Insider Purchases Talk and Buybacks Whisper

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Abstract

This study compares and contrasts actual share repurchase transactions with insider purchases. With a unique daily data set of actual share repurchases and insider purchase transactions from the London Stock Exchange, we provide direct evidence on market timing and price support. We find strong evidence of the undervaluation hypothesis for actual share repurchases. We show that insider purchases can provide price support for the company, which is a less expensive option compared to buybacks. Furthermore, the evidence shows that undervaluation, size and liquidity are the major determinants of the market reaction for both share repurchases and insider purchases. Finally, we find that undervaluation and size are the major differentiating factors between insider purchases and share repurchases.

Key words: Actual share repurchases, insider purchases, price support, market timing, undervaluation, London stock exchange.

JEL Classification: G3, G11,G14.

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1. Introduction

If managers can signal the firm's undervaluation to the market with their own trades then they should be able to do the same with corporate finance decisions. If managers perceive that firm's equity is undervalued they can purchase shares for themselves or they can conduct share buybacks with firms' excess cash. However, due to the fact that insider purchases involve insiders' own wealth, the signal to the market should be stronger relative to open market share repurchases which involves the firm's funds. Therefore, we argue that share repurchases and insider purchases are two corporate events that can have similar motives, at least, in terms of signalling the firm's undervaluation to the market. Furthermore, if the motive for executing open market share repurchases is to support prices, it is also possible that insider purchases can be used to support prices as well.

We analyse and contrast actual open market share repurchases with insider share purchases. Even though there are previous studies on repurchases and insider trading, this is the first paper to employ daily data to address the following questions: When do companies conduct open market share repurchases? Is the share price performance prior to trades different for companies conducting share repurchases as compared to insider purchases? Are buyback/insider purchase transactions executed for supporting falling share prices or due to market timing? What is the market reaction of open market repurchases as compared to insider purchases? Are the characteristics different for companies conducting open market share repurchases compared to insider purchases?

The empirical evidence on signalling when firms actually repurchase their own shares is limited, though there are some evidence of market timing in the context of share repurchase announcements. A number of studies[1] on share repurchases, the majority of which focuses on the U.S. market, report negative abnormal returns prior to the announcement of intention to repurchase shares in the open market which are followed by a period of positive abnormal returns (Ikenberry, Lakonishok, and Vermaelen, 1995; Chan, Ikenberry, and Lee, 2007; Andriosopoulos and Lasfer, 2011). Hence, suggesting that open market share repurchase announcements are interpreted as signals by the market regarding the firms' true valuation. However, the announcement of a share repurchase programme poses no commitment to the firm, and quite often is not fully implemented, or firms may choose not to repurchase any

[1] For a review of the related literature please see Allen and Michaely (2003).

shares at all(Simkovic,2007;Stephens and Weisbach, 1998)[2]. This lack of commitment for completing the announced open market share repurchase programmes makes the signalling hypothesis quite controversial, since an open market share repurchase is not a costly signal (meaning that it could be imitated even by a bad firm), thus lacking credibility. In other words, there is no clear evidence that firms effectively repurchase their shares when they are undervalued. Also, it is not clear whether companies repurchase shares for signalling, to exploit market timing or to support price.

A number of previous studies show that insider trades are informative (e.g. Rozeff and Zaman, 1988; Gregory, Matatko, Tonks and Purkis, 1994). It is well established in the insider trading literature that insider purchases are preceded by a price decline. Seyhun (1986, 1992) shows that insiders are more likely to purchase (sell) shares following periods of significant price declines (appreciation). This is consistent with the notion that insiders are trading in anticipation of subsequent price reversals, which has been loosely termed as insiders having market timing ability. However, price support, which is a related concept, has not been examined in the literature in the context of insider's purchases, except for Hoque and Lasfer (2010) who provide limited evidence of price support in the context of IPOs. To our knowledge, this is the first study to examine the price support hypothesis through insider purchases.

Furthermore, there is limited evidence of managers timing the market in the context of share repurchases. For instance, Lee, Mikkelson and Partch (1992) find that on average managers of repurchasing firms increase their frequency of buying shares and decrease their frequency of selling shares prior to repurchase announcements. In a more recent study, Doukas et al. (2010) analyse repurchasing firms and find that for those firms where insiders are "pure sellers" prior to repurchase announcements (relative to "pure buyers") actually buyback less shares, the firm receives a less positive market reaction to repurchase announcements, and shows a poorer long-term performance. These results support the view that some repurchasing firms announce share repurchases to boost stock price in the short term. In line with this, Bonaimé and Ryngaert (2010) find that repurchasing firms with insider buying display significantly higher abnormal returns compared to repurchasing firms with insider selling. Their findings are consistent with the notion that insider trades either validate or negate the undervaluation signal of the repurchase. Consistent with these findings are the

[2]In addition, Rau and Vermaelen (2002) report that in the U.K. firms repurchase only 37%, and Ginglinger and Hamon (2007) report evidence that firms in France repurchase only 10% of the intended amount.

results reported in Babenko, Tserlukevich and Vedrashko (2011), who find that in the U.S. market, larger managerial purchases are associated with larger announcement returns. In sum, their findings suggest that insider purchases prior to the announcement of intention to repurchase shares in the open market strengthen the undervaluation signal.

However, the overwhelming majority of the literature, that analyses insider trading and share repurchases, focuses on the U.S. market, being restricted to the employment of quarterly data. Therefore, we contribute to the existing body of the literature by employing unique hand-collected daily data on actual open market share repurchase trades and daily data on insider purchases in the U.K. Hence, the data employed in this study allows us to robustly determine whether insider purchases and open market share repurchases are executed due to market timing, or in order to provide price support. For a clear distinction between the market timing and price support hypotheses, we define them as follows. When a firm's share price is significantly lower on repurchase (insider purchase) days compared to subsequent non-repurchase (non-insider purchase) days then it is market timing. When a firm's share price is not significantly lower (or significantly higher) on share repurchase (insider purchase) days compared to subsequent non-repurchase (non-insider purchase) days then it is price support.

We contribute to the existing literature in several ways. First, we provide evidence that repurchase transactions are conducted for price support. Previous studies report that insiders time the market (Lakonishok and Lee, 2001). We provide fresh evidence that insider purchases can be done for price support. While there is evidence of price support through share repurchases, insiders' own money can achieve the same goal. Moreover, insiders commit less money on insider purchases compared to repurchase transactions and send a stronger signal of undervaluation to the market. Hence, insider purchases can be a less expensive method of price support compared to stock buybacks. This finding is consistent with Cook, Krigman and Leach (2004) who argue that in share repurchase programs, companies buy shares (either at the bid or ask) to hold the price at or return it to a targeted level.

Second, we show that with actual share repurchase transactions managers send signals regarding undervaluation. Brav, Graham, Harvey, and Michaely (2005) report that 86.4% of U.S. firms surveyed, state that the current market price of their stock is an important or a very important factor to their repurchase decisions. We document that the share price decline prior to the buyback execution is one of the major determinants of firms' share repurchasing

decisions. The results are in line with De Cesari, Espenlaub, Khurshed, and Simkovic (2009), who report that firms repurchase their shares at relatively lower prices, within each month of repurchase activity and buy more shares when market prices are relatively low, suggesting that firms time the execution of their share repurchase trades. Similarly, Ben-Rephael, Oded and Wohl (2011) find that share repurchasing activity increases subsequent to poor stock price performance, which significantly improves following the actual share repurchase trades. Therefore, suggesting that managers display market timing ability.

Third, we analyse the determinants of the market reaction and show that the actual repurchase trades have broadly similar determinants to insider purchases. We show that the perceived undervaluation and the size of the company are the major driving factors of the short term market reaction. Furthermore, we find that large firms are more likely to repurchase their shares while smaller firms are more likely to have insider trading. This is the first paper (to our knowledge), which utilises daily insider purchases and actual share repurchases data and performs a detailed comparative analysis of those trading activities. Fourth, we show the "wealth transfer effect" (Fried, 2005) of ownership concentration on actual share repurchase transactions.

The results of this paper can be summarised as follows. We find that the average price paid for share repurchases is higher than the respective price during the pre and post non-repurchase days. Therefore, suggesting that firms repurchase their shares in order to provide price support. The evidence from insider purchases show that the average price paid is lower than the respective price during the pre-event non-insider purchase days, but higher compared to the respective post-event non-insider purchase days. Hence, insiders are providing price support by signalling the firm's undervaluation, which in turn gives a boost to the declining share price. Furthermore, the share price increase following the insider purchases does not reach the pre-event price levels, therefore reinforcing the argument that insider purchases provide price support at the least possible cost for insiders.

We analyse the market reaction to actual share repurchase transactions and insider purchases. The results show that the actual buyback transactions trigger a lower market reaction compared to insider purchases. Hence, it appears that insider purchases "talk" while buybacks "whisper". There is a slightly delayed market reaction for the actual repurchase transactions. We further analyse CARs in terms of company characteristics like market-to-book, Tobin's q, size, ownership concentration, liquidity, Intangible asset ratio, leverage and size of trade. We

show that undervaluation measures like CAR(-100,-3), M/B, Tobin's q are all negative related to the market reaction of actual buyback trades. Size is negatively related to the market reaction. The drivers of market reaction for actual buyback transactions are broadly similar to insider purchases, except liquidity.

The logit analysis on actual share repurchases versus insider purchases reinforces the findings in the cross sectional analysis of the market reaction. The results show that the market-to-book ratio (M/B) is positive and significant, meaning that companies with high M/B are more likely to repurchase shares than insiders to purchase shares. Size is positive, implying that companies which conduct share repurchases are larger than companies where insiders purchase shares. If the ownership concentration is lower, firms are more likely to conduct share repurchases than insiders to purchase shares. Finally, firms with higher excess cash holdings and higher leverage are more likely to repurchase their own shares than insiders to purchase shares.

The remainder of the paper is organised as follows. Section 2 describes the data employed. In section 3, we test market timing versus price support hypotheses for actual share repurchases and insider purchases. In section 4 we employ an event study methodology for the market reaction to actual buyback transactions and insider purchases, and perform a cross sectional analysis on the determinants of the market reaction. Section 5 reports the logit analysis of actual repurchase transactions versus insider purchases. In Section 6 we perform robustness checks. Finally, section 7 concludes.

2. Data and sample description

A. Share repurchases data

For the open market share repurchase trades, the sample is constructed by identifying all the announcements of intention to repurchase ordinary shares in the open market from hand-collected data, reported in the news articles posted in Perfect Analysis and Factiva databases from January 1997 to December 2006. These databases report any news announcements that were available in the press, made by U.K. corporations on open market share repurchases. The sample is refined so as to involve solely those firms that announce their intention to repurchase ordinary shares in the open market, thus excluding announcements concerning the repurchase of B-shares or preference shares. We also control the sample for American Depositary Receipts (ADRs) and cross-country listings. Furthermore, the firms included in

the sample are required to have their share prices listed on DataStream and their accounting data on Worldscope. The announcements of the executed open market share repurchase trades are collected by Factiva, which contains all public announcements that are made by the press or any regulatory news service e.g. Dow Jones Newswires, Regulatory News Service (RNS), Financial Times, etc. Hence, it is possible to accurately measure the number of the repurchased shares and in a timely manner since they are reported on a daily basis[3]. The final sample is comprised of 8,448 open market share repurchase trades.

According to the financial regulations in the United Kingdom, firms must a) obtain shareholder approval at the general meeting; b) firms must state the maximum number of shares that are to be authorised for repurchasing (which cannot exceed the 15% of the total common shares outstanding); c) determine both the maximum and minimum range of prices which may be paid for the shares, and specify a date on which the repurchase programme is to expire (not be later than 18 months) (Companies Act 1985, 166)[4,5]. However, a firm is not required to publicly announce its intention to initiate the open market share repurchase programme that has been approved at the shareholders' general meeting. Finally, regarding the execution of the open market share repurchases, firms must notify the regulatory authorities (FSA – RIS) no later than 7.30 am on the business day following the calendar day on which the share repurchase occurred[6].

B. Insider trading data

This study uses *Directors Deals*, a large database of all UK firms' directors' trades spanning from January 1999 to December 2007, to collect data on trades undertaken by directors. The database includes news items on directors' trades disclosed by all UK firms to the Regulatory News Service (RNS). A number of observations that are not likely to be driven by private information, such as exercise of options or derivatives, script dividends, bonus shares, rights

[3] It should be noted that for a small sample of ten test firms the total number of repurchased shares has been collected by their respective fiscal year statements in order to validate the completion rates estimated from the collection of the daily actual share repurchase trades and they show no significant statistical differences.

[4]Furthermore, a firm cannot repurchase more than 25% of the average daily volume of its shares in any one day on the regulated market on which the repurchase is carried out (for details, please see the Financial Services Authority, Model Code MAR 1 Annex 1.1.9).

[5] According to the regulations of the London Stock Exchange, firms are prevented from repurchasing their shares during period prior to the announcement of a firm's financial results (for details, please see the Financial Services Authority Model Code LR 9.2, Annex 1).

[6] Firms are required to disclose the date of the share repurchase, the number of shares bought, the value weighted average price paid and the number of shares purchased for cancellation and the number of shares that are to be held as Treasury shares.

issues, awards made to directors under incentive plans or reinvestment plans, are excluded. Also excluded are all directors' transactions in investment companies.[7] After this screening, there are 36,943 insiders' trades from the UK market. The data is checked for errors and excludes 2,952 (8%) trades as the difference in announcement and transaction date is more than 5 days. The final sample includes 33,991 directors' trades in 2,664 listed companies, of which 26,268 (77%) are purchases. This insider-trading database includes the following: transaction price, amount and value; the post-transaction holding; change in holding; name and position of the insider; and announcement and transaction dates. However, it must be noted that even though UK insiders can delay up to five days the announcement of their trade, most of them report their trades on the RNS on the transaction date (Korczak and Lasfer, 2009).

C. Sample description

Table 1 shows the summary statistics for sample actual repurchase trades and insider purchase trades. The variables include number of trades, number of shares, value of shares, percentage holding, trade size as a percentage of market capitalization, and market capitalization at the time of trade. The average number of trades per company is 10 for insiders and the mean value of shares bought is £90,376. In contrast, as expected, the average number of share repurchase trades and the respective average value of the repurchased shares is significantly higher, where each repurchasing firm conducts on average 53 trades and repurchases approximately £570 million.

[Insert Table 1 here]

The value of shares can be misleading because for large companies the figure will naturally be higher than for small companies. When the value of the trades is scaled by market capitalization, this study reports that both buy trades and share repurchases are smaller. The average buy trades as a percentage of market capitalization is 0.15% while share repurchases are on average significantly higher at approximately 11% of the market capitalisation. This

[7]Similar sample selection is adopted in previous studies (e.g., Jaffe, 1974; Finnerty, 1976; Pope et al., 1990; Gregory, Matatko, Tonks and Purkis, 1994; Gregory et al., 1997; Friederich et al., 2002; Hillier and Marshall, 2002; Fidrmuc et al., 2006; Korczak and Lasfer, 2009). Our sample size is more comprehensive than the studies that examine directors' share trading studies in the UK. For example, Gregory et al. (1997) use 6,756 transactions for 1,683 companies between January 1986 and December 1990, Friederich et al. (2002) use 4,399 transaction for 196 companies between October 1986 and December 1994, Hillier and Marshall (2002) use 7,796 transaction for 1,350 companies between September 1991 and March 1997 and Fidrmuc et al. (2006) use 10,140 buys and 5,523 sells between 1991-1998, Korczak and Lasfer (2009) use 10,414 buys and 2, 953 sells from 1999 to 2003.

shows that firms commit significantly larger amounts of excess cash for share repurchases compared to the insiders' own funds that are utilised for insider purchases.

Furthermore, the average size of repurchasing firms is higher than the average size of the firms where insider purchases occur[8].The differences between insider purchases and open market share repurchases is logical, since insiders usually conduct a small number of trades, whereas for open market share repurchases firms can be authorised to repurchase up to 15% of their outstanding capital for each repurchase programme they initiate.

3. Market timing vs. Price support

According to the market timing hypothesis, a firm's share price should be lower during repurchase (insider purchase) days, compared to previous and subsequent non-repurchase (non-insider purchase) days. In contrast, the price support hypothesis implies that the firm's share price should be higher or not significantly different on share repurchase (insider purchase) days compared to subsequent non-repurchase (non-insider purchase) days (Ginglinger and Hamon, 2007). For a clear distinction between the market timing and price support hypothesis the following equations are provided.

$$Price_{event} < Average\ Price_{pre-event} \qquad (1)$$

$$Price_{event} < Average\ Price_{post-event} \qquad (2)$$

In order for the market timing hypothesis to hold, both equations (1) and (2) must hold, suggesting that the execution price is lower compared to both the past and post share price performance and therefore providing evidence of market timing ability. In the case where only equation (1) holds, then it is price support since the post event price is not significantly higher than the execution price, hence not providing any evidence of opportunistic trading[9].

In order to test the two contending theories of management's market timing and price support, in the spirit of Ginglinger and Hamon (2007), we assess the share price behaviour

[8]The average size of the repurchasing firms for our sample firms is similar to the average size of repurchasing firms reported in Grullon and Michaely (2004) and Cook, Krigman and Leach (2004).

[9]It should be noted though that regarding open market share repurchases, according to the regulatory framework in the United Kingdom, firms are not allowed to repurchase their shares at a price that is higher than 5% above the average market value of the company's shares for the 5 business days prior to the day the repurchase is made (FSA Handbook, L.R. 12.4). This can limit firms' flexibility on timing their repurchase trades in the case where their incentive is to provide price support. Nevertheless, firms still have a certain level of flexibility for timing the actual repurchase trades when their motive is to either exploit any potential undervaluation or to provide price support.

surrounding the insider buy trading and the share repurchase trades in relation to the execution price of each of these trades respectively. To achieve this, first we estimate the value-weighted average price for the insider purchase trades and open market share buyback trades that occurred on each day, weighted by the volume of each of the respective trades (VWAPIT for insider trades and VWAPBB for open market share repurchases). Then, the daily value weighted average price (VWAPC) is estimated, as the daily closing price weighted by the daily volume of the traded stock, for the days when the insider trades or the share repurchases took place. We divide each of the three value weighted average price ratios (i.e. VWAPIT, VWAPBB and VWAPC respectively) with the value weighted average price estimated from the pre- and post-event time periods of *n* months (VWAP*(n)*). Specifically, *n* takes the values of 1, 2, 3, 4, 6, and 12months, before and after each insider or share repurchase trade takes place. Following the construction of these three ratios we assess whether these ratios are significantly different.

Table 2 reports the results for the open market share repurchases. Panel A reports the VWAP ratios for the days prior to repurchases and Panel B reports the respective VWAP ratios for the days following the repurchases. The results show that the repurchase trades and their execution price are on average significantly higher compared to the share price prior to the repurchases (VWAPBB/VWAP) and also compared to the closing price of the day when a repurchase trade occurred (VWAPC/VWAP), for all the time periods prior to the repurchase trades. For instance, we find that the VWAPBB/VWAP*(1 month*) for the actual trades is significantly higher by 21.2% compared to the respective VWAPC/VWAP*(1 month)* ratio for the closing price of the day when a repurchase trade occurred, for the twenty days prior to the repurchases. The results remain the same for the extended period of 2, 3, 4, 6, and 12months prior to the share repurchase trades. Moreover, when comparing the repurchase trades to the post-repurchase time intervals, we find again that the value weighted average price paid for the open market share repurchases is higher than the post-repurchase closing prices (VWAPC/VWAP(n)), for all of the six post-repurchase periods of the analysis.

[Insert Table 2 here]

The results on share repurchases show that managers pay a higher price for the actual repurchases compared to the firm's value weighted average price of both prior and post non-repurchase days. Hence, managers try to support the share price by offering a higher price. In addition, by paying a higher price, managers signal their belief to the market that the firm's

share price is undervalued, and consequently it is a bargain for them to buy by committing their own wealth. Therefore, the evidence shows that the management's incentive for executing open market share repurchases is price support rather than market timing.

However, these results contradict the findings of De Cesari et al. (2009), who report that firms in the U.S. repurchase shares at relatively lower prices and that they tend to repurchase more shares during months when the prevailing market prices are relatively low. Nevertheless, due to the reporting regulations in the U.S., previous studies employ monthly data which could be one of the reasons that lead to the difference in the findings of timing ability, along with the difference in institutional settings between the U.S. and the U.K. markets. Moreover, the interpretation of these findings is still consistent with the findings of Ginglinger and Hamon (2007) where they conclude that the incentive for the actual repurchases is price support.

Table 3 reports the respective results for the insider repurchases. Panel A reports the VWAP ratios for the days prior to insider purchases and Panel B reports the respective VWAP ratios for the days following the insider purchases. In this case, when comparing the value weighted average price paid for the insider purchase trades relative to the share price and respective volume for both prior and post the insider purchases (VWAPIT/VWAP*(n)*), the results show that the ratio is lower than one which indicates the insiders' attempt to time their trades. However, when comparing this ratio with the closing on the respective day when insider purchases occurred (VWAPC/VWAP*(n)*), we find that during the shorter periods of 1, 2, 3, and 4months there is no significant difference. But for the longer pre event periods of 6 and 12 months the results show that managers do pay a lower price for their insider trades relative to the closing prices. Therefore, contrary to our expectations, it is only relevant to the longer past share price performance that managers are able to time their trades and not during the shorter time intervals prior to their trades.

[Insert Table 3 here]

However, when assessing the findings from the post insider purchases time intervals, we find that relative to the 4-, 6-, and 12-month share price performance the insiders have after all paid a relatively higher price of 0.9%, 1.1% and 1.7% on average respectively. Therefore, by assessing the insider purchases relative to the ex-ante and ex-post share price performance collectively, we argue that insiders are trying to provide price support but with the least

possible cost for them. Hence, they strive to send a strong signal to the market by investing their own money at the lowest possible cost for them, which they expect to regain with the market's correction reflected in the firm's future share price. This is better illustrated in Figure 2, where the market responds positively and significantly high on the day of the insider purchase signalling, but it does not return to the previous longer term historical levels.

In order to have a better understanding as to why insiders will commit their own wealth when they also have the ability to utilise the firm's own free cash flow instead, we compare the value weighted average price paid for insider purchases (VWAPIT/VWAP*(n)*) relative to the value weighted average price (VWAPBB/VWAP*(n)*). The results are reported in Table 4 and show that for both prior and post trading months, managers consistently commit their own wealth for purchasing shares whereas firms consistently utilise their free cash flow in order to repurchase its own shares.

[Insert Table 4 here]

In sum, the results show that both insider purchases and open market share repurchases are executed in order to provide price support to the firms' declining share price performance. However, insiders are providing a price support by purchasing shares at the least possible cost for them and hence displaying some timing ability by exploiting the insider's informational advantage over the investors. This is also supported when comparing the value weighted average price paid for open market share repurchases directly with the respective value weighted average price paid for insider purchases, where the price for share repurchases is significantly higher than insider purchases. This shows that insiders are willing to incur a cost by committing a small amount of their wealth in order to support the firm's share price. In contrast, they commit a much larger amount of the firm's excess cash for share repurchases for the price support, since the average value of the shares bought by insiders is significantly smaller relative to the average value of share repurchases. In the following section we investigate whether the price support incentive is interpreted as such by the market, which would be reflected by the market's reaction to such signals.

4. Market reaction of actual buyback trades vs. insider purchases

For the analysis of the market reaction the standard market-adjusted returns have been estimated, with FTSE All Share Index as the proxy for the market portfolio. The general form of the market model employed in this research study is as follows:

$$AR_{it} = R_{it} - R_{mt} \qquad (3)$$

Where AR_{it} is the abnormal return for security i in period t; R_{it} is the actual stock return for security i in period t; and R_{mt} is the actual market return in period t with the FTSE All Share Index being the proxy for the market portfolio. However, for robustness check, we also estimate the abnormal returns with the implementation of the standard OLS market model. The general form of the OLS market model is as follows:

$$AR_{it} = R_{it} - E(R_{it}) \qquad (4)$$

$$R_{it} = \hat{\alpha}_i + \left(\hat{\beta}_i * R_{mt}\right) + \varepsilon_{it} \qquad (5)$$

Where AR_{it} is the abnormal return for security i in period t; R_{it} is the actual stock return for security i in period t; $E(R_{it})$ is the expected return for security i in period t. The market model coefficients alpha ($\hat{\alpha}_i$) and beta ($\hat{\beta}_i$) are estimated over the time window -300 to -100 days relative to the event, with the FTSE All Share Index being the proxy for the market portfolio. The abnormal returns estimated from the OLS market model are reported in the Appendix. The comparison of the results derived from the OLS market model and the market adjusted returns, shows that in both cases the abnormal returns remain qualitatively the same. Therefore, the analysis and estimations of this research study are henceforth based on the abnormal returns derived from the standard market-adjusted returns.

Table 5 presents the market reaction to actual buyback transactions and compares it with the market reaction to insider purchases. In the pre-event period there is share price decline for the companies conducting open market repurchases. For example, the CAR for the pre-event window (-100,-3) is -1.21% with a t-statistic of -4.31. It shows that there is a price decline before companies conduct open market repurchases. However, the price decline is smaller when compared to the price decline for insider purchases (-4.86%) for the same event window. The mean difference is statistically significant. In the event day, the abnormal return is still negative for repurchases. There is a delayed market reaction when the repurchase transactions took place (Figure 2). On the other hand, for insider purchases the market reacts quickly and the information is disseminated almost immediately as the abnormal return is 0.51% on announcement day. In the post-transaction period buybacks have higher cumulative abnormal returns if measured over the period +3 to +100. CAR for buybacks is 1.08%, while CAR for insider purchases is 0.81%, though the differences in means are not statistically

significant. In general, the ex-ante price decline is lower for insider purchases and there is a higher market reaction when insiders purchase shares compared to share repurchases.

[Insert Table 5 here]

4.1 Univariate sorting of CARs on selected firm characteristics

Table 6 presents the cumulative abnormal returns based on different firm characteristics. For the cumulative abnormal returns, we calculate the average CARs for each samples' pair of below and above median, and do a mean difference test for these two groups. The size of the trade shows that there are higher event and post–event returns for both share repurchases and insider purchases. This is expected as market microstructure studies find that the size of the trade is associated with the price movement for a particular stock. This is consistent with Fidrmuc et al. (2006) for the UK market and Betzer and Theissen (2009) for the German market, who report higher abnormal returns for large transactions compared to small transactions. For share repurchases, the pre-trade price decline is smaller for the below median market–to-book group, and the event-day and post-event day CARs are higher. So, for undervalued stocks (as measured by low M/B) the market reaction is higher. This is true for insider purchases as well. If we use Tobin's q as a measure of undervaluation, it shows a larger price decline before for pre-event window and higher CARs for event and post-event window for repurchase transactions. However, the mean difference rejects the null of equality only in (+1, +4) window. The effect of Tobin's q on insider purchases is not very clear.

Nevertheless, the effect of firm size is unambiguous on share repurchases and insider purchases. Smaller companies are associated with a higher price decline; and open market repurchases trigger a higher market reaction for small companies. Regarding buyback trades, for companies with below-median ownership concentration, there is a higher price decline in the pre-event window and the market reaction is very small (negative) in the event window which remains considerably low during the post-event window. Regarding insider purchases, for above median ownership concentration, there is a higher price decline and the market reaction is higher for the event window (+1, +4), but the effect fades out shortly thereafter. Even, in the post event window, the CAR is negative (-0.04%).

[Insert Table 6 here]

The effect of excess cash on share repurchase transaction is more pronounced on the pre-event and post-event window. It shows that there is a larger price decline (-1.48%) for companies which have less cash available and the post-event CAR is higher for this group (1.54%). For companies, which have higher levels of cash available the price decline is lower (-0.59%) for pre-event window and there is a smaller post-transaction CAR (0.68%) for this group. In case of insider purchases, low cash firms display a larger price decline as opposed to high cash firms.

The effect of higher intangible assets is not visible for the pre-event or event window as the mean difference test across two groups (below and above median) is not significant. For repurchases, if a company has higher intangible assets (above median) it has a higher post-event CAR (1.71%) and the mean difference across the two groups is significant. For insider purchases, there is less price decline and higher post-event returns for companies with low intangible assets. This is consistent with Aboody and Lev (2000) who showed that insiders gain higher returns in high R&D firms than in lower R&D firms. The reason behind this is that information asymmetries are higher in R&D-intensive firms and firms with high intangible assets, due to the uncertainty of the outcome of R&D projects or the value of intangible assets.

For the case of buybacks, firms with higher leverage have higher post-event returns (1.48%) and the mean difference is significant across low leverage and high leverage companies. For insider purchases, there is a lower price decline in the pre-event period and a higher event and post-event return.

Table 7 represents the pre-, event and post-event returns for ten industry categories. There is higher price decline for Technology stocks for buybacks and insider purchases. The highest market reaction in (+1,+4) window was triggered by Industrials for buybacks and by Technology firms for insider purchases. Finally, the post-event return for buybacks is far higher in the Technology (9.59%) and Utilities sectors (9.40%).

[Insert Table 7 here]

4.2 Cross sectional analysis of event day returns

In this section, we perform across sectional analysis of event day returns in a multiple regression framework. The motivation for buybacks and insider purchases can be price

support and/or market timing, both of which can be motivated by information asymmetries. Our objective is to see what drives the market reaction of actual buyback transactions as compared to insider purchases. While we recognise that there are substantial differences between corporate transactions and insider trading, this study analyses the common driving factors of such trades. Even though buyback decisions may not be as simple as insider purchases, there are a number of merits that render both buybacks and insider purchases comparable (Allen and Michaely, 2003).

A. The Model and the Variables

We regress the four-day cumulative abnormal returns (+1,+4) against a set of explanatory variables. Since, buyback transactions display a delayed market reactions, we use (+1,+4) cumulative abnormal returns instead of using traditional event windows[10].The choice of the explanatory variables is derived from the vast corporate finance literature on various corporate issues.

CAR (-100, -3): Recent share price performance can be a driver of buyback or insider purchases. Both price support and market timing hypothesis support the view that buyback or insider purchases are followed by a decline in share price. In the insider trading literature it has been termed as contrarian strategy and contrarians are more likely driven by information (Brennan and Cao, 1996). As suggested in the current literature (e.g. Ikenberry et al., 1995; Jagannathan and Stephens, 2003; Dittmar, 2000), a reduction of the stock price is observed almost entirely prior to a share repurchase announcement, thus suggesting potential undervaluation. In order to capture a potential undervaluation, we use CAR (-100, -3), which is the daily cumulative market adjusted return for the period of 100 to 3 days prior to the actual share repurchase or insider purchases.

Size of trade: We measure size of trade by the Pound Sterling value of each trade divided by the market capitalisation of the trade. Our objective is to examine whether large trades contain more information, hence displaying their ability to push share prices higher compared to small trades. By following Fidrmuc et al (2006), we include size of the trade to examine the effect of size on market reaction of insider purchases and buyback transactions.

M/B: Market-to-book is used as a measure as a proxy for growth. Value stocks are more risky than growth stocks and that is the reason why value stocks offer a risk premium. Firms with

[10] The traditional windows used are (-1, +1) or (-2, +2).

higher market to book ratios have higher growth opportunities (Hovakimian, Opler and Titman, 2001). High growth companies are likely to rely more on internally generated funds due to the higher cost of external funding. Moreover, Ikenberry et al. (1995) report that firms with high market-to-book ratios earn significantly positive abnormal returns in the subsequent periods, which is in line with the undervaluation hypothesis. Thus, we include in the regression the variable market-to-book, which is the market value of equity divided by the book value of equity. Further, market-to-book can be used in order to control for a firm's potential investment opportunity

Tobin's Q: Tobin's Q is calculated as the market value of a company divided by the replacement value of the firm's assets. A low Q means that the cost to replace a firm's assets is greater than the value of its stock, which implies that the stock is undervalued. Conversely, a high Q implies that a firm's stock is worth more than the replacement cost of its assets, which implies that the stock is overvalued. This measure of stock valuation is the driving factor behind investment decisions in Tobin's model.

Size: We measure size by the log of the market capitalisation of the company. Larger companies have more asset base and earnings capacity, and may be more diversified. They may have more power to obtain finance in case of financial distress. There is large empirical literature which states that large firms are less risky compared to small ones and that larger firms have lower information asymmetries compared to smaller firms which attract less scrutiny by the market (Fama and French, 1993). Following Dittmar (2000) and Grullon and Michaely (2002) for share repurchases, and following Lakonishok and Lee (2001) for insider purchases we include size for analysing these transactions and their impact.

Ownership Concentration: Ownership concentration is a measure of agency problem in the firm as addressed in Jensen and Meckling (1976). If a firm's ownership is highly concentrated, then the agency costs between managers and shareholders are likely to be higher. Furthermore, the impact of the ownership concentration can also be extended to the conflicting interest between the controlling and the minority shareholders, which quite often is systematically related to corporate actions taken by a firm. When there is a higher ownership concentration, there would be a higher level of information asymmetry. Therefore, we expect to find a positive relationship between the levels of ownership concentration and the market reaction. Thus, we include ownership concentration which is the percentage of closely held shares divided by the number of common shares outstanding. When insider

ownership increases, there is an increase in insiders' inclination to extract wealth from poorly informed shareholders by making repurchases at bargain prices (e.g., Fried, 2005). Hence, the wealth transfer effect of insider ownership may boost a firm's propensity to time repurchases. In addition, institutional investors are often regarded as active monitors that strive to maximize the value of their equity investments in firms e.g., the presence of institutional ownership may, therefore, provide an incentive to executives to repurchase own stock at comparatively low prices.

Liquidity: Liquidity is based on the Opler and Titman (1993) measure of free cash flow, i.e., a firm's cash flow is measured as operating income before taxes, interest, and depreciation (EBITDA). It is expressed as a ratio of the firm's total assets. The existing literature asserts that the larger the firm's cash flow the greater the incentives for the owner-manager to take actions that will give them the control over those cash flows. Hence, the higher the free cash flows, the higher the agency costs that arise (Easterbrook, 1984; Jensen, 1986; and Lehn and Poulson, 1989). In order to test for the excess cash flow hypothesis, according to which firms repurchase their stock in order to distribute their excess capital and reduce potentially arising agency costs, we follow Dittmar (2000), and we include in the regression the variable liquidity. If the firm's motive to repurchase its shares is to distribute the excess capital instead of misplacing it to negative NPV projects, then it should be positively related to the market reaction, since it distributes its excess capital back to its shareholders.

Leverage: As a proxy for a firm's leverage ratio, following Dittmar (2000) and Grullon and Michaely (2002), we use the ratio of total debt to total assets at the end of the calendar year prior to the repurchase announcement, in order to test the market reaction in relation to a firm's leverage ratio. The use of higher amount of leverage may put the company in financial difficulty. The higher the debt a firm holds, the higher the financial risk. Consequently, the higher a firm's risk the less likely it is for insiders to invest their own capital in that firm. On the other hand, though, higher debt might impose more discipline on managers and thus have less control over the firm's cash flows. Furthermore, when a firm chooses to distribute its excess capital as a payout to its shareholders through a share repurchase, it reduces its equity capital, which in turn increases its leverage ratio. Consequently, Bagwell and Shoven (1988) and Hovakimian et al. (2001) argue that a share repurchase programme, displays the managers' preference to employ debt instead of equity, so that they can approach their target leverage ratio. Hovakimian et al. (2001) find that firms with low leverage and high

profitability are more likely to repurchase their shares than retire debt. In line with these findings, Mitchell and Dharmawan (2007), and Dittmar (2000) find that firms with lower than average leverage ratios are more likely to repurchase their shares. Therefore, we expect to find a positive relationship between leverage and the market reaction and that the lower the leverage the more likely it will be for a firm to repurchase its shares.

Asset Tangibility: Asset tangibility is measured by the ratio of intangible to total assets and is calculated by following Rajan and Zingales (1995). Intangible assets include: blueprints or building designs, client lists, computer software patent costs, contract rights, costs associated with approved patents, copyrights, and design costs. Masori and Massoud (2007) assert that the asset tangibility is a measure of the degree of asymmetric information between insiders and outsiders regarding the value of the firm's assets. Specifically, insiders should be able to value them properly and use their proprietary information. This is an important measure as the companies with financial difficulties may need to sell the assets to meet the financial obligations.

B. Empirical Results

Table 8 presents the coefficient estimates from OLS regression on the market reaction against a set of explanatory variables. Panel A reports the results for share repurchases and Panel B reports the results for insider purchases. We examine three models for share repurchases and three models for insider purchases. All the variables cannot be included in a single equation because of multicollinearity problem. In the share repurchase models, M/B, Tobin's q and liquidity was creating multicollinearity. In the insider purchase models, M/B[11], closely held shares and size are significantly correlated, we estimate three different models.

As table 8 shows, a larger price decline before share repurchase transactions is associated with higher market reaction. If $CAR_{(-100,-3)}$ is more negative the stock price reaction is higher, suggesting that the market perceives this as an undervaluation signal, hence displaying a positive reaction. $CAR_{(-100,-3)}$ is significant throughout all the models we estimated. This result is not consistent with Zhang (2005) who report an insignificant CAR (-20,-1). M/B is negative and significant with a t-stat of -1.96, implying that a high growth company shows a market reaction. Size is significantly and negatively related to the market reaction, meaning that in case of small companies there is higher market reaction, which is also in accordance

[11] Though M/B and Tobin's q are not significantly correlated, we do not include them in the same regression.

with the notion that smaller firms have higher information asymmetries, hence triggering a higher market reaction. However, this result is not consistent with Zhang (2005) who reports that size is not statistically significant in his model. The results shown in Model 2 are quite similar to those reported in Model 1. In this model, Tobin's q was used instead of M/B and the variable is significant at the 10 percent level only (t=-1.69). Again, the results on Tobin's q imply that if the shares are undervalued and the firm experiences a lower growth then the market reaction is higher. Furthermore, the variable ownership concentration is statistically significant and positively related to the market reaction, suggesting that the market translates share repurchases as appositive sign which reduces the agency costs that could potentially arise, especially for firms that are less widely held.

Finally, in model 3, we introduce the liquidity variable and as expected, it is positively related to the market reaction of share repurchase trades. This suggests that firms with higher excess cash and subsequently with higher potential agency costs, experience a higher and positive market reaction. This is in line with Ikenberry et al. (1995) and Ikenberry, Lakonishok and Vermaelen (2000) who show that firms with low market-to-book earn significant and positive abnormal returns in the subsequent periods, suggesting that these firms were potentially undervalued. Similarly, Dittmar (2000) reports that firms which repurchase their own shares show an inverse relationship between the dollar amount of repurchased shares and the respective market-to-book ratio, suggesting that firms repurchase their stock in order to take advantage of their undervaluation.

In summary, we find robust evidence concerning the undervaluation hypothesis, as expected, that the past market adjusted return which is an alternative proxy for undervaluation, is inversely related to the market reaction. This means that the market perceives a share repurchase announcement as a positive signal, especially when it is preceded by poor past share price performance. In sum, the "undervaluation hypothesis" holds for actual buyback transactions. These findings are in line with the findings of Stephens and Weisbach (1998) on repurchase announcements, showing that firms repurchase their stock after a period of negative share price performance. Firm's size is inversely related to the market reaction to actual open market share repurchase transactions, which is in line with Ikenberry at al. (1995) and Grullon and Michaely (2002).

Table 8, panel B reports the results from insider purchases. Across all the models, it shows that $CAR_{(-100,-3)}$ is negative and significantly related to the market reaction, which implies that

insiders are contrarians. These contrarian trades convey information to the market; as a result there are higher market reactions. M/B is negative and significant (t=-2.49), implying that high market-to-book firms convey more information and trigger a higher market reaction. This is consistent with Lakonishok and Lee (2001), who document that insiders tend to purchase stocks that are cheap according to the book to market value. Size is negative and significantly related to the market reaction, which is consistent with the view that small companies are associated with higher information asymmetry and thus trigger a higher market reaction. This is consistent with Lakonishok and Lee (2001), who find that insider purchases in small firms have higher CARs than insider purchases in large firms. Since large firms are closely monitored by analysts compared to small firms, the information asymmetries are higher for small firms. Therefore, the new information that stems from a directors' dealings report about a small firm will carry a higher information content compared to large firms. Liquidity is negatively related to the market reaction, implying that in distressed companies insider purchases trigger a higher market reaction which is consistent with Fidrmuc et al. (2006). In Model 2, we use Tobin's q instead of M/B, and the variable is highly significant (t=-6.69) and negative, implying that the higher the undervaluation, the higher the market reaction when insiders purchase shares. In model 3, we introduce ownership concentration and it is not significant.

[Insert Table 8 here]

The difference in magnitude of market reaction between insider purchases and share buybacks, leads us to the examination of whether volume is abnormally high around these event. Normally we expect to find abnormally high trading volume on the days when share buybacks are executed, since buybacks provide an additional demand side in the market. In addition, the signalling effect of share buybacks may cause an increasing trading activity in the firm's shares since the market will trade on this new information. Similarly, in the case of insider purchases, when the information that managers commit their own wealth for purchasing their firm's shares becomes available, this will send a strong signal to the market that the current market price is a bargain and therefore causing a herding effect in the market.

For assessing the impact on volume, we estimate the abnormal trading volumes surrounding the insider purchases and share buybacks. Following Brav and Gompers (2003) and Field and Hanka (2001) we calculate the abnormal trading volume relative to each firm's pre-event mean trading volume as:

$$\text{Abnormal Volume}\bar{\omega}_{i,T} = \frac{V_{i,T}}{\frac{1}{250}\sum_{t=-101}^{-351} V_{i,t}} - 1 \qquad (6)$$

where $V_{i,T}$ is the trading volume obtained from Worldscope for firm i on day T. We define as normal volume the mean daily volume over the period -351 to -101 relative to the event day. The results presented in Figure 3 display that for both buybacks and insider purchases there is an abnormally high abnormal volume on the day of the event. However, the abnormal volume is significantly higher for insider purchases than for buybacks. This is due to the fact that insider purchases occur quite often in smaller firms which have lower trading activity as compared to larger firms which are more likely to execute a share buyback. Moreover, the difference in abnormal volume activity between insider purchases and buybacks is reflected by the fact that the commitment of insider's wealth for purchasing shares is a stronger signal compared to buybacks and therefore sparking abnormally high trading volumes.

The observed abnormally high volume that occurs on the event day gradually readjusts to normal trading activity on the following days suggesting the presence of a herding effect. However, in order to assess this phenomenon we perform a regression analysis of trading volumes of each of the five days (days 0 to 4) on the market reaction ($CAR_{+1,+4}$) to buybacks and insider purchases. Since, the trading volumes for days 0 to 4 show high degrees of autocorrelation, we estimate the effects of volume individually by regressing each daily volume on $CAR_{(+1,+4)}$. The results are presented in Table 9. For buybacks, as expected, it is only the abnormal volume of day 4 that has a significant impact on the market reaction, which is consistent with the finding that buybacks have a delayed market reaction. For insider purchases the coefficients of volume are significant for all days except day 2, implying that volume increases following insider purchases. This can be explained by the fact that other non-insider investors purchase shares following insiders' purchases. Hence, we argue that insiders are followed by the market participants and there is evidence of herding behaviour by the general investors. Therefore, the higher market reaction of insider purchases can be partly explained by the herding behaviour of the non-insider investors.

[Insert Table 9 here]

5. Logit analysis of share repurchases vs. insider purchases

In this section, our objective is to examine whether the characteristics of the firms conducting open market share repurchases and insider purchases vary or are similar. The variables used

in this section are the same variables that we used to analyse the drivers of the market reaction for both share repurchases and insider purchases.

A. Univariate Analysis

The univariate analysis shows the differences in characteristics of firms in terms of the CAR(-100,-3), size of trade, M/B, Tobin's q, size, ownership concentration, liquidity, intangible asset ratio, and leverage. Table 10 shows that the price decline is much higher for insider purchases (-3.779) compared to buyback transactions (-1.209). The mean and median differences are both significant. Ownership concentration and Tobin's q is significantly lower for buyback transactions. Liquidity, intangible asset ratio, market-to-book, leverage is significantly higher for the companies conducting repurchases.

[Insert Table 10here]

B. Unmatched Logit Results

Table 11presents the coefficient score results of the logit analysis together with the marginal effect of the variable. Dy/Dx is the marginal effect of the change of each of the employed variables on the likelihood to repurchase shares and is evaluated at the sample means of the explanatory variables. Product is the marginal effect multiplied with the standard deviation of each respective variable. The dependent variable takes the value of one for share repurchases and zero for insider purchases. The explanatory variables used are $CAR_{(-100,-3)}$, size of trade, M/B, Tobin's q, size, ownership concentration, liquidity, intangible asset ratio, and leverage.

The pre-trade share price decline does not explain insider purchases versus buyback trades as the variable $CAR_{(-100,-3)}$ is not significant. Both insider purchases and share repurchases are driven by price decline before trade. This is why the variable is not significant. Market-to-book is negative and significant, implying that if the share is undervalued, insiders purchase the shares immediately as it is their own money, but corporations need to have excess cash to repurchase shares. Furthermore, the marginal effect shows that 1% increase in M/B increases the probability of repurchases by 0.89% (from its mean value).

Similarly, size is positively related to repurchases as compared to insider purchase transactions. A 1% increase in size increase the probability of repurchases by 9.6%. It implies that insiders are more active in small companies and share repurchase transactions are more

common in large companies. Furthermore, small companies are associated with more information asymmetry; therefore, it might be easier for insiders to exploit any inside information. Another explanation is that in large companies buyback transactions are used to support prices, whereas in small companies insider purchases are used to support prices. This is plausible as large companies have more cash available to conduct repurchases.

[Insert Table 11 here]

Ownership concentration, which is a proxy for agency costs, is negative and statistically significant. This means that the higher the ownership concentration the fewer shares a corporation will repurchase. A 1% increase in ownership concentration decreases the probability of share repurchases by 0.21%. Suggesting that firms that are less widely held are less likely to repurchase their shares and it is more likely insiders will purchase more of the firm's shares.

The variable liquidity is negative and significant, meaning that excess cash is positively related to share repurchase transactions. In other words, the more excess cash a firm has the more likely it is to utilise this cash for repurchasing its own shares. A 1% increase in liquidity will increase share repurchases by 0.51%. It implies that insiders are active in those companies where liquidity is limited, suggesting that these companies may be financially distressed to some extent.

Intangible asset ratio is positively related to share repurchases. The higher the information asymmetry, the more companies are likely to repurchase their shares. A 1% increase in intangible assets ratio will increase repurchases by 0.07%. Finally, a 1% increase of leverage will increase the probability of buyback by 0.037%. This shows that leverage is positively related to share repurchases suggesting that firms with higher leverage are more likely to repurchase their shares, hence being a self-imposed managerial discipline mechanism.

6. Robustness of Empirical Results

A. Robustness of CARs

Since both actual share repurchases and insider purchases are occasionally executed in consecutive days, the concern of event clustering can be of vital importance, as one might expect. In this section we perform a robustness analysis on event clustering. In a successive event, the market reaction of an earlier trade may contaminate the market reaction of later

events. However, due to the fact that in our research study we have a number of events that occur within 20 days of the first event, it can be a potential cause of concern for the robustness of our results.

To address the issue, we filter out the contaminated data in order to treat the event clustering problem. Following Betzer and Theissen (2010), trades that are less than 20 days apart were considered to form a series. We included only the first trade of each series in the pre-event sample and only the last trade of each series in the post-event sample. The final sample (after treating it for clustering) consists of 1,179 share purchase trades and of 14,095 insider purchases for the sample period. We then repeat the event studies, using the pre-event sample to calculate pre-event CARs and using the post-event sample to calculate post-event CARs. The full event window CARs (i.e., the $CAR_{-100,+100}$) were calculated from a sample that does not contain trades which are part of a series (i.e., the sample contains only trades that were neither preceded, nor followed by another trade).

The results of the event cluster-free sample are reported in Table 12, Panel A. The pre-event window (-100,-3) shows slightly lower price decline, compared to the initial results, for both actual repurchases and insider purchases. However, for the post-event window (+3,+100), the cumulative abnormal returns are higher for both actual repurchases and insider purchases. Also, the event window (+1,+4) results show that the market reaction is higher for the cluster-free sample compared to the initial overall sample. However, except for the minor difference on the cumulative abnormal returns, the results remain qualitatively similar. Thus, we conclude that event clustering does not alter our findings and interpretations.

[Insert Table 12 here]

B. Matched Sample Analysis

The fact that the motives for both share repurchases and insider purchases, as well as their effect on the market, are investigated as individual trading activities, without taking into account the potential interaction which can occur between them, could be a potential cause of concern. Therefore, in order to ensure that our findings are robust, we replicate our estimations on a reduced matched sample (Table 12, Panel B). Our approach for matching the two samples is the following. First, we identify those firms that have executed at least one share repurchase trade throughout the time period of our research study. Then we use this

reduced sample and identify which of these firms also appear at the insider purchases sample. The total number of firms that have conducted at least one share repurchase or insider purchase trade during the time period of this research study is 76. From these 76 firms we then identify 8,448 share repurchase event days and 7,440 insider purchase event days. Following this, we use these two reduced (matched) samples and replicate the estimations for the assessment of the market reaction drivers (cross-section analysis) and the drivers for executing either a share repurchase or an insider purchase trade (logit analysis), the results of which are reported on Tables 13 and 14.

[Insert Table 13 here]

The results from the cross-section analysis on the matched samples show that the initial results do not alter significantly. It is notable however that the size of firms that conduct both share repurchases and insider purchases does not affect the market reaction to share repurchases. Regarding the market reaction to insider purchases for the matched sample, the results show that growth and intangible assets do not affect the market reaction.

[Insert Table 14 here]

The results on what drives the choice between share repurchases and insider purchases for the matched sample, show that the initial findings remain unaltered. The only difference is that for firms where both share repurchases and insider purchases take place, the lower the past share price performance the more likely it is for insiders to purchase shares and hence send a stronger signal of undervaluation to the market, as opposed to the weaker signal that share repurchases send to the market.

7. Conclusion

The goal of this paper is to identify whether firms and insiders conducting open market share repurchases and insider purchases are timing the market and trade opportunistically, or whether they strive to support the share price. In addition we analyse the market's perception and reaction to these events and assess whether share repurchases and insider purchases have the same motives for executing such trades respectively. Moreover, we thoroughly investigate the extent of the impact of such trades on the market and the respective share price performance. For achieving this goal, a unique hand-collected data set on the U.K. market is employed, which renders a large number of share repurchases (8,448) and insider

purchases (26,268). The advantage of employing this data is that they are publicly reported on a daily basis, contrary to the regulatory requirements in the U.S. Therefore, anyone can follow up the respective firms' market performance.

In this study we provide new evidence that firms repurchase their own shares and insiders purchase the firm's shares as well, in order to support the declining share prices. However, firms do not exhibit timing ability on executing share repurchases at a lower cost, whereas insiders, who commit a small amount of their own wealth, time their trades while still providing a price support which is reflected in the market's reaction. Additionally, we find that insider purchases send a significantly stronger signal to the market as indicated by the higher market reaction to insiders' trades as opposed to the lower market reaction to share repurchases. Furthermore, we find that for both share repurchases and insider purchases, firms with a poor past share price performance, lower growth prospects and smaller size- which are characteristics leading to higher information asymmetries (Grullon and Michaely, 2004) and prospective higher agency costs - experience a higher market reaction on the days of the trade announcement. In addition, we find that the less widely held a firm is, and the higher liquidity it has, then this firm experiences a higher market reaction following share repurchases. In contrast, following insider purchases, firms with lower liquidity will experience a lower market reaction following the insider trades.

When assessing the motives underlying the decision to either repurchase shares in the open market or conduct insider share purchasing, we find that large firms with excess cash and higher levels of intangible assets are more likely to conduct an open market share repurchase than insiders purchasing shares. However, insiders are more likely to purchase shares in lower growth and more undervalued firms that have higher levels of ownership concentration and lower levels of leverage. In sum, the major differentiating factors on the decision to either undertake and open market share repurchases or conduct insider purchases, are size and the perceived undervaluation of the firm.

While one might expect the drivers of market reaction might be the same for buybacks and insider purchases, two important differences should be noted. First, a share repurchase is a corporate decision whereas an insider share purchase is an individual decision. Corporate decisions can be more complex as compared to individual decisions. Second, the motive of insider purchases can be to make a profit or take greater control of the firm, whereas the primary motive of buybacks can be distributing excess cash. While, repurchases reduce the

excess cash available within the firm, which is in line with the free-cash-flow hypothesis of Lehn and Poulsen (1989) and Opler and Titman (1993), an increase of insider ownership might exacerbate the agency problems. We document that "insider purchases talk" in terms of immediate and significant market reaction, whereas "buybacks whisper". While we document that insider purchases can support prices in a less expensive way compared to actual share repurchases, how general investors differentiate the signals sent by share repurchases compared to insider purchases can be a subject for further research.

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Table 1: Summary statistics

	10^{th} percentile	Median	Mean	90^{th} percentile
Panel A: Buyback trades				
Number of trades	3	27	53	158
Number of Shares (000s)	882.9	9,502.0	114,285.9	182,484.0
Value of shares (£000s)	1,728.0	39,485.0	569,563.3	842,181.2
Percentage Holding (%)	19.209	31.304	36.635	60.514
Trade as % of market cap	0.471	3.559	10.891	11.130
Market capitalization (£ mil)	58.39	1,299.88	8,400.29	22,439.21
Panel B: Insider Purchases				
Number of trades	1	6	10.46	25
Number of Shares (000s)	1.4	12.0	128.8	160.0
Value of shares (£000s)	2.9	14.2	90.3	100.0
Percentage Holding (%)	0.002	0.094	2.904	8.19
Trade as % of market cap	0.0004	0.016	0.15	0.23
Market capitalization (£ mil)	7.64	105.29	2,536.72	3,705.59

We obtain insider holdings data for the period January 1999 to December 2007 from the Directors Deals. The open market share repurchase trades for the period January 1997 to December 2006 were hand collected from the Regulatory News Service (RNS) which are complemented with announcements made in other public media. Percentage Holding is the percentage of total shares traded which is owned by the director for the case of Insider Purchases, whereas for the case of share repurchases, Percentage Holding is defined as one minus the number of common shares outstanding over the total number of authorised shares. Market capitalization is measured at year end.

Table 2: VWAP for Open Market Buybacks

Panel A.	*VWAPBBs/ VWAP (median)*	*VWAPC/ VWAP (median)*	*Difference in means (p-value)*	*Difference in medians (p-value)*
1 month pre	1.201	0.989	0.212*	0.002
	(0.996)	(0.994)	(0.087)	(0.245)
2 months pre	1.286	0.990	0.297**	0.004
	(1.008)	(1.004)	(0.048)	(0.224)
3 months pre	1.285	0.989	0.297**	0.023
	(1.024)	(1.001)	(0.047)	(0.167)
4 months pre	1.286	0.988	0.298**	0.018
	(1.018)	(0.999)	(0.047)	(0.212)
6 months pre	1.296	0.984	0.312**	0.015
	(1.013)	(0.999)	(0.047)	(0.286)
12 months pre	1.328	0.988	0.340*	0.020
	(1.027)	(1.007)	(0.051)	(0.408)

Panel B.	*VWAPBBs/ VWAP (median)*	*VWAPC/ VWAP (median)*	*Difference in means (p-value)*	*Difference in medians (p-value)*
1 month post	1.323	0.983	0.340**	-0.015*
	(0.983)	(0.998)	(0.030)	(0.052)
2 months post	1.322	0.985	0.337**	-0.017*
	(0.984)	(1.000)	(0.031)	(0.054)
3 months post	1.321	0.981	0.340**	-0.024*
	(0.975)	(0.999)	(0.032)	(0.072)
4 months post	1.315	0.977	0.339**	-0.027*
	(0.964)	(0.991)	(0.033)	(0.087)
6 months post	1.304	0.973	0.331**	-0.024*
	(0.958)	(0.982)	(0.033)	(0.071)
12 months post	1.303	0.980	0.324**	-0.021
	(0.936)	(0.957)	(0.039)	(0.210)

This table reports the value weighted average price paid for executing the open market buyback trades. The sample consists of 8,448 share purchase trades for the period January 1997 to December 2006. The average price for the open market share repurchase trades that occurred on each day is estimated and it is weighted by the volume of each of the respective trades (VWAPBB). The daily value weighted average price (VWAPC) is the daily closing price weighted by the daily volume of the traded stock, for the days when the share repurchases where executed. VWAP(n) is the value weighted average price estimated from the pre- and post-event time periods of n months, where n takes the values of 1, 2, 3, 4, 6, and 12months, before and after each share repurchase trade. Panel A. reports the results for the n months prior to the share repurchases. Panel B. reports the equivalent results for the *n* months after the share repurchases. For the difference in means the t-test p-values are reported. For the differences in medians the Wilcoxon/Mann-Whitney test p-values are reported. The data is winsorised at the 1% and 99% tails. ***, **, * represents significance at 1, 5 and 10 percent level, respectively.

Table 3: VWAP for Insider Purchases

Panel A.	*VWAPIT/ VWAP (median)*	*VWAPC/ VWAP (median)*	*Difference in means (p-value)*	*Difference in medians (p-value)*
1 month pre	0.990	0.988	0.002	0.000
	(0.998)	(0.997)	(0.624)	(0.400)
2 months pre	0.974	0.974	0.000	-0.001
	(0.984)	(0.985)	(0.940)	(0.874)
3 months pre	0.963	0.966	-0.003	-0.003
	(0.973)	(0.976)	(0.512)	(0.654)
4 months pre	0.956	0.962	-0.006	0.002
	(0.968)	(0.966)	(0.219)	(0.335)
6 months pre	0.945	0.956	-0.011**	0.001*
	(0.956)	(0.955)	(0.038)	(0.074)
12 months pre	0.939	0.956	-0.017***	0.003***
	(0.949)	(0.946)	(0.004)	(0.002)

Panel B.	*VWAPIT/ VWAP (median)*	*VWAPC/ VWAP (median)*	*Difference in means (p-value)*	*Difference in medians (p-value)*
1 month post	0.985	0.984	0.001	-0.001
	(0.990)	(0.990)	(0.709)	(0.820)
2 months post	0.988	0.984	0.004	-0.001
	(0.991)	(0.992)	(0.388)	(0.824)
3 months post	0.991	0.984	0.007	-0.003
	(0.990)	(0.993)	(0.143)	(0.816)
4 months post	0.992	0.983	0.009*	-0.003
	(0.991)	(0.994)	(0.061)	(0.776)
6 months post	0.993	0.982	0.011**	-0.001
	(0.990)	(0.991)	(0.029)	(0.666)
12 months post	0.995	0.979	0.017***	-0.002
	(0.990)	(0.992)	(0.003)	(0.563)

This table reports the value weighted average price paid for executing the insider purchase trades. The sample consists of 26,271 insider purchases for the period January 1999 to December 2007. The average price for the insider purchase trades that occurred on each day is estimated and it is weighted by the volume of each of the respective trades (VWAPIT). The daily value weighted average price (VWAPC) is the daily closing price weighted by the daily volume of the traded stock, for the days when the insider purchases were executed. VWAP(n) is the value weighted average price estimated from the pre- and post-event time periods of n months, where n takes the values of 1, 2, 3, 4, 6, and 12months, before and after each insider purchase trade. Panel A. reports the results for the n months prior to the insider purchases. Panel B. reports the equivalent results for the *n* months after the insider purchases. For the difference in means the t-test p-values are reported. For the differences in medians the Wilcoxon/Mann-Whitney test p-values are reported. The data is winsorised at the 1% and 99% tails. ***, **, * represents significance at 1, 5 and 10 percent level, respectively.

Table 4: VWAP for Open Market Buybacks vs. Insider Purchases

Panel A.	*VWAPIT/ VWAP mean (median)*	*VWABBs/ VWAP mean (median)*	*Difference in means (p-value)*	*Difference in medians (p-value)*
1 month pre	0.990	1.201	-0.211***	0.002
	(0.998)	(0.996)	(0.000)	(0.190)
2 months pre	0.974	1.286	-0.312***	-0.024***
	(0.984)	(1.008)	(0.000)	(0.004)
3 months pre	0.963	1.285	-0.322***	-0.051***
	(0.973)	(1.024)	(0.000)	(0.001)
4 months pre	0.956	1.286	-0.330***	-0.050***
	(0.968)	(1.018)	(0.000)	(0.001)
6 months pre	0.945	1.296	-0.351***	-0.057***
	(0.956)	(1.013)	(0.000)	(0.001)
12 months pre	0.939	1.328	-0.389***	-0.078***
	(0.949)	(1.027)	(0.000)	(0.002)

Panel B.	*VWAPIT/ VWAP mean (median)*	*VWABBs/ VWAP mean (median)*	*Difference in means (p-value)*	*Difference in medians (p-value)*
1 month post	0.985	1.323	-0.338***	-0.008**
	(0.990)	(0.998)	(0.000)	(0.042)
2 months post	0.988	1.322	-0.334***	-0.009*
	(0.991)	(1.000)	(0.000)	(0.039)
3 months post	0.991	1.321	-0.330***	-0.009
	(0.990)	(0.999)	(0.000)	(0.126)
4 months post	0.992	1.315	-0.323***	0.000
	(0.991)	(0.991)	(0.000)	(0.214)
6 months post	0.993	1.304	-0.311***	0.008
	(0.990)	(0.982)	(0.000)	(0.341)
12 months post	0.995	1.303	-0.308***	0.033
	(0.990)	(0.957)	(0.000)	(0.975)

This table reports the value weighted average price paid for executing the open market buybacks and the insider purchases respectively. The sample consists of 8,448 share purchase trades for the period January 1997 to December 2006 and of 26,271 insider purchases for the period January 1999 to December 2007. The average price for the insider buy trades and open market share repurchase trades that occurred on each day is estimated and it is weighted by the volume of each of the respective trades. VWAPIT and VWAPBB is the value weighted average price for insider trades and open market share repurchases respectively. VWAP(n) is the value weighted average price estimated from the pre- and post-event time periods of n months, where n takes the values of 1, 2, 3, 4, 6, and 12months, before and after each insider or share repurchase trade takes place. Panel A. reports the results for the n months prior to the repurchases. Panel B. reports the equivalent results for the *n* months after the repurchases. For the difference in means the t-test p-values are reported. For the differences in medians the Wilcoxon/Mann-Whitney test p-values are reported. The data is winsorised at the 1% and 99% tails. ***, **, * represents significance at 1, 5 and 10 percent level, respectively.

Table 5: Market reaction to Buybacks and Insider Purchases (Transaction date)

	Buybacks		Insider Purchases		p-value (t-diff $_{\text{Buyback vs Insider Purchases}}$)
Event windows	CAR	t-stat	CAR	t-stat	
(-100,-3)	-1.209***	-4.31	-4.856***	-4.07	0.00
(-50,-3)	-0.693***	-3.53	-2.694***	-3.23	0.00
(-2,+2)	-0.214***	-3.38	1.057***	3.93	0.00
(-1,+1)	-0.142***	-2.89	0.970***	4.65	0.00
(0)	-0.055**	-1.95	0.507***	4.21	0.00
(+1,+4)	0.032	0.56	1.125***	4.67	0.00
(+1,+10)	0.031	0.34	1.341***	3.52	0.00
(+3,+50)	0.193	0.98	1.632**	1.96	0.00
(+3,+100)	1.080***	3.85	0.812	0.68	0.13

The table presents cumulative average abnormal returns (CAR) around buyback transactions and directors' share purchases computed using an event study methodology. The abnormal returns are estimated as the market adjusted returns with the FTSE All Share index as the proxy for the market portfolio. The sample consists of 8,448 share purchase trades for the period January 1997 to December 2006 and of 26,271 insider purchases for the period January 1999 to December 2007. p-value represents the probability of rejecting the null for mean difference t-test. T-statistics are reported in parenthesis. ***, **, * denote significance at the 0.01, 0.05 and 0.1 level, respectively.

Table 6: Univariate sorting of CARs

	Buybacks			Insider Purchases		
	Below Median	Above Median	p-value	Below Median	Above Median	p-value
Size of trade (%)						
(-100, -3)	-0.557	-1.965	(0.000)	-3.332	-6.271	(0.000)
(+1, +4)	-0.008	0.078	(0.153)	0.720	1.482	(0.000)
(+3, +100)	0.113	2.204	(0.000)	1.278	0.104	(0.003)
Market-to-Book						
(-100, -3)	-0.466	-2.111	(0.000)	-4.109	-5.636	(0.000)
(+1, +4)	0.084	-0.053	(0.019)	1.216	0.900	(0.000)
(+3, +100)	2.702	-0.838	(0.000)	2.285	-1.568	(0.000)
Tobin's Q						
(-100, -3)	-1.416	-0.972	(0.112)	-6.255	-2.476	(0.000)
(+1, +4)	0.097	-0.043	(0.018)	1.003	1.112	(0.191)
(+3, +100)	1.258	0.875	(0.161)	0.598	0.992	(0.303)
Size						
(-100, -3)	-2.546	0.148	(0.000)	-5.416	-3.792	(0.000)
(+1, +4)	0.099	-0.034	(0.025)	1.431	0.671	(0.000)
(+3, +100)	1.913	0.362	(0.000)	0.861	0.685	(0.637)
Ownership concentration(%)						
(-100, -3)	-1.818	-0.444	(0.000)	-3.769	-5.712	(0.000)
(+1, +4)	-0.010	0.078	(0.141)	0.886	1.269	(0.000)
(+3, +100)	0.301	2.152	(0.000)	1.385	-0.044	(0.000)
Liquidity (%)						
(-100, -3)	-1.481	-0.590	(0.001)	-6.693	-2.693	(0.000)
(+1, +4)	0.020	0.051	(0.600)	1.133	0.914	(0.005)
(+3, +100)	1.540	0.678	(0.001)	-0.963	2.189	(0.000)
Intangibles assets (%)						
(-100, -3)	-1.244	-1.169	(0.790)	-3.024	-6.638	(0.000)
(+1, +4)	0.060	0.000	(0.316)	1.011	1.101	(0.275)
(+3, +100)	0.528	1.714	(0.000)	2.007	-0.824	(0.000)
Leverage (%)						
(-100, -3)	-1.406	-1.125	(0.312)	-3.797	-5.656	(0.000)
(+1, +4)	-0.014	0.075	(0.131)	1.202	0.857	(0.000)
(+3, +100)	0.754	1.478	(0.008)	1.518	-0.188	(0.000)

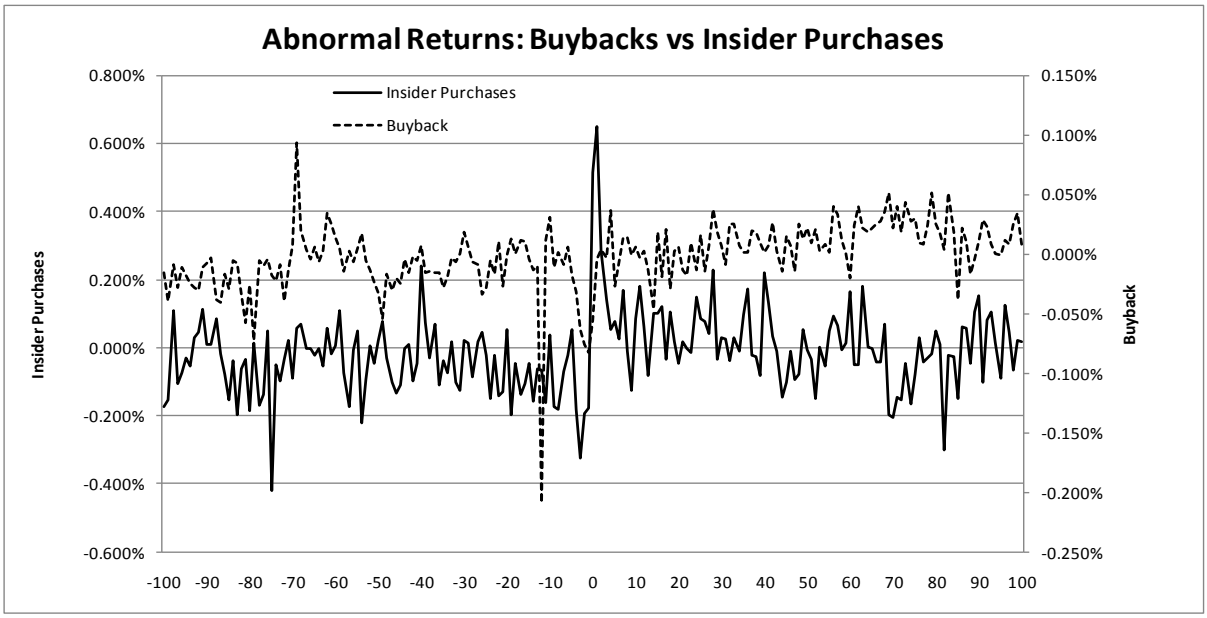
The table presents cumulative average abnormal returns around buyback transactions and directors' share purchases computed using an event study methodology. The cumulative average abnormal returns (CARs) are estimated as the market adjusted returns with the FTSE All Share index as the proxy for the market portfolio. The sample consists of 8,448 share purchase trades for the period January 1997 to December 2006 and of 26,271 insider purchases for the period January 1999 to December 2007. p-values represents the probability of rejecting the null for mean difference t-test. Size of trade is pound sterling value of trade divided by market capitalisation. M/B is the market-to-book ratio. Tobin's Q is computed as ((Total assets-Book equity) + market value of equity)/ Total assets. Size is measured as total asset value of the company. Ownership concentration is the percentage of closely held shares, which includes shares held by officers, directors and their immediate families; Shares held in trust; Shares of the company held by any other corporation (except shares held in a fiduciary capacity by banks or other financial institutions); Shares held by pension/benefit plans; Shares held by individuals who hold 5% or more of the outstanding shares. Liquidity is EBITDA (earnings before interests, tax and depreciation) /Total assets, TD/TA is total debt divided by total assets. Intangible asset ratio is intangible asset divided by total assets.

Table 7: Industry Effects on CARs

	$CAR_{(-100, -3)}$			$CAR_{(+1, +4)}$			$CAR_{(+3, +100)}$		
	Buybacks	Insider purchases	p value	Buybacks	Insider purchases	p value	Buybacks	Insider purchases	p value
Oil & Gas	-0.157	2.732	(0.011)	-0.083	1.196	(0.000)	-0.624	2.488	(0.046)
Basic Materials	6.626	-0.846	(0.000)	0.315	1.000	(0.076)	0.947	1.694	(0.471)
Industrials	-1.541	-5.195	(0.000)	0.565	1.325	(0.000)	1.127	1.514	(0.579)
Consumer Goods	2.672	-4.878	(0.000)	0.092	0.867	(0.000)	3.809	1.617	(0.003)
Health Care	-4.714	-4.957	(0.850)	-0.337	0.881	(0.000)	-5.084	-2.386	(0.031)
Consumer Services	-1.431	-4.908	(0.000)	0.102	0.887	(0.000)	1.894	1.051	(0.141)
Telecommunications	-5.732	-7.552	(0.272)	-0.407	-0.251	(0.708)	-7.806	-5.046	(0.152)
Utilities	-3.145	-3.714	(0.671)	0.459	0.572	(0.710)	9.401	4.051	(0.000)
Financials	-1.957	-1.751	(0.664)	-0.033	0.727	(0.000)	-0.879	1.925	(0.000)
Technology	-6.830	-14.350	(0.000)	0.012	2.301	(0.000)	9.597	-5.205	(0.000)

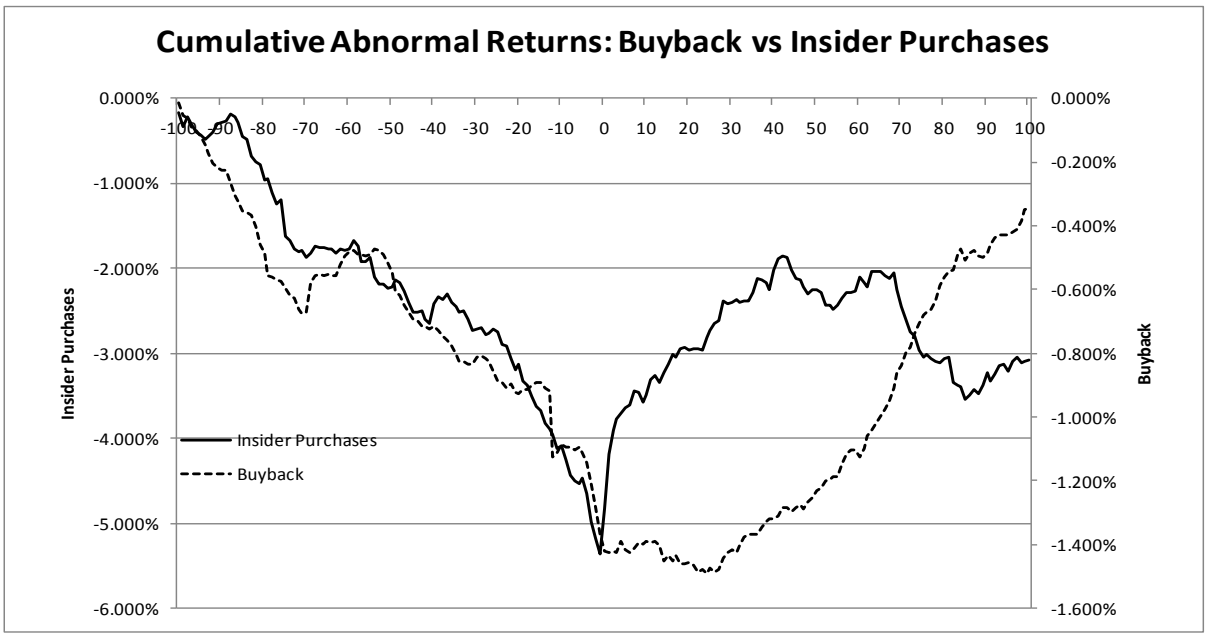
The table presents cumulative average abnormal returns around buyback transactions and directors' share purchases computed using an event study methodology. The cumulative average abnormal returns (CAR) are estimated as the market adjusted returns with the FTSE All Share index as the proxy for the market portfolio. The sample consists of 8,448 share purchase trades for the period January 1997 to December 2006 and of 26,271 insider purchases for the period January 1999 to December 2007.The ten industry categories are obtained from DataStream. p-value represents the probability of rejecting the null for mean difference t-test.

Figure 1: Abnormal Returns



The figure presents average abnormal returns around buyback transactions and directors' share purchases computed using an event study methodology. The abnormal returns are estimated as the market adjusted returns with the FTSE All Share index as the proxy for the market portfolio. The sample for insider purchases includes 26,271 purchases. The sample for share buybacks includes 8,448 buyback trades. The sample for share buybacks includes 8,448 buyback trades. All results are reported relative to the trading day of each trading execution, i.e., the date when directors' trading or a share buyback occurred.

Figure 2: Cumulative Abnormal Returns



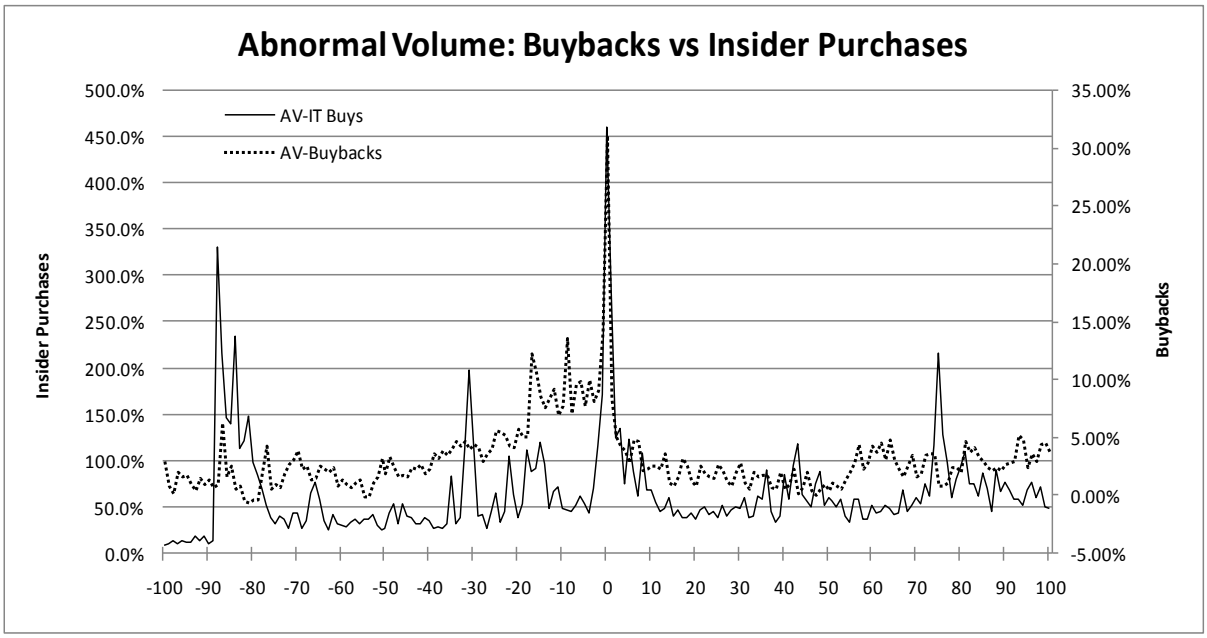
The figure presents cumulative average abnormal returns (CARs)around buyback transactions and directors' share purchases computed using an event study methodology. The abnormal returns are estimated as the market adjusted returns with the FTSE All Share index as the proxy for the market portfolio. The sample for insider purchases includes 26,271 purchases. The sample for share buybacks includes 8,448 buyback trades. The sample for share buybacks includes 8,448 buyback trades. All results are reported relative to the trading day of each trading execution, i.e., the date when directors' trading or a share buyback occurred.

Table 8: OLS regression of Market Reaction of Buybacks and Insider Purchases

	Panel A: Buybacks						Panel B: Insider Purchases					
	Model 1		Model 2		Model 3		Model 1		Model 2		Model 3	
	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat
$CAR_{(-100 \text{ to } -3)}$	-0.013***	-3.19	-0.013***	-5.15	-0.013***	-5.24	-0.015***	-3.26	-0.013***	-2.93	-0.014**	-2.93
Size of trade	-0.088*	-1.79	-0.089*	-1.89	-0.040	-1.06	0.009	0.36	0.009	1.13	0.009	1.40
M/B	-0.015**	-1.96	--	--	--	--	-0.117**	-2.49	--	--	--	--
Tobins q	--	--	-0.051*	-1.69	--	--	--	--	-0.007***	-6.69	-0.001***	-5.70
Log(size)	-0.131***	-3.69	-0.131***	-3.59	-0.131***	3.57	-0.437**	-2.77	-0.392	-2.85	--	--
Ownership concentration	0.006*	1.76	0.005*	1.80	0.006**	2.12	--	--	--	--	0.009	1.49
Liquidity	--	--	--	--	0.008**	1.96	-0.012*	-1.84	-0.013*	-1.70	-0.018**	-2.03
Intangible Asset	-0.001	-0.56	-0.002	-1.04	-0.003	-1.41	0.001	0.4	0.002	0.49	0.002	0.59
Leverage	0.003	1.63	0.003	0.63	0.002	1.02	0.001	0.48	0.002	0.55	0.000	0.09
Constant	0.229	0.80	-0.042	-0.15	-0.006	-0.02	-3.244***	-4.79	-4.091***	-7.06	-2.323***	-6.56
Ind./year dummies	Yes		Yes		Yes		Yes		Yes		Yes	
Adjusted R^2		2.03		2.01		1.74		2.69		2.95		2.66
N		7,285		7,864		7,817		22,656		22,944		22,312

Dependent variable is cumulative abnormal return over +1 to +4 days ($CAR_{(+1,+4)}$) for buybacks and insider purchases. The independent variables are CAR(-100,-3), which is measured over -100 to -3 days. Size of trade is pound sterling value of trade divided by market capitalisation. M/B is the market-to-book ratio. Tobin's Q is computed as ((Total assets-Book equity) + market value of equity)/ Total assets. Size is measured as total asset value of the company. Ownership concentration is the percentage of closely held shares, which includes shares held by officers, directors and their immediate families; Shares held in trust; Shares of the company held by any other corporation (except shares held in a fiduciary capacity by banks or other financial institutions); Shares held by pension/benefit plans; Shares held by individuals who hold 5% or more of the outstanding shares. It excludes: Shares under option exercisable within sixty days; Shares held in a fiduciary capacity; Shares held by insurance companies; Preferred stock or debentures that are convertible into common shares. Liquidity is EBITDA (earnings before interests, tax and depreciation) /Total assets, TD/TA is total debt divided by total assets. Intangible asset ratio is intangible asset divided by total assets. Leverage is total debt over total assets. *Industry Dummies* are based on 10 industry categories. t-statistics based on robust covariances (clustering adjusted) are reported. The data is winsorised at the 1% and 99% tails. ***, **, * represents significance at 1, 5 and 10 percent level, respectively.

Figure 3: Cumulative Abnormal Returns



The figure presents average abnormal trading volumes around buyback transactions and directors' share purchases, computed using an event study methodology. Abnormal daily trading volume is measured relative to each firm's mean daily trading volume over the period -351 to -101 prior to the event day. The sample for insider purchases includes 26,271 purchases. The sample for share buybacks includes 8,448 buyback trades. All results are reported relative to the trading day of each trading execution, i.e., the date when directors' trading or a share buyback occurred.

Table 9: Abnormal volume and herding effect

	Dependent Variable. $CAR_{(+1,+4)}$				
Panel A.	**Buybacks**				
	(1)	(2)	(3)	(4)	(5)
Abnormal Volume - day 0	-0.070				
	(-0.47)				
Abnormal Volume - day 1		-0.016			
		(-0.03)			
Abnormal Volume - day 2			0.605		
			(0.92)		
Abnormal Volume - day 3				0.957	
				(1.61)	
Abnormal Volume - day 4					1.178*
					(1.82)
Constant	0.000	0.000	0.000	0.000	0.000
	(-0.09)	(-0.13)	(-0.26)	(-0.33)	(-0.37)
N	8,074	8,066	8,058	8,061	8,065
R^2	0.000	0.000	0.001	0.001	0.002
Panel B.	**Insider Purchases**				
	(1)	(2)	(3)	(4)	(5)
Abnormal Volume - day 0	0.052**				
	(2.48)				
Abnormal Volume - day 1		0.004*			
		(1.67)			
Abnormal Volume - day 2			0.029		
			(1.33)		
Abnormal Volume - day 3				0.029*	
				(1.90)	
Abnormal Volume - day 4					0.262*
					(1.65)
Constant	0.011***	0.011***	0.011***	0.011***	0.011***
	(22.08)	(22.43)	(22.51)	(22.58)	(22.01)
N	18,758	18,471	18,326	18,297	18,232
R^2	0.002	0.000	0.000	0.001	0.003

The dependent variable $CAR_{(+1,+4)}$ is the cumulative average abnormal return estimated over +1 to +4 days, for buybacks and insider purchases. The independent variables are the abnormal volumes for day 0 to day 4 relative to the event day when a share buyback or an insider purchase occurred. The abnormal volume is estimated as the difference of the volume in each day relative the average volume estimated over the days -351 to -101 relative to the event day. The coefficients are multiplied by 10^3 for illustration purposes. t-statistics based on robust covariances (clustering adjusted) are reported in brackets. ***, **, * represents significance at 1, 5 and 10 percent level, respectively.

Table 10: Mean (Median) Differences of Firm Characteristics

	Buybacks			Insider Purchases				
	N	Mean	Median	N	Mean	Median	Diff. in means *(p value)*	Diff. in medians *(p value)*
$CAR_{(-100, -3)}$	8,447	-1.209	-0.595	34,717	-3.779	-0.014	(0.000)	(0.000)
Size of trade (%)	7,815	0.095	0.036	22,533	0.091	0.014	(0.309)	(0.000)
Market-to-book	8,474	4.371	2.800	34,744	2.676	1.630	(0.000)	(0.000)
Tobin's Q	7,864	2.006	1.736	22,715	2.107	1.220	(0.037)	(0.000)
Size (£ millions)	8,472	41,959	5,593	26,270	10,937	82	(0.000)	(0.000)
Ownership concentration	7,832	10.813	1.086	30,479	22.795	16.990	(0.000)	(0.000)
Liquidity (%)	7,864	15.727	15.473	34,134	7.899	8.647	(0.000)	(0.000)
Intangible assets (%)	7,864	24.934	16.982	30,808	18.400	8.102	(0.000)	(0.000)
Leverage (%)	7,864	26.650	25.612	30,808	21.811	18.399	(0.000)	(0.000)

$CAR_{(-100,-3)}$is the cumulative average abnormal return which is measured over -100 to -3 days. Size of trade is pound sterling value of trade divided by market capitalisation. M/B is the market-to-book ratio. Size is measured as total asset value of the company. Ownership concentration is the percentage of closely held shares, which includes shares held by officers, directors and their immediate families; Shares held in trust; Shares of the company held by any other corporation (except shares held in a fiduciary capacity by banks or other financial institutions); Shares held by pension/benefit plans; Shares held by individuals who hold 5% or more of the outstanding shares. It excludes: Shares under option exercisable within sixty days; Shares held in a fiduciary capacity; Shares held by insurance companies; Preferred stock or debentures that are convertible into common shares. Liquidity is EBITDA (earnings before interests, tax and depreciation) /Total assets. Leverage is total debt divided by total assets. Intangible asset ratio is intangible asset divided by total assets. Leverage is total debt over total assets. P-value is the probability of rejecting null for the mean and median difference.

Table 11: Logit Analysis of Buybacks vs. Insider Purchases

	Coef.	Z-stat	Marginal Effect	Product	p-value
$CAR_{(-100 \text{ to } -3)}$	-0.12	-0.27	-0.010	-0.295	0.785
M/B	10.59***	3.13	0.889***	3.110	0.002
Log(size)	114.19***	13.02	9.579***	12.236	0.000
Ownership concentration	-2.53***	-5.58	-0.212***	-4.633	0.000
Liquidity	6.13***	4.13	0.514***	8.181	0.000
Intangible Asset Ratio	0.83**	2.42	0.070**	1.552	0.027
Leverage	0.44*	1.88	0.037*	0.882	0.066
Constant	2.710***	3.34			
Ind./year dummies	Yes				
Log pseudo-likelihood		-8,599.89			
Pseudo R^2		50.14			

This table reports logit regression results. The dependent variable is a dummy equal to one if repurchases and zero for insider purchases. The independent variables are $CAR_{(-100,-3)}$, which is the cumulative average abnormal return measured over -100 to -3 days. M/B is the market-to-book ratio. Size is measured as total asset value of the company. Ownership concentration is the percentage of closely held shares, which includes shares held by officers, directors and their immediate families; Shares held in trust; Shares of the company held by any other corporation (except shares held in a fiduciary capacity by banks or other financial institutions); Shares held by pension/benefit plans; Shares held by individuals who hold 5% or more of the outstanding shares. It excludes: Shares under option exercisable within sixty days; Shares held in a fiduciary capacity; Shares held by insurance companies; Preferred stock or debentures that are convertible into common shares. Liquidity is EBITDA (earnings before interests, tax and depreciation) /Total assets. Leverage is total debt divided by total assets. Intangible asset ratio is intangible asset divided by total assets. Leverage is total debt over total assets. *Industry Dummies* are based on 10 industry categories. Z-statistics corrected for clustering are reported. Marginal effect is the Dy/Dx and is evaluated at the sample means of explanatory variables. Product is the marginal effect times the standard deviation of the variable.p-value is the significance of the marginal effect. The coefficients and marginal effect is multiplied by 10^2.The data is winsorised at the 1% and 99% tails. ***, **, * represents significance at 1, 5 and 10 percent level, respectively.

Table 12: Robustness Checks

	Buybacks		Insider Purchases		p-value (t-diff Buyback vs Insider Purchases)
Panel A: Market Adjusted Model (Non-clustered events)					
Event windows	CAR	t-stat	CAR	t-stat	
(-100,-3)	-0.803	-1.55	-3.058***	-2.78	0.01
(-50,-3)	-0.603*	-1.66	-1.558**	-2.02	0.14
(-2,+2)	-0.282**	-2.40	0.842***	3.39	0.00
(-1,+1)	-0.125	-1.38	0.740***	3.85	0.00
(0)	-0.008	-0.16	0.364***	3.28	0.02
(+1,+4)	0.094	0.90	0.923***	4.15	0.00
(+1,+10)	0.113	0.68	1.103***	3.14	0.00
(+3,+50)	0.285	0.79	1.356*	1.76	0.09
(+3,+100)	1.344***	2.60	0.627	0.57	0.40
Panel B: Market Adjusted Model (Matched events)					
Event windows	CAR	t-stat	CAR	t-stat	
(-100,-3)	-0.937***	-3.28	-5.60***	-4.84	0.00
(-50,-3)	-0.594***	-2.97	-3.54***	-4.36	0.00
(-2,+2)	-0.168***	-2.60	0.07	0.28	0.07
(-1,+1)	-0.116**	-2.32	0.30	1.46	0.00
(0)	-0.052*	-1.78	0.36***	3.11	0.00
(+1,+4)	0.026	0.44	0.50***	2.16	0.00
(+1,+10)	0.013	0.14	0.96***	2.61	0.00
(+3,+50)	0.249	1.25	1.73***	2.14	0.00
(+3,+100)	1.067***	3.73	2.29*	1.97	0.00

Panel A presents the cumulative average abnormal returns (CAR) for the non-clustered events around buyback transactions (1,179) and directors' share purchases (14,095) computed using an event study methodology. Panel B presents the cumulative average abnormal returns for the matched sample of buyback transactions and directors' share purchases computed using event study methodology. The sample consists of 8,448 share buyback trades and of 7,440 insider purchases. For both Panels, the sample period for buybacks is from January 1997 to December 2006 and for insider purchases from January 1999 to December 2007. We compute abnormal returns where FTSE All Share Index is the proxy for the market portfolio. p-value represents the probability of rejecting the null for mean difference t-test. t-statistics are reported in parenthesis. ***, **, * denote significance at the 0.01, 0.05 and 0.1 level, respectively.

Table 13: OLS regression of Market Reaction of Buyback and Insider Purchases (Matched Samples)

	Panel A: Buybacks						Panel B: Insider Purchases					
	Model 1		Model 2		Model 3		Model 1		Model 2		Model 3	
	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat
$CAR_{(-100 \text{ to } -3)}$	-0.013***	-5.17	-0.013***	-2.98	-0.014***	-3.13	-0.023*	-1.77	-0.023*	-1.74	-0.021	-1.58
Size of trade	-0.098**	-2.49	-0.093*	-1.74	-0.091*	-1.81	0.676	0.68	0.705	0.71	0.691	0.66
M/B	-0.016**	-1.96	--	--	--	--	0.001	0.02	--	--	--	--
Tobin's q	--	--	0.024	0.43	--	--	--	--	0.026	0.87	0.038	1.50
Log(size)	0.001	0.01	0.035	0.47	0.075	1.02	-0.700***	-2.81	-0.689***	-2.79	--	--
Ownership concentration	0.005*	1.68	0.006*	1.95	0.007**	2.27	--	--	--	--	0.019*	1.85
Liquidity	--	--	--	--	0.017***	2.97	-0.009	-0.49	-0.011	-0.58	-0.010	-0.53
Intangible Asset	-0.002	-0.93	-0.004	-1.63	-0.004*	-1.80	0.012	1.10	0.012	1.12	0.014	1.51
Leverage	0.001	0.62	0.001	0.42	0.001	0.44	0.009	1.08	0.009	1.08	0.010	1.30
Constant	0.134	0.46	-0.011	-0.03	-0.364	-0.94	2.063*	1.64	1.938	1.52	-0.774	-0.95
Ind./year dummies	Yes		Yes		Yes		Yes		Yes		Yes	
Adjusted R^2	1.48		1.43		1.67			4.99		5.04		4.21
N	7,182		7,182		7,182			1,121		1,121		1,121

The dependent variable $CAR_{(+1,+4)}$ is the cumulative average abnormal return estimated over +1 to +4 days, for buybacks and insider purchases. The independent variables are $CAR_{(-100,-3)}$, which is the cumulative average abnormal return measured over -100 to -3 days. Size of trade is pound sterling value of trade divided by market capitalisation. M/B is the market-to-book ratio. Tobin's Q is computed as ((Total assets-Book equity) + market value of equity)/ Total assets. Size is measured as total asset value of the company. Ownership concentration is the percentage of closely held shares, which includes shares held by officers, directors and their immediate families; Shares held in trust; Shares of the company held by any other corporation (except shares held in a fiduciary capacity by banks or other financial institutions); Shares held by pension/benefit plans; Shares held by individuals who hold 5% or more of the outstanding shares. It excludes: Shares under option exercisable within sixty days; Shares held in a fiduciary capacity; Shares held by insurance companies; Preferred stock or debentures that are convertible into common shares. Liquidity is EBITDA (earnings before interests, tax and depreciation) /Total assets, TD/TA is total debt divided by total assets. Intangible asset ratio is intangible asset divided by total assets. Leverage is total debt over total assets. Industry dummies are based on 10 industry categories. t-statistics based on robust covariances (clustering adjusted) are reported. The data is winsorised at the 1% and 99% tails. ***, **, * represents significance at 1, 5 and 10 percent level, respectively.

Table 14: Logit Analysis of Buybacks vs. Insider Purchases (matched samples)

	Coef.	Z-stat	Marginal Effect	Product	p-value
$CAR_{(-100 \text{ to } -3)}$	1.06***	4.95	0.061***	0.962	0.000
M/B	3.86***	2.87	0.220***	1.078	0.006
Log(size)	53.38***	7.42	3.045***	2.793	0.000
Ownership concentration	-1.67***	-4.45	-0.095***	-1.329	0.000
Liquidity	3.07***	5.52	0.175***	1.740	0.000
Intangible Asset Ratio	0.70**	2.38	0.040**	0.913	0.019
Leverage	0.47**	2.00	0.027**	0.524	0.048
Constant	16.69***	4.96			
Ind./year dummies	Yes				
Log pseudo-likelihood		-2,438.11			
Pseudo R^2		26.58			

This table reports logit regression results. The dependent variable is a dummy equal to 1 for buybacks and 0 for insider purchases. The independent variables are $CAR_{(-100,-3)}$, which is the cumulative average abnormal return measured over -100 to -3 days. M/B is the market-to-book ratio. Size is measured as total asset value of the company. Ownership concentration is the percentage of closely held shares, which includes shares held by officers, directors and their immediate families; Shares held in trust; Shares of the company held by any other corporation (except shares held in a fiduciary capacity by banks or other financial institutions); Shares held by pension/benefit plans; Shares held by individuals who hold 5% or more of the outstanding shares. It excludes: Shares under option exercisable within sixty days; Shares held in a fiduciary capacity; Shares held by insurance companies; Preferred stock or debentures that are convertible into common shares. Liquidity is EBITDA (earnings before interests, tax and depreciation) /Total assets. Leverage is total debt divided by total assets. Intangible asset ratio is intangible asset divided by total assets. Leverage is total debt over total assets. *Industry Dummies* are based on 9 industry categories. Z-statistics corrected for clustering are reported. Marginal effect is the Dy/Dx and is evaluated at the sample means of explanatory variables. Product is the marginal effect times the standard deviation of the variable. P-value is the significance of marginal effect. The coefficients and marginal effect is multiplied by 10^2.The data is winsorised at the 1% and 99% tails. ***, **, * represents significance at 1, 5 and 10 percent level, respectively.

Appendix – OLS market model for robustness checks

	Buybacks		Insider Purchases		p-value (t-diff $_{\text{Buyback vs Insider Purchases}}$)
Panel A: OLS market model (All events)					
Event windows	CAR	t-stat	CAR	t-stat	
(-100,-3)	-1.17%***	-4.54	-5.96%***	-7.53	0.00
(-50,-3)	-0.57%***	-3.14	-5.15%***	-9.24	0.00
(-2,+2)	-0.24%***	-4.12	1.70%***	9.46	0.00
(-1,+1)	-0.17%***	-3.67	1.92%***	13.77	0.00
(0)	-0.07%***	-2.63	0.85%***	10.54	0.00
(+1,+4)	0.02%	0.34	0.78%***	4.35	0.00
(+1,+10)	0.10%	1.20	1.14%***	4.51	0.00
(+3,+50)	0.40%**	2.19	1.16%**	2.08	0.00
(+3,+100)	1.41%***	5.46	1.66%**	2.10	0.35
Panel B: OLS market model (Non-clustered events)					
Event windows	CAR	t-stat	CAR	t-stat	
(-100,-3)	-1.61%***	-5.92	-4.64%***	-6.05	0.00
(-50,-3)	-0.88%***	-4.62	-4.14%***	-7.67	0.00
(-2,+2)	-0.35%***	-5.71	1.37%***	7.88	0.00
(-1,+1)	-0.20%***	-4.21	1.60%***	11.88	0.01
(0)	-0.05%*	-1.84	0.70%***	9.03	0.00
(+1,+4)	0.00%	0.08	0.67%***	3.83	0.05
(+1,+10)	0.08%	0.88	0.99%***	4.03	0.01
(+3,+50)	0.16%	0.86	1.22%**	2.27	0.00
(+3,+100)	0.83%***	3.06	1.59%**	2.07	0.09

The table presents the cumulative average abnormal returns around buyback transactions and directors' share purchases computed using an event study methodology. The abnormal returns are estimated based on the OLS market model. The market model coefficients $\hat{\alpha}$ and $\hat{\beta}$ are estimated over days -300 to -101 relative to the event, with FTSE All Share Index as the proxy for the market portfolio. Panel A presents the cumulative average abnormal returns for all the events (clustered events) around buyback transactions and directors' share purchases computed using an event study methodology. The sample consists of 8,448 share purchase trades for the period January 1997 to December 2006 and of 26,271 insider purchases for the period January 1999 to December 2007.Panel B presents the cumulative average abnormal returns for the non-clustered events around buyback transactions and directors' share purchases. The sample consists of 1,179 share purchase trades for the period January 1997 to December 2006 and of 14,095 insider purchases for the period January 1999 to December 2007. p-value represents the probability of rejecting the null for mean difference t-test. t-statistics are reported in parenthesis. ***, **, * denote significance at the 1,5 and 10 percent level, respectively.