The Informative Content of CEO and CFO Insider Trading: New Evidence from the Financial Crisis

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12 April 2013

Abstract

This paper investigates the impact of CEO and CFO insider purchases on stock returns. The analysis distinguishes between the opportunistic and routine trades made before, during and after the financial crisis of 2007-2008. The results suggest that the informative content of insider trading is weaker than what prior research suggests. The returns on purchases are stronger in the short term and CEO purchases are on the whole more informative than CFO purchases. Finally, we find that the opportunistic trades are generally more informative but there is no evidence for the positive impact of opportunistic purchases on returns during the crisis.

Keywords: CEO, CFO, insider trading, managerial characteristics, financial crisis.

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I. Introduction

This paper investigates the relation between insider trading and subsequent stock returns. Prior studies of insider trading show that insiders generally earn abnormal returns on their trades, which is taken as evidence that insiders have superior information about a firm's future performance and earnings realizations. There is also evidence that insiders trade on the basis of their contrarian beliefs, buying (selling) undervalued (overvalued) shares in an attempt to take advantage of any perceived misvaluation (Jiang and Zaman (2010), Piotroski and Roulstone (2005), Rozeff and Zaman (1998)). There are reasons why insider trading is recognized as an important source of information and outsiders expect insider transactions to be informative. For example, company directors, in particular the executives, are better informed about the operating and financing characteristics of their firms. They are also able to realize more quickly than others the changes in business conditions and fundamentals, which can affect the firm's future cash flows and its current valuation.

Early research on insider trading considers the short-term market reaction and provides evidence of abnormal returns on aggregate insider trading (Finnerty (1976), Jaffe (1974), Seyhun (1986), Seyhun (1988)). This earlier strand of the literature was followed by research that focuses on the long-term impact, providing similar evidence with regard to the profitability of insider trading (Lakonishok and Lee (2001)). The findings suggest that the predictive power of insider trades regarding the future market returns is high, which is generally seen as evidence for insiders' informational advantage.

More recently, the informative content and trading performance of different types of directors have been considered in the literature. It is argued that the returns following the transactions by insiders may depend on the position they hold within the firm. For example, in a

study of US companies, focusing on the trades made by CEOs and CFOs, Wang, Shin and Francis (2012) provide strong evidence that CFOs earn significantly greater returns from their purchases of company shares than CEOs. They argue that trades made by CFOs reveal more information about future stock returns. Also, Ravina and Sapienza (2010) examine the impact of purchase transactions made by independent company directors. They find that positive abnormal returns, which independent directors earn when they purchase their company stock, are not significantly different from those earned by the firm's executive directors. Fidrmuc, Goergen and Renneboog (2006) also report positive abnormal returns on insider purchases for UK firms. However, they find that the market's positive reaction to the trades made by CEOs is lower than it is for other directors.

In a similar vein to Wang, Shin and Francis (2012), we investigate the informative content of trades made by CEOs and CFOs by examining the impact of their purchases on stock returns. In doing so we note that they are the most informed directors about the issues relevant to firm value, while we assume the ability to convey and trade on information varies between these two executives. Although the market perceives their trades as a signal of superior information, the information content of their trades, and hence the impact on prices, are likely to differ. The argument and evidence on the extent to which the returns on their trades diverge are, however, mixed. On the one hand, it is recognized that, in comparison to CFOs, CEOs are higher in the corporate hierarchy and usually have superior insights into the firm's affairs. Therefore, CEO insider transactions are potentially more informative than CFO trading (Lin and Howe (1990), Seyhun (1986)). On the other hand, it is argued that CFO trades may be more informative because CEOs are more closely scrutinized by the market and hence may be more reluctant to trade using their informational advantage over outsiders. In contrast, CFOs would be more

willing to exploit their superior information by trading, which makes their transactions more informative and closely related to future earnings and returns (Wang, Shin and Francis (2012)).

We extend the analysis of Wang, Shin and Francis (2012) in two main ways. Firstly, we note that insider trading is not homogenous in that trades can be made opportunistically or routinely. In line with the analysis of Cohen, Malloy and Pomorski (2012), we argue that routinely made trades are less informative as they are more predictable. Accordingly, they are expected to signal little information because of their regular occurrence. On the other hand, opportunistic trades reveal more information about future returns and consequently lead to a stronger relation between insider trades and the subsequent market returns.

Secondly, we incorporate the view that the predictive power of insider trades is likely to vary over time with market-wide changes and macroeconomic shocks. We argue that if the information content of director trades depends on the degree of informational asymmetry between insiders and outsiders, then the severity of asymmetric information, and hence the impact of private information on returns, should be greater during and after the recent global financial crisis. To test this hypothesis, we derive results for three distinct periods. Specifically, we test whether the predicted relation between insider trading and market-adjusted returns changes between the normal times, captured by the trades during the period from 2000 to 2006, and the crisis period from 2007 to 2008. Additionally, we consider the period from 2009 to 2010 as the post-crisis period. The crisis period is of special importance as the degree of the information asymmetry between insiders and outsiders is likely to be more severe, which possibly makes the insider trading more relevant and valuable. On the other hand, it is possible that outside investors may be more suspicious of the insiders' motives when they trade during the crisis period, which is generally characterized by lower stock prices and higher pressure on

the executive directors to perform. It is also likely that the trades of the executive directors during abnormal times are more contrarian rather than initiated by superior information.

Our analysis of CEO and CFO trades differs from prior research also in terms of the additional factors we incorporate in the analysis as the potential determinants of insider trading returns. We focus on two important groups of variables, namely managerial characteristics and the corporate governance attributes of firms. Furthermore, in our empirical specification we control for several firm-specific variables including size, book-to-market and information on past returns. Including a rich set of control variables not only allows us to provide further insights into the determinants of returns from insider trading, but also minimizes the omitted variable bias which may arise in the empirical analysis.

We consider four important characteristics of trading directors regarding the relation between trades and subsequent stock returns. First, we argue that managers with longer tenure in their firms are more likely to have superior knowledge about the firm's prospects and the internal processes within the firm, leading them to have greater power and influence in the company. However, the likely impact of tenure on the informative content of insider trading is not clear-cut. The impact may be positive as tenure improves access to relevant information (Bebchuk, Grinstein and Peyer (2010)). Nevertheless, the effect may also be negative as longer tenure is likely to lead to excessive managerial power, which in turn may be perceived negatively by the market. The second director feature included in our analysis is the equity ownership held by the trading executive. It is argued that greater equity ownership not only increases the ability of directors to influence firm decisions, but also provides them with more flexibility to trade (Denis, Denis and Sarin (1997), Eckbo and Thorburn (2003)). To the extent that this happens, we expect that the informative content of director transactions increases with higher equity ownership.

However, as also discussed in Fidrmuc, Goergen and Renneboog (2006), an increase in the equity ownership of directors would not significantly impact the informative content of purchase transactions if it is made by executives who already hold large stakes. Two further managerial characteristics we include in our empirical specification relate to the amount of time directors have before their retirement and the number of previous trades each trading director makes in the firm prior to the current transaction. Both variables can potentially reflect director experience and add the sophistication of executives to take more risks in their decision-making, which in turn may affect the realized returns and the reaction of the market to trading.

Corporate governance literature suggests several mechanisms that can limit the adverse effects of the information asymmetry between insiders and outsiders in the presence of costly agency incentives. In this paper we consider three corporate governance characteristics which may affect the informativeness of insider trading and its impact on returns, namely board size, board independence and institutional ownership concentration. A positive relation is expected between board size and the effective monitoring of executives as a greater number of board members is expected to increase both the quantity and quality of advice and expertise they provide firms with (Pearce and Zahra (1991)). Acharya and Johnson (2010) analyze the impact of the number of insiders on the frequency of their trades and suggest that a greater number of insiders lead to more insider trading. Even if large boards are less effective in monitoring corporate financial decision-making they are expected to be more effective in terms of decreasing the information gap between insiders and outsiders. Hence, to the extent that larger boards increase the possibility of superior information being shared by others, it is possible that board size has a negative impact on the informative content of CEO and CFO trades.

Another aspect of corporate governance that may influence the returns on insider trading relates to board independence. We argue that the monitoring of executive directors in firms with less independent boards is weaker. This in turn makes it more likely for executive directors to use private information and generate abnormal returns. Accordingly, a negative relation is expected between the returns from director trades and board independence. However, non-executive directors may choose to play a less confrontational role as they lack sufficient incentives to provide an effective monitoring of executives. Furthermore, the reduced ability of corporate governance codes to enforce the duties of directors may cause non-executive directors to be less active. To the extent that this happens, the impact of non-executives on the returns from insider trading can be weaker or insignificant.

The last corporate governance attribute we incorporate in our analysis is the institutional ownership concentration. There are mainly two reasons that justify the influence of large institutional investors on the profitability of director trades. First, large investors have greater voting power as well as more incentives to monitor management, promoting a good corporate governance (Agrawal and Knoeber (1996), Shleifer and Vishny (1997)). Second, institutional investors are better than other investors at collecting and processing information, which will equip them with an informational advantage over other investors. Although they may also trade on the basis of noise, they are expected to make their decisions based on relevant and superior information (Ke and Petroni (2004), Yan and Zhang (2009)). Therefore, in the presence of large shareholders the degree of information asymmetry between insiders and outsiders is likely to be reduced, resulting in a lower predictive power of the insider trading and smaller profitability. In this respect, insider trading and institutional ownership concentration are substitutes in conveying information to the capital markets.

In examining the informative content of insider trading, we also control for firm-specific characteristics including size, growth opportunities, industry and past returns, which can influence stock returns irrespective of the identity of the trader. To this end, based on previous research, which shows that managers may exhibit contrarian behavior (Lakonishok and Lee (2001), Rozeff and Zaman (1998)), we expect a negative relation between the past returns and the subsequent returns on purchase transactions. The profitability of insider trading will also depend on firm size. In larger firms the scrutiny of investors is much greater, which reduces the informational advantage of executives. Moreover, in smaller firms the ability of top executives to access valuable information is greater. Hence, we expect an inverse relation between firm size and the profitability of insider trading (Jeng, Metrick and Zeckhauser (1999), Seyhun (1986)). The next control variable used in the study is book-to-market ratio, which is a proxy for the firm's growth opportunities, and is generally taken as a predictor of future stock returns (Fama and French (1995)). It is expected that the book-to-market ratio will exert a positive impact on returns from insider trading by executives.

Our sample consists of 10,230 insider transactions executed in 679 UK firms by 1,477 top executives during the period from 2000 to 2010. We find that the subsequent market-adjusted returns to insider purchase transactions are generally positive. However, the findings also reveal that the positive returns to insider trading are much weaker in the longer term than the short-term market adjusted returns. This possibly suggests that the informative content of the trades by CEOs and CFOs is less significant than the market's perception of how informative they are. Our initial findings imply that there are no significant differences between opportunistic and routine trades. Nonetheless, the results change when we distinguish between opportunistic and routine trades made by both types of executives and carry out the analysis for different sub-periods.

More specifically, the findings indicate that the opportunistic trades made by both CEOs and CFOs are more informative than the routine ones in the longer term, but only in the post-crisis period. We can't provide any evidence supporting the view that opportunistic trades would be more informative during the crisis as they reduce the severity of asymmetric information between insiders and outsiders. If anything, the market reacts more positively to routine trades in the short term, in particular to the routine trades made by CEOs. Moreover, the longer-term market-adjusted returns associated with CEO opportunistic trades are significantly lower. Overall, the strongest results we can provide for the positive impact of insider purchases on returns relates to those trades made by the CEOs in the post-crisis period. We also find that the market-adjusted returns seem to increase with the size of trade and decrease with greater external affiliations and the number of past trades. Among the corporate governance characteristics included in the analysis, board independence affects the returns positively during the crisis and negatively in the post-crisis period. The latter finding possibly suggests that board independence and insider purchases are substitutes in reducing the information asymmetry between insiders and outsiders.

This paper contributes to the literature on the informative content of insider trading in several main ways. Firstly, the analysis of the paper extends the recent studies of Wang, Shin and Francis (2012) and Cohen, Malloy and Pomorski (2012) by unifying their analyses in a framework that allows us to distinguish not only between the CEO and CFO purchase transactions but also whether their trades are opportunistic or routine. Also, differently from both studies, we incorporate in the empirical analysis important managerial and corporate governance characteristics, which may have an effect on returns subsequent to director purchases. Including them in the analysis enables us to control for the potential role they may play as an additional

channel of information and a tool to reduce the consequences of asymmetric information between insiders and outsiders. Secondly, the empirical analysis is carried out in the period that covers the recent financial crisis period and its immediate aftermath. Each prediction is tested for the whole sample as well as separately for three sub-periods to investigate whether the findings of earlier research change with the experience of the recent global financial crisis. Consequently, one of the important insights of the paper is that considering the impact of director dealings on stock returns in isolation may lead to misleading inferences regarding the informative content of insider trading. Our unique sample covering the period from 2000 to 2010, and a large number of transactions made by both CEOs and CFOs, enable us to identify the circumstances in which inside transactions are more, or less, likely to be informative. To the best of our knowledge, this paper provides the first attempt that combines in the same framework the identity and personal attributes of trading executive directors, firm-level corporate governance features, the nature of purchase transactions, and the trading period characteristic. Last but not least, our analysis makes a clear distinction between the immediate and gradual reaction to insider trading by considering both the short-term market reaction to insider trading and the long-term informativeness of the trade carried by CEOs and CFOs.

The remainder of the paper proceeds as follows. In the next section we discuss our data. Section 3 provides the descriptive and univariate analysis of the returns to insider trading. In Section 4, we discuss the regression results. Section 5 concludes the paper.

II. Data

Our primary data on insider trades are collected from the Morningstar UK (previously called Hemmington Scott) database, which provides information on trade characteristics (i.e. type, size,

date) and the identity of trading directors (i.e. name, role). The database also provides information on the equity ownership of insiders prior to their transactions. Additional information on the managerial and corporate governance characteristics used in the analysis are sourced from BoardEx. To merge the information from different sources, in addition to the names and the role titles of executives, we use International Securities Identification Numbers (ISIN). Using ISINs and financial data provided by Datastream (Thomson Reuters) we follow analyzed securities for up to 90 days before and after each transaction. All the returns used in the regression analysis are market-adjusted, and the FTSE All-Share index is used for the adjustment. In line with the majority of earlier research, we base our analysis only on open purchases. All other types of insider transactions (e.g., exercises of options, private purchases and sales, shares acquired through compensation) are excluded. Our analysis is focused on purchases as they are more likely to represent actions taken as a result of private information. In our analysis, we differentiate between routine and opportunistic trades for both CEOs and CFOs by classifying the insider transaction as routine if an executive director trades in the same month over the past three consecutive years prior to the transaction that is considered. Otherwise, the trade is classified as opportunistic.

Several sample selection criteria are applied. First, in line with previous research (e.g., Fidrmuc, Goergen and Renneboog (2006)), transactions performed by directors of financial institutions (i.e., banks, insurance companies, investment trusts, property investment firms) are excluded. Second, small transactions with a value lower than £10 are excluded to avoid unnecessary noise in the estimation of returns. Furthermore, multiple purchases made by the insider on the same day are combined into a single data point, assuming that they are motivated by the same information.

III. Descriptive and Univariate Analysis

In presenting our descriptive statistics and the results, we consider three sub-periods, as well as reporting results for the whole sample period of 2000 to 2010. The three sub-periods are as follows: 2000-2006 (*pre-crisis*); 2007-2008 (*crisis*); and 2009-2010 (*post-crisis*).

A. Descriptive Analysis of Independent Variables

Table 1 presents a summary of the stages to derive the final sample of firms and directors used in the study. Our initial sample includes 19,298 open-market purchase transactions, of which 10,548 were made by CEOs during the sample period. In our final sample, we have 10,230 observations for purchase transactions in which there are 4,780 and 5,450 purchases carried out by CEOs and CFOs respectively. Of 10,230 purchases, 2,930 transactions are recorded during the crisis period, compared to 2,843 purchases made in the post-crisis period. Furthermore, the final sample used in the empirical analysis provides us with transactions performed by 1,477 distinct executives from 679 different firms. In any sub-periods, we have at least 406 firms and 656 executives to include in the analysis.

[*Insert Tables 1 and 2 here*]

Table 2 provides summary statistics (mean, median and standard deviation) of the variables that are used in the subsequent empirical analysis. We report these statistics across the three sub-periods as defined earlier and by grouping them into firm, corporate governance, managerial, and transaction characteristics. The average (median) book-to-market value during the whole sample period is 0.60 (0.46). However, as would be expected, there are significant differences in these values across different sub-periods. The mean book-to-market value during

the crisis drops to 0.46 whereas in the post-crisis it increases to 0.86, possibly suggesting that there are more value firms during the period following the crisis. The average board size for the total sample is 7.7 and remains similar in the three sub-periods. The average sample firm has 55 percent of their board members as non-executive directors. Notably, the ratio of the number of non-executive directors to total board size, which is an indicator of board independence in our analysis, increases from 53 percent in the pre-crisis period to 58 percent after the crisis. The concentration of institutional ownership, *Inst_Own_Cont*, is relatively stable across the sub-periods with an average value of 22.59 percent for the pre-crisis period and 27.66 and 26.96 percent for the crisis and post-crisis periods respectively. The average (median) concentration for the whole sample is 25.12 (23.15) percent.

Moving on to directors' characteristics, we observe that the average holdings of both CEOs and CFOs increase over time. Specifically, the mean value of CEO (CFO) holdings increases to 2.28 (0.39) percent in the post-crisis period from 1.72 (0.33) percent observed in the pre-crisis period. The findings suggest that on average CEOs have a longer tenure than CFOs in their current firm at the time of their trading. The average tenure for a CEO (CFO) during the sample period is just over 6 (5) years. Furthermore, CEOs are relatively closer to retirement than CFOs, who have on average 2.5 more years than CEOs to retire at the time of their trades. The average number of external affiliations of the trading directors also differs significantly. On average, 21 percent of the CEOs in the sample are linked to another firm as a director, whereas the mean percentage value for the CFOs is only 12. More interestingly, the external affiliations of both director groups decrease during the crisis compared to the pre-crisis period, from 24 (14) for the CEOs (CFOs) to 18 (9) percent. Although the ratio remains unchanged for the CEOs during the post-crisis period, it increases for the CFOs, to a level that is even higher than its pre-

crisis value. The average number of times CEOs and CFOs trade, *Past_Trades*, during the sample period are 7.50 and 9.50 respectively. The frequency of CFO trading is consistently greater than that of CEO trading in all periods. In line with the findings of previous research (Cohen, Malloy and Pomorski (2012)), there are more opportunistic purchases for both executives in all periods. However, while the percentage of opportunistic trades is 68 and 67 percent respectively in the pre-crisis and the crisis periods, it drops to 54 percent during the period following the crisis. This holds for both CEOs (52 percent) and CFOs (55 percent). It is likely that the number of profit-making opportunities during the crisis remains high due to lower market prices and possibly undervalued assets, which may partially explain why the percentage of opportunistic trades remains almost unchanged during this period. Similarly, once the market has corrected itself in the subsequent period, the sharp drop in the ratio of opportunistic to total trades may indicate either an unwillingness of directors to use private information in trading or a lack of relevant private information. We explore these possibilities later in the paper when we analyze the determinants of returns across different periods.

[*Insert Table 3 here*]

In Table 3, we provide further information on the purchase transactions that are made by both types of directors in both types of trade, i.e., opportunistic and routine, during the whole sample and three sub-periods. There are several observations that stem from the analysis of the results reported in the table. First, the value of the average opportunistic trade during the whole sample is much greater, at about £46K, than the average routine trade, which is about £11K. The significant difference in the average transaction values of the two types of trade holds across all sub-periods, where it is the largest during the post-crisis period with the mean value of the routine trades (about £9.9K) being less than 15 percent of that of opportunistic ones (about

£68.8K). Second, comparing the value of the purchase transactions across different periods, we observe that the mean value of transactions increases from £24.7K in the pre-crisis period to £38.7K during the crisis and continues to increase to £41.5K in the post-crisis period. This is despite the fact that the number of purchase transactions drops sharply during the same period from 4,457 in the pre-crisis period to 2,843 in the post-crisis period (see Panel C). Furthermore, while the average value of the opportunistic trade increases by about 127 percent from £30.4K in the pre-crisis period to £68.8K in the post-crisis period, the average routine trade value decreases by about 23 percent during the same period, from £12.8K to 9.9K. Interestingly, this does not hold for the CEO routine trades, whose value increases first sharply during the crisis period, from £10.9K to £15.3K, and then drops again to £11.9K, which is still above the pre-crisis level. The only mean trade value which drops below the corresponding average level of the pre-crisis period is that of the CFO routine trade in which the values are about £14K and £7.9K respectively, representing a drop of about 44 percent. Overall, we conclude that while the volume of purchase trades increases during the sample period the observed increase seems to result from the significant rise in the mean transaction value of opportunistic trades rather than an increase in the number of transactions. Finally, in Panel B of Table 3, we report the value of transactions as a percentage of the market capitalization of firms.

B. Descriptive Analysis of Returns

In Table 4, we present descriptive statistics for market-adjusted returns after the transactions. Starting with Panel A, which reports the returns on all purchase transactions, we observe that the

returns on CEO purchases are always greater than those reported for CFO transactions. For example, the adjusted cumulative returns for 90 trading days after the transaction is about 2.05 percent for CEOs compared to 1.9 percent for CFOs. However, the differences are not unambiguous when we distinguish between the opportunistic and routine trades. While the opportunistic CEO trades always lead to greater market-adjusted returns, the discrepancy between the CEO and CFO routine returns is either not significant (e.g., *RET_10*, *RET_60* and *RET_90*) or different from what we observe for the opportunistic trades. That is, the adjusted cumulative returns for 5 and 90 trading days, *RET_5* and *RET_90*, are lower for the CEOs (0.007 and 1.69 percent respectively) than they are for the CFOs (0.056 and 1.79 percent respectively). The returns for 10 and 60 trading days, *RET_10* and *RET_60*, are very similar for both types of director.

[*Insert Tables 4 and 5 here*]

In Table 5 we provide a more detailed analysis of adjusted returns by focusing on the differences in returns on the CEO and CFO trades across three periods. In doing so, we attempt to see whether the crisis period of 2007 and 2008 makes any difference in the impact of insider trades on the observed stock returns in the subsequent trading days. The findings reported in Table 4 for the whole sample period generally hold in that the opportunistic CEO trades generate greater adjusted returns regardless of the sub-period under consideration.[2] More importantly, when we differentiate between the returns in different periods, we note that the return on routine CEO trades is always positive and greater than the return on CFO trades during the crisis period. Furthermore, the returns on CFO trades during the same period are mostly negative. Also,

[2] The only exception relates to the returns for *RET_60* in the pre-crisis period in which the mean value of CEO opportunistic trades (2.86 percent) is lower than it is for the CFOs (3.18 percent).

importantly, we note that the longer-term routine CEO trade returns (*RET_60* and *RET_90*) are higher than the corresponding opportunistic CEO trades in the crisis period. For example, whereas the average *RET_90* for the CEO opportunistic trades in the crisis period is -2.44 percent, the average *RET_90* value for the CEO routine trades in the same period is about 2.62 percent. In fact, this is the highest adjusted return for any type of trade observed in the crisis period.

Moving on to the return during the post-crisis period, all adjusted opportunistic returns are greater than the corresponding ones in the crisis period. Similarly, the returns on routine CFO trades in the post-crisis period are greater except for *RET_5*. However, the observed returns on routine CEO trades drop significantly in this period in which the shorter-term returns, *RET_5* and *RET_10*, turn negative.

C. Univariate Analysis of the Relation Between Returns and Independent Variables

In Table 6 we provide univariate mean difference tests for the variables used in the empirical analysis using four sub-samples of firms grouped on the basis of the mean value of two different returns, one short-term (*RET_5*) and one longer-term return (*RET_90*). The first quartile in each panel (Q1) represents those firms with the lowest average value of the corresponding return (*RET_5*, or *RET_90)* and the fourth (Q4) with the highest average. Accordingly, the reported mean values are for the sub-groups of firms included in each quartile. Finally, the mean comparison test statistics relate to the mean values of each variable in the first and fourth quartiles. The results for *RET_5* confirm our initial findings that opportunistic and CEO purchases are associated with higher returns. Also, compared to the lowest return quartile, the mean values for the variables *Trade_size* and *Holdings* are significantly greater in the highest return quartile, possibly providing support for the view that the greater the volume of purchase

transactions and directors' holdings prior to the trade, the higher the market-adjusted cumulative returns in the 5 subsequent trading days. However, the average number of previous trades for firms in the highest return quartile (Q4) is lower than that in the lowest return quartile (Q1). The higher number of trades does not necessarily lead to greater returns. As for the relationship between the average values of adjusted returns and directors' characteristics across the first and fourth quartiles, we do not observe a significant association between the adjusted returns and the variable *Retirement*, capturing the number of years directors have to retire at the time of their trade. However, the mean difference tests in relation to the variables *Tenure* and *Affiliations* yield significant results. Specifically, the returns increase with the shorter tenure directors have in the firm and the lower number of external affiliations. Finally, the univariate analysis provides evidence that firms in the highest return quartile have on average smaller boards and a lower percentage of non-executive directors on the board. However, the average concentration of institutional ownership is not significantly different between the first and fourth quartiles.

Conducting a similar analysis using the 90-day cumulative returns yields less meaningful results. The mean difference tests reveal significant results only in relation to three variables. We find that the average amount of time to retirement is shorter for directors in firms with the highest average 90-day returns. Similar to the results for the 5-day cumulative returns, the average ratio of non-executives is significantly lower for the fourth quartile firms. One important difference between the 5-day and 90-day results concerns the institutional ownership concentration, which seems to be significantly higher for firms in the lowest return quartile.

IV. Regression Results

A. The Determinants of Returns – Baseline Model

In Table 7 we report the findings for our baseline model in which the regression results are obtained using the whole sample period. We distinguish between different sub-periods by incorporating period time dummies in the analysis, *Crisis* and *Post-crisis*. In addition to other executive director characteristics, including tenure, time to retirement and external affiliations, we also include dummy variables to test the impact of different types of trade on the observed adjusted returns. Specifically, leaving the routine trades made by CFOs as the baseline group, we examine whether the returns subsequent to opportunistic and routine trades by CEOs and opportunistic trades by CFOs are significantly different from the returns following routine trades by CFOs. We achieve this by including the first three dummy variables in the table. Accordingly, the CFO routine trades that are made in the pre-crisis period serve as the baseline category in the model, captured by the constant term. The regression results relate to four types of return. The first two, *RET_5* and *RET_10*, capture the short-term cumulative market-adjusted returns from insider trading, whereas *RET_60* and *RET_90* are included to reflect the long-term impact of the trades made by directors.

[*Insert Table 7 here*]

Turning to the results, we find that the trades by both CEOs and CFOs lead to positive market-adjusted returns in the short term. Specifically, the 5-day and 10-day returns on CFO routine purchases in the pre-crisis period, captured by the constant term, are positive and significant at the 1% level. The estimated coefficients for the other sub-groups of trades, namely *CEO_Opportunistic*, *CEO_Routine* and *CFO_Opportunistic*, are not statistically different from those estimated for the *CFO_Routine* dummy. The findings suggest that the market perceives inside purchases as informative about the future prospects of the company and reacts accordingly

in the early subsequent days regardless of the type of trade and executive director. However, there is no significant relation between inside purchases and the returns in 60 and 90 days. These results remain unchanged when we change the baseline category to capture, for example, the CEO opportunistic trades in the pre-crisis period.

As we report in the previous section, the returns from CEO purchases and opportunistic trades are generally greater. This is in line with the hypothesis that CEOs are more likely to use private information in their trades than CFOs and their opportunistic trades normally lead to greater returns. Accordingly, we would expect at least the estimated coefficient on the dummy variable identifying the opportunistic trades made by CEOs, *CEO_opportunistic*, to be positively and significantly different from the constant term, which is not the case.

Although the different types of purchase do not reveal significant differences, transaction size (*Trade_Size*) and the number of previous trades (*Past_Trade)* by directors affect the adjusted returns, albeit differently. All market-adjusted returns are significantly greater for larger transactions, suggesting that the size of purchases made by directors impacts the market's perception of how significant inside purchases are, supported by the results in relation to RET_5 and RET_10, and how informative they are, supported by the results in relation to RET_60 and RET_90. However, the number of previous trades does not seem to increase the informativeness of purchases. The greater the number of purchases made by directors, the lower the return they lead to in the short term, while the impact is insignificant in the medium term. Similarly, we find mixed results in relation to the director characteristics we include in the analysis. The holdings of directors prior to the transaction do not affect the subsequent returns. On the other hand, the amount of time they sit on the board, *Tenure*, has a significant impact only on the return in 5 days and the impact is negative. It has no bearing on longer subsequent

returns. We have similar results with respect to the time to retirement. The longer the time to retirement, the lower the effect we observe on subsequent returns, and the relation is significant only for 5-day returns. This is not in line with what we would normally expect to hold. To the extent that directors with less time to retirement are expected to be more experienced but more cautious, when they trade they are more likely to do so relying on relevant information, which makes their trade more informative. The only director characteristic that seems to be relevant in the medium term relates to their outside experience. The adjusted returns on the trades made by directors who have external affiliations are lower, reflected in the negative and significant estimated coefficients for 60- and 90-day returns. On the other hand, outside experience, in terms of additional outside commitments, has no impact on short-term returns.

Purchases in value firms with higher book-to-market ratios lead to positive and significant adjusted returns both in the short term and in the long term. It seems that executive directors have superior information about the market value of their companies supported by the stronger results (both economically and significantly) with regard to long-term returns. The findings for firm size are mixed. Although the adjusted returns are insignificant in the short term, it seems that purchases in larger firms are informative reflected in the positive and significant estimated coefficients for 60-day and 90-day returns.

Although we do not test directly the hypothesis that the behavior of directors is contrarian, we provide some evidence that there is a relation between the short-term returns on director purchases and the returns observed prior to their trades. Purchases made by directors following higher past 30- and 90-day returns lead to negative adjusted returns in the short term with no significant impact in the long term. Similarly, those purchases following negative recent returns lead to gains above the market return in the short term.

Turning to the findings on the relation between corporate governance characteristics and the market-adjusted returns, we find that board characteristics and institutional ownership play a limited role in determining the returns subsequent to inside purchases. Purchases by directors sitting on larger boards lead to smaller-than-the-market returns in 5 days with no significant impact on other returns. Moreover, board independence, proxied by the ratio of non-executive directors to the total number of directors on the board, does not impact the adjusted returns except in the long term and only for 90-day returns. Purchases by directors in firms with more independent boards are associated with negative adjusted returns in the long term. To the extent that board independence is a desirable and effective corporate governance feature, the executive directors have limited or no ability to access private (superior) information in companies with more independent directors and any attempts to gain from trading in those companies do not pay off. Similarly, purchases in the companies with greater concentration of institutional ownership lead to negative adjusted returns in the short term and no significant gains or losses in the long term. We do not investigate this issue further, but one possibility for the negative short-term impact of purchases may be that the market perceives director purchases as an attempt to impact the perception of the company favorably, which is ineffective as it is less likely that trading directors will use private information in their trades. This is also supported by the insignificant estimated coefficients of the institutional ownership variable for longer-term returns.

Finally, in line with our earlier descriptive results, the adjusted returns associated with purchases during the crisis period of 2007 and 2008 are significantly lower than those in the pre-crisis period. However, the post-crisis and the pre-crisis period returns are similar except for the average 90-day adjusted return. During the post-crisis period, purchases made by directors are

associated with lower market-adjusted returns in the long term compared to the pre-crisis period. We will explore the differences across different sub-periods further in the next section.

B. The Determinants of Returns in the Sub-periods

Although the above analysis controls for the possibility that adjusted returns differ across different periods, and in particular the returns during the crisis period may be significantly different, it does not allow the impact of the determinants of adjusted returns to change between the periods. In Table 8 we estimate the same model for three different sub-periods to test whether the results change across different sub-periods, as defined earlier.[3]

[*Insert Table 8 here*]

The results for the pre-crisis period are overall similar to those provided for the baseline model in Table 7. More specifically, the adjusted returns subsequent to purchase transactions are positive and significant in the short term and purchases do not seem to be informative in the long term. Whether trades are opportunistic or routine and made by CEOs or CFOs does not seem to matter. One noticeable change in the results, however, is that the estimated impact of transaction size is positive and significant for all returns both in the short term and in the long term during the pre-crisis period. That is, the market reacts positively to larger purchases and they seem to be informative.

The results regarding the crisis period reveal several important differences. First, the routine purchases made by CEOs are more informative than all other purchase transactions. The estimated coefficient of *CEO_Routine* is positive and significant only for 90-day returns. The

[3] We focus on director, trade and corporate governance characteristics and hence do not report in the following tables the findings in relation to firm-specific characteristics and the past returns for brevity. However, the results are available upon request.

findings reveal that the CEO routine purchases yield a market-adjusted return in 90 days which is 2.71 percent more than the routine purchases made by CFOs. There is some evidence that opportunistic trades are neither well received by the market in the short term nor informative in the long term during the crisis. Although the results are insignificant, the estimated coefficients associated with opportunistic trades are negative regardless of the return and the executive. Second, in the crisis period the importance of transaction size and the number of previous trades are reduced substantially. Third, moving to the results for the director characteristics, we find that the time directors spend on the board affects the adjusted returns in the long term negatively. The negative and significant results regarding the variable which is proxy for the board experience of directors are more difficult to explain for the long-term adjusted returns. In contrast to the pre-crisis period, when purchases are made by directors who have other board experience the adjusted returns for all types are insignificant, reflected in the estimated coefficient of the variable *Affiliations*. However, the amount of time directors have to retire exerts a significant effect for returns both in the short term and the long term. The longer the amount of time to retire, or in other words the younger the executive is, the less likely that the inside purchase is informative. To the extent that this variable also captures the experience and age of directors, the findings are in line with the view that more experienced directors are more likely to access private information and use it in trading. Finally, our results suggest that the influence of corporate governance characteristics of firms on the adjusted returns from inside purchases changes during the crisis period. What seems to matter most as a governance mechanism that affects returns is the degree of board independence. The findings reveal that inside purchases by directors of firms in which there are relatively more independent directors are likely to be more informative in the long term. The positive relation between board

independence and adjusted returns may be seen to be at odds with the view that the likelihood of directors having private information and using it in their trading is lower in a *good* corporate governance environment. Accordingly, board independence, a corporate governance feature regarded as desirable, should not lead to positive market-adjusted returns subsequent to director transactions. On the contrary, the relationship is normally expected to be negative. As for the effect of institutional ownership on adjusted returns during the crisis, we find that the negative effect, albeit moderate, that we observe in the pre-crisis period recedes largely in the crisis years.

Finally, in Table 8 we present the regression results in the post-crisis period, which provide us with stronger results than the findings reported for the earlier periods. First, it is clear that the opportunistic purchases made by CEOs and CFOs generally lead to greater returns in the long term. Also, the market reacts positively to inside trades in the short term as evidenced by the significant constant term for *RET_5*. The findings imply that the market-adjusted returns on routine trades made by CFOs are positive, albeit significant only for *RET_5*, and the returns on other types of trade are not significantly different. This provides some evidence on the relevance of inside trades at least in the short term. However, findings regarding the informativeness of purchases in the long term are unambiguous. The cumulative adjusted returns on the opportunistic trades by both CEOs and CFOs after transactions over 60 and 90 days are significantly higher. More importantly, the CEO opportunistic trades in the post-crisis period yield greater returns than those made by CFOs. Specifically, the adjusted returns from CEO (CFO) opportunistic trades in 60 and 90 days are respectively about 4.25 and 6.63 (3.62 and 4.98) percent greater than the return on CFO routine trades. The difference between CEO and CFO returns during these subsequent trading days is 0.63 percent in 60 days and 1.65 percent in 90 trading days. Overall, the findings are strongly in favor of the opportunistic trades by both

directors for their ability to convey relevant information to the market, with some evidence that CEO opportunistic trades are more effective in doing so.

Another important finding in Table 8 relates to the impact of board independence. Contrary to the positive effect it has on returns during the crisis period, the role of board independence in determining the returns associated with purchase transactions in the post-crisis period seems to have changed substantially. There is strong evidence that the returns after directors purchase stocks are significantly lower in firms in which board independence is stronger. By the same token, it can be argued that the returns and hence the informativeness of purchases are greater when board independence is weakened. This implies that board independence is an effective mechanism in mitigating the asymmetric information between insiders and outsiders, which renders the trades by insiders much less informative. In that sense, it is a substitute for the role played by insider trading in conveying private information, and directors can neither signal private information to outsiders nor profit from their trades.

C. Regression Results for CEOs and CFOs in Sub-periods

So far we have examined both CEO and CFO trades together by only distinguishing between the directors in the analysis with respect to the nature of their trades, i.e., whether the trade is opportunistic or routine. That approach allowed us to some extent to test whether the effects on the market-adjusted returns of the trades by CEOs and CFOs depend on a specific period and the type of the trade. Although this is a useful analysis and provides us with important insights into the differences between the trades by the two executives, it is limited in its ability to investigate whether the influence of other control variables is also dependent upon who makes the trade and when. In what follows, in each sub-period we separate CEO and CFO purchases and estimate the empirical model for each subset of the sample. In doing so, we are able to compare the effect of

each characteristic on returns across different periods and executives. We also incorporate appropriate dummy variables to incorporate the potential differences in the effects of the opportunistic and routine trades on returns.

[*Insert Tables 9 and 10 here*]

Our results for the pre-crisis trades, which are not reported for brevity, confirm what we have already shown so far. That is, purchases generally lead to positive returns in the short term and the returns from opportunistic trades are not significantly different from those of the routine ones. We can't therefore provide evidence for the view that inside purchases are informative in the long term during the pre-crisis period. In other words, our results support the hypothesis that purchases are better predictors of future stock returns. However, the results suggest that there are differences between the CEO and CFO trades. The estimated coefficients for the constant term for the pre-crisis period indicate that the purchase transactions made by CFOs during this period are more likely to lead to positive and significant adjusted returns. However, as the results presented in Table 9 reveal, during the crisis period only the purchases made by CEOs lead to positive and significant market-adjusted returns and there is no significant difference between the opportunistic and routine trade returns. Also, importantly, the subsequent returns on opportunistic trades are negative for both groups of directors, with the difference that the CEO opportunistic purchases lead to much lower returns in the long term than both the CFO opportunistic purchases and the CEO routine ones. Nevertheless, the results in the post-crisis period, reported in Table 10, diverge considerably. The adjusted returns on routine purchases made by both directors are not statistically significant except for the CFO trades in 5 days, which is positive but significant at the 5% level. On the other hand, the opportunistic purchases made by CEOs during this period lead to significantly greater returns in the long term compared to the

returns from the CEO routine trades. As for the CFO opportunistic purchases, only the return in the 90-day window is positive and significant, providing some evidence for the view that CFO opportunistic purchases are more informative than the routine ones.

Turning to the results in the tables regarding the impact of other control variables on the returns, there are several important observations to mention. Starting with the effects of director characteristics on returns, we find that they are far more important during the crisis and in the post-crisis period in determining the returns. However, CFO (CEO) characteristics seem to matter more in the crisis (post-crisis) period. For example, the holdings of CEOs prior to transactions, *Holdings*, and whether they have board membership in other companies, *Affiliations*, do not play a role in determining the subsequent returns. On the contrary, both variables are negatively significant for CFO purchases for the majority of the returns in which the findings for *Affiliations* are stronger and consistent. Interestingly, neither of the variables are significant in the post-crisis period for either of the directors. The effect of the amount of time to retirement is generally negative, albeit not always statistically significant, for both CEOs and CFOs in the crisis period and significantly negative in the post-crisis period only for CEOs. This is in line with the finding in relation to the board experience of directors. It exerts a positive impact on the long-term returns only for CEOs in the post-crisis period, suggesting that the subsequent returns are greater when they are made by the executives, but in particular by CEOs, with longer board experience and less time to retirement.

Turning to the corporate governance findings, in both the crisis and post-crisis periods board size becomes irrelevant for purchases made by both director groups, whereas board independence plays an important role in affecting returns both in the short and long terms, though quite differently across the two periods and director types. The findings reveal that the

returns on CEO purchases during the crisis are positively greater when the purchases are made by the CEOs in firms with more independent boards. On the contrary, board independence does not seem to matter for CFO trades. In the post-crisis period, however, we observe the opposite. First, the impact of board independence on returns on CEO purchases turns negative but statistically insignificant. Second, there is very strong evidence for the negative impact board independence exerts on returns subsequent to CFO purchases. Purchases made by CFOs in firms with a relatively greater number of non-executive directors lead to significantly lower returns. Put differently, it seems that CFO purchases are informative only in firms where board independence is restricted.

V. Conclusions

The objective of this paper is to investigate the impact of CEO and CFO insider purchases on stock returns. Using a large sample of insider transactions carried out by executive directors in the UK during the period from 2000 to 2010, our analysis shows that director characteristics and the position that directors hold in the firm can partially explain the market-adjusted returns on insider trading. We find that the subsequent market-adjusted returns to insider purchase transactions are generally positive. The findings also reveal that the positive abnormal returns are much weaker in the longer term, suggesting that the informative content of the trades by CEOs and CFOs is less significant than the market's perception of how informative they are. When we distinguish between opportunistic and routine trades made by both types of executive and carry out the analysis for different sub-periods, the findings indicate that the opportunistic trades made by both CEOs and CFOs are more informative than the routine ones in the longer term. However, this result holds only in the post-crisis period. There is no evidence to support the view

that opportunistic trades are more informative during the crisis. On the contrary, our analysis shows that the market reacts more positively to routine trades in the short term, in particular to the routine trades made by CEOs. Overall, the strongest results we can provide for the positive impact of insider purchases on returns relate to the trades made by the CEOs in the post-crisis period. We also find that the market-adjusted returns increase with the size of trade and decrease with greater external affiliations and the number of past trades. Among the corporate governance characteristics, board independence affects the returns positively during the crisis and negatively in the post-crisis period.

References

Acharya, V. V., and T. C. Johnson. "More Insiders, More Insider Trading: Evidence from Private-equity Buyouts." *Journal of Financial Economics,* 98 (2010), 500–523.

Agrawal, A., and C. R. Knoeber. "Firm Performance and Mechanisms to Control Agency Problems between Managers and Shareholders." *Journal of Financial and Quantitative Analysis,* 31 (1996), 377–397.

Bebchuk, L. A., Y. Grinstein, and U. Peyer. "Lucky CEOs and Lucky Directors." *The Journal of Finance,* 65 (2010), 2363–2401.

Cohen, L., C. Malloy, and L. Pomorski. "Decoding Insider Information." *Journal of Finance,* 67 (2012), 1009–1043.

Denis, D. J., D. K. Denis, and A. Sarin. "Ownership Structure and Top Executive Turnover." *Journal of Financial Economics,* 45 (1997), 193-221.

Eckbo, B. E., and K. S. Thorburn. "Control Benefits and CEO Discipline in Automatic Bankruptcy Actions." *Journal of Financial Economics,* 69 (2003), 227–258.

Fama, E. F., and K. R. French. "Size and Book-to-Market Factors in Earnings and Returns." *Journal of Finance,* 50 (1995), 131–155.

Fidrmuc, J. P., M. Goergen, and L. Renneboog. "Insider Trading, News Releases, and Ownership Concentration." *The Journal of Finance,* 61 (2006), 2931–2973.

Finnerty, J. "Insiders and Market Efficiency." *Journal of Finance,* 31 (1976), 1141–1148.

Jaffe, J. "Special Information and Insider Trading." *Journal of Business,* 47 (1974), 410–28.

Jeng, L. A., L. A. Metrick, and R. Zeckhauser. "The Profits to Insider Trading: A Performance-Evaluation Perspective." In NBER (1999), Working Paper 6913.

Jiang, X., and M. A. Zaman. "Aggregate Insider Trading: Contrarian Beliefs or Superior Information?" *Journal of Banking and Finance,* 34 (2010), 1225–1236.

Ke, B., and K. Petroni. "How Informed are Actively Trading Institutional Investors? Evidence from their Trading Behavior before a Break in a String of Consecutive Earnings Increases." *Journal of Accounting Research,* 42 (2004), 895–927.

Lakonishok, J., and I. Lee. "Are Insiders' Trades Informative?" *Review of Financial Studies,* 14 (2001), 79–111.

Lin, J.-C., and J. S. Howe. "Insider Trading in the OTC Market." *The Journal of Finance,* 45 (1990), 1273–1284.

Pearce, J. A., and S. A. Zahra. "The Relative Power of CEOs and Boards of Directors: Associations with Corporate Performance." *Strategic Management Journal,* 12 (1991), 135–153.

Piotroski, J. D., and D. T. Roulstone. "Do Insider Trades Reflect Both Contrarian Beliefs and Superior Knowledge about Future Cash Flow Realizations?" *Journal of Accounting and Economics,* 39 (2005), 55–81.

Ravina, E., and P. Sapienza. "What Do Independent Directors Know? Evidence from Their Trading." *The Review of Financial Studies,* 23 (2010), 962–1003.

Rozeff, M., and M. A. Zaman. "Overreaction and Insider Trading: Evidence from Growth and Value Portfolios." *Journal of Finance,* 53 (1998), 701–716.

Seyhun, H. N. "Insiders' Profits, Costs of Trading and Market Efficiency." *Journal of Financial Economics,* 16 (1986), 189–212.

—. "The Information Content of Aggregate Insider Trading." *The Journal of Business,* 61 (1988), 1–24.

Shleifer, A., and R. W. Vishny. "A Survey of Corporate Governance." *The Journal of Finance*, 52 (1997), 737–783.

Wang, W., Y.-C. Shin, and B. B. Francis. "Are CFOs' Trades More Informative than CEOs' Trades?" *Journal of Financial and Quantitative Analysis*, 47 (2012), 743–762.

Yan, X. S., and Z. Zhang. "Institutional Investors and Equity Returns: Are Short-Term Institutions Better Informed?" *Review of Financial Studies*, 22 (2009), 893–924.

TABLE 1

Sample Selection Stages

This table describes the sampling procedure and reports the number of insider purchases in our sample. It also provides information on the number of distinct firms and executives that make the transactions. The final sample is presented on the basis of the identity of the trader and divided into three further sub-periods: 2000-06 (*Pre-crisis*); 2007-08 (*Crisis*); and 2009-10 (*Post-crisis*).

		Number of purchase transactions		
Stage	Description	CFO	CEO	Total sample
1	Number of purchase transactions performed by CEOs or CFOs	8,750	10,548	19,298
2	Number of transactions performed by the same manager on the same day cumulated into one record	8,354	10,054	18,408
3	Final sample			
	Number of transactions after matching with available board, managerial, and financial characteristics; and excluding outliers and transactions smaller than £10.00	**5,450**	**4,780**	**10,230**
	Pre-crisis	*2,511*	*1,946*	*4,457*
	Crisis	*1,437*	*1,493*	*2,930*
	Post-crisis	*1,502*	*1,341*	*2,843*
	Number of distinct firms	**550**	**553**	**679**
	Pre-crisis	*323*	*301*	*406*
	Crisis	*325*	*351*	*455*
	Post-crisis	*313*	*323*	*428*
	Number of distinct executives	**715**	**734**	**1,477**
	Pre-crisis	*385*	*375*	*759*
	Crisis	*332*	*368*	*699*
	Post-crisis	*321*	*335*	*656*

TABLE 2

Summary Statistics

This table presents descriptive statistics (mean, median, standard deviation) of the explanatory variables used in the analysis. The descriptive statistics are additionally presented for three sub-categories depending on the transaction date, i.e., 2000-06 (*Pre-crisis*); 2007-08 (*Crisis*); and 2009-10 (*Post-crisis*). Definitions of all variables can be found in Appendix 1.

		Total sample			**Pre-crisis**			**Crisis**			**Post-crisis**		
		Mean	Median	Std.dev	Mean	Median	Std.dev	Mean	Median	Std.dev	Mean	Median	Std.dev
Firm characteristics													
Size		12.07	11.9	2.18	12.33	12.15	2.12	11.79	11.59	2.17	11.86	11.57	2.42
Book_to_Mkt		0.6	0.46	0.54	0.55	0.45	0.46	0.46	0.37	0.39	0.86	0.64	0.71
Corporate governance characteristics													
Board_Ind		0.55	0.57	0.14	0.53	0.53	0.14	0.56	0.57	0.14	0.58	0.6	0.14
Board_Size		7.7	7	2.44	8.19	8	2.58	7.34	7	2.28	7.15	7	2.13
Inst_Own_Con		25.12	23.15	17.35	22.59	20.41	17.08	27.66	26.16	17.59	26.96	26.08	16.98
Managerial characteristics													
Holdings	CEO	2.12	0.16	6.08	1.72	0.08	5.44	2.62	0.24	7.59	2.28	0.27	5.17
	CFO	0.36	0.05	1.50	0.33	0.04	1.23	0.39	0.05	1.57	0.39	0.07	1.88
Tenure	CEO	6.09	4.70	5.26	5.85	4.70	5.00	6.26	4.55	5.53	6.33	4.70	5.39
	CFO	5.11	3.50	4.77	5.44	3.85	4.93	4.66	2.95	4.58	4.88	3.50	4.59
Retirement	CEO	14.43	14.50	6.58	14.39	14.30	6.84	14.76	15.20	6.50	14.11	14.50	6.19
	CFO	16.93	17.00	6.81	17.00	17.30	6.98	17.28	17.50	6.60	16.40	16.00	6.67
Affiliations	CEO	0.21	0.00	0.40	0.24	0.00	0.43	0.18	0.00	0.39	0.18	0.00	0.38
	CFO	0.12	0.00	0.33	0.14	0.00	0.35	0.09	0.00	0.28	0.13	0.00	0.33
Past_Trades	CEO	7.50	3.00	13.98	5.14	2.00	8.30	7.87	3.00	13.83	11.15	4.00	19.91
	CFO	9.50	3.00	22.36	7.49	2.50	17.90	10.71	3.00	29.17	12.30	3.00	21.88
Transaction characteristics													
Opportunistic	CEO	0.66	1	0.47	0.71	1	0.45	0.72	1	0.45	0.52	1	0.50
	CFO	0.62	1	0.49	0.65	1	0.48	0.62	1	0.49	0.55	1	0.50

TABLE 3

Size of the Transactions

This table presents the descriptive statistics on the size and the number of purchase transactions. It is presented in real values (£) and also as a percentage of market capitalization. The total sample is divided into sub-categories depending on the timing (i.e., 2000-06 (*Pre-crisis*); 2007-08 (*Crisis*); and 2009-10 (*Post-crisis*)) and the type (i.e., *opportunistic* vs *routine*) of the transaction.

	Purchases			**Opportunistic**			**Routine**		
	CFO	CEO	Total	CFO	CEO	Total	CFO	CEO	Total
Panel A. Size of purchase transactions in real values (£)									
Total									
Mean	20,500	48,015	33,356	27,068	66,463	46,135	9,982	12,464	11,069
Std. dev	169,027	365,836	279,170	211,027	445,551	345,586	53,257	85,521	69,266
Pre-crisis									
Mean	14,872	37,346	24,685	15,350	48,201	30,365	13,977	10,945	12,783
Std. dev	56,849	235,652	161,814	49,471	276,348	191,020	68,608	62,582	66,295
Crisis									
Mean	26,613	50,316	38,691	39,127	64,157	52,784	6,193	15,305	10,170
Std. dev	271,140	207,510	241,077	342,398	235,816	289,344	39,791	98,286	71,576
Post-crisis									
Mean	24,059	60,936	41,453	37,296	106,077	68,798	7,884	11,934	9,858
Std. dev	166,964	590,277	423,492	221,769	810,873	573,348	37,459	93,712	70,714
Panel B. Size of purchase transactions in percentages of market value (%)									
Total									
Mean	0.02	0.06	0.04	0.03	0.09	0.06	0.00	0.00	0.00
Std. dev	0.10	0.43	0.30	0.13	0.52	0.38	0.03	0.02	0.03
Pre-crisis									
Mean	0.02	0.04	0.03	0.02	0.06	0.04	0.01	0.00	0.01
Std. dev	0.10	0.41	0.28	0.12	0.48	0.34	0.05	0.02	0.04
Crisis									
Mean	0.19	0.09	0.05	0.03	0.12	0.07	0.00	0.00	0.00
Std. dev	0.09	0.57	0.41	0.12	0.67	0.50	0.01	0.02	0.01
Post-crisis									
Mean	0.02	0.05	0.04	0.04	0.10	0.07	0.00	0.00	0.00
Std. dev	0.12	0.21	0.17	0.16	0.28	0.22	0.01	0.03	0.02
Panel C. Number of purchase transactions (N)									
Total	5,450	4,780	10,230	3,355	3,147	6,502	2,095	1,633	3,728
Pre-crisis	2,511	1,946	4,457	638	1,379	3,017	873	567	1,440
Crisis	1,437	1,493	2,930	891	1,070	1,961	546	423	969
Post-crisis	1,502	1,341	2,843	826	698	1,524	676	643	1,319

TABLE 4
Summary Statistics of Market-adjusted Returns

This table reports the descriptive statistics of market-adjusted returns subsequent to purchase transactions (RET 5, RET 10, RET 60, RET 90) for the total sample of purchases and the opportunistic and routine purchases separately.

		RET 5	RET 10	RET 60	RET 90
Total sample					
	Mean	0.596	0.612	1.569	1.900
CFO	Median	0.110	0.223	1.073	1.514
	Std. dev	5.586	7.264	16.508	20.063
	Mean	0.970	0.984	1.705	2.047
CEO	Median	0.257	0.302	0.936	1.289
	Std. dev	6.582	8.295	17.677	22.191
	Mean	0.771	0.786	1.632	1.968
Total	Median	0.194	0.263	0.987	1.419
	Std. dev	6.074	7.765	17.064	21.083
Opportunistic					
	Mean	0.934	0.909	1.878	1.965
CFO	Median	0.273	0.347	0.979	1.360
	Std. dev	6.187	7.894	17.675	21.279
	Mean	1.470	1.425	2.030	2.234
CEO	Median	0.577	0.449	1.187	1.287
	Std. dev	7.530	9.411	19.736	24.781
	Mean	1.193	1.158	1.952	2.096
Total	Median	0.430	0.400	1.073	1.304
	Std. dev	6.875	8.665	18.700	23.039
Routine					
	Mean	0.056	0.138	1.073	1.795
CFO	Median	-0.075	0.081	1.163	1.708
	Std. dev	4.405	6.093	14.434	17.948
	Mean	0.007	0.136	1.079	1.685
CEO	Median	-0.112	0.013	0.424	1.292
	Std. dev	4.015	5.448	12.791	16.061
	Mean	0.035	0.137	1.076	1.747
Total	Median	-0.092	0.054	0.851	1.538
	Std. dev	4.238	5.819	13.737	17.145

TABLE 5

Descriptive Statistics of Returns in Three Sub-periods

This table presents the descriptive statistics of market-adjusted returns from CEO and CFO purchase transactions (RET 5, RET 10, RET 60, RET 90) for three sub-periods: 2000-06 (*Pre-crisis*); 2007-08 (*Crisis*); and 2009-10 (*Post-crisis*).

		Pre-crisis				**Crisis**				**Post-crisis**			
		RET 5	RET 10	RET 60	RET 90	RET 5	RET 10	RET 60	RET 90	RET 5	RET 10	RET 60	RET 90
Total sample													
	Mean	0.69	0.83	2.79	3.40	0.42	0.17	-1.61	-2.01	0.61	0.68	2.56	3.14
CFO	Median	0.17	0.37	2.16	2.89	0.11	-0.11	-1.40	-1.43	0.05	0.17	0.94	1.63
	Std. dev	4.87	6.30	14.79	18.02	6.40	8.34	17.40	21.62	5.86	7.64	17.91	21.24
	Mean	0.87	1.07	2.36	3.54	1.06	0.82	-0.14	-1.01	1.02	1.05	2.81	3.28
CEO	Median	0.23	0.43	1.73	2.93	0.44	0.12	-0.85	-1.22	0.18	0.17	1.01	1.39
	Std. dev	5.55	7.25	15.68	20.49	7.60	9.59	18.49	22.97	6.73	8.17	19.27	23.33
Opportunistic													
	Mean	0.99	1.12	3.18	3.78	0.58	0.32	-1.97	-3.19	1.21	1.14	3.46	3.93
CFO	Median	0.31	0.47	2.29	3.10	0.09	-0.24	-2.34	-2.53	0.34	0.55	1.20	1.57
	Std. dev	5.46	6.96	16.36	19.99	6.92	8.90	17.55	21.66	6.68	8.44	19.61	22.42
	Mean	1.26	1.44	2.86	4.19	1.39	0.94	-0.69	-2.44	2.02	2.13	4.55	5.54
CEO	Median	0.57	0.68	2.11	3.36	0.72	-0.04	-1.56	-2.90	0.48	0.70	2.51	3.05
	Std. Dev	6.28	8.19	17.71	23.27	8.41	10.51	19.76	24.21	8.32	9.84	22.81	27.38
Routine													
	Mean	0.14	0.29	2.08	2.68	0.15	-0.08	-1.01	-0.10	-0.12	0.13	1.46	2.18
CFO	Median	-0.04	0.20	2.02	2.39	0.13	0.11	-0.13	-0.14	-0.31	-0.28	0.32	1.75
	Std. dev	3.44	4.76	11.24	13.55	5.44	7.35	17.14	21.43	4.58	6.50	15.52	19.68
	Mean	-0.07	0.16	1.13	1.97	0.22	0.50	1.24	2.62	-0.07	-0.12	0.93	0.82
CEO	Median	-0.27	-0.01	1.21	2.39	0.13	0.67	0.42	1.11	-0.08	-0.28	-0.49	-0.02
	Std. dev	2.96	4.03	8.88	10.99	4.94	6.69	14.75	19.02	4.14	5.61	14.26	17.61

TABLE 6
Univariate Analysis

This table presents a univariate analysis between the market-adjusted returns and the variables used in the analysis. The analysis is carried out for two different returns, RET_5 and RET_10, based on four quartiles determined by the values of the corresponding returns. Definitions of all variables are provided in Appendix 1. **, * indicate that the coefficient is significant at the 1% and 5% level, respectively.

	Panel A: RET_5							**Panel B: RET_90**					
	Q1	Q2	Q3	Q4	t-test			Q1	Q2	Q3	Q4	t-test	
RET_5	-5.23	-0.93	1.39	7.85	-87.59	**	RET_90	-22.02	-3.78	6.4	27.27	-110	**
Size	12.68	13.31	0.49	12.32	5.83	**	Size	12.4	13.29	13.31	12.52	-1.96	*
Book_to_Mkt	0.53	0.47	13.2	0.59	-3.75	**	Book_to_Mkt	0.54	0.45	0.47	0.62	-4.79	**
Opportunistic	0.65	0.56	0.59	0.74	-6.36	**	Opportunistic	0.68	0.59	0.58	0.69	-0.54	
CEO_dummy	0.46	0.46	0.46	0.49	-2.49	**	CEO_dummy	0.46	0.48	0.46	0.47	-0.17	
Trade_Size	35,034	29,807	28,988	39,593	-0.49		Trade_Size	27,479	42,635	29,874	33,427	-1.23	
Past_Trades	25.52	33.15	31.21	20.01	5.02	**	Past_Trades	22.36	29.53	34.42	23.57	-1.15	
Holdings	0.91	0.6	0.61	1.2	-2.58	**	Holdings	0.99	0.69	0.59	1.04	-0.51	
Tenure	6.3	6.41	6.33	5.89	2.94	**	Tenure	6	6.3	6.46	6.17	-1.21	
Retirement	15.13	13.73	14.12	15.15	-0.09		Retirement	15.65	13.92	13.42	15.15	2.69	**
Affiliations	0.19	0.25	0.24	0.16	2.14	*	Affiliations	0.17	0.25	0.24	0.16	0.75	
Board_Size	8.21	8.75	8.6	7.85	5.27	**	Board_Size	7.96	8.77	8.63	8.06	-1.54	
Board_Ind	0.57	0.58	0.57	0.56	3.51	**	Board_Ind	0.57	0.58	0.57	0.56	2.72	**
Inst_Own_Con	26.13	22.05	23.03	25.66	0.97		Inst_Own_Con	27.49	21.76	21.87	25.89	3.25	**

TABLE 7
OLS Regression Results – Baseline Model

This table presents regression results for the determinants of market-adjusted returns cumulated in the 5, 10, 60 and 90 days subsequent to the transaction date. The sample period is 2000 to 2010. Definitions of all variables used in the models are presented in Appendix 1. Standard errors are presented in parentheses. **, * indicate that the coefficient is significant at the 1% and 5% level respectively.

	RET 5	RET 10	RET 60	RET 90
CEO_Opportunistic	0.019	-0.181	0.596	0.811
	[0.198]	[0.265]	[0.625]	[0.773]
CEO_Routine	-0.088	-0.1	0.141	0.253
	[0.152]	[0.205]	[0.484]	[0.606]
CFO_Opportunistic	-0.152	-0.328	0.569	0.561
	[0.180]	[0.235]	[0.559]	[0.685]
Trade_Size	0.151**	0.206**	0.167*	0.218**
	[0.028]	[0.035]	[0.084]	[0.102]
Past_Trades	-0.249**	-0.343**	-0.239	0.047
	[0.072]	[0.090]	[0.203]	[0.244]
Holdings	0.026	0.019	0.085	0.227
	[0.030]	[0.039]	[0.118]	[0.175]
Tenure	-0.261*	-0.006	0.31	-0.182
	[0.116]	[0.145]	[0.323]	[0.409]
Retirement	-0.327**	-0.216	-0.52	-0.558
	[0.113]	[0.143]	[0.317]	[0.342]
Affiliations	-0.039	-0.123	-1.781**	-2.552**
	[0.156]	[0.208]	[0.456]	[0.556]
Book_to_Mkt	0.334	0.466*	1.432**	1.935**
	[0.182]	[0.227]	[0.469]	[0.599]
Size	-0.058	-0.089	0.302*	0.662**
	[0.063]	[0.077]	[0.174]	[0.215]
Return_Volatility	0.03	-0.097	0.521*	0.774**
	[0.076]	[0.092]	[0.237]	[0.275]
RET_minus30_10	-0.057**	-0.053**	-0.015	-0.012
	[0.010]	[0.011]	[0.023]	[0.027]
RET_minus90_30	-0.020**	-0.015*	0.008	0.009
	[0.004]	[0.006]	[0.013]	[0.016]
Board_Size	-0.930*	-0.435	-0.94	-0.438
	[0.414]	[0.519]	[1.006]	[1.242]
Board_Ind	-0.875	-0.601	-1.741	-4.385*
	[0.633]	[0.774]	[1.737]	[2.081]
Inst_Own_Con	-0.012*	-0.020**	-0.006	0.01
	[0.005]	[0.006]	[0.013]	[0.016]
Crisis	-0.152	-0.422*	-4.144**	-6.045**
	[0.165]	[0.210]	[0.461]	[0.564]
Post-crisis	0.186	0.276	-0.763	-1.748**
	[0.173]	[0.220]	[0.487]	[0.609]
const	4.796**	3.783**	0.209	-4.135
	[1.080]	[1.345]	[3.018]	[3.645]
N	9413	9413	9413	9413
R^2	0.048	0.03	0.028	0.037

TABLE 8

OLS Regression Results – Sub-periods

This table presents regression results for the determinants of market-adjusted returns cumulated in the 5, 10, 60 and 90 days subsequent to the transaction date in three sub-periods: 2000-06 (*Pre-crisis*); 2007-08 (*Crisis*); and 2009-10 (*Post-crisis*). Definitions of all variables used in the models are presented in Appendix 1. Standard errors are presented in parentheses. **, * indicate that the coefficient is significant at the 1% and 5% level respectively.

	Pre-crisis				**Crisis**				**Post crisis**			
	RET 5	RET 10	RET 60	RET 90	RET 5	RET 10	RET 60	RET 90	RET 5	RET 10	RET 60	RET 90
CEO_Opportunistic	0.084	0.065	-0.116	0.6	-0.21	-0.418	-0.627	-2.276	0.336	-0.087	4.244**	6.630**
	[0.240]	[0.324]	[0.751]	[0.929]	[0.438]	[0.578]	[1.186]	[1.478]	[0.431]	[0.585]	[1.582]	[1.873]
CEO_Routine	0.044	0.068	-0.605	-0.235	-0.048	0.233	2.080	2.716*	-0.133	-0.457	0.033	-0.72
	[0.198]	[0.262]	[0.594]	[0.722]	[0.378]	[0.497]	[1.086]	[1.341]	[0.244]	[0.341]	[0.825]	[1.008]
CFO_Opportunistic	0.028	-0.018	0.535	0.695	-0.759	-0.759	-1.112	-1.835	0.415	0.009	3.621**	4.981**
	[0.212]	[0.294]	[0.675]	[0.826]	[0.434]	[0.537]	[1.160]	[1.428]	[0.369]	[0.491]	[1.304]	[1.596]
Trade_Size	0.104**	0.149**	0.218*	0.283*	0.110	0.143	0.011	-0.065	0.235**	0.350**	0.25	0.410
	[0.035]	[0.047]	[0.103]	[0.131]	[0.066]	[0.077]	[0.162]	[0.195]	[0.053]	[0.070]	[0.193]	[0.221]
Past_Trades	-0.182*	-0.346**	-0.555*	-0.653*	-0.219	-0.247	-0.095	0.311	-0.400**	-0.421*	0.187	0.888
	[0.091]	[0.115]	[0.254]	[0.326]	[0.177]	[0.213]	[0.403]	[0.459]	[0.144]	[0.180]	[0.515]	[0.601]
Holdings	0.07	0.033	0.013	0.115	-0.008	-0.019	0.227	0.494	-0.027	0.053	-0.126	-0.171
	[0.054]	[0.052]	[0.098]	[0.117]	[0.038]	[0.064]	[0.219]	[0.324]	[0.066]	[0.118]	[0.237]	[0.288]
Tenure	-0.469**	-0.244	0.677	0.334	-0.321	0.278	-1.244*	-1.459	0.239	0.252	1.676**	0.918
	[0.155]	[0.197]	[0.428]	[0.557]	[0.263]	[0.322]	[0.630]	[0.823]	[0.206]	[0.261]	[0.650]	[0.750]
Retirement	-0.065	-0.034	0.014	-0.151	-0.768*	-0.248	-2.754**	-2.259**	-0.495*	-0.794**	-0.195	-0.627
	[0.125]	[0.160]	[0.342]	[0.425]	[0.334]	[0.413]	[0.843]	[0.745]	[0.198]	[0.250]	[0.679]	[0.740]
Affiliations	0.089	0.108	-1.804**	-2.112**	-0.302	-0.592	-0.659	-1.858	0.427	0.607	-0.189	-0.23
	[0.195]	[0.248]	[0.564]	[0.687]	[0.406]	[0.528]	[0.979]	[1.211]	[0.290]	[0.400]	[0.982]	[1.159]
Board_Size	-0.547	-0.194	-2.800*	-2.638	-1.133	-1.03	0.341	2.496	-1.043	0.078	0.62	-0.36
	[0.471]	[0.594]	[1.377]	[1.737]	[0.992]	[1.260]	[1.890]	[2.450]	[0.868]	[0.993]	[2.515]	[2.847]
Board_Ind	-0.241	-0.576	-0.5	-3.86	1.337	3.617*	9.711**	12.904**	-3.803*	-4.941**	-12.593**	-17.402**
	[0.741]	[0.988]	[2.196]	[2.804]	[1.515]	[1.835]	[3.513]	[4.068]	[1.497]	[1.678]	[4.514]	[5.045]
Inst_Own_Con	-0.008	-0.023**	-0.030	-0.035	-0.014	-0.021	0	0.006	-0.008	-0.006	0.023	0.062
	[0.006]	[0.009]	[0.018]	[0.024]	[0.010]	[0.012]	[0.024]	[0.028]	[0.009]	[0.012]	[0.029]	[0.034]
const	4.280**	4.745*	1.489	-2.069	5.818*	3.506	0.695	-10.333	4.243*	3.104	-2.212	-1.053
	[1.481]	[1.900]	[3.617]	[4.814]	[2.452]	[3.040]	[5.568]	[6.964]	[2.023]	[2.355]	[7.295]	[7.913]
N	3952	3952	3952	3952	2755	2755	2755	2755	2706	2706	2706	2706
R^2	0.078	0.056	0.05	0.066	0.044	0.028	0.048	0.083	0.081	0.063	0.059	0.078

TABLE 9

Regression Results – the Crisis Period

This table presents OLS regression coefficients based on the crisis period, which includes transactions performed from 2007 to 2008. All models include control variables: Size, Book_to_Mkt, Return_Volatility, RET_minus30_10 and RET_minus_90_30, and industry dummies. Definitions of all variables used in the models are presented in Appendix 1. Standard errors are presented in parentheses. **, * indicate that the coefficient is significant at 1% and 5% respectively.

	CEO				CFO			
	RET 5	RET 10	RET 60	RET 90	RET 5	RET 10	RET 60	RET 90
Opportunistic	-0.326	-0.687	-3.090*	-5.113**	-0.747	-1.043	-1.053	-2.269
	[0.457]	[0.583]	[1.260]	[1.518]	[0.477]	[0.624]	[1.263]	[1.585]
Trade_Size	0.084	0.137	0.066	-0.150	0.164	0.145	-0.188	-0.200
	[0.090]	[0.104]	[0.230]	[0.283]	[0.096]	[0.114]	[0.228]	[0.274]
Past_Trades	0.059	0.183	0.152	0.472	-0.438	-0.776*	-0.740	-0.563
	[0.276]	[0.323]	[0.637]	[0.738]	[0.229]	[0.301]	[0.547]	[0.673]
Holdings	-0.011	-0.002	0.323	0.572	-0.076	-0.303	-1.110**	-0.634*
	[0.040]	[0.069]	[0.225]	[0.347]	[0.147]	[0.161]	[0.297]	[0.293]
Tenure	-0.890*	-0.246	-1.210	-1.423	0.369	1.136*	-0.765	-0.554
	[0.396]	[0.445]	[0.863]	[1.148]	[0.405]	[0.571]	[1.001]	[1.285]
Retirement	-1.377*	-0.410	-3.235*	-1.49	-0.164	-0.148	-2.421**	-3.345**
	[0.578]	[0.664]	[1.377]	[1.144]	[0.322]	[0.480]	[0.788]	[1.045]
Affiliations	0.471	-0.155	-0.208	-0.58	-1.582*	-1.891*	-3.264*	-5.546**
	[0.584]	[0.752]	[1.376]	[1.600]	[0.629]	[0.836]	[1.561]	[2.130]
Board_Size	-0.649	-0.352	1.036	3.695	-0.597	-0.523	1.919	3.379
	[1.336]	[1.689]	[2.553]	[3.259]	[1.527]	[1.897]	[2.941]	[3.979]
Board_Ind	1.094	5.940*	14.613**	18.047**	0.586	0.258	3.248	8.148
	[2.278]	[2.868]	[5.281]	[6.323]	[2.099]	[2.467]	[4.994]	[5.717]
Inst_Own_Con	-0.018	-0.029	-0.029	-0.028	-0.010	-0.014	0.025	0.036
	[0.016]	[0.019]	[0.035]	[0.042]	[0.012]	[0.017]	[0.033]	[0.038]
const	11.019**	5.401	-0.289	-14.439	0.266	1.658	3.402	-3.252
	[3.601]	[3.763]	[8.306]	[10.554]	[3.292]	[4.653]	[7.124]	[9.299]
N	1381	1381	1381	1381	1374	1374	1374	1374
R^2	0.073	0.049	0.068	0.113	0.034	0.029	0.065	0.077

TABLE 10
Regression Results – the Post-crisis Period

This table presents OLS regression coefficients based on the post-crisis period, which includes transactions performed from 2009 to 2010. All models include control variables: Size, Book_to_Mkt, Return_Volatility, RET_minus30_10 and RET_minus_90_30, and industry dummies. Definitions of all variables used in the models are presented in Appendix 1. Standard errors are presented in parentheses. **, * indicate that the coefficient is significant at 1% and 5% respectively.

	CEO				**CFO**			
	RET 5	RET 10	RET 60	RET 90	RET 5	RET 10	RET 60	RET 90
Opportunistic	0.889	1.262	6.363**	9.815**	0.098	-0.571	2.393	3.860*
	[0.527]	[0.694]	[2.096]	[2.479]	[0.427]	[0.574]	[1.458]	[1.818]
Trade_Size	0.222*	0.332**	0.211	0.452	0.226**	0.364**	0.252	0.373
	[0.090]	[0.118]	[0.295]	[0.352]	[0.071]	[0.092]	[0.254]	[0.280]
Past_Trades	-0.527	-0.257	0.261	1.092	-0.416*	-0.529*	0.389	1.083
	[0.286]	[0.329]	[1.013]	[1.189]	[0.187]	[0.237]	[0.547]	[0.642]
Holdings	-0.018	0.063	-0.153	-0.222	0.066	-0.017	-0.273	0.032
	[0.074]	[0.133]	[0.269]	[0.313]	[0.155]	[0.197]	[0.496]	[0.809]
Tenure	0.740*	0.637	3.498**	2.753*	-0.100	-0.131	-0.128	-0.845
	[0.344]	[0.435]	[1.068]	[1.209]	[0.297]	[0.371]	[0.949]	[1.093]
Retirement	-0.698**	-1.092**	-1.164	-2.171*	-0.407	-0.604	-0.125	0.040
	[0.269]	[0.343]	[0.811]	[0.978]	[0.324]	[0.417]	[1.252]	[1.307]
Affiliations	0.548	0.706	1.181	1.409	0.399	0.533	-1.570	-1.605
	[0.421]	[0.612]	[1.495]	[1.737]	[0.454]	[0.601]	[1.338]	[1.617]
Board_Size	-0.775	0.754	5.045	4.648	-1.457	-0.412	-2.613	-3.466
	[1.241]	[1.476]	[3.278]	[3.844]	[1.293]	[1.446]	[3.911]	[4.304]
Board_Ind	-1.268	-5.398	-9.501	-9.075	-5.300**	-4.451*	-12.741*	-20.289**
	[2.652]	[2.934]	[6.814]	[7.584]	[1.843]	[2.108]	[6.134]	[6.773]
Inst_Own_Con	0.004	-0.006	0.001	0.021	-0.012	-0.009	0.040	0.096*
	[0.014]	[0.018]	[0.044]	[0.051]	[0.012]	[0.016]	[0.039]	[0.045]
const	1.940	0.443	-11.173	-11.693	5.560*	4.856	5.917	4.974
	[2.884]	[3.453]	[10.710]	[12.095]	[2.843]	[3.307]	[10.345]	[10.996]
N	1266	1266	1266	1266	1440	1440	1440	1440
r2	0.080	0.069	0.073	0.090	0.098	0.068	0.069	0.097

APPENDIX 1

Definitions of variables

Variable name	Definitions
RET	Market-adjusted stock returns estimated up to 90 trading days before and after the purchase transactions take place.
Opportunistic	Dummy variable which takes the value of 1 if a trade is opportunistic, and 0 if it is routine. CEO_Opportunistic, CFO_Opportunistic, CEO_Routine represent routine or opportunistic transactions performed by the CEO or the CFO accordingly.
Trade_Size	The natural logarithm of the value purchase transaction.
Past_Trades	The number of trades made by the executive prior to the purchase transaction.
Holdings	The percentage holding of the trading executive on the day of a transaction.
Tenure	Time on a board of the trading executive in the year of a trade.
Retirement	Time remaining to retirement expressed in number of years.
Affiliations	Dummy variable, which takes the value of 1 if an executive is a member of at least one board of directors except the analyzed one, and 0 otherwise.
Board_Size	Total number of executives on the board of directors.
Board_Ind	The ratio of non-executive directors to board size.
Inst_Own_Cont	The percentage sum of institutional shareholdings, whose individual ownership is higher than 3% of market capitalization.
Pre-crisis	Dummy variable, which takes the value of 1 if a transaction was made before year 2007, and 0 otherwise.
Crisis	Dummy variable, which takes the value of 1 if a transaction was made during the years 2007 or 2008, and 0 otherwise.
Post-crisis	Dummy variable, which takes the value of 1 if a transaction was made during the years 2009 or 2010, and 0 otherwise.
Size	The natural logarithm of total assets expressed in constant prices.
Book_to_Mkt	The ratio of the book value of equity to market capitalization.
Return_Volatility	Standard deviation of the daily market-adjusted returns of a stock measured over the period between 90 and 10 trading days prior to a transaction.
Industry	Categorical variable representing different industries based on Industry Classification Benchmark (ICB code).