Insider Trading Around Open Market Share Repurchase Announcements

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Open market share buyback announcements are generally viewed as a signal of firm undervaluation; however these announcements can be employed opportunistically to mislead investors. Repurchase announcement will be a more credible undervaluation signal when it is supported by insiders' actions. Consistent with this I find that the market reacts more positively to buyback announcements when insiders trade parallel to their repurchase signal before the announcement. However, analysis of post-announcement insider trades suggests that insiders take advantage of higher post-announcement price and sell more heavily. This is especially true for firms that are more (less) likely to be overvalued (undervalued). The negative relationship between post-announcement insider sales and longer-term returns indicates firms with higher insider sales under perform in the long-run.

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I gratefully acknowledge helpful comments from Steve Young (Lancaster University), Jana Fidrmuc (Warwick Business School) and my Ph.D. examiners Edward Lee (Manchester Business School) and Chendi Zhang (Warwick Business School).

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1 Introduction

The corporate finance literature regards open market share repurchase announcements as a managerial signal of equity undervaluation. A survey of US corporate executives on firm payout policy suggests that undervaluation is the primary rationale behind managements' decision to repurchase a firm's stock (Brav et al. (2005)). However, the market may not view such an announcement as a strong signal of undervaluation. This is partly due to the fact that firms are increasing relying on share repurchases to distribute cash to shareholders as an alternative to dividends (see e.g., Fama and French (2001); Grullon and Michaely (2002) and Skinner (2008)); and partly because open market repurchase announcements only represent managements' commitment to repurchase shares but are not binding obligations on the part of firm management to complete (Stephens and Weisbach (1998) and Chan et al. (2010)).

In addition to the above factors investors may also discount the open market repurchase "signal" due the possibility that such an announcement may be driven by managerial incentives rather than signalling stock undervaluation to investors. As the market generally views the repurchase announcement as good news, managers may announce the repurchase programme to sell their shares at higher post-announcement prices. Edmans et al. (2014) demonstrate that managers' strategically time the disclosure of positive news (in months in which their equity vests), so that they can cash out at a higher stock price. Fried

(2001) and (2005) also suggests that open market repurchase announcements reflect opportunistic managerial behaviour and claims that the empirical evidence on share repurchases is more consistent with his "managerial opportunism" theory as compared to signalling theory.

The intuition in this paper is that the market should respond more favourably to a repurchase announcement when insiders' private information, as reflected in their personal trades, supports the repurchase signalling theory. The objectives of this study are twofold. First, I argue that a repurchase announcement will be a more credible signal of equity undervaluation when it is supported by insider actions. Specifically, insiders who buy more (or sell less) stocks of their firm before an open market repurchase announcement signify that they believe their stock to be under-priced. Holding additional firm's equity is costly and exposes already undiversified insiders to considerable risk. This is particularly true if the stock is overpriced. So, investors should take into account how insiders have traded in their personal account before the repurchase announcement in their reaction to stock buyback signal. Second, there is also a possibility that insiders may announce a repurchase programme to cash out at a higher post-announcement price (Fried (2005)).[1] If this is the case then such insiders will sell more shares after the repurchase announcement. These post-announcement insider sales will be particularly beneficial for insiders when announcement returns are high. So,

[1] Fried (2001) suggests that repurchase announcements can be used as a false signalling device as these are not binding obligations. Massa et al. (2007) and Chan et al. (2010) provide evidence that managers may use repurchase programs to fool the market.

one should expect higher post-announcement insider sales when repurchase announcement returns are high.

Seyhun (1998) and Lakonishok and Lee (2001) argue that small firms present the greatest potential of gains from insider trading. Smaller firms are more likely to be mispriced compared to large firms as the latter are under more scrutiny from analysts and media, and thus are generally priced more efficiently. They claim that insiders can predict long-run price performance of small firms (for up to two year) and hence can trade profitably in such firms. Therefore, I expect higher insider sales post-announcement for small firms. Similarly, I expect higher post-announcement insider sales for growth firms where the repurchase announcement is less likely to be a signal of stock undervaluation.

Finally, I explore the signaling effect of post-announcement insider trades on a firm's longer-term stock price performance. Insiders will sell more stock of their firm when they believe it to be either over-priced or at least not significantly under-priced. Thus post-announcement insider trades signal insiders' private information about a firm's true value. Thus, firms where insiders sell more shares post-announcement should not outperform or underperform in the long-run as compared to other repurchase announcing firms where insiders retain more equity in their firm. Therefore, I expect post-announcement net insider sales to be either unrelated or negatively related to longer-term returns of repurchase announcing firms.

I test these predictions by employing a sample of 8,945 open market repurchase programmes announced between 1990 and 2012. My analysis suggests that the repurchase announcement returns are higher for firms where insiders retain more equity (purchase more or sell fewer stocks) in their firm prior to the event (repurchase announcement). Firms with lower net insider sales earn buy-and-hold abnormal return of 2.4 percent in the 3-day (-1, 1) window around the event, that is 0.80 percent greater than firms with higher net insider sales before the event. The difference is highly significant at conventional levels.[2] However, pre-announcement trades affect only short-term announcement returns and I find no significant difference in the longer-term returns of the two groups.

My regression results indicate that short-term repurchase announcement returns are significantly related to pre-announcement insider trades. Insider trading literature suggests that purchases are more informative than insider sales as insiders may sell for reasons unrelated to signalling.[3] For example, Lakonishok and Lee (2001) show that only insider purchases provide value relevant information while insider sales have no predictive ability. Though pre-announcement insider purchases are strongly positively related to the 3-day announcement returns but I find that insider sales are also negatively related to

[2] The results hold when event firms are sorted on 6-month trading window before the announcement. Although, the magnitude of return difference between low and high net insider sales groups is smaller in this case but the difference is still statistically significant. 5-day (-2, 2) return difference between the two groups is similar to the number reporter above.

[3] Ofek and Yermack (2000) and Jin (2002) show that insider sales may be driven by reasons other than signalling such as liquidity needs and option exercises or stock-based grants.

returns. The market reaction to repurchase announcement is stronger for undervalued (value) firms and for firms that suffer from higher information asymmetry (small firms). My results also indicate that pre-announcement insider trades closer to the event are more value relevant as the 3-month insider trading has a stronger effect on the 3-day returns as compared to insider trades during the 6-month period.[4]

Next I investigate the relationship between post-announcement insider trades and repurchase announcement returns. Consistent with Fried's (2005) theoretical argument that manager may announce repurchase programmes to sell their shares at a higher price, I find empirical evidence that insiders sell more shares in the 3-month window post-announcement as compared to pre-announcement 3-month window. There however is no significant difference in insider purchases between the two periods. In order to minimize the litigation risk, insiders trade more cautiously in the 6-month (-3, 3) window centred on the repurchase announcement date as compared to the 12-month (-6, 6) window.

Analysis of insider trades based on firm characteristics indicates that insiders sell (purchase) more (less) shares when their firm is less likely to be undervalued. Insiders also sell significantly more shares when repurchase announcement returns are high allowing them to cash out at higher stock prices. I further show that controlling for repurchase announcement returns,

[4] Regression coefficients on the 3-month insider trade variables (purchases, sales, net sales) are higher than those of 6-month insider trades.

insiders sell more shares when a firm is less likely to be under-priced (low book-to-market ratio) and offers potential gains to exploiting insider trades (small firms). Regression results show that insider sales (purchases) are significantly positively (negatively) related to short-term announcement returns suggesting that insiders sell greater number of shares when repurchase announcement returns are high. These findings provide empirical evidence that insiders may use repurchase programmes in their self-interest rather than signalling undervaluation. This is the first research study (to the best of my knowledge) that provides empirically evidence on Fried's (2001; 2005) managerial opportunism theory of repurchases.

Finally, I explore the relationship between post-announcement insider trades on the longer-term returns of firms that announce a repurchase program. I find mixed results for the signalling effect of post-announcement insider sales on the longer-term returns of share repurchasing firms. Higher post-announcement insider sales signal that insiders believe their stock to be either overvalued or fairly valued but not significantly undervalued. Consistent with this, I find that post-event 1-month net insider sales is not related to first year buy-and-hold abnormal return (BHAR) and weakly negatively related to second year BHAR. However, regressions of 3-month net insider sales post-

announcement show that it is positively related to first year BHAR but negatively related to second year BHAR of share repurchasing firms.[5]

This paper contributes to the growing literature addressing the credibility of share repurchase programme announcements as a signal of equity undervaluation and also to the corporate payout policy literature, more generally. Vermaelen (1981) and Comment and Jarrell (1991) evaluate the relative market reaction to repurchase tender offers, Dutch auctions and open market share repurchases and find that the latter is considered to be a least effective signalling tool with the lowest announcement returns as compared to other repurchase methods. Ikenberry et al. (1995; 2000) and Peyer and Vermaelen (2009) document significant positive drift in the longer-term returns of share repurchasing firms and attribute it to the market's underreaction to repurchase signal. Fried (2001; 2005) and Chan et al. (2010) show that repurchase announcements are used by managers in their self-interests rather than conveying value relevant information to investors. Fenn and Liang (2001) show that managers with a higher number of stock options use repurchase announcements to artificially increase stock prices. I add to the literature by empirically documenting that insiders, in fact, take advantage of higher post-announcement stock prices and sell more heavily.

[5] The unexpected positive relationship of 3-month net insider sales with first year BHAR might be due to higher demand for the firm's shares due to its repurchase activity resulting in higher returns for the year.

The paper also adds to the literature on insider trading. Seyhun (1998), Lakonishok and Lee (2001) and Agrawal and Nasser (2012) show that insider trading contains value relevant information for market participants. This research study also sheds light on the trading behaviour of insiders around buyback announcements and their investment horizon. I contribute to the literature on insider trading by demonstrating that insider trades both before and after the repurchase announcement provide value relevant information to investors in evaluating the credibility of repurchase announcement as a signal of undervaluation as well as insiders views about firm value.

The remainder of the paper is organised as follows. Section 2 provides some background to research questions explored in the study. In section 3, I describe data sources, sample selection criteria and report summary statistics of the sample data. In section 4, I present and discuss my empirical results. Finally, I conclude in section 5.

2 Background

Academic literature has mainly focused on the value signalling aspect of share repurchase announcements. Especially in the corporate finance literature, positive repurchase announcement returns are explained by signalling theory which regards such announcements as a signal of equity undervaluation (see e.g., Vermaelen (1981) and Comment and Jarrell (1991)). With Ikenberry et al. (1995) began another phase of research on share repurchases where they document significant positive drift in returns of repurchase announcing firms

over the next four years. They attribute this abnormal long-run performance of repurchasing firms to market's underreaction to the repurchase signal. Later, Peyer and Vermaelen (2009) show that unlike many other stock market anomalies which disappeared over time, repurchase announcing firms continue to outperform in the long-run. They demonstrate that longer-term abnormal returns of repurchasing firms result as the market corrects itself from an overreaction to bad news before the repurchase announcement.

Business press however raised early concerns about the dubious nature of repurchase signal.[6] Fried (2001) was amongst the first academics to formerly question the idea that repurchase announcements be uniformly viewed as a managerial signal of equity undervaluation. He proposes an alternative "managerial opportunism" hypothesis and suggests that managers opportunistically use share repurchase programmes to maximise their personal wealth. He suggests that managers of undervalued firms may announce and carry out share repurchases to transfer wealth from selling shareholders to themselves and remaining shareholders. In cases where managers want to sell equity they may announce a repurchase to sell their shares at higher stock prices. Fried (2005) highlights that insiders are not barred from trading after the repurchase programme announcement and hence can time the market

[6] "When it comes to stock-buyback, public traded companies show a lot of bark than bite. It's oh-so-easy for a company to announce a buyback program. And it's gratifying, no doubt, for a company to watch its shares jump as a result of announcements. But the open secret on Wall Street is that few companies actually buy anywhere near the amount of stock that they indicate they might." – The Wall Street Journal (Mar. 27, 1995)

around the event.[7] He raises serious concerns about the credibility of repurchase announcements as a signal of stock under-pricing by claims that the empirical evidence on repurchases is inconsistent with the signalling theory and terms buyback announcements as a "false signalling device".

However, observing insider trades around repurchase announcements affords us with the possibility to infer insiders' private information about firm value and repurchase programme objective(s). For example, Lakonishok and Lee (2001), Fidrmuc et al. (2006) and Agrawal and Nasser (2012) show that insider trading provides value relevant information to market participants about insiders' beliefs regarding firm value and its future prospects. Repurchase announcement signal will be more credible when insiders trade in the direction of their signal. In other words, the market should only trust buyback signal if it is supported by insiders actions. Specifically, insiders who truly believe that their firm's stock is undervalued should sell less and/or buy more stocks prior to repurchase announcement.[8]

This is consistent with the signalling explanation of repurchase announcement as undiversified insiders will only purchase or hold more equity if they believe their firm's stock to be undervalued. Buying addition equity of own firm's stock is especially costly when the firm's stock is overvalued and

[7] Although Section 16 (b) of Securities and Exchange Act contains "short-swing" profit rule and prohibits insiders from buying and selling their firm's shares in a short period of time. Insiders are required to hold purchased shares for at least 6-months. However, insiders already owning significant stock of their firm can still profit from selling at post-announcement prices.

[8] Babenko et al. (2012) present a simple model of managerial behaviour based on signalling literature and find that investor reaction to repurchase announcement is stronger for firms where insiders purchase more shares in the six month period before repurchase announcement.

exposes already undiversified insiders to considerable risk. Investors should incorporate this (insider trading) information in their reaction to share repurchase announcement. Thus the market reaction to a firm's repurchase announcement should be more positive for firms where insiders acquire/retain more equity of their firm prior to the announcement.

Fidrmuc et al. (2006) and Agrawal and Nasser (2012) also argue that insider purchases serve as a more informative signal as these are more costly. Insiders put greater personal wealth at stake by purchasing more equity and bear the cost of holding less than an optimally diversified portfolio as a result. Compared to purchases, insider sales may be a less informative (negative) signal to the market as insider sales may be driven by their liquidity needs rather than changes in their expectation about the firm's future cash flows. Seyhun (1998), Lakonishok and Lee (2001) show that the market reacts more strongly to insider purchase decisions as compared to insider sales. I analyse the market reaction to both insider purchases and sales around the repurchase announcement event.

A significant body of literature also documents that managers engage in opportunistic behaviour and informed trading.[9] The flexibility of open market share repurchases affords managers with the possibility to ustilise these

[9] For example, Gosnell et al. (1992) find that corporate insiders get rid of most of their stake in the company in the five months preceding a bankruptcy announcement. Kim and Varaiya (2003) find that managers sell more heavily in quarters where their firms are repurchasing shares. Yermack (2009) shows that CEOs gift stocks before significant declines in their stock prices and thereby allowing themselves to benefit from increased personal income tax savings.

opportunistically in their self-interest rather than as a market signal. Fenn and Liang (2001) and Chan et al. (2010) show that managers may intentionally mislead the market by announcing repurchase programmes for their personal gain. Kothari et al. (2009) find that a range of personal incentives and career concerns motivates managers to time news disclosures. They show that managers delay the release of bad news up to a certain threshold but immediately release good news. In a recent paper, Edmans et al. (2014) show that managers strategically time the disclosure of discretionary news to coincide with months in which their equity vests. They show that managers disclose significantly more positive news in months in which their equity vests, thus allowing them to sell their stocks and/or exercise options at a higher price. A closer look at the distribution of share repurchase related corporate news in their data shows that more than half of all buyback announcements and updates are made in months in which managers equity vests. This suggests that managers may time the disclosure of share repurchase announcements to sell at higher stock prices.

The paper also tests how managers trade after the repurchase announcements. If insiders use buyback announcements to time the market then they will sell more when stock prices soar after the repurchase announcement. Insider sales will be especially higher when the market reaction to repurchase announcement is stronger. Thus, I expect a positive relationship between net sales and short-term announcement returns. Higher insider stock

sales or lower purchases post-announcement also signal that insiders believe their stock to be either overvalued or at least not significantly undervalued. Thus insider sales post-announcement should be unrelated or negatively related to longer term returns of repurchase announcing firms.

3 Data and summary statistics

Share repurchase announcement data is extracted from the Thomson Financial Security Data Company (SDC) Mergers and Acquisition database between January 1, 1990 and December 31, 2012. I restrict my repurchase announcements data to open market share repurchases only. I delete multiple repurchase announcements by a firm that are made within a period of two years. In such cases I only keep the first announcement. This also eliminates the problem of duplicate announcements. Banyi et al. (2008) document that an announcement may appear more than once in the SDC data as it may report the same announcement more than once if it appears in different news sources on different dates.

Insider trading data come from the Thomson Financial insider trading database. Insider trades are obtained from the Form 4 that is filed with Security and Exchange Commission (SEC) whenever insiders make a stock sales or purchase transaction. I following Babenko et al. (2012) and only consider open market stock purchases and sales and exclude stocks accumulated via option exercises and grants. In order to focus on economically significant trades, I delete all trades that involve exchange of fewer than 100 shares. Prior literature

suggests that insider purchases may be more informative as insiders often sell for reasons unrelated to signalling, such as diversification and liquidity needs (see e.g., Kahl et al. (2003) and Ofek and Yermack (2000)). Babenko et al. (2012) also highlight that anecdotal evidence suggests managers are more likely to be sued for their sales based on private information. However, I focus on both purchase and sale transactions as insiders can exploit both active and passive trading strategies around the repurchase announcement to achieve the desired outcomes. For example, an insider may be able to generate similar economic effect by selling less prior to the repurchase announcement rather than actively purchasing more stocks.

I follow Babenko et al. (2012) to calculate number of shares sold (purchased) by insiders as the sum of shares sold (purchased) by all insiders over a given time window scaled by total number of outstanding shares of the firm.[10] If no sales or purchase data are available for a firm due to non-trading activity, I set insider trades (sale and purchase) equal to 0. The net sales are defined as the difference between insider sales and purchases over a given time window.

In addition to aggregate insider sales, purchases and net sales, I also use abnormal sales, abnormal purchases and abnormal net sales measures. I use two measures to calculate abnormal trades (abnormal sales, abnormal purchases and abnormal net sales). First, I calculate normal trades using

[10] Insiders are as defined by Thomson Financial Insider trading database.

methodology similar to Kahle (2000), as the average monthly trades in the previous three year period starting six month before the buyback announcement. Next abnormal trades are defined as the difference between the actual insider trades and the average insider trades over the last three year period for the same time window. It is possible that insiders might have equity vesting plans or more need for cash over certain time periods during a year so they might have concentrated trading activity in those periods. Agrawal and Nasser (2012) suggest that a time series control i-e, insider trades over the same period a year before the event serves as a good control for such firm characteristics. So, my second measure of abnormal trades defines normal trades as the last year trades over the same time window.

The market reaction to repurchase announcement is calculated using stock return data from the CRSP database. I define abnormal repurchase announcement return as the difference between the 3-day (-1 to +1) buy-and-hold return of the event firm centered on the announcement date (day 0) and the buy-and-hold return of the market over the same window. The market return is the daily value weighted return of CRSP index. As an alternative, I use 3-day cumulative abnormal returns (CAR) around the event date (-1, +1), defined as the sum of the difference between the event firm return on the day and the return on the market.[11] To calculate longer-term abnormal returns, I use buy-and-hold abnormal returns (BHAR) approach. Taffler et al. (2004) favour

[11] Results are qualitatively similar when I use cumulative abnormal returns instead of buy-and-hold abnormal returns.

BHAR methodology as it accurately captures investor's experience. Buy-and-hold abnormal return of the event firm is the difference between the buy-and-hold return of the firm and the market over the one year and two year periods post-announcement, where a year is defined as 252 trading days starting from the event date (day 0).

Intended size of the repurchase programme is measured as the percentage of intended dollar value to be spent on repurchase activity over the total market value of the firm at the beginning of year. Stock price run-up is calculated as forty days buy-and-hold return of a firm starting 4 days prior to the repurchase announcement day. For other accounting data, I rely on the COMPUSTAT database. All the variables in the final dataset are winsorized at the 1^{st} and 99^{th} percentiles to mitigate the effect of extreme observations.

Table 1 presents the frequency, average market value, average book-to-market ratio and average percentage of intended size of announced repurchase programmes by year. My final dataset contains 8,945 unique share repurchase programmes announced between 1990 and 2012. The highest number of share repurchase announcements were made in years 1998 and 1999. Average size of the repurchase programme over the entire sample period is slightly higher than the number reported in earlier studies; this is mainly due to larger size of intended repurchase programmes announced after the financial crisis of 2007-2008. Mean book-to-market ratio of repurchase announcing firms is 0.64 which

is similar to other studies. The average nominal market value of repurchase announcing firms for the entire sample period is around $3,845 million.

Panel B of table 1 shows the number of share repurchase announcements by industry classification. Manufacturing industry accounts for nearly 39 percent of the total repurchase announcements in the dataset. Repurchase announcements made by finance and insurance companies represent nearly one fourth of all repurchase announcements made during the sample period. Given their frequency and following earlier studies such as Chan et al. (2004) and Peyer and Vermaelen (2009), I include these in my analysis.

Table 2 presents summary statistic of announcement and post-announcement returns, insider trading and other firm characteristics of sample firms. Panel A of the table presents short-term and longer term returns of share repurchasing firms. Mean three day buy-and-hold abnormal return (BHAR) around the buyback announcement date (-1, 1) is 2.3 percent which is comparable to the 3-day cumulative abnormal return (CAR) of 2.4 percent. These buyback announcement returns are similar to announcement returns reported in earlier studies such as Ikenberry et al. (1995) and Peyer and Vermaelen (2009) but slightly higher than the ones reported in later studies such as Babenko et al. (2012) and Bonaimé (2012). According to Kothari et al. (2007) short-term returns are not much affected by risk adjustment(s). They show that the potential error in estimation of daily expected return is only

0.05% which is much smaller than the reported short-term announcement returns.

The mean one year buy-and-hold abnormal return is 4.5 percent which supports the finding of positive drift in returns after the repurchase announcement as documented by earlier studies e.g., Peyer and Vermaelen (2009). The mean (median) stock price run-up in the 40 trading days prior to repurchase announcement starting 4 days before the announcement is -6.7 (-4.9) percent. This suggests that managers are more likely to announce a share repurchase programme after significant decline in stock price.

Panel B of the table shows summary statistics for insider trades over different time windows around share repurchase announcement. As expected insider sales are generally larger than purchases. In the one month (0, 30) post-announcement period, insiders sell on average 0.064% of outstanding equity while they purchase only 0.021%. The net sales for the window are thus 0.043%. In the 3-month (0, 90) window post-announcement the difference between insider sales and purchases increases to 0.13% of total shares outstanding. However using either measure of benchmark trades (described above), abnormal net sales are negative in both 1 and 3 month windows post-announcement. Firm characteristics are reported in panel C of table 2. Firm size is measured as log of total assets and both mean and median values are similar. Leverage is ratio of total debt to total assets. Cash, cash flow, capital expenditure and research and development expenses are defined as percentages

of cash, operating cash flows, capital expenditure and research and development expenses over total firm assets respectively. Tobin's Q is ratio of market-to-book value and return volatility is the standard deviation of daily stock returns in the one year period before the repurchase announcement. All accounting variables represent fiscal year values prior to the buyback announcement. The averages reported for these variables are comparable to ones reported in Babenko et al. (2012).

4 Results

4.1 Pre-announcement trades and short-term returns

Table 3 shows mean short-term and longer-term returns for firms that announce a share repurchase programme by high and low net insider sales in the pre-announcement period. The left (right) hand side panel is categorised on 3-month (6-month) insider trades before the repurchase announcement. Low (High) net insider sales represent higher (lower) purchases and/or lower (higher) sales during the period. Consistent with the undervaluation argument, the market reacts more positively to share repurchase announcements where insiders retain more equity prior to repurchase announcement. Average 3-day BHAR around the repurchase announcement for firms with high net insider sales in the three-month window before the repurchase announcement date is only 1.6 percent as compared to average return of 2.4 percent for firms with lower net insider sales. Thus, mean three day BHAR around the repurchase

announcement is 0.8 percent higher for firms with lower net sales and is significant at the 1 percent level.

Mean 3-day CAR and 5-day BHAR around the repurchase announcement between low and high net insider sales firms are 0.9 percent and 1.1 percent respectively and are significant at the 1 percent level. These findings suggest that the market considers insider trading in evaluating the credibility of repurchase signal and responds more favourably to those where insider retain greater ownership interest in the firm. However, the difference between low and high net insider sales groups for longer-term returns is not significant. Specifically, difference of 1st year and 2nd year BHAR between the two groups of firms is not statistically significant.

Table 4 presents results from regressing short-term announcement returns on insider trading measures calculated for different time windows before the repurchase announcement. Specifically, I regress 3-day BHAR around the repurchase announcement event on insider trading variables in different model specifications. I control for other factors identified in earlier studies that may affect short-term repurchase announcement returns. I follow Kahle (2002) and include stock price run-up as a control variable in my regression specifications. Stock price run-up controls for the possibility of pseudo-market timing and also serves as a control for tax effects (Babenko et al. (2012)). Schultz (2003) suggests that abnormal market returns calculated around an event might be biased if managers' decisions are influenced by a

firm's recent stock price performance. This suggests that abnormal returns around repurchase announcements might be biased upwards when they are preceded by significant decline in stock price. If however, share repurchase announcement are preceded by significant increases in stock price, the relative tax advantage of share repurchases over dividends is significantly reduced (Lie and Lie (1999)).

To control for differences in firm size, I use log of total firm assets. Ikenberry et al. (1995); Fama and French (1992) and Peyer and Vermaelen (2009) suggest that smaller firms tend to have higher returns. They also document that value firms earn higher returns in the long-run as compared to growth firms. I use book value to market value ratio as a proxy for firm undervaluation as used in earlier studies. I control for repurchase programme size as literature (e.g., Chan et al. (2010) and Bonaimé (2012)) suggests that repurchase programme size might affect investors' reaction to repurchase announcement.[12] Dittmar (2000) suggests that repurchase programmes are also used by managers to make capital structure adjustments. Therefore I control for firm leverage in my regression models. Firms' growth and investment opportunities can also affect both insider trading as well as repurchase announcement returns. Managers may hold greater ownership interest in a firm with higher growth potential and attractive investment opportunities and thus is more likely to earn higher returns. I use tobin's Q to proxy for firms' growth and investment opportunities. Using Petersen (2009) methodology, I report t-

[12] Although the empirical evidence on this is mixed.

statistics based on robust standard errors after adjusting for clustering at the firm level.

The dependant variable in all model specifications is three day BHAR in table 4. Model 1 regresses short-term announcement returns on insider purchases during the six month window before the repurchase announcement and other control variables. The coefficient on the pre-announcement 6-month insider purchases is positive and significant at conventional significance levels. This suggests that the market reaction is stronger for firms where insiders purchase more shares before the buyback announcement event. Model 2 shows that the market reaction is even stronger and highly significant at the 1 percent level for insider purchases made in the more recent period closer to the announcement date (purchases in the 3-month window before the repurchase announcement).

In models 3 and 4 I introduce net insider sales variable for the 6-month and 3-month pre-announcement periods respectively. Net insider sales account for both the active and passive trading strategies of insiders. Regression results in models 3 and 4 suggest that higher net insider sales is significantly negatively related to announcement returns at the 5 percent and 1 percent levels respectively. The results indicate that investors take into account pre-announcement insider trading information in their reaction to the buyback signal. Insiders purchasing more or selling less equity before a repurchase

announcement appear to be signalling their confidence in their firm's stock being worth more than its current market value.

Cheng and Lo (2006), Huddart et al. (2007) and Agrawal and Nasser (2012) suggest that insiders prefer a passive trading strategy to reduce litigation risk. It is also argued that insider sales are less informative than insider buys as insider might sell for a number of other reasons unrelated to signalling private information. To test this, in models 5 and 6 announcement returns are regressed on insider sales in the pre-announcement 3-month and 6-month event windows respectively. Coefficients on the insider sales variables are significant at conventional significance levels in both models and suggest that pre-announcement insider sales too have some explanatory power for short-term repurchase announcement returns.

4.2 Post-announcement insider trades

In this section, I test whether insiders announce repurchase programmes to be able to sell their holdings at higher post-announcement prices. The first (second) panel in table 5 presents mean differences in insider trades between pre- and post-announcement periods over 1-month (3-month) windows. The mean difference between 3-months pre- and post-announcement insider sales is -3.4 and is highly significant at the 1 percent level. However the difference between pre- and post-announcement purchases is not statistically significant. The net sales difference between the two periods, which is mainly due to differences in insider sales, is -2.93 and is again highly significant at the 1

percent level. It is also interesting to note that both abnormal net sales measures are negative in the pre- and post-announcement periods. The difference of abnormal net sales 2 measure between the pre- and post-announcement periods is also statistically significant. This is consistent with insiders potentially reducing their trading around share repurchase announcements. It also suggests that insiders actually sell fewer shares in the 3-month period before the repurchase announcement rather than buying more shares. This passive trading strategy indicates that insiders are aware of litigation risk associated with active trading around the repurchase announcement and aim to minimise it by reducing their trades. However, the difference between 3-month pre- and post-announcement abnormal net sales as measured against the three year average insider trades prior to the repurchase announcement is still negative and significant at the 1 percent level.

A similar pattern is observed when 1-month trades are compared for the pre- and post-announcement periods. Insiders sell significantly more shares in the 1-month window after the repurchase announcement as compared to average insider sales in the pre-announcement 1-month window. The difference between average insider sales in the two periods is 3.47 and is highly significant at the 1 percent level. Insiders also seem to purchase slightly more on average in the 1-month window post-announcement.[13] The two highly

[13] One possible reason for this reverse trend might be that insiders believe that the market has under reacted to the repurchase signal and their stock remains significantly undervalued. Another explanation could be that insiders might want/have to retain a certain proportion of firm equity due to contractual or control reasons.

significant negative abnormal net sales measures indicate that insiders trade fewer shares around the repurchase announcement. However, the negative difference for the two measures between the pre- and post-announcement 1-month windows indicate that insiders still sell more in the post-announcement period as compared to pre-announcement period even though the aggregate level of trades decline around the repurchase announcement.

Insiders are likely to sell more post-announcement when they believe their firm's stock to be either overvalued or at least not significantly undervalued. This suggests that post-announcement insider sales will be especially high for firms that are less likely to be undervalued. Fried (2005) also suggests that managers use repurchase announcements to artificially boost share price so that they can sell their equity holdings at a higher price. Thus insiders announcing repurchase programmes to sell their stock will sell more shares when the stock is less likely to be undervalued and when repurchase announcement returns are high.

Table 6 reports mean insider trades for different proxies of firm undervaluation and announcement returns. Panel A of table 6 shows mean insider trades for subsamples by high and low book-to-market value firms. Peyer and Vermaelen (2009) rely on book-to-market ratio as a measure of firm undervaluation. Firms with book-to-market ratio above (below) the sample mean are classified as value (growth) firms. Differences in mean trades of value and growth firms show that insiders in growth firms, in fact, sell more

and buy fewer shares in the 1-month and 3-month periods post-announcement. The difference between net sales of the two groups is also highly significant. A similar trend is observed in the 3-month trades post-announcement.

Panel B of table 6 shows mean 1-month and 3-month insider trades for subsamples of firms by high and low stock price run-up. Firms that experience significant declines in share price prior to the repurchase announcement are more likely to be undervalued. Insiders in firms that have higher (lower) run-up return, i.e., above (below) the sample mean, sell more (less) and purchase fewer (more) shares. The difference between insider trades (sales and purchases) of the two groups is also highly significant. Panel C partitions the sample data on pre-announcement 6-month net sales. Babenko et al. (2012) suggest that pre-announcement insider trades can signal their belief about firm valuation. They argue that higher pre-announcement insider purchases add credibility to a firm's repurchase undervaluation signal as buying additional equity exposes undiversified insiders to considerable risk and they will only hold more equity if they believe their firm to be undervalued. My results show that the differences between post-announcement 1-month and 3-month mean insider sales (purchases) for high and low net sales firms are positive (negative) and highly significant. These findings are consistent with the argument that insiders sell more equity after the repurchase announcement when the firm is either overvalued or fairly valued but not undervalued.

Panel D of table 6 partitions the sample data on 3-day buy-and-hold returns. Higher (lower) return firms are defined as firms with 3-day buy-and-hold return above (below) the sample mean. Consistent with Fried's (2005) argument, I find that insiders sell more shares post-announcement when repurchase announcement returns are higher. However, there is no significant difference in purchases of the two subsamples. The net sales difference between the two groups of firms is also highly significant. Overall table 6 suggests that insiders sell more shares post-announcement especially when their stock is less likely to be undervalued and when the market reacts mor positively to the repurchase announcement.

As a further test, in table 7, I report average net insider sales post-announcement of two-way sorted portfolios of firms. First, each year I rank firms into high and low short term announcement return groups. I then sort firms in each rank group into two subgroups based on firms' book-to-market ratio, size and return volatility in panels A, B and C respectively.[14] Panel A of table 7, reports mean net insider sales in each announcement rank group for subsamples by low and high book-to-market value firms. Insiders sell significantly more shares in growth firms as compared to value firms in the post-announcement period even after controlling for repurchase announcement returns.

[14] Sorting on these firm characteristics is based on mean values for the sample data. For example, large (small) firms are defined as firms with size above (below) the average firm size in the sample data.

In panel B firms with high and low repurchase announcement returns are sorted into subgroups by market capitalization. Corwin (2003) and Zhang (2006) proxy for degree of information asymmetry between insiders and investors by firm size. Small firms suffer from a higher degree of information asymmetry as they receive little media coverage unlike large firms, and are followed by fewer analysts. Lakonishok and Lee (2001) also find that the highest potential gains from insider trading are possible in small firms as these are less efficiently priced due to higher information asymmetry. Such results suggest that insiders in small firms sell down more of their stock holdings after the repurchase announcement as compared to insiders in large firms. This is especially true for firms with high announcement returns. For such firms the mean difference in the 1-month (3-month) net insider sales between small and large firms is 1.95 (4.94), significant at the 5 percent level.

Panel C sorts firms with high and low repurchase announcement returns into subgroups by their daily return volatility over the previous year before the repurchase announcement. Babenko et al. (2012) argue that it is more risky for undiversified insiders to hold more equity of their firm when the stock volatility is high. However, I do not find any significant difference in post-announcement net insider sales between high and low volatility firms. This suggests that stock volatility may not be the most important factor for insiders in their decision to sell stocks post-announcement.

Similar to Babenko et al. (2012) where they argue that pre-announcement insider purchases can add credibility to their repurchase undervaluation signal, my empirical analysis suggests that post-announcement insider trades can also signal insiders' private information regarding firm value. Post-announcement insider sales will be positively related to short-term announcement returns when insiders announce a repurchase to cash out at higher stock prices as suggested by Fried (2001; 2005). Higher post-announcement insider sales also signal that they do not believe their stock to be significantly undervalued.

However, the literature also suggests that the market under reacts to share repurchase signal (see e.g., Ikenberry et al. (1995; 2000) and Peyer and Vermaelen (2009)) and repurchasing firms earn higher longer-term returns. Post-announcement insider trades thus can signal insiders' expectations about future firm performance. Insiders will retain more equity when they believe that the market has underreacted to their repurchase signal and the stock is still under-priced. Higher post-announcement insider sales signal managerial pessimism about future firm performance. On this basis, I expect post-announcement insider sales to be negatively related to longer-term returns of such firms.

Finally, in table 8, I regresses post-announcement insider trades on short-term repurchase announcement returns, longer-term returns of share repurchasing firms and other control variables in different model

specifications. Short-term announcement return is 3-day buy-and-hold abnormal return around the repurchase announcement. I restrict long-run post-announcement performance to two years as Seyhun (1998) suggests that insider trades can predict stock price performance for up to two years in to the future. I use 1st year BHAR and 2nd year BHAR in different model specifications. Other control variables are as defined earlier in section 3, data and descriptive statistics. T-statistics are reported in parenthesis and are reported after adjusting for heteroskedasticity in standard errors as suggested by White (1980).

The dependent variable in models 1 to 3 is the 1-month net sales post-announcement. Regression results in model 1 suggest that insider sales in the 1-month post-announcement period are significantly positively related to (short-term) repurchase announcement returns. This indicates that insiders take advantage of increase in stock price after the repurchase announcement and sell more heavily. Model 2 in table 8 shows that net insider sales are significantly positively related to short-term returns but unrelated to post-announcement first year buy-and-hold abnormal returns. Net insider sales in model 3 are significantly negatively related to longer-term post-announcement (second year buy-and-hold abnormal) returns. This is consistent with the argument that a higher post-announcement insider sale represents insiders' pessimism about firms' longer-term stock price performance. Insiders sell more shares when they believe that the stock will not outperform in the long-run.

Lakonishok et al. (1994) show that value firms earn higher returns in the long-run as compared to growth firms after the repurchase announcement. As value firms are more like to be undervalued, I find that insiders in such firms sell fewer shares after the repurchase announcement. Table 8 shows that the book-to-market ratio is significantly negatively related to post-announcement net insider sales. I also find that the stock price run-up is significantly positively (negatively) related to insider sales and net insider sales (purchases) in all regression models. This indicates that insiders might be employing a contrarian trading strategy around the repurchase announcement. As firms with higher pre-announcement returns are less likely to be undervalued or at least not significantly undervalued, thus insiders in such firms sell more post-announcement to cash out at higher stock prices.

My analysis also suggests that firm size is unrelated to post-announcement net insider sales. Firm size is insignificant in all three (1-3) models where the 1-month net insider sales is used as a dependent variable. However, intended repurchase programme size is slightly positively related to net insider sales. Since repurchase programme size is often linked to the credibility of repurchase signal (Chan et al. (2010)), this finding suggests that insiders sell more post-announcement when they announce to repurchase a greater number of outstanding shares. I find that firm leverage is significantly negatively related to net insider sales and positively related to insider purchases (column 5 in table 8) in the post-announcement period. As higher leverage is

associated with higher risk, insider sales in such firms can send a very negative signal about a firm's prospects. The negative relationship between leverage and post-announcement insider sales suggests that insiders sell more cautiously in high leverage firms. A positive relationship between post-announcement insider sales and Tobin's q, which represents higher firm market valuation, is consistent with the argument that insiders sell more when their firm's stock is less (more) likely to be undervalued (overvalued).

As a robustness test, in models 4 and 5 respectively I separately regress post-announcement 1-month sales and 1-month purchases on (short-term) repurchase announcement returns and other explanatory variables. Regression results in model 4 show that insider sales are positively related to repurchase announcement returns and the coefficient is highly significant at the 1 percent level. The signs on other variables are as expected. Unlike the regression models with net insider sales as regressand, firm size is significantly negatively related to the post-announcement 1-month insider sales. This is in line with Lakonishok and Lee (2001) who highlight that insiders of small firms are better able to predict future returns and hence can time their trades accordingly. Insiders in small firms sell more after the repurchase announcement. Regression results in model 5 show that the post-announcement 1-month insider purchases are significantly negatively related to short-term announcement returns. This indicates that when announcement returns are high undervaluation will be either eliminated or significantly reduced and thus it

will be more costly for insiders to purchase more equity. Also the incentive to purchase an undervalued stock will be eliminated when stock price increases after the repurchase announcement. Thus insiders purchase fewer shares when the market reacts more positively to the repurchase announcement signal. However, as expected, book-to-market is significantly positively related to post-announcement insider purchases. This suggests that insiders are willing to purchase more equity in their firm when it is undervalued.

Finally, as a further robustness test I regress post-announcement 3-month net insider sales on the same independent variables in models 6 to 8. Results are very similar to regression results of models 1 to 3. One distinction however is that the 3-month insider sales are positively related to one year BHAR which was insignificant in the case of 1-month net insider sales. The relationship however with second year BHAR is still negative and significant at the 10 percent significance level. The signs on other control variables are expected.

5 Conclusion

The paper analyses insider trades around open market repurchase announcements to infer insiders' private information about firm value, and to evaluate its relevance for investors in assessing the credibility of an open market repurchase announcement as a signal of firm undervaluation. Lower pre-announcement net insider sales signal to the market that insiders believe

the stock to be under-priced. However, higher post-announcement sales signal that the stock is either over-priced or fairly priced.

The empirical evidence in the paper suggests that investors react more positively to repurchase announcements where insiders retain more equity before the announcement. The finding is in line with the signalling explanation of share repurchases. However, my analysis also suggests that insiders sell more shares post-announcements when repurchase announcement returns are higher. This is particularly true for firms that are less likely to be undervalued (growth firms) and present the highest potential gains from exploiting insider trading such as small firms. I find empirical evidence that the post-announcement insider sales are significantly positively related to repurchase announcement returns and negatively related to firm size. I also document a negative relationship between insider sales and longer-term post-announcement returns (second year buy-and-hold abnormal return). This is consistent with the expectation that insiders sell more post-announcement when the stock is less likely to be undervalued and less likely to outperform in the long-run.

The findings in the paper suggest that investors pay attention to pre-announcement insider trades in determining the credibility of repurchase signal and respond accordingly. However, higher insider sales post-announcement suggest that insiders may also announce repurchase programmes to sell their equity at a higher post-announcement stock price. The negative relationship between post-announcement sales and longer-term returns indicates that the

market understands insiders will sell more shares after the buyback announcement when they believe their stock to be either overvalued or at least nor significantly undervalued and hence do not expect their stock to out-perform in the long-run.

6 References:

Agrawal, A. and T. Nasser (2012). "Insider trading in takeover targets." Journal of Corporate Finance, 18(3): 598-625.

Babenko, I., Y. Tserlukevich and A. Vedrashko (2012). "The Credibility of Open Market Share Repurchase Signaling." Journal of Financial and Quantitative Analysis, 47(05): 1059-1088.

Banyi, M. L., E. A. Dyl and K. M. Kahle (2008). "Errors in estimating share repurchases." Journal of Corporate Finance, 14(4): 460-474.

Bonaimé, A. A. (2012). "Repurchases, Reputation, and Returns." Journal of Financial & Quantitative Analysis, 47(2): 469-491.

Brav, A., J. R. Graham, C. R. Harvey and R. Michaely (2005). "Payout policy in the 21st century." Journal of Financial Economics, 77(3): 483-527.

Chan, K., D. Ikenberry and I. Lee (2004). "Economic Sources of Gain in Stock Repurchases." Journal of Financial and Quantitative Analysis, 39(03): 461-479.

Chan, K., D. L. Ikenberry, I. Lee and Y. Wang (2010). "Share repurchases as a potential tool to mislead investors." Journal of Corporate Finance, 16(2): 137-158.

Cheng, Q. and K. I. N. Lo (2006). "Insider Trading and Voluntary Disclosures." Journal of Accounting Research, 44(5): 815-848.

Comment, R. and G. A. Jarrell (1991). "The Relative Signalling Power of Dutch-Auction and Fixed-Price Self-Tender Offers and Open-Market Share Repurchases." The Journal of Finance, 46(4): 1243-1271.

Corwin, S. A. (2003). "The Determinants of Underpricing for Seasoned Equity Offers." The Journal of Finance, 58(5): 2249-2279.

Dittmar, A. K. (2000). "Why Do Firms Repurchase Stock?" The Journal of Business, 73(3): 331-355.

Edmans, A., G.-P. Luis, W. Yanbo and X. Moqi (2014). "Strategic News Releases in Equity Vesting Months". NBER Working Paper No. w20476; European Corporate Governance Institute (ECGI) - Finance Working Paper No. 440/2014. 2015.

Fama, E. F. and K. R. French (1992). "The Cross-Section of Expected Stock Returns." The Journal of Finance, 47(2): 427-465.

Fama, E. F. and K. R. French (2001). "Disappearing Dividends: Changing Firm Characteristics or Lower Propensity to Pay?" Journal of Applied Corporate Finance, 14(1): 67-79.

Fenn, G. W. and N. Liang (2001). "Corporate payout policy and managerial stock incentives." Journal of Financial Economics, 60(1): 45-72.

Fidrmuc, J. P., M. Goergen and L. U. C. Renneboog (2006). "Insider Trading, News Releases, and Ownership Concentration." The Journal of Finance, 61(6): 2931-2973.

Fried, J. M. (2001). Open Market Repurchases: Signaling or Managerial Opportunism? Theoretical Inquiries in Law. 2.

Fried, J. M. (2005). "Informed Trading and False Signaling with Open Market Repurchases." California Law Review, 93(5): 1326-1386.

Gosnell, T., A. J. Keown and J. M. Pinkerton (1992). "Bankruptcy and Insider Trading: Differences Between Exchange-Listed and OTC Firms." The Journal of Finance, 47(1): 349-362.

Grullon, G. and R. Michaely (2002). "Dividends, Share Repurchases, and the Substitution Hypothesis." The Journal of Finance, 57(4): 1649-1684.

Huddart, S., B. Ke and C. Shi (2007). "Jeopardy, non-public information, and insider trading around SEC 10-K and 10-Q filings." Journal of Accounting and Economics, 43(1): 3-36.

Ikenberry, D., J. Lakonishok and T. Vermaelen (1995). "Market underreaction to open market share repurchases." Journal of Financial Economics, 39(2-3): 181-208.

Jin, L. (2002). "CEO compensation, diversification, and incentives." Journal of Financial Economics, 66(1): 29-63.

Kahl, M., J. Liu and F. A. Longstaff (2003). "Paper millionaires: how valuable is stock to a stockholder who is restricted from selling it?" Journal of Financial Economics, 67(3): 385-410.

Kahle, K. M. (2000). "Insider trading and the long-run performance of new security issues." Journal of Corporate Finance, 6(1): 25-53.

Kahle, K. M. (2002). "When a buyback isn't a buyback: open market repurchases and employee options." Journal of Financial Economics, 63(2): 235-261.

Kim, J. and N. Varaiya (2003). "Disclosure on Open Market Repurchase Transactions in the U.S.: Does it Create a Conflict of Interest." Working paper: San Diego State University.

Kothari, S. P., S. Shu and P. D. Wysocki (2009). "Do Managers Withhold Bad News?" Journal of Accounting Research, 47(1): 241-276.

Kothari, S. P., J. B. Warner and B. E. Eckbo (2007). Econometrics of Event Studies. Handbook of Empirical Corporate Finance. San Diego, Elsevier**:** 3-36.

Lakonishok, J. and I. Lee (2001). "Are Insider Trades Informative?" The Review of Financial Studies, 14(1): 79-111.

Lakonishok, J., A. Shleifer and R. W. Vishny (1994). "Contrarian Investment, Extrapolation, and Risk." The Journal of Finance, 49(5): 1541-1578.

Lie, E. and H. J. Lie (1999). "The Role of Personal Taxes in Corporate Decisions: An Empirical Analysis of Share Repurchases and Dividends." Journal of Financial and Quantitative Analysis, 34(04): 533-552.

Massa, M., Z. Rehman and T. Vermaelen (2007). "Mimicking repurchases." Journal of Financial Economics, 84(3): 624-666.

Ofek, E. and D. Yermack (2000). "Taking Stock: Equity-Based Compensation and the Evolution of Managerial Ownership." The Journal of Finance, 55(3): 1367-1384.

Petersen, M. A. (2009). "Estimating Standard Errors in Finance Panel Data Sets: Comparing Approaches." Review of Financial Studies, 22(1): 435-480.

Peyer, U. and T. Vermaelen (2009). "The Nature and Persistence of Buyback Anomalies." Review of Financial Studies, 22(4): 1693-1745.

Schultz, P. (2003). "Pseudo Market Timing and the Long-Run Underperformance of IPOs." The Journal of Finance, 58(2): 483-518.

Seyhun, H. N. (1998). Investment intelligence from insider trading., The MIT Press, Cambridge and London.

Skinner, D. J. (2008). "The evolving relation between earnings, dividends, and stock repurchases." Journal of Financial Economics, 87(3): 582-609.

Stephens, C. P. and M. S. Weisbach (1998). "Actual Share Reacquisitions in Open-Market Repurchase Programs." The Journal of Finance, 53(1): 313-333.

Taffler, R. J., J. Lu and A. Kausar (2004). "In denial? Stock market underreaction to going-concern audit report disclosures." Journal of Accounting and Economics, 38(0): 263-296.

Vermaelen, T. (1981). "Common stock repurchases and market signalling : An empirical study." Journal of Financial Economics, 9(2): 139-183.

White, H. (1980). "A Heteroskedasticity-Consistent Covariance Matrix Estimator and a Direct Test for Heteroskedasticity." Econometrica, 48(4): 817-838.

Yermack, D. (2009). "Deductio' ad absurdum: CEOs donating their own stock to their own family foundations." Journal of Financial Economics, 94(1): 107-123.

Zhang, X. F. (2006). "Information Uncertainty and Stock Returns." The Journal of Finance, 61(1): 105-137.

Table 1: Distribution of repurchase announcements by year and industry

The table reports the distribution of repurchase announcements by year and industry. Panel A reports the distribution by year. Year is the fiscal year in which repurchase announcement was made. Frequency counts the number of open market repurchase programmes announced in a given year. Book-to-market is the ratio of book value of assets to market value at the beginning of the fiscal year. Market value is the average market value of firms in millions of dollars. Intended percentage is the percentage of outstanding shares that management states it intends to repurchase at the time of announcement.

Panel B reports the distribution of repurchase announcements by industry. Industries are classified based on two digit Standard Industrial Classification (SIC) code in COMPUSTAT.

Panel A: Distribution by year.

Year	Frequency	Book-to-market	Market value ($M)	Intended percentage
1990	433	0.84	898.85	7.32
1991	114	0.86	1223.93	8.59
1992	215	0.61	1498.94	7.35
1993	240	0.59	1651.03	5.85
1994	446	0.65	1378.79	6.14
1995	421	0.68	1384.05	6.99
1996	559	0.58	2264.09	6.46
1997	488	0.54	1787.50	7.23
1998	866	0.65	1803.72	8.34
1999	635	0.73	1819.54	8.02
2000	372	0.78	3837.12	9.03
2001	361	0.67	6959.89	8.37
2002	250	0.74	3917.20	8.77
2003	253	0.60	4313.64	7.94
2004	311	0.48	6314.72	8.51
2005	360	0.47	6983.02	8.02
2006	354	0.47	9137.10	8.48
2007	522	0.57	7084.00	9.21
2008	556	0.74	3543.54	9.90
2009	182	0.77	5204.74	9.73
2010	300	0.62	6745.56	10.00
2011	426	0.62	5842.62	10.08
2012	281	0.69	8051.59	11.18
All	8945	0.64	3854.37	8.26

Panel B: Distribution of repurchase announcements by industry

Industry	Frequency	Percent	Cumulative frequency	Cumulative percentage
Agriculture, forestry, and Fishing	21	0.23	21	0.23
Construction	100	1.12	121	1.35
Finance and Insurance	2205	24.65	2326	26.00
Manufacturing	3486	38.97	5812	64.97
Mining	200	2.24	6012	67.21
Public administration	28	0.31	6040	67.52
Retail trade	644	7.2	6684	74.72
Services	1419	15.86	8103	90.59
Transportation and communication	537	6	8640	96.59
Wholesale trade	305	3.41	8945	100.00

Table 2: Summary statistics of key variables for firms that announce repurchase programmes

The table reports summary statistics of main variables for firms that announced open market share repurchase programmes. The table reports number of observations (N), mean, standard deviation (SD) and the 1st, 50th and 99th percentiles of sample data. Panel A reports on announcement and longer-term return statistics (in percentage) of share repurchase announcing firms. 3-day CAR (BHAR) is the 3 day (-1, 1) cumulative (buy-and-hold) abnormal return around the announcement date (day 0) using value weighted market return as benchmark. 1st year BHAR is the 1 year (0, 252 days) buy-and-hold abnormal return against the value weighted return on the market starting from the event date (day 0). 2nd year BHAR is the second year (253, 504 days) buy-and-hold abnormal return starting from the first anniversary of event date. Stock price runup is the 40 days buy-and-hold return of event firms starting 4 days prior to repurchase announcement.

Panel B reports summary statistics of insider trading around repurchase announcements. 1 (3)-month sales (purchases) is the number of shares sold (bought) by insider in the one (three) month period after the repurchase announcement normalized by the number of outstanding shares and multiplied by 10,000. 1-month (3-month) net sales is the difference between number of shares sold and bought by insiders in the one (three) month period post-announcement normalized by the number of outstanding shares and multiplied by 10,000. 1-month (3-month) Abnormal net sales is the one (three) month difference between net insider sales and net insider sales in the time period last year. 1-month (3-month) Abnormal net sales 2 is the one (three) month difference between net insider sales and normal net insider sales for the same period (number of month) where normal net insider sales are measured as the average monthly difference number of share sold and bought by insiders in the previous three year period starting six month before the repurchase announcement. All trades are normalized by the number of outstanding shares and multiplied by 10,000. Pre-3(6)-month net sales is the difference between the number of shares sold and bought by insiders in the three (six) month period before repurchase announcement normalized by the number of outstanding shares and multiplied by 10,000.

Panel C provides summary statistics on firm characteristics for my data. Firm size is the log of book value of assets. Leverage is the ratio of total debt to total firm assets. Book-to-market is the ratio of book value of firm assets to its market value. Cash (Cash flow) is the cash (operating income before depreciation) divided by book assets. Capital expenditure (R&D expense) is the capital expenditures (research and development expenditures) scaled by book assets. Cash, cash flow, capital expenditure and R&D expense are shown as percentages. Tobin's Q is the ration of market to book value of assets. Return volatility is the volatility of stock returns measured over 1 year prior to repurchase announcement.

				Percentiles		
Variables	**N**	**Mean**	**SD**	**1st**	**50th**	**99th**
Panel A: Returns						
3-day CAR	8945	2.40	7.90	-23.0	1.80	31.0
3-day BHAR	8945	2.30	7.70	-22.6	1.60	30.3
1st-year BHAR	8944	4.50	47.90	-84.8	-1.60	212.9
2nd-year BHAR	8652	6.60	49.90	-88.4	0.10	229.8
Stock price runup	8942	-6.70	17.80	-57.5	-4.90	41.2
Panel B: Insider trades						
1-month Sales	8945	6.40	26.24	0.00	0.00	206.1
1-month Purchases	8945	2.00	9.04	0.00	0.00	70.5
1-month Net sales	8945	4.33	27.20	-68.2	0.00	199.8
1-month Abnormal net sales	8945	-1.92	38.11	-186.3	0.00	164.5
1-month Abnormal net sales 2	8945	-1.88	32.72	-122.1	-0.29	157.1
3-month Net sales	8945	12.72	65.58	-144.3	0.00	492.5
3-month Abnormal net sales	8945	-11.76	124.57	-785.1	0.00	372.8
3-month Abnormal net sales 2	8945	-5.89	86.08	-375.5	-0.42	360.6
Pre-3-month Net sales	8945	9.79	56.34	-156.8	0.00	409.1
Pre-6-month Net sales	8945	41.64	197.82	-286.8	0.95	1551.4
Panel C: Firm Characteristics						
Firm size	8945	2.78	0.87	0.98	2.74	5.1
Leverage	8919	0.54	0.26	0.07	0.53	1.0
Book-to-Market	8900	0.64	0.44	0.06	0.55	2.5
Cash	8945	16.15	18.34	0.09	8.28	77.3
Cash flow	8859	12.12	11.06	-25.72	12.05	47.7
Capital expenditure	8945	4.58	5.44	0.00	3.02	30.0
R&D expense	8945	2.65	5.09	0.00	0.00	24.4
Tobin's Q	8900	2.61	2.57	0.40	1.83	17.4
Return volatility	8942	0.03	0.02	0.01	0.03	0.1

Table 3: Pre-announcement net insider sales and returns of repurchasing firms

The table shows mean short-term and longer-term returns by high and low net insider sales for firms that announced a share repurchase programme. The first (second) panel categorises returns by 3 (6) months net sales in the pre-announcement period. Pre-3(6)-month net sales is the difference between the number of shares sold and bought by insiders in the three (six) month period before repurchase announcement normalized by the number of outstanding shares and multiplied by 10,000. 3-day BHAR is the 3 day (-1, 1) buy-and-hold abnormal return around the event date (day 0). 3-day CAR is the 3 day (-1, 1) cumulative abnormal return around the event date (day 0). 5-day BHAR is the 5 day (-2, 2) buy-and-hold abnormal return around the event date (day 0). 1st year BHAR is the 1 year (0, 252 days) buy-and-hold abnormal return starting from the event date. 2nd year BHAR is the second year (253, 504 days) buy-and-hold abnormal return starting from the first anniversary of event date. Abnormal returns are estimated against the value weighted market return as the benchmark. High (low) columns report mean returns of firms with pre-announcement net sales above (below) the mean value of insider net sales. The difference (Diff) column reports the difference between mean returns of firms with high and low pre-announcement net insider. T-test is used to test the significance of the difference from zero. P-values associated with the t-test are reported in the table.

	Pre 3 Months net sales				Pre 6 Months net sales			
Variables	high	low	Diff	P-value	high	low	Diff	P-value
3-day BHAR	0.016	0.024	-0.008***	0.0001	0.019	0.023	-0.004**	0.044
3-day CAR	0.017	0.026	-0.009***	0.0001	0.021	0.025	-0.004**	0.0336
5-day BHAR	0.013	0.024	-0.011***	0.0001	0.014	0.024	-0.010***	0.0001
1st year BHAR	0.052	0.044	0.008	0.5409	0.036	0.047	-0.011	0.4192
2nd year BHAR	0.062	0.067	-0.005	0.7529	0.061	0.067	-0.006	0.6957

Significance at the 1%, 5%, and 10% levels is denoted by ***, **, and * respectively.

Table 4: Announcement returns and pre-announcement insider trades.

The dependent variable in all model specifications (column 1-6) is the three-day BHAR calculated as the three day (-1, 1) buy-and-hold abnormal return around the announcement date (day 0) using value weighted return on the market as the benchmark. All the trading variables are calculated in the pre-announcement period. 3 (6)-month sales (purchases) is the number of shares sold (bought) by insider in the three (six) month period before repurchase announcement normalized by the number of outstanding shares and multiplied by 10,000. 3-month (6-month) net sales is the difference between number of shares sold and bought by insiders in the three (six) month period before repurchase announcement normalized by the number of outstanding shares and multiplied by 10,000. Intended percentage is the target value the firm plans to repurchase as listed in the announcement normalized by the market value of equity. The other control variables are as defined in table 2. t-statistics in parentheses are based on standard errors adjusted for clustering at the firm level.

	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	3.29*** (7.25)	3.23*** (7.09)	3.53*** (7.84)	3.53*** (7.89)	3.53*** (7.83)	3.54*** (7.83)
6-month purchases	0.53** (2.33)					
3-month purchases		1.52*** (3.14)				
6-month net sales			-0.13** (-2.44)			
3-month net sales				-0.52*** (-2.97)		
3-month sales					-0.34* (-1.91)	
6-month sales						-0.11** (-2.15)
Stock price runup	-4.83*** (-8.00)	-4.82*** (-7.98)	-4.92*** (-8.12)	-4.84*** (-8.01)	-4.83*** (-7.99)	-4.9*** (-8.1)
Firm size	-1.05*** (-9.29)	-1.03*** (-9.08)	-1.11*** (-9.97)	-1.1*** (-9.91)	-1.12*** (-9.97)	-1.12*** (-10.01)
Book-to-market	1.36*** (4.34)	1.34*** (4.29)	1.37*** (4.33)	1.35*** (4.29)	1.38*** (4.38)	1.38*** (4.37)
Intended percentage	0.01 (0.76)	0.01 (0.76)	0.01 (0.79)	0.01 (0.8)	0.01 (0.79)	0.01 (0.78)
Leverage	0.78** (2.13)	0.76** (2.07)	0.79** (2.17)	0.78** (2.13)	0.82** (2.23)	0.81** (2.22)
Tobin's Q	0.07* (1.71)	0.07* (1.69)	0.08* (1.92)	0.08* (1.85)	0.08* (1.83)	0.08* (1.9)
R-squared	4.03%	4.14%	4.05%	4.08%	4.00%	4.03%

Significance at the 1%, 5%, and 10% levels is denoted by ***, **, and * respectively.

Table 5: Difference between pre- and post-announcement insider trades.

The table reports the average insider trades in the pre- and post-announcement 3(6)-month periods. Pre (post) column reports trades before (after) repurchase announcement. The difference (Diff) column reports the difference between pre- and post-announcement insider trades and also shows if the difference is significantly different from zero. The significance test is based on t-test and the associated p-values are also reported in the P-value column. Sales (Purchases) are defined the number of share sold (bought) by insiders during the 3 (6)-month window before and after repurchase announcement and normalized by the number of outstanding shares and multiplied by 10,000. Net is the difference between number of shares sold and bought by insiders during the time window. Abnormal net sales is the difference between net insider sales and net insider sales in the time period last year over the same time window. Abnormal net sales 2 is difference between net insider sales and normal net insider sales for the same period (number of months) where normal net insider sales are measured as the average monthly difference number of share sold and bought by insiders in the previous three year period starting six month before the repurchase announcement. The p-value rows are associated with t-test of the difference of abnormal net sales from zero.

	1 Month trades				3 Month trades			
Shares traded	Pre	Post	Diff	P-value	Pre	Post	Diff	P-value
Sales	2.93	6.40	-3.47***	0.000	15.41	18.81	-3.4***	0.000
Purchases	1.52	2.00	-0.49***	0.000	5.37	5.30	0.07	0.814
Net sales	1.37	4.33	-2.96***	0.000	9.79	12.72	-2.93***	0.000
Abnormal net sales	-3.39	-1.92	-1.47***	0.001	-10.46	-11.76	1.3	0.426
p-value	0.001	0.001			0.00	0.00		
Abnormal net sales2	-4.84	-1.88	-2.96***	0.000	-8.82	-5.89	-2.93***	0.000
p-value	0.001	0.001			0.00	0.00		

Significance at the 1%, 5%, and 10% levels is denoted by ***, **, and * respectively.

Table 6: Post-announcement insider trades of repurchasing firms in subsamples

The table reports post-announcement 1-month and 3-month mean insider trades for different subsamples of firms. Panel A subsamples the data based on book-to-market ratio. High (low) book-to-market ratio refers to firms with book-to-market ratio above (below) the sample mean. Panel B subsamples data based on stock price runup. High (low) stock price runup refers to firms with stock price runup above (below) the sample mean. Panel C subsamples the data based on 6-month pre-announcement net sales. High (low) 6-month pre-announcement net sales refers to firms with net sales above (below) the sample mean. Finally, Panel D subsamples the data based on three day (-1, 1) repurchase announcement returns. High (low) announcement returns refer to firms with three day BHAR above (below) the sample mean. The trade variables are as defined in tables 2 and 4. The difference between column 1 and 2 for each panel is reported in the Diff column. One sample t-test tests for the difference to be significantly different from zero. P-values associated with t-test are also reported in column 4 of each panel.

	Panel A: Book-to-Market ratio				Panel B: Stock price runup			
Variables	low	high	Diff	P-value	high	low	Diff	P-value
1-month Sales	7.43	4.83	2.6***	0.0001	7.45	5.14	2.31***	0.0001
1-month Purchases	1.66	2.52	-0.86***	0.0001	1.43	2.69	-1.26***	0.0001
1-month Net sales	5.69	2.26	3.43***	0.0001	5.96	2.37	3.59***	0.0001
3-month Sales	21.32	15.00	6.32***	0.0001	20.41	16.89	3.52**	0.017
3-month Purchases	4.32	6.79	-2.47***	0.0001	3.89	6.99	-3.1***	0.0001
3-month Net sales	15.95	7.81	8.14***	0.0001	15.66	9.2	6.46***	0.0001
	Panel C: Net sales 6m Pre-announcement				Panel D: Ann. Return (3-day BHAR)			
Variables	high	low	Diff	P-value	high	low	Diff	P-value
1-month Sales	15.61	4.4	11.21***	0.0001	7.44	5.57	1.87***	0.0001
1-month Purchases	1.61	2.09	-0.48**	0.0313	1.97	2.03	-0.06	0.778
1-month Net sales	13.85	2.27	11.58***	0.0001	5.43	3.45	1.98***	0.000
3-month Sales	43.58	13.45	30.13***	0.0001	20.82	17.21	3.61**	0.015
3-month Purchases	4.81	5.41	-0.60	0.3225	5.46	5.17	0.29	0.537
3-month Net sales	36.98	7.47	29.51***	0.0001	14.3	11.46	2.84**	0.041

Significance at the 1%, 5%, and 10% levels is denoted by ***, **, and * respectively.

Table 7: Two-way sorted subsamples of repurchasing firms

The table reports average post-announcement insider net sales in the 1-month and 3-month time windows for subsamples sorted on two variables. Vertically, every year the data is sorted into two groups based on repurchase announcement ranks. Low (high) rank refers to firms that have lower (higher) announcement returns. Horizontally, panel A subsamples the data based on book-to-market ratio. High (low) book-to-market ratio refers to firms with book-to-market ratio above (below) the sample mean. Panel B subsamples the data based on firm size. Small (large) refers to firms with firm size below (above) the sample mean. Panel C subsamples the data based on stock return volatility. High (low) stock return volatility refers to firms with stock return volatility above (below) the sample mean. Variables are as defined in tables 2 and 4. The difference between column 1 and 2 for each panel is reported in the Diff column. One sample t-test tests for the difference to be significantly different from zero. P-values associated with t-test are also reported in column 4 of each panel.

Ann. Return Rank	Panel A: Book-to-market				
	Variable	low	high	Diff	P-value
Low	1-month Net sales	4.47	1.65	2.82***	0.0004
	3-month Net sales	14.76	6.32	8.44***	0.0001
high	1-month Net sales	7.02	2.79	4.22***	0.0001
	3-month Net sales	17.25	9.13	8.11***	0.0001
Ann. Return Rank	Panel B: Firm size				
	Variable	small	large	Diff	P-value
Low	1-month Net sales	3.45	3.38	0.06	0.9332
	3-month Net sales	14.12	9.39	4.73**	0.0147
high	1-month Net sales	6.07	4.12	1.95**	0.0234
	3-month Net sales	15.95	11.00	4.94**	0.0138
Ann. Return Rank	Panel C: Return volatility				
	Variable	high	low	Diff	P-value
Low	1-month Net sales	3.37	3.43	-0.06	0.9378
	3-month Net sales	13.13	10.82	2.30	0.2598
high	1-month Net sales	5.16	5.30	-0.15	0.8639
	3-month Net sales	15.29	12.65	2.65	0.1851

Significance at the 1%, 5%, and 10% levels is denoted by ***, **, and * respectively.

Table 8: Post-announcement insider trades and returns of repurchasing firms

The table reports regression results of insider trades on short-term and longer-term returns of firms that announce a repurchase program. The dependent variable in models (columns) 1-3 is the 1-month net insider sales. Models (columns) 4-5 regress 1-month insider sales and 1-month insider purchases on explanatory variables respectively. In models (columns) 6-8, the dependent variable is the 3-month net insider sales. T-statistics are in parenthesis and are reported after adjusting standard errors for heteroskedasticity as suggested by White (1980). The variables are as defined in table 2.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Intercept	9.15***	9.14***	9.35***	11.93***	2.91***	28.12***	28.02***	28.64***
	(5.7)	(5.69)	(5.79)	(7.7)	(5.5)	(7.32)	(7.31)	(7.37)
3-day BHAR	25.58***	25.6***	25.8***	16.59***	-7.83***	48.49***	48.35***	53.26***
	(5.65)	(5.64)	(5.58)	(3.78)	(-4.27)	(4.39)	(4.38)	(4.75)
1st year BHAR		0.29					4.68***	
		(0.41)					(2.71)	
2nd year BHAR			-0.89*					-2.66*
			(-1.71)					(-1.86)
Stock price runup	16.25***	16.25***	16.75***	11.92***	-4.01***	30.08***	30.04***	31.4***
	(7.95)	(7.95)	(8.08)	(5.99)	(-6.13)	(6.36)	(6.36)	(6.6)
Firm size	-0.28	-0.29	-0.35	-1.54***	-1.29***	-2.56***	-2.59***	-2.61***
	(-0.73)	(-0.74)	(-0.89)	(-4.18)	(-9.77)	(-2.76)	(-2.8)	(-2.79)
Book-to-market	-2.76***	-2.77***	-2.93***	-1.37	1.28***	-7.36***	-7.56***	-8.1***
	(-2.7)	(-2.72)	(-2.89)	(-1.44)	(3.17)	(-3.11)	(-3.23)	(-3.5)
Intended percentage	0.05	0.06	0.06*	0.07**	0.02	0.23**	0.23**	0.24**
	(1.49)	(1.5)	(1.7)	(2.04)	(1.45)	(2.09)	(2.13)	(2.19)
Leverage	-6.76***	-6.74***	-6.39***	-4.19***	2.55***	-13.56***	-13.35***	-12.96***
	(-5.45)	(-5.42)	(-5.08)	(-3.55)	(5.64)	(-4.67)	(-4.6)	(-4.39)
Tobin's Q	0.55***	0.54***	0.51**	0.65***	0.09	1.07**	1.05**	1.01**
	(2.69)	(2.69)	(2.47)	(3.33)	(1.57)	(2.23)	(2.19)	(2.09)
Adj. R-Squared	2.37%	2.37%	2.43%	1.75%	2.64%	1.86%	1.97%	2.02%

Significance at the 1%, 5%, and 10% levels is denoted by ***, **, and * respectively.