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**The Credit Crunch and  
Insider Trading**

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**Abstract:** This paper examines the behaviour and information content of insiders' trades before and after the credit crunch and, in particular, examines the extent to which some insiders anticipated the market crash and took actions to protect their positions. In part, the market crash was brought about by the excessive borrowing of financial institutions. Our results point to the view that a number of insiders, primarily directors, were aware that the excessive use of leverage by financial institutions would ultimately have an eventual impact on the economy. These insiders acted by selling their shares prior to the market collapse and subsequently buying them back at a lower price. Supportive evidence for the above view is provided through both graphical evidence and regression analysis. In particular, we demonstrate a link between insider behaviour and the rapid decline in share values. Further evidence is also provided of a link between insider behaviour and future risk as measured by the CDS premium. In short, we argue that this selling was not motivated by liquidity or other contrarian strategies but was a result of understanding how higher levels of leverage and excessive new risky derivative trading could lead to higher levels of risk, an insight possessed only by a subset of insiders.

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## **The Credit Crunch and Insider Trading**

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## **The Credit Crunch and Insider Trading**

### Abstract

This paper examines the behaviour and information content of insiders' trades before and after the credit crunch and, in particular, examines the extent to which some insiders anticipated the market crash and took actions to protect their positions. In part, the market crash was brought about by the excessive borrowing of financial institutions. Our results point to the view that a number of insiders, primarily directors, were aware that the excessive use of leverage by financial institutions would ultimately have an eventual impact on the economy. These insiders acted by selling their shares prior to the market collapse and subsequently buying them back at a lower price. Supportive evidence for the above view is provided through both graphical evidence and regression analysis. In particular, we demonstrate a link between insider behaviour and the rapid decline in share values. Further evidence is also provided of a link between insider behaviour and future risk as measured by the CDS premium. In short, we argue that this selling was not motivated by liquidity or other contrarian strategies but was a result of understanding how higher levels of leverage and excessive new risky derivative trading could lead to higher levels of risk, an insight possessed only by a subset of insiders.

Key word: Credit crunch, insider trading, market efficiency

## **1. Introduction.**

Historically, insider trading and crashes have attracted a large amount of attention and especially so in more recent years. The central belief is that insiders know more about their own company than any outsider, including Wall Street analysts. As such, the demand for credible, yet lawful information that could potentially help investors predict the future movement of stocks is enormous. Evidence for which can be seen by the number of data vendors, such as CDA/Investnet, who use insiders' trades to predict returns for institutional and individual investors (Lakonishok and Lee, 2001). Studies of managerial decisions suggest that insiders are indeed better informed about their companies' prospects and that the market is slow in adjusting to managerial signals.

It is our belief, however, that not all insiders, and especially not all management, behave in the same way. Notably a minority of insiders, specifically directors and to a lesser extent senior managers (officers), may be able to anticipate market movements and, for the purposes of this paper, crash/bubbles better than other insiders. That is, certain insiders can time a crash and sell their position with a view to repurchasing after share prices fall. Our results suggest a clear pattern of insider sales and buys very closely related to the recent crash. This suggests that some of the insiders' trading behaviour, especially sales, was motivated by superior judgement and not solely driven by liquidity needs, diversification, evading SEC scrutiny or contrarian strategies as suggested in the literature (Fidrmuc et al., 2006; Jenter, 2005; Lakonishok and Lee, 2001; Marin and Olivier, 2008; Rozeff and Zaman, 1998). Instead, we argue that it was largely motivated by an insight common to a select group of insiders predicting a market-wide crash. This is consistent with the view that well informed insiders pulled out of the market prior to

the crash and joined again after the crash (Marin and Olivier, 2008).

Following Acharya et al. (2009) the idea presented here is that it can be argued that the provision of cheap credit to avoid a slowdown in the economy following the dot.com crisis and the desire of the US government for low income groups to own their own houses, helped to create the housing bubble. Acting on the government's desire for higher levels of homeownership, investment-banking firms borrowed heavily (in some cases 33-to-1) and provided liquidity to the markets by buying mortgages from mortgage lenders. Interestingly, after 2004 most of the mortgages purchased by investment-banking firms were subprime in nature. Through a process of securitization investment-banking firms combined these subprime mortgage loans into collateralized debt obligations (CDO). Given the nature of subprime mortgages, designed with ballooning interest payments, implying that the mortgages would have to be refinanced within a short time frame, meant that as interest rates rose, as they had to and did in 2004, a wave of future defaults in the housing market and especially in the subprime mortgage market was predictable and that a systemic event (risk) affecting other sectors of the economy was inevitable. This was recognised by a number of insiders, particularly directors, who acted strategically by selling their holdings in their companies with a view to future repurchase.

Prior US research has examined the relationship between insider trading and the subsequent behaviour of share returns (Finnerty, 1976; Jaffe, 1974; Jeng et al., 2003; Lakonishok and Lee, 2001; Lin and Howe, 1990; Lorie and Niederhoffer, 1968; Penman, 1982; Rozeff and Zaman, 1998; Seyhun, 1986; Seyhun, 1988). In addition, it appears that the results can depend on whether the insiders buy or sell. This is because while an insider buy can convey favourable information on the firm's prospects, it is less clear

about the information content of an insider sell. That is, it may represent either unfavourable information about the firm's prospects or it could simply be to meet the liquidity needs of the insider (Fidrmuc et al., 2006). Here we argue that there is another plausible explanation of an insider sell, namely, that they could anticipate a crash after prolonged period of growth, with price rises well above fundamentals. This paper examines the relationship between insider's transactions before and after the recent credit-related crash over the period 2003-2010. In particular, we examine the selling and buying behaviour of insiders in aggregate and subgroups in the financial sector. We also examine whether firm size is an important factor. The aim is to assess to what extent insiders anticipated the credit bubble and used that information to make abnormal profit. We argue that a group of (particularly) directors and senior managers recognised the build-up of the bubble, sold their stocks with a view to buying them back after the crash. This represents a superior insight and not contrarian trading indicators (e.g. scaled price ratios such as book-to-market and price earning ratios, past stock returns and firm size). Although excess profits can be related to both contrarian trading and private information (about the future prospects of their firms and not yet incorporated in the stock prices) in volatile markets (Gangopahyay et al., 2009; Jiang and Zaman, 2010), here we make a distinction between private information, available to all insiders, and insight possessed only by a subset of these insiders.

## **2. Prior Research and Background.**

The on-going financial crisis, the start of the severe shortage of money (the credit crunch), can be traced to a steep reduction in credit in the US, with its full effect realised

on the 9<sup>th</sup> August 2007 when the French Investment bank BNP Paribas informed its investors that it had to suspend redemptions and that they would not be able to take money out of its funds because it could not value the assets in them, owing to illiquidity in the market (Gup, 2010). This was a reaction to the run on the assets of its three structured investment vehicles exposed largely to subprime and other questionable credit quality assets. The announcement caused the asset-back commercial paper market to freeze (Acharya et al., 2009), with banks refusing to do business with each other. However, the roots of the credit crunch started earlier, linking it to the US subprime mortgages and collateralisation of debt obligations, among others.

While the volume of literature on the origin, causes, consequences and remedies of credit crunch is rising (see e.g. Acharya et al., 2009; Brunnermeier, 2009; Buckley, 2011; Diamond and Rajan, 2009) there are only a few studies on insider trading and crashes (Gangopahyay et al., 2009; Marin and Olivier, 2008; Seyhun, 1990). While there is unanimous agreement that insiders have private information about their companies, questions remain regarding the extent to which they have predictive information about the evolution of the entire market and if they do, who exactly possess that insight. Marin and Olivier (2008) argue that if insider trading and crashes are related at the individual stock level it would be due to idiosyncratic shocks and not market-wide shocks. Here we argue the opposite, that a sub-group of directors and, to a lesser extent, senior managers (officers), do have valuable information about the evolution of the whole market. Whereas, previous insiders' papers refer insiders to management, large shareholders and others, one of the contributions of this paper is to disaggregate management into directors and senior managers/officers and examine their trading behaviour before and after the



crash separately. Our results shed new light on the informative nature of the roles of these specific groups of insiders' sales. Thus, this paper makes a distinction not only between management insiders, but also between the timing and information content of each group.

It has been suggested that insiders trade not only on the basis of contrarian beliefs but also on private information (Lakonishok and Lee, 2001; Piotroski and Roulstone, 2005; Rozeff and Zaman, 1998; Seyhun, 1988), and are thus able to predict and time the market movements. However, the evidence is mixed. Studies by Jenter (2005), Lakonishok and Lee (2001), Rozeff and Zaman (1998) suggest that insiders are contrarian investors, while others (Jiang and Zaman, 2010; Ke et al., 2003) suggest that the insiders are better informed about their firms' future prospects and thus are able predict and time the market. By comparison, Piotroski and Roulstone (2005) find evidence that insiders possess private information and are contrarian traders. Here we focus on the case of insider information and their selling strategy in the period leading up to the crash. This is because all management insiders generally have access to the same type of insider information; thus, we are interested in whether all management insiders behave in the same way in volatile market conditions.

We find evidence that some insiders sold months before there was any indication of a crash. While generally selling could be related to a number of reasons such as liquidity and diversification, to escape SEC scrutiny, time restrictions on trading and poor earnings growth, the pattern of selling can also indicate another reason, the coming of the crash. This is because a group of insiders sold a large volume of their stocks many months before there was a sharp drop in prices and gradually reduced their selling shortly before the crash. According to Marin and Olivier (2008) the larger the volume of sells in

the far past, the higher the likelihood of a crash.

Following the dot.com crisis, in order to avoid recession, the Federal Reserve kept interest rates low (below 1% till 2004). However, this helped to create both a credit bubble and a housing bubble. By mid-2006, the ratio of house price to rental income was at its all-time high (Acharya et al., 2009). As US interest rates started to rise from 2004, from just over 1% to around 5.5% in 2006 (Acharya et al., 2009; Mayer et al., 2009), this triggered a slowdown in the US housing market. Such a slowdown was seen by some insiders as the start of systemic default on a large scale, as a large proportion of mortgages were aimed at a subset of the market called subprime mortgages (marginal-credit-quality). These were based on the presumption that house prices would continue to appreciate, giving homeowners the equity with which they could repay their loans (Acharya et al., 2009; Diamond and Rajan, 2009).

Thus, it can be argued that the financial crisis started in the first quarter of 2006 when the housing market turned, and the housing bubble burst, such that several hundred non-bank mortgage lenders, mostly specialising in subprime, collapsed or merged with other financial institutions. A clear sign that a crash was imminent was when mortgage lenders such as Ownit Mortgage Solutions went bankrupt in late 2006, and a further sign was the failure of the second largest subprime lender, New Century Financial, in April 2007. This was followed by the collapse of two highly leveraged Bear Stearns-managed hedge funds on 20<sup>th</sup> June 2007 that invested heavily in subprime mortgage-backed securities (MBSs). Furthermore, with the collapse of subprime mortgages, the prices of the collateralized debt obligations (CDOs) began to fall and the scale of financial crisis then became apparent.

However, although the cause of the credit crisis is related to a number of factors, including high levels of leverage, easy availability of credit and a housing bubble, maturity mismatch, poor transfers of the credit risk, poor regulatory systems and a lack of understanding of the nature of the risks involved in some of the new complex derivatives used (Acharya et al., 2009; Brunnermeier, 2009; Goddard et al., 2009; Gup, 2010; Mayer et al., 2009; Milne, 2009), our aim here is to show to what extent insiders had predicted the coming crisis and thus sold their holding in their companies with a view to buying them back when prices had fallen. It is argued that the then coming crisis was inevitable (Acharya et al., 2009; Buckley, 2011), not least given the background of rising interest rates and the falling value of MBSs, together with banks holding a large amount of subprime MBSs plus other risky derivatives and loans on their books financed largely by short term debt. Given the complexity of such products, pricing them became difficult and volatile, making it harder to borrow against, even in the short term, causing some institutions a liquidity problem. As banks tried to sell, prices dropped further, and concerns about illiquidity turned to potential insolvency as there was now not enough asset value to offset the liabilities, resulting in takeovers, e.g. the takeover of BEAR Stearns by JP Morgan in March of 2008 (Diamond and Rajan, 2009). However, despite the Federal Reserve opening new facilities that allowed banks to borrow against illiquid positions, some bankruptcy could not be avoided, and the Lehman Brothers' bankruptcy triggered a worldwide panic. This led to the freezing of interbank lending, except after a variety of interventions by central banks, including guarantees of bank debt and bank recapitalizations.

### **3. Data.**

To show that a group of insiders have the ability to evaluate the market-wide events and thus predict market crashes/bubbles, following Marin and Olivier (2008) we hypothesize that insiders' sales preceding a crash was not done to evade SEC investigation of wrong doing, but done in the recognition of a looming crash. As shown below, sales by insiders were continuous starting at high levels well prior to the crash (2007Q3) but gradually declining with continuous net purchases following the crash without causing any large jump in prices.

To rule out potential liquidity aspects of trading, we consider only traders who were active in both the early and later part of the period, Jan. 2003-March 2010, in a particular company. Here we define these periods as before and after August 2007 as this is recognised as the time when financial markets started to experience a steep contraction in credit and money and thus the start of credit crisis. Accordingly, we calculate each trader's traffic (shares bought or sold) in the periods before and after August 2007. If the trader's total traffic is greater than 100 in each period, we regard that as an active trader. An issuer (firm) with at least one active trader is regarded as an active issuer.

The insider trading data used in this paper include only purchases and sales that trade on the NYSE, AMEX and NASDAQ markets, and have been compiled from EDGAR Online, Insider Trades Data Feed, a new database on insiders' trading. Details of some 6.5 million transactions were obtained covering the period from January 2003 to March 2010, a total of 87 calendar months. This period incorporates both a growth and recessionary period for the economy. The data was aggregated to the monthly frequency. The data was cleaned using a number of filters and excluded transactions for which there

were no exact trading or reporting dates. Following other studies (Iqbal and Shetty, 2002; Lakonishok and Lee, 2001; Lamba and Khan, 1999) we have included only firms with open market transactions of 100 shares or more. Similarly, following Conrad and Kaul (1993) and Lakonishok and Lee (2001) we have excluded non-common shares (shares with CRSP share codes other than 10 or 11), American Depository Receipts, closed-end funds, real estate investment trusts, convertible debt, exchange notes and options (purchase or sale of share through the exercise/conversion, warrants, or convertible bonds) in this study. Some two million transaction records were unsuitable for our purposes either because they lacked a transaction date or because they were not associated unambiguously with a particular trader. The top and bottom percentile of transactions (by share volume) have also been excluded. This leaves 4,320,462 transaction records of which 3,276,068 relate to the acquisition or disposal of stocks, and 1,044,294 to transactions in derivatives.

The 4,320,462 transaction records represent trading in 11,535 issuers (firms) by 125,595 individual owners (traders). Since some owners hold an insider position in more than one issuer, this represents a total of 160,843 trading relationships between a particular owner and a particular issuer. It is these trading relationships that we are investigating in this paper.

Here we are interested in transactions in stocks, not derivatives; 22,414 of the 160,843 trading relationships involved derivatives only. We are also interested only in trading relationships that were active both before and after August 2007. A trading relationship is regarded as active if the total number of shares bought or sold was greater than 100. Of the 138,429 stock trading relationships 108,435 were active before August

2007 and 78,849 active after August 2007, with 50,301 active in both periods. The study, therefore, is based on these 50,301 trading relationships that represent 45,071 individual traders, 6,229 firms and a total of 2,783,376 transactions.

Economic data for the firms involved in the study were obtained from Datastream and Bloomberg. Linking the Datastream and Bloomberg information with the transaction information from Edgar was done using the CUSIP. Firms were excluded if they did not have share price information. Of the 6,229 firms whose transaction data were used, 773 had no CUSIP, so economic data were obtained for 5,456 firms, of which 2,176 firms represent the subset firms whose insider traders sold their holding prior to August 2007 and bought the same stock back after August 2007 credit crash. Data were aggregated to generate monthly panel data and non-trading cases during a given month were set to zero.

Insiders are classified into three groups: the Directors (including President and Chief Executive Officer, Chairman, Executive Vice President and Vice Chairman); Officers (senior management group including Chief Financial Officer, Chief Operating Officer and Controller); and Others, which includes large shareholders, those who own more than 10% of shares and are not in management groups as well as those who are required to report their trading to the SEC but are neither in management group nor are large shareholders (e.g. company lawyers).

Following Seyhun (1988) throughout this paper, we have divided the sample firms into three sizes: small firms with a market value of less than \$250 million, medium size firms with a market value of between \$250 million and \$1 billion and large firms with market values of greater than \$1 billion.

## 4. Summary Evidence

### 4.1. Aggregate results

Table 1 shows the number of firms in all sectors and in the financial sector with their respective subset groups. We define the subset group as those traders that sold before the crash and bought afterwards. This allows us to highlight graphically that there indeed existed a group of insiders who appeared to be able to time the crash. We are particularly interested in the finance sector here because of its direct relevance to the crisis period *and also it showed a clear trading behaviour similar to the subset group*. This confirmed the unbiasedness of sample selection,<sup>1</sup> and that our empirical results, that a group of insiders could predict the crash, do not depend on this subset selection of insiders by construction, thus emphasising this trait. Here we argue that it is not just by random chance that about 8-10% of insiders happen to be subset insiders (see Table 3). In fact as the graph below show (see Figure 7), all insiders in the financial sector had negative net acquisitions over -14 million shares in 2006Q4 and then rising to over -18 million shares in 2007Q2. However, further analysis by firms sizes in the financial sector (see below) showed that net selling was much prominent and bigger with large firms with net acquisitions of over -20 million shares in 2006Q4 rising to just under -30 million shares in 2007Q2 before dropping to -6.5 million shares in 2007Q4 and then with positive net acquisitions of 11.7 million shares in 2008Q1. Further subset group analyses re-emphasised such trading behaviour across both directors and officers.

This paper shows the relative positions of the subset insiders (primarily directors) within the subset firms. That said, one could examine some basic characteristics of these subset

insiders, such as their occupations (CEO, chairman, etc.), education, training and their age and gender, in order to see if there are any systematic differences in such characteristics between subset and non-subset directors. However, this paper deals with a group of individuals labelled as “Directors” and “Officers” and not an individual such as Chairman or CEO. The problems are that such data are complex as some firms can have up to 30 individuals classified with directorship role, and some can appear in more than one company given their position and firm types (e.g. holding companies). Furthermore, given the level of expertise required to hold such high financial positions, the small percentage of subset compared to non-subset, it is not expected that such analysis would shed any light. As Frank Knight (1921) argued, such traits are not measurable as they cannot be gained with, for example, education, as it is something that some possess a particular kind of knowledge which is costless.

Table 2 shows the number of firms by size with valid DataStream codes (ISIN) for small, medium and large companies in all sectors and in the financial firms with their respective subset groups. While the percentage of medium sized firms are very similar in both all and the finance firms and their subset groups, the percentage of small and large firms in both all and the financial sector vary substantially, with large firms having a much higher proportions in the subset and small firms having lower proportion in subset compared to all. This will no doubt have some impact on the overall trading behaviour as we see below.

(Insert Tables 1 and 2 here)

Table 3 shows the total number of active traders in both 2003Q1-2007Q2 and 2007Q3-2010Q1. The subset refers to those who were net sellers before 2007Q3 and net



buyers after, dealing in the same stocks. The figures show that it is only a minority of directors/officers, about 8%, in each owner/role group (forming the subsets, selling prior to 2007Q3 and buying the same stocks thereafter) were able to predict the crash and thus act strategically. It also shows the types of traders, their subsets who were active in both 2003Q1-2007Q2 and 2007Q3-2010Q1 in the financial sectors as well as all. The data suggests that sub-groups are less than 11% of traders but as the data will show later that these small subgroups were large traders in their respective roles.

(Insert Table 3 here)

To supplement the evidence in Table 3, Figure 1 shows net share acquisitions of all insider traders over the period 2003-March 2010. It shows substantial volume of trading per quarter ranging from net selling about 150 million shares to net buying over 200 million shares. However, Figure 1 does not show any clear pattern of trading. Figure 2 shows a subset of traders who sold their stocks before August 2007 with a view to buying the same stock back after the credit crash of August 2007 referred to as subset group(s). Figure 2 shows the trading behaviour of these minority insiders, suggesting they were able to predict and time the looming credit crunch and thus act strategically. While the definition of the subset will inevitably produce the kind of pattern reported, the important points to note is that first such pattern of trading is clearly evident for all traders in the financial sector (see graph below) albeit with a much smaller volume of trading and secondly the subset insiders' negative acquisitions (and most notably their sales) have been much larger after 2006Q1 than the earlier periods (stocks bought and sold can be obtained from authors). Figure 2 shows that the selling peaked in second quarter 2006 and continued to the fourth quarter when the house prices and interest rates

reached their peak. Following Marin and Olivier (2008) that the larger the volume of sells in the far past the more likelihood of a crash thus suggesting the crash was on the horizon.

Figures 3-4 (directors) and 5-6 (officers) show shares bought and sold of all directors and of all officers and their respective subsets. Figure 3 shows that while all directors were buying and selling a roughly similar quantity for the period 2003Q1 to 2007Q3, the subset of directors show a different trading behaviour, being heavy sellers with selling starting from late 2004 peaking in 2006Q4 and buying after the crash. Figures 5 and 6 show share trading of officers, who are rather different from directors, they seem to be rather heavy buyers for the same period. However, the officers' subset shows a very similar pattern to those directors' subset but with a delay lag in selling as could be expected with their selling peaking in 2006Q4, dropping in 2007Q1 and peaking again in 2007Q2 suggesting officers' subset follow their directors.<sup>2</sup> Again, the construction of the subset will inevitably lead to the general pattern observed, but the interest lies in the increased selling activity during late 2006 and early 2007.

As for the financial sector, Figure 7 shows all insiders' net acquisitions trading. Financial sector provides an interesting case in that at the aggregate level all insiders in the financial sector started selling heavily from 2006Q4 with net negative acquisitions of just under 15 million shares rising to over net negative acquisitions 18 millions shares in 2007Q2. This suggests that financial firms' insiders (specially directors, see below) were clearly better informed and thus be able to time the crash and were not subject to subset selection of insiders by construction

#### *4.2. Firm Sizes*

Table 2 shows that out of a total of 4,399 firms with valid ISIN there are 1,826 firms in the subset groups to whom relevant economic information was available to classify them into small, medium and large firms. Figures 8-10 show net stock acquisitions per quarter for all, directors and officers in all sectors in different firm sizes. What is interesting to note is that while traders in large firms were largely net sellers, when their roles are taken into account it is the directors in large firms that were the main net sellers followed by directors in medium sized firms, while directors in small firms were net buyers throughout the sample period. As for officers, while all officers in all sectors had net positive acquisitions across all firm sizes throughout the sample period, the large firms had a marginally a higher level of net trading.

As for all subset insiders in all sectors (Figure 11), large firms were the biggest net sellers followed by medium and small firms before the crash, but post crash large and small firms had similar net acquisitions followed by medium sized firms. As for the traders' role, directors in large firms were heavy sellers before the crash with net negative acquisitions of reaching 17.4 million shares, 14 million shares and just under 10 million shares for large, medium and small firms respectively in 2006Q2 and falling there after (Figures 12). Figures for directors in large firms within the subset firms for 2006Q4 and 2007Q2 were -16.93 million and just under -5 million respectively. However, post crash it was the directors in small subset firms followed closely by large firms that were heavy net buyers. As for officers (Figure 13), large subset firms were both heavy sellers and buyers before and after the crash but with much smaller volume of trading; net acquisitions were -3.2 million shares in 2006Q2, over -3.8 million shares in 2006Q4 and

over just under -4 million shares in 2007Q2 suggesting a time lag with respect to directors' trading in that managers were responding to the events as they were occurring/developing rather than predicting. Post crash large subset firms officers were also the largest net acquirers with net acquisition of 4.6 million in 2008Q1 and 6.3 million shares in 2009Q1 while corresponding figures for officers for medium sized subset firms were 2.5 million shares in 2008Q1 and 1.77 million shares in 2009Q1 and for small subset firms were 2 million and 2 million shares for 2008Q1 and 2009Q1 respectively. The general patterns is that officers in large firms seem to track their directors trading behaviour with a time lag. The general interesting observation that emerges from the analysis of the subset of all firm sizes is that while directors' trading showed similar trading patterns before and after the crash, it was largely the officers in the large firms that tend to dominate trading both before and post-crash.

Table 2 also shows that out of 891 financial firms, 369 firms were classified as the subset firms to whom relevant economic information was available to classify them into small, medium and large firms. Figures 14-16 show that for all insiders in the financial sector show that inside traders in large firms were the main net sellers with net negative acquisitions of over 20 million in 2006Q4 rising to over -29 million shares in 2007Q2 with positive net acquisition of over 11.7 million shares in 2008Q1. Other insider traders in medium and small firms were largely net acquirers for the period 2006Q2-2009Q1. As with trader's role, data showed that it was directors in large firms that were heavy net sellers prior to credit crash (with net selling of over -2 million shares in 2006Q4 rising to -3.6 million in 2007Q1 and -6.8 million shares in 2007Q2) while the director of small financial firms were net acquirers with trading pattern of directors of medium sized firms

showing no clear pattern and with thin trading. As for officers, the data showed that officers in the financial sector of all firm sizes were net acquirers with large firms dominating the trading. However, the most interesting observation is that among the inside traders, directors in large firms were the main sellers followed with just thin selling by medium sized firms; directors in small firms were the main insider buyers. As for the officers they were all largely buyers for the same time periods (2006Q4-2007Q2). This supports the view that directors were generally better informed than other insiders thus capable of anticipating the coming crash.

For financial subset firms (Figures 17-19), all insiders in large firms had the largest volume of trading followed by small and medium sized firms. As for traders' role it was directors who were the main traders with negative acquisitions ranging over 2.3 million in 2006Q1 to over 1.4 million shares in 2007Q2. All officers in financial subset firms had rather thin trading with negative acquisitions of generally less than 1 million share per quarter before the crash. Again officers in large firms were the main traders with maximum negative acquisitions of 629,226 in 2006Q4.

In general, large firms' insiders, mainly directors, were heavy sellers prior to the crash and net buyers post crash. This is, however, more prominent for the financial sector where all insiders and in particular directors in large firms were heavy sellers prior to the crash. This suggests that large firms' insiders were clearly better informed and thus were able to time the crash and were not subject to sub-set selection of insiders by construction. This could be related to the fact that larger firms are more likely to have a larger and better team of economic advisers and thus better access to information than the smaller firms. As for officers in all sectors and financial sector data showed that they

were largely net acquirers across all firm sizes. For the subset firms, while as expected, officers and directors followed the same pattern of trading, subset officers in all sectors showed a time lag behaviour with their negative acquisitions maintaining high levels of negative net acquisitions; -6.2 millions shares in 2006Q4 and -6 million shares in 2007Q2 compared to -1 million to -325,227 shares for the same time period for subset officers in the financial sector. Finally, as for differences between directors and officers (managers) within each firm size, officers had much lower levels of net acquisitions especially in medium and small sized firms. This suggests that directors in large firms may have not only more financial resources at their disposals but may also have better access to a wider pool of finance, information that may not be publicly available (e.g. CDS prior to 2008), larger team of economic and financial advisers and network of external contacts that would enhance their insights thus enabling these subset directors (and to a lesser extent managers) to exploit and act strategically.

## **5. Regression Results.**

We consider three empirical exercises to support the above graphical evidence. First, we begin with a standard regression approach to examine whether insider behaviour has any predictive power for stock returns. Second, we consider the crash dummy approach used by Marin and Olivier (2008). Finally, we examine whether there is any relationship between insider behaviour and firm risk as measured by the CDS premium.

### 5.1. Predictive Regression

In line with previous work (e.g., Seyhun, 1988; Lakonishok and Lee, 2001; Iqbal and Shetty, 2002) we begin with a standard predictive regression approach for insider trading.

That is, we estimate the model:

$$(1) \quad r_{i,t+1} = \alpha + \delta IT_{i,t} + \sum_j^k \gamma_j x_{j,t} + \varepsilon_{i,t+1}$$

where  $r_{i,t}$  is the return on stock  $i$  at time  $t$  associated with the insider information and  $IT_{i,t}$  is the insider information variable, defined as the net purchase position (i.e., insider buys minus insider sells).<sup>3</sup> If insider information contains predictive content for returns we would expect to see the  $\delta$  coefficient both significant and positive. Of course, it is argued within the existing literature that a number of variables may have predictive power for returns, and thus, we wish to see if insider information has predictive power over and above any predictive power contained within publicly available information. Thus, we include a set of variables, denoted,  $x_{j,t}$ , put forward within the literature and that are argued to have predictive power. These include the dividend yield, the price-earnings ratio, the price-to-book ratio, the market change, the companies' beta, the equity to debt ratio and the movement of short-term interest rates.

Table 4 reports the results of this regression across the three definitions of insider, directors, officers and others. We only report the coefficient for the insider trading variable,  $\delta$ , for the sake of clarity and conciseness. These results reveal a similar pattern to what has been reported previously in the literature (e.g. Lakonishok and Lee, 2001; Tavakoli et al, 2012). Of note, there is evidence of predictive power for stock returns arising from directors and officers across all firms. Furthermore, this predictive power holds when examining small and medium sized firms, but not for large firms. With

respect to the others category, there is only evidence of predictive power for medium sized firms. This evidence confirms the belief that certain insiders can predict the movements of stocks and of small stocks better than large stocks in particular (Lakonishok and Lee, 2001; Hotson et al, 2008).

## 5.2. Crash Prediction

This section utilises the crash prediction model of Marin and Oliver (2008) to examine the relationship between the crash event and lagged insider behaviour. The model and test of Marin and Oliver examines the degree to which insiders traded prior to a crash occurring. In particular, they argue that insider activity can take place several months prior to the crash. This, they argue, may be due to the need to avoid SEC scrutiny as well as any rules regarding trading prior to company announcements and the re-purchase of stock recently sold.

Marin and Oliver define a crash dummy variable as one in which the demeaned return,  $r_{i,t} - E(r_{i,t})$ , is less than or equal to negative two times the standard deviation,  $2\sigma_{i,t}$ , that is:

$$(2) \quad CRASH = 1 \text{ if } r_{i,t} - E(r_{i,t}) \leq -2\sigma_{i,t}; 0 \text{ otherwise.}$$

We define returns in two ways, first, using the raw return and second using the excess return. The excess returns are defined as the individual stock return minus the S&P500 market index return. The crash dummy is then regressed on several variables designed to examine the effect of insider behaviour. First, the crash dummy is regressed on a one period lag of insider behaviour,  $IT_{i,t}$  in order to examine whether insiders acted immediately prior to the crash. Following Marin and Oliver (2008) and as suggested in



the Introduction, where insiders were able to anticipate the crash and in order to avoid scrutiny, they may have acted prior to the onset of the crash. Therefore, we include the sum of insider behaviour in the year prior to the crash, excluding the first lag. That is, we use insider behaviour from two months to one year prior to the event. Additionally, we consider two versions of the insider trading variables. First, we include insider sales and second, we include net transactions. While we would expect to see insider sales in the run-up period before a crash, the use of the net trading variable helps to make any conclusion regarding sales robust. That is, whether the net trading measure indicates that insiders were indeed selling more than they were buying. Given the argument that insiders can act as contrarian traders (Lakonishok and Lee, 2001), we include the cumulative excess return over the past year. Finally, we include trading volume both with a single lag and cumulative volume over the past year. This follows from Chan et al (2001) who argue that trading volume is a good predictor of negative skewness, which is in turn related to crashes. Therefore, we estimate the following:

$$(3) \quad \text{CRASH}_t = \alpha + \beta_1 IT_{t-1} + \beta_2 IT_{\Sigma t-1 \dots t-12} + \sum_i^k \phi_i z_{i,t} + \varepsilon_{t+1}$$

where the variable IT refers to insider sales or insider net transactions and  $z$  contains the other variables as outlined above (cumulative annual excess returns, a single lag of trading volume and cumulative annual trading volume). In estimating the model we include firm specific fixed effects and report in Tables 5 and 6 the results based on the linear probability model with Newey-West standard errors to correct for any heteroscedasticity and autocorrelation. Estimates using a conditional logit model produce similar results.<sup>4</sup>

The results from using insider sales as the insider variable are reported in Table 5. From this table we can see that for directors and officers on the basis of all firms and regardless of whether the crash is defined using raw returns or excess returns there is a positive and significant relationship between the crash probability and one period lag insider sales. Furthermore, this result is stronger for officers, while for both groups of insiders the cumulative annual measure is not significant. For the others group there is no significant relationship. Examining the subset group, again we can see that the one-period lag is positive and significant for directors and officers but not others. Further, we can now see that the cumulative one year lag is also positive and significant. The above results support the view that insiders were able to predict the crash in the immediate period prior to the crash. But also that a certain portion of insiders were able to predicted the crash notably earlier than others.

Table 6 presents the same regression but replaces insider sales with net insider transactions. This is to examine whether collectively insiders were selling prior to the crash. Here we can see that the results from sales only are essentially replicated. That is, across all firms there is a significant and now negative relationship between the crash probability and one period lag insider activity for directors and officers. The negative coefficient on the insider trading variable supports the view that insiders were net sellers. As with Table 5, across all firms the cumulative annual lag is not significant at the 5% level, neither are the activities of the other grouping. When examining the subset, then the cumulative annual lag on insider behaviour is significant. This again supports the view that a sub-set group of insiders were able to predict the crash and act accordingly, although nonetheless, all management insiders were able to predict the crash in the period

immediately prior to the crash.

Finally, with respect to the other variables included in the regression, first, we see that the cumulative annual excess return is negative and significant throughout, while, second, we see that one-period lagged trading volume is positive and significant (including to the 10% level) with cumulative lagged annual volume negative and significant. These results, therefore, confirm those previously reported by Marin and Oliver (2008) and Chen et al (2001), particularly regarding the role of volume.

### *5.3. Insider Behaviour and Risk*

The above two sub-sections have highlighted that insider behaviour has predictive power for returns in general and for stock market crashes. The aim of this section is to look at the relationship between insider activity and firm risk as measured by the CDS spread. CDSs are purely about the likelihood of default and thus can provide useful information about credit risks. Given the nature of CDS contracts, being private, traded OTC and unregulated, makes the existence of asymmetric information<sup>5</sup> and insider trading highly likely (Acharya and Johnson, 2007). Historical monthly data on CDS spread, expressed in basis points, with maturity of five years as they most liquid, were obtained from Bloomberg using the CUSIP. CDS data were only available for 573 firms, who had active monthly data (at least for part of the period January 2003 to March 2010) and matched records in the Datastream and Edgar databases.

To examine the relationship between risk, as measured by the CDS spread, and insider activity we estimate a series of vector autoregressive (VAR) models and conduct the usual Granger causality test. In particular, it is of interest to know whether insiders act

after changes in the CDS spread and thus after the market has adjusted its view of risk or whether insider activity precedes changes in risk. More specifically, we estimated a bivariate VAR model as follows:

$$(4) \quad \begin{aligned} CDS_{i,t} &= \sum_{j=1}^p A_{11} CDS_{i,t-j} + \sum_{j=1}^p B_{12} IT_{i,t-j} + e_{1,t} \\ IT_{i,t} &= \sum_{j=1}^p A_{22} IT_{i,t-j} + \sum_{j=1}^p B_{21} CDS_{i,t-j} + e_{2,t} \end{aligned}$$

where  $CDS_t$  and  $IT_t$  are the CDS spread and insider trading activity variables (for firm  $i$ ) respectively,  $p$  is the maximum number of lagged observations included in the model and where the lag length was determined by minimising the AIC. The coefficient matrices  $A$  contains the autoregressive coefficients, while the  $B$  matrices contain the key information, which is the contributions of each other series lagged observations to the predicted of the CDS spread and insider trading,  $e_{1,t}$  and  $e_{2,t}$  are residuals (prediction errors) for each series. In testing for Granger causality we are interested in, for example, the null hypothesis that  $IT_{i,t}$  does not strictly Granger cause  $CDS_{i,t}$ , which is rejected if the coefficients in  $B_{12}$  are jointly significantly different from zero. Bi-directional causality exists if causality runs in both directions. That is, if the coefficients in both  $B_{21}$  and  $B_{12}$  are jointly significantly different from zero.

The Granger causality results are presented in Table 7; again we use both insider sales and insider net purchases as the measure of activity. The results here present an interesting picture. First, with respect to directors we can see that there is evidence of significant Granger causality running from the actions of directors to the CDS spread. In other words the actions of directors preceded the change in firm risk. This is confirmed for both the insider sales and the insider net purchase data. This highlights the existence of asymmetric information in the CDS market that enabled some insiders to act

strategically where such information was not readily available to all investors. Second, with respect to officers there is a weaker, but similar, relationship with regard to insider sales, whereby sales precede change in the CDS spread. However, when looking at officers for all net purchases we see a different pattern whereby changes in the CDS spread precede changes in net purchases. This suggests that in general the insider action of officers does not precede market changes in risk but when officers sell then this does precede such changes. Finally, with respect of the others category, we again see that their actions do not affect the share, although there is some evidence that changes in the CDS spread precede others net purchase behaviour.<sup>6</sup>

## **6. Conclusion**

There is now consensus that both governments and financial institutions were responsible for the recent credit crunch. To increase home ownership, governments encouraged banks to lend mortgages to those with poor credit ratings. While this made sense to borrowers as a cheaper option than renting, while taking little risk, starting with low interest rates and often with no deposits, it was a much riskier proposition for the lenders. With subprime mortgages, a crash became inevitable as these assets only work well when interest rates are low and house prices are rising. However, in a downturn the risk of default becomes magnified. Furthermore, weakened standards, in terms of bank monitoring and supervision, allowed institutions to move away from their traditional patterns in lending behaviour. Moreover, with an aggressive attitude to taking excessive debts and the development of new risky derivatives such as CDSs, which made it ever

more possible to create new risky products without fully understanding their impact when the markets fell, economic-wide risk increased.

Thus, the signs of the coming crisis were clear: high levels of corporate and bank debt (with debt to equity ratios of more than 33 to 1), interest rates rising from low levels, high house price to earnings ratios, capitalization of banks in excess of country's gross domestic product, heavily reliance on short term money markets to finance long term loans and slackened monitoring and supervision of banks. While these signs were potentially there for all to see, they were only acted upon by very small groups of insider traders. Indeed, our results show that there is a hierarchy of insiders started with a subset of directors followed by a subset of officers (managers) who sold their stock in their companies well before the crash and bought them back after the crash, with the likelihood of substantial abnormal profits. Thus, it is argued that it is not just the information but also the foresight of such insiders that can provide special information to the wider investors.

More specifically, using both graphical and regression analysis we show that the insider activities of directors and officers have predictive power for the stock returns of their companies. Furthermore, they also have predictive power for an imminent stock crash. Of further interest, the activities of a subset of these insiders have predictive power for a crash over the preceding year. Finally, we reported evidence that the activities of directors precede changes in the market perception of the firms risk as measured by the CDS spread. Officer sells also exhibit similar Granger causality, but this is not true with all officer activities. In sum, these results confirm the view that directors and to a lesser extent officers were able to predict and act prior to the onset of the crisis.

Table 1: Number of firms

Sector	All	Subset <sup>+</sup>
Financial	1,079 (19.78%)	439 (20.17%)
Total	5,456	2,176

+. Firms that some of their insiders sold prior to August 2007 credit crash and bought the same stock after August 2007.

Table 2. Firm Sizes with Valid DataStream codes (ISIN)

Sectors	All			Subset		
	Small	Medium	Large	Small	Medium	Large
Financial	505 (56.7%)	188 (21.1%)	198 (22.2%)	178 (48.2%)	79 (21.4%)	112 (30.4%)
Total	2285 (51.9%)	807 (18.3%)	1307 (29.7)	694 (38.0%)	386 (21.1%)	746 (40.9%)

Table 3: Total number of traders, directors, officers, others and their respective %

Total Traders								
Number					Subset			
	Small	Medium	Large	Total	Small	Medium	Large	Total
Financial	4342 (47.6%)	1773 (19.5%)	2999 (32.9%)	9114 (100%)	325 (44.3%)	151 (20.6%)	258 (35.1%)	734 (100%)
Total	12121 (32.7%)	7488 (20.2%)	17410 (47.0%)	37019 (100%)	1107 (32.8%)	744 (22.1%)	1523 (45.1%)	3374 (100%)
Directors								
Number					Subset			
	Small	Medium	Large	Total	Small	Medium	Large	Total
Financial	2945 (51.9%)	1074 (18.9%)	1655 (29.2%)	5674 (100%)	247 (52.1%)	99 (20.9%)	128 (27.0%)	474 (100%)
Total	8079 (38.0%)	4218 (19.8%)	8954 (42.1%)	21251 (100%)	774 (40.5%)	434 (22.7%)	701 (36.7%)	1909 (100%)
Officers								
Number					Subset			
	Small	Medium	Large	Total	Small	Medium	Large	Total
Financial	1230 (39.9%)	612 (19.9%)	1237 (40.2%)	3079 (100%)	62 (28.1%)	40 (18.1%)	119 (53.8%)	221 (100%)
Total	3508 (24.1%)	2967 (20.4%)	8069 (55.5%)	14544 (100%)	286 (21.6%)	273 (20.6%)	768 (57.8%)	1327 (100%)
Others								
Number					Subset			
	Small	Medium	Large	Total	Small	Medium	Large	Total
Financial	167 (46.3%)	87 (24.1%)	107 (29.6%)	361 (100%)	16 (41.0%)	12 (30.8%)	11 (28.2%)	39 (100%)
Total	534 (43.6%)	303 (24.8%)	387 (31.6%)	1224 (100%)	47 (34.1%)	37 (26.8%)	54 (39.1%)	138 (100%)

*Total* is the number of traders active in both 2003Q1-2007Q2 and 2007Q3-2010Q1. *Subset* is the numbers who were net sellers in the earlier period and net buyers in the later period.



Table 4: Insider Net Purchase Predictive Regressions.

	All Insiders			Subset of Insiders		
	Directors	Officers	Others	Directors	Officers	Others
All Firms	0.219 (1.85)	0.122 (3.09)	0.217 (1.09)	0.215 (1.65)	0.135 (2.55)	0.182 (0.93)
Small Firms	0.176 (2.54)	0.318 (2.36)	0.199 (1.40)	0.595 (1.99)	0.185 (2.19)	0.143 (1.75)
Medium Firms	0.151 (3.66)	0.521 (4.06)	0.189 (1.87)	0.125 (2.01)	0.318 (1.98)	0.233 (2.78)
Large Firms	0.133 (1.09)	0.109 (2.31)	0.120 (0.69)	0.133 (1.01)	0.940 (1.58)	0.922 (0.51)

Coefficient values are for delta in equation (1), numbers in parentheses are *t*-values.

Table 5: Insider Sales and Crash Predictive Regressions.

	All Insiders			Subset of Insiders		
	Directors	Officers	Others	Directors	Officers	Others
	Crash Defined Using Raw Returns					
Sales (-1)	0.062 (8.14)	0.312 (2.25)	0.036 (1.32)	0.058 (1.97)	0.165 (1.84)	0.014 (1.55)
Sales (-2 to -12)	0.014 (1.65)	0.192 (1.43)	0.031 (1.26)	0.353 (2.62)	0.433 (2.56)	0.009 (0.89)
Ret.s (-1 to -12)	-0.002 (-8.61)	-0.026 (-2.55)	-0.014 (-3.67)	-0.026 (-2.72)	-0.019 (-2.01)	-0.009 (-2.55)
Volume (-1)	0.001 (2.43)	0.001 (1.99)	0.003 (2.03)	0.002 (1.77)	0.001 (2.51)	0.003 (1.81)
Volu. (-2 to -12)	-0.001 (2.35)	-0.001 (-2.54)	-0.002 (-2.17)	-0.001 (-2.58)	-0.001 (-2.45)	-0.001 (-2.34)
	Crash Defined Using Excess Returns					
Sales (-1)	0.041 (5.75)	0.054 (1.98)	0.008 (0.97)	0.029 (2.01)	0.066 (2.10)	0.009 (1.06)
Sales (-2 to -12)	0.007 (1.43)	0.010 (1.23)	0.004 (0.65)	0.068 (2.18)	0.185 (2.41)	0.002 (0.38)
Ret.s (-1 to -12)	-0.001 (-7.89)	-0.015 (-2.07)	-0.012 (-2.87)	-0.019 (-2.05)	-0.017 (-2.13)	-0.010 (-2.76)
Volume (-1)	0.001 (2.56)	0.001 (2.02)	0.004 (2.24)	0.001 (1.65)	0.002 (1.66)	0.002 (1.75)
Volu. (-2 to -12)	-0.001 (-2.44)	-0.001 (-2.38)	-0.002 (-2.09)	-0.001 (-2.28)	-0.001 (-2.37)	-0.001 (-2.19)

Coefficient values are for delta in equation (1), numbers in parentheses are  $t$ -values.

Table 6: Insider Net Purchases and Crash Predictive Regressions.

	All Insiders			Subset of Insiders		
	Directors	Officers	Others	Directors	Officers	Others
TODO	Crash Defined Using Raw Returns					
NP (-1)	-0.038 (-4.87)	-0.084 (-3.01)	-0.027 (-1.46)	-0.034 (-4.23)	0.065 (-2.12)	-0.018 (-1.45)
NP (-2 to -12)	-0.009 (-1.65)	-0.055 (1.62)	0.031 (0.77)	-0.018 (-2.45)	-0.035 (-2.14)	0.005 (0.62)
Ret.s (-1 to -12)	-0.002 (-2.54)	-0.003 (-2.87)	-0.002 (-3.01)	-0.002 (-13.60)	-0.004 (-2.11)	-0.002 (-2.37)
Volume (-1)	0.001 (2.51)	0.001 (1.66)	0.002 (1.33)	0.001 (1.67)	0.001 (1.67)	0.002 (1.79)
Volu. (-2 to -12)	0.001 (2.06)	-0.001 (-2.37)	-0.001 (-2.21)	-0.001 (-2.56)	-0.001 (-2.18)	-0.001 (-2.48)
	Crash Defined Using Excess Returns					
NP (-1)	-0.024 (5.75)	-0.032 (-2.02)	-0.011 (-1.13)	-0.021 (-4.27)	-0.028 (-1.99)	-0.010 (-1.46)
NP (-2 to -12)	-0.008 (1.63)	-0.017 (1.65)	-0.002 (-0.79)	-0.016 (2.08)	-0.015 (-2.05)	-0.002 (0.87)
Ret.s (-1 to -12)	-0.001 (-5.34)	-0.004 (-2.01)	-0.002 (-2.56)	-0.004 (-2.14)	-0.002 (-2.44)	-0.004 (-2.89)
Volume (-1)	0.002 (1.76)	0.001 (2.54)	0.002 (1.18)	0.001 (1.72)	0.002 (2.56)	0.001 (1.68)
Volu. (-2 to -12)	-0.001 (-2.35)	-0.001 (-2.18)	-0.001 (-2.13)	-0.001 (-2.17)	-0.001 (-2.54)	-0.001 (-2.27)

Coefficient values are for delta in equation (1), numbers in parentheses are  $t$ -values.

Table 7: Insider Trading and CDS Premium – Granger Causality.

	Directors	Officers	Others
	Insider Sales		
Insider Sales → CDS Premium	2.19 (0.03)	1.80 (0.08)	0.23 (0.88)
CDS Premium → Insider Sales	0.21 (0.99)	0.50 (0.83)	0.36 (0.78)
	Insider Net Purchases		
Insider NP → CDS Premium	3.04 (0.00)	0.87 (0.48)	0.33 (0.81)
CDS Premium → Insider NP	0.40 (0.92)	3.65 (0.00)	7.41 (0.00)

Figure 1

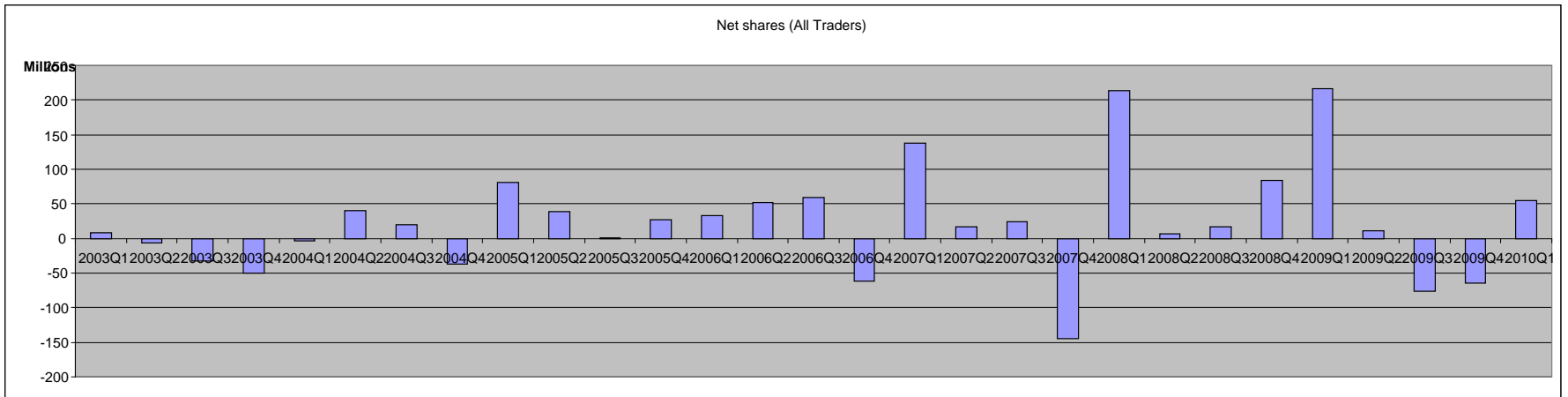


Figure 2

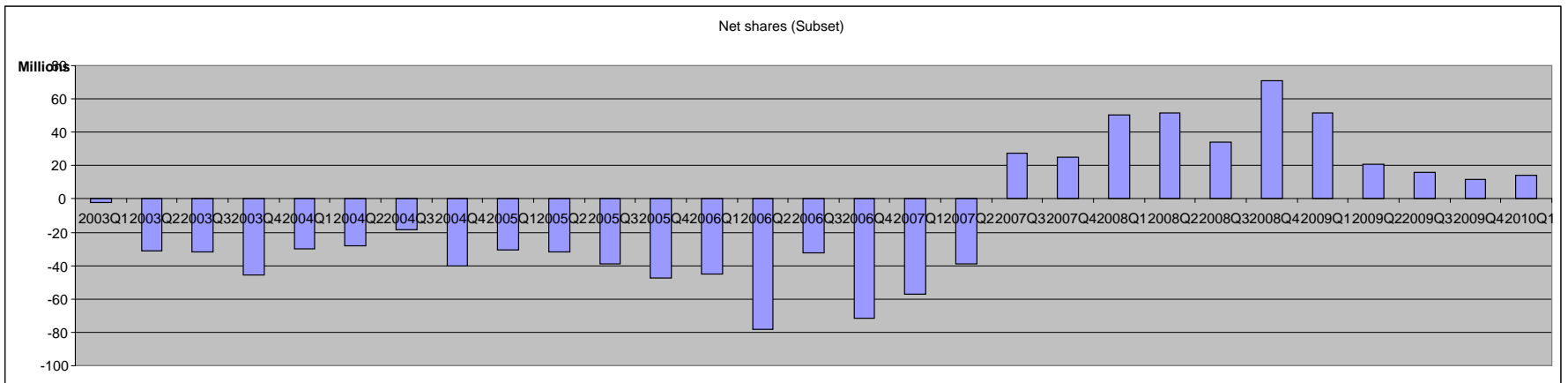


Figure 3

All directors: Shares bought by net buyers and sold by net sellers

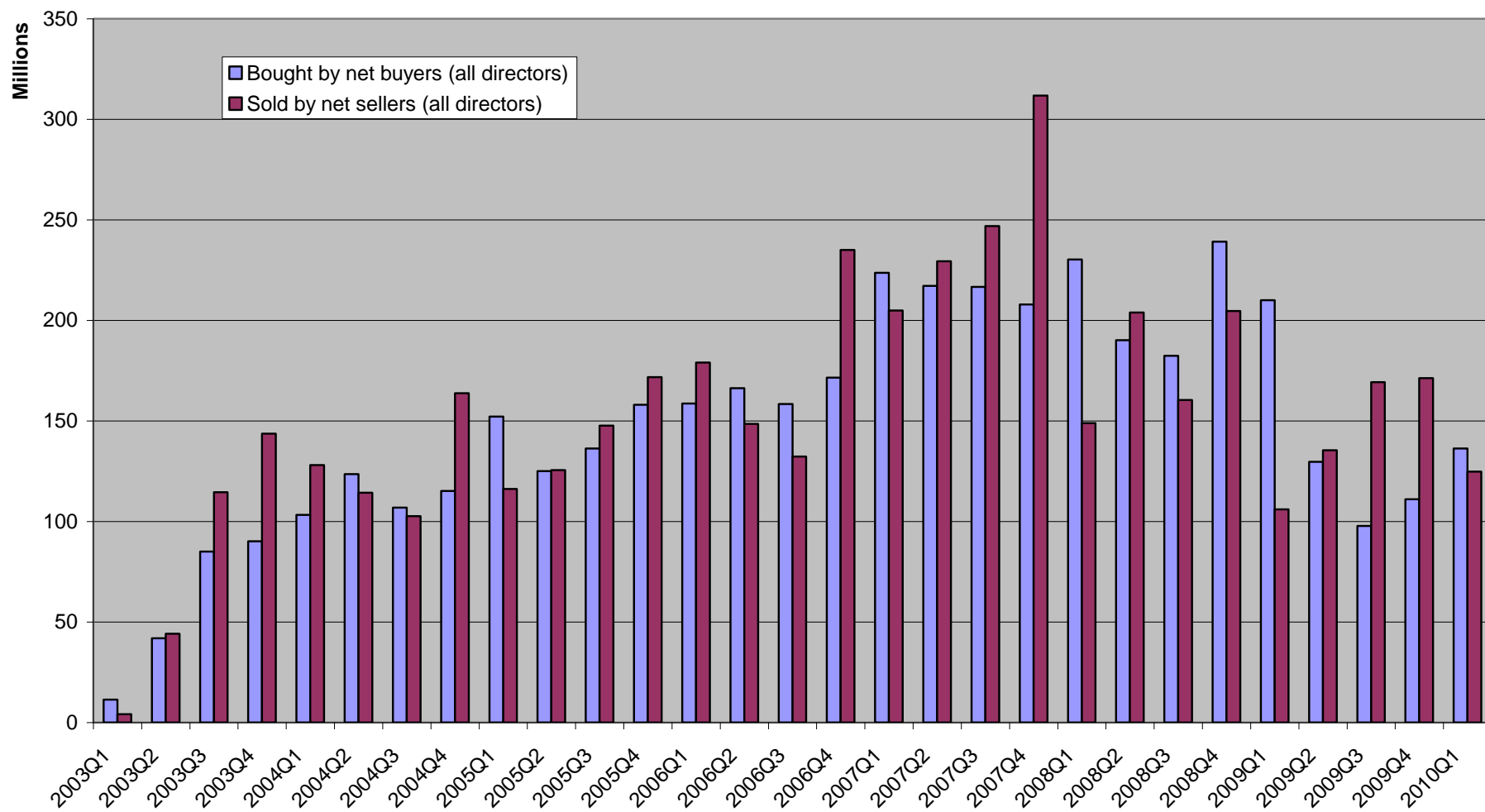


Figure 4

**Subset of directors: Net shares bought by net buyers and sold by net sellers**

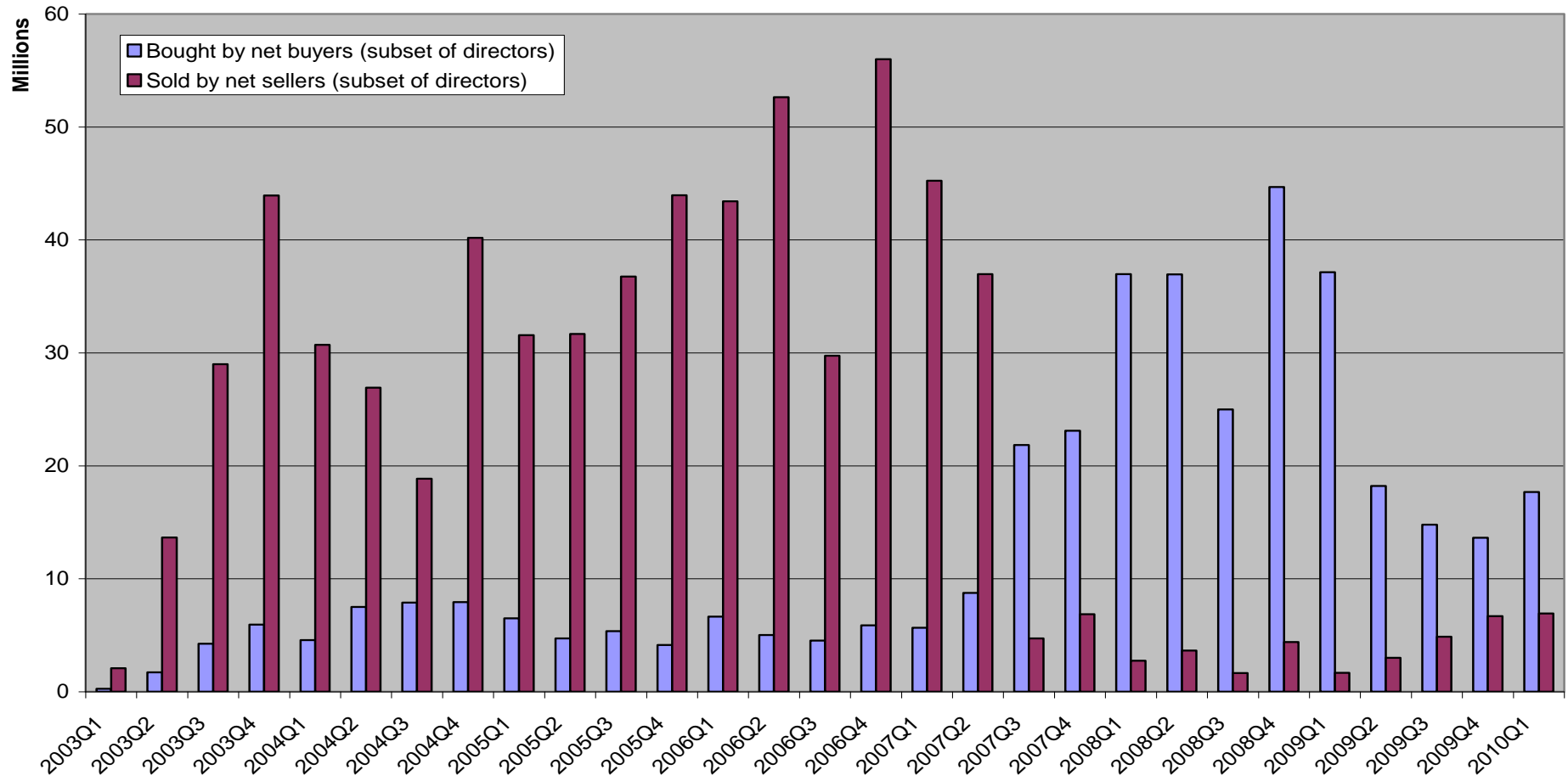


Figure 5

**All officers: Stocks bought by net buyers and sold by net sellers**

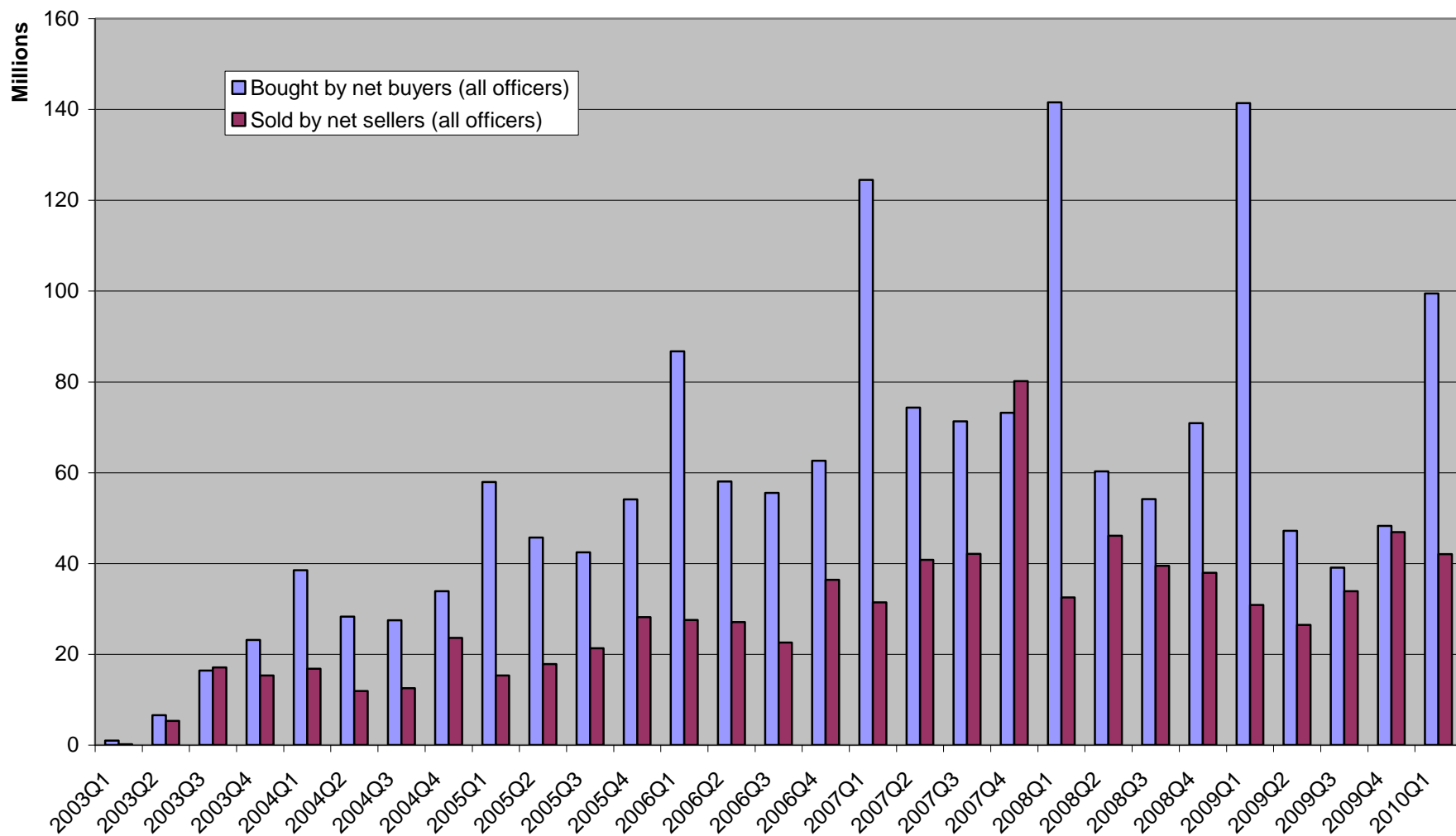




Figure 6

Subset of officers: Stocks bought by net buyers and sold by net sellers

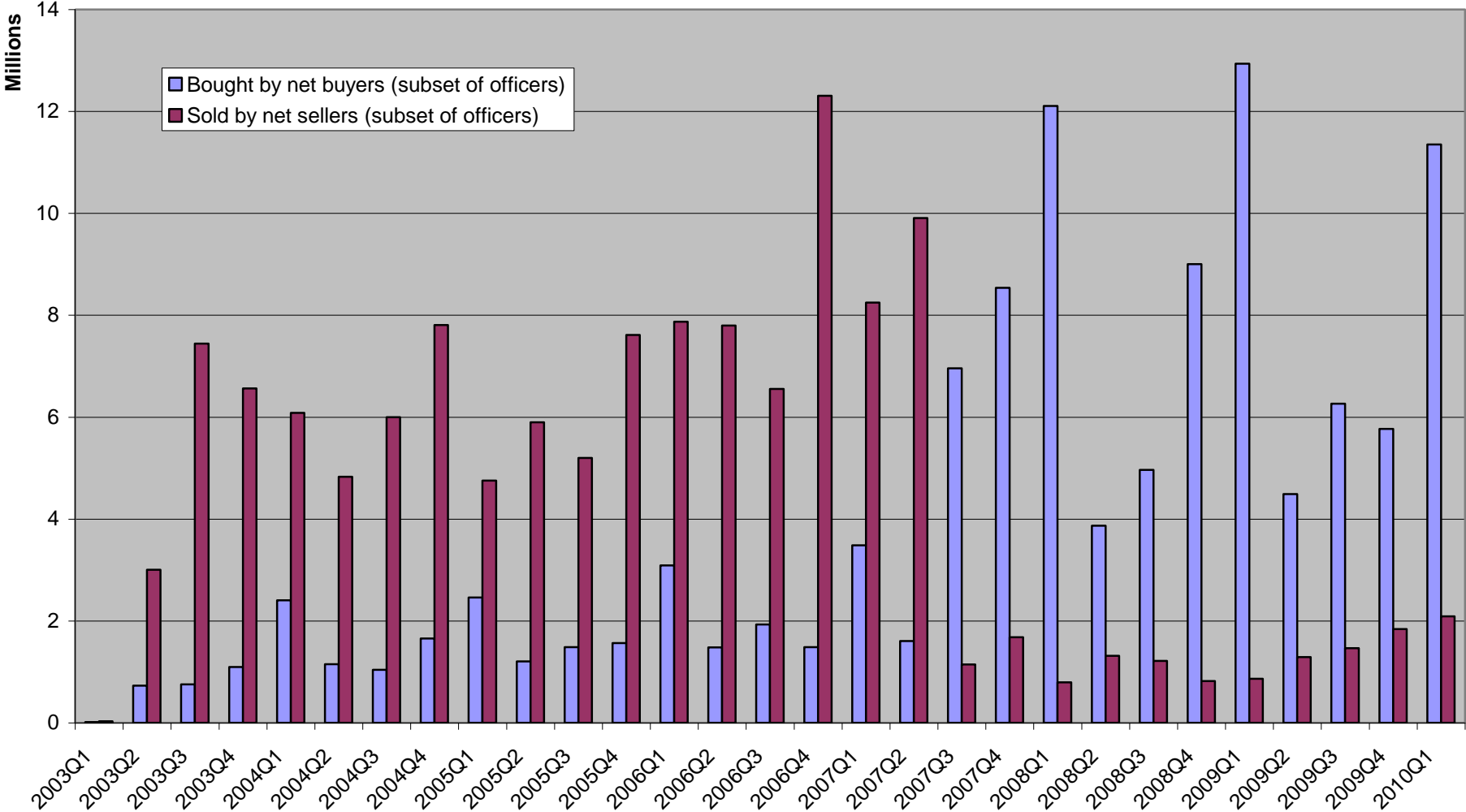


Figure 7

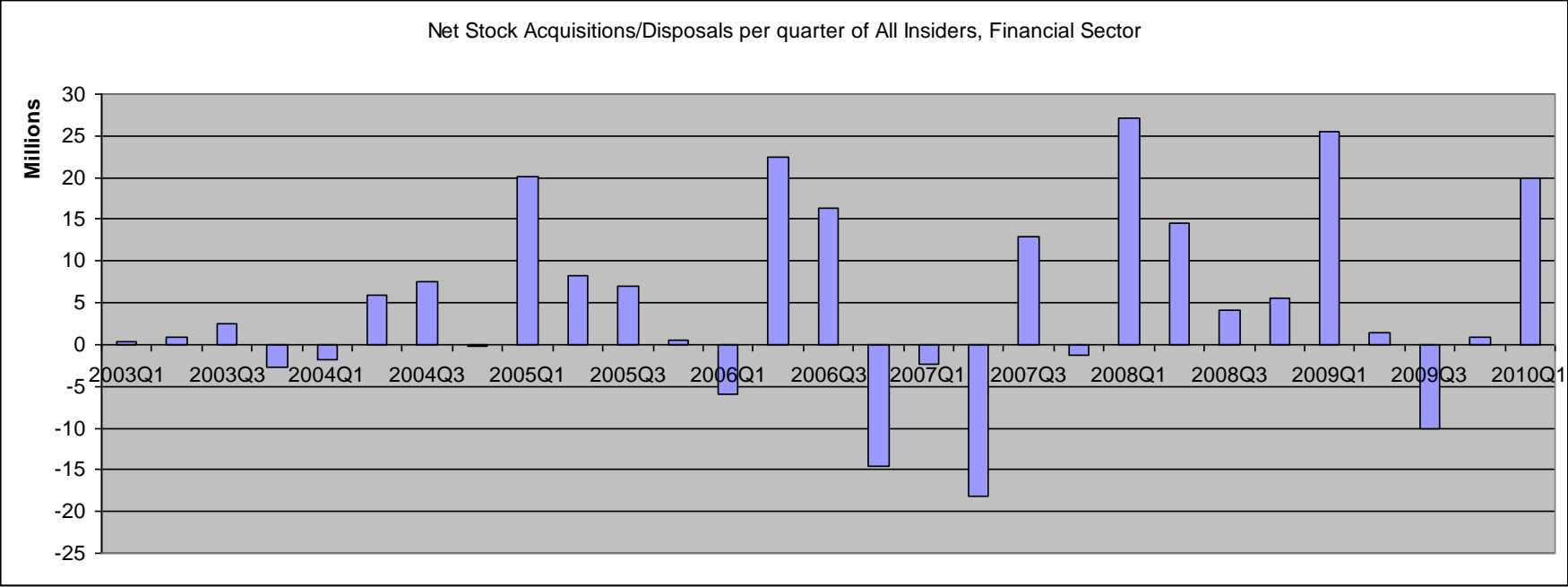


Figure 8

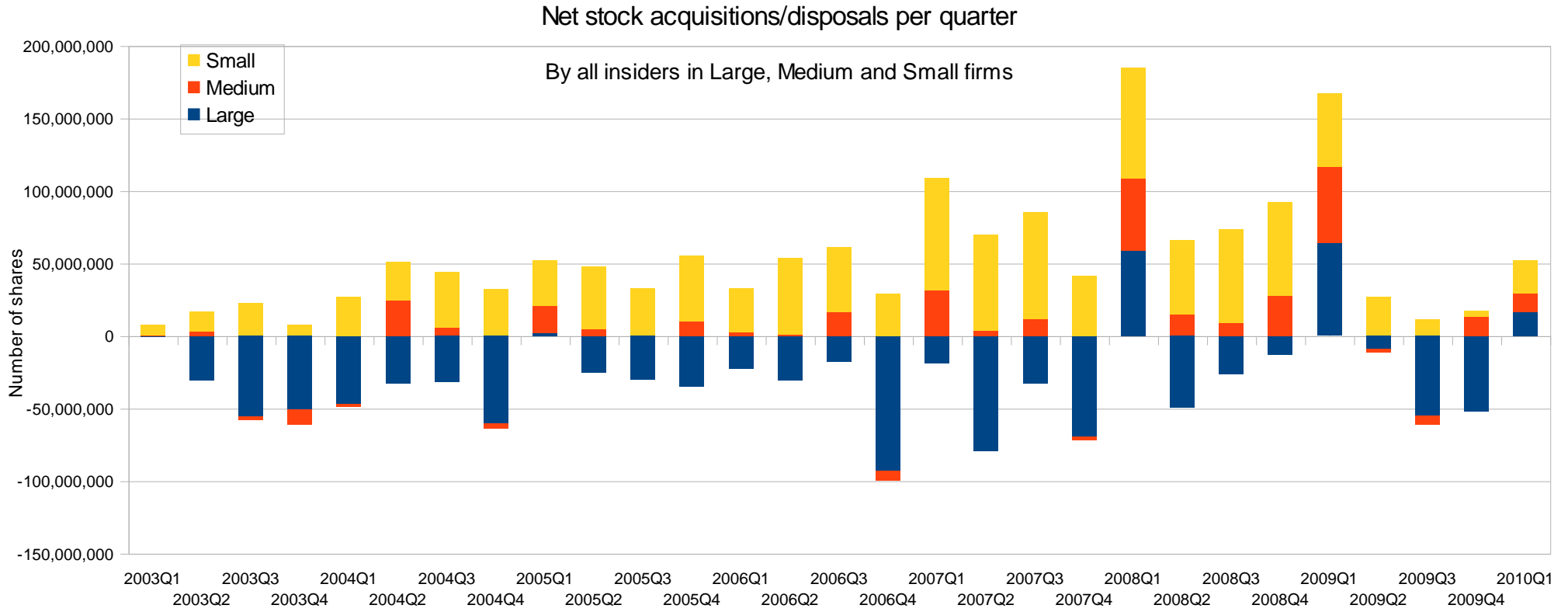


Figure 9

Net stock Acquisitions/Disposals per quarter

by Directors in Large, Medium and Small firms

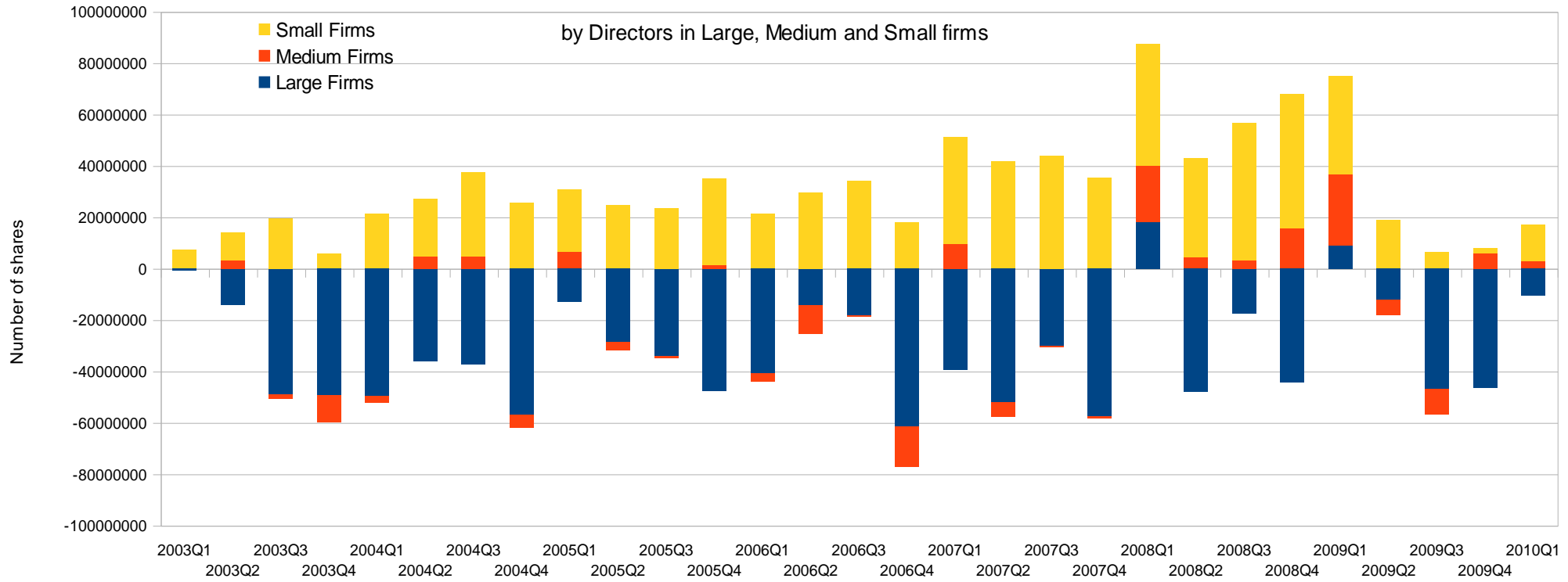


Figure 10

Net Stock Acquisitions/Disposals per quarter  
by Officers in Large, Medium and Small firms

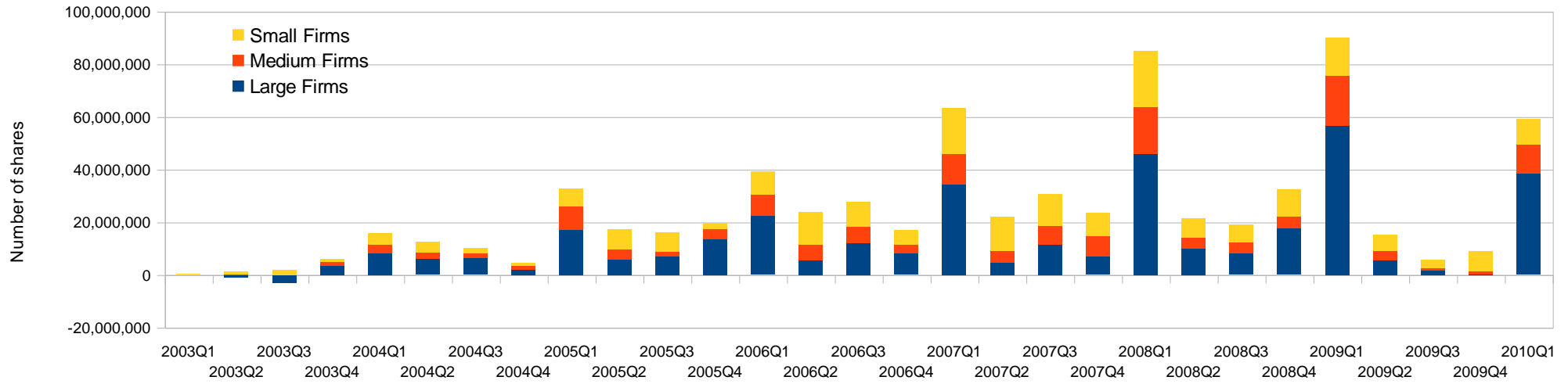


Figure 11

Net Stock Acquisitions/Disposals per quarter

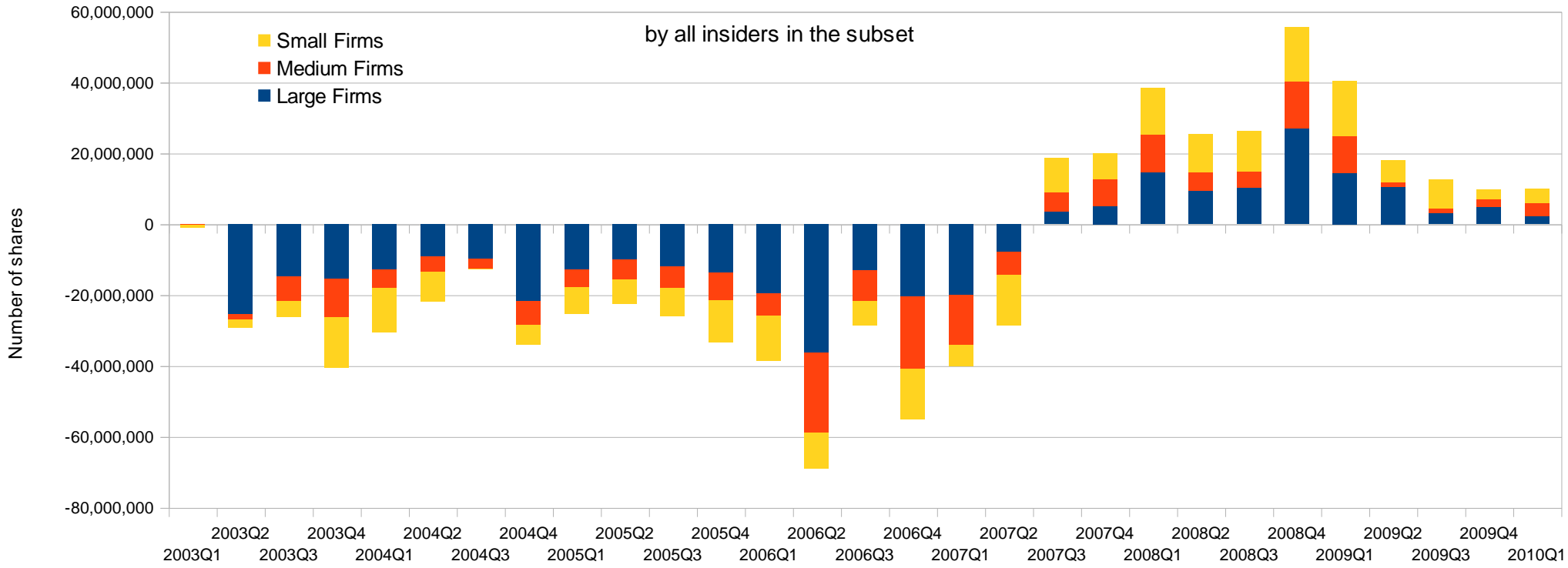


Figure 12

Net stock acquisitions/disposals per quarter

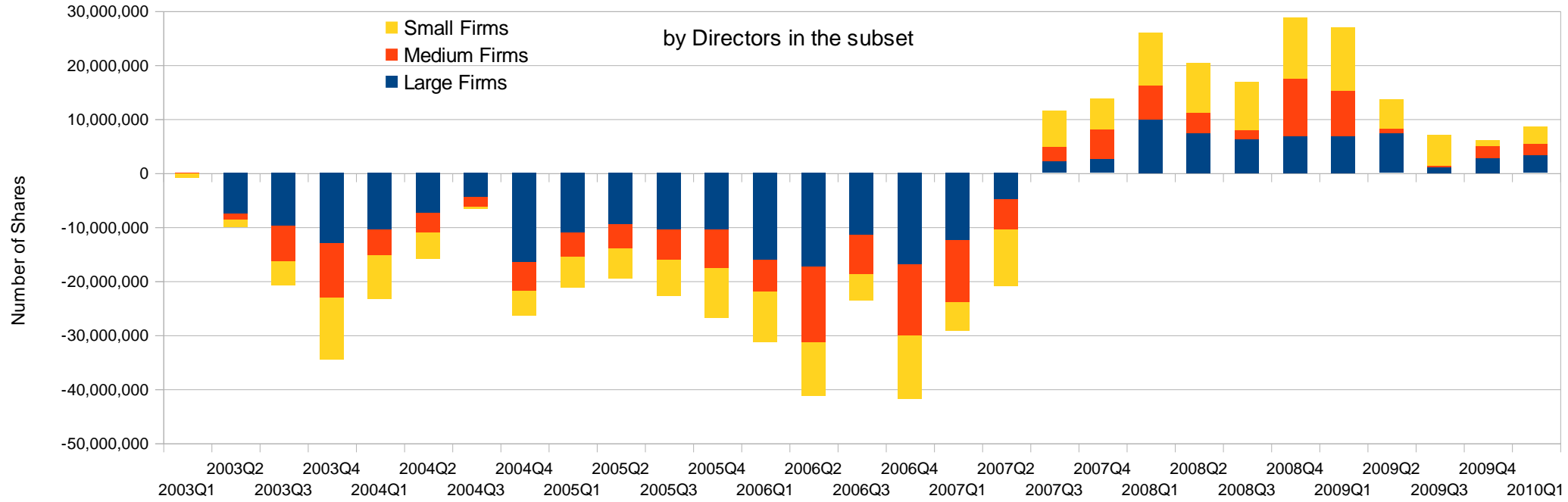


Figure 13

Net Stock acquisitions/disposals per quarter

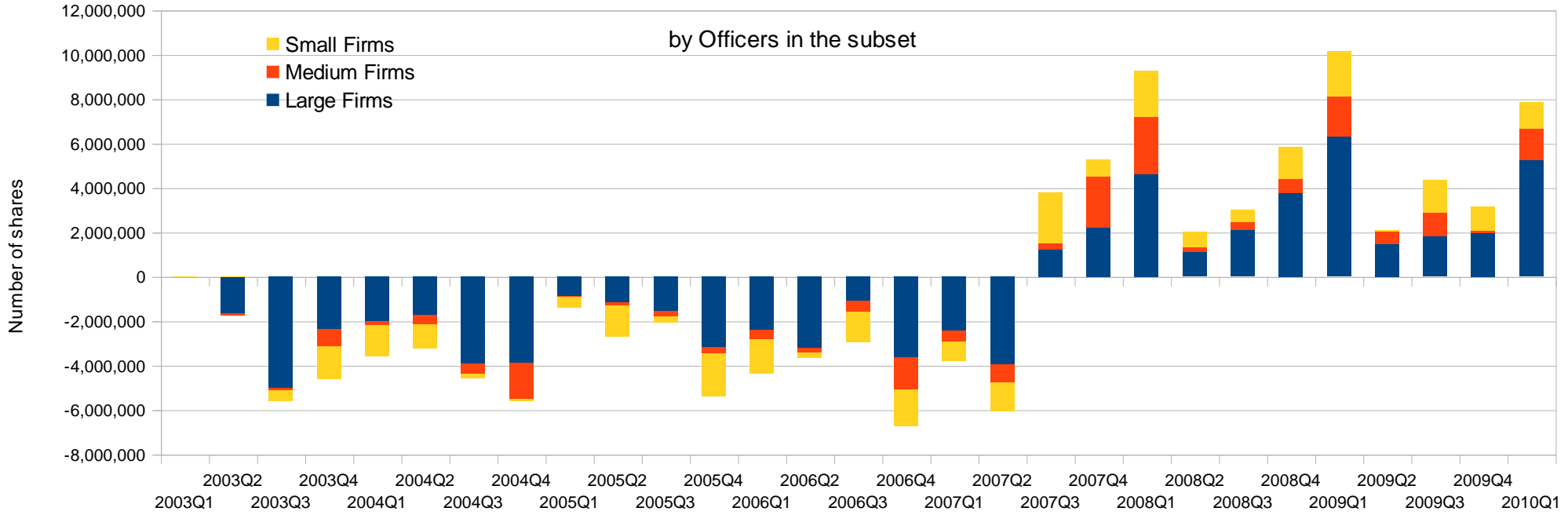




Figure 14

Net Stock Acquisitions/Disposals per Quarter

by all insiders in financial sector

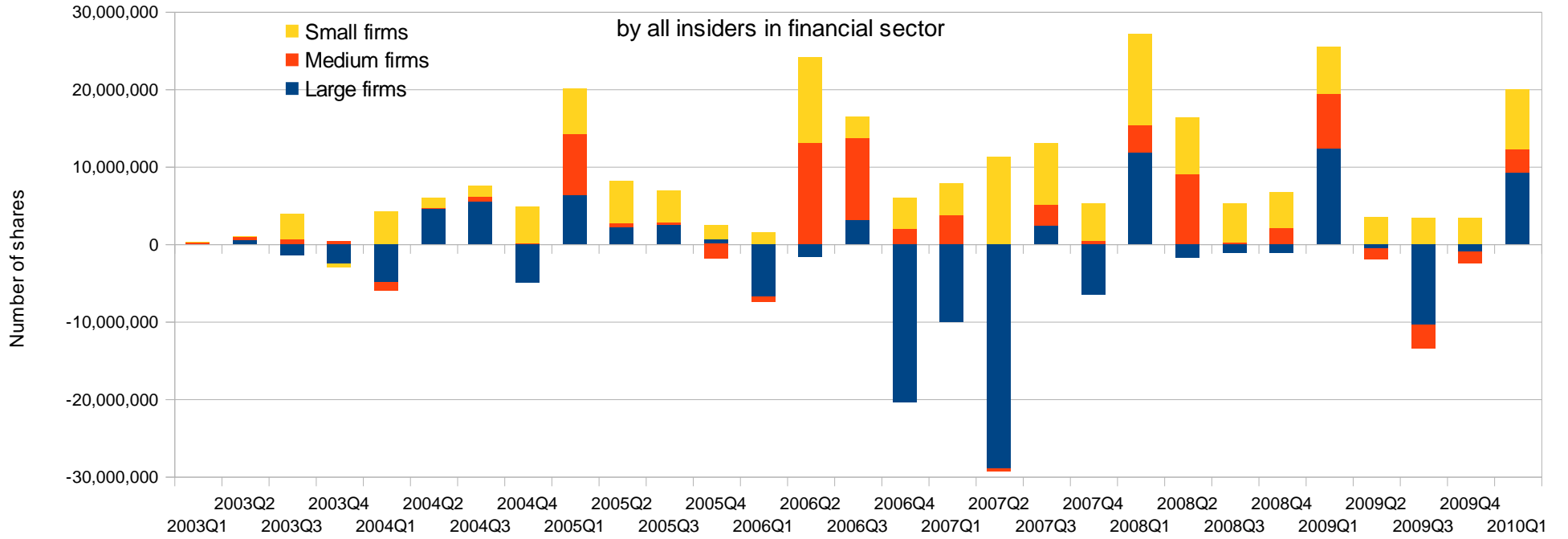


Figure 15

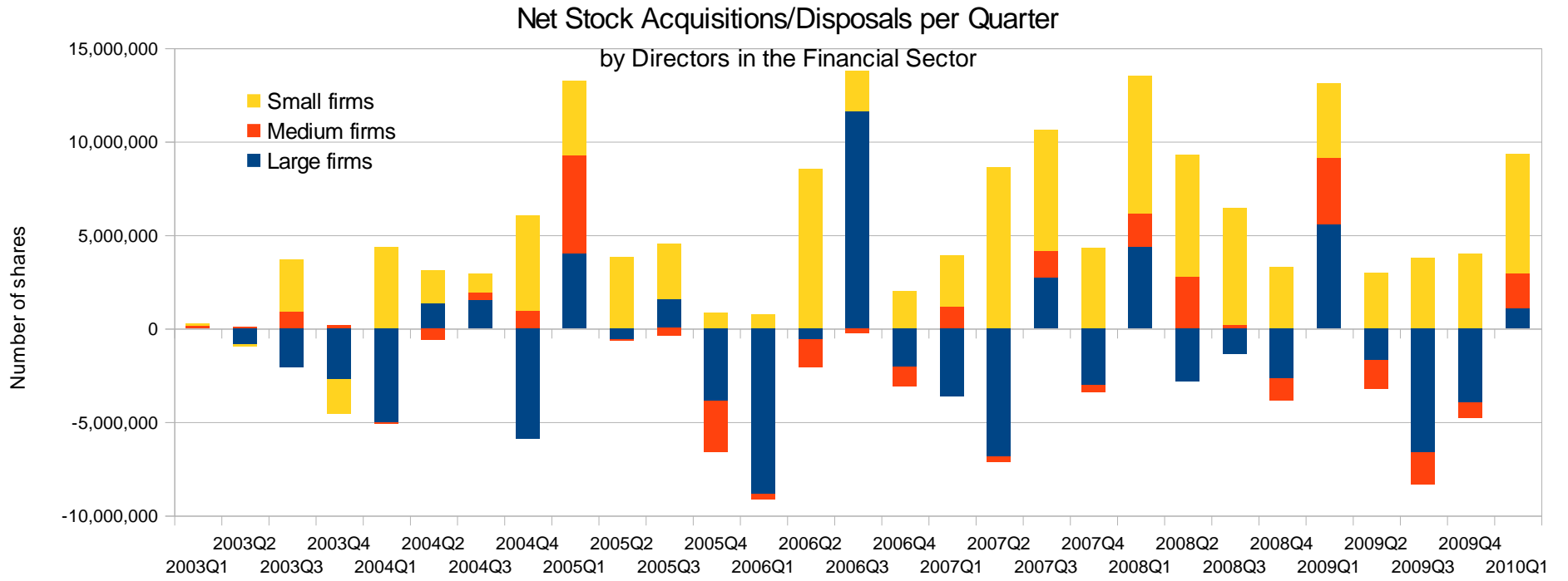


Figure 16

### Net Stock Acquisitions/Disposals per Quarter

by Officers in the Financial Sector

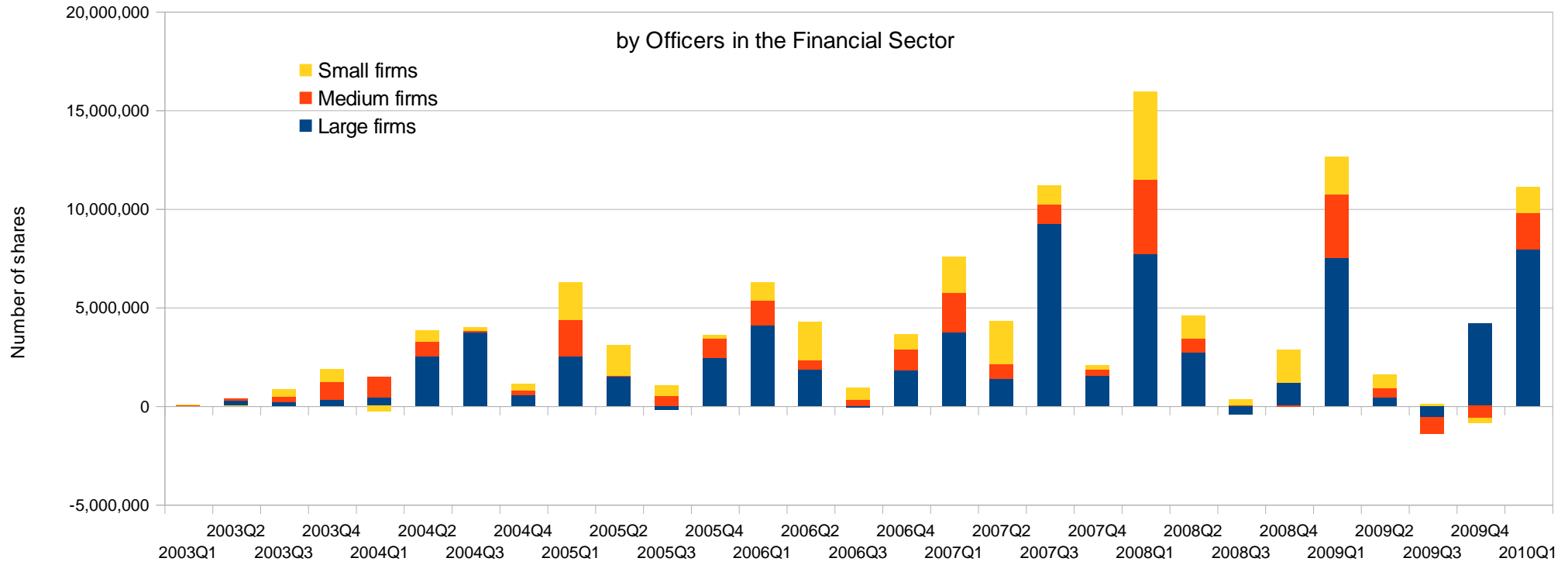


Figure 17

Net Stock Acquisitions/Disposals in each quarter

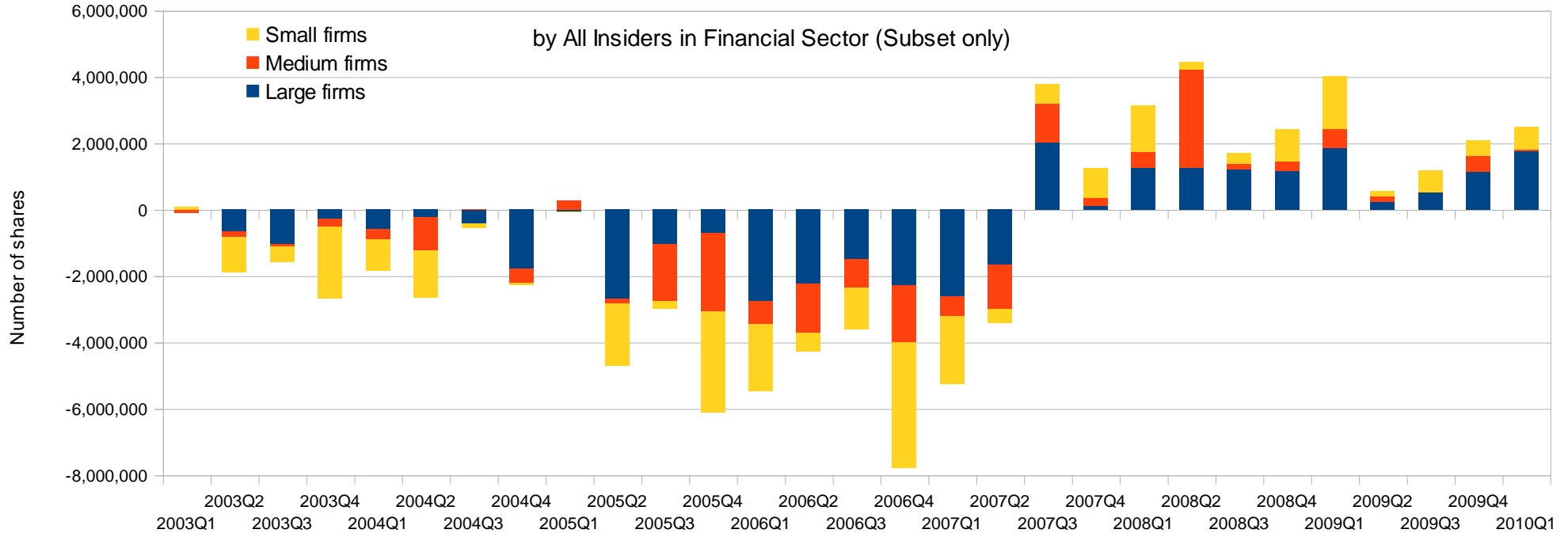


Figure 18

Net Stock Acquisitions/Disposals per Quarter

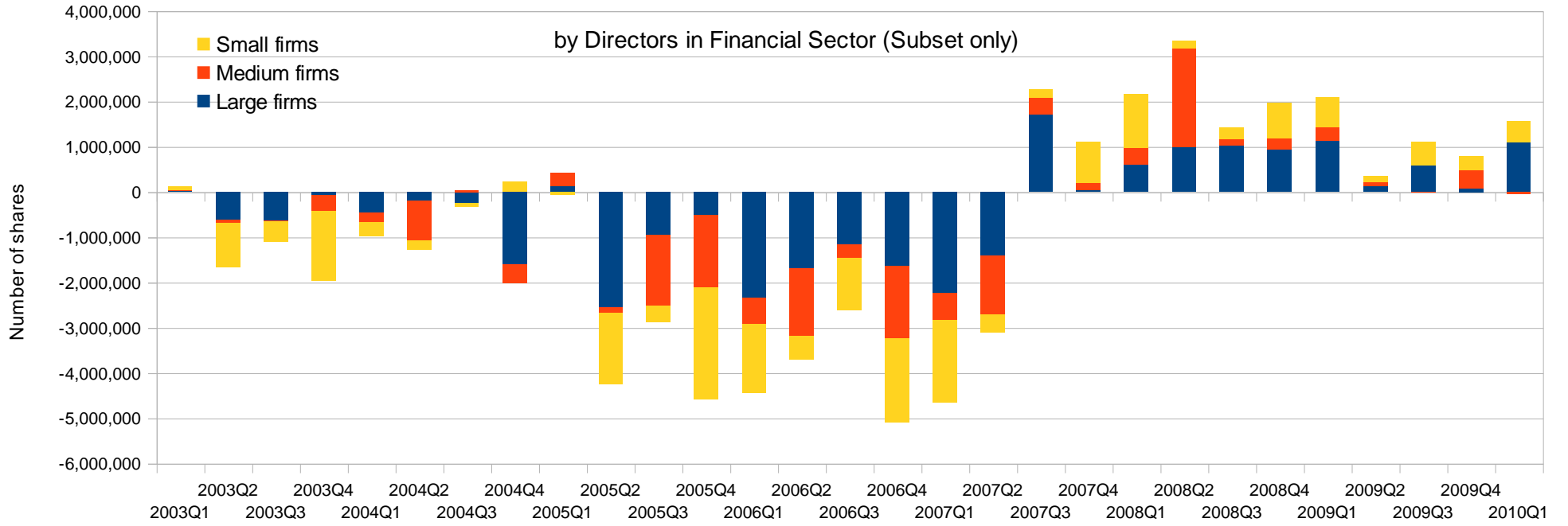
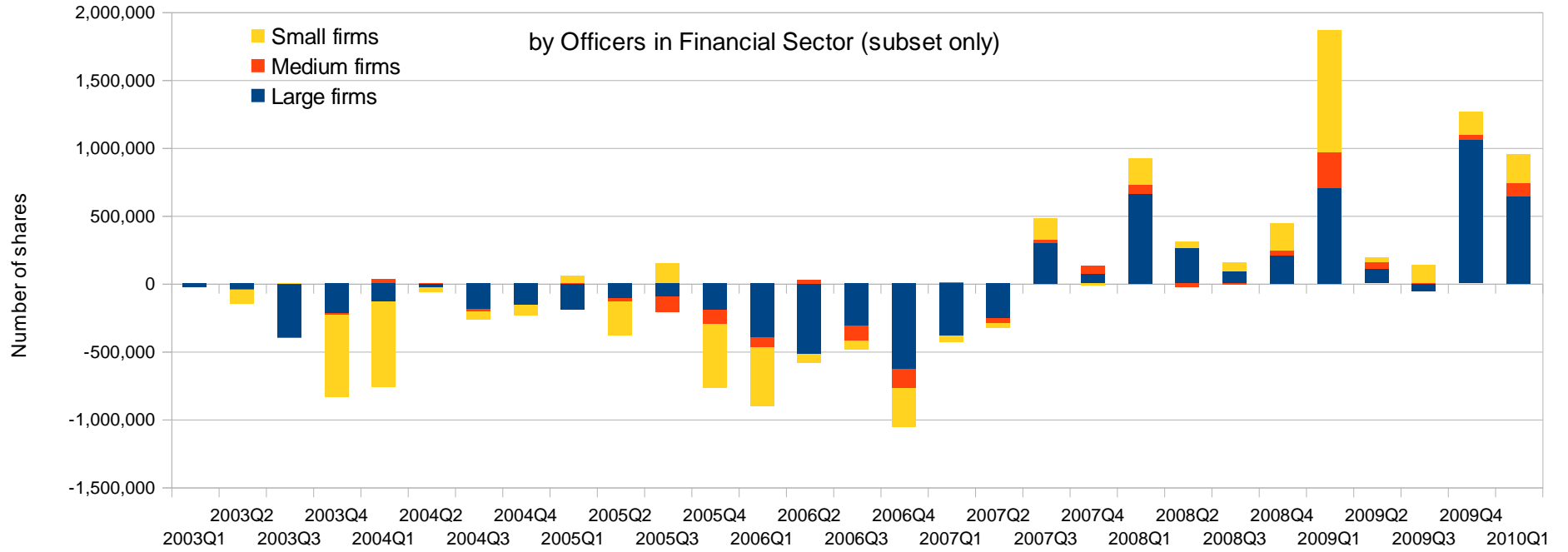


Figure 19

### Net Stock Acquisitions/Disposals per Quarter



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<sup>1</sup> Annual and quarterly net acquisition across industrial sectors and other graphs not reported in the text can be obtained from the authors.

<sup>2</sup> The Figures for other groups are not shown here as there was no clear pattern emerging from their trading and there were rather a small group. However, they can be obtained from the authors.

<sup>3</sup> In respect of returns we consider raw returns, excess (over the short-term Treasury bill) and abnormal returns (over the S&P500). The results are both qualitatively and quantitatively similar. The effect of using excess and abnormal returns is to remove the influence of cyclical economic-wide factors and to control for the belief that insiders may act in a contrarian fashion (for example, Lakonishok and Lee, 2001).

<sup>4</sup> The use of a binary dependent variable would normally imply either logit or probit estimation; however, the inclusion of fixed effects means that such estimators are not consistent. OLS, in contrast, remains consistent. Nonetheless, Chamberlain (1980) proposed a conditional maximum likelihood estimator for the logit model with fixed effects.

<sup>5</sup> The Depository Trust and Clearing Corporation (DTCC) began publishing the CDS information on November 7, 2008 after Lehman's default in order to increase transparency on CDS in OTC market.

<sup>6</sup> Results for the subset of insider traders essentially replicate the reported results for all traders and thus are not tabulated but are available upon request.



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