm and a highly priced technology firm. I use the price-to-sale (P/S) ratio in order to identify technology stocks that are more likely to be overvalued. For each month during the 1998-2000 period, I compute P/S ratio using end-of-month market capitalization and sales figures that are lagged at least six months and. I sort NASDAQ stocks based on P/S ratio and form five portfolios based on P/S quintile breakpoints. I rebalance these portfolios every month. In Figure II.1, I graph the value weighted return indices of NASDAQ stocks in the highest, the middle and the lowest P/S quintile.

Figure II.1 shows that the price index of NASDAQ stocks in the highest P/S quintile increased four times by March 2000 and about half of the gains were wiped out by the end of the same year. This trend is similar to those reported in studies which only focus on internet stocks (i.e., Ofek and Richardson (2003)). I refer to NASDAQ stocks in the highest P/S quintile as technology stocks. This parsimonious classification is also used in studies such as Brunnermeier and Nagel (2004) and Dass, Massa and Patgiri (2008) which investigate hedge funds' and mutual funds' trading at technology stocks during this period. I follow this classification because it enables me to investigate insider trading activity in technology stocks (such as Sun Microsystems and EMC) which are not internet stocks but had high prices during this period.

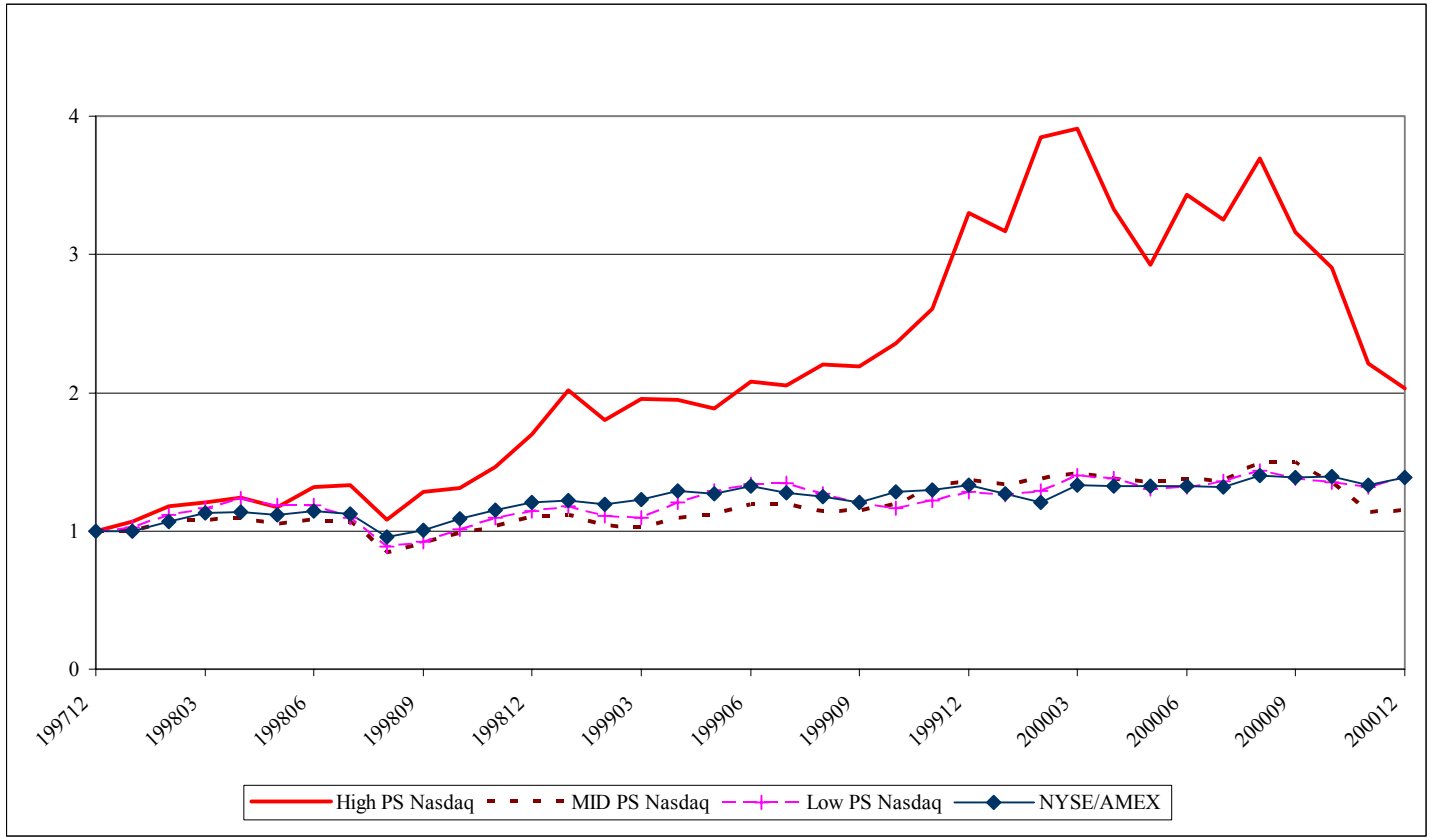

Figure II.1: Return Index

The NASDAQ stocks are grouped into five portfolios based on Price/Sales ratio at the end of each month from December 1997 to December 2002. Then value weighted monthly returns of each portfolio is compounded to compute return indices. The figure shows the value weighted return indices for (I) NASDAQ portfolios with highest Price/Sales ratio, (II) NASDAQ portfolios with Mid-level Price/Sales ratio, (III) NASDAQ portfolios with lowest Price/Sales ratio and (IV) NYSE/AMEX portfolio.

II.2 Empirical Results

I report annual summary statistics on insider transactions for technology stocks, Other NASDAQ Stocks and NYSE/AMEX Stocks in Panel A of Table II.1. I subtract monthly insider sales from insider purchases in each stock to determine monthly net purchases. I annualize the monthly insider purchases, sales and net purchases at stock level and compute annual summary statistics for the period of 1998-2000.

The first row summarizes the fraction of firms with at least one insider transaction. The fraction of technology stocks with insider sales is higher than the fraction of Other NASDAQ Stocks with insider sales. The second row shows that the average number of insider sales in technology stocks is higher than the average number of insider sales in Other NASDAQ Stocks. Moreover, the average number of insider purchases in technology stocks is lower than the average number of insider purchases in Other NASDAQ Stocks and NYSE/AMEX Stocks. I define the average percent share volume (average percent dollar volume) as the average of insider share (dollar) volume scaled by outstanding shares and report the statistics in row three (four). The last two rows document the total dollar volume and share volume (in millions). The statistics on insider sales and insider net purchases are similar; hence I omit interpretation of net purchases. Overall statistics suggest that the insider sales at technology stocks are larger than the insider sales at both Other NASDAQ stocks and NYSE/AMEX stocks.

Table II.1, Panel B reports the number of technology stocks with a price peak in each quarter during 1999-2000. The table includes only the price peaks of the sub-

sample of technology stocks that are investigated in the rest of the study.[14] For each stock, I construct a monthly total return index from 1998 to 2000. I define the price peak as the calendar month end in which the total return index reached its highest level. The technology stocks are comprised of NASDAQ stocks that were in the highest P/S quintile of NASDAQ at the time of their peak. I examine only stocks that peaked in 1999 or 2000 since most technology stocks reached their highest valuations in these years. The NASDAQ index reached its highest level in March 2000, and not surprisingly the first quarter of 2000 has the most number of stock peaks. However, the table shows that some technology stocks peaked as early as in the first quarter of 1999 but some technology stocks peaked after the market peak.

II.2.A Insider Trading Around Individual Stock Price Peaks

Seyhun (1988, 1992) document that aggregate insider trading activity predicts future market movements. Lakonishok and Lee (2001) document a positive relation between aggregate insider trading and aggregate returns. An earlier study, Seyhun (1990) investigates insider trading around the market crash of 1987 and concludes that overreaction was an important part of crash. I conduct an event study to examine the insider trading activity around individual stock price peaks during the technology bubble. If insiders have superior information about their firms' cash flows, then their aggregated trades should reflect their view about fundamentals.

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[14] Some Nasdaq stocks drops out of the sample because of data requirements in empirical analysis. I require stocks to exist at least twelve month in 1998 to construct their price indices. I further require stocks to have at least four years of data for the time series test in the next section. The frequency distribution of price peaks is similar when I consider all stocks that are classified as technology stock based on P/S quintiles.

Table II.1: Descriptive Statistics

Panel A reports annual summary statistics of insider transactions for High PS NASDAQ, Other NASDAQ and NYSE/AMEX stocks from January, 1998 to December 2000. Purchases and sales include open market transactions of CEO/Chair, officers, executives and board of directors. Net purchases is computed as the difference between purchase and sale transactions at a firm. The monthly purchases, sales, and net purchases are annualized for each firm and then averaged across firms. Fraction refers to the average fraction of firms with at least one insider transaction. Number of trades is the average number of trades per company. Average percent share volume is the average of insider share volume scaled by outstanding shares. Average percent dollar volume is the average of insider dollar volume scaled by market capitalization. Total number of shares and total dollar volume are in millions. P-values from Wilcoxon two-Sample test that use High P/S NASDAQ stocks as benchmark are reported in parenthesis. Panel B reports the number of price peaks in each quarter during 1999-2000. It includes only High P/S NASDAQ stocks that have 97 months of data. ***, **, and * denote significant at 1%, 5% and 10% level respectively.

Panel A. Summary Statistics

	High PS NASDAQ Median # of Firms: 607			Other NASDAQ Median # of Firms: 1,058			NYSE/AMEX Median # of Firms: 915		
	Purchases	Sales	Net Purchases	Purchases	Sales	Net Purchases	Purchases	Sales	Net Purchases
Fraction of Firms with Insider Transactions	0.48	0.74	0.88	0.55	0.59 *	0.81 *	0.61	0.69	0.87
				(0.38)	(0.08)	(0.08)	(0.19)	(0.19)	(1.00)
Number of Trades	2.62	22.54	-22.67	3.62	8.20 *	-5.71 *	3.59 *	13.02	-10.89
				(0.08)	(0.08)	(0.08)	(0.08)	(0.19)	(0.19)
Average Percent Share Volume	0.35%	1.40%	-0.99%	0.54% *	1.10% *	-0.44% *	0.16% *	0.53% *	-0.31% *
				(0.08)	(0.08)	(0.08)	(0.08)	(0.08)	(0.08)
Average Percent Dollar Volume	0.34%	1.38%	-1.19%	0.53% *	1.08% *	-0.74% *	0.16% *	0.53% *	-0.42% *
				(0.08)	(0.08)	(0.08)	(0.08)	(0.08)	(0.08)
Total Number of Shares (milions)	43.8	758.3	-714.5	99.6	410.7	-311.1	66.0	705.9	-639.8
Total Dollar Volume (millions)	510	50,899	-50,389	695	12,787	-12,092	1,424	35,851	-34,426

Panel B. Frequency of Stock Price Peaks

Year	Quarter	Number of Peaks
1999	1	5
	2	11
	3	3
	4	17
2000	1	91
	2	24
	3	68
	4	34
Total		253

I measure aggregate insider trading activity at technology stocks, Other NASDAQ Stocks and NYSE/AMEX Stocks using the Net Purchase Ratio (NPR).[15] NPR is defined as the difference between the number of insider purchases and sales as fraction of total number of insider transactions.

$$\text{NPR}= \frac{Purchases - Sales}{Purchases + Sales} \tag{1}$$

I investigate the insider trading activity around individual stock price peaks in a spirit of event study. I align monthly insider transactions at each stock in event time (time zero equals the peak month). I aggregate insider transactions within in each three groups of stocks and calculate three different NPR series based on aggregated numbers. I run time series regressions of NPR for three groups of stocks separately. In the regressions, I include dummy variables for the peak month and up to four quarters (three-month peroids) before and after the peak. These dummy variables enable me to examine the abnormal insider trading activity around the peaks. I require stocks to have at least four years of data before and after their peaks to be included in calculation of NPR.[16] NPR series is positively auto-correlated, hence I allow for first order autocorrelation in error term in time series tests.

[15] Seyhun (1990) use purchase ratio while investigating insider trading around the market crash of 1987. Lakonishok and Lee (2001) make use of net purchase ratio to investigate the return predictability of insider trading.

[16] I repeat my tests requiring stocks to have only four years of data before their peaks. The results remain similar. See Section IV for more details.

(2)

$$\text{InsiderTradingVariable}_t = \alpha_0 + \alpha_1 I(t)_{-12,-10} + \alpha_2 I(t)_{-9,-7} + \alpha_3 I(t)_{-6,-4} + \alpha_4 I(t)_{-3,-1} + \alpha_5 I(t)_0 + \alpha_6 I(t)_{1,3} + \alpha_7 I(t)_{4,6} + \alpha_8 I(t)_{7,9} + \alpha_9 I(t)_{10,12} + v_t$$

where $v_t = \varphi\, v_{t-1} + \varepsilon_t$ with $\varepsilon_t\ N(0,\sigma^2)$ and $I_{a,b}(t) = 1$ *if* $t \in [a,b]$

and $I_{a,b}(t) = 0$ *otherwise*

Table II.2, Panel A reports the results for three NPR series The intercept terms show the average (mean) level of NPR for each series outside one year around the peaks. The coefficients of the quarter and the peak month dummy variables show the difference of NPR from its mean, hence measure abnormal insider trading activity in those periods.

The NPR series can take values between minus one and plus one. It equals to minus (plus) one when all insider transactions are sales (purchases). The intercept is negative for the technology stocks (- 0.756), Other NASDAQ stocks (- 0.604) and NYSE/AMEX stocks (- 0.678) and this result confirms that insiders are on average sellers. For technology stocks, the NPR is around its lower limit (- 0.756 - 0.227= - 0.983) in the peak month suggesting that almost all insider transactions in the peak month were sales. The coefficient of the quarter dummies ($I_{-9,-7}$, $I_{-6,-4}$, and $I_{-3,-1}$) for the three quarters before the peak are negative and significant for the technology stocks. This shows that NPR for technology stocks in each quarter before the peak is lower than its mean. The coefficients of dummy variables for quarters after the peaks are not significant for the technology stocks. Finally, none of the coefficients of quarter dummy variables are significant for Other NASDAQ stocks and NYSE/AMEX stocks.

Table II.2: Time Series Regression of Monthly Insider Trading Activity around Stock Price Peaks

Panel A reports the results for time series test of Net Purchase Ratio (NPR) for High PS NASDAQ portfolio, Other NASDAQ portfolio and NYSE/AMEX portfolio. NPR is defined as the ratio of net insider purchases (purchases - sales) over total insider transactions (purchases + sales). Purchases and Sales are first summed across the firms in each portfolio and NPR of each portfolio is computed using aggregated data. Sample includes firms that have data for 97 months around their peak months. The indicator variable $I(t)_t$ equals one for period t relative to the peak month and equals zero otherwise (e.g., I_0 equals one when insider trading activity belongs to the peak month, and it equals zero otherwise. $I_{-3,-1}$ equals one when insider trading activity belongs to one, two and three months prior to the peak month, and it equals zero otherwise). The insider trading activity is based on number of transactions. Time series analysis is based on first on first order autoregressive error model. Panel B reports the estimates using series of insider purchases and sales separately. P values are in parentheses. ***, **, and * denote significant at 1%, 5% and 10% level respectively.

Panel A. Net Purchase Ratio

		N	Intercept	$I_{-12,-10}$	$I_{-9,-7}$	$I_{-6,-4}$	$I_{-3,-1}$	I_0	$I_{1,3}$	$I_{4,6}$	$I_{7,9}$	$I_{10,12}$
NPR	High PS NASDAQ	253	-0.756 ***	-0.054	-0.165 **	-0.142 *	-0.185 ***	-(0.23)**	-0.103	-0.122	-0.048	-0.132
			(0.00)	(0.50)	(0.05)	(0.09)	(0.03)	(0.03)	(0.23)	(0.15)	(0.57)	(0.11)
	Other NASDAQ	506	-0.604 ***	0.109	-0.042	0.078	0.009	-0.062	-0.011	-0.111	0.074	0.127
			(0.00)	(0.27)	(0.72)	(0.51)	(0.94)	(0.64)	(0.93)	(0.35)	(0.52)	(0.20)
	NYSE/AMEX	586	-0.678 ***	0.090	0.023	-0.060	-0.135	-0.147	-0.043	-0.150	0.043	-0.026
			(0.00)	(0.34)	(0.82)	(0.57)	(0.22)	(0.23)	(0.69)	(0.16)	(0.68)	(0.78)

Panel B. Sales and Purchases

		N	Intercept	$I_{-12,-10}$	$I_{-9,-7}$	$I_{-6,-4}$	$I_{-3,-1}$	I_0	$I_{1,3}$	$I_{4,6}$	$I_{7,9}$	$I_{10,12}$
Sales	High PS NASDAQ	253	0.452 ***	0.208	0.296 **	0.427 ***	0.568 ***	1.041 ***	0.242	0.143	-0.044	-0.031
			(0.00)	(0.15)	(0.04)	(0.00)	(0.00)	(0.00)	(0.10)	(0.33)	(0.76)	(0.83)
	Other NASDAQ	506	0.600 ***	-0.048	0.013	-0.009	0.015	0.626 ***	-0.110	-0.049	-0.090	-0.087
			(0.00)	(0.74)	(0.94)	(0.96)	(0.94)	(0.00)	(0.56)	(0.79)	(0.60)	(0.54)
	NYSE/AMEX	586	0.828 ***	0.009	0.252	0.190	0.205	(0.99)	0.161	0.227	-0.057	-0.032
			(0.00)	(0.97)	(0.37)	(0.51)	(0.50)	0.003 ***	(0.59)	(0.44)	(0.84)	(0.90)
Purchases	High PS NASDAQ	253	0.055 ***	0.003	-0.030 *	-0.012	-0.029	-0.052 **	-0.001	-0.016	-0.013	-0.034 **
			(0.00)	(0.85)	(0.10)	(0.50)	(0.11)	(0.03)	(0.95)	(0.38)	(0.46)	(0.05)
	Other NASDAQ	506	0.126 ***	0.052 **	0.005	0.036	-0.001	-0.012	-0.019	-0.021	0.022	0.021
			(0.00)	(0.04)	(0.84)	(0.16)	(0.95)	(0.73)	(0.46)	(0.42)	(0.40)	(0.40)
	NYSE/AMEX	586	0.130 ***	0.090 ***	0.102 ***	-0.001	-0.052	-0.045	0.010	-0.014	0.034	-0.001
			(0.00)	(0.01)	(0.01)	(0.97)	(0.16)	(0.36)	(0.78)	(0.70)	(0.35)	(0.99)

These findings suggest that there were abnormal insider trading activity at technology stocks in the ten months before their peak month; and this abnormal activity is not observed in other stocks that peaked in the same period.

NPR captures both the number of insider sales and purchases and the abnormal levels of NPR may be due to large number of insider sales or low number of insider purchases during the pre-peak period. I repeat my tests using number of insider sales and purchases (in millions) as a measure of insider trading activity. I report the results in Panel B of Table II.2. For technology stocks, the total number of sale transactions is significantly higher than its mean in each of the three quarters before the peak and in the peak month. The total number of purchases in technology stocks was significantly low only in the third quarter prior to the peak month and in the peak month. These findings show that insiders in technology stocks not only increased their sales starting three quarters prior to peaks but also decreased their purchased less in the third quarter prior to the peaks.

Figure II.1 shows that price index of technology stocks doubled in the ten months prior to the NASDAQ market peak in March, 2000. Further investigation (not reported) shows that the technology stocks in the sample had 199.57% return (value weighted) during the ten months prior to the peaks. Other NASDAQ stocks and NYSE/AMEX stocks had 130% and 68% returns during their pre-peak period. The findings in this part suggest that tech-insiders sold their shares heavily during the steep price run-up prior to the peaks.

II.2.B Cross Sectional Tests

Jenter (2005) and Marin and Oliver (2007) suggest that insider sales contain information. Meulbroek (2000) argues that insiders of internet firms have an incentive to sell their share holdings because of high volatility of these stocks.[17] The abnormal tech-insider sales reported in the previous section may be based on information. Alternatively, insider sales may be driven by their portfolio rebalancing needs that are exacerbated by rising prices and high volatilities. In this section, I try to disentangle these two alternatives by making use of cross-sectional analysis.

II.2.B.1 Demeaned and Scaled Net Insider Purchases

The net purchase ratio, that is utilized to investigate aggregate insider trading activity in time series, is a poor measure of insider activity at stock level. When insiders of a firm do not trade in a month the NPR is undefined.[18] More importantly, at stock level the NPR does not capture the magnitude of abnormal insider trading activity. Different insiders of a firm generally trade in the same direction and NPR practically shows only the direction of insider trading activity at stock level. In order to facilitate cross sectional analysis, I use net share purchases as a fraction of firms' outstanding shares (NSP).

$$\text{NSP} = \frac{\text{Purchases} - \text{Sales}}{\text{Shares Outstanding}} \tag{3}$$

[17] Ittner, Lambert, and Larcker (2003) document that the equity compensation in high technology firms substantially exceeds the equity compensation in large, "old-economy" manufacturing firms.
[18] To overcome this problem, Seyhun (1990) groups stocks into 100 portfolios based on size and beta. Alternatively, Lakonishok and Lee (2001) aggregate prior six months insider trading activity at stock level.

Insiders receive their firms' stock through their compensation package and they are expected to sell their shares sometime regardless of price levels. In fact, some firms announce the amount of shares that insiders plan to sell ahead of time. In order to capture abnormal insider trading activity which is likely to be informative, I demean net share purchases using its time series mean (ΔNSP).

$$\Delta NSP = NSP - \overline{NSP} \quad \text{where } \overline{NSP} \text{ is time series mean of NSP} \tag{4}$$

To alleviate look-ahead bias, I compute the mean of scaled net share purchases using data until the beginning of the calendar year of the observation. I require stocks to exist at least twelve months before the observation month and to have at least one month in which net share purchases is different from zero. I refer to this demeaned and scaled net shares purchases (ΔNSP) as abnormal net insider trading in the rest of the study.

II.2.B.2 Insider Trading Activity Controlling for Portfolio Rebalancing Needs

In this section, I run cross sectional regressions of abnormal insider trading activity on proxy variables for insiders' portfolio rebalancing needs. I pool monthly abnormal insider trading (ΔNSP) of all stocks during the twelve months before and after their peaks. I create dummy variables and their interactions for the technology stocks, the peak month and the pre-peak period. Insiders are likely to sell more shares when their firms' stock has higher risk. I control for the effects of risk on insiders trading incentives by volatility.[19] The insiders are likely to sell more shares as prices go up. I control for the effects of rising prices on insider trading motives, I include the cumulative returns from January 1998 until the observation month (price run-up). I

[19] I define volatility as the standard deviation of daily returns in the previous month.

control for firm size (log of market capitalization), which previous studies have shown to effect the insider trading. Finally, I include lagged value of the abnormal insider trading activity to control for autocorrelations.

Table II.3: Cross Sectional Regressions of Abnormal Insider Trading Activity

This table reports the results from cross sectional tests of abnormal insider trading activity around stock price peaks. Net Share Purchases (NSP) is defined as purchases minus sales and it is scaled by shares outstanding. NSP is demeaned using its time series mean (ΔNSP). The ΔNSP of High P/S NASDAQ stocks, Other NASDAQ stocks, and NYSE/AMEX stocks in the twelve months before and after the peaks are pooled together for cross sectional test. Peak is a dummy variable that equals one if the observation belongs to the peak month and zero otherwise. Pre-Peak is a dummy variable that equals one if the monthly observation belongs to one to twelve months prior to the peak month and zero otherwise. High P/S NASDAQ is a dummy variable that equals one if a firm was at the highest P/S quintile of NASDAQ when it peaked and zero otherwise. Price Run-up is the compounded returns from January, 1998 to the observation month. Volatility is the standard deviation of daily prices in the month prior to the observation month. Size is defined as logarithm of market capitalization and lagged one month. Lagged value of ΔNSP is included to control for autocorrelations. P-values based on robust standard errors which are corrected for clustering are in parentheses. ***, **, and * denote significant at 1%, 5% and 10% level respectively.

	(1)	(2)	(3)	(4)
High PS NASDAQ x Pre-Peak	-0.0564***	-0.0625***	-0.0588***	-0.0638***
	(0.00)	(0.00)	(0.00)	(0.00)
Pre-Peak Dummy	0.0016	-0.0014	0.0003	-0.0022
	(0.76)	(0.79)	(0.96)	(0.69)
High PS NASDAQ	0.0220***	0.0375***	0.0315***	0.0435***
	(0.01)	(0.00)	(0.00)	(0.00)
Peak	-0.0682***	-0.0676***	-0.0682***	-0.0677***
	(0.00)	(0.00)	(0.00)	(0.00)
High PS NASDAQ x Peak	-0.0578**	-0.0511*	-0.0587**	-0.0524*
	(0.04)	(0.07)	(0.03)	(0.06)
Price Run-up		-0.0072***		-0.0066***
		(0.00)		(0.00)
Volatility			-0.4370***	-0.3321***
			(0.00)	(0.01)
Size	-0.0005	0.0006	-0.0024*	-0.0010
	(0.71)	(0.65)	(0.06)	(0.47)
Lagged Δ NSP	0.0002***	0.0002***	0.0002***	0.0002***
	(0.00)	(0.00)	(0.00)	(0.00)
Constant	0.0032	0.0027	0.0324***	0.0250**
	(0.73)	(0.77)	(0.01)	(0.04)
Number of Observations	33,316	33,316	33,316	33,316
Adjusted R-squared	5.80%	8.20%	6.20%	8.70%

Table II.3 reports the results.[20] Column 1 reports the regression results without controlling for portfolio rebalancing needs. Colum 2 and Column 3 report the results from regressions which control for price run-up and volatility, respectively. Colum 4 reports the result controlling for both price run-up and volatility. The main results from each specification are similar, so I interpret the results from the full model in Column 4. Note that the inclusion of dummy variables for technology stocks, pre-peak period, and peak month leaves the post peak period of NYSE/AMEX stocks and Other NASDAQ stocks as control. The coefficient of the interaction variable for technology stocks (High PS NASDAQ stocks) and the pre-peak period is significant and negative (-0.064). The coefficient of dummy variable for technology stocks is positive and significant (0.044). The sum of these two coefficients is -0.020 and it shows that abnormal tech-insider sales in the pre-peak period were large even after controlling for price run-up and volatility. The coefficient of the peak month dummy variable and coefficient of its interaction with dummy variable for technology stocks is also negative. These show that abnormal tech-insider sales in the peak month were large after controlling for price run-up and volatility. And finally, the coefficients for price run-up and volatility are negative, as expected.

The results in this section show that controlling for the insiders' portfolio rebalancing needs, the abnormal insider sales at technology stocks were large prior to the peaks. In the next section, I further investigate whether these sales contained information

[20] I repeat the tests using abnormal insider trading based on overall time series mean of net share purchases. The results remain similar.

by examining the relation between the abnormal insider trading activity and the subsequent returns for technology stocks.

II.2.B.3 Insider Trading Activity and Post-Peak Returns

If insider trading activity in the pre-peak period is only driven by portfolio rebalancing needs (a naïve contrarian strategy), then there should be no relation between insider trading before the peaks and price declines after the peaks. If insider trading contains information, then abnormal insider trading activity in the pre-peak period should predict price declines in the post peak period.

Figure II.1 shows that the return index of technology stocks lost half of its value in the nine months following the market peak in March, 2000. I compound the returns of stocks in the nine months after the peak (post-peak returns) in order to measure decline in prices [21]. I measure abnormal insider trading activity by demeaned and scaled net share purchases (ΔNSP) as described in section III.B.1. I cumulate monthly ΔNSP of each stock from nine months prior to the peak month to the peak month (event window [-9, 0], ten months) and refer to it as total abnormal insider trading activity (Total ΔNSP). I run regressions of post peak returns on total abnormal insider trading and price run-up, volatility and firm size that computed for the peak month for High P/S NASDAQ stocks, Other NASDAQ stocks and NYSE/AMEX stocks. Also, I pool the total abnormal insider trading and post peak returns of stocks in each group and run the regressions on overall sample. In this regression, I include a dummy variable for

[21] I also investigate compounded returns in 3, 6, 12 and 24 months after the peak. The results are similar.

technology stocks (High PS NASDAQ) and its interaction with total abnormal insider trading activity.

Table II.4: Insider Trading Activity and Post-Peak Returns

This table reports the relation between post-peak returns and total abnormal insider trading activity in the pre-peak period. Post-peak returns are the compounded returns in nine months after the peaks. Abnormal insider trading activity is measured by demeaned net share purchases ΔNSP as defined in Table 3. Total ΔNSP is the sum of monthly ΔNSP in ten months prior to the price peaks and in the peak month. High P/S NASDAQ is a dummy variable that equals one if a firm was at the highest P/S quintile of NASDAQ when it peaked and zero otherwise. Price Run-up is the compounded returns from January, 1998 to the peak month. Volatility is the standard deviation of daily prices in the month prior to the peak month. Size is defined as logarithm of market capitalization in the peak month. P-values based on robust standard errors which are corrected for clustering are in parentheses. ***, **, and * denote significant at 1%, 5% and 10% level respectively.

	High PS NASDAQ	Other NASDAQ	NYSE/AMEX	All
Total Δ NSP	1.5963**	1.0096	1.2511**	1.0485***
	(0.02)	(0.54)	(0.02)	(0.00)
High PS NASDAQ X Total Δ NSP				1.9113***
				(0.00)
High PS NASDAQ				-0.1003***
				(0.00)
Volatility	-2.9476***	-4.0288***	-4.7053***	-4.2480***
	(0.00)	(0.00)	(0.00)	(0.00)
Price Run-up	-0.0068***	-0.0210***	-0.0131*	-0.0127***
	(0.00)	(0.01)	(0.07)	(0.00)
Size	-0.0101	-0.0158*	-0.0077	-0.0068*
	(0.30)	(0.09)	(0.12)	(0.10)
Constant	-0.2462**	-0.0305	-0.0304	-0.0628**
	(0.01)	(0.64)	(0.55)	(0.07)
Number of Observations	253	506	586	1,345
Adjusted R-squared	12.00%	13.00%	16.00%	20.00%

Table II.4 reports the results. Note that Total ΔNSP for the ten months before the peaks (pre-peak period) is negative since insiders were heavy sellers in the pre-peak period. The post-peak returns are negative as prices declined after the peak. The first

column shows that the total abnormal insider trading activity (Total (ΔNSP)) in technology stocks is positively related to the post peak returns. In the second column, the coefficient of Total ΔNSP is positive but insignificant. Hence, total insider trading activity is not related to post-peak returns of Other NASDAQ stocks. The third column shows that total abnormal trading activity in NYSE/AMEX stocks is also related post-peak returns. In column 4, the coefficient for the High PS NASDAQ indicator variable is negative and significant; hence total insider trading in technology stocks was more negative than those in other stocks. Also, the interaction of High PS NASDAQ dummy variable and total insider trading activity is positive and significant, which suggests that tech-insider trading in the pre-peak period contained information. In all tests volatility is negatively related to the post peak returns. This shows that the prices of riskier stocks dropped more in the post peak period. Price run up is also negatively related to the post-peak returns. The stocks with large increases in their valuations in the previous two years had larger price declines in the post peak period.

Table II.4 suggests that technology stocks that were sold more extensively by insiders in the pre-peak period had larger price declines in the post peak period. Hence, the abnormal insider activity in the pre-peak period was not only insiders' response to rising prices.

The results in Table II.2 show that there were large insider sales in the peak month and technology insiders were heavy sellers during the nine months prior to the peaks. The relation between the total abnormal insider trading and the post peak returns may be largely driven by the abnormal sales in the peak month. On the other hand, the

abnormal tech-insider trading activity many months before the peaks may predict the post peak returns. I further investigate the abnormal tech-insider trading activity many months before the peaks and post peak returns. More specifically, I run separate regressions using Total ΔNSP that is calculated by dropping abnormal tech-insider trading for the month closest to the peak month one at a time.

Table II.5 reports the results from regressions that include Total ΔNSP for various pre-peak event windows in Columns 2 to Column 10. The other variables in the regression are measured at the time of the peak month as in Column 1. The coefficients of Total ΔNSP for various event windows show that the abnormal insider sales as early as nine months before the peaks are positively related to price declines; hence contained information.[22]

II.2.C Net Order Flow and Insider Trading

The order flow may be a signal of private information and cause market makers to update their price and quantity quotations. Hence, order flow can reduce liquidity and move prices permanently consistent with information asymmetry models (Kyle (1985), Glosten and Milgrom (1985), Easley and O'Hara (1987)). Inventory models (Stoll (1978), Ho and Stoll (1983) and Spiegel and Subrahmanyam (1995)) imply that market makers revise their bid-ask spreads when they face inventory problems caused by order flows. Consistent with theory, Chordia, Roll and Subrahmanyam (2002) and Chordia,

[22] In the table Total ΔNSP of [-9, -4] is insignificant but positive. Unreported results show that the monthly abnormal insider trading activity (ΔNSP) in the nine, seven , three, and one month before the peak months are positively related to post peak returns.

Table II.5: Tech Insider Trading Activity and Post-Peak Returns

This table reports the relation between post-peak returns and total abnormal insider trading activity in the pre-peak period. Post-peak returns are the compounded returns in nine months after the peaks. Abnormal insider trading activity is measured by demeaned net share purchases ΔNSP as defined in Table 3. Total ΔNSP is the sum of monthly ΔNSP in the event window. The event window shows event months over which the total ΔNSP is calculated. All windows start in the ninth month before the peak month. The first window end in the peak month (t=0) and from left to right the windows drop one event month closest to the peak month. (i.e., [-9,0] includes all months in the pre-peak period and [-9,-9] window includes only the ninth month before the peak). The sample includes only High P/S NASDAQ stocks. Price Run-up is the compounded returns from January, 1998 to the peak month. Volatility is the standard deviation of daily prices in the month prior to the peak month. Size is defined as logarithm of market capitalization in the peak month. P-values based on robust standard errors which are corrected for clustering are in parentheses. ***, **, and * denote significant at 1%, 5% and 10% level respectively.

Window	[-9,0]	[-9,-1]	[-9,-2]	[-9,-3]	[-9,-4]	[-9,-5]	[-9,-6]	[-9,-7]	[-9,-8]	[-9,-9]
Total Δ NSP	1.596	1.406	1.194	1.938	1.011	2.568	3.063	3.196	4.049	5.264
	(0.02)**	(0.04)**	(0.07)*	(0.01)**	-0.25	(0.00)***	(0.00)***	(0.00)***	(0.02)**	(0.00)***
Volatility	-2.948	-2.981	-2.991	-2.973	-2.962	-2.985	-2.989	-3.003	-2.986	-2.935
	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***
Price Run-up	-0.007	-0.007	-0.007	-0.007	-0.007	-0.007	-0.007	-0.008	-0.007	-0.008
	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***
Size	-0.01	-0.01	-0.009	-0.009	-0.009	-0.009	-0.009	-0.009	-0.009	-0.009
	(0.30)	(0.33)	(0.34)	(0.34)	(0.37)	(0.33)	(0.36)	(0.37)	(0.37)	(0.37)
Constant	-0.246	-0.25	-0.253	-0.255	-0.259	-0.252	-0.255	-0.256	-0.258	-0.26
	(0.01)**	(0.01)**	(0.01)**	(0.01)**	(0.01)***	(0.01)**	(0.01)**	(0.01)**	(0.01)***	(0.01)***
Number of Observations	253	253	253	253	253	253	253	253	253	253
Adjusted R-squared	12.00%	12.00%	11.00%	12.00%	11.00%	12.00%	12.00%	12.00%	11.00%	11.00%

and Subrahmanyam (2004) show that net order flow is positively related to stock returns.

Lin and Rozeff (1995) suggest that 85% to 88 % of insiders' private information is incorporated into prices within one day. Earlier studies (Givoly and Palmon (1985), Meulbroek (1992), Cornell and Sirri (1992) and Chakvarty and McConnell (1997)) suggest that insider trading facilitates rapid price discovery on insider trading days. Consistent with microstructure theories, the abnormal insider trading activity may be a signal of private information. When insiders trade excessively, other market participants may realize existence of an informed trader and insiders' information will be incorporated to the prices. To the extent other market participants follow the insiders there will be net order flow in the same direction of insider trading activity.

I investigate the relation between the net order flows and abnormal insider trading activity at 1,345 stocks from January, 1996 to August, 2002. I classify intraday trades using Lee and Ready (1991) algorithm as buyer initiated or seller initiated trades. In this algorithm, if a trade is executed at a price higher (lower) than the prevailing quote midpoint then it is classified as a buyer (seller) initiated trade. If a trade is executed at the quote midpoint then it is classified as buyer (seller) initiated trade based on the previous transaction price (i.e., if the transaction price is higher (lower) than previous transaction price then it is buyer (seller) initiated trade). I calculate weekly net order flows ($OIBSHR_{i,t}$) as the difference between share volume of buyer initiated and seller initiated transactions as a fraction of total share volume in a week. I measure abnormal

net insider trading ($\Delta NSP_{i,t}$) as described in section III.B.1, but I use insider transactions at weekly level rather then monthly level.[23]

I run firm-fixed-effects regressions of weekly net order flow on abnormal insider trading activity, the contemporaneous returns, and the lagged values of the net order flows and the returns up-to four weeks. In order to investigate the relation between net order flows and abnormal insider trading activity during the pre-peak period, I include a dummy variable for the pre-peak period and its interaction with the contemporaneous abnormal insider trading. Specifically, I estimate the following regression equation using separate data panels for High P/S NASDAQ stocks, Other NASDAQ stocks and NYSE/AMEX stocks.

(5)

$$OIBSHR_{i,t} = \alpha + \beta_1 \Delta NSP_{i,t} + \beta_2 \Delta NSP_{i,t} \times \Pr epeak + \beta_3 \Pr epeak + \beta_4 RET_{i,t} + \sum_{k=1}^{4} \lambda_{t-k} \Delta NSP_{i,t-k} + \sum_{k=1}^{4} \gamma_{t-k} OIBSHR_{i,t-k} + \sum_{k=1}^{4} \delta_{t-k} RET_{i,t-k} + u_{i,t}$$

$$with\ u_{i,t} = \mu_i + \varepsilon_{i,t}\ where\ i=1,..,number\ of\ stocks\ \ and\ t=1..340$$

The contemporaneous returns ($RET_{i,t}$), lagged returns ($RET_{i,t-k}$) and lagged net order flow ($OIBSHR_{i,t-k}$) is included in the regressions as previous studies (i.e., Chordia and Subrahmanyam (2004)) show that the net order flow is positively related to the contemporaneous returns and the net order flow is positively auto-correlated.

[23] Insider trading activity is quite infrequent at daily level. In order to eliminate biases created by large number of non-insider trading days, I run the tests at weekly level. The tests using daily abnormal insider trading and daily net order flows yield economically similar results.

Table II.6, Panel A reports the correlation structure for the main variables. The net order flow and abnormal insider trading are positively correlated. While the correlation coefficient is low, it is statistically significant. The abnormal insider trading is negatively correlated with the contemporaneous returns. The abnormal insider trading and lagged abnormal insider trading are highly correlated.

Table II.6, Panel B reports the results from firm-fixed-effects regressions in equation 5. The net order flow is positively related to the abnormal insider trading activity. The pre-peak dummy variable is positive but only significant for technology stocks. This shows that there were more buyer (or less seller) initiated trades at technology stocks during the pre-peak period. The interaction of pre-peak dummy variable and abnormal insider trading activity is negative. These results suggest the positive relation between net order flows and abnormal insider trading was weaker during the pre-peak period.

II.3 Robustness Tests

I document that that tech-insiders were heavy sellers during ten months prior to the price peaks. In this section, I provide additional tests to show that the results are not driven by sample selection or variable definitions.

In time series regression, I require sample stocks to exist four years before and after the peaks. Especially, the requirement of four years of data after the peaks may introduce a survivorship bias as many technology firms failed after 2000. I repeat my time series tests requiring stocks to have only four years of data before the peaks. I report the results in Table II.7, Panel A. Similar to the results in Panel A of Table II.2, I

Table II.6: Net Order Flow and Abnormal Insider Trading Activity

Panel A reports the correlation matrix for the main variables. Panel B reports the results from firm-fixed-effects regressions of weekly net order flow on weekly abnormal insider trading, contemporaneous returns, lagged abnormal insider trading, returns, and net order flows. The sample includes weekly trading activity of 1,345 firms from January 1996 to August, 2002. The regressions are run on three separate panels for High P/S NASDAQ stocks, Other NASDAQ stocks and NYSE/AMEX stocks. The intraday transactions are classified as buyer or seller initiated transactions using Lee and Ready (1991) algorithm. Net order flow, OIBSHR, is defined in terms of share volume (buyer initiated transactions minus seller initiated transactions scaled by total transactions). Abnormal insider trading, ΔNSP , is defined as the difference between net number of share purchases (purchases minus sales as a fraction of shares outstanding) and its historical time series mean. Pre-peak is a dummy variable that equals one if observation belongs to the weeks in the ten months prior to the price peaks and zero otherwise. ***, **, and * denote significant at 1%, 5% and 10% level respectively.

Panel A: Correlation Matrix

	High PS NASDAQ					Other NASDAQ					NYSE/AMEX				
	$OIBSHR_t$	$OIBSHR_{t-1}$	ΔNSP	ΔNSP_{t-1}	RET_t	$OIBSHR_t$	$OIBSHR_{t-1}$	ΔNSP	ΔNSP_{t-1}	RET_t	$OIBSHR_t$	$OIBSHR_{t-1}$	ΔNSP	ΔNSP_{t-1}	RET_t
$OIBSHR_t$	1.00					1.00					1.00				
$OIBSHR_{t-1}$	0.20	1.00				0.19	1.00				0.30	1.00			
	(0.00)					(0.00)					(0.00)				
ΔNSP	0.01	-0.03	1.00			0.01	-0.03	1.00			0.02	-0.02	1.00		
	(0.00)	(0.00)				(0.03)	(0.00)				(0.00)	(0.00)			
ΔNSP_{t-1}	0.01	0.01	0.24	1.00		-0.00	0.01	0.19	1.00		-0.00	0.02	0.18	1.00	
	(0.11)	(0.00)	(0.00)			(0.53)	(0.03)	(0.00)			(0.04)	(0.00)	(0.00)		
RET_t	0.34	-0.01	-0.03	-0.00	1.00	0.34	-0.01	-0.03	0.00	1.00	0.28	-0.01	-0.02	-0.00	1.00
	(0.00)	(0.00)	(0.00)	(0.73)		(0.00)	(0.00)	(0.00)	(0.10)		(0.00)	(0.01)	(0.00)	(0.75)	
RET_{t-1}	0.05	0.34	-0.03	-0.03	-0.03	0.06	0.34	-0.02	-0.03	-0.05	0.05	0.28	-0.04	-0.02	-0.04
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)

Table II.6 Continued

Panel B: Net Order Flow and Abnormal Insider Trading Activity

	High PS NASDAQ	Other NASDAQ	NYSE/AMEX
ΔNSP	0.2474***	0.2109***	0.2795***
	(0.00)	(0.00)	(0.00)
ΔNSP X Pre-Peak	-0.2385***	-0.4317***	-0.2384***
	(0.00)	(0.00)	(0.00)
Pre-Peak	0.0003***	0.0001	0.0000
	(0.00)	(0.42)	(0.23)
ΔNSP_{t-1}	0.0114	-0.0243	-0.0510***
	(0.60)	(0.11)	(0.00)
ΔNSP_{t-2}	-0.0221	0.0200	-0.0203*
	(0.31)	(0.19)	(0.09)
ΔNSP_{t-3}	-0.0834***	-0.0273*	-0.0386***
	(0.00)	(0.07)	(0.00)
ΔNSP_{t-4}	0.0380*	0.0688***	0.0120
	(0.08)	(0.00)	(0.31)
$OIBSHR_{t-1}$	0.1508***	0.1613***	0.1903***
	(0.00)	(0.00)	(0.00)
$OIBSHR_{t-2}$	0.0832***	0.0307***	0.1013***
	(0.00)	(0.00)	(0.00)
$OIBSHR_{t-3}$	0.0606***	0.0264***	0.0855***
	(0.00)	(0.00)	(0.00)
$OIBSHR_{t-4}$	0.0465***	0.0103***	0.0761***
	(0.00)	(0.00)	(0.00)
RET_t	0.0283***	0.0320***	0.0199***
	(0.00)	(0.00)	(0.00)
RET_{t-1}	0.0004	0.0024***	0.0005***
	(0.16)	(0.00)	(0.00)
RET_{t-2}	-0.0023***	-0.0007***	-0.0014***
	(0.00)	(0.00)	(0.00)
RET_{t-3}	-0.0020***	0.0006***	-0.0015***
	(0.00)	(0.01)	(0.00)
RET_{t-4}	-0.0015***	-0.0000	-0.0016***
	(0.00)	(0.99)	(0.00)
Constant	-0.0001***	-0.0008***	0.0005***
	(0.00)	(0.00)	(0.00)
Number of Firm-Weeks	82,137	157,982	192,776
Number of Firms	253	504	582
R-squared	16.00%	15.00%	17.00%

find that the Net Purchase Ratio for technology stock was significantly lower in the nine months prior to the peaks and in the peak month.

The previous studies on insider trading literature utilize net purchase ratio based on both number of transactions and number of shares. The ratios calculated based on the number of shares are noisier and most studies have significance when these ratios are computed based on the number of insider transactions (i.e., Seyhun (1992), Lakonishok and Lee (2001)). I also repeat the investigation of Net Purchase Ratio around the price peaks using Net Purchase Ratio series based on number of shares insiders traded. The results in Panel B of Table II.7 show that Net Purchase Ratio based on number of shares was lower in the three quarter and one quarter before the price peaks of technology stocks. The Net Purchase Ratio based on number of shares is also significantly lower in the first quarter after the peaks. Further investigation shows that the tech-stock insiders sold large number of shares at firms that peaked earlier than the market peak in March 2000. Hence, insiders of these technology stocks were able to sell large number shares before the stock prices started to fall.

In this essay, I investigate the insider trading activity during the special bubble period. To highlight uniqueness of insider trading activity at technology firms during this period, I further investigate insider trading activity around stocks peaks in 1996 and 1997. I re-calculate the price indices for individual stocks starting from January, 1995. Then, I classify the stocks into three groups based on P/S quintiles and investigate the Net Purchase Ratio around the price peaks during 1996 and 1997. I report the results in

Panel C of Table II.7. The results show that Net Purchase Ratio was not different from its mean around the peaks during 1996 and 1997.

Table II.7: Robustness Tests

This table reports robustness tests for time series analysis of Net Purchase Ratio (NPR). Panel A, utilize NPR series computed on a sample that only requires sample firms to exist in forty eight months prior to their peaks. N* denotes median number of stocks in each portfolio. Panel B, utilize NPR series computed based on insider share volume. Panel C, investigates NPR series (based on number of transactions) around the price peaks in 1996 and 1997. All other definitions are similar to Table 2. ***, **, and * denote significant at 1%, 5% and 10% level respectively.

Panel A: NPR Series for Large Sample

		N*	Intercept	$I_{-12,-10}$	$I_{-9,-7}$	$I_{-6,-4}$	$I_{-3,-1}$	I_{0}	$I_{1,3}$	$I_{4,6}$	$I_{7,9}$	$I_{10,12}$
NPR	High PS NASDAQ	344	-0.757 ***	-0.032	-0.148 *	-0.141 *	-0.184 **	-0.227 **	-0.102	-0.141	-0.111	-0.144
			(0.00)	(0.69)	(0.10)	(0.09)	(0.05)	(0.05)	(0.27)	(0.12)	(0.21)	(0.14)
	Other NASDAQ	701	-0.622 ***	0.058	-0.071	0.064	0.008	-0.101	0.021	-0.048	0.065	0.101
			(0.00)	(0.57)	(0.58)	(0.65)	(0.96)	(0.54)	(0.89)	(0.73)	(0.61)	(0.32)
	NYSE/AMEX	623	-0.681 ***	0.135	-0.010	-0.074	-0.105	-0.108	0.009	-0.061	0.040	-0.017
			(0.00)	(0.22)	(0.93)	(0.57)	(0.44)	(0.47)	(0.95)	(0.64)	(0.75)	(0.88)

Panel B: NPR Series Computed Based on Number of Shares

		N	Intercept	$I_{-12,-10}$	$I_{-9,-7}$	$I_{-6,-4}$	$I_{-3,-1}$	I_{0}	$I_{1,3}$	$I_{4,6}$	$I_{7,9}$	$I_{10,12}$
NPR	High PS NASDAQ	253	-0.893 ***	-0.018	-0.087 *	-0.067	-0.083 *	-0.098	-0.086 *	-0.063	-0.074	-0.060
			(0.00)	(0.71)	(0.07)	(0.16)	(0.09)	(0.19)	(0.07)	(0.19)	(0.12)	(0.21)
	Other NASDAQ	506	-0.805 ***	0.147 *	-0.130	-0.034	-0.054	-0.118	-0.066	-0.022	-0.038	0.008
			(0.00)	(0.06)	(0.11)	(0.67)	(0.50)	(0.27)	(0.42)	(0.79)	(0.63)	(0.92)
	NYSE/AMEX	586	-0.845 ***	0.085	-0.035	-0.101	-0.135 *	-0.139	-0.081	-0.086	0.025	-0.081
			(0.00)	(0.24)	(0.63)	(0.17)	(0.07)	(0.20)	(0.27)	(0.24)	(0.73)	(0.26)

Panel C: NPR Series around the Price Peaks in 1996 and 1997

		N	Intercept	$I_{-12,-10}$	$I_{-9,-7}$	$I_{-6,-4}$	$I_{-3,-1}$	I_{0}	$I_{1,3}$	$I_{4,6}$	$I_{7,9}$	$I_{10,12}$
NPR	High PS NASDAQ	199	-0.810 ***	0.082	-0.070	-0.105	-0.114	-0.135	-0.072	-0.005	0.043	0.140
			(0.00)	(0.41)	(0.48)	(0.29)	(0.25)	(0.30)	(0.46)	(0.96)	(0.66)	(0.12)
	Other NASDAQ	733	-0.478 ***	-0.007	0.013	0.000	-0.212	-0.264	-0.223	-0.098	-0.074	-0.106
			(0.00)	(0.97)	(0.94)	(1.00)	(0.20)	(0.13)	(0.16)	(0.52)	(0.59)	(0.35)
	NYSE/AMEX	879	-0.708 ***	0.155	0.134	0.039	-0.035	-0.093	-0.048	-0.077	-0.004	0.017
			(0.00)	(0.25)	(0.31)	(0.76)	(0.78)	(0.45)	(0.67)	(0.46)	(0.96)	(0.81)

CHAPTER III

INSIDER TRADING AND EARNINGS SURPRISES: THE CASE OF EXPEDITED DISCLOSURE OF INSIDER TRANSACTIONS

This chapter is organized as follows. Section III.1 summarizes the insider disclosure requirements that are changed by Sarbanes Oxley Act. Section III.2 describes the data and the methodology. Section III.3 discusses the empirical results.

III.1 The Sarbanes-Oxley Act and Insider Disclosure Requirements

Prior to the Sarbanes–Oxley Act of 2002 and subsequent changes in the SEC rules, insiders had to report open market transactions to the SEC by the tenth day of the next month (Form 4 filing). However, certain types of insider transactions could be reported any time within 45 days after the end of the fiscal year (Form 5 filing).

The congress started to discuss Sarbanes–Oxley Act in early 2002 and the SEC substantially tightened the rules on reporting of insider transactions on August 27, 2002. Below, I briefly describe the changes on reporting requirements of insider transactions.[24]

- Form 4 has to be filed electronically on EDGAR within 2 days (The insider has an additional day if trade execution is difficult,).
- The small acquisitions (insider purchases of $10,000 or less) and transactions between the firm and the insider (Rule 16b-3) have to be reported on Form 4 rather then Form 5 that is reported after fiscal year end.

[24] The full list of changes is available at www.sec.gov

Recent empirical studies investigate the Act's presumptions and its affects on issues related Form-5 filing. Cheng, Nagar and Rajan (2007) show that insiders used Form-5 opportunistically to hide their transactions until after the fiscal year end. Prior to the Act, the option grants to executives were reported in Form-5 filing after the fiscal year end which raised option backdating issues. Recent studies (i.e., Heron and Lie (2007) Collins, Gong and Li (2005), Narayanan and Seyhun (2005)) show a sharp decline of option grants that appears to be backdated after the Act. In contrast to these studies, I focus on expedited disclosure of insider open market transactions that were already being reported in Form 4 filings. Specifically, I examine the affect of insider trading disclosure within two business days rather than forty calendar days.

III.2 Data and Methodology

III.2.A Sample Selection

The sample is comprised of 10,395 quarterly earnings announcements by 432 firms over two four-year periods (January 1996 to December 1999 and January 2003 to December 2006)[25]. The data comes from four different sources. I use (i) Thomson Financial Network (TFN) for insider trading data; (ii) Center for Research in Security prices (CRSP) for stock returns; (iii) CRSP/Compustat merged database for accounting data; (iv) Institutional Brokers Estimate System (IBES) for earnings forecasts. I merge the data using CUSIP numbers and examine firms that exist in all four databases.

[25] Sarbanes-Oxley act was preceded by the Selective Disclosure and Insider Trading Regulation Act known as Fair Disclosure (FD) which went into effect in October 2000. Given that it is difficult to attribute changes on insider trading behavior to FD or expectations of stricter regulation during the transitory period, I exclude 2000-2002 from my sample period.

I further require that (i) quarterly announcement dates are available from Compustat; (ii) price, trading volume and return data are available from CRSP; (iii) the firms' common stock is trading either at New York Stock Exchange (NYSE) or at the American Stock exchange (AMEX) (iv) the firms' fiscal year-end date is December 31st; (v) the stock price by the end of quarter is larger than $5; and (vi) each firm has to have at least one earnings announcement before and after the Act. I require the first two criterions to have usable data for the analysis. The third criterion is required to refrain from the effects of technology bubble. The purpose of the fourth criterion is to align the quarterly dates accurately. The fifth criterion is required to eliminate microstructure biases on returns and biases related to firms that are likely to be in financial distress. The last criterion is required to have a comparable sample across two periods.

III.2.B Insider Trading Measures

I follow Lakonishok and Lee (2001) and filter insider trading data to avoid inconsistencies between TFN and CRSP.[26] I investigate only open-market transactions by top management (CEOs, chairman of board, CFOs, directors, officers, and executives).

I define the pre-announcement window to be the month before the earnings announcement ([t- 32, t - 2], where t = earnings announcement date), because IBES forecasts generally precede the earnings announcement by one month. To facilitate

[26] Due to erroneous reporting of insider transactions, I delete the following insider transactions: (i) the transactions with missing prices and number of shares; (ii)the transactions with price which is not within twenty percent range of daily CRSP price; (iii) the transactions in which number of shares an insider trades is larger than twenty percent of firms' outstanding shares; (iv) the transactions less than 100 shares; (iv) the transactions in which number of shares traded is larger than CRSP daily share volume; and (v) the transactions which are duplicates.

comparability of insider trading measures between the pre and post-announcement windows, I measure post-announcement trading over an equal sized window of the month following the earnings announcement ([t + 2, t + 32]). Finally, approximately thirty days between the pre-announcement window and the prior quarter's post-announcement window is defined as the benchmark window. Some level of trading by insiders occurs normally hence insider trading during this period might be considered as 'benchmark' trading. These definitions of pre, post and benchmark periods have been previously used in Garfinkel (1997) which investigates the effects of increased threat of legal sanction on insider trading.[27]

I measure net insider trading activity during pre-announcement, post-announcement and benchmark periods by using Net Purchase Ratio (NPR). The NPR is defined as the difference between the number of shares purchased by insiders and the number of shares sold by insiders as a fraction of the total number of shares transacted by insiders in a period. Specifically:

$$\text{NPR}= \frac{Purchases - Sales}{Purchases + Sales} \qquad (6)$$

The NPR varies between -1 and +1 hence it does not suffer from large firm biases that would skew unscaled measures of net insider trading activity.[28]

[27] I also classified two months prior to upcoming earnings announcement and one month after the earnings announcement as pre and post announcement windows. I also divided approximately 90 days between earnings announcements equally as pre and post earnings announcement windows. The results are similar when alternative definitions of pre and post windows are used.

[28] NPR has been used in many previous insider trading studies such as Seyhun(1990), Lakonishok and Lee (2001).

The Sarbanes-Oxley Act may affect insider purchase and sale transactions differently. Hence, the results for insider purchases and insider sales are reported separately though out the paper. In multivariate analysis, I also scale insider share purchases and sales by firms' outstanding shares to mitigate large firm biases.

III.2.C Earnings Surprises and Other Variables

I define the earnings surprise as the actual earnings minus the median analyst earnings forecasts scaled by the stock price at the end of the earnings quarter (Surprise). I measure the price reaction to earnings surprises (or the news in the earnings surprise) by the cumulative abnormal return for the three day window (-1, +1) centered on the earnings announcement days (CAR). I compute the CAR by subtracting the average return on a same size-book-to-market Fama and French portfolio (six portfolios) from the raw return. I winsorize the Surprise at 5 and 95 percentiles to alleviate the effects of extreme outliers.

In the multivariate analysis, I control for various factors that may affect insider trading. Prior literature suggests that (i.e., Lakonishok and Lee (2001) and Seyhun (1986)) insider trading may be driven by past returns (contrarian strategy) or may be driven by insiders' information (not limited to upcoming earnings announcement). To control for these, I include the size deciles adjusted buy and hold returns from six months prior to earnings announcement to two days prior to earnings announcement (PreRet6) and similarly, the size deciles adjusted buy and hold returns from two days after earnings announcement to six months after the earnings announcement (PostRet6). Rozeff and Zaman (1998) show that insider sales are larger at glamour firms. I include

B/M (the book value of equity scaled by the market value of equity). Also, insiders at research and development intensive firms have a large information advantage. To control for this effect, I include research and development expense scaled by sales (R&D). The insider trading has been shown to be different at small and large firms. I control for firm size with market value of equity at the end of previous quarter. Also, insiders are likely to trade more when they can hide their trades. To control for this liquidity effects, I include the standard deviation of daily share turnover (StdVol) between two earnings announcements. I measure the accounting based variables at the time of prior earnings announcement. I also take the logarithm of size and StdVol, since these measures are highly skewed.

III.3 Empirical Results

Table III.1 reports the descriptive statistics on pre-announcement, post-announcement and benchmark period insider trading before and after Sarbanes-Oxley Act. The table also includes the differences of means tests for insider trading variables before and after Sarbanes-Oxley Act.

The first three rows report the frequency of insider transactions around earnings announcements. The proportion of earnings announcements accompanied by pre-announcement insider trading declined 5% after the Act. The proportion of earnings announcements accompanied by insider purchases in the pre, post and benchmark periods declined after the Act. On the other hand, the proportion of earnings announcements accompanied by insider sales in the post-announcement and benchmark periods increased after the Act.

The last four rows of Table III.1 report the number of insider transactions and the number of shares insiders traded around earnings announcements. The results for insider purchases are similar to frequency based measures, confirming that insiders purchase less after the Act. On the other hand, the mean number of insider sales and number of shares sold by insiders in all pre, post and benchmark windows increased after the Act.

To summarize, the Act deterred insider purchases and the incidences of pre-announcement insider trading. While the Act did not deter insider sales, it seem to have an affect on timing of insider sales. Note that insider sales may be based on information or due to insiders' liquidity needs. Hence, this univariate statistics may hide the incidences of informed sales. The increased visibility of insider transactions after the Act may cause insiders to avoid insider sales prior to negative earnings announcement. In the next section, I investigate insider purchases and sales around positive and negative earnings surprises.

III.3.A Insider Trading and Earnings Surprises

The Sarbanes-Oxley Act requires expedited disclosure of insider transactions and hence the Act is likely to deter insider trading on price relevant information. This should imply that the positive relation between insider trading and future earnings surprises is weaker after the Act. In this section, I first investigate the affects of the Act on insider trading activity around positive and negative earnings surprises through univariate

TABLE III.1: Descriptive Statistics on Insider Trading Before and After Sarbanes-Oxley Act

This table describes insider trading activity around the earnings announcements before and after Sarbanes-Oxley Act. Before Sox and After Sox include quarterly earnings announcements in four years around the Act (1996-1999 and 2003-2006 respectively). Pre-announcement period includes thirty days ([t-32, t-2]) before an earnings announcement. Post-announcement period includes thirty days ([t+2, t+32]) after an earnings announcement. Benchmark period includes approximately thirty days between the prior quarter's post-announcement period and the pre-announcement period. ***, **, * denote significantly different from Before Sox mean at 1%, 5% and 10% level respectively.

	Pre Announcement				Post Announcement				Benchmark			
	Before Sox N=5,116	After Sox N=5,279	Difference	% Change	Before Sox N=5,116	After Sox N=5,279	Difference	% Change	Before Sox N=5,116	After Sox N=5,279	Difference	% Change
Frequency of Earnnings Annoncements with Insider Transactions	0.154	0.104***	-0.050	-32.45%	0.429	0.423	-0.005	-1.24%	0.259	0.258	-0.002	-0.60%
Frequency of Earnnings Annoncements with Insider Purchases	0.062	0.013***	-0.049	-78.49%	0.176	0.105***	-0.072	-40.67%	0.101	0.038***	-0.063	-62.10%
Frequency of Earnnings Annoncements with Insider Sales	0.100	0.093	-0.007	-7.01%	0.306	0.357***	0.051	16.78%	0.180	0.231***	0.051	28.32%
Mean Number of "Purchase" Trades	0.135	0.031***	-0.104	-77.17%	0.411	0.255***	-0.155	-37.83%	0.237	0.087***	-0.150	-63.37%
Mean Number of "Sale" Trades	0.358	1.030***	0.672	187.56%	1.737	4.659***	2.922	168.15%	0.666	2.421***	1.754	263.41%
Mean Volume of Shares Purchased	549	136***	-414	-75.28%	2,368	1,276***	-1,092	-46.13%	2,284	418***	-1,865	-81.68%
Mean Volume of Shares Sold	3,507	4,849**	1,342	38.25%	22,386	32,081***	9,696	43.31%	7,783	13,005***	5,222	67.09%

analysis. Then, I more formally investigate the affects of the Act on the relation between insider trading and earnings surprises. and on the relation between price reactions to earnings surprise and insider trading.

III.3.A.1 Tests of Act's Effects on Pre and Post Announcement Insider Trading

The expedited and on-line disclosure of insider trading makes insider transactions more visible. Hence, the Act not only decreases the information advantage of insiders but also increases the likelihood of legal sanctions for insiders. The Act is likely to deter insiders' informed trades. In this section, I investigate insider trading in pre and post-announcement periods differentiating among positive and negative earnings surprises.

Insider sales may be based on both their information and due to liquidity needs. On the other hand insider purchases are more likely to be informed given their high exposure company stock and their diversification needs. In these univariate tests, I view the insider purchases (sales) before positive (negative) earnings announcements as informed insider trading.

Panel A of Table III.2, reports the changes in the frequency of insider selling and buying around negative and positive earnings surprises after the Act. After the Act, the incidences of insider selling prior to negative earnings surprise decreased to 6.53% from 7.86% (a 17.2% decline compared to before the Act). The incidences of insider purchases before positive earnings announcements decreased after the Act (a 76.2% decline compared to that of pre-Act period). These findings show that the Act deterred

TABLE III.2: Univariate Tests of Pre-Announcement and Post-Announcement Informed Insider Trading

Panel A describes the frequency of insider trading in the pre-announcement and post-announcement periods of positive and negative earnings surprises. Before Sox and After Sox include quarterly earnings announcements in four years around the Act (1996-1999 and 2003-2006 respectively). Pre-announcement period includes thirty days ([t-32, t-2]) before an earnings announcement. Post-announcement period includes thirty days ([t+2, t+32]) after an earnings announcement. Benchmark period includes approximately thirty days between the prior quarter's post-announcement period and the pre-announcement period. Surprise is the actual earnings minus median analyst forecasts scaled by the price at the end of earnings quarter. Panel B and Panel C reports the number insider transactions and share volume of insider transactions around positive and negative earnings surprises. ***, **, * denote significantly different from Before Sox mean at 1%, 5% and 10% level respectively.

Panel A: Frequency

	Negative Earnings Surprises				Positive Earnings Surprises			
	Before Sox N=1,373	After Sox N=1,512	Difference	% Change	Before Sox N=3,059	After Sox N=3,313	Difference	% Change
Pre Announcement Selling	7.86%	6.53%*	-1.34%*	-17.02%*	10.91%	10.56%	-0.35%	-3.25%
Post Announcement Selling	24.02%	28.74%***	4.72%***	19.64%***	32.49%	38.83%***	6.34%***	19.50%***
Pre Announcement Buying	6.72%	1.14%***	-5.59%***	-83.06%***	5.67%	1.33%***	-4.35%***	-76.62%***
Post Announcement Buying	17.62%	9.68%***	-7.94%***	-45.05%***	17.50%	10.73%***	-6.77%***	-38.67%***

Panel B: Number of Trades

	Negative Earnings Surprises				Positive Earnings Surprises			
	Before Sox N=1,373	After Sox N=1,512	Difference	% Change	Before Sox N=3,059	After Sox N=3,313	Difference	% Change
Pre Announcement Selling	0.379	0.369	-0.009	-2.45%	0.374	1.210**	0.837**	223.86%**
Post Announcement Selling	1.407	3.555***	2.148***	152.63%***	1.895	5.255***	3.360***	177.26%***
Pre Announcement Buying	0.139	0.046*	-0.094*	-67.30%*	0.100	0.022***	-0.077***	-77.60%***
Post Announcement Buying	0.419	0.255**	-0.164**	-39.10%**	0.403	0.264**	-0.139**	-34.45%**

Panel C: Number of Shares

	Negative Earnings Surprises				Positive Earnings Surprises			
	Before Sox N=1,373	After Sox N=1,512	Difference	% Change	Before Sox N=3,059	After Sox N=3,313	Difference	% Change
Pre Announcement Selling	4,345	3,023	-1,323	-30.43%	3,378	5,772**	2,394**	70.89%**
Post Announcement Selling	15,176	25,124**	9,948**	65.55%**	24,041	34,931***	10,890***	45.30%***
Pre Announcement Buying	580	203**	-377**	-64.99%**	314	108**	-206**	-65.61%**
Post Announcement Buying	2,775	1,898	-876	-31.58%	1,568	1,049*	-519*	-33.12%*

insider transactions which may be claimed to be based on private information and subject to legal sanctions.

Insiders may also exploit their information advantage by deferring their trades. These types of transactions include insider sales after positive earnings surprises and insider purchases following negative earnings surprises. An insider who is planning to sell his shares may defer his sale until after the positive earnings announcement. And this type behavior is difficult to catch for legislators as insiders can always argue that they need liquidity. Interestingly, this type of transactions increased after the Act. Frequency of insider sales after positive earnings surprises increased 19.50% compared to pre-Act period. However, this increase in frequency of insider sales after positive earnings announcements is less then the increase in frequency of other insider sales. The insiders may also profit by deferring their purchase transactions until after negative earnings surprises. The results show that insider purchases after negative earnings surprises decreased 45.5% after the Act.

Panel B and Panel C of Table III.2 report insider trading activity around positive and negative earnings announcements based on number of trades and number shares. The results are similar to statistics reported based on frequency of insider transactions in Panel A. To summarize, the Act deterred insider trading prior to earnings announcement (i.e., insider sales (purchases) prior to negative (positive) earnings surprises) that are likely to be claimed as information based insider trading.

III.3.A.2 Descriptive Statistics on Earnings Surprises and Other Control Variables

I report descriptive statistics for independent variables in Panel A of Table III.3 The first two columns report the mean and differences of means test for earnings' surprise and markets response to earnings surprise (CAR). The mean of Surprise and CAR before and after the Act are not statistically different. The mean of other control variables are statistically different before and after the Act. Hence, it is important to control for these factors while testing the effects of the Act on the relation between insider trading and earnings surprises.

I report the correlations between earnings surprises and insider trading variables in Panel B of Table III.3. The correlations between earnings surprises and insider trading variables are quite low.

III.3.A.3 Pre-Announcement Insider Trading and Earnings Surprises

If insiders trade on private information on upcoming earnings announcements, then insider trading will be positively related to earnings surprises. To the extend the Act deterred insider transactions on private information, the positive relation between insider trading and earnings surprises will be weaker after the Act than it was before the Act. In this section, I investigate insider trading prior to quarterly earnings announcements and earnings surprises. Specifically, I run the following firm-fixed effects regression:

(7)

$$\begin{aligned} InTrade_{Pre\,i,q} = {} & \alpha + \beta_1\, InTrade_{Benchmark\;i,q} + \beta_2\, Surprise_{i,q} + \beta_3 Surprise_{i,q} * Sox + \beta_4 Sox \\ & + \beta_5 Surprise_{i,q-1} + \beta_6 Surprise_{i,q-1} * Sox + \beta_7\, Pre Ret6_{i,q} + \beta_8\, Post Ret6_{i,q} \\ & + \beta_9 Ln(Size)_{i,q-1} + \beta_{10} B/M_{i,q-1} + \beta_{11} R\&D_{i,q-1} + \beta_{12} Ln(StdVolume)_{i,q} + u_{i,t} \\ & with\; u_{i,t} = \mu_i + \varepsilon_{i,t}\; where\; i=1,..,432\;\; and\; q=1,..,32 \end{aligned}$$

TABLE III.3: Descriptive Statistics for Independent Variables

Panel A describes the independent variables used in multivariate analysis. Before Sox and After Sox include quarterly earnings announcements in four years around the Act (1996-1999 and 2003-2006 respectively). Surprise is the actual earnings minus median analyst forecasts scaled by the price at the end of earnings quarter. CAR is three day (-1, +1) cumulative abnormal returns around the earnings announcements. The abnormal return is size and book to market adjusted return (using six Fama-French size and book-to market portfolios). Size is defined as market value (in millions) of equity. B/M is the book value of equity scaled by the market value of equity. R&D is the research and development expense (scaled by sales). Post6ret is the size deciles adjusted returns from two days after the earnings announcement to six months after the announcement. Pre6ret is size deciles adjusted returns from six months prior to the announcement to two days prior to earnings announcement. StdVol is standard deviation of daily share volume during three months prior to earnings announcement. Panel B reports the correlations between Surprise and insider trading variables. Surprise is the actual earnings minus median analyst forecasts scaled by the price at the end of earnings quarter. Net Purchase Ratio is defined as the ratio of net insider purchases (number of shares purchased – number of shares sold) over total insider transactions (number of shares purchased + number of shares sold). ***, **, * denote significantly different from Before Sox mean at 1%, 5% and 10% level respectively.

Panel A: Independent Variables

		Before Sox N=5,116	After Sox N=5,279
Surprise	Mean	0.00108	0.00110
	StdDev	0.00373	0.00393
CAR	Mean	0.00012	0.00011
	StdDev	0.00204	0.00212
Size	Mean	6,391	8,990***
	StdDev	18,178	26,149
B/M	Mean	0.44194	0.49487***
	StdDev	0.40804	0.65854
R&D	Mean	0.39679	0.43626***
	StdDev	0.48928	0.49597
Post6Ret	Mean	-0.01379	0.02533***
	StdDev	0.28092	0.26688
Pre6Ret	Mean	-0.00060	0.03709***
	StdDev	0.27500	0.30906
StdVol	Mean	2.72708	3.97842***
	StdDev	3.03460	4.20710

Table III.3 Continued

Panel B: Correlation of Earnings Surprises and Insider Trading

	Before Sox		After Sox	
	Surprise $_{q}$	Surprise $_{q-1}$	Surprise $_{q}$	Surprise $_{q-1}$
Surprise $_{q-1}$	0.28	1.00	0.21	1.00
	(0.00)		(0.00)	
NPR $_{pre}$	-0.01	-0.01	-0.02	-0.04
	(0.27)	(0.52)	(0.08)	(0.00)
NPR $_{post}$	-0.04	-0.01	-0.07	-0.03
	(0.00)	(0.38)	(0.00)	(0.02)
In. Sales $_{pre}$	0.01	-0.02	0.01	0.03
	(0.42)	(0.09)	(0.37)	(0.02)
In. Sales $_{post}$	0.03	0.05	0.04	0.04
	(0.01)	(0.00)	(0.00)	(0.00)
In. Purchases $_{pre}$	0.00	0.00	0.01	-0.01
	(0.87)	(0.77)	(0.65)	(0.52)
In. Purchases $_{post}$	-0.01	0.01	-0.01	-0.02
	(0.26)	(0.67)	(0.65)	(0.13)

I include the insider trading during the benchmark period to control for autocorrelations in insider trading and the normal level of insider trading. The main variable of interest is Surprise. I also include earnings surprise in the previous quarter to investigate whether insiders trade on past earnings surprises. To observe the effects of the Act, I include an indicator variable that equals to one for observations after the Act and it equals zero otherwise (Sox). I also interact the surprise variable with Sox.

The first column in Table III.4 reports the results from the regression that uses NPR as insider trading variable. The second and the third column report the results from regressions that use insider sales and insider purchases as the dependent variable. In all regressions the coefficients of Surprise and its interaction with Sox are insignificant.

TABLE III.4: Pre-Announcement Insider Trading and Earnings Surprises

This table reports results from firm-fixed effects regressions of pre-announcement insider trading variables on earnings surprises. In the first column Net Purchase Ratio (NPR) is used as dependent variable. NPR is defined as the ratio of net insider purchases (number of shares purchased – number of shares sold) over total insider transactions (number of shares purchased + number of shares sold). Second and third column uses number of shares insiders sold and number of shares purchased (scaled by outstanding shares) as the dependent variable. Surprise is actual earnings minus median analyst forecasts scaled by the price at the end of earnings quarter. Sox is an indicator variable that equals one if quarterly earnings announcement belongs to four years (2003-2006) after the Act and zero otherwise. Control variables are defined similar to Table 10. P-values based on robust standard errors are in parentheses. ***, **, and * denote significant at 1%, 5% and 10% level respectively.

	NPR	Insider Sales	Insider Purchases
Insider Trading $_{Benchmark}$	0.1425***	0.0965***	0.1628***
	(0.00)	(0.00)	(0.00)
Surprise $_{q}$	-1.2698	-1.2021	0.3024
	(0.36)	(0.57)	(0.63)
Surprise $_{q}$ *Sox	0.4356	1.8823	-0.3208
	(0.81)	(0.50)	(0.71)
Sox	-0.0099	-0.0153	-0.0099***
	(0.21)	(0.20)	(0.01)
Surprise $_{q-1}$	0.4140	-4.7319**	-0.4543
	(0.76)	(0.02)	(0.47)
Surprise $_{q-1}$ *Sox	-1.8490	6.0969**	0.3982
	(0.31)	(0.03)	(0.63)
PreRet6 $_{q}$	-0.0799***	0.0596***	-0.0076
	(0.00)	(0.00)	(0.19)
PostRet6 $_{q}$	-0.0005	-0.0204	0.0049
	(0.97)	(0.30)	(0.40)
Size $_{q-1}$	-0.0332***	0.0058	0.0002
	(0.00)	(0.60)	(0.95)
B/M $_{q-1}$	0.0227*	-0.0820***	-0.0004
	(0.05)	(0.00)	(0.95)
R&D $_{q-1}$	-0.0428***	0.0041	-0.0009
	(0.00)	(0.82)	(0.86)
Ln (STDVolume)	0.0134**	0.0235***	0.0001
	(0.02)	(0.01)	(0.96)
Constant	0.2036***	0.0294	0.0104
	(0.00)	(0.72)	(0.68)
Number of Firm Quarters	10,395	10,395	10,395
Number of Firms	432	432	432
R-squared	5.00%	3.00%	18.00%

The previous quarters' Surprise is negatively related to insider sales. This suggests that insider sell less (more) after positive (negative) earnings surprises. The coefficient of the interaction of prior quarters' earnings surprise and Sox is positive; and it is larger than the magnitude of the coefficient of prior quarters' earnings surprise. This show that the relation between insider sales and earnings surprises in the previous quarter reversed after the Act. After the Act, insiders sell more (less) after positive (negative) earnings surprises. The coefficient of PreRet6 shows that insiders are contrarians. Insiders sell more after large abnormal returns.

The results in this section suggest that insider trading and upcoming earnings surprises are not significantly correlated in the late nineties even before the Act. In the next section, I investigate whether insider trading activity is driven by past earnings announcements.

III.3.A.4 Post-Announcement Insider Trading and Earnings Surprises

Insiders may trade on past earnings surprises rather than trading on upcoming earnings announcements. In this section, I investigate the relation between post-announcement insider trading and earnings surprises. Specifically, I run the following firm-fixed effects regression:

(8)

$$\begin{aligned} InTrade_{Post\ i,q} = {} & \alpha + \beta_1 InTrade_{\Pr e\ i,q} + \beta_2\ InTrade_{\ Benchmark\ \ i,q} + \beta_3\ Surprise_{\ i,q} \\ & + \beta_4 Surprise_{\ i,q} * Sox + \beta_5 Sox + \beta_6\ \Pr e\,\mathrm{Re}t6_{i,q} + \beta_7\ Post\,\mathrm{Re}t6_{i,q} \\ & + \beta_8 Ln(Size)_{i,q-1} + \beta_9 B/M_{i,q-1} + \beta_{10} R\,\&\,D_{i,q-1} + \beta_{11} Ln(StdVolume)_{i,q} + u_{i,t} \\ & with\ u_{i,t} = \mu_i + \varepsilon_{i,t}\ where\ i=1,..,432\ \ and\ q=1,..,32 \end{aligned}$$

TABLE III.5: Post-Announcement Insider Trading and Earnings Surprises

This table reports results from firm-fixed effects regressions of post-announcement insider trading variables on earnings surprises. In the first column Net Purchase Ratio (NPR) is used as dependent variable. NPR is defined as the ratio of net insider purchases (number of shares purchased – number of shares sold) over total insider transactions (number of shares purchased + number of shares sold). Second and third column uses number of shares insiders sold and number of shares purchased (scaled by outstanding shares) as the dependent variable. Surprise is actual earnings minus median analyst forecasts scaled by the price at the end of earnings quarter. Sox is an indicator variable that equals one if quarterly earnings announcement belongs to four years (2003-2006) after the Act and zero otherwise. Control variables are defined similar to Table 10. P-values based on robust standard errors are in parentheses. ***, **, and * denote significant at 1%, 5% and 10% level respectively.

	NPR	Insider Sales	Insider Purchases
Insider Trading $_{Pre}$	0.1796***	-0.0439**	0.1566***
	(0.00)	(0.02)	(0.00)
Insider Trading $_{Benchmark}$	0.1064***	0.0592***	0.0472***
	(0.00)	(0.00)	(0.00)
Sox	-0.0755***	-0.0144	-0.0496***
	(0.00)	(0.50)	(0.00)
Surprise $_{q}$	-6.2334***	0.6025	-5.3101***
	(0.00)	(0.87)	(0.00)
Surprise $_{q}$ *Sox	-4.8287*	3.2033	5.3985**
	(0.09)	(0.52)	(0.01)
PreRet6 $_{q}$	-0.2559***	0.2658***	-0.0263*
	(0.00)	(0.00)	(0.08)
PostRet6 $_{q}$	0.0440**	-0.0058	0.0630***
	(0.03)	(0.88)	(0.00)
Size $_{q-1}$	-0.0754***	0.0752***	-0.0055
	(0.00)	(0.00)	(0.53)
B/M $_{q-1}$	0.0227	-0.0781**	0.0172
	(0.20)	(0.01)	(0.19)
R&D $_{q-1}$	-0.0332*	0.0099	-0.0141
	(0.07)	(0.76)	(0.30)
Ln (STDVolume)	0.0317***	0.0296*	0.0100
	(0.00)	(0.06)	(0.14)
Constant	0.3780***	-0.4100***	0.1000
	(0.00)	(0.01)	(0.12)
Number of Firm Quarters	10,395	10,395	10,395
Number of Firms	432	432	432
R-squared	7.00%	1.00%	2.00%

Table III.5 reports the results from this regression. NPR is negatively related to the recent earnings surprises. After positive earnings surprises, insiders are likely to sell more or buy less. The interaction of surprise with Sox is also negative. This suggests the above relation gets stronger after the Act. The insider sales are not statistically related to recent earnings surprises. However, insider purchases are negatively related to recent earnings surprises. Insiders purchase less after positive earnings surprises. The interaction of surprise with Sox has a positive and significant coefficient. This suggests that after the Act, insiders purchase more after positive (negative) earnings surprises. The results in this section show that insiders trade against the recent surprises.

III.3.B The Information Content of Earnings Announcements

In this section, I investigate earnings response coefficients of earnings surprises. Less informed trading prior to earnings announcement implies that earnings announcements will be more informative after the Act. Givoly and Palmon (1985), Cornell and Sirri (1992) and Melbrouk (1992) suggest that insider trading leads to price discovery. However, if the Act deterred informed insider trading, then there will be less price discovery prior to earnings announcements and news component of earnings surprises will increase after the Act.[29]

I run firm-fixed effects regressions of CAR on earnings surprise, insider trading variables and other control variables. The regressions also include Sox indicator variable and its interaction with Surprise and insider trading variables. Specifically, I run the following regression equation:

[29] The Act also requires better corporate governance mechanisms and more accurate reporting of accounting data. Hence, the news in earnings surprises is expected to increase after the Act.

(9)

$$CAR_{i,q} = \alpha + \beta_1 Sox + \beta_2\, Surprise_{i,q} + \beta_3 Surprise_{i,q} * Sox + \beta_4\, \mathrm{Pre}\,\mathrm{Ret}6_{i,q} + \beta_5\, \mathrm{Pre}\,\mathrm{Ret}6_{i,q} * Sox + \beta_6 Ln(Size)_{i,q-1} + \beta_7 B/M_{i,q-1} + \beta_8 R\&D_{i,q-1} + \beta_9\, InTrade_{\mathrm{Pre}\,i,q} + \beta_{10}\, InTrade_{\mathrm{Pre}\,i,q} * Sox + u_{i,t}$$

$$with\ u_{i,t} = \mu_i + \varepsilon_{i,t}\ where\ i=1,..,432\ \ and\ q=1,..,32$$

The results are reported in Table III.6. The specification in the first column excludes the insider trading variables. The specifications in the second column use NPR as insider trading variable. The specification in the last column use insider purchases and sales as insider trading measure. The coefficient of Surprise is positive and significant in all three specifications. As expected the response of market is larger when there is more surprise in earnings announcements. The coefficient of interaction of Surprise with Sox is positive and significant. This shows that the response of market to earnings surprises become stronger after the Act.

The coefficients for NPR and its interaction with Sox are not statistically significant. However, the coefficients for insider purchases and its interaction with Sox are significant in the third specification. The negative coefficient on insider purchases show that when insiders purchase more, there is smaller market price reaction to earnings surprises. This is consistent with the view that informed insider trading leads price discovery before the earnings announcements. The coefficient of the interaction of insider purchases with Sox is positive and significant. The magnitude of this coefficient is larger then the magnitude of the coefficient of insider purchases (the sum of two coefficients becomes positive: -0.0312+0.1818=0.151). These suggest that the Act not

TABLE III.6: Price Reactions to Earnings Surprises

This table reports the results from firm-fixed effects regressions of three day earnings announcement returns (CAR) on earnings surprises and insider trading variables. CAR is the three day (-1, +1) cumulative abnormal returns around earnings announcements. The abnormal returns are size and book to market adjusted returns (using six Fama-French size and book-to market portfolios). Surprise is the actual earnings minus median analyst forecasts scaled by the price at the end of earnings quarter. Sox is an indicator variable that equals one if quarterly earnings announcement belongs to four years (2003-2006) after the Act and zero otherwise. Regressions in the second and third column include Insider Net Purchase Ratio, and Insider Purchases and Sales in the pre-announcement period. Other control variables are defined similar to Table 10. P-values based on robust standard errors are in parentheses. ***, **, and * denote significant at 1%, 5% and 10% level respectively.

	CAR	CAR	CAR
Sox	0.00	0.00	0.00
	(0.67)	(0.72)	(0.61)
Surprise $_{q}$	0.1369***	0.1371***	0.1369***
	(0.00)	(0.00)	(0.00)
Surprise $_{q}$ *Sox	0.0219**	0.0219**	0.0223**
	(0.03)	(0.03)	(0.03)
PreRet6 $_{q}$	-0.0525***	-0.0514***	-0.0527***
	(0.00)	(0.00)	(0.00)
Size $_{q-1}$	-0.0125***	-0.0122***	-0.0121***
	(0.00)	(0.00)	(0.00)
B/M $_{q-1}$	0.0004	0.0003	0.0008
	(0.94)	(0.96)	(0.90)
R&D $_{q-1}$	0.0195***	0.0197***	0.0196***
	(0.00)	(0.00)	(0.00)
NPR $_{Pre}$		0.0045	
		(0.51)	
NPR $_{Pre}$ *Sox		0.0027	
		(0.80)	
Insider Sales $_{Pre}$			0.0029
			(0.52)
Insider Sales $_{Pre}$ * Sox			-0.0095
			(0.20)
Insider Purchases $_{Pre}$			-0.0312***
			(0.01)
Insider Purchases $_{Pre}$ * Sox			0.1818***
			(0.00)
Constant	0.001	0.001	0.001
	(0.01)***	(0.01)***	(0.01)***
Number of Firm Quarters	10,395	10,395	10,395
Number of Firms	432	432	432
R-squared	8.00%	8.00%	8.00%

only deterred price discovery through insider purchases but actually insider purchases seem to add more surprise to earnings announcement after the Act.

To summarize, I document that news in earnings surprises increased after the Act. I also find little evidence that decline in insider trading contributed more informative earnings announcements after the Act.

CHAPTER IV

SUMMARY AND CONCLUSIONS

Insider trading may convey information to the market and promote accurate pricing of stocks. In this dissertation, I investigate two special issues on insider trading at the turn of the century. The title of the first essay is *"Insider Trading During the Technology Bubble"*, the title of the second essay is *"Insider Trading and Earnings Surprises: The Case of Expedited Disclosure of Insider Transactions"*.

IV.1 Insider Trading During the Technology Bubble

Recent studies document that hedge funds and institutional investors traded differently during the late 1990s and their trading activity contributed to the rise of technology stock prices. Insiders, with superior information, are generally referred to as informed traders. This study investigates insider trading activity during the rise of technology stock prices. The results show that tech-insiders were heavy sellers during ten months prior to the price peaks during which prices more then doubled.

The cross sectional tests show that abnormal insider sales prior to the peaks were large even after controlling for portfolio rebalancing needs of insiders. Moreover, the tech-stocks that are sold by insiders more extensively before the peaks had large price declines after the peaks. These findings suggest that burst of the bubble was not a surprise for technology stock insiders.

This study also makes use of intraday data and investigates the relation between insider trading and net order flow. I document that the net order flow is positively related

to abnormal insider trading activity. However, this positive relation becomes weaker in the peak period; which implies less price discovery through insider trading during the rise of technology stock prices.

The overall evidence of this essay is consistent with the view that insiders' information was not fully and timely incorporated to the prices during the rise of technology prices. Complementing limits to arbitrage literature that recognizes different factors to explain recent technology bubble; this essay highlights another missing factor during the bubbles.

IV.2 Insider Trading and Earnings Surprises: The Case of Expedited Disclosure of Insider Transactions

The Sarbanes-Oxley Act of 2002 requires expedited and on-line disclosure of insider transactions and hence increases the visibility of insider trading. The Act not only reduces informational advantage of insiders but also increases the likelihood of legal sanctions for insiders. As a consequence, the Act is likely to deter insider trading and the price discovery through insider trading.

This study investigates how the expedited disclosure requirements introduced by the Act affected insider trading behavior around earnings announcements. I show that the Act has a significant impact on insider trading behavior. In particular, I document that insider purchases significantly declined after the Sarbanes-Oxley Act. In addition, the incidences of insider purchases (sales) prior to positive (negative) earnings surprises declined after the Act.

I also investigate the relation among insider trading, earnings surprises and price reactions to earnings announcements before and after the Act. I find that that the earnings announcements become more informative after the Act which is consistent with less informed trading and less price discovery prior to earnings announcements. However, there is little evidence that the decline in insider trading contributed to more informative earnings announcements after the Act.

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