

Are insider sales under 10b5-1 plans strategically timed?

Rik Sen^{*}

New York University

June 2008

Contact Information: Rik Sen, Stern School of Business, New York University, New York, NY -10012.
Ph: (212) 998 0345. Email: rsen@stern.nyu.edu

^{*} I would like to thank Menachem Brenner, Holger Mueller, Renuka Sane, Robert Tumarkin and Daniel Wolfenzon for helpful comments. I am especially grateful to David Yermack for many helpful discussions. All errors are mine.

Are insider sales under 10b5-1 plans strategically timed?

ABSTRACT

Previous research and numerous media articles suggest that sales executed under 10b5-1 trading plans are strategically timed. However, we find no significant difference in stock price performance following plan sales and non-plan sales. We demonstrate that price contingent orders (e.g. limit orders), a common feature in trading plans, give rise to empirical patterns that have been taken as evidence of strategic timing of sales. Event study methods employed in previous research on plan sales are shown to give biased estimates of post-event abnormal returns when the events are not exogenous to past returns.

Recent academic studies suggest that the Rule [10b5-1] is being abused. The academic data shows that executives who trade within a 10b5-1 plan outperform their peers who trade outside of such a plan by nearly 6% [...] This raises the possibility that plans are being abused in various ways to facilitate trading based on inside information. We're looking at this – hard. We want to make sure that people are not doing here what they were doing with stock options.

Linda Chatman Thomsen, Director, Division of Enforcement,
U.S. Securities and Exchange Commission, March 8th 2007

SEC Rule 10b5-1 protects corporate insiders against allegations of illegal trading if their trades conform to a written pre-arranged trading plan that was set up at a time when the insider had no material nonpublic information. In 2006 about 45% of all sale transactions by top management were executed through such trading plans (henceforth referred to as “10b5-1 plans”). Prior research and numerous media articles find evidence of strategically timed sales executed under 10b5-1 plans and suggest that certain loopholes in the rule allow insiders to trade profitably on private information while still obtaining legal protection. However, we find no evidence of abuse of the 10b5-1 safe harbor. We demonstrate that price contingent orders (e.g. limit orders), a common feature in trading plans, give rise to empirical patterns that have been taken as evidence of strategic timing of sales.

The question of whether sales by corporate insiders precede stock price underperformance has been extensively studied. Earlier studies (Jaffe (1974), Seyhun (1986, 1998)) find stock price underperformance following insider sales. However, more recent studies (e.g. Lakonishok and Lee (2001), Jeng et al. (2003)), which correct for returns on stocks with similar characteristics (like size, book-to-market and past returns), find insider sales are not informative about future abnormal returns. Our empirical methods are similar to the ones used in the latter studies. Stock price performance following sales that were executed under a trading plan (henceforth referred to as plan sales) has been examined in Jagolinzer (2007). The study finds that plan sales are followed by statistically significant negative abnormal returns (about -6% over 6 months). However, we show that the event study methodology used in the study gives downward biased estimates of abnormal returns following plan sales. The bias arises from the average abnormal return calculation method that tends to give a lower weight to an event if it is followed by a positive abnormal return and higher weight if it is followed by a negative abnormal return.

From a comprehensive sample of insider sales between January 2003 and June 2006 that were

reported to the SEC, we identify the ones that were executed under a trading plan by searching the footnotes of the submitted Form 4 documents. We find that abnormal returns following plan sales are small and statistically indistinguishable from zero. We also fail to find any difference in abnormal returns following plan sales and non-plan sales. However, there is a striking difference in the distribution of occurrence of plan and non-plan sales around earnings announcement dates. There are very few non plan sales in the month before earnings announcement and lot in the month after it. This is consistent with prior research (Bettis et al. (2000)) showing firms impose blackout periods before earnings announcements during which insiders are not allowed to trade. In contrast, the number of plan sales before and after earnings announcements are comparable. This indicates that most plan sales are not subject to blackout period restrictions.

Our study has implications for regulation of insider trading and profitability of trading strategies based on insiders' trades. Negative abnormal returns following plan sales by insiders would indicate that outside investors are trading at an informational disadvantage. If outsiders perceive that the markets are unfair to them they would be less willing to trade, which could affect the liquidity and efficiency of the market. Prior academic research and articles in the media give an impression that insiders are indeed able to trade at a significant information advantage under the cover of 10b5-1 plans. While it is possible that 10b5-1 plans are being abused in a small number of firms, our results show that the aggregate profitability of sales by corporate insiders under 10b5-1 plans is negligible. To our knowledge, this is the first study that uses a comprehensive cross section of US public firms and documents that a fairly high proportion of all insider sales are being executed under 10b5-1 trading plans.

The remainder of the paper is organized as follows. The next section contains the background information related to 10b5-1 plans. Section II describes the data used for this study. Section III presents the methodology and the main results. Section IV explains why prior research finds underperformance following plan sales and we don't. Section V discusses our results and concludes.

I. 10b5-1 plans

A. Background

SEC Rule 10b-5 prohibits any act or omission resulting in fraud or deceit in connection with the

purchase or sale of any security, including insider trading. Before 2000, different courts of appeals had come to different conclusions about what constituted illegal insider trading under Rule 10b-5. They differed on whether someone could be held liable for insider trading simply by trading while in possession of inside information, or the fact that the person actually used that inside information when making the trading decision needed to be proved. In October 2000 the SEC promulgated Rule 10b5-1 which stated that a person violates Rule 10b-5 simply by trading while in possession of material nonpublic information. In addition, the rule provided certain affirmative defenses (legal protection) to give “appropriate flexibility to persons who wish to structure securities trading plans and strategies when they are not aware of material nonpublic information, and do not exercise any influence over the transaction once they do become aware of such information”¹.

SEC Rule 10b5-1 provides legal protection to trades by insiders if they conformed to a written trading plan that was set up at a time they were not in possession of material nonpublic information, and the following conditions were satisfied²:

- i. The plan was established in good faith and not as part of a scheme to evade insider trading regulations
- ii. (a) The plan specified the amount (either number of shares or dollar amount), prices and dates, or (b) The plan specified a formula or algorithm to determine amounts, prices and dates, or (c) The decisions were delegated to a person who had no material nonpublic information.
- iii. The insider had no influence or discretion over how, when and whether to effect the trades after entering into the plan

The rule does not prevent someone from initiating a lawsuit against insiders but provides a defense which is available only if insiders entered into a plan in good faith³. Presumably, the intent of the regulator was to avoid imposing too much restriction on trading by insiders while ensuring that they are unable to trade based on private information.

¹ Quoted from the SEC release on selective disclosure and insider trading available at <http://www.sec.gov/rules/final/33-7881.htm>

² Summarized from Rule 10b5-1(c)(1)

³ SEC Rule 10b5-1(c)(1)(ii) states – “Paragraph (c)(1)(i) of this section is applicable only when the contract, instruction, or plan to purchase or sell securities was given or entered into in good faith and not as part of a plan or scheme to evade the prohibitions of this section.”

Companies or insiders are not required to disclose details or even the existence of trading plans. However, many insiders choose to disclose in a footnote of Form 4 that trades were made under a 10b5-1 plan when reporting their trades to the SEC. Some firms disclose plan initiations, modifications and cancellations by insiders through form 8-K filings or press releases. Such disclosures usually do not provide any details of the plans.

B. Benefits of 10b5-1 plans

Executives receive a significant portion of their compensation in the form of options and stock grants. Therefore they may justifiably want to sell stock of their own firm to meet their liquidity needs and for optimal management of personal portfolios. Properly implemented 10b5-1 plans allow executives to demonstrably separate the timing of the decision to sell from the timing of the actual sale thereby avoiding some restrictions and reducing litigation risks associated with stock sales.

Even when a corporate insider sells when she has no material nonpublic information there is a possibility that the stock price drops after the sale. Subsequently, the insider may face allegations of timing her sale based on inside information. The risk of facing such allegations is likely to be lower if the sale was made as a part of a trading plan that was set up well in advance, and at a time when the insider was unlikely to have material nonpublic information. Prior research (Bettis et al. (2000)) shows that most firms allow trading in their stock by corporate insiders only during certain trading windows. Our results suggest that most firms allow plan trades to execute even during blackout periods, since these trades were planned in advance and are not based on information possessed at the time of the trade. Some executives might be in almost constant possession of material nonpublic information. Consequently, they would be prohibited from selling their stock most of the time. A 10b5-1 trading plan to sell at regular intervals, or when the price reaches certain target levels can help meet trading needs arising for liquidity and portfolio management reasons with a lower risk of facing insider trading allegations.

C. Concerns about 10b5-1 plans

Cancellation of trading plans based on material nonpublic information does not result in liability under Rule 10b-5 as there cannot be a basis for securities fraud under the rule without an actual transaction involving the trading of securities. However, cancellation of a plan could affect the availability of legal protection for the trades already executed under the plan as it could call into

question whether the plan was entered into in good faith. Plans can be modified without affecting legal protection if it is done in good faith and at a time when the insider has no material nonpublic information⁴. Numerous media articles and an academic study (Jagolinzer (2007)) suggest that insiders employ trading strategies that use private information and earn abnormal trading returns while enjoying legal protection provided by Rule 10b5-1. BusinessWeek conducted an empirical study and concluded that 10b5-1 plans give a “surprising amount of leeway over preplanned trades” (Sasseen et al. (2006)). Jagolinzer (2007) finds that “the Rule appears to enable strategic trade”. We discuss a few strategies pointed out in the above studies and media articles that might allow insiders to earn abnormal returns.

The ability to cancel existing plans based on material private information might allow insiders to follow strategies that generate abnormal returns. An insider could set up a plan to sell a fixed amount of stock after say 3 months. When the date of trade execution approaches, the insider could choose to cancel the plan if she has private information indicating that the stock price is likely to go up after the chosen sale date. On the other hand, if the insider does not have any such information, or has private information that stock prices are likely to drop after the sale date, she could allow the planned trade to execute. In the latter case, she would enjoy the legal protection under Rule 10b5-1 since the trade was planned in advance. In the former case, the cancellation of the trade does not violate insider trading laws. Since pre-planned trades are allowed to execute even during blackout periods, the above strategy could open up profitable trading opportunities that were not available earlier. However, repeated use of the above strategy i.e. cancellation of plans, would call into question whether plans were being entered into in good faith, and the trades might not enjoy the legal protection.

Insiders could choose the timing and content of information releases to the market in order to maximize profits from their preplanned trades. For example, insiders could delay the release of negative news to after the execution of their pre-planned trades and release positive information before their trades. Since the timing of the trade was decided much earlier, the insider has a lower chance of being charged with illegally timing his trades based on private information. Delaying the

⁴ SEC release on selective disclosure and insider trading states – “... a person acting in good faith may modify a prior contract, instruction, or plan before becoming aware of material nonpublic information. In that case, a purchase or sale that complies with the modified contract, instruction, or plan will be considered pursuant to a new contract, instruction, or plan.” Text available at http://www.sec.gov/rules/final/33-7881.htm#P259_99295

trade until after positive news is released or releasing positive news early does not violate insider trading laws even in the context of non-plan trades. Therefore the additional opportunity to profit from trading under a plan comes from the possibility of delaying the release of negative news. If insiders could influence the timing and amount of the trades under a plan (which is explicitly disallowed) without too much risk of getting caught, they could sell higher amounts before anticipated stock price drops and lower amounts before stock price rises. It is not clear that insiders would indulge in the above strategies since all of them involve some risk of litigation.

II. Data

While firms and insiders are not required to disclose the existence of 10b5-1 plans, many of the Form 4 filings, which are used by corporate insiders to report their trades to the SEC, have footnotes indicating that the reported transactions were a part of a 10b5-1 trading plan. Electronically filed Form 4s are available online at SEC's Edgar website. We conducted text searches within these forms to identify the trades that were part of a trading plan. These were then matched with Thomson Financial's insider trading database. Electronic filing of Form 4 became mandatory on June 30th 2003. However, since a fairly high proportion of forms were filed electronically since January 2003, that is the beginning of our sample period. We get daily returns, prices and shares outstanding from CRSP. At the time of this study CRSP had data until Dec 2006. We include sales occurring until June 2006 in our sample so as to have 6 months of returns following all trades. Our sample of plan trades does not include those which were not disclosed as being executed under a plan in Form 4 filings. Since trades under a plan get a legal protection under Rule 10b5-1, we expect that a large fraction of insiders would voluntarily identify trades that are part of a trading plan to reduce the risk of litigation. However, inferences drawn from our sample may not apply to plan trades that were not voluntarily disclosed.

A single sale order might be split up into multiple orders by the broker while executing it in the market. Some insiders report in Form 4 filings every individual order that was executed in the market as part of the same transaction. Others report just the total shares and the volume weighted average price of all sales made in a day. To make the definition of a transaction comparable across insiders, we aggregate multiple sales by an insider on the same day into a single transaction. Our definition of an insider is a unique person-firm pair. Therefore the CEO of one firm who is also a

director of another firm will be considered as two different insiders. The above definition of transactions gives us 213,445 sale transactions during our sample period, of which 53,317 were executed under a 10b5-1 plan. After matching with CRSP we were left with 203,184 sales out of which 53,032 were plan sales. In this sample 5184 insiders from 1545 firms had at least one plan sale during our sample period. On matching this sample with Compustat and dropping firms which did not satisfy data requirements for computing size, book-to-market and momentum portfolio assignment, we are left with 170,274 sale transactions with 44,944 plan sales. Since the decrease in sample size not negligible, some of our results that do not require information on size, book-to-market and momentum portfolio assignments are based on the CRSP matched sample.

Table 1 presents the basic summary statistics of plan and non-plan trades for the CRSP-Compustat matched sample. 4472 insiders from 1324 firms in this sample have at least one plan sale. Of the above insiders, about 58% sold at least once outside a trading plan during our sample period. Insiders who sell under a trading plan have smaller transaction sizes, higher number of transactions and sell larger amounts in aggregate. Figure 1 shows a clear increasing pattern in the ratio of the number of plan sales to total sales during our sample period. In 2006 more than 30% of all insider sales transactions were plan sales. Table 2 shows plan sales usage across different categories of insiders and over time. We categorize insiders as follows. CEOs, CFOs, COOs, Chairmen of the board, Presidents and General Counsels are categorized as “top management”. Other executives of the firm are categorized as “officers”. These include executives who are directors and large shareholders. Owners of more than 10% of the shares outstanding, who are not officers or top management, are classified as “large shareholders”. These include large shareholders who sit on the board of the firm. Finally directors of companies who are neither officers of the firm nor hold more than 10% of the firm’s shares are classified as “outside directors”. The increasing trend in usage of plan sales is seen across all categories of insiders. In 2006 the ratio of number of plan sales to all sale transactions was more than 30% for all insiders and about 45% for top management. These estimates are lower bounds as we do not capture those plan sales which were not disclosed in Form 4 filings. To our knowledge, this is the first study that uses a comprehensive cross section of US firms to document the increasing popularity of plan sales and point out that a fairly high proportion of insider sales are being executed under a trading plan. The results of Table 2 are based on the CRSP-Compustat matched sample. The CRSP matched sample gives almost identical results.

Plan usage across firms of different size and book-to-market is shown in Table 3. All firms in the CRSP-Compustat matched universe with positive book equity are sorted independently into size and book-to-market quintiles at the end of June in every year. These portfolio assignments apply from the next month to June of the following year. The definitions of size and book-to-market ratio follow Fama and French (1993). Size is defined as market equity i.e. number of shares outstanding times the price of each share. Book-to-market ratio is computed as the ratio of book equity⁵ from the previous year to the market equity on the last trading day of the previous year. Table 3 shows that the ratio of number of plan sales to total sales is higher for firms with lower book-to-market. The ratio of number of firm-months with at least one plan sale to the number of firm-months with at least one sale also decreases with book-to-market. These patterns suggest that plan sales are more popular among high book-to-market firms. The proportion of plan sales to total sales seems to be smaller in smallest quintile of firms. This suggests that 10b5-1 plans are less popular among smallest firms. However, this could in part reflect a lower tendency among insiders of these firms to disclose that sales were executed under a plan.

III. Methodology and main results

We use event study methods, as is standard in insider trading literature, to study whether plan sales by corporate insiders are well timed. We conduct a preliminary examination by calculating abnormal returns as the return on the stock minus return on the value weighted CRSP index. For each sale transaction we calculate daily abnormal returns over a window of 90 days before and after the event. The sum of abnormal returns on all days in a window gives the cumulative abnormal return (CAR) for that window. We then look at the equally weighed average of CARs for windows of 90 days before and after plan sales transactions. Plan sales are preceded by an average CAR of about 11% and are followed by an average CAR of -0.72% which is not statistically distinguishable from zero (t -statistic = -0.93). The above t -statistic is computed using the methodology in Patell (1976). Studies of insider trading (Seyhun (1986, 1998), Lakonishok and Lee (2001), Jeng et al. (2003)) find that insiders sell stocks after rises. We find that this is true even for pre-planned sales. This suggests

⁵ Book equity is stockholder's equity plus any deferred taxes and any investment tax credit, minus the value of any preferred stock. To determine the value of preferred stock we use redemption value if this is available, otherwise we use liquidating value if it is available, and if not we use carrying value.

that insiders incorporate price contingent orders in their plans allowing them to sell in response to stock prices rises. The measures of abnormal returns used above are crude. In addition to the issue of using the return on the value-weighted market index as a benchmark return for all stocks, there are statistical problems in the computation of t-statistics due to cross sectional dependence in the abnormal returns of transactions in the same firm and across firms. We therefore base our statistical tests on a calendar time event study method that eliminates issues related to cross sectional dependence and controls for returns on stocks with similar characteristics while calculating abnormal returns.

A calendar time event study methodology, which is used by Loughran and Ritter (1995), Brav and Gompers (1997) and is one of the methods in Jeng et al. (2003), involves calculating the time series of returns on a hypothetical calendar time portfolio and looking at the intercept from a regression of this series on time series of factor returns (e.g. Fama-French factors and the momentum factor). Barber, Lyon and Tsai (1999) find that such methods do not perform well “in samples with size and book-to-market based biases”. The above methods yield ill specified tests that tend to significantly over-reject the null against an alternative of underperformance when the sample has a lot of low book-to-market firms⁶. This is likely to be a concern for study of plan sales since sales in general tend to be concentrated among low book-to-market firms (Jenter (2005)) and, as seen in Table 3, the proportion of plan sales is higher among low book-to-market firms. An alternate calendar time method used in the literature (e.g. Jeng et al. (2003)) calculates abnormal return on a stock as the difference between the return on the stock and that on a characteristic matched portfolio. The abnormal return on a portfolio of stocks is then obtained as an average of abnormal returns on the constituent stocks. Barber, Lyon and Tsai (1999) show that tests of abnormal returns using this type of calendar time methodology are reasonably well specified⁷. Our study uses a calendar time methodology of the latter type the details of which are presented below.

Let us suppose we are interested in examining whether abnormal returns over a 90 day window following plan sales are significantly negative. To test this we look at abnormal returns on a dynamic

⁶ Table X, Panel A of Barber, Lyon and Tsai (1999) shows that in a randomly selected sample of low book-to-market firms, regression intercept method rejects the null of zero abnormal returns in 22.8% of the cases against an alternative of negative abnormal returns at a one-tailed significance level of 2.5%.

⁷ Table XI, Panel A of Barber, Lyon and Tsai (1999) shows that in a randomly selected sample of low book-to-market firms, the reference portfolio method rejects the null of zero abnormal returns in about 4% of the cases against an alternative of negative abnormal returns at a one-tailed significance level of 2.5%.

calendar time portfolio that adds stocks to the portfolio on the day after it has a plan sale and keeps it in the portfolio for 90 days. If a stock that is already in the portfolio has a plan sale, then it is not added multiple times to the portfolio. However, the stock is kept in the portfolio for 90 days following the recent plan sale. On each day, the abnormal return for each stock in the portfolio is calculated as the difference between the stock return and the return on a matching portfolio of stocks with similar characteristics⁸. The construction of the matching portfolio is described in Appendix A. The abnormal return on the calendar time portfolio for each day is obtained by averaging the abnormal returns of the constituent stocks. This gives us a time series of daily abnormal returns on the calendar time portfolio. Days on which the calendar time portfolio has less than 20 stocks are dropped. The annualized average abnormal return is calculated by averaging the above time series of abnormal returns and multiplying it by 250. To test whether the abnormal return on the calendar time portfolio is significantly different from zero, we look at the t-statistic calculated as $[(\text{average}) * \sqrt{(\text{no of days})} / (\text{standard deviation})]$.

The above procedure is followed with stocks being included in the portfolio for 10, 22, 90 or 130 days to examine abnormal returns over different horizons following plan sales. The above procedure is followed to obtain estimates for abnormal returns following non-plan sales over different horizons. Estimates of abnormal returns over various horizons following plan and non-plan sales are presented in Table 4. Panel A presents the results for the case in which abnormal return on the calendar time portfolio for each day is calculated as an *equally* weighed average of the abnormal returns of the constituent stocks. Annualized abnormal return over a 6-month (130 days) horizon following plan sales is -2.45% (t-stat = -1.38). The corresponding abnormal return following non-plan sales is -0.64% . The difference in abnormal performance between the two portfolios is not statistically significant (t-stat = -1.07). The test statistic is obtained by first calculating the time series of the difference in abnormal returns between plan sale and non-plan sale portfolios and then calculating $[(\text{average}) * \sqrt{(\text{no of days})} / (\text{standard deviation})]$ for this series.

One might argue that small plan sales are unimportant and unlikely to be strategically timed. Larger plan sales might be more likely to be followed by negative abnormal returns than smaller plan sales.

⁸ The matching is done based on characteristic of the stock as of the most recent plan sale date. This ensures that while calculating abnormal returns a stock that had a plan sale is compared to other stocks that were similar to it at the time of the event.

Additionally, sales by multiple insiders or multiple sales by the same insider within a short period of time might be more likely to be followed by underperformance. The calendar time portfolio used to obtain results presented in Panel A gives equal weight to all stocks in the portfolio irrespective of the number of sale transactions and the size of the sales. This might result in a low power for detecting underperformance. To address these concerns, we use an alternate method for calculating abnormal returns on the calendar time portfolio that weights stocks unequally. On each day the abnormal return on the calendar time portfolio is the weighted average of the abnormal returns of the constituent stocks, where the weights are proportional to the total dollar value sold under 10b5-1 plans over the previous k days. The value of k is 10, 22, 90 or 130 and is chosen to match the number of days for which the stocks are kept in the calendar time portfolio after a plan sale. Panel B presents the annualized average abnormal return for dollar-value-of-plan-sales weighted calendar time portfolios and corresponding test statistics. The tests are unable to reject the hypothesis of equal abnormal returns following plan and non-plan sale for any horizon.

The above procedure might give too much weight to larger firms and firms with many insiders. To address this, we calculate abnormal returns on the calendar time portfolio by assigning weights to the constituent stocks that are proportional to the proportion of outstanding shares sold under 10b5-1 plans over the previous k days. The value of k is chosen to match the number of days for which the stocks are kept in the calendar time portfolio after a plan sale. Panel C presents the results for proportion-of-outstanding-shares-sold weighted calendar time portfolios and the corresponding test statistics. None of the tests are able to reject the hypothesis that abnormal returns following plan and non-plan sales are equal.

Prior studies (Bettis et al. (2000)) show that firms restrict trading by corporate insiders during a window preceding earnings announcements, since insiders are likely to possess nonpublic information at this time. We now examine if similar restrictions apply to plan sales. Figure 3 shows the distribution around earnings announcement date of plan sales, non-plan sales across all firms, and non-plan sales after the first observed plan sale in firms that have at least one plan sale. The earnings announcement dates were obtained from Compustat. There is a striking difference in the occurrence of non-plan sales before and after earnings announcement. There are very few non-plan sales in the four weeks preceding an earnings announcement and a large number of non-plan sales in the week following it. The number of non-plan sales gradually declines in the subsequent weeks.

This is consistent with previous research on insider sales around earnings announcement. However, there is a much smaller difference in number of plan sales before and after earnings announcements. This suggests that most firms allow pre-planned trades to execute during blackout periods. The distribution of non-plan sales in the firms with plan sales is almost identical to the distribution of all non-plan sales. Therefore the difference in distribution of plan sales and non-plan sales around earnings announcement does not arise from firm level differences in enforcement of black-out period restrictions. The striking difference in the distribution pattern for plan and non-plan sales around earnings announcement dates suggests that misclassification of plan and non-plan sales are small.

IV. Comparison with prior research

A. Event study methodologies in Jagolinzer (2007)

Jagolinzer (2007) finds (in Table II) that sales under 10b5-1 plans are followed by a mean abnormal return per insider of around -6% over the subsequent 6 months. The abnormal returns were calculated as follows. First, the abnormal return over a window following every sale was calculated as the difference between the return on the stock and the CRSP value-weighted market index over that window. Next, abnormal returns were averaged to each insider by taking the sales proceeds (in dollars) weighted average of the abnormal returns over all plan sales by a particular insider. Finally, the equally weighed average of the averages obtained from the previous step was calculated.

Figure 1 of Jagolinzer (2007) shows a steep drop in average cumulative abnormal returns following plan sales by corporate insiders. The figure was obtained by the following procedure. For each firm with at least one plan sale during the sample period, sale was drawn at random from its pool of plan sales. The average CAR profile was obtained by averaging across all the CARs around the selected sale events. To ensure that a single influential draw does not confound results, the random draws were repeated 100 times and the average CAR profile across the 100 draws was plotted. The above procedure was used “to mitigate the potential that overlapping returns or multiple firm observation bias will confound results”. We argue below that the mean abnormal return following plan sales calculated using the above procedures have a negative expected value, even if insiders do not time their sales strategically, but incorporate price contingent orders in their trading plans.

B. Price contingent orders in 10b5-1 plans

Previous research on insider trading found that insiders tend to sell after rise in stock prices. Since insiders are allowed to incorporate price contingent orders in 10b5-1 plans, we expect that many insiders would do so. This hypothesis is supported by Figure 4 that shows plan sales are preceded by large positive abnormal returns on an average. While plan initiation announcement by companies usually do not divulge any information about the plans, a few of them that do often mention that sales would occur only if certain price targets are met, or are subject to minimum price requirements. An example of one such press release is presented in Appendix B. Greg Besner, the president of Restricted Stock Systems, a software and service provider focusing on restricted and controlled stock plans was quoted in Sherman (2007)⁹ as saying “*We’ve probably seen thousands of trading plans over the years. Over 90 percent of the trades that are put in place by these trading plans are limit orders.*” Taken together the above pieces of evidence suggest that insiders incorporate price contingent orders in 10b5-1 plans. As a result plan sales cannot be treated as exogenous events since their probability of occurrence is related to past stock price performance.

C. Example illustrating the source of bias

The following example illustrates the source of bias in the event study procedures described in subsection A. In our example insiders have no ability to forecast future returns, yet the estimates of abnormal returns following plan sales have negative expected values i.e. they are biased. We assume that market earns a return of zero and every firm earns a return of either +10% or –10% in each period. The two possible values for returns are equally likely and unpredictable and returns are independent across firms. We assume all firms have a stock price of \$100 in the beginning i.e. at time $t=0$. Every firm has exactly one insider who has set up the following trading plan: sell one stock at time $t=0$; sell two stocks if the price goes up to \$110 at time $t=1$ and no stocks if price drops to \$90. This is represented graphically in Figure 2. This stylized example captures a simple price contingent order in a trading plan. Stocks can follow four possible paths which are equally likely. Let us represent the paths by UU, UD, DU and DD. UU indicates that the stock price went up in both periods. Note that in the above setup insider trades are triggered based on past stock price behavior and are not based on any information about future stock price movements.

⁹ The article is available online at http://www.thecrossbordergroup.com/pages/1168/December+2007.stm?article_id=12303

We now look at the expected value of the average one-period post event abnormal return calculated using the event study method described in sub-section A. We first find the value weighted average abnormal return for each insider. Insiders who belong to firms that have a positive return in the first period sell at $t=0$ and $t=1$. The average abnormal returns for insiders belonging to firms whose stock price paths are UU and UD would be $(100 * 10\% + 220 * 10\%)/320 = 10\%$, and $(100 * 10\% + 200 * -10\%)/320 = -3.75\%$ respectively. The average abnormal returns for insiders belonging to firms with price paths DU and DD would be -10% , since they have only one sale which is followed by an abnormal return of -10% . The probability of a particular firm having one of the four possible price paths is $1/4$. Therefore the expected value of average abnormal return following plan sales is equal to

$$(10\% - 3.75\% - 10\% - 10\%)/4 = -3.44\%.$$

Now let us analyze the second event study method described in subsection A in the context of the above example. For each firm a plan sale is drawn at random and the abnormal returns following the randomly drawn plan sales are then averaged. For firms that follow the price paths UU or UD the first sale and the second sale have an equal chance of being drawn. For the other firms there is only one sale and that will be drawn with probability one. The ex-ante expected value of abnormal return following a randomly drawn plan sale for a given firm is

$$\{ 10\% + [(1/2) * (10\%) + (1/2) * (-10\%)] + -10\% + -10\% \} * (1/4) = -2.5\%$$

Therefore the ex-ante expected value of the average abnormal returns across firms will also be -2.5% . The above calculations illustrate that abnormal returns calculated using both methods described in the subsection A have a negative expected value when insiders use price contingent orders in their plans even when they have no ability to predict future returns. Even if insiders do not use price contingent orders in their plans but are more likely to enter into new plans following rises in stock prices, the event study methods would be biased since high returns are more likely to be followed by more plan sales.

The bias demonstrated above arises from the fact that the weight each abnormal return gets in the final average abnormal return calculation is inversely related to the abnormal return following the event. If the abnormal return following a sale by an insider is positive, the insider is more likely to

sell again in the future since the stock price is likely to go up. This implies that the abnormal return would tend to get a lower weight, since each abnormal returns gets a weight in the final answer depending on total sales by the insider or total number of sales for that firm. The calculations of expected value of abnormal return estimates do not depend on the number of firms. Therefore the above procedures would remain biased even when the number of firms in the sample becomes large. It can be shown that in the above example the expected value of the equally weighted average of abnormal returns following all observed plan sales converges to zero (in probability) as the number of firms becomes large. Therefore an equally weighted average is consistent and asymptotically unbiased, while the two methods described in subsection A yield estimates that are biased and inconsistent.

From the above example we note that firms that have more plan sales i.e. where the stock price path is either UU or UD, have an average post-plan-sale abnormal return of either +10% or 0% with equal probability. Therefore the expected value of the abnormal return estimate for these firms is 5%. For firms that have fewer plan sales i.e. where the stock price path is either DU or DD, have an average post-plan-sale abnormal return of -10% with probability 1. Therefore the expected value of the abnormal return estimate for these firms is -10%. Hence we observe that for firms that end up having a higher number of total plan sales, the average abnormal returns following plans sales is higher.

D. Empirical impact of the above bias

If the events are exogenous, it can be shown that the event study methods described in subsection A are unbiased under the null of zero post-event abnormal returns. However, as argued earlier, plan trades have a higher chance of occurring after positive abnormal returns and are therefore not exogenous. The previous section shows that this could potentially bias post sale abnormal return estimates negatively. However the extent to which this bias could affect empirical results is not clear. In this section we explore this question by comparing results obtained using methods used in Jagolinzer (2007) to those using other methods that are similar but do not suffer from the bias.

An equally weighted average of post-event abnormal returns is asymptotically unbiased under the null of zero abnormal returns. As reported earlier, this gives us an abnormal return estimate of -0.72% over a 6 month window following plan sales. First averaging the 6-month abnormal returns

to each insider and then averaging across insiders gives -6.2% in our sample. This is even lower than the value of -6.0% that Jagolinzer (2007) reports. This suggests that the difference between results of our study and that of Jagolinzer (2007) are not due to differences in the samples, but are completely attributable to differences in methodology. Figure 1 of Jagolinzer, which shows a drop in CAR after plan sales, is obtained by averaging across CAR profiles of 100 random sample draws. The details of the procedure have been explained in subsection A. If instead of 100 draws, the number of draws tends to infinity, the CAR profile from the methodology converges to the CAR profile obtained by first averaging the CAR profiles to each firm and then averaging these across firms. Figure 4 plots the CAR profile obtained in this manner and the equally weighted average of CARs across all plan sales. Averaging the firm averages results in a CAR profile that shows a decline after plan sales, just like Figure 1 of Jagolinzer (2007). In contrast, the equally weighted average of CARs stays almost flat after plan sales.

In the previous subsection we argued that average abnormal returns following plan sales in firms that have a higher number of plan sales should be higher. To check if this holds in the data, we classify firms into four categories based on number of plan sales observed during the sample period – less than 21, between 21 and 50, between 51 and 200 and greater than 200. For firms in each category, we generate the CAR profile around plan sales by taking an equally weighted average across events. Figure 5 shows that plan sales in firms that have less than or equal to 20 plan sales during out sample period are followed by significant negative abnormal returns, while plan sales in firms which have more than 200 plan sales are followed by positive abnormal returns. The other two categories lie in between. This shows that the bias demonstrated in the previous subsection using a stylized example is empirically relevant for the study of plan sales.

An equally weighed average across all events overweighs firms that have more insiders. This was one of the reasons why the CAR profile in Jagolinzer (2007) was generated by picking one plan sale at random from the pool of multiple plan sales for each firm. The equally weighted calendar time portfolio method presented in section III accounts for the above concern. Even if a firm has plan sales by multiple insiders around the same time that weight of the firm in the hypothetical portfolio does not increase. An alternate way to address the above concern using a simple event study methodology would be to include only the first plan sale for each firm in each calendar month in the event study. This ensures that sales by multiple insiders in the same firm around the same time are

not considered as different events. Note that the selection of the event is based on information that is available at the time of the event occurring and therefore will not suffer from any kind of look-ahead biases. If abnormal returns are calculated as the excess over value weighted market returns, we get an average CAR over 90 days following the event of -0.51% ($t\text{-stat} = -0.11$). Therefore even this test fails to find any evidence of negative abnormal returns following plan sales by insiders.

E. Sample selection bias in comparison sample of Jagolinzer (2007)

In Jagolinzer (2007) the abnormal returns following plan sales are compared with abnormal returns following non-plan sales for firms which had at least one plan sale. The sample of non-plan sales suffers from a look-ahead bias. Jagolinzer considers all non-plan sales during the entire sample period for firms that had at least one plan sale. Some of these non-plan sales occurred before the first plan sale was observed for that firm. Therefore they were included in the sample based on information that was not available at the time of the sale. If insiders are more likely to enter into trading plans following an increase in stock prices, the abnormal returns following these non-plan sales are expected to be positive conditional on the fact that insider will enter into trading plans in the future. Therefore the comparison sample suffers from a look-ahead bias.

The sample of non-plan sales which occurred after the first plan sale in the firm would not suffer from this bias. In our sample we find that the average 90 day abnormal returns following all non-plan sales during our sample period for plan-sale firms is around $+1.9\%$. On the other hand, the average 90 day abnormal return following the sample of non-plan sales following the first observed plan sale is around -1.0% . This shows that the look-ahead bias significantly affects the estimate of average abnormal returns for the comparison sample of non-plan sales used in Jagolinzer (2007).

V. Discussion and conclusion

A number of articles in the media suggest that pre-planned sales by insiders are well timed. Following is an excerpt for one such article (Sasseen et al. (2006))¹⁰: “*BusinessWeek found a surprising amount of leeway over preplanned trades. At nearly half the companies examined, sales were concentrated in the*

¹⁰ Available online at http://www.businessweek.com/magazine/content/06_51/b4014045.htm

months leading up to a stock's peak or just thereafter. Frequently, the number of shares sold increased as the stock hit new highs, then trailed off or ended as the stock dove.” The above patterns could be a result of insiders incorporating price contingent orders in their trading plans i.e. sell only when the stock price hits certain pre-determined levels. There is some evidence that incorporating such orders in trading plans is quite common. Therefore the observed patterns do not necessarily imply any wrongdoing by corporate insiders.

Jagolinzer (2007) finds significant stock price underperformance following plan sales by corporate insiders. We show that the post-event abnormal return estimates in the study, which are obtained using non-standard methods, are negatively biased if plan sales have higher chance of occurring after a run-up in stock prices. Since many trading plans incorporate limit orders, they execute only when stock prices hit a predetermined level. As a result plan trades indeed have higher chance of occurring after stock price increases. The bias arises from the average abnormal return calculation method that tends to give a lower weight to an event if it is followed by a positive abnormal return and higher weight if it is followed by a negative abnormal return. The negative post plan-sale abnormal return estimates in Jagolinzer (2007) largely reflect the negative bias in the estimation methodology. We find that average abnormal return is -1.23% over 6 months following plan sales as against -6.0% reported in Jagolinzer (2007). Statistical tests fail to reject the hypothesis that abnormal returns following plan sales are equal to zero or the hypothesis that they are equal to abnormal returns following non-plan sales. Our sample of plan sales include only those sales that are identified as being executed under a trading plan in Form 4 documents. To the extent that this sample is not representative of all plan sales, our results do not reflect stock price performance following all plan sales.

Since we classify plan sales based on automated text searches, there is a possibility that some plan sales are not captured, while some non-plan sales get classified as plan sales. Significant misclassification of plan and non-plan sales could result in an inability to find differences in stock price performance following them. However, we find a striking difference in the distribution of our sample of plan and non-plan sales around earnings announcement dates. This suggests that misclassification errors in our sample are very small.

In 2006 about 45% of all sale transactions by top management of firms were under a trading plan.

This number is a lower bound since we do not capture all sales that were executed under a trading plan. To our knowledge, this is the first study to document that such a high proportion of sales are under a trading plan in a comprehensive cross section of U.S. public firms. Contrary to previous research and media articles, we do not find any evidence of large scale timing of sales executed under 10b5-1 plans. However, it is possible that in a small subset of firms plan sales are strategically timed. Our study does not explore this. Our study shows that event study methods that seem reasonable may give biased abnormal return estimates when the events are not exogenous. Therefore, event study techniques that are not standard should be analyzed to check if the abnormal return estimates obtained are consistent.

References

- Bettis, J. C., J. L. Coles, and ML Lemmon, 2000, Corporate policies restricting trading by insiders, *Journal of Financial Economics*, 57, 191-220.
- Brav, A., and P.A. Gompers, 1997, Myth or reality? The long-run underperformance of initial public offerings: Evidence from venture and nonventure capital-backed companies, *Journal of Finance*, 52, 1791-1821.
- Carpenter, J. N., and B. Remmers, 2001, Executive Stock Option Exercises and Inside Information, *Journal of Business*, 74, 513-534.
- Daniel, K., M. Grinblatt, S. Titman, and R. Wermers, 1997, Measuring mutual fund performance with characteristic-based benchmarks, *Journal of Finance*, 52, 1035-1058.
- Fama, E.F., and K.R. French, 1993, Common risk factors in the returns on stocks and bonds, *Journal of Financial Economics*, 33, 3-56.
- Jaffe, J.F., 1974, Special Information and Insider Trading, *Journal of Business*, 47, 410-428.
- Jagolinzer, A.D., 2007, Sec Rule 10b5-1 and Insiders' Strategic Trade, Working Paper, Stanford University.
- Jegadeesh, N., 1990, Evidence of predictable behavior of security returns, *Journal of Finance*, 45, 881-898.
- Jenter, D., 2005, Market Timing and Managerial Portfolio Decisions, *Journal of Finance*, 60, 1903-1949.
- Lakonishok, J., and I. Lee, 2001, Are insider trades informative?, *Review of Financial Studies*, 14, 79-111.

Loughran, T., and J.R. Ritter, 1995, The new issues puzzle, *Journal of Finance*, 50, 23-51.

Lyon, J.D., B.M. Barber, and C.L. Tsai, 1999, Improved Methods for Tests of Long-Run Abnormal Stock Returns, *Journal of Finance*, 54, 165-201.

Patell, J.M., 1976, Corporate forecasts of earnings per share and stock price behavior: Empirical tests, *Journal of Accounting Research*, 14, 246-276.

Sasseen, J., M. Tucker, N. Saminather, L. Woellert, J. Cady, and S. Zegel, 2006, Insiders with a Curious Edge, *BusinessWeek*, December 7th.

Seyhun, H.N., 1986, Insiders' profits, costs of trading, and market efficiency, *Journal of Financial Economics*, 16, 189-212.

Seyhun, H.N., 1998, *Investment Intelligence from Insider Trading*, MIT Press.

Sherman, E., 2007, Trouble on the Horizon, *Corporate Secretary*, December.

Appendix A : Construction of benchmark portfolios

This appendix describes the construction of matching portfolios. The method is similar to the one used in Daniel et al. (1997). Stocks in the CRSP-Compustat matched universe are classified every month into 250 bins through dependent $10 \times 5 \times 5$ sorts based on size (market equity value), book-to-market ratio and momentum. Size and book-to-market sorts are performed once a year at the end of June, while the momentum sorts are performed monthly. Therefore stocks can change bins every month. Every June stocks in the CRSP-Compustat universe are first sorted into size deciles based on market equity, the product of number of shares and share price, obtained from CRSP. Then the stocks within each size decile are further sorted into quintiles based on their book-to-market ratio. In calculating the book-to-market ratio, we use the book equity from the previous year and the market equity on the last trading day of the previous year. Book equity is stockholder's equity plus any deferred taxes and any investment tax credit, minus the value of any preferred stock, all obtained from Compustat. To determine the value of preferred stock we use redemption value if this is available, otherwise we use liquidating value if it is available, and if not we use carrying value. The end of June is used as the sorting date because the annual report containing the book-equity value for the preceding year is virtually certain to be public information by that time (Fama and French (1993)). The above procedure sorts stocks into 50 bins based on size and book-to-market ratio at the end of every June which applies to all months from July of the sorting year to June of the subsequent year. Within each of these 50 bins, at the beginning of every month, firms are further sorted into quintiles based on the returns over the 12 months preceding the month before the sorting month. The return over the month preceding the sorting month is not used. This avoids problems associated with bid-ask bounce and monthly reversals (Jegadeesh (1990)). Only those firms, for which book equity data is available from Compustat and is positive, have prices available on CRSP in both December of the previous year and June of the sorting year and have monthly returns data in CRSP for at least six out of the twelve months required for momentum sorting, are classified into bins by the above procedure. The value weighted returns of stock in each of the 250 bins are calculated on each day and used as the return on the matched portfolio for stocks in that bin. The above procedure ensures that there are an equal number of firms in the 250 matching portfolios at all times.

Appendix B:

Press release by Interphase Corporation (NASDAQ: INPH) announcing adoption of 10b5-1 plans by executive officers



Press Release

FOR IMMEDIATE RELEASE

Interphase Executives Adopt 10b5-1 Trading Plans

PLANO, Texas, June 26, 2006 — Interphase Corporation (NASDAQ: INPH), a leading global supplier of next-generation networking technologies, today announced that six of its Executive Officers have established 10b5-1 plans to sell shares of Company stock in accordance with guidelines specified under the Securities Exchange Act of 1934 and the Company's policies with respect to insider sales.

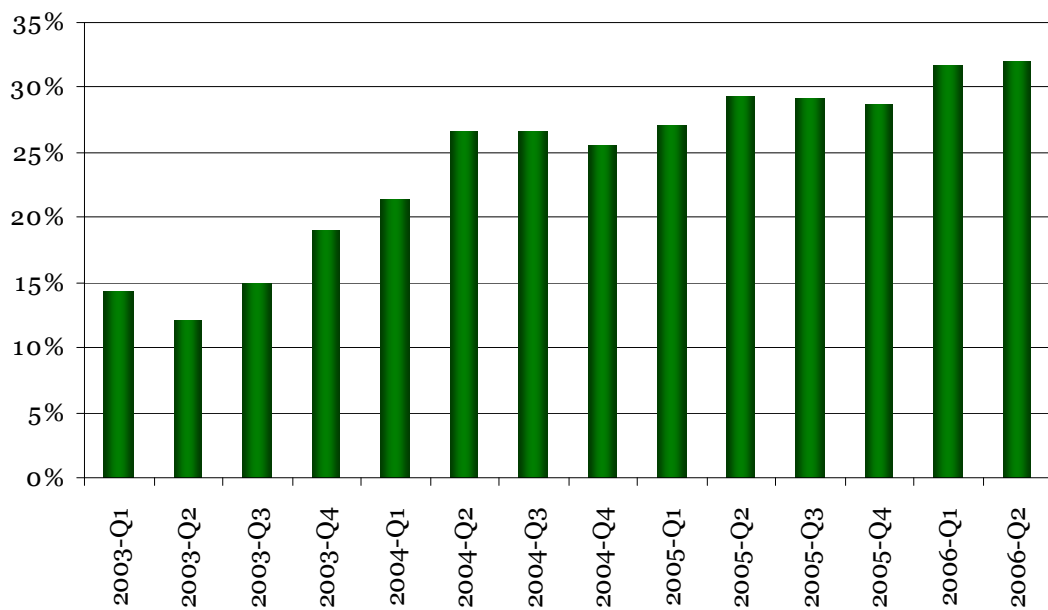
Gregory B. Kalush, Chairman, President and Chief Executive Officer; Thomas N. Tipton, Jr., Chief Financial Officer and Vice President of Finance; Felix V. Diaz, Vice President of Engineering and Chief Technology Officer; Randall E. McComas, Vice President of Global Sales and Customer Support; Deborah Shute, Vice President of Human Resources and Administration and James W. Gragg, Vice President of Operations and Fulfillment, have established 10b5-1 plans to sell a portion of their holdings of Company common stock. The maximum number of shares of Interphase Corporation common stock to be sold by the six Executive Officers under these plans is approximately 640,000 shares **at limit prices ranging from \$15.00 per share to \$41.00 per share**, beginning on August 1, 2006 and ending on August 1, 2007. Any transactions under the plans will be disclosed publicly through Form 144 and Form 4 filings with the Securities and Exchange Commission.

Rule 10b5-1 plans permit insiders to sell fixed portions of their holdings over a designated period of time under prearranged written plans that are established at a time when they are not in possession of material non-public information. Such programs provide for regular selling of a predetermined, fixed number of company shares in order to gradually diversify the individual's investment portfolio, minimize the market effect of share sales by spreading them out over an extended period of time and avoid concerns about initiating transactions while in possession of material non-public information.

Figure 1: Growth in 10b5-1 plan sales

The sample is obtained by matching all insider sales from Thomson Financial insiders trading database from Jan 2003 to June 2006 with CRSP. Plan sales are identified by conducting text searches through Form 4s filed by insiders. Multiple sales of the same type (plan or non-plan) by an insider on the same day are consolidated into a single sale transaction. An insider is defined as a unique person-firm pair. Panel A presents the ratio of number of plan sale transactions to the total number sale transactions within each quarter during our sample period. Panel B presents the ratio of total amount (in dollars) sold under a plan to total sales in each quarter.

Panel A



Panel B

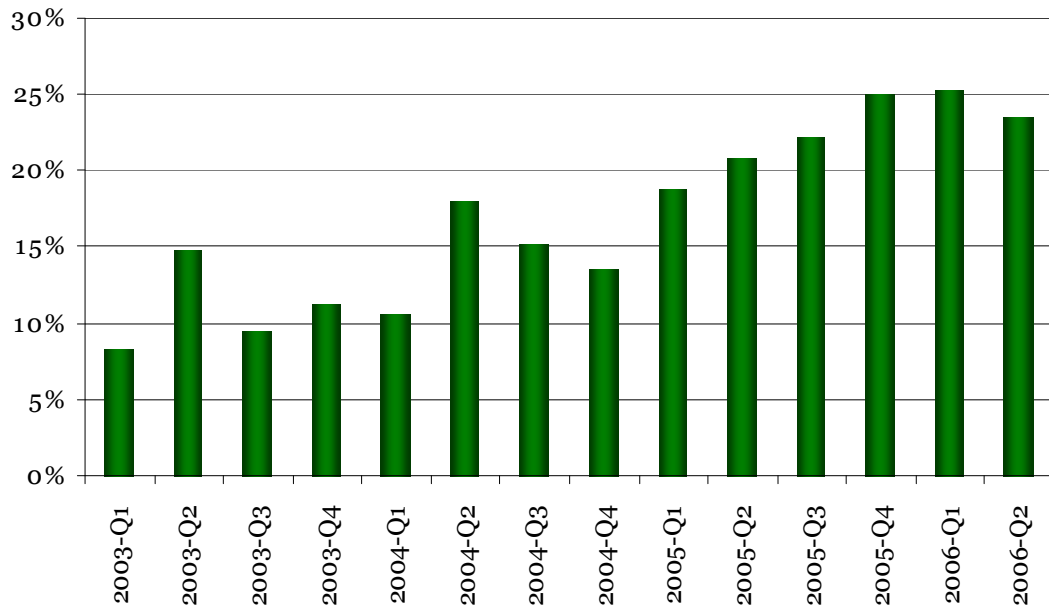


Figure 2: Price contingent orders and abnormal return calculations

The figure presents a two-period, binomial tree model for a simple price contingent order. The analysis of abnormal return estimates for this example is presented in section IV C of the paper.

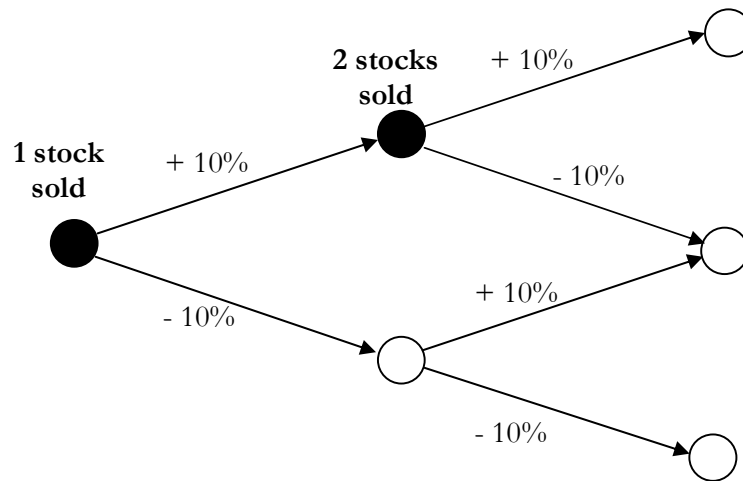


Figure 3: Distribution of plan and non-plan sales around earnings announcements

The sample is obtained by matching all insider sales from Thomson Financial insiders trading database from Jan 2003 to June 2006 with CRSP and Compustat. Plan sales are identified by conducting text searches through Form 4s filed by insiders. Multiple sales of the same type (plan or non-plan) by an insider on the same day are consolidated into a single sale transaction. An insider is defined as a unique person-firm pair. Earnings announcement dates are obtained from Compustat. The figure shows the distribution of transactions for ten weeks around earnings announcement dates for three categories of sales – a) plan sales, b) Non-plan sales after the first observed plan sale (in firms that have at least one plan sale during our sample period), and c) all non-plan sales during our sample period. The histograms show the ratio of number of transactions observed in each week relative to the earnings announcement date to the total number of transactions of that type occurring within ± 5 weeks of earnings announcement. The day of earnings announcement and the four prior days are defined as week -1 and the five trading days following the earnings announcement date constitute week +1.



Figure 4: Effect of calculation method on CAR profile around 10b5-1 plan sales

The figure shows average cumulative abnormal return profile calculated by different methods. The solid red line is the result of first averaging the CARs to each firm and then averaging these across firms. This is similar to the method used to obtain Figure 1 in Jagolinzer (2007). The green line is obtained by averaging the CARs across all plan sales. The sample is obtained by matching all insider sales from Thomson Financial insiders trading database from Jan 2003 to June 2006 with CRSP. Plan sales are identified by conducting text searches through Form 4s filed by insiders. Multiple sales of the same type (plan or non-plan) by an insider on the same day are consolidated into a single sale transaction.

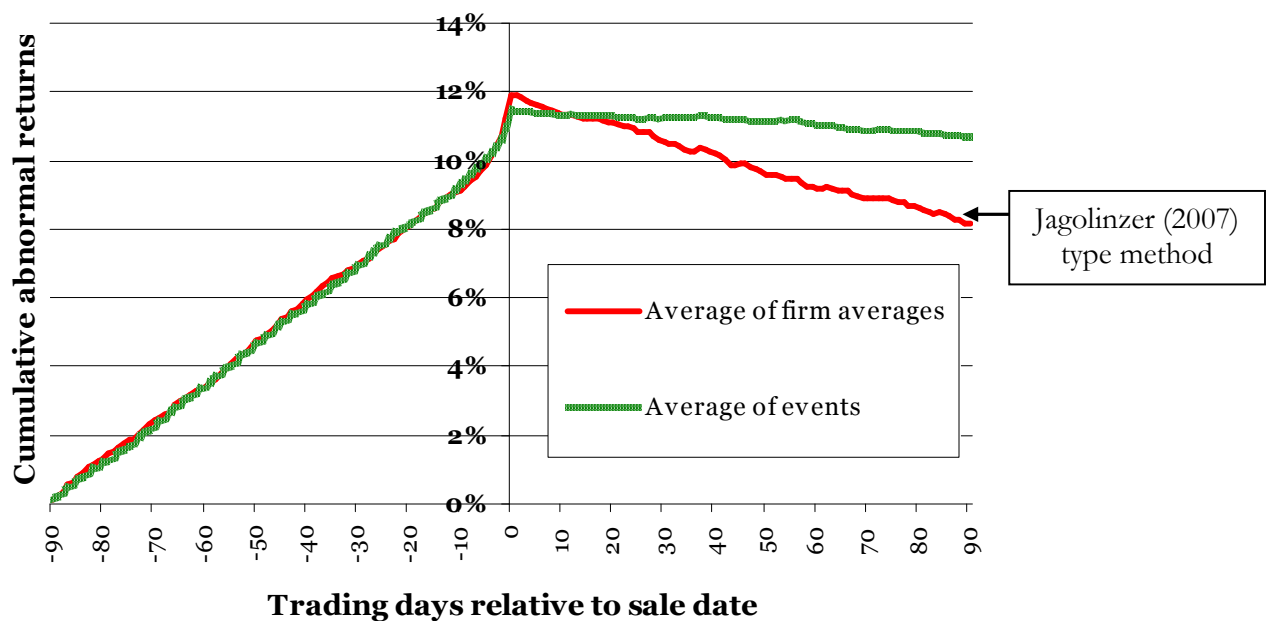


Figure 5: Number of plan sales in a firm and cumulative abnormal returns

Firms are categorized into four categories based on the number of plan sales observed during our sample period – a) less than 21, b) between 21 and 50, c) between 50 and 200, and d) greater than 200. Plan sales from these firms are correspondingly categorized. The figure shows the equally weighed average of CARs for each plan sales in a category. The sample is obtained by matching all insider sales from Thomson Financial insiders trading database from Jan 2003 to June 2006 with CRSP. Plan sales are identified by conducting text searches through Form 4s filed by insiders. Multiple sales of the same type (plan or non-plan) by an insider on the same day are consolidated into a single sale transaction.

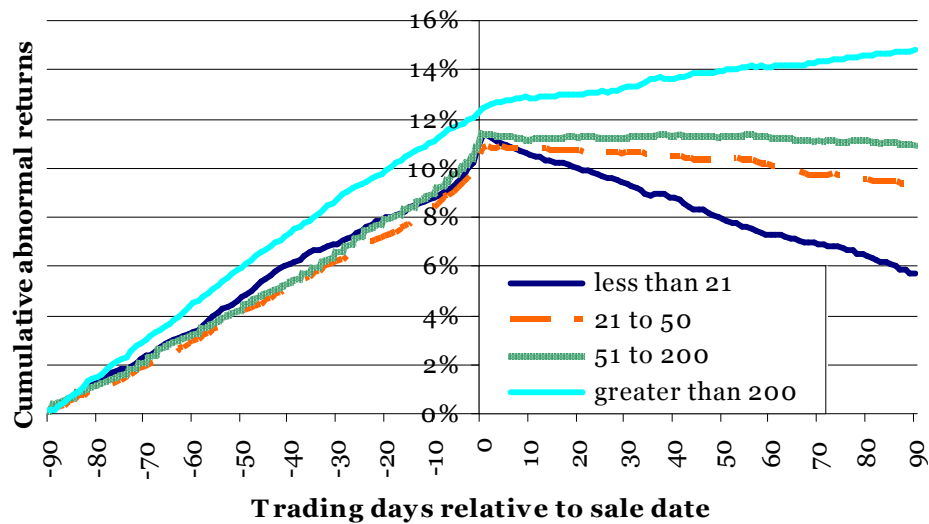


Table 1: Summary of data for plan sales, non-plan sales and all sales

The sample in this table is obtained by matching all insider sales from Thomson Financial insiders trading database from Jan 2003 to June 2006 with CRSP and Compustat. Firms that do not meet data requirements for sorting into portfolios based on size, book-to-market and momentum are dropped. Multiple sales of the same type (plan or non-plan) by an insider on the same day are consolidated into a single sale transaction. An insider is defined as a unique person-firm pair. The data in each column of the table is for the sample of firms with at least one transaction of that type. The means and medians for different variables are conditional on the variable being greater than zero. For example the mean amount sold per insider under a plan sale is calculated only across insiders that have at least one plan sale during our sample period.

	Plan Sales	Non plan sales	All sales
Number of sale transactions	44,944	125,395	170,274
Number of unique firm sale days	34,596	98,943	131,586
No of insiders	4,472	29,897	31,765
No of firm-months of trade	11,225	36,687	44,255
No of firms	1,324	4,280	4,332
Value of sale per transaction (\$)			
Mean	726,835	1,123,368	1,019,132
Median	140,701	193,864	176,444
Amount sold per firm-month of sale (\$)			
Mean	2,910,189	3,839,637	3,921,176
Median	510,000	482,891	522,582
Total amount sold per insider (\$)			
Mean	7,304,757	4,711,668	5,462,982
Median	1,138,779	674,640	760,958
No of selling days per insider			
Mean	10.1	4.2	5.4
Median	5.0	2.0	3.0
No of trades per firm-month of sale			
Mean	4.0	3.4	3.8
Median	2.0	2.0	2.0

Table 2: Proportion of 10b5-1 plan sales over time and across insider categories

We categorize insiders as follows. CEOs, CFOs, COOs, Chairmen of the board, Presidents and General Counsels are categorized as “top management”. Other executives of the firm are categorized as “officers”. Owners of more than 10% of the shares outstanding, who are not officers or top management, are classified as “large shareholders”. Finally directors of companies who fall in none of the above categories are classified as “outside directors”. Panel A presents the ratio of number of plan sale transactions to the total number sale transactions within each quarter during our sample period and across insider categories. Panel B presents the ratio of total amount (in dollars) sold under a plan to total sales in each quarter across insider categories.

Panel A:

	Top management	Officers	Large Shareholders	Outside Directors	All
2003-Q1	25.4%	16.5%	5.6%	8.3%	14.3%
2003-Q2	22.1%	10.6%	2.2%	11.3%	12.2%
2003-Q3	24.3%	14.6%	4.3%	12.2%	14.9%
2003-Q4	30.3%	18.4%	8.1%	14.8%	19.0%
2004-Q1	33.5%	21.5%	6.7%	17.4%	21.5%
2004-Q2	38.7%	24.6%	8.6%	24.5%	26.6%
2004-Q3	38.0%	23.5%	11.0%	22.4%	26.5%
2004-Q4	38.9%	22.7%	12.1%	17.4%	25.6%
2005-Q1	40.2%	23.7%	21.5%	17.7%	27.1%
2005-Q2	43.9%	25.2%	22.8%	21.0%	29.3%
2005-Q3	43.3%	24.9%	25.7%	21.7%	29.2%
2005-Q4	40.2%	26.3%	24.5%	20.3%	28.6%
2006-Q1	44.2%	30.7%	18.1%	22.5%	31.7%
2006-Q2	44.6%	33.8%	14.3%	23.1%	32.0%
All	37.5%	23.5%	13.1%	18.7%	25.0%

Panel B:

	Top management	Officers	Large Shareholders	Outside Directors	All
2003-Q1	7.9%	15.1%	8.3%	3.6%	8.2%
2003-Q2	35.4%	5.5%	0.5%	6.9%	14.9%
2003-Q3	13.0%	13.9%	2.2%	10.5%	9.5%
2003-Q4	23.9%	14.5%	2.2%	8.0%	11.2%
2004-Q1	19.9%	12.5%	1.9%	6.4%	10.6%
2004-Q2	31.6%	19.1%	4.8%	9.2%	18.0%
2004-Q3	24.9%	15.1%	2.9%	11.9%	15.2%
2004-Q4	23.5%	18.0%	3.0%	5.7%	13.6%
2005-Q1	23.4%	25.2%	11.2%	11.4%	18.8%
2005-Q2	24.1%	31.4%	4.9%	13.3%	20.8%
2005-Q3	24.4%	33.9%	11.0%	18.0%	22.2%
2005-Q4	25.7%	43.8%	15.1%	11.8%	25.0%
2006-Q1	32.1%	41.2%	5.2%	14.5%	25.3%
2006-Q2	30.9%	41.9%	5.0%	26.4%	23.6%
All	25.2%	26.9%	5.4%	11.8%	17.7%

Table 3: Proportion of 10b5-1 plan sales across book-to-market and size quintiles

All firms in the CRSP-Compustat matched universe with positive book equity are sorted every year in at the end of June into independent size and book-to-market quintiles. In calculating the book-to-market ratio, we use the book equity from the previous year and the market equity on the last trading day of the previous year. Book equity is stockholder's equity plus any deferred taxes and any investment tax credit, minus the value of any preferred stock, all obtained from Compustat. To determine the value of preferred stock we use redemption value if this is available, otherwise we use liquidating value if it is available, and if not we use carrying value. The tables present various measures of plan sale usage during our sample period of Jan 2003 to June 2006 across size and book-to-market quintile based categories. Proportion of transactions is the ratio of number of plan sale transactions for firms in a category to the total number of sales transactions in that category. Proportion of firm-months is the ratio of number of firm-months in which at least one plan sale was observed for firms in a particular category to the number of firm-months in which at least one sale (of any type) was observed for firms in the same category. Proportion of dollar amount is defined in a similar manner by looking at the total value of stocks sold under a plan to the total value of stocks sold. Panel A presents the ratios across book-to-market ratio based quintiles, while Panel B presents the same across size based quintiles.

Panel A:

Book-to-market quintiles	Proportion of transactions	Proportion of firm-months	Proportion of dollar amount
Growth	34.5%	34.5%	23.5%
2	24.9%	25.8%	14.1%
3	24.6%	23.5%	19.4%
4	22.5%	20.4%	17.2%
Value	18.9%	16.9%	8.5%

Panel B:

Size quintiles	Proportion of transactions	Proportion of firm-months	Proportion of dollar amount
Small	13.2%	11.6%	6.5%
2	23.0%	21.5%	8.8%
3	29.5%	28.8%	14.7%
4	28.8%	29.0%	14.5%
Big	26.3%	25.4%	21.2%

Table 4: Calendar time abnormal returns on plan and non-plan sale portfolios

For each trading day between 1st February 2003 and 30th September 2006, hypothetical plan and non-plan sale portfolios are constructed for various portfolio formation periods of k trading days. All stocks that had at least one plan sale during k -day window ending on the previous trading day are included in the portfolio. The abnormal return on a hypothetical portfolio for that day is the weighed average of abnormal returns of the stock in the portfolio. Abnormal return for each stock is calculated as the difference between return on the stock and that on a matched portfolio of similar stocks. The construction of the matched portfolio is described in Appendix A. The stocks in the matched portfolio are selected based on the characteristics on the date of the last plan (or non-plan) sale during the portfolio formation window. The annualized abnormal returns are obtained by multiplying the average of daily abnormal returns on hypothetical portfolios by 250. Days on which the hypothetical portfolio has less than twenty stocks are dropped. The time series of the difference in daily abnormal returns between the plan sale and non-plan sale portfolios are used to calculate the t-statistic to test differences in performance. Panel A presents the results for the case where abnormal returns on the hypothetical portfolio is equally weighted average of abnormal returns for all the stocks included in the portfolio. Panel B presents the results when each stock gets a weight proportional to the total amount of sales by all insiders during the portfolio formation period. For Panel C, the stocks weights are proportional to the ratio of total number of shares sold by all insiders during the portfolio formation period to the total number of outstanding shares.

Panel A: Equally weighted portfolio

Window	Plan sales		Non-plan sales		t-stat for difference
	Abnormal returns (annualized)	t-stat	Abnormal returns (annualized)	t-stat	
[+1, +130]	-2.45%	-1.38	-0.64%	-1.19	-1.07
[+1, +90]	-2.56%	-1.40	-1.28%	-2.20	-0.73
[+1, +22]	-3.92%	-1.87	-2.42%	-2.73	-0.70
[+1, +10]	-4.43%	-1.86	-4.74%	-4.23	0.07

Panel B: Portfolio weighted by sales proceeds (in dollars)

Window	Plan sales		Non-plan sales		t-stat for difference
	Abnormal returns (annualized)	t-stat	Abnormal returns (annualized)	t-stat	
[+1, +130]	1.00%	0.24	0.71%	0.40	0.07
[+1, +90]	0.71%	0.17	0.78%	0.40	-0.02
[+1, +22]	-3.21%	-0.69	-0.13%	-0.05	-0.59
[+1, +10]	-3.10%	-0.63	-3.27%	-0.95	-0.07

Panel C: Portfolio weighted by proportion of shares outstanding sold

Window	Plan sales		Non-plan sales		t-stat for difference
	Abnormal returns (annualized)	t-stat	Abnormal returns (annualized)	t-stat	
[+1, +130]	-1.64%	-0.44	0.09%	0.03	-0.42
[+1, +90]	-3.32%	-0.87	-0.23%	-0.07	-0.70
[+1, +22]	-5.46%	-1.22	-4.98%	-0.89	-0.07
[+1, +10]	-2.23%	-0.41	-5.03%	-0.67	0.53