Market sentiment, volatility, timing and the information content of directors' trades

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Abstract

We examine the impact of aggregate director dealings in the UK. We find that, in aggregate, directors are contrarians, but their trades are not informative, contrary to previous US evidence. We suggest that this discrepancy is related to the regulatory setting in the UK where directors have to report their trades within six days. Aggregate directors' trading is affected by the market sentiment as they are net purchasers in the bear market and net sellers in the bull market. Since directors' reporting is faster in the UK, we then analyze the short-run market reaction to director trades. We find that the information content of director dealings is limited to the period surrounding the announcement dates. We show that market-to-book, company size, stock volatility and market volatility have a significant impact on disclosure period returns. In addition, we find that the market reaction is significantly weaker after controlling for market-to-book and size. Finally, we show that directors time their trades in volatile stocks and following high market volatility.

Keywords: Directors' trading, bull-bear market, market-to-book, size, volatility, contrarian strategy, managerial timing.

JEL classification: G14, G39.

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1 Introduction

Insiders are contrarian traders as they buy shares following a price decline and sell after a price run up, though the extent to which such trades convey information is mixed. For example, Lakonishok and Lee (2001) find that insider trades are not informative in the short run. In contrast, Fidrmuc et al. (2006) show that insider trades convey information to the market as share prices increase (decrease), subsequently to their buy (sell) trades. Seyhun (1992) documents that the aggregate net number of open market purchase and sell trades by corporate insiders in their own firms predict up to 60% of the variation in the one-year ahead aggregate stock returns. Knewtson et al. (2010) show that demand by aggregate insiders predicts time series variation in the value premiums. Lakonishok and Lee (2001) show that insiders in aggregate are contrarian traders but they have better predictive ability than simple contrarian strategies. Marin and Oliver (2008) investigate insider trading activity prior to crashes and find that insider purchases remain low all year long, but increase only one month prior to the share price jump. On the other hand, Fahlenbrach and Stultz (2011) find that bank CEOs do not reduce their shareholdings in anticipation of the crisis or during the crisis, leading to wealth losses in the wake of the crisis.

However, the literature that investigates the impact of aggregate insider trading on market returns focuses on the US and, to the best of our knowledge, no study focuses on the UK. We consider the shortcomings and unresolved puzzles in the insider trading literature to explore further the information provided by the corporate insiders and relate it to the alternative information environment in which they trade. Insiders in the UK are more likely to possess superior information because they are limited to executive and non-executive directors. In contrast, in the US the definition is much broader as officers, key employees and large shareholders are all considered as insiders.

In the UK, insiders are prevented from trading before the release of any price-sensitive information. For example, insiders are prevented from trading two months before preliminary, interim, or final earnings announcements (Hillier and Marshall, 2002). Outside the ban period, insiders need permission from the chairman of the board before trading. Fidrmuc et al. (2006) argue that US regulations favor more frequent news disclosure to avoid misuse of any significant information, whereas UK law directly prohibits insiders from trading before any price-sensitive news announcement. Moreover, in the UK, directors must disclose to their firm any transaction carried out personally no later than the fifth business day following their trade. Then, the firm must inform the London Stock Exchange and the information is publicly disclosed via the Regulatory News Service (RNS). In the US, prior to the Sarbanes-Oxley (2002) Act, directors had to report their trades on the 10th of each month following the transaction, resulting in a maximum delay of 10 to 42 calendar days, depending on the trading date. Therefore, these differences in insider trading regulations and in reporting periods between the UK and the US[1] can provide additional insights.

When information is symmetric, directors' trades should have no price impact in the market, whereas, under high information asymmetries, insiders' trades will have higher information content and will cause a larger price impact (Kyle, 1985; Milgrom and Stokey, 1982). Since higher market volatility leads to higher information asymmetry, volatility should have a significant impact on the market reaction to directors' trades. For instance, Marin and Oliver (2008) find that directors' trading is affected by market crash and jumps in terms of standard deviations. Therefore, we extend the existing literature by assessing whether directors are better at timing their trades in the short run following periods of higher volatility in the market and in more volatile stocks.

[1] For a detailed discussion on the differences in regulations and reporting periods, please see Fidrmuc et al. (2006) and for a discussion on trading bans see Hillier and Marshall (2002).

It is documented that insiders sell shares following significant stock price increases and buy shares following price declines (Seyhun, 1988, 1992; Lakonishok and Lee, 2001). Similarly, Jiang and Zaman (2010) assert that a contrarian strategy implies insider trading as a reaction to market returns. We use varying market conditions (bull and bear markets) to test the contrarian behavior of directors. If managers use the market platform to act like contrarians, their purchases are expected to dominate in bear periods, and their sell trades during bull periods. We define as bull markets the periods January 1999 through March 2000 and January 2004 through December 2007 and as bear markets the period April 2000 through December 2003. Furthermore, we test whether there is an asymmetric price response of buy and sell trades in bull and bear periods.

The existing evidence shows that insiders try to take advantage of perceived mispricing, suggesting market timing (Jenter, 2005; Lakonishok and Lee, 2001; and Rozeff and Zaman, 1998). However, insider trading is not random in value and glamour stocks (Rozeff and Zaman, 1998; Lakonishok and Lee, 2001; Gregory et al., 2013)[2]. However, this evidence is based on long run returns only. Therefore, we test whether the directors' view differs systematically from market valuations and whether they can take advantage of a potential misvaluation in the *short run* where their trades in the UK are reported more timely as opposed to US disclosure regulations.

The contribution of this study is threefold. First, we examine the information content of aggregate director trading in the UK. Second, we assess whether managers use market sentiment as a platform to act like contrarians. Third, we employ daily data on insiders' trades made available due to the UK's disclosure regulations to investigate insiders' timing ability

[2] Though Gregory et al. (2013) analyze value/glamour strategies, their focus is on long run returns. In this paper we focus on short run returns.

and informativeness, in the short run, while controlling for size, glamour or value status and volatility.

We find that net purchase ratio (NPR) is positive (negative) in a bear (bull) market, even after controlling for insiders' contrarian behavior. Our findings suggest that insiders purchase (sell) in the bear (bull) market. Overall, the aggregate director dealings show that managers use bull/bear markets as a platform to act like contrarians. The event study results on individual directors' trades show that the price response to these trades is not asymmetric in bull and bear markets and the short-term abnormal returns are economically and statistically significant. In addition, the perceived mispricing, as measured by market-to-book (M/B) ratio, significantly affects the market reaction to directors' trades in the *short run*. Finally, our findings are consistent with the view that directors' trading behavior is driven by the perceived mispricing of smaller and volatile stocks.

This paper proceeds as follows. Section 2 discusses the existing literature and sets the hypotheses. Section 3 describes the data. In section 4, the relationship between market return and aggregate director dealings is analyzed. Section 5 presents and discusses the empirical results. Section 6 concludes.

2 Related Literature and Hypotheses

The existing evidence consistently shows that insiders are contrarian traders. For example, insiders are more likely to sell (purchase) shares following periods of significant price increase (decrease), consistent with the notion that insiders trade in anticipation of subsequent price reversals (Seyhun 1986, 1992). Lakonishok and Lee (2001) show that aggregate insider purchases increase (decrease) when market returns are lower (higher). Although contrarian behavior is well documented in the UK for individual director dealings there are no studies, to our knowledge, which consider aggregate director dealings. We set the following hypothesis.

H1: On an aggregate basis, directors buy (sell) shares after a significant decrease (increase) in price, with a price reversal following their trade.

If the contrarian strategy is employed by insiders at the firm-specific level then there should be no relation between market returns and insider trading. On the other hand, if informed trading is a market wide phenomenon then a relation between aggregate insider trading and market return should exist (Jiang and Zaman, 2010). In this case, market returns would predict insider trading behavior. Chowdhury et al. (1993) and Lakonishok and Lee (2001) provide evidence that aggregate insider trading is driven by contrarian strategies. We test whether the director dealings pattern is different across the bull and bear markets, i.e. whether insider buying is higher in a bear market and insider selling is higher in a bull market. If insiders use a market platform to act like contrarians, we expect them to buy in bear periods, and sell in bull periods, to reflect their expectations of price reversals. Therefore, we split our sample period into bull (01/1999 through 03/2000 and 01/2004 through 12/2007) and bear (04/2000 through 12/2003) periods to assess the trading patterns of directors[3].

H2: Market sentiment (bull and bear periods) has no impact on insiders' buying or selling of shares.

A related question arises whether the market reaction to director dealings differs during bull and bear markets. Chiyachantana et al. (2004) consider this question in the context of institutional trading. They find that varying market reactions to buy and sell trades depend on bull (bear) market conditions. They argue that following a sell order in bullish markets the suppliers of liquidity will not push down prices as it is easy to find a buyer. In contrast, in bearish markets institutions have to offer discounts to find buyers for their sell orders, which results in buys (sells) having a bigger and permanent price impact in bullish (bearish) markets.

[3] Though these bull and bear markets are very well known in financial markets, to avoid any subjectivity, we calculate monthly market returns and confirm that market returns remain negative during the bear period and market returns remain positive during the bull period.

On the other hand, Friederich et al. (2002) assert that an additional reason for contrarian trades to be informative, is that in bearish markets there is a high demand for good stocks which depresses the price of smaller stocks. Corporate insiders may see this as the time to buy stocks at bargain prices if they have 'inside' information about the stocks. To our knowledge, no study considers this impact in the case of director dealings. Therefore, we set up the following hypothesis:

H3: Market sentiment (bull and bear periods) have no impact on the market reaction to insiders' buying or selling shares.

Rozeff and Zaman (1998) show that insider transactions are not random across growth and value stocks. Insider buying increases as stocks change from growth to value categories. Insiders buy heavily in value stocks and sell glamour stocks (Jenter, 2005; Lakonishok and Lee, 2001). Gregory et al. (2013) report that when directors buy (sell) value (glamour) stocks earn positive (negative) returns which persist for up to two years after the directors' trades. They also report that abnormal returns are particularly concentrated in smaller value stocks. All of the aforementioned studies examine the value-glamour strategy in the long run. Recognizing the fact that value-glamour strategies are more relevant in the long run, it would be useful to examine the market reaction to director dealings in the short run in the UK where trades are reported to be relatively quicker.

H4a: When insiders purchase shares, the short-term market reaction is higher (lower) for value (glamour) stocks.

H4b: When insiders sell shares, the short-term market reaction is higher (less negative) for value stocks.

Jenter (2005) finds little evidence that managers use inside information in their trades. The excess returns after controlling for size and book-to-market (B/M) effects are not different from zero. However, these results do not suggest that managers never use valid inside

information when making private and corporate decisions. The author argues that the results are consistent with Lakonishok and Lee (2001) who document that director dealings do not predict subsequent returns, once size and B/M effects are controlled for. There is some predictability of excess returns in the case of equity purchases in small firms, but no predictability of excess returns is found for the sell trades. On the other hand, recent research using UK data shows that insider buy and sell trades trigger an immediate market reaction of 1.16% and -0.26% respectively (Fidrmuc et al., 2006). We test whether insider trades in the UK convey information after controlling for M/B and size effects.

H5: After controlling for size and M/B the short-term excess returns of director trades are not different from zero.

Insiders possess superior information about the firm and information asymmetry is the focal point to insider trading (Aboody and Lev, 2000). In a market with a higher level of information asymmetry, insider trades will have a higher price impact (see, for instance, Kyle, 1985; Milgrom and Stokey, 1982). Hence, asymmetric information should be positively related to the variance of returns. Marin and Oliver (2008) define market crash and jumps in terms of standard deviations, and find a relationship with director dealings. We hypothesize that volatility is positively related to the market reaction to insider trades.

H6a. Directors' purchases (sells) trigger a higher (lower) market reaction for high volatility stocks.

H6b. Directors' purchases (sells) trigger a higher (lower) market reaction following high market volatility.

3 Data

This paper uses *Directors Deals*, a comprehensive database of all UK firms' directors' trades, from January 1999 to December 2007. The database includes news items on directors' trades

disclosed by all UK firms to the Regulatory News Service (RNS). We exclude 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 issues, and awards made to directors under incentive plans or reinvestment plans. Also all directors' transactions in investment companies are excluded. After this screening, we obtain 36,943 directors' trades from the UK market. We check the data for errors and exclude 2,952 (8%) trades as the difference in announcement and transaction date is more than five trading days. The final sample includes 33,991 directors' trades in 2,664 listed companies, split into 26,268 (77%) purchases and 7,723 (23%) sell trades. This insider-trading database includes transaction price, amount, and value, post-transaction holding, change in holding, name and position of the director, and announcement and transaction dates, as UK insiders can delay up to five days the announcement of their trade, but most report their trades on the RNS on the transaction date (Korczak et al., 2010).

The sample period covers two sub-periods: the bull periods (January 1999 - March 2000 and January 2004 - December 2007) and the bear period (April 2000 - December 2003), which allows us to test whether insiders time their trades differently under different market conditions. Adjusted daily share prices, data on the FTSE All Share Price Index, and firm-specific data are retrieved from Thomson Reuters.

4 Market Return and Aggregate Insider Trading

4.1 Impact of pre-event returns on aggregate director dealings

If insiders are contrarians, it is expected that market returns will affect aggregate director dealings. In other words, an increase (decrease) in market price will lead insiders to sell (buy). We then relate insider sell (buy) to market conditions as measured by bull (bear) markets.

Since, in the bull market prices are up, higher insider sells are expected. In contrast, in bear market prices are down, hence higher insider purchases are expected.

Following Lakonishok and Lee (2001), this paper uses NPR which is the ratio of net purchases to total insider transactions, for measuring the aggregate director dealings activities. Each month starting from January 1999 to December 2007, the total numbers of insider purchases and sells and respective Pound Sterling volumes are calculated. We then calculate the NPR by dividing the net aggregate number (volume) of insider purchases by the total aggregate number (volume) of insider transactions. Return on FTSE All Share Price Index is used as a proxy for market return. Figure 1 shows that there is a negative relationship between NPR and market returns, which supports the contrarian behavior.

[Insert Figure 1 here]

The following regression model is estimated to examine the relationship between aggregate director dealings and the market return:

$$\mathrm{NPR}_t = \alpha + \beta PR(\mathrm{k})_t + \gamma BB + \varepsilon_t (1)$$

Where, NPR is the aggregate director dealings activity in month t. *BB* is a binary variable equal to one for two periods: January 1999 - March 2000 and January 2004 - December 2007. The bear market is from April 2000 - December 2003. $PR(\mathrm{k})_t$ is the prior k-holding period return on market at time t. A negative relationship is expected between NPR and prior return (PR) as contrarian strategy implies a buy (sell) after a price decline (rise). Since NPR is positive (negative) if insiders are net buyer (seller), then we expect PR should be negatively related to NPR. We use 6-, 12-, 24- month returns prior to the event to examine whether the insiders buy (sell) as a reaction to market returns.

Panel A shows the mean and median NPRs in the bull and bear markets. We calculate the NPR based on amount of shares traded and Pound Sterling value of trades. The mean NPR (value) for the bull and bear market is -0.59 and -0.23, respectively. This shows that the NPR

is more negative when the market is in bullish state compared to bearish state. The medians are very closer to means. NPR (amount) shows that in a bull market it is negative while in a bear market it is positive, suggesting that insiders are net sellers in bull markets and net buyers in bear markets. Figure 2 shows that in a bear market most of the NPRs are positive, suggesting that insiders are net buyers. In a bull market (shaded area) most of the NPRs are negative, meaning insiders are net sellers.

[Insert Table 1 and Figure 2 here]

Panels B and C of Table 1, report the regression results with and without accounting for market sentiment, based on NPR number of transactions and NPR money volume, respectively. Without accounting for sentiment, the results consistently show that PR over the k-period is statistically and economically significant. The negative sign of PR implies that insiders are contrarians and suggests that insiders sell after a price rise, and buy after a price decline, which supports our hypothesis (H1); our findings are consistent with Lakonishok and Lee (2001) and Jiang and Zaman (2010) who show that insiders are contrarians.

Although all the coefficients of PR are negative, the coefficient of PR becomes smaller as the holding period become longer. For example, the coefficient is -2.02 when a 6-month PR is used, compared to -0.55 when 24-month PR is used. This provides evidence that insiders rely more on recent price performance. The adjusted R^2 also declines from 23.7% to 8%. Similar results are obtained using the NPR measure based on money volume. The predictive power of money volume-based NPR is higher than the number of transaction-based NPR. This may imply that when market moves are larger, insiders make large trades.

When including market sentiment, in the first regression, we only use the BB dummy as an independent variable to examine the effect of the bull (bear) market on NPR. In the other regressions, we use 6-, 12-, 24-month PRs with the BB dummy. The results are consistent with the notion that insider buy trades increase in the bear market and insider sell trades are higher

in the bull market. Both the NPR measures are negatively related to the BB dummy, suggesting that insiders buy in the bear market with an expectation to sell in the bull market. Hence, insiders use the bull (bear) markets as a platform to act like contrarians. For instance, the BB dummy is -0.17 and statistically significant (t=-1.89).The evidence holds even after controlling for the contrarian behavior of the insiders by incorporating PRs; PR is -1.57 and statistically significant (t=-3.12). After controlling for contrarian strategies, we show that insiders further use the bull (bear) market to time the market, which supports hypothesis 2.

4.2 Predictability of post-trade returns

The previous section reports that insiders are contrarians. Here, we test whether the aggregate director dealings predict future market returns. If insider trades are informative, a positive relationship between aggregate director dealings measure (NPR) and future market return is expected. The following regression is estimated to examine the relationship between aggregate director dealings and return on market:

$$\prod_{t=k}^{t+T}(1 + R_{M,K}) - \prod_{t=k}^{t+T}(1 + R_{\mathrm{f,k}}) = \alpha + \beta\, NPR_{\mathrm{t}} + \gamma PR24_{\mathrm{t}} + \varepsilon_t \quad (2)$$

Where, $R_{\mathrm{M,K}}$ is the market return in month k, $R_{f,k}$ is the monthly treasury bill rate in month k, $\mathrm{NPR_t}$ is the NPR of aggregate director dealings activity in month t, $PR24_{\mathrm{t}}$ is the prior two-year holding period market return at time t[4]. We include the prior two-year holding period return in the regressions to control for the fact that insiders are contrarians, following Lakonishok and Lee (2001). We also control for the momentum factor documented in previous studies, as stocks that perform the best (worst) over a 3- to 12-month period tend to continue to perform well (poorly) over the subsequent 3 to 12 months (Jegadeesh and Titman, 2001). We control for the fact that the current market return is affected by the previous market returns, hence isolating insiders' information from the simple contrarian strategy/momentum effect.

[4] In unreported regressions, we use 6, 12 and 18 months PRs and the results are qualitatively similar.

[Insert Table 2 here]

Table 2 reports the regression results for 3, 6, 9 and 12-month holding periods. The coefficient NPR is negative and significant in most of the regressions. For example, Panel A, Table 2 shows that the coefficient of NPR is -0.05 (t=3.28) for the 3-month holding period, which shows that director dealings predict stock prices contrary to expectations. For the alternative holding periods, the results are qualitatively similar. For money volume, similar results are obtained for holding periods 3 and 9, while for holding periods 6 and 12 the coefficient is not significant. Overall, the results show that director dealings predict market return in the opposite direction to expectations. The negative coefficient of NPR is contrary to the findings of earlier studies undertaken on the US market (e.g., Lakonishok and Lee, 2001) suggesting that the aggregate director dealings do not convey enough information to forecast future prices. Since the insider trades in the UK market are reported within 6 days, the information is short-lived.[5] It might be possible that director dealings in the UK do not convey enough information to predict the aggregate market returns. Since insiders are net sellers (as NPR is negative for most of the time period) and individual sell trades do not convey information (as the returns are statistically and economically insignificant), the results of aggregate director dealings are partially consistent with that.

5 Event Period Returns

5.1 Descriptive Statistics and Information Content of Insider trades

Table 3, Panel A presents the descriptive statistics and t-tests for differences in means for company fundamentals. We measure size as the market value of equity five days before directors' trades, M/B as the market value to book value of equity five days before directors' trades, Stock volatility as standard deviation of stock measured from -240 to -41 days window

[5] For example, Fidrmuc et al. (2006) did not find any significant returns outside the (-20, +20) window.

relative to the trade, and market volatility as the standard deviation of market index over the same window. The results show strong differences between buy and sell trades. The average company sizes for buy and sell trades are statistically different. This is an early indication that the stocks insiders buy and sell are different, which is consistent with previous literature (e.g. Lakonishok and Lee, 2001). The average M/B is also different for buy and sell trades. Furthermore, the mean difference t-test shows that they are statistically different.

Table 3, Panel B, reports the results on the market reaction to insiders' trades.[6] For the whole sample the cumulative abnormal returns (CARs) for buy trades over the pre-event periods [-40, -2] are negative and highly significant. In contrast, before the sell trades, the abnormal returns are positive and significant. The results clearly indicate the contrarian strategies adopted by insiders and the impact of the trades on the announcement dates, as well as the post-trade performance.

The event day and post-event day returns for buy trades are positive and significant. In contrast, for the sell trades, the event day returns are negative, but not significant. Interestingly, the post-event day abnormal returns are neither negative nor significant for sell trades. After the buy trades, share prices recover to a certain extent. However, after the sell trades, share prices do not decline, rather the trend stops and share prices level off. These results support the earlier findings that the buy trades convey information, but the sell trades are not informative (Lakonishok and Lee, 2001). The t-test of differences in mean shows that the buy and sell trades are different.

[Insert Table 3 here]

[6] This study uses the standard event study methodology based on the market model (Brown and Warner, 1985), with the parameters α and β computed over the estimation window [-240, -41] days relative to the event day to investigate the stock price reaction to directors' trades. The event period is [-40, +40]. We use the FTSE All Share Price Index, which covers 800 UK listed firms (about 50% of the companies listed in the main market and more than 97% market value of equity), as the market index because our sample includes small as well as large firms. We define event dates as the dates when the insider trades are announced. For robustness checks, we repeat all the analysis by using a market adjusted return model, and the results are qualitatively similar.

Lakonishok and Lee (2001) note that the abnormal returns around the reporting dates are not economically meaningful, though statistically significant. For example, they report abnormal returns of 0.13% and -0.23% for purchases and sells, respectively around reporting day. However, their findings are contrary to our results where we find abnormal returns of 1.02% and -0.13% for buy and sell trades respectively. Pope et al. (1990) and Gregory et al. (1994) find puzzling results as market model CARs are negative for buys, and the returns are substantial. The results change dramatically when they adjust for size as the CARs become positive for buys and negative for sells in the post-event window. We find that the abnormal returns for the buy trades are statistically and economically significant when measured around the announcement date, which is consistent with Fidrmuc et al. (2006), and Pope et al.'s (1990) and Gregory et al.'s (1994) size adjusted returns.

5.2 Market Sentiment and Price Impact of Insider Trades: Univariate Analysis

This paper examines the price impact asymmetry and hence tests for market timing by splitting the sample period into bull (01/1999 - 03/2000 and 01/2004 - 12/2007) and bear (04/2000 - 12/2003) periods. We find that the behavior of share prices following buy and sell trades does not depend on market conditions (Table 3, Panel B). The mean difference t-tests show that the behavior of CARs over different event windows is not significantly different. The only exception to this is that buy trades over the estimation window [-40, -2] in bull and bear markets show significant differences. Our results are in line with Korczak and Lasfer (2009), who find that the behavior of share prices following buy and sell trades does not depend on market conditions. These findings are in contrast to Chiyachantana et al. (2004) who assert that in a bull market, suppliers of liquidity are suspicious of buy orders, and run up the prices in the face of a strong buying interest.

Chiyachantana et al. (2004) argue that suppliers of liquidity are not as cautious about the institutional sell orders in a bullish environment and do not run down prices as much when

they face selling interests. In bearish markets the situation is exactly the opposite. In a bullish market, buys have a bigger price impact, but in bearish markets sells have a bigger price impact. However, we find evidence which is almost contrary to this argument. The absolute magnitude of CARs for buy trades in bear periods is higher than the bull period trades [-5.53 vs. -3.14, 1.12 vs. 0.92, 2.23 vs. 2.03 over the event window (-40, -2), (-1, +1), (+2, +40) respectively]. The only evidence which is consistent with Chiyachantana et al. (2004) is the absolute magnitude of the sell trades' CAR in the bear period, which is higher than sell trades [-0.26 vs. -0.001 over the event window (-1, +1)]. However, for both buy and sell trades, we do not find any significant difference in price response in bull and bear periods. Thus we accept hypothesis 3.

5.3 Market-to-book Quintiles: Univariate Analysis

We form quintiles according to M/B ratios to test whether insiders buy undervalued shares, and sell over-valued shares and whether they time their trades. A major difference between the current study and those of Rozeff and Zaman (1998) and Lakonishok and Lee (2001), is in forming those quintiles. Rozeff and Zaman (1998) rank their companies into deciles each year by annual book-to-price ratios. Similarly, Lakonishok and Lee (2001) divide their sample into three B/M groups based on the B/M ratio at the end of April of each calendar year. The annual measures are not likely to be good proxies for market mispricing and insiders' timing in the context of individual director dealings where the trades are announced daily. Lakonishok and Lee (2001) examine whether the value (growth) strategy adopted by insiders can earn different returns in the long run. However, in this paper our objective is to examine whether there is any significant difference in the market reaction to director dealings in the short run in value and growth stocks. Hence, we compute the M/B ratios five days prior to the announcement date of directors' trades to form M/B quintiles. The companies are sorted in quintiles each year by M/B ratios. Similar procedures are applied to form quintiles based on size.

The analysis of M/B quintiles shows evidence of signaling over- (under-) valuation (Table 4, Panels A and B). Low M/B companies (value stocks) are companies that are perceived to be undervalued. We expect insiders in these companies to signal undervaluation when they purchase shares, resulting in positive post-event abnormal returns. As expected, for buy trades, as we move from low M/B to high M/B stocks, the post-event abnormal returns are becoming smaller. For example, the CAR for quintile 1 is 3.46 (t=5.72) and for quintile 5 is 0.79 (t=1.08) in the post-event window. The mean difference t-test indicates that quintile 1 is statistically different from quintile 5. Also, the chi-square test for differences among the means rejects equality of means. The results of the pre-event returns are also according to our expectations. As we move from low M/B to high M/B stocks, the pre-event abnormal returns are larger. The means of 'value' (low M/B) and 'glamour' (high M/B) stocks are different. Moreover, the chi-square test shows differences among the means. When insiders buy in low M/B companies, the immediate price reaction of trades and price recovery is much higher, compared to high M/B companies (hypothesis 4). This is consistent with value strategies.

In contrast, high M/B stocks are glamour stocks, which are likely to be over-valued. The post-sell trades' abnormal returns in these companies should be negative. Table 4, Panel B shows that sell trades do not show strong evidence of signaling over-valuation. Only, the pre-event window CARs show some evidence of insiders' systematic trading based on their perceptions about the company. For example, the CARs are becoming higher as we move from value stocks to glamour stocks in the pre-event period, consistent with the literature. Even though there are pairwise differences in means between value and glamour stocks, the chi-square test $\chi^2(4)$ does not indicate that there are significant differences among the quintiles. The event day and post-event day returns are not fully consistent with predictions. None of the CARs across the M/B quintiles are statistically significant. The mean difference t-test is not significant and the chi-square test shows there are no significant differences among the means.

Overall, insiders sell after a significant rise in prices and the trend stops following their sell trades. Hence, there is weak evidence of timing. Our results suggest that insiders are able to time their trades, but they are not fully capable of changing the market's perception regarding their firm's true value. In sum, the results provide partial support for the proposition that insiders follow growth strategies when they sell their shares.

[Insert Table 4 here]

5.4 Size Quintiles: Univariate Analysis

Table 4, Panels C and D show the univariate results on size quintiles. The results show that there is evidence of market timing by the insiders for small stocks. If managers have timing abilities in small companies, we expect pre-event CARs to be higher as we move from small to large companies. Also, event and post-event abnormal returns will be lower as we move from small to large companies. In the case of buy trades, even though the signs are as predicted, the pre-event returns do not increase as expected when moving through the quintiles. For instance, for smallest size quintile CAR is -2.25 (t=-2.69) compared to -2.93 (t=-4.87) for large size quintile stocks. The mean difference t-test between small and large companies is statistically insignificant, but the chi-square test for the differences in means for different quintiles is highly significant.

In terms of event and post-event CARs the results are in line with our expectations. For example, the event day CARs are gradually declining as we move from small to large companies (3.02, 1.22, 0.76, 0.15 and -0.12 respectively with the latter two not being statistically significant). The post-event CARs also show similar patterns (2.95, 3.47, 2.36, 0.94, 0.48 respectively, with all being significant except the last one). Furthermore, the mean difference t-test between small and large companies shows significance at the 1% level for event day and post-event abnormal returns. The evidence is substantiated by the chi-square test which shows that there is a significant difference across the means over the different quintiles

for both event day and post-event returns. Overall, the results support the proposition that insiders buy shares after a significant price decline; that after purchases the share price recovers; and that this behavior is more pronounced for small firms.

The results for the sell trades do not provide strong evidence of market timing in the case of small companies (Table 4, Panel D). The pre-event window CARs show mixed evidence of managers' systematic trading based on their perceptions about the company. For example, the CARs increase as we move from quintile 1 to quintile 3 and then decline again. Additionally, there are no significant differences in means between small and large stocks, and the differences across the quintiles are not statistically significant. The event day and post-event day returns are not fully consistent with our predictions. None of the CARs across the size quintiles are statistically significant, except the post-event return for quintile 1. The mean difference t-test is not significant for event day returns and the chi-square test shows that there are no significant differences among the means. Overall, insiders sell after a significant rise in prices and the trend stops after they sell. This shows weak evidence of timing. Therefore, the results indicate that insiders are able to time their buy trades but not their sell trades in the case of small companies. This is consistent with Lakonishok and Lee (2001) in the US and Gregory et al. (1994) in the UK, who find that insiders' timing ability is more pronounced in small firms.

5.5 M/B and Size Sorting of Abnormal Returns

This section provides two-way sorting based on M/B and size. The purpose of two-way sorting is to examine the effect of M/B and size simultaneously. Jenter (2005) shows that insiders' trades, in the US, hardly convey any information after controlling for M/B and size. We examine in this section whether the same applies in the UK. In the case of buy trades, most of the results in earlier analyses were driven by small companies and low M/B companies (Table 5). For example, the event period returns show that all the returns across M/B quintiles are significant only for the small company quintile. None of the event period returns are significant

for the large company quintile. In addition, the post-event returns are significant in the small company quintile and all the post-event returns are insignificant in the large company quintile. This implies, after controlling for M/B and size, that insider purchases do not convey any information (hypothesis 5).

[Insert Table 5 here]

For example, the event day return for the largest company quintile and largest M/B quintile is actually negative (-0.58, t=- 0.98). The post-event return for the largest company and high M/B quintile is also negative (-0.31, t=-0.23). These results are consistent with earlier findings in the US that most of the insider returns are not indistinguishable from zero, once the size and M/B effects are controlled for. However, Lakonishok and Lee (2001) find that the abnormal returns around the reporting dates do not depend on size or M/B. We find that the reporting period abnormal returns are directly related to M/B and size. Our results are consistent with the view that smaller companies are associated with more information asymmetry and hence the market reaction is higher. Smaller companies are also more risky, which may yield higher returns when insiders trade.

[Insert Table 6 here]

The results on sell trades (Table 6) show that prior to directors' sell trades there is a significant price run up for most of the size and M/B quintiles and suggest that glamour stocks have higher pre-trade returns than value stocks. For example, for the 3rd size quintile and the 1st M/B quintile (low M/B) the pre-trade short-term average return is 3.82% (t=2.02) while, for the same size quintile and high M/B, the average pre-trade return is 8.03% (t=3.43). The results on the event period returns show there is no significant market reaction, suggesting that directors' sell trades do not convey any information in the short run. In addition, the post-trade returns are mostly insignificant. Overall, the pre-, event, and post-event returns show that directors time their sell trades by selling at a higher price, though their trades do not convey

any information to the market. Our results are consistent with earlier findings of directors' sell trades being motivated by other considerations, such as portfolio rebalancing and diversification, rather than being information driven (Lakonishok and Lee, 2001).

5.6 Stock and Market Volatility sorting

In this section, we sort the CARs from low to high stock volatility.[7] The results (Table 7, Panel A) show that for buy trades, low volatility stocks display lower price drops in the pre-event window and the market reaction is smaller immediately and in the post-event period compared to the high volatility stocks. The mean difference between low and high volatility is highly significant. In addition, we find that the means are different across all the quintiles for the pre-event and event windows. However, for sell trades, the CAR is lower for low volatility stocks during the pre-event window compared to high volatility stocks. (Table 7, Panel B). Furthermore, the means between high and low volatility stocks are significantly different and the chi-square test shows that the means across quintiles are not homogeneous. The results imply that insiders have more knowledge on high volatile stocks (hypothesis 6).

When we sort the stocks based on market volatility, the results are similar (Table 7, Panel C and D). For buy trades, the higher the market volatility prior to the trades, the higher the market reaction. This holds for both the event and the post-event windows. The post-event market reaction for low volatility (0.97%) is significantly lower compared with high volatility (3.46%). Regarding the sell trades, they are preceded by high market volatility and the market reaction in the post-event period is positive and significant (1.89% with t=2.93). The mean difference between low and high is highly significant, and chi-square rejects the null of

[7] We document that returns are larger when market and stock volatility are larger, though this could be driven by the use of CARs which can be biased for anything other than short-term windows. Therefore, one might argue that a positive relationship between CARs and returns is unsurprising, given the well-known problems of positive bias in CARs (Kothari and Warner, 1997). We repeat the analysis using BHARs (unreported) and the results remain qualitatively similar. Hence, we conclude that insiders are more knowledgeable in volatile stocks.

homogeneity. In sum, we find that high (low) stocks, and market volatility prior to the insiders' trades are related to high (low) market reaction.

[Insert Table 7 here]

5.7 Cross Sectional Variation in Abnormal Returns

This section runs cross-sectional regressions to control for a number of factors simultaneously. The overall results of univariate analysis show that insiders buy (sell) undervalued (over-valued) stocks as measured by M/B and find evidence of market timing in the purchase of small company stocks. In particular, as we move from low to high quintiles for M/B, size, stock volatility and market volatility for the pre-event, event and post-event, abnormal returns vary. Clearly, these provide evidence that the abnormal returns vary with M/B, size, stock volatility and market volatility.

Therefore, we estimate the following model separately for the buy and sell trades:

$$CAR_j = \alpha + \beta_1 Ln(Size)_j + \beta_2 M/B_j + \beta_3 StockVol_j + \beta_4 MktVol_j + \kappa BBDum + \gamma Year + \theta Industry$$

where, *Ln (size)* is the log of firm size measured as the market value of equity five days before the trade, *M/B* is the market-to-book ratio, where the market value of equity is taken five days before the trade and the book value is the book value of equity at the balance sheet date, *Stock Vol* is the standard deviation of stock returns over -240 to -41 days relative to the directors' trades, *Mkt Vol* is the standard deviation of market returns over -240 to -41 days relative to the directors' trades, and *BB Dum* is a dummy equal to 1 for the Bull Market and 0 otherwise.

In order to isolate the pure cross-sectional component of the M/B and size effect on director dealings, a set of regressions are estimated using the entire sample period from 1999 to 2007. The results are reported in Table 8. The M/B effects are negative and significant in the case of buy trades, suggesting that managers buy undervalued stocks. These findings are consistent with the M/B quintile analysis. Therefore, the director dealings decisions are

influenced by the relative market valuations. We also examine the impact of size on insiders' market timing ability. The coefficient is negative and significant for the buy trades, which is consistent with the evidence that insiders try to time the market in the case of small companies. For buy trades, both the stock and market volatility are positive and significant in most cases, suggesting that risky stocks earn higher returns, and high market volatility is related to higher returns. This is consistent with Huddart and Ke (2006), who assert that for companies where information asymmetry is higher, the abnormal returns are higher. In sum, the results suggest that insiders time their buy trades.

[Insert Table 8 here]

For sell trades, M/B has a positive but not significant relationship (Table 8). The sign is consistent with our predictions, suggesting that insiders sell over-valued stocks. Furthermore, size has a negative relationship and market volatility has a positive relationship but only for the post-event market reaction CAR (+2, +40). Overall, the results suggest that M/B, size and market volatility significantly affect the market's reaction to director dealings.

Finally, the documented pattern of insider purchases and sells across M/B, size and stock volatility quintiles could also be due to some omitted variable measuring and unobserved heterogeneity across firms in different quintiles. One crude measure of heterogeneity across firms is the industry in which they operate. It is well established that the M/B ratios in the same industry tend to move together and that several industries are characterized by extreme valuations. Some particular businesses are considerably more investment intensive and the company size of that industry can be larger than in other industries. Therefore, in order to determine whether the M/B and size effect on director dealings is simply an industry effect, we incorporate industry dummies in the regressions. Finally, for assessing whether the results are time dependent or not, we also include year dummies in our regressions. In none of the cases

are the industry dummies or year dummies significant, suggesting that our results are not driven by industry or time effects.

6 Conclusion

This study employs a unique data set to test whether insiders time their trades or not. This is one of the first studies to examine aggregate in director dealings in the context of UK. We find that on an aggregate basis, insiders are contrarians but aggregate director dealings do not predict monthly returns. This is consistent with the view that the information content of director dealings is limited to the period surrounding the announcement dates. We then examine whether director dealings are related to the market sentiment, as measured by a bull (bear) market. The aggregate director dealings activity shows a relationship between insiders' market timing and market sentiment, as measured by bull (bear) periods. This provides evidence that insiders use market sentiment to act like contrarians. However, we do not find a significant difference in the price response during bull and bear periods.

Further, this study examines whether there are any relationships between company fundamentals and the timing of insider trades, as addressed in Rozeff and Zaman (1998), Lakonishok and Lee (2001), Jenter (2005) and Gregory et al. (2013). Insiders tend to buy stocks with poor past performance, and those that are cheap according to proxies such as the M/B ratio. Consistent with the existing literature, the insiders' ability to time their trades is not homogeneous across all market capitalization groups. Insiders have a relative advantage in timing in the case of small stocks compared to large stocks. We show that the information asymmetry has an important impact on the market reactions to insider trades, as in Kyle (1985).

The results question the notion that insiders are able to earn excess returns with their trades when controlling for size and M/B effects. Recent insider trading literature confirms the finding that most excess returns to insider trades can be explained by the size and M/B effects, and suggests that the economically significant excess returns in older studies are due to the lack

of control for these observable firm characteristics (Jenter, 2005). In line with the US findings of Lakonishok and Lee (2001), we show that in the UK excess returns are not significant in the short run after controlling for M/B and size. Finally, we show that insiders show timing ability in highly volatile stocks, and following high volatility in the market.

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Table 1. Aggregate Insider Trading and Market Return

Panel A: Mean Differences in NPR between Bull and Bear markets					
	Mean		**Median**		
	Bull	**Bear**	**Bull**	**Bear**	**P (bull-bear)**
NPR (amount)	-0.25	0.12	-0.28	0.11	0.00
NPR (value)	-0.59	-0.23	-0.62	-0.28	0.00

Regression Results

Prior Returns	**Constant**	**PR**	**BB**	$\bar{R}^2$
Panel B: Number of Transactions				
6	0.12 (1.18)	--	-0.37 (-3.27) ***	16.1
	-0.04 (-1.03)	-2.02 (-4.44) ***		23.7
	0.04 (0.63)	-1.57 (-3.12) ***	-0.17 (-1.89) *	25.3
12	-0.04 (-0.73)	-1.32 (-3.36) ***		18.2
	0.03 (0.43)	-0.89 (-1.80) *	-0.16 (-1.17)	18.7
24	-0.04 (-0.92)	-0.55 (-3.06) ***		8.0
	0.12 (1.18)	0.00 (0.00)	-0.37 (-2.45) ***	15.3
Panel C: Money Volume				
6	-0.22 (-2.09) **	--	-0.37(-3.24) ***	18.1
	-0.39 (-10.14)	-2.08 (-4.71) ***		29.6
	-0.32 (-4.54) ***	-1.70 (-3.20) ***	-0.15 (-1.65) *	31.0
12	-0.39 (-7.26) ***	-1.26 (-3.48) ***		19.5
	-0.30 (-3.84) ***	-0.79 (-1.99) *	-0.18 (-1.51)	20.6
24	-0.37 (-5.72) ***	-0.76 (-3.03) ***		18.8
	-0.28 (-3.85)	-0.46 (-2.04) **	-0.20 (-1.90) *	20.9

Panel A of this table represents mean (median) of NPR for each month from January 1999 through December 2007.

Panel B reports the results from the following regression:

$$NPR_t = \alpha + \beta PR(k)_t + \gamma BB$$

NPR_t^i is the NPR of aggregate director dealings activity in month t. $PR(k)_t$ is the prior two-year holding period return on market at time t. BB is a binary variable equal to 1 for the Bull market and 0 otherwise, where the Bull Market includes two periods: January 1999 through March 2000 and January 2004 through December 2007. Bear market is from April 2000 through December 2003. Each month starting from January 1999 through December 2007, we calculate the total numbers of (and the total Pound Sterling volume) of insider purchases and sells. We then calculate the NPR by dividing the net aggregate number (volume) of insider purchases by the total aggregate number (volume) of insider transactions. We use 6, 12 and 24-month PRs. The Newey-West autocorrelation and heteroskedasticity adjusted t-statistics are in parenthesis. ***,**,* represent significance at 1, 5 and 10% levels respectively.

Table 2. Predictive Ability of Post-trade Returns

Holding Period(months)	Constant	NPR	PR24	$\bar{R}^2$
Panel A	Number of transactions			
3	-0.01(-1.11)	-0.05 (-3.28) ***	0.03(0.79)	12.3
6	-0.02(-1.22)	-0.07(-2.90) ***	0.04(0.59)	13.9
9	-0.03(-1.31)	-0.11(-3.48)***	0.02(0.22)	15.8
12	-0.05(-1.40)	-0.14(-3.33) ***	-0.01(-0.12)	14.4
Panel B	Money Volume			
3	-0.02(-2.49)	-0.04(-1.86)*	0.03(0.64)	8.0
6	-0.04(-2.06) **	-0.05(-1.57)	0.05(0.56)	7.6
9	-0.06(-1.87) *	-0.07(-1.69) *	0.04(0.30)	5.9
12	-0.07(-1.56)	-0.07(-1.25)	0.02(0.14)	2.0

This table reports the regression results from the following model.

$$\prod_{t=k}^{t+T}(1+R_{M,K}) - \prod_{t=k}^{t+T}(1+R_{f,k}) = \alpha + \beta NPR_t + \gamma PR24_t$$

Where, $R_{M,K}$ is the return on market in month k, $R_{f,k}$ is the monthly Treasury bill rate in month k, NPR_t is the NPR of aggregate director dealings activity in month t, $PR24_t$ is the prior two-year holding period return at time t. Each month starting from January 1999 through December 2007, we calculate the total numbers of (and the total Pound Sterling volume) of insider purchases and sells. We then calculate the NPR by dividing the net aggregate number of insider purchases by the total aggregate number of insider transactions. We predict market returns for 3, 6, 9 and 12-month horizons. The Newey-West autocorrelation and heteroskedasticity adjusted t-statistics are in parenthesis. ***,**,* represent significance at 1, 5 and 10% levels respectively.

Table 3. Descriptive Statistics and Market Reaction of Insider Trades

Panel A: Fundamentals					
	Buy trades		**Sell trades**		**(p Buy-sell)**
	Mean	**Median**	**Mean**	**Median**	
Size (Market Cap)	5,073.86	403.1	6,817.81	403.34	0.02
M/B	2.28	1.46	3.94	2.34	0.00
Stock Volatility	0.023	0.021	0.022	0.019	
Market Volatility	0.012	0.011	0.012	0.011	
Number of Observations	26,268		7,723		
Panel B: Cumulative Abnormal Returns in Different Market Conditions					
	Full sample	**Bear Period**	**Bull Period**		**P Bear-Bull**
Buy trades					
N	26,268	10,274	15,994		
CAR(-40,-2)	-4.32***	-5.53***	-3.14***		0.00
	(-15.37)	(-13.87)	(-7.39)		
CAR(-1,+1)	1.02***	1.12***	0.92***		0.41
	(13.11)	(10.14)	(7.83)		
CAR(+2,+40)	2.13***	2.23***	2.03***		0.71
	(7.59)	(5.60)	(4.77)		
Sell trades					
N	7,723	2,312	5,411		
CAR(-40,-2)	5.60***	5.06***	6.11***		0.27
	(10.05)	(7.12)	(8.17)		
CAR(-1,+1)	-0.13	-0.26	-0.001		0.39
	(-0.83)	(-1.30)	(-0.01)		
CAR(+2,+40)	0.24	0.76	-0.26		0.20
	(0.44)	(1.08)	(-0.35)		

This table provides the descriptive statistics of the companies in our sample and event study results. Panel A represents company fundamentals. Size is the market value of equity five days before directors' trades, M/B is the market value to book value of equity five days before directors' trades, Stock volatility is the standard deviation of stock measured from -240 to -41 days' window, and market volatility is the standard deviation from the market from the same window. Panel B presents cumulative average abnormal returns around directors' share trading events computed using event study methodology. The market model coefficients α and β are estimated over days -240 to -41 relative to the event, with the FTSE All Share Price Index as the proxy for market portfolio. All results are reported relative to directors' share trading announcement day, i.e., the date of the public announcement of directors' share trading. The bull period covers from January 1999 through March 2000 and January 2004 through December 2007 and the bear period covers April 2000 through December 2003. T-statistics are reported in parenthesis. ***, **, * denote significance at the 0.01, 0.05 and 0.1% levels, respectively.

Table 4. Distribution of Cumulative Abnormal Returns by Market-to-Book and Size

Market-to-Book Quintiles

	Low	2	3	4	High	P High-Low	$\chi^2(4)$
Panel A: Buy							
-40,-2	-7.18***	-6.82***	-4.58***	-1.76***	-1.11	0.00	82.06***
	(-11.87)	(-12.02)	(-7.06)	(-3.03)	(-1.59)		
-1,+1	1.41***	0.97***	0.83***	0.78***	1.01***	0.38	7.17
	(8.43)	(6.16)	(4.61)	(4.86)	(5.33)		
+2,+40	3.46***	3.08***	1.33**	1.95***	0.79	0.00	12.43**
	(5.72)	(5.42)	(2.06)	(3.34)	(1.08)		
Panel B: Sell							
-40,-2	3.30***	4.70***	5.64***	6.88***	7.33***	0.01	7.72
	(2.57)	(4.10)	(5.40)	(6.83)	(6.35)		
-1,+1	-0.07	0.14	0.09	-0.37	-0.44	0.37	2.83
	(-0.19)	(0.46)	(0.33)	(-1.36)	(-1.39)		
+2,+40	0.03	0.58	0.99	-0.60	0.22	0.89	1.18
	(0.02)	(0.50)	(0.95)	(-0.61)	(0.19)		

Size Quintiles

Panel C: Buy							
	Small	**2**	**3**	**4**	**Large**	**P small-large**	$\chi^2(4)$
-40,-2	-2.25***	-4.89***	-7.79***	-3.76***	-2.93***	0.53	43.79***
	(-2.69)	(-7.53)	(-12.42)	(-6.75)	(-4.87)		
-1,+1	3.02***	1.22***	0.76***	0.15	-0.12	0.00	156.47***
	(13.03)	(6.77)	(4.37)	(1.03)	(-0.70)		
+2,+40	2.95***	3.47***	2.36***	0.94*	0.48	0.00	57.33***
	(3.52)	(5.34)	(3.76)	(1.68)	(0.81)		
Panel D: Sell							
-40,-2	4.62***	5.65***	6.67***	5.58***	5.45***	0.58	1.55
	(3.40)	(6.14)	(6.25)	(4.54)	(5.76)		
-1,+1	0.20	-0.44	-0.28	0.28	-0.40	0.27	5.02
	(0.53)	(-1.73)	(-0.95)	(0.82)	(1.54)		
+2,+40	3.00**	-0.83	-0.08	-0.46	-0.42	0.00	6.39
	(2.21)	(-0.89)	(-0.08)	(-0.38)	(-0.45)		

The table represents cumulative average abnormal returns around directors' share trading by using the event study methodology. The market model coefficients α and β are estimated over days -240 to -41 relative to the event date, with FTSE All Share Price Index as the proxy for the market portfolio. The full sample includes 33,991 directors' trades in 2,664 listed companies, split into 26,268 purchases and 7,723 sells. All results are reported relative to directors' share trading announcement day, i.e., the date of the public announcement of directors' share trading. The market-to-book quintiles were formed five days before the announcement dates. If we define t as the event date, then we use t-5 days' M/B ratio to form quintiles based on the M/B ratio. In forming the quintiles we first sort the CARs by year according to the market-to-book ratio. Each year we then sort the CARs in quintiles by the market-to-book ratio. Finally, we sort them based on quintiles. In doing so, the year effect has been removed from the M/B quintiles. The same steps are followed to form the size quintiles. $P_{high\text{-}low}$ reports the p value of mean difference test between CARs from highest M/B vs. lowest market-to-book quintiles. $P_{small\text{-}large}$ reports the p value of mean difference test between CARs for small vs. large companies. The last column reports the chi-square test for differences in means across market-to-book and size quintiles. t-statistics are reported in parenthesis. ***, **, * denote significance at the 0.01, 0.05 and 0.1% levels, respectively.

Table 5. Distribution of Abnormal Returns of Buy Trades by Size & M/B

	Low M/B	2	3	4	High M/B
			Pre-trade Returns (-40,-2)		
Small	-4.65***	-4.83***	-3.62**	-3.40**	-0.32
	(-3.62)	(-3.52)	(-2.34)	(-2.04)	(-0.15)
2	-12.82***	-13.32***	-6.44***	-5.02**	0.29
	(-5.56)	(-6.30)	(-3.63)	(-2.13)	(0.14)
3	-7.62***	-4.82***	-6.87***	-7.18***	-0.73
	(-4.08)	(-2.73)	(-3.19)	(-3.68)	(-0.36)
4	-9.09***	-5.75***	-1.95	-2.26	-2.17
	(-4.57)	(-2.55)	(-0.86)	(-0.96)	(-1.32)
Big	-1.68	-14.91***	-3.64	-1.05	-2.06
	(-0.25)	(-3.54)	(-1.53)	(-0.62)	(-1.09)
			Event day Returns (-1,+1)		
Small	1.92***	2.35***	2.35***	1.90***	4.13***
	(4.80)	(5.48)	(4.87)	(4.87)	(6.04)
2	1.38**	0.88	0.65	1.20*	2.54***
	(1.91)	(1.33)	(1.18)	(1.64)	(3.80)
3	1.10*	0.52	-0.49	0.20	0.45
	(1.87)	(0.94)	(-0.73)	(0.32)	(0.72)
4	0.43	-1.68**	0.33	0.44	0.22
	(0.69)	(-2.38)	(0.47)	(0.59)	(0.43)
Big	3.16	0.09	-0.31	0.06	-0.58
	(1.53)	(0.07)	(-0.41)	(0.12)	(-0.98)
			Post-trade Returns (+2,+40)		
Small	4.66***	2.49**	1.98*	2.07*	3.12**
	(5.11)	(2.55)	(1.80)	(1.74)	(2.01)
2	5.23***	7.07***	0.67	1.80	1.64
	(3.19)	(4.70)	(0.53)	(1.07)	(1.08)
3	3.58***	1.49	2.05	3.45	-1.73
	(2.69)	(1.18)	(1.34)	(2.49)	(-1.22)
4	-0.66	1.57	1.07	1.60	1.56
	(-0.47)	(0.98)	(0.66)	(0.96)	(1.33)
Big	1.34	7.13**	0.43	0.96	-0.31
	(0.29)	(2.38)	(0.25)	(0.79)	(-0.23)

The above table represents cumulative average abnormal returns around directors' share trading by using event study methodology. The market model coefficients α and β are estimated over days -220 to -41 relative to the event, with FTSE All Share Price Index as the proxy for the market portfolio. The sample includes 26,268 purchases. All results are reported relative to directors' share trading announcement day, i.e., the date of the public announcement of directors' share trading. The M/B and size quintiles were formed five days before the announcement dates. If we define t as the event date, then we use t-5 days' M/B and size to form quintiles based on M/B and size. In forming the quintiles, the CARs were first sorted by year according to M/B and size. For each year the CARs were then sorted into quintiles first by M/B and then by size. In doing so, the year effect has been removed from the quintiles. T-statistics are reported in parenthesis. ***, **, * denote significance at the 0.01, 0.05 and 0.1% levels, respectively.

Table 6. Distribution of Abnormal Returns of Sell Trades by M/B and Size

	Low M/B	2	3	4	High M/B
			Pre-trade Returns (-40,-2)		
Small	3.83**	2.91	4.01	2.59	0.11
	(2.51)	(1.05)	(1.60)	(1.00)	(0.02)
2	7.67***	1.21	10.60**	1.39	0.48
	(4.94)	(0.56)	(2.40)	(0.47)	(0.14)
3	3.82**	3.84	10.40***	5.32**	8.03**
	(2.02)	(1.55)	(3.10)	(2.18)	(3.43)
4	10.66***	7.44***	3.85	7.56***	3.20
	(3.99)	(3.49)	(1.20)	(3.90)	(1.22)
Big	4.23	9.52***	7.97***	7.22***	4.17
	(1.42)	(3.95)	(4.52)	(3.38)	(1.06)
			Event day Returns (-1,+1)		
Small	-0.45	0.50	-0.08	0.80	-1.32
	(-0.94)	(0.57)	(-0.10)	(0.98)	(0.90)
2	0.27	0.14	-1.90	0.51	0.31
	(0.56)	(0.21)	(-1.37)	(0.55)	(0.29)
3	0.79	-0.75	0.04	0.63	-0.67
	(1.33)	(-0.97)	(0.03)	(0.83)	(-0.91)
4	-1.03	-0.61	0.03	0.01	-0.37
	(-1.23)	(-0.92)	(0.03)	(0.01)	(-0.44)
Big	0.16	-0.33	-0.43	-0.80	-0.66
	(0.17)	(-0.44)	(-0.77)	(-1.19)	(-0.54)
			Post-trade Returns (+2,+40)		
Small	1.80	-0.30	-0.83	-4.77**	4.25
	(1.39)	(-0.13)	(-0.39)	(-2.16)	(0.90)
2	1.90	1.28	-1.51	-2.43	-2.19
	(1.44)	(0.69)	(-0.40)	(-0.96)	(-0.77)
3	-1.02	2.04	-0.28	3.54*	1.41
	(-0.63)	(0.97)	(-0.10)	(1.70)	(0.71)
4	-1.76	-1.04	2.40	-0.43	-1.20
	(-0.77)	(-0.57)	(0.88)	(-0.26)	(-0.54)
Big	5.19**	-1.07	-2.31	1.43	3.58
	(2.04)	(-0.52)	(-1.54)	(0.78)	(1.08)

The above table represents cumulative average abnormal returns around directors' share purchases by using event study methodology. The market model coefficients α and β are estimated over days -220 to -41 relative to the event, with FTSE All Share Price Index as the proxy for the market portfolio. The sample includes 7,723 sells. All results are reported relative to directors' share trading announcement day, i.e., the date of the public announcement of directors' share trading. The M/B and size quintiles were formed five days before the announcement dates. If we define t as the event date, then we use t-5 days' M/B and size to form quintiles based on M/B and size. In forming the quintiles, the CARs were sorted first by year according to M/B and size. For each year the CARs were then sorted into quintiles first by M/B and then by size. In doing so, the year effect has been removed from the quintiles. T-statistics are reported in parenthesis. ***, **, * denote significance at the 0.01, 0.05 and 0.1% levels, respectively.

Table 7. Distribution of CARs by Stock and Market Volatility

	Low	2	3	4	High	$P_{High-Low}$	$\chi^2(4)$
Stock volatility Quintiles							
Panel A: Buy							
-40,-2	-1.32***	-3.53***	-5.06***	-3.50***	-8.20***	0.000	30.15***
	(-5.11)	(-13.10)	(-16.41)	(-11.07)	(-12.80)		
-1,+1	0.75***	0.66***	0.85***	0.45***	2.35***	0.000	15.65**
	(10.87)	(7.09)	(8.73)	(3.83)	(12.36)		
+2,+40	2.16***	1.63***	1.01***	2.23***	3.19***	0.000	5.3
	(10.55)	(6.88)	(3.78)	(8.56)	(8.15)		
Panel B: Sell							
-40,-2	5.66***	4.66***	3.77***	4.26***	9.59***	0.024	12.95*
	(6.12)	(5.30)	(4.38)	(4.22)	(6.52)		
-1,+1	0.14	-0.45*	-0.22	-0.49	0.36	0.692	3.44
	(0.81)	(-1.78)	(-0.76)	(-1.55)	(0.69)		
+2,+40	0.14	-0.20	1.09	-0.95	1.15	0.450	3.36
	(0.18)	(-0.29)	(1.29)	(-0.89)	(1.04)		
Market volatility Quintiles							
Panel C: Buy							
-40,-2	-7.49***	-4.93***	-2.69***	-1.16***	-5.36***	0.092	42.90***
	(-20.71)	(-11.08)	(-7.27)	(-3.95)	(-12.18)		
-1,+1	0.76***	0.79***	1.06***	1.02***	1.43***	0.081	3.63
	(7.16)	(6.54)	(8.89)	(8.52)	(10.38)		
+2,+40	0.97***	1.44***	0.45*	3.86***	3.46***	0.000	29.80***
	(3.23)	(4.17)	(1.78)	(17.16)	(13.79)		
Panel D: Sell							
-40,-2	7.46***	6.29***	5.86***	5.07***	3.30***	0.018	8.78*
	(4.94)	(6.88)	(5.75)	(6.05)	(3.77)		
-1,+1	-0.59	0.24	-0.17	0.15	-0.27	0.496	3.44
	(-1.61)	(0.66)	(-0.63)	(0.42)	(-0.91)		
+2,+40	-1.62	-1.66	0.41	2.21***	1.89***	0.007	16.42**
	(-1.45)	(-1.51)	(0.52)	(3.02)	(2.93)		

The above table represents cumulative average abnormal returns around directors' share trading by using event study methodology. The market model coefficients α and β are estimated over days -220 to -41 relative to the event, with FTSE All Share Price Index as the proxy for the market portfolio. The full sample includes 33,991 directors' trades in 2,664 listed companies, split into 26,268 purchases and 7,723 sells. All results are reported relative to directors' share trading announcement day, i.e., the date of the public announcement of directors' share trading. Stock Volatility is the standard deviation of stock returns over -240 to -41 days and Market Volatility is the standard deviation of market returns over -240 to -41 days. In forming stock volatility quintiles, CARs are sorted by stock volatility. In forming market volatility quintiles, CARs are sorted by market volatility. $P_{low-high}$ reports the p value of the mean difference test between CARs from the highest volatility vs. lowest volatility quintiles. The last column reports the chi-square test for differences in means across size quintiles. T-statistics are reported under the CARs. ***, **, * denote significance at the 0.01, 0.05 and 0.1% levels, respectively.

Table 8. OLS Results on CARs

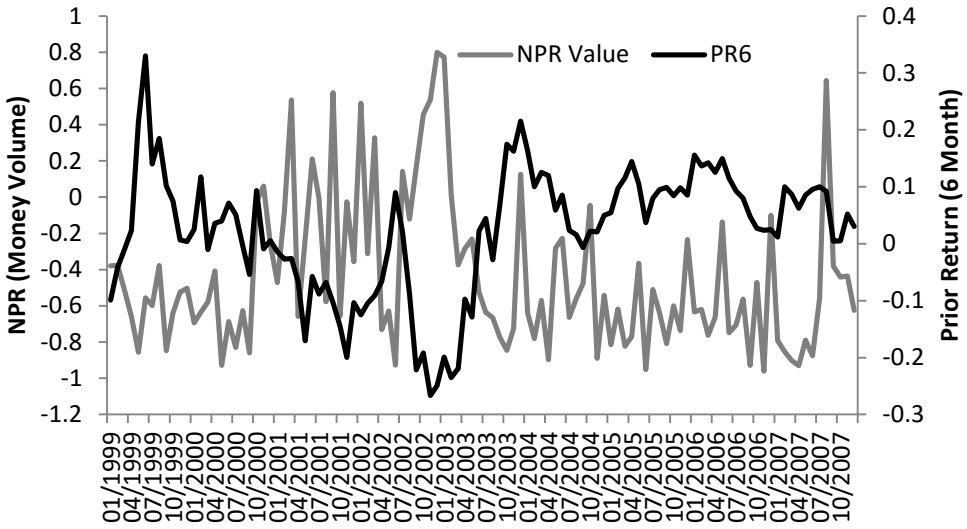
	Panel A: Buy Trades				**Panel B: Sell Trades**			
	$CAR_{-1,+1}$		**$CAR_{+2,+40}$**		**$CAR_{-1,+1}$**		**$CAR_{+2,+40}$**	
	Model 1	**Model 2**	**Model 1**	**Model 2**	**Model 1**	**Model 2**	**Model 1**	**Model 2**
Intercept	0.003	-0.005	0.003	-0.085***	0.003	0.002	-0.052*	-0.048*
	(0.79)	(-0.37)	(0.11)	(-2.39)	(0.25)	(0.29)	(-1.76)	(-1.89)
Size	-0.003***	-0.003***	-0.004**	-0.004**	-0.005	-0.006	-0.004***	-0.004**
	(-5.27)	(-5.09)	(-2.23)	(-2.23)	(-0.84)	(-0.74)	(-2.92)	(-2.25)
Market-to-book	-0.001*	-0.003*	-0.007	-0.007*	-0.001	-0.003	0.002*	0.001*
	(-1.94)	(-2.36)	(-1.61)	-(1.80)	(-0.57)	(-0.64)	(1.74)	(1.65)
Stock Volatility	0.518***	0.510***	0.840***	0.789***	0.075	0.073	0.553	0.353
	(4.80)	(3.13)	(2.52)	(2.36)	(0.25)	(0.31)	(0.54)	(0.46)
Market Volatility	0.353	0.838	0.29***	0.523***	0.414	0.264	0.852***	0.912***
	(0.60)	(1.06)	(3.17)	(5.42)	(0.45)	(0.41)	(4.54)	(4.52)
BB Dummy	0.001	--	0.008	--	0.003	--	0.002	--
	(0.44)		(1.25)		(0.57)		(0.52)	
Industry Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummy	--	Yes	--	Yes	--	Yes	--	Yes
Adj. R^2	0.053	0.053	0.042	0.033	0.035	0.020	0.022	0.022
F (Probability)	5.72 (0.00)	5.40(0.00)	3.53(0.00)	3.73(0.00)	0.46 (0.81)	0.38(0.85)	5.06 (0.00)	4.59 (0.00)
Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

The above table reports the regression results using the following model.

$$CAR_j = \alpha + \beta_1 Ln(Size)_j + \beta_2 M/B_j + \beta_3 StockVol_j + \beta_4 MktVol_j + \kappa BBDum + \gamma Year + \theta Industry$$

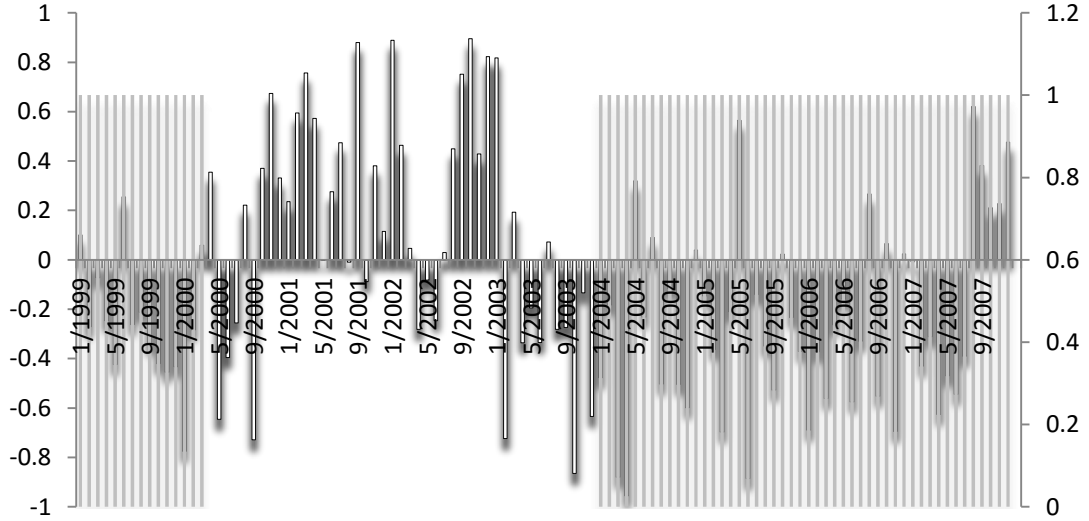
where, $CAR_{j,t}$ is the CAR of insider trades for the (-1,+1) and (+2,+40) event windows. Model 1 is the model with a bull (bear) dummy and industry dummy and model 2 is the model with a year dummy and industry dummy. *Size is* the natural logarithm of the market value of equity, *Market-to-book* is the ratio of market-to-book value of equity. *Stock Volatility* is the volatility of a stock measured by the standard deviation over 180 days prior to the event. *Mkt Volatility* is the volatility of the market measured by the standard deviation over 180 days prior to the event. The BB dummy is 1 if the trade is from the bull period (January 1999 - March 2000 and January 2004 - December 2007) and 0 otherwise. White heteroskedasticity consistent t-statistics are reported in parenthesis. The last row reports F-statistics with p-values in parenthesis next to them. ***, ** and * indicate significance at 1, 5 and 10% levels, respectively.

Figure 1. Monthly NPR and Market Returns



This figure represents a time series of net purchase ratio (*NPR Value*) and 6-month prior return (*PR6*) for each month from January 1999 through December 2007. For each month, we calculate the total Pound Sterling volume (and the total numbers of) insider purchases and sells. We then calculate the *NPR* by dividing the net aggregate value of insider purchases by the total aggregate value of insider transactions. Prior Returns (PR6) represents the FTSE All Share Price Index returns over the 6 months before the trade.

Figure 2. Aggregate Insider Trading and Bull (Bear) Market



This figure represents a time series of NPR for each month from January 1999 through December 2007. The shaded region is the bull market and contains two periods (January 1999 through March 2000 and January 2004 through December 2007). For each month, we calculate the total numbers of (and the total Pound Sterling volume) insider purchases and sells. We then calculate the NPR by dividing the net aggregate number of insider purchases by the total aggregate number of insider transactions.