Information Content of Insider Trades, IPO lockup Expiration and long-run IPO Performance

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List of Acronyms

AIM: Alternative investment market, market for small companies in London Stock Exchange

BHARs: Buy and hold abnormal returns

CARs: Cumulative abnormal returns

CEO: Chief executive officer

FSA: Financial Services Authority

HML: High minus low factor (Fama-French)

IPOs: Initial public offerings

M&A: Mergers and acquisitions

M/B: Market-to-book ratio

NOMAD: Nominated advisor

RNS: Regulatory news services

SEC: Securities and Exchange Commission

SEOs: Seasoned equity offerings

SMB: Small minus big factor (Fama-French)

VCs: Venture capitalists

Dedication

To my parents, my wife and two lovely kids, for their support, sacrifice and care.

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Declaration

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Abstract

A number of previous studies have assessed whether insider trades convey information to the market. Whilst lots of research has been undertaken in the past three decades, the issue is still contentious and there is ongoing debate concerning the legality and profitability of insider trading. Regulators restrict insider trading before any material news announcements, so that insiders cannot take advantage of private information. Motivated by the studies in individual and aggregate insider trading, the objective of this thesis is to understand the role of signals that insiders send to the financial market about their companies when they trade, in general, and to assess the role of insider trading in the context of initial public offerings (IPOs), particularly under lockup restrictions and the high information asymmetries inherent in IPOs.

The first empirical chapter finds, in general, insider purchases convey information to the market and insider sells do not significantly affect stock prices. The market reaction to insider trading depends strongly on market-to-book and size of the company. However, the market reaction is weaker than previously documented. This thesis finds that insiders are net buyers in bear market and net sellers in bull market, which is consistent with the contrarian strategy. However, there is no difference in price reaction between the bull and bear markets. I also find that aggregate insider trading does not predict market returns.

In the second empirical chapter, I analyse insider trading within the lockup period. In almost all IPOs, the lockup agreement puts restrictions on insider trading before a certain date, which is known as the lockup expiration date. This thesis contributes to previous evidence by analysing insider trading under such institutional constraint. In particular, the insider trading before lockup expiration and the signals insiders send through their trades are examined. This thesis documents that insiders sell (buy) before lockup expiration. The characteristics of companies where insiders sell and where insiders buy are contrasted. While insiders sell in over-performing, large and low institutional

holding IPOs, they buy in underperforming IPOs with lower under-pricing and lower proportion of shares locked in. Finally, I relate insiders buying and selling with the share price drop around lockup expirations.

The third chapter uses aggregate insider trading measure to address the issue of long run IPO performance. The study analyses insider trading within three years after an IPO to address the issue of IPO underperformance in the long run. In line with most of the existing studies, this thesis produces evidence that IPOs underperform in the long run. However, *Net Sell* IPOs over-perform, while *Net Buy* IPOs underperform. Moreover, the IPOs with insider trades perform better than the IPOs with no insider trades, which is consistent with the 'price discovery' argument of insider trading. The share price behaviour of *Net Buy* IPOs is not consistent with the 'informed trading' or 'signalling' hypothesis. In the case of *Net Sell* IPOs the results are consistent with the 'timing' as the insiders sell when the IPO reaches its optimum value. The trading behaviour is also consistent with the disposition effect in behavioural finance as insiders exhibit a tendency to sell winners and hold on to losers for too long.

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Chapter 1

1 Introduction

Insider trading has gained considerable attention in academic research and from the media. For instance, the cover page news in *Financial Times* reports "Insider Trading Crackdown …billionaire investor charged….and former executives of Bear Stearns, IBM, Intel and McKinsey were charged yesterday in an alleged insider scheme that US prosecutors called the biggest ever."[1] In most of the developed countries laws regarding insider trades exist,[2] and insider trading is illegal based on the proposition that insiders have superior 'inside' information. If they are allowed to trade based on such information, they are going to harm outside investors. The issue whether insider trading should be allowed or not is still controversial, as there are arguments in favour of and against insider trading (see, Bainbridge (2000) for a review). Regulators and the financial community are interested in insider transactions to measure insider gains and any distortion in prices that result from insider trades (Leland (1992)). Some argue that current rules

[1] Financial Times, October 18, 2009.

[2] Bhattacharya and Daouk (2002) provide a comprehensive survey. They find that 103 countries had stock markets at the end of 1998. Insider trading laws existed in 87 countries.

against insider trading prevent prices from reflecting the correct value of the firm and, thus, damaging market efficiency (Manne, 1966, and Meulbroek, 1992). On the other hand, if non-informed investors are aware of the wealth transfer induced by insider trading, they refrain from trading, resulting in illiquidity, and therefore inefficiency in the markets (Bhattacharya and Spiegel (1991)). Thus, regulators advocate the need to impose a set of rules to enhance investors' confidence in the fairness of trading in financial markets.[3] In line with this argument, Bhattacharya and Daouk (2002) find that the successful prosecutions affect market liquidity, rather than the introduction *per se* of insider trading rules.

The issue of legalisation of insider trading was first raised by Manne (1966), who argue that it offers an incentive for managers to release information that leads to more precise security valuation. However, Manne's work does not answer how the information is incorporated into market prices, and how insider trading affects other market participants. More recently, this question has been investigated in a series of theoretical papers based on asymmetric information paradigm. For example, Copeland and Galai (1983), Glosten and Milgrom (1985), Kyle (1985), Easley and O'Hara (1987), and Admati and Pfleinderer (1988, 1989), model the reaction of observable market parameters at the onset of informed, or insider, trading. Cespa (2008) questions whether trading by an insider allows the information to be incorporated into stock prices in the most effective way. He

[3] Financial Times report on 6th April 2010 that Facebook has banned employees from selling stock on the secondary market outside specific trading windows opened by the company, in a move that comes as demand for shares of the private company continues to surge.

asserts that insiders trade on long-lived information and they control the flow of information. Hence, legislation that effectively curb insider trading may therefore facilitate the fundamental information to be incorporated in stock prices. Motivated by the ‘private information’ proposition a vast literature addresses the question as to whether insider trades convey information to the market. The overall results are mixed.

A number of previous studies show that insider trades are informative (e.g. Jaffe (1974) and Finnerty (1976a), Rozeff and Zaman (1988) Pope, Morris and Peel (1990) Gregory, Matatko, Tonks and Purkis (1994)). Jaffe, (1974) and Finnerty, (1976a) in the US show that insiders are able to earn significant abnormal returns, around 5% and 7% respectively during the first five months after trading. Using UK data, Pope, Morris and Peel (1990) find significant abnormal returns following directors’ sells while Gregory, Matatko, Tonks and Purkis (1994) identify significant excess gains after directors’ purchases. More recently, Fidrmuc, Goergen and Renneboog (2006) find that insider purchases and sells trigger significant immediate market reactions of 1.16% and -0.26% respectively. However, Lakonishok and Lee (2001) find that insider trades in most firms do not convey any immediate information[4] and on an average, outsiders are not able to obtain any abnormal returns after taking into account transactions costs (Seyhun (1986), Pope, Morrison and Peel (1990), Gregory, Matatko, Tonks (1997), Jeng,

[4] There is some predictability of excess returns left using equity purchases in small firms, but no predictability of excess returns at all is found on the sell side, or for medium-sized and large firms on both the buy and sell side.

Metrick and Zeckhauser (2003) and Friederich, Gregory, Matatko and Tonks (2002)).[5]

A number of empirical studies provide evidence that corporate insiders use private information to strategically trade their own shares around corporate events and gain significant abnormal returns. For example, Seyhun and Bradley (1997) report that insiders of companies that file for bankruptcy protection sell their holdings before a decrease in stock prices and buy after prices have fallen. Karpoff and Lee (1991) show that insiders sell before firm's announcement of new stock offering. Lee, Mikkelson and Partch (1992) report that insiders trade around the announcement of stock repurchases. Other studies focus on earnings forecasts (Penman (1982)), takeovers (Seyhun (1990)), and dividend announcements (John and Lang (1991)). These studies provide support for the hypothesis that insiders are able to trade profitably around major corporate event announcements.

Marin and Oliver (2008) analyse insider trading and large movements in market prices. They document that insider sells peak many months before a large drop in stock prices, while insider purchases peak only the month before a large jump. They provide several explanations for such selling behaviour which is consistent with the market timing theories. Their results could imply that insiders

[5] Seyhun (1986) found that outsiders earn a gross return of only 1.2% per annum in the 100 days following receipt of official summary, a level of return that is certainly unprofitable after deducting transactions costs. However, over the 100 days following the transactions date, insiders earn only a gross return of 2.3% per annum, indicating virtually no insider trading profit after deducting transactions costs. Moreover, Seyhun (1986) also reports that gross insider trading profits are 3.1% per annum in the 300 days following the date of trading, substantially less than the 7.4% profit reported by Jaffe (1974).

trade avoiding lawsuits.[6] However, the selling behaviour challenges the conventional view that insider sells are mostly driven by the needs for diversification and liquidity.

Rozeff and Zaman (1998) find that insider transactions are not random across growth and value stocks. They find that insider buying increases as stocks change from growth to value categories and their purchases are higher after low stock returns, and lower after high stock returns. Lakonishok and Lee (2001) obtain similar findings—insiders tend to buy value stocks and sell glamour stocks. Jenter (2005) provides further evidence on market timing and managerial portfolio decisions. He finds that managers' perceptions of fundamental values diverge systematically from market valuations, and perceived mispricing is an important determinant of manager's decision making. Insider trading patterns show that low valuation firms are regarded as undervalued by their own managers relative to high valuation firms. Further evidence by Jenter (2005) links manager's private portfolio decisions to changes in corporate capital structures, suggesting that managers try to actively time the market both in their private trades and in corporate level decisions.

Two recent studies challenge the conventional wisdom that insider trades are informative. The first one is Lakonishok and Lee (2001) who use a comprehensive data of 1.028 million transactions over the period of 1975-95 and show that the market basically ignores inside information when it is reported. The

[6] In the US, most companies prohibit insiders from trading prior to earnings announcement and short-swing rule prohibits profit taking by insiders for offsetting trades within 6 months. In contrast, in the UK, insiders are not allowed to trade 2 months prior to earnings announcements.

observed magnitude of reporting period returns[7] is less than 0.5%. However, they find that insider trades are informative in the long term, suggesting that the market under-reacts to this information. In line with these arguments, Jenter (2005) provides further evidence that managers use little inside information in their trades. The excess returns to insider trades, after controlling for size and book-to-market effects, are not different from zero. He argues that these economically insignificant returns suggest that managers may not use much valid inside information in their decisions above and beyond the information contained in observable firm characteristics such as size and book-to-market.[8]

Previous studies are subject to numerous criticisms. Firstly, most of the studies in insider trading are undertaken in the US market where insiders are defined as board members, officers and large shareholders. Large shareholders are likely to have less 'private' information compared to officers and board members. Secondly, US studies are also subject to data problems. For example, until recently,[9] US companies are not required to report the insider trades to SEC immediately. There is a significant delay between the trade date and reporting date as trades need to be disclosed within 10 days after the end of the month in which they took place. A number of studies use the quarterly changes of insider ownership to infer insider trading in that company. However, there are some studies in the UK market, where the reporting and disclosure is much faster

[7] Reporting period is measured as -2 to +2 days.
[8] However, the results in Jenter (2005) do not suggest that managers never use valid inside information when they trade.
[9] In the US, during the pre-Sarbanes-Oxley (2002) period, insiders have to report their trades on the 10th of the month following the transaction, resulting in a maximum delay of between 10 and 42 days, depending on the trading date. Even recent studies (e.g., Jiang and Zaman (2010)) use pre-Sarbanes-Oxley data.

compared to the US. Finally, previous studies analyse insider trading under the legislative constraints in that particular country. For example, in the US, insiders are not allowed to trade before material news announcements. Insiders' strategic trading behaviour might be very different in other countries where the legislation is different.

Insiders face additional constrains while making decisions to trade. For example, Bettis, Coles and Lemmon (2000) find that insider trading is regulated by the company policy. Most of the firms in their sample have a blackout period when insider trading is not allowed. Particularly, in IPOs insiders are not allowed to sell during the lockup period agreed with the underwriters. Previous studies have not fully addressed whether insider trading occurs under these additional constraints and in IPOs where the information asymmetry is high.

While fully acknowledging the previous work relating to insider trading, I consider the shortcomings and unresolved puzzles in the insider trading literature to explore further the information provided by the corporate insiders and relate it to the alternative information environment in which they trade. Insiders in the UK are more likely to possess superior information because they are limited to executive and non-executive directors. In contrast, in the US, the definition is much broader as officers, key employees and large shareholders are all considered as insiders. Moreover, the differences in insider trading regulations and in reporting periods between the UK and the US can provide additional insights and may answer some anomalies addressed in the corporate finance literature.

The main objective of this thesis, therefore, is to examine the information content of insider trading and use this information to address some dilemmas in corporate finance literature. The corporate finance event that is used in this thesis is initial public offerings (IPOs). To address some of the puzzles in the IPO literature,[10] this thesis uses the information provided by the individual insider trades as well as that provided by the aggregate insider trades. Net purchase ratio (NPR) is used as the aggregate insider trading measure, following Lakonishok and Lee (2001). Specifically, this study uses individual insider trades to address the issue of the drop in share price around the IPO lockup expiry dates and uses aggregate insider trading measure to address the long run performance of IPOs. This study divides the sample of IPOs where insiders trade and where insiders do not trade and relates it to the impact of insider trading on performance.

The purpose of this research is not meant to solve the puzzles in corporate finance (IPO) literature. This thesis intends to explore further and to shed additional light on these issues, which might help in closing the gap between where we stand in corporate finance and the empirical anomalies documented in the literature. Specifically, this research empirically investigates why insiders actively buy (sell) in other IPOs, while they don't trade in some IPOs. What are the implications of insider trades for such companies who floated shares in the market?

There are three main issues underlying insider trading: (i) legalisation constraints and (ii) information asymmetries (iii) agency problems. The former differs across countries and raises the issue of enforcements. The second and third one differs across firms and information regimes. This thesis expands these three factors by introducing an additional constraint on insider trading that is specific to

[10] The puzzles reported in the IPO literature are underpricing, lock-up expiration effects, long run underperformance and cyclicality in IPO volume.

newly quoted firms, which is known as lockup agreements. This study also expands the link between insider trading and information asymmetry by (i) analysing the information content of insider trading and the ability of insiders to predict future returns within the UK context where any trades undertaken by insiders are disclosed within 5 days and (ii) focusing more specifically on the ability of insiders to affect the short and long-term returns of IPOs, firms that are usually considered to have high information asymmetries.

The issue of insider trading is still contentious and this study contributes to the literature by paying attention to the empirical debate of whether insider trades are informative by using more recent UK data. The purpose of this thesis, first, is to examine insider trading in existing companies, analyse the information content and timing of their trades. Second, do insiders trade under institutional constraints, such as lockup agreements, in Initial Public Offerings (IPOs)? Third, can insider trading predict the long run performance of IPOs? The research questions in this study are motivated by the gaps and controversies in the literature, the specific characteristics of the UK market relative to the US where insider trading literature is predominantly undertaken and possible changes in the recent time periods when the financial regulator in the UK (FSA) is considering stricter rules.[11] Following this short summary of the purpose and objective of this thesis, I will now describe in more detail the background and motivation of this thesis.

[11] Evening Standard on 26 March 2010 reports that: as the Financial Services watchdog gets tough with insider traders, why corrupt bankers should be very afraid of its law enforcer.

1.1 Research Background and Motivation

The thesis examines the information provided by insider trades and then analyses insider information in the context of IPOs where insiders face lockup constraints and newly quoted companies are subject to high information asymmetries. As the information asymmetries are high these firms are subject to high moral hazard problem (agency problem). This section addresses why insider trades are important in the firms using asymmetric information paradigm, agency theory framework and legal constraints faced by the firms. Then, the research links insider information in the context of IPOs, and shows that insider trades can provide more information in the case of recently quoted firms.

Asymmetric information provides a potential explanation as to why insiders are able to earn excess returns. Given little uncertainty in the marketplace regarding the firm's value, there is little scope for the insiders to profit, even if insiders have perfect information about the fundamental value of the firm. Conversely, if there is great uncertainty about the value of the firm, then perfect information held by the insiders would be quite profitable. These arguments form the basis of why UK insiders are not allowed to trade for two months prior to earnings announcements. Insiders might have information regarding earnings, and, if they are allowed, they can profitably trade based on this information.

A basic prediction about information asymmetry and insider trading is that when an insider's information advantage is higher, the abnormal return following a purchase should be higher, and the abnormal return following a sell should be lower, all else is equal. Whether insiders buy (sell) more shares when the firm is undervalued (overvalued) depends on the assumptions about the expected price adjustment associated with a trade of a given size. In price-taking models, such as Grossman and Stiglitz (1976), individuals believe they can trade any amount without altering the prevailing stock price. In this set-up, factors such as risk aversion, wealth constraints, or trading rules limit the quantity traded by informed insiders. In contrast, in models of imperfect competition, the size of a transaction does influence prices, as illustrated by Kyle (1985) and Spiegel and Subrahmanyam (1992). In such models, insiders choose the quantities they trade anticipating consequent price adjustments.

These models predict that as the quality or importance of the information possessed by insiders improve, the bid-ask spread tends to widen. Because the spread compensates the market maker for the cost of trading with informed agents, the greater the informational advantage the insiders have over the market maker, the greater the adverse selection problem, and the wider the spread. Similarly, the adverse selection model predicts that the market liquidity, i.e., the number of shares that can be traded in the market for a given change in the stock price, will drop as the intensity of informed trading rises. The intuition is similar to that expressed for the widening of the bid-ask spread. When informed agents are trading, the market maker attaches more importance to the arrival of an order in computing the conditional price of the security. Thus, when a buy order is issued, the market maker elevates his or her posterior assessment of the securities value, and, therefore raises the price because it could have come from an informed trader with positive information. On the other hand, the price is lowered for sell orders. Therefore, when informed traders are perceived to be present in the market, a trade of a given quantity will move prices further, *ceteris paribus*.

After establishing the link between information asymmetry, insider trading and price discovery, it is reasonable to assume that information asymmetry is even more crucial in the context of IPOs, as they are new companies. Therefore, it will be interesting to focus on the information content of insider trading of the newly listed firms. These firms are likely to subject to larger information asymmetries than existing firms. In addition, they are subject to lockup agreement with their underwriters, which restricts insiders to sell before the lockup expiry. Lockup contracts reduce the information asymmetry and mitigate agency problems between the insider-managers and the outside shareholders (Brau et. al. (2004)). Ibbotson and Ritter (1995) state that investors are ready to pay more for a firm with a lockup agreement because any negative information being withheld is likely to be revealed before the locked-up shares can be sold, reducing the benefit of withholding information. Thus, the lockup expiration will shed additional light on the level of asymmetric information between the insiders and outside shareholders. This thesis chooses lockup contracts to further analyse information asymmetry documented in the context of insider trading literature and to examine whether insider trading can explain the anomalous behaviour of the drop in share price around lockup expiration dates.

Further, the information asymmetry and price discovery arguments of insider trading can provide a potential explanation for the long run underperformance of IPOs. After first being documented by Ritter (1991), the long run underperformance of IPOs has been a puzzle. As insider trading fosters efficient capital markets by improving the price discovery procedures in financial markets, it can shed some light on the underperformance of IPOs. Using data on illegal insider trading from SEC, Meulbroek (1992) finds that the stock market perceives the possibility of informed trading and impounds this information on stock prices. Similarly, Cornell and Sirri (1992) and Chakravarty and Mcconnell (1997) advocate that insider trading increases stock price accuracy by moving stock prices significantly. This research looks for a potential explanation of IPO underperformance in the long run, conditional on insider trading.

Another influential proposition—agency theory—could establish a link between insider trading and long run IPO performance. Agency theory (Jensen and Meckling (1976)) predicts that ownership will be more concentrated when controlling insiders find it easier to take advantage of outside or minority shareholders. As insiders' ownership increases, their actions become better aligned with the interests of minority shareholders but they also bear more risk. There is a large literature on agency costs and governance, with an intense controversy evolving over time whether firms in which managers own more shares perform better and have higher valuations or not (see Himmelberg, Hubbard, and Palia (1999), Demsetz and Villalonga (2001), and McConnell, Servaes, and Lins (2005), Lasfer (2006)). Insider buying (selling) can shed additional light on the performance of IPOs if there is a link between insider ownership and performance.

Leland and Pyle (1977) model the retention of shares by insiders as a signal of the quality of a firm when information asymmetries are high. As Myers and Majluf (1984) show, if insiders maximize the wealth of existing shareholders, they will choose to sell equity only if they can do so at an advantageous price. This adverse selection makes it expensive to sell shares when information asymmetries are important. Maug (2002) and Subrahmanyam and Titman (1999) point out that it becomes advantageous for firms to have outside shareholders, and hence to have more dispersed ownership, when information from outside the firm becomes more important in managerial decision making. Thus, in the context of these models, more dispersed ownership becomes more advantageous when the informational advantage of insiders becomes less important. As, in the case of IPOs, insiders can take advantage of the outside shareholders in the presence of the moral hazard problems. This is an interesting avenue for research which is addressed in this thesis when I analyse insider trading within the lockup period.

In signalling models of lockup insiders play an important role by retaining the IPO allocations. Insiders of a good firm have to send a signal that insiders of a bad firm could not afford to mimic. Brau et al. (2005) extend Courteau (1995) model by endogenizing and allowing for a band of lockup lengths. In words of Brau et al. (2005) "Thus, insiders cannot just *put* their money where their mouth is; rather, they must commit to *keep* it there if the signal is to be credible" (p. 520). In Brau et al. (2005) model the lockup period performs this keeping function, as in Courteau (1995). Longer lockups hurt mimickers more than they hurt insiders of good firms. A longer lockup imposes two penalties on mimickers. In a mean-variance framework, longer lockups decrease the mean, and they can increase the information variance of the post-lockup payoff. Increasing transparency increases the probability that mimickers will get caught, and higher levels of idiosyncratic risk impose mimickers a cost in terms of lack of diversification, both resulting in a separating equilibrium with shorter lockups. Insider trading within the lockup period can be an interesting ground to gain insights about the signals send by the insiders.

Another line of research argues that insiders trade to take advantage of mispricing (for example, see Rozeff and Zaman (1998) and Jenter (2005)). At the same time, there are also studies which suggest that managers are successful in identifying mispricing around stock repurchases (see Chan, Ikenberry and Lee (2007)). If corporate decisions, in fact, reflect manager's perception of mispricing, then this perception should also be reflected in their trading decisions. There is a large amount of literature examining the extent to which managers use private information to make trades in their companies' stocks and the resulting insider profits. Karpoff and Lee (1991), Lee (1997), and Kahle (2000) find that insider sells increase relative to insider purchases before seasoned equity offerings. In addition, a recognized literature on insider trading also suggests that managers may have some timing skill (Lakonishok and Lee (2001), Jenter (2005), Marin and Oliver (2008)). In this thesis, I further explore insider timing skills in the specific case of IPOs, where information asymmetries are high and insider trading is expected to have a higher impact on share prices.

Yet, in another theoretical paper, John and Narayanan (1997) convincingly show that the disclosure rules generate incentives for an informed trader to manipulate the stock market from time to time by trading in the wrong direction i.e., buying and selling when insiders have bad and good news about the firm but the net effect is consistent with the direction of net buy (sell). This contrarian trading lessens the informativeness of insiders' subsequent trade disclosure because the market is no longer certain whether an insider buy (sell) indicates good (bad) news. Consequently, the insider maintains information superiority over the market for a longer period of time and uses it to reap large profits in later periods by trading in the right direction. Huddart et al. (2001) show the extent to which insiders can profit from long-lived information even though they need to disclose the trades. They also show that to maximise his expected profits, the insider dissimulates his information by adding a random component to his trade. Dissimulation is costly, since it causes the insider at times to trade in a manner inconsistent with his private information. As IPOs are new companies, they provide an interesting venue to explore informational advantage and dissimulation by the insiders.

Bainbridge (2000) notes that serious empirical research on insider trading is hindered by the fact that it is illegal to trade on the basis of insider information. The sources of data regarding legal trades are the disclosure made by corporate insiders, and it is not very likely that managers will report these violations. The exclusive source of data concerning illegal trades is confidential as it comes from court filings. To my knowledge, only one study uses illegal insider trading data is Meulbroek (1992). Bhattacharya and Daouk (2002) further point out that, because of the availability of data, and the long time taken to make laws on insider trading, practically all empirical research on insider trading has been concentrated in the US. Although some studies are based on the UK institutional setting, previous studies find it difficult to obtain data for a large sample of companies in UK. This thesis analyses unique data set on corporate insiders in the UK and addresses several research questions.

This research is also motivated by the institutional differences between the US and the UK.[12] Within the context of insider trading, the differences pertain to the definition of an insider, the fundamental nature of the regulation, the enforcement and the delay within which trades have to be reported. It is expected that UK insider trades are likely to be more informative than US trades for the following reasons. A trade must be made public within at most 6 business days in the UK, compared to up to 40 days in the US (Fidrmuc et al. (2006)). Both Lakonishok and Lee (2001) and McConnell, Servaes and Lins (2005) report that the information on insiders' trades enters the public domain in the US only several days after it is released by the SEC.[13] Fidrmuc et al. (2006) show that no such delay occurs in the UK. In the UK, mandatory reporting by insiders is limited to top management and to the non-executive directors only. In contrast, US insiders (legally) comprise a much larger group: insiders are large shareholders, directors (non-executive) and managers (officers). These reasons suggest that director trades in the UK are likely to be more informative.[14]

This thesis first assesses whether insider trading is informative under the UK institutional setting where insiders are limited to board members and their trade is disseminated in the market very quickly. I also expand the past literature by focusing on trading by insiders under the lockup constraints. This thesis

[12] A detail discussion on differences in the US and the UK regulations are in Appendix I.

[13] In Contrast, using illegal insider trading data, Meulbroek (1992) shows that prices compound insider trading information on the day when the trade is made.

[14] However, since insiders can manipulate/dissimulate public reporting before they exploit their full informational advantage, the information the market gathers as a regulatory prescription is exogenous, may be misleading. The analysis of possible effects the settings of reporting insider trades imply for the insiders to manipulate/dissimulate information is an interesting avenue to pursue. I do not address these issues fully in my dissertation, but they remain ways of further research.

empirically examines the information provided by insider trades and the influence of such trading on IPOs. Motivated from the information provided by insider trading and timing skills of corporate insiders in their personal and corporate decisions, this research asks the following questions: Do insiders trade within lockup constraints? What information is provided by sell and buy trades within the lockup period? Are the documented lockup expiry returns related to the selling activity around the lockup expiry dates? Do insiders buy stocks in their own IPOs before the lockup expiry dates, if so what are the characteristics of such IPOs? Previous studies have not addressed directly these questions, particularly within the UK institutional environment.[15] The buy and sell trades within the lockup period are interesting to analyse. While the sell trades may highlight early releases from the lockups, the buy trades are likely to indicate price support if the IPOs are underperforming. This research, therefore, assesses fully why insiders trade before the lockup expiry date. Finally, the impact of insider trading on the long term performance of IPOs has been analysed. The main research question addressed is whether insiders buy (sell) in over-performing (under-performing) IPOs to maximise their returns. This thesis assesses whether the trading activity of insiders reduces the information asymmetries and the differences of opinions across investors and leads to a more efficient long-term valuation of IPOs. I argue that since insiders, defined as board members, are closer to their firm, they are likely to know its true value, as they are able to make a better forecast of the future cash

[15] Espenlaub et al. (2002) analyse the trading by directors around the lockup expiry date and report statistically insignificant abnormal returns around the lockup expiry dates.

flows than the market. This information is expected to be conveyed through their personal trades in their own company.

1.2 Main Findings and Contribution

Empirical evidence in this thesis shows that insider trades convey information in general, and, they convey more information in the case of IPOs. However, the role of insider information is slightly different in IPOs than in non-IPOs. This is due to the fact that as IPOs are new companies and as little is known about these companies, the information asymmetry and the agency problems are higher. Moreover, IPOs are subject to lockup agreements where insiders sells is almost prohibited during lockup period. This makes the insider information superior in IPOs compared to non-IPOs.

The findings of this thesis are as follows. The first empirical paper (chapter four) finds that, in general, insider purchases are informative while the sell trades of insiders are not. However, the abnormal returns vary to a great extent with M/B and size. I then analyse the connections between company fundamentals and the timing of their trades. I follow Rozeff and Zaman (1998), Lakonishok and Lee (2001) and Jenter (2005) methodology. Insiders tend to buy stocks with poor past performance and those that are cheap measured by market-to-book. I find that they tend to purchase value stocks which underperformed in the past, and, conversely sell glamour stocks which performed well in the past. This study finds evidence that there are connections between company fundamentals as measured by market-to-book and the timing of trades undertaken by the insiders. The results suggest that insiders tend to have contrarian views with regard to their own company stock. Their disagreements with the market are not randomly distributed across firms. They seem instead to be described by insiders in low valuation firms evaluating their stocks as undervalued and insiders in high valuation firms evaluating their stocks as overvalued. Therefore, it appears that the perception of mispricing is an important factor behind the market timing behaviour of the corporate insiders. While, previous literature on insider trading almost unanimously finds that insiders are contrarians, this study provides further evidence that insiders use market sentiment as a platform to act like contrarians. Using aggregate insider activity measures, this study finds strong relationship between market timing by insiders and market sentiment as measured by bull (bear) periods. However, the difference in the price response to insider trades across the two periods is not statistically significant, suggesting that the market values homogenously the information content of insider trading independent of market conditions.

The second empirical paper (chapter five) focuses on the market timing ability of insiders in initial public offerings (IPOs). Insiders are likely to sell before the lockup expiration if the IPO performs exceptionally well. This study finds that, compared to the US, lockups are relatively longer in the UK, but significant insider buy and sell trades occur before the expiry date. The results highlight the underwriter involvement in the lockup enforcement. They suggest that the early trades are likely to be pre-arranged with the underwriters rather than decided unilaterally by insiders. This study finds strong evidence that IPOs with early buy/sell trades are more likely to have prestigious underwriters. In addition, since the buy (sell) trades occur in under- (over-) performing IPOs, the results indicate that the underwriters appear to release insiders of over-performing IPOs from the lockup constraints but force those of under-performing ones to increase their holdings. This asymmetric impact on the lockup suggests that although lockups are relatively longer in the UK compared to the US, underwriters appear to have a power to enforce them, and the ability to amend them when necessary.

Third empirical paper (Chapter six) reports that IPOs underperform in the long run (three years) by using event studies and the Fama-French calendar time approach. The finding that IPOs underperform in the long run are analysed by using the information extracted from insider trading. This study divides all sample IPOs in firms with insider trading and firms without insider trading. The results from the univariate analysis show that IPOs with insider trades underperform less than IPOs without insider trades. Interestingly, IPOs with net sell trades overperform relative to the various benchmarks. In multivariate settings, after controlling for standard explanatory factors, this study finds insider trading activity can explain IPO performance in the long run. All the insider trading measures are highly significant and negatively related to long-run IPO performance.

In summary, this research contributes to the current literature in five ways. First, it increases our understanding of the information content of insider trades. In this study, perceived mispricing is shown to be an important determinant of insider trading. The market reaction to insider trades is not similar across market-to-book quintiles and size quintiles. This research is an effort to analyse the 'value' and 'glamour' strategy adopted by the corporate insiders. This thesis also produces evidence which is consistent with the notion that insiders mechanistically react to the valuation level of the company (see Rozeff and Zaman (1998), Lakonishok and

Lee (2001) and Jenter (2005)). Compared to these studies, instead of using quarterly data on insiders' holdings changes, my research uses daily data to examine the market reaction and link it with valuation ratios. This research also finds evidence consistent with recent insider study using data from the UK, that insider trading in the UK provides more information compared to the US and attributes this to the information environment of the UK.

Second, the results help understand the role of lockups in the context of going public process. Previous research suggests that lockup mitigates the information assymetry and agency problems (Brav and Gompers (2003) and Brau et al. (2005)). This reserach produces similar findings and extends the previous findings by utilising a unique UK data set. However, while earlier research only analyses the sell trades of insiders before the lockup expiration, I also analyse the buy trades, along with sell trades before lockup expirations. I show that, the major drivers of insider purchase trades are share price performance and prestigous underwriters. In particular, this study reports that share prices decline significantly before the buy trades. Although share prices increase substantially on the announcement date, they revert into being negative in the post trade period. These results suggest that insiders buy trades are not information driven, but they are undertaken to support the price of falling IPOs. These results also suggest that insiders do not take advantage of the outside shareholders as they do not appear trade on private infromation. This study contributes to windows of opportunity hypothesis tested in context of secondary equity issues (Clarke, Dunbar and Kahle (2004)).

Third, this research sheds some additional light on the on the drivers of the long run performance of IPOs. Most previous studies show that IPOs underperform in the long run. This negative performance is considered to be a puzzle in empirical finance (see Ritter and Welch (2002)). This study contributes to the literature by analysing long run IPO performance and linking it to the informed trading by corporate insiders.This study shows that the IPOs in which insiders are active perform better compared to IPOs where insiders do not trade. This is consistent with the notion that insider trading mitigates information assymmetry and provides price discovery in IPOs. This study also contributes to the agency theory litarature, which examines how ownership explains performance (Mikkelson, Partch, and Shah (1997)) and considers ownership dynamics after IPO (Helwege, Pirinsky and Stulz (2007)).

Fourth, the study contributes to the timing skills of insiders when they undertake their trades. While the timing skill emanates from the contrarian trading adopted by insiders (Lakonishok and Lee (2001)), this thesis produces further evidence that insiders can time their trades well in the context of IPOs. I find that insiders wait for the IPO to reach its optimal value before selling their shares. However, the selling by corporate insiders does not hurt outside shareholders as the share price does not decline after insider sell trades.

Finally, by constructing unique data set on the lockup characteristics, this research provides further empirical evidence on the puzzles reported in the previous corporate finance literature. The lockup data set is unique as it is hand collected from company prospectuses issued at the time of the IPO. In addition, the insider trading data used in this study is one of the largest in the corresponding literature and for the last two empirical chapter I collect data on all IPOs issued in the UK over the period 1999 to 2006. The findings from this research are therefore stronger, genralisable and updated. As far as I know, the full analysis of insider trading in IPOs has not been covered in the past literature. As such, my results provide new insights into various puzzles documnted in the past IPO literature. Whilst some previous literature address them, most are based on US data. Empirical results based on UK data further complements early documented findings.

The remainder of the thesis is organized as follows. Chapter 2 reviews the related literature for this research. Chapter 3 describes the data and empirical methodology used throughout this thesis. Chapter 4 examines the information content of insider trading in existing companies, and analyses market conditions, market timing and information content of individual and aggregate insider trading. Chapter 5 focuses on insider trading around IPO lockup expirations. In Chapter 6, this thesis examines the impact of insider trading on long run performance of IPOs. Chapter 7 summarises the findings, concludes the study, and discusses the limitations of this study and suggests some future research directions.

Chapter 2

2 Literature Review

2.1 Introduction

This chapter provides a brief review of the literature relating to this thesis. Since this study explores the information content of insider trades in existing companies, and explains the IPO lockup expiration effects, and any impact of insider trading on long run performance of IPOs, several areas of research in finance are covered, especially empirical issues in insider trading and IPOs. First, studies in the insider trading literature are reviewed. Second, this thesis explains studies relating to effect of IPO lockup expiry as it examines insider trading under institutional constraints, namely IPO lockups. Finally, I summarise previous studies that analyse the long run performance of IPOs, and various explanations provided for the underperformance.

The literature in these three areas is relatively dense,[16] and a comprehensive coverage is unlikely without a book-length literature review. I will therefore concentrate only on the area, which is the focus of this thesis. The literature review in this chapter can be broadly categorised into three parts. The first part deals with the general insider trading literature. For describing insider trading studies, the information content of individual insider trades are reviewed, and then studies related to aggregate insider trading are described. This is followed by studies that analyse market timing behaviour of insider trades, the legal issues surrounding insider trades, insider trading around corporate events. Second part reviews the literature on lockup expiry and the relatively limited number of studies which relate lockup expirations to insider trading. Finally, the long-run IPO performance literature is covered. As there has been lots of debate surrounding this issue the main focus is on reasons for underperformance and how insider trading can shed additional light on this issue rather than giving a full coverage on different controversies.

2.2 Review of Insider Trading Literature

2.2.1 Information Content of Insider Trades

Starting with the pioneering work by Manne (1966), numerous empirical studies address the extent to which it conveys information to the market. A number of studies argue that insider trades convey special information, and, as a result should influence stock prices. One of the ground-breaking works done in this area is by

[16] Insider trading literature starts with Mannes (1966) work. Although the first study on the long run IPO performance was by Ibbotson (1975), it was not really noticed until Ritter (1991). Comparatively, IPO lockup studies are new, as the first published paper was by Field and Hanka (2001) and only very few papers covered this topic to date.

Jaffe (1974), who tests profitability of insider trading. Using data from the US market between 1962-68, he finds that insiders possess special information. He shows that after adjusting for transaction costs only the intensive samples with an 8-month holding period earn statistically large returns. He also reports that outsiders following insiders in this holding period can earn abnormal return of 2.5%. Other US studies show similar finding— insiders are better informed and earn significant abnormal returns (Finnerty (1976a), Seyhun (1986, 1988), Lin and Howe (1990), Jeng, Metrick and Zeckhauser (2003)). In contrast, some studies show that the post-event returns are random. For example, Rozeff and Zaman (1988) re-examine the profitability of insider trading over 1973-82, using a method to measure abnormal returns that takes into account the known tendency of stock returns to depend on market value of equity and earnings-to-price ratio. Their empirical findings do not support the view that corporate insiders have information that the market does not have as insiders do not earn substantial profits on a routine basis in stock trading.

Lakonishok and Lee (2001) improve the understanding of the specific nature of private information that insiders possess, and the use of this information in trading. They analyse 1.028 million insider transactions in all traded companies on the NYSE, AMEX, and NASDAQ during the 1975-1995 period. In general, they find stock price do not move significantly when insiders trade, and when they report their trades to the SEC. They also explore the informativeness of strong buy and sell signals. A strong signal occurs when at least three different insiders are trading sizable amounts. Their results show that strong buy signals produce high returns. However, they find that for large companies even strong buy signals do not convey any information. The strong sells signal do not convey any information for all companies.

Similar studies have been undertaken in the UK market. King and Roell (1988) find that the beta adjusted CARs for the post-trade period of 1, 3 and 12 – months are 2.38%, 6.62% and 56.22% respectively for buy trades and they are statistically significant. The post event window returns for sell trades are positive as expected and not statistically significant. The analysis shows that insider buys are profitable but insider sells are not. In contrast, Pope, Morris, Peel (1990) find that post-trading behaviour of CARs for months +1 to +6 for the buy trades are generally positive but statistically insignificant. While for sell trades, they are negative and statistically significant. In the pre-trading period, they find that none of the CARs (for months -1 to -6) are statistically significant for both the buy and sell trades. In general, they find no market reaction from the buy trades but some market reaction from the sell trades.

Gregory, Matatko and Tonks (1997) investigate whether the signal definition explains the different conclusions drawn by earlier studies (King and Roell (1988), Pope et al. (1990), and Gregory et al. (1994)). They find puzzling results as market model CARs are negative for buy. Furthermore, these returns are substantial, between -8.52% and -19.08% over 12 months after the trade. The results change dramatically when they adjust for size as the CAR's become positive for buys and negative for sells in the post event window. In another paper, Friedrich et al. (2002), investigate short-run returns around the trades of corporate insiders on the London Stock Exchange. Their main focus is on smaller firms, since previous work by Gregory et al. (1997) report a highly disproportionate amount of directors' trading activity in less liquid stocks. They report evidence on market timing: directors buy shares after a decline in their company's share price, and sell after a stock price run-up. More recently, Fidrmuc, Goergen, Renneboog (2006) analyze the immediate market reaction to directors' transactions, excluding sells after the exercise of options, for companies listed on the London Stock Exchange during the 1990s. Their results support the findings from previous studies that directors' trades convey new information on the firm's future prospects, as the returns to post buy (sell) trades are positive (negative) and significant.

The studies cited so far use data from the legal insiders' trade.[17] There are also studies on the illegal insider trading.[18] For example, Cornell and Sirri (1992) analyse trading by corporate insiders and their tepees in Anheuser-Busch's 1982 tender offer for Campbell Taggart. They use the Court records, which identify insider transactions, to sort out each individual insider trades from liquidity trades. In line with earlier studies, they find that insider trading have a significant impact on the price of Campbell Taggart. Chakravarty and McConnell (1997) analyse Ivan Boesky's trades during the three month period prior to the acquisition of Carnation by Nestle in 1984. At that time Ivan Boesky purchased 1.7 million shares of Carnation's stock on the basis of illegally obtained inside information. They find a positive and significant relationship between Boesky trades and stock price changes. Chakravarty and McConnell (1999) use the same Ivan Boesky data, and find that the tests they employed are unable to differentiate the price effect of

[17] Legal insider trades represent the trades done by following the rules and regulations of SEC. The data is from the Security and Exchange Commission Ownership reporting System data file. The ORS data starts in 1975 and contain all transactions by insiders that are subject to disclosure according to section 16 (a) of the Securities and Exchange Act 1934.

[18] The data comes from different court cases filed by the US Justice Department.

Boesky's purchases of Carnation's stock from the effect of non-insider purchases. The methodological message of Chakravarty and McConnell (1999) study is that the effect of insider trading on market price should identify the effect of non-insider trading on market price and then determine whether the effects of insider trading differs from non-insider trading.

2.2.2 Aggregate Insider Trading and Stock Market Returns

Other studies focus on insider trading over several months and assess whether insiders are net sellers or net buyers. For example, Seyhun (1988) was the first to investigate the relationship between market movements and aggregate insider trading. He shows that net aggregate insider trading activity in a given month is significantly positively correlated with the market return during the subsequent 2 months. In general, insiders increase (decrease) their stock purchases (sells) prior to increase (decrease) in the stock market. Insiders in high market risk firms are more likely to trade on the basis of mispricing caused by economy wide factors. Also, insiders in small firms who are more successful predictors of their firms' performance tend to trade mostly on firm specific information. The evidence suggests that insiders cannot always distinguish between the effects of firm-specific and economy-wide factors. Seyhun (1988) also presents evidence that future market returns stay predictable, to some extent even after the publication of the insider trading information.

In another study, Seyhun (1992) documents that for the period from 1975 to 1989, the aggregate net number of open market purchases and sells by corporate insiders in their own firms predict up to 60 percent of the variation in one year ahead aggregate stock returns. Changes both in the business condition as well as movements away from fundamentals contribute to the information content of aggregate insider trading. This finding surpasses considerably the previously documented degree of predictability of short horizon stock returns using past stock returns to dividend yields. Interestingly, aggregate insider trading in small firms predicts future stock returns to a larger group of firms. The predictability of stock return rises with the length of forecasting horizon, the number of months of past insider trading, and the market sensitivity of stocks. They provide evidence which indicates that current aggregate insider trading is positively related to future real activity as measured by the growth rates of after tax corporate profits, the index of industrial production, and the gross national product.

Choudhury, Howe and Lin (1993) use weekly data to examine the relationship between aggregate insider transactions and stock market returns in vector autoregressive (VAR) framework. They find that stock market returns Granger cause insider transactions. A positive shock in returns causes a strong increase in insider sells and decrease in insider purchases. There is strong serial correlation in the data, that is, insider purchases tend to follow insider purchases and insider sells tend to follow insider sells. Consistent with previous studies, there is some predictive content associated with aggregate insider transactions, but the magnitude is low. It is argued that the degree of mispricing observed by insiders is relatively small and very little of the mispricing is associated with unanticipated macroeconomic factors. Furthermore, investors cannot use aggregate insider transactions to profitably predict future market returns over the next eight weeks.

Contrary to Choudhury, Howe and Lin (1993), Lakonishok and Lee (2001) use comprehensive data and show that aggregate insider trading appears to predict market movements. They also find that insider trading activity can predict cross-sectional stock returns.

2.2.3 Controversies on Insider Trading Regulation

Regulators and the financial community are interested in insider transactions to measure insider gains and any distortion in prices that result from insider trades (Fidrmuc and Renneboog (2002)). However, one can still question whether insider trading practice affects the liquidity and efficiency of financial markets (Bainbridge (2000)). Some argue that current rules against insider trading prevent stock prices from reflecting the correct value of the firm and, thus, damage market efficiency (Manne (1966) and Meulbroek (1992)). On the other hand, if non-informed investors are conscious of the wealth transfer bring about by insider trading, they abstain from trading, resulting in illiquidity, and thus inefficiency, in the markets (Bhattacharya and Spiegel (1991)). Thus, regulators advocate the need to impose a set of rules to enhance investors' confidence on the fairness of trading in the financial markets.

Cespa (2008) develop a model which predicts that insiders should base their trading on long-lived information and insiders can control the flow of information. His model suggests that insider trading should be based on information that can be repeatedly exploited before it is revealed in the market. The model also strengthen the case against insider trading, showing that actually insider trading can slow down the information to be incorporated into prices and thus resulting a thinner market. Thus rules that limits insider trading may help to transmit the fundamental information into prices.

Whether insider trading affects stock prices is central to both current debate as to insider trading is beneficial or harmful. Opponents of insider trading argue that it decreases market liquidity, produces abusive managerial practices, and is unfair to uninformed investors. On the other hand, proponents of insider trading assert that it fosters efficient capital markets by improving the price discovery procedure in financial markets. Jaffe (1974) find evidence that inside information is extensive, and implies that insiders in fact do violate security regulations. The verification of information in the intensive trading samples makes it easier for the law enforcers to detect the violators. Rozeff and Zaman (1988) find that insiders do not earn significant return after deducting transaction costs, suggesting that the Security and Exchange Commission Regulations are effective.

Another group of researchers investigate the effects of insider trading in terms of market efficiency. Firstly, insider gains imply that there is a wealth transfer from uninformed investors to individuals with privileged information and that financial markets do not reveal private information[19] (Jaffe (1974), Finnerty (1976a, b), Seyhun (1986), Gregory, Matatko, Tonks (1997) and Friederich, Gregory, Matatko and Tonks (2002)). Secondly, if insiders profit from their private

[19] Insider trading has been viewed in the literature with the theoretical framework of market efficiency. The existence of insider profit has been deemed evidence inconsistent with the strong form of efficient market hypothesis. Profitable insider trading has not been viewed as a surprising phenomenon because the widespread belief that corporate insiders possess some inside information. On the other hand, profits to outsiders by following insiders are a serious exception to efficient market hypothesis, because they violate semi strong form of market efficiency. Earning profits by imitating insiders is known as “insider trading anomaly”.

information, their transactions can lead to trading strategies by non-informed investors. Since an insiders' purchase (sell) would be followed by subsequent outsiders' purchases (sells), insiders can automatically benefit from price run-ups (falls) even though they trade without information (Jaffe (1974)). This argument imply that the markets are semi-strong form of inefficient, but studies in general show that, on average, outsiders are not able to obtain abnormal returns after accounting for transactions costs[20] (Seyhun (1986), Pope, Morrison and Peel (1990), Gregory, Matatko, Tonks (1997), Jeng, Metrick and Zeckhauser (2003) and Friederich, Gregory, Matatko and Tonks (2002)). However, this proposition is based on the assumption that all insider transactions are driven by privileged information. Seyhun (1986) assert that the insiders profit vanishes if the expected loss to informed traders is taken into account by incorporating the bid-ask spread as an added cost of trade. This evidence suggests that the markets are efficient as outside investors cannot use publicly available information about insiders' transactions to earn abnormal profits. Similar results are obtained by Rozeff and Zaman (1988) who show that insiders do not earn substantial abnormal returns after transactions cost.

King and Roell (1988) highlight the benefits and costs of insider trades. The empirical evidence from the US and the UK suggest that information is more quickly disseminated in the markets, improving the choice of decision makers. The

[20] Seyhun (1986) found that outsiders earn a gross return of only 1.2% per annum in the 100 days following receipt of official summary, a level of return that is certainly unprofitable after deducting transaction costs. However, over the 100 days following the transaction date, insiders earn only a gross return of 2.3% per annum, indicating virtually no insider trading profit after deducting transaction costs. Moreover, Seyhun (1986) also reports that gross insider trading profits are 3.1% per annum in the 300 days following the date of trading, substantially less than 7.4% profit reported by Jaffe (1974).

costs are increase in bid-ask spreads. They also assert that since all other traders are potential losers, there are many victims but no realistic plaintiffs, thus the need for regulations. Using previously unexplored data on illegal insider trading from SEC, Meulbroek (1992) finds that the stock market perceives the possibility of informed trading and impounds this information into the stock price. The study advocates that insider trading increases stock price accuracy by moving stock prices significantly. These results have direct public policy implications for both supporters and opponents of insider trading regulation. There are price discovery benefits of insider trading that should be considered when evaluating future legislation concerning insider trading penalties.

Prior studies report a positive correlation between insider trading and stock price changes implying that insider trades affect price discovery differently than non-insider trades (Meulbroek (1992), Cornell and Sirri (1992)). Based on these results, various studies have argued for the legalization of insider trading to facilitate rapid price discovery. Chakravarty and McConnell (1999) analyse the trading activity of a confessed inside trader, Ivan Boesky, in Carnation's stock just prior to Nestlé's acquisition of Carnation in 1984, and find that the tests they employ are unable to differentiate the price effect of Boesky's purchases of Carnation's stock from the effect of non-insider purchases. Chakravarty and McConnell (1999) raise questions on the methods used by previous studies. The effect of insider trading on market price should identify the effect of non-insider trading on market price and then determine whether the effects of insider trading differs from non-insider trading. The public policy message is that earlier studies such as Meulbroek (1992), Cornell and Sirri (1992) cannot be used as a basis for legalization of insider trades. Jeng, Metrick and Zeckhauser (2003) use a performance evaluation methodology but their policy message was very similar to the earlier literature. They assert that the US system is sufficiently effective so that outsiders are only slightly disadvantaged when selling stock in the open market, and they are not at all disadvantaged when buying stocks. Insider purchases comprise just 0.03% of all purchases on the open market. On average, outsiders lose just 10 cents on a $10,000 sell trade because an insider may be on the other side. For small stocks, these expected losses are still only 33 cents on a $10,000 transaction.

The current disclosure rules on insider trades made corporate managers adopt strategies to profit from trading on insider information and avoid prosecution. In a theoretical model, John and Narayanan (1997) show that the disclosure rule creates incentives for an informed trader to manipulate the stock market from time to time trading in the wrong direction (i.e. buying when she has bad news and selling when she has good news about the firm). This contrarian trading lessens the informativeness of her subsequent trade disclosure because the market is no longer certain whether an insider buy (sell) indicates good (bad) news. Consequently, the insider maintains her information superiority over the market for a longer period of time and uses it to reap large profits in later periods by trading in the right directions.

Though the debate about the pros and cons of allowing insider trading in the stock markets has been quite controversial in the law and finance literature, it needs to be examined from the point of view of actual practice. Before considering whether insider trading regulations are effective it is essential to assess whether insider regulations are in place. Bhattacharya and Daouk (2002) show that the existence and enforcement of insider trading laws in stock markets is a phenomenon of the 1990s. They study 103 countries which have stock markets and find that insider trading laws exist in 87 of them. However, the enforcement as evidenced by prosecutions, has taken place in only 38 countries. Before 1990, the respective numbers were 34 and 9. They find that the cost of equity in a country, after controlling other variables, does not change after the introduction of insider trading laws, but decreases significantly after the first prosecution.

2.2.4 Signalling Firms' Mispricing

A number of other studies suggest that insiders trade because they consider that their firm is mispriced in the market. Rozeff and Zaman (1998) find that insider transactions are not random across growth and value stocks. They find that insider buy trades are high when stocks change from growth to value categories and after low stock returns. Lakonishok and Lee (2001) obtain similar findings. They show that insiders tend to buy value stocks and sell glamour stocks. Such trading behaviour is consistent with insiders purchasing (selling) securities with high (low) expected returns or the greatest amount of undervaluation (overvaluation) (e.g., Fama and French (1992), Lakonishok et al. (1994)). Past research, however, does not separate the source of insiders' superior trading performance. Rozeff and Zaman's (1998) pattern of trading across book-to-market portfolios could reflect insiders trading on market pricing errors (e.g., overreaction to past performance, Lakonishok et al. (1994)), but it could also reflect insiders' superior knowledge of future earnings performance. For instance, LaPorta et al. (1997) show that, on average, value (growth) firms tend to have positive (negative) future earnings announcement period returns. Because earnings announcement returns tend to be correlated with actual changes in performance, Rozeff and Zaman's findings do not differentiate trading on the basis of contrarian beliefs from trading on the basis of superior information about future cash flows. Piotroski and Roulstone (2005) provide evidence that insiders are contrarians and at the same time possessors of superior information. They find that insider trades are positively associated to the firm's future earnings performance (proxy for superior cash flow information), positively related to the firm's book-to-market ratio and inversely related to the firm's recent returns (proxies for trading against misvaluation). Each variable has incremental explanatory power, yet information about future cash flow changes explains a smaller portion of insider purchases than do proxies for security misvaluation.

Jenter (2005) provides further evidence on market timing and managerial portfolio decisions. He finds that managers' perceptions of fundamental value diverge systematically from market valuations, and perceived mispricing is an important determinant of manager's decision making. Insider trading pattern show that low valuation firms are regarded as undervalued by their own managers relative to high valuation firms. Further evidence by Jenter (2005) links manager's private portfolio decisions to change in corporate capital structures, suggesting that managers try to actively time the market both in their private trades and in corporate level decisions.

2.2.5 Contrarian Strategy and/or Market Timing

Recent research on aggregate insider trading has established that insiders are able to predict future market movements and to time the market (Seyhun (1988), Lakonishok and Lee (2001)). Seyhun (1986, 1992) shows that insiders are more likely to sell (purchase) shares following periods of significant price appreciation (declines), consistent with insiders trading in anticipation of subsequent price reversals. However, it is not clear from the evidence whether this predictability of market returns is due to insiders acting as contrarian investors (Rozeff and Zaman (1998), Lakonishok and Lee (2001)), or whether managers are better informed about their firm's future prospects and it is 'information' that explains their market timing ability (Ke, Huddart and Petroni (2003)), or whether it is a function of both (Piotroski and Roulstone (2005)). There is substantial evidence that corporate officers and directors are able to distinguish the apparent mispricing in their firm's securities based on firm's related information, resulting in profitable trades (Rozeff and Zaman (1998) and Jenter (2005)). If this information is linked to future economy wide activity, then the aggregate insider trading should predict future market movements and the market timing ability of insiders will be based on information unanticipated by the market (see Seyhun (1988)). If insiders are motivated to trade because of perceived mispricing, it is also conceivable that they may react to market returns.

It is possible that noise traders may drive market prices way from intrinsic values, even in the absence of new information. Hence, a stock that was trading roughly at its intrinsic value could decline (rise) significantly because of such noise trading. Corporate insiders may then perceive the stock to be undervalued (overvalued) and buy (sell) it. To the extent that noise trading is a market wide phenomenon, I expect market returns to 'predict' aggregate insider transactions in line with Rozeff and Zaman (1998), Chowdhury, Howe and Lin (1993) and Lakonishok and Lee (2001). Such a relationship would be viewed as insiders following a contrarian investment strategy. Even though under both strategies insider trading is related to market returns, the key distinction is that managerial timing implies insider trading will predict future market returns while contrarian strategy implies insider trading is a reaction to market returns (Jiang and Zaman (2010)).

Other related studies on managerial decisions also suggest that insiders are better informed about their companies' future prospects. For example, Ikenberry, Lakonishok and Vermaelen (1995) find positive abnormal returns earned by shareholders of companies that have announced open market share repurchases. These abnormal returns persist up to 5 ears after the announcement. One of the main motivations for repurchases seems to be that insiders perceive their company's to be undervalued in the market. Loughran and Ritter (1995), on the other hand, observe a prolonged underperformance of companies following seasoned equity offerings. This is in line with the hypothesis that companies tend to issue seasoned equity when they perceive the market is too optimistic about the prospects of their company. Baker and Wurgler (2000) find that the share of equity issues in total new equity and debt issues is a stable predictor of US stock market returns between 1928 and 1997 (see Baker, Taliaferro and Wurgler (2006)) among others).

A related line of research on insider trading focused on whether aggregate insider trading can predict market movements, and could be used as a tool to time the market. Seyhun (1988, 1992) provides evidence suggesting that some of the mispricing observed by insiders in their own firms' securities is caused by unanticipated changes in economy wide activity. He finds that aggregate insider transactions are correlated with the return on the market during the subsequent two months. Chowdhury, Howe and Lin (1993) find that stock market returns Granger-causes insider transactions while the predictive content of aggregate insider transactions for subsequent market returns is slight. Lakonishok and Lee (2001) also provide evidence in support of the predictive ability of aggregate insider trading and market movement. They conclude that insiders' market timing ability is partially explained by the fact that insiders act as contrarian investors. They also conclude that after adjusting for the predictive power of simple contrarian strategies, the information conveyed through insider trading is still beneficial. Friedrich et. al. (2002), find patterns in abnormal returns in the days around a director's trade that are consistent with short-term market timing by directors in the UK market. All the studies are summarised in Table 2-1.

Another recent paper by Marin and Oliver (2008) investigate the insider trading prior to crashes. They show that, on an aggregate basis, insiders sell peak 10 months before the drop and then decline sharply before the drop occurs. In contrast, aggregate purchases by insiders show a very different pattern. Insider purchases remain low all year long but increases only 1 month prior to jump. These results also demonstrate the market timing ability of the corporate insiders.

Table 2-1 Summary of Previous Studies

Issues	Author	Market	Data	Long/ short term	Finding
Panel A. Information content					
	Jaffe (1974)	US	1962-1968 (952 trades)	M, 1,2,8	• Insiders earn profit on their own account • Imply that insiders trade contain information
	Seyhun (1986)	US	1975-81 24,371 buys 34,777 sells	D -100, +100	• CAR increases (decreases) after insider purchases (sells) • Diamond shaped graph reported.
	Damodaran and Liu (1993)	US	1982-1989,small sample	D, -10,+10	• No market response to the public announcement of this information
	Lakonishok and Lee (2001)	US	1975-95, 1.028 million trades	M 3,12	• Market basically ignores the information when it is reported • Insiders tend to buy value stocks and sell glamour stocks • Insiders extensive buying is in small cap stocks.
	Cornell and Sirri (1992)	US	1982 acquisition of Campbell Taggart	D	• Insider trading have a significant impact on price of Campbell Taggart
	Chakravarty and McConnell (1997)	US	1984 Ivan Boesky	D	• Positive and significant relationship between Boeskey's trade and stock price changes.
	Chakravarty and McConnell (1999)	US	1984 Ivan Boesky	D	• Authors are unable to distinguish the price effect of Boesky's (informed) purchases of Carnation stocks from the effect of non-insider (uninformed) purchases.
	Pope, Morris and Peel (1990)	UK	1977-84, 564 trades	M, -6,+6	• The study doesn't find any market reaction from the buy trades but some market reactions from the sell trades.
	Gregory, Matatko, Tonks, Purkis (1994)	UK	1984-86, 1,653 trades	M,3,12, 24	• Abnormal returns tend to be concentrated in smaller firms. • When an appropriate benchmark portfolio is used, the significance of abnormal return is substantially reduced.
	Gregory, Matatko and Tonks (1997)	UK	1986-90, 3,722 Purchases 3,034 Sells	M (3,6,12, 24)	• The puzzling results they got is that the market model CARs are negative for buy, and furthermore, these returns are substantial, between -8.52% and -19.08% over 12 months. The results changed dramatically when they have made adjustments for size. • The variable "size" can be of fundamental importance in an event study where a large number of smaller companies are included in the sample.

	Friederich, Gregory, Matatko, Tonks (2002)	UK	1986-1994 2558 purchases 1841 Sells	D -20,+20	• Abnormal returns in the days around directors' trade are consistent with the short term market timing. • Medium sized trades are more informative than large trades consistent with Barclay and Warner's 'stealth trading' hypothesis • After adjusting for the transaction costs the abnormal returns disappear. • Use of monthly data can be misleading as the market reacts immediately to the insider trades.
	Fidrmuc, Goergen, Renneboog (2006)	UK	1991-98, 10,140 buy 5,523 sell	D, (-20,-1; 0,1; 0,4)	• Insider purchases and sells trigger significant immediate market reactions of 1.16% and -0.26% respectively. • When several directors trade on the same day the announcement reaction is stronger • They do not find support for information hierarchy
	Ravina and Sapienza (2006)	US	1986-2003 527,999 trades	D -20, +180	• Independent directors earn positive and substantial abnormal returns when they purchase their company stocks, and that the difference with the same firm's officers is relatively small at most horizons. • Executive officers and independent directors make higher returns in firms with weaker governance and the gap between these two groups widens in such firms.
Panel B. Controversies on insider trading regulation					
	Jaffe (1974)	US	1962-1968 (952 trades) Intensive trading sample 1950's	M, 1,2,8	• Insiders do violate security regulations • The law enforcers should search for the violators
	Finnerty (1976)	US	1969-72 9,602 buy 21,487 sells	M, 0-11	• Insiders are able to outperform the market. • This finding tends to refute the strong-form of efficient market hypothesis.

	Seyhun (1986)				• Insiders' profit disappear if the expected loss to informed traders is taken into account by including the bid-ask spread as an additional cost of trade. • This evidence is consistent with market efficiency: Outside investors cannot use publicly available information about insider's transactions to earn abnormal profits.
	Rozeff and Zaman (1988)	US	1973-1982, 365 P, 333 S.	M, 1,3,6,12	• Evidence does not support insiders have information that market doesn't have • Insiders does not earn substantial return after transactions cost, suggesting market efficiency • SEC regulation is effective
	King and Roell (1988)	UK	1986-1987, 121 cases.	M,1,3,12	• Information is more quickly disseminated in the markets, improving the choices of decision makers. • Costs are the increase in bid-ask spreads • Because all other traders are potential losers, there are many victims but no realistic plaintiffs, thus the need for regulation.
	Meulbroek (1992)	US	1980-89, 320 cases	D	• Insider trading increases stock price accuracy by moving stock prices significantly. • Price discovery benefits of insider trading should be considered when evaluating future legislation concerning insider trading penalties.
	John and Narayanan (1997)	Theoretical			• The disclosure rule creates incentives for an informed insider to manipulate the stock market by sometimes trade in the wrong directions. • This contrarian trading reduces the informativeness of her subsequent trade disclosures.
	Chakravarty and McConnell (1999)	US	1984 Ivan Boesky	D	• The public policy message is that the studies of Melbroek (1992), Cornell and Sirri (1992) and Chakravarty and McConnell (1997) cannot be used as a basis for legalization of insider trading because they assert that insider trading facilitate rapid price discovery.

	Jeng, Metrick, Zeckhauser (2003)	US		Not an event study	• The system is sufficiently effective so that outsiders are only slightly disadvantaged when selling stock on the open market, and they are not disadvantaged at all when buying.
Panel C. Signalling firms' mispricing					
	Seyhun (1986)	US	1975-81, 24,371 buy 34,777 sell		• Insiders purchase stock prior to an abnormal rise in stock prices and sell stock prior to an abnormal decrease in stock price.
	Rozeff and Zaman (1998)	US	1978-1991 12,162 firm-year	M, 12,36, not event study	• Insider transactions are not random across growth and value stocks • Insider buying climbs as stock change from growth to value categories • Insider buying also is greater after low stock returns, and lower after high stock returns. • These findings are consistent with a version of overreaction.
	Lakonishok and Lee (2001)		1.028 mil	D, M	• Insiders tend to buy value stocks and sell glamour stocks
	Ke, Huddart and Petroni (2003)				• Insider stock sells are greater for growth firm
	Pitroski and Roulstone (2005)	US	1992-99, 25,893 observations	Y, not event study	• Insider purchases are positively related to future earnings performance, positively related to book-to-market ratios and inversely related to past returns • Superior information about future cash flow changes explains a small portion of insider purchase activities than do proxies for securities misvaluation
Panel D. Market Timing					
	Jenter (2005)	US		Not event study	• Insiders react mechanistically to growth and value strategies while they trade. • Insiders time their trades in their own trades and in corporate decisions.
	Marin and Oliver (2008)	US	1986-2002 1.18 mil	Not event study	• Insiders sells peak 10 months before the crash. • Insiders purchases pick up only one month before the jump in stock price. • Insiders time their trades to evade prosecution.
Panel E. Insider trading and news releases					

	Givoly and Palmon (1985)	US	1973-75, Amex, 1151 buys 426 sells	M, 1,3,8,12	• The major part of the observed abnormal performance of insiders is likely to be due to price changes arising from the information revealed through the trades. • There is a low incidence of insider trading in anticipation of an impending new disclosure.
	Fidrmuc, Goergen, Renneboog (2006)	UK	1991-98, 10,140 buy 5,523 sell	D, (-20,-1; 0,1; 0,4)	• There is a strong relation between the presence of specific categories of block holders and price reaction to director's trade. • The share price reactions remain valid when the transactions are preceded by news. It is crucial to adjust news regarding M&A's (to a lesser extent CEO replacement) as these news items cancel out the significant share price reactions to directors trades.
	Korczak and Lasfer (2007)	UK	1999-2003 10,414 buy 2,953 sells	D	• They find strong evidence that insider's trade before news announcements in both domestically listed and cross-listed firms. • The type of news on which insiders trade do not necessarily have a higher value as measured by the announcement abnormal returns, than news on which they don't trade upon.
	Korczak, Korczak and Lasfer (2010)	UK	8086 trades		• The study show that insider purchases before positive news announcements • Sell trades are primarily affected by the reputational and legal risk.
	Ke, Huddart and Petroni (2003)	US	1989-1997, 309,190 trades	Q, not event study	• Insiders possess and trade upon significant knowledge of specifically and economically significant forthcoming accounting disclosures
	Ravina and Sapienza(2006)				• Independent directors earn significantly higher returns than the market when they sell the company stock in a window before bad news and around a restatement announcement.
Panel F. Market microstructure					
	Lin and Howe (1990)	US (OTC)	1975-83 3,449 buy 4,176 sells	M -6 to+12	• Transactions of insiders have predictive content. • Bid-ask spreads are too high to preclude insiders from realising positive abnormal returns from an active trading strategy.

	Cornell and Sirri (1992)	US	1982 acquisition of Campbell Taggart	D	• The impact of informed trading on the market is complicated • Contrary to the broad implications of adverse selection models, Campbell Taggart's liquidity improved when insiders were active in the market.
	Chakravarty and McConnell (1997)	US	1984 Ivan Boesky	D	• Bid-ask spread appear to be unaffected • Depths appear to be unaffected or improved by Boeskey's trades.
Panel G. Aggregate insider trading and stock market returns					
	Seyhun (1988)	US	1975-81 24,371 buy 34,777 sell	M, -24 to +24.	• Insiders increase (decrease) their stock purchases (sells) prior to increase (decrease) in stock market. • Insiders in high market risk firms are more likely to observe and trade on the basis of mispricing caused by economy wide factors. • Also, insiders in the small firms who tend to be more successful predictors of their firms' performance tend to trade mostly on firm specific information. • Net aggregate insider trading activity can be a useful component of leading indicators of future economic activity.
	Seyhun (1992)	US	1975-1989, 426,804 buy 417,603 sells	M, 1,3,6,12	• The aggregate net no. of purchases and sells by insiders predicts upto 60% variation in 1-year ahead aggregate stock returns. • Changes in the business condition as well as movements away from fundamentals contribute to the information content of aggregate insider trading.
	Chowdhury, Howe and Lin (1993)	US	1975-86 46,327 buys 95,558 sells	W (VAR)	• Stock market returns Granger cause insider transactions • Predictive content of aggregate insider transactions for subsequent market returns appears to be slight. • The findings imply that: 1) the degree of mispricing observed by insiders is relatively small 2) very little of the mispricing is associated with unanticipated macroeconomic factors.

	Lakonishok and Lee (2001)				• Aggregate insider trading appears to predict market movements • Insider trading activity can predict cross-sectional stock returns.
Panel H. Insiders trading: Performance evaluation					
	Eckbo and Smith (1998)	Norway	1985-92, 11,896 buy 6,405 sells	M	• Performance analysis rejects the hypothesis of positive abnormal performance by insiders. • When classical event study technique is used they find some evidence of abnormal returns of insider sells trades. • Insiders on average do not outperform the average mutual fund in their sample.
	Jeng, Metrick, Zeckhauser (2003)	US	1975-96 208,055 buys 350,174 sells	D -100, +100	• Insider purchases can earn abnormal returns more than 6% per year and insider sells do not earn significant abnormal returns. • Insiders disproportionately purchases shares in small firms, value firms, and those that have recently underperformed.

D=Daily, W=Weekly, M=Monthly, Q=quarterly, Y=Yearly.

2.2.6 Insider Trading Around Corporate Events

A number of empirical studies provide evidence that corporate insiders use private information to strategically trade their own shares around corporate events and gain significant abnormal returns. For example, Seyhun and Bradley (1997) report that insiders of companies that file for bankruptcy protection sell their holdings before a decrease in stock price and buy after prices have fallen. Karpoff and Lee (1991) show that insiders sell before firm's announcement of new stock offering. Lee, Mikkelson and Partch (1992) report that insiders trade around the announcement of stock repurchases. Other studies focus on earnings forecasts (Penman (1982)), takeovers (Seyhun (1990)) and dividend announcements (John and Lang (1991)). All these studies provide support for the hypothesis that insiders are able to trade profitably around major corporate events.

If managers can time the market with their own trades they should be able to opportunistically time the market in their corporate finance decisions. Both Karpoff and Lee (1991) and Kahle (2000) show that the number of insider sells significantly increases before SEOs and convertible bond issues, but not before straight bond issues. The evidence associated with insider trading pattern around various security issues is consistent with the proposition that managers take advantage of informational asymmetry between insiders and outside investors (Myers and Majluf (1984)). Lee (1997) finds that secondary issuers with top executives who sell their shares before the issue significantly underperform their matching firms. On average, secondary issuers do not underperform their benchmarks. These results indicate that those top executives who sell their shares before the SEO seem to knowingly sell overvalued security, and they have superior timing ability. Also, there is evidence of timing by the managers in context of share repurchases. For instance, Lee, Mikkelson and Partch (1992) find that on average managers of repurchasing firms increase their frequency of buying and decrease their frequency of selling shares prior to repurchase announcements. The unusual frequency of trading is pronounced in the six months that immediately precede the repurchase announcement. Managers generally do not undertake unusual trading of their firms shares following repurchases.

Givoly and Palmon (1985) reasoned that insiders earn excess return because they possess and use superior information for their trading. They analyse the degree to which abnormal returns achieved by insiders is earned through price changes arising from the disclosure of the trade itself or from the subsequent disclosure of specific news about the company which insiders know. The results suggests that a major part of the observed abnormal performance of insiders is likely to be due to price changes arising from the information revealed through the trades themselves. Ke, Huddart and Petroni (2003) provide evidence that insiders own, and trade upon, information of definite and economically significant forthcoming accounting disclosures as long as 2 years prior to the disclosure. Stock sells by insiders increase in three to nine quarters prior to announcements of a series of consecutive increases in quarterly earnings. Insider stock sells are greater for growth firms, before a longer period of declining earnings, and when the earnings decline at the break is greater. In addition, the finding that insider purchases are more informative than insider sells (e.g., Seyhun (1998)) may be related to the finding that insider sells prompted by earnings breaks precede the break by 9 months to 2 years. If insider purchases take place closer to the time that good news is disclosed, the difference in the informativeness of purchases and sells may be related to the window over which trades are examined. In another paper, Ravina and Sapienza (2006) analysed the trades of independent directors and find that independent directors earn significantly higher returns than the market when they sell the company stock in a window before the bad news and around restatement announcement.

Fidrmuc, Goergen and Renneboog (2006) assert that it may be essential to account for news releases preceding trades as this may be one of the reasons why the CARs they find are larger than those reported by studies based on US data. Certainly, the announcement effect may not be due to the directors' transactions but to the release of news. The CARs may still be significantly influenced by specific types of price-sensitive information. Furthermore, they demonstrate that most news releases, prior to directors' transactions, do not have any impact on the value of the signal, not even the frequent announcements about a firm's prospects. There is only one type of news releases which has a significant impact on the CARs which is the trades that occur before the earnings announcements. The other news announcements do not have an impact on market prices. If news about a merger or acquisition is released within 7 or 30 days prior to a purchase, the market reaction is close to zero. This suggests that directors' purchases do not contain much additional information after an M&A announcement. They also find weak evidence that the value of information of directors' trades is reduced, when the trade follows within a month after news concerning the replacement of the CEO.

These two types of news reduce or even cancel out the otherwise positive market reaction to purchases.

Yet, in another study on the UK market, Korczak and Lasfer (2009a) find that insiders do trade before material news is announced. Although this frequency is limited to about 5% for the buy trades and 20% for the sell trades, the propensity of trading is usually independent of the type of news announcements, which is in contrast with Fidrmuc, Goergen and Renneboog (2006). However, they find that directors are less likely to buy before news on earnings, other results and dividends and restructuring. Given the fact that directors are knowledgeable about these types of forthcoming announcements, the results suggest that insiders are likely to pick the news they are willing to trade upon. It is also interesting to note that, even in the case of earnings announcements where the regulation is tighter, they still find that insiders buy in 3%, and sell in 26% of total positive and negative earnings announcements, respectively. In addition, for the buy trades before good news, they find that the difference in the abnormal returns between "News preceded by directors' trades" vs. "News not preceded by directors' trades" is not statistically significant. In particular, consistent with the earnings trading ban, they show that the higher the earnings impact, the lower the probability of trading. For the restructuring category they also observe decreased probability of buying before news with high market reaction. However, they find strong evidence that insiders are more likely to sell when the announcement abnormal returns are significantly lower, i.e., before bad news releases. This propensity to trade occurs mainly before the announcements of earnings, other results and dividends, and board changes, but less before news on restructuring.

2.3 IPO Lockup

2.3.1 Motivations for examining Insider trading under IPO lockups

Lockups are voluntary agreements between the underwriter and corporate insiders not to sell shares without the written consent of the underwriter during a specified post-IPO period. The lockup agreement clearly specifies that insiders are not allowed to sell shares without the written consent of the underwriters. For example, the lockup contract of ARC International (UK Main Market) is as follows:

> "The Company, the Directors, the Selling Shareholders and the Underwriters have entered into an underwriting agreement relating to the Global Offer (the "Underwriting Agreement"). Pursuant to the Underwriting Agreement, the Company has agreed to certain restrictions on the issue or offer of Ordinary Shares for six months after the date of Admission without the prior written consent of Goldman Sachs International. Such restrictions will not apply to the granting or exercise of options or other rights under the Share Option Schemes or the payment of scrip dividends or capitalisation of issues associated with dividends."

Previous studies show that lockup contracts may emanate from (i) agency costs, (ii) information asymmetries between managers and shareholders, (iii) signalling of firm's quality, (iv) rent seeking by underwriters, and, (v) commitment hypothesis (Brav and Gompers (2003)). Lockup contracts are designed to reduce the information asymmetry and mitigate agency problems between the insider-managers and the outside shareholders (Brau et al. (2004)). Ibbotson and Ritter (1995) argue that investors are willing to pay higher price for a company with a lockup agreement primarily for two reasons. Firstly, any negative information being withheld is likely to be revealed before the locked-up shares can be sold, reducing the benefit of withholding information. Secondly, as long as insiders retain large holdings, their incentives are aligned with outsiders' incentives (Ibbotson and Ritter (1995)). Lockup agreements do not, however, completely mitigate informational asymmetries that exist between insiders and outsiders.

The restrictions on insider sells for a pre-specified time period is often claimed to be an important commitment mechanism to make the investors buy shares at the public offering. In absence of any such restrictions, if insiders have better information regarding the firm's future prospects, they may try to take advantage of that information at or soon after the floatation of the shares. Insiders might wish to cash in at a high price if they knew that the price immediately after the offering was excessively high. The lockups act as a commitment device, which might mitigate moral hazard problem. In this case, the level of information asymmetries regarding the actions of the managers is important. A firm with higher moral hazard problem would have to accept a longer lockup in order to convince the investors to purchase stock in the offering (Brav and Gompers (2003)). During the lockup period, when insiders are prohibited to sell shares, information regarding firm's future prospects will be made known to general investors and will reduce the chance that insiders can act opportunistically. That is why, the lockup agreement would be a commitment device.

In a signalling model ((Welch, 1989), Grinblatt and Hwang (1989), Allen and Faulhaber (1989)), underwriter lock-ups might be used as a means to signal the quality of a company. In Welch's (1989) model, firms want to underprice their offering to signal their quality. High quality firms are willing to bear the cost of underpricing because they are willing to issue additional equity in a future seasoned equity offering (SEO). However, insiders care about the price at which they can sell the rest of their shares. Therefore, rather than only considering an SEO, they consider the price that they will be able to sell their shares after the expiration of the lock-up. Insiders can essentially signal their quality using three variables: underpricing, percentage of shares locked, and the length of the lock-up contract. In a separating equilibrium high quality issuers will either underprice more, lock for a longer period of time, or lock a larger percentage of shares outstanding and subsequently sell at a more favourable price when lock up expires (Brav and Gompers (2003)).

While the previous literature examines the selling behaviour of the insiders, the buy trades under the lockup period remain unexplored and can be an interesting area to explore. The insider purchases are fascinating, as insiders' cannot sell their IPO allocations in the lock-up period, why would insiders buy. One possibility is that the company is good and the insiders have information that market does not have. Insider purchases are strongly motivated by 'inside' information. Another possibility is that insiders purchases stocks of their own companies to support prices. What information is conveyed by insiders' buying activities is an interesting avenue for research and addressed in this thesis.

2.3.2 Role of IPO Lockups

A limited number of empirical studies examine the role of lockups in the going-public process. Brav and Gompers (2003) use 2794 initial public offerings to assess whether lockups serve as (i) a signal of firm quality (ii) a commitment device to mitigate moral hazard problems (iii) a device for underwriters to extract additional compensation from the issuing firm. Their results support the commitment hypothesis refuting the other two. Insiders of firms that are associated with greater potential for moral hazard lockup their shares for a longer period of time. Insiders of firms that have experienced larger excess returns, are backed by venture capitalists, or go public with high quality underwriters are more likely to be released from the lockup restrictions.

Brau, Lambson and McQueen (2005) use a sample of 4,013 IPOs and 3,279 SEOs. They show how Brav and Gompers (2003) empirical analysis about firm transparency provides support to the insider signalling explanation. They find that Brav and Gompers (2003) evidence of an inverse relationship between transparency and lockup length supports the signalling model at least as much as the commitment explanation. Also, they find empirical support for the signalling model's prediction that the lockup will be longer when the degree of asymmetric information is larger and the level of idiosyncratic risk is lower. Their extensions suggest that signalling remains a valid explanation for lockups.

2.3.3 Lockup Expiration

As lockup expiration is publicly available information mentioned in the IPO prospectus, the price reaction at the expiration of lockup should be zero. However, previous studies have documented a negative price reaction around the expiry of the lockup (Field and Hanka (2001), Brav and Gompers (2003)). Field and Hanka (2001) consider several hypotheses, whether the abnormal return (i) is an illusion caused by an increase in the percentage of trades carried out at the bid price; (ii) is a temporary decline caused by price pressure; (iii) corresponds to a loss in value owing to increased trading costs; (iv) is caused by downward sloping demand curves; and (v) is caused by insider sells that consistently exceed investors' expectations. The hypothesis that lockup expiration leads to an increase in the proportion of trades at the bid is consistent with market efficiency. The temporary price pressure hypothesis may be consistent with some forms of market efficiency, for example the liquidity equilibrium modelled in Grossman and Miller (1988). The remaining three hypotheses which imply that the market consistently fails to anticipate the predictable events on the unlock day are not consistent with market efficiency.

If transaction prices usually represent a combination of trades at the bid and the ask, but transactions around the unlock day tend to be insider sell orders that are executed at the bid, then transaction prices around the lockup expiration day will imply a spurious, temporary negative return, even if there is no change in the bid or ask prices (Field and Hanka (2001)). Prior research finds that this bid-ask effect may contribute to abnormal returns around the execution days of seasoned equity offers (Lease, Masulis, and Page (1991)).

On the lockup expiration day, a large number of insider sell orders may temporarily depress the share price due to 'price pressure'. In particular, a temporary price drop may be necessary in equilibrium in order to attract liquidity providers (Field and Hanka (2001)). The previous literature finds mixed evidence for price pressure. For example, Kadlec, Loderer and Sheehan (1997) examine price changes around the execution days of seasoned equity offers, and find that price drops largely reversed within a few days. A crucial feature of price pressure is that its effect is temporary. When the effect is permanent, it is interpreted as a downward sloping demand curve.

If insiders sell their shares, the public has to take up a greater number of shares. The demand curve hypothesis predicts that as the public's demand curve slopes downward, so the share price will drop permanently (Field and Hanka (2001)). Practitioners occasionally refer to this effect as a 'scarcity premium' for IPOs with a small public float. The distinction between the demand curve hypothesis and the price pressure hypothesis is the difference between a permanent stock effect and a temporary flow effect (Field and Hanka (2001)). A demand curve effect is caused by a permanent increase in the stock of shares that must be owned by the public, while a price pressure effect is caused by a temporary flow of sell orders (Field and Hanka (2001)).

Insider sells tend to convey bad news, as they suggest a reduction of insider's incentives, a lack of insider confidence, and an increase in the supply of shares that may drive the price down (Field and Hanka (2001)). If current insider sells are a predictor of future insider sells, then even modest insider sells could have a large effect on stock price. If this effect causes the abnormal return, then it should be limited only to the firms with insider sells. If there are no insider sells around the lockup expiry day, then the abnormal return around the unlock day should be zero or even positive (Field and Hanka (2001)).

Share prices tend to decline around the expiry day independently of whether insiders do actually trade (e.g., Brau et al. (2004), Brav and Gompers (1999, 2003), Bradley et al. (2001), Ofek and Richardson (2000), Field and Hanka (2001)). Several explanations have been offered in the literature to account for this impact.

Ofek and Richardson (2000) examine several plausible explanations, including bid-ask bounce, liquidity effects and biased expectations of supply shocks, but find little support for any of these. However, it is not possible to make a profit by exploiting the drop in share price around the lockup expiry, which confirms that arbitrage is not violated. Brau et al. (2004) find a significantly positive relationship between the percentage of management ownership after the IPO, their proxy for agency costs and the 5-day cumulative abnormal returns.

Field and Hanka (2001) provide alternative hypotheses that may explain the observed pattern in the returns around the lockup expiration. Consistent with the downward-sloping demand curve hypothesis, they find that the abnormal return is more negative when the trading volume is abnormally high. They find that 17% of their sample firms report at least one insider trade around the week before lockup expiration. They also find that the abnormal returns are significantly more negative when insiders sell shares around the expiry of the lock-in. In particular, the mean (median) 3-day abnormal returns of the firms which report insider trade around the lockup expiration day are -4.5% (-5.1%). By contrast, the corresponding abnormal returns for firms which do not report any insider trading are -2.5% (-2%). These results suggest that the abnormal returns are more negative when insiders report a sell around the lockup expiration day. This suggests that the abnormal returns are partly caused by the worse than expected insider sells. However, since the abnormal returns are also negative for firms which do not report any sells, the price drop is not solely driven by worse-than-expected insider selling.

Brav and Gompers (2003) find that in 15% of their sample firms insiders sell shares before lockup expiration. They find insiders sell prior to lockup expiration in firms that are associated with less moral hazard, that is, larger firms, firms with high turnover, firms backed by venture capitalists, and firms with higher abnormal returns in the preceding 30-day period. Insiders are likely to be very concerned with insider selling activity at low liquidity firms, firms not backed by venture capitalists and firms with low returns because of the higher level of asymmetric information. They conclude that, as predicted by commitment hypothesis, firms that have reduced information asymmetry problems are likely to be released from the lockup early.

Bradley, Jordan, Yi and Roten (2001) find that negative lockup expiration is mostly due to the 45% of the firms in their sample which are venture capital backed. Such firms lose, on average, 3-4% of their value around the lockup expiration period, and the high tech companies with VC backing are the ones which are mostly affected. Non-VC backed firms lose relatively little value regardless of the industry. In a multivariate analysis, they find little or no reaction in the non-VC backed sample. For the VC-backed sample, the post-IPO price performance and the trading volume are the most significant factors. Firms associated with high-quality underwriters also appear to sustain larger losses around the expiration of the lockup.

While the US studies report a price drop around lockup expiration, UK studies did not find any price reaction. To my knowledge, there are only two studies and their evidence is not strong partly because of the relatively smaller sample size and data unavailability. For example, Espenlaub et al. (2001) studied 188 IPOs from the London stock market over 1992 to 1998. They focus on the characteristics of the lock-in agreements. However, they were unable to determine the actual date where the lockup is a relative lockup date as the sample was small and there was absolute lockup dates (calendar dates) and relative lockup dates (dates relative to other corporate events like publication of annual reports), it posses a serious challenge for them. Espenlaub et. al. (2001) find that 54 out of 188 IPOs (29%) in their sample set lockup in terms of calendar date. In another study by Espenlaub et al. (2002) using the same IPO data analysed the trading by directors around the lockup expiry date. Both studies report statistically insignificant abnormal returns around the lockup expiry.

2.4 Long-run Performance of IPOs

2.4.1 Evidence on Long run IPO Performance

Although Ibbotson (1975) was first to report the underperformance of IPOs, the controversy gained more attention after Ritter's (1991) work. Using a sample of 1,526 firms that went public in the US in the 1975-1984 period, Ritter (1991) find that in 3 years after going public, these firms perform poorly compared to a set of benchmark firms matched by size and industry. The 3-year average cumulative abnormal return on a matching firm basis is -29.13%. Ritter (1991) also report that there is substantial variation in the underperformance year to year and across industries. The companies that went public in high volume years are the worst performers. Ritter (1991) conjectured that the results are consistent with the market where investors are periodically overoptimistic about the earnings potential of young growth companies, suggesting that companies take advantage of these 'windows of opportunity'.

In a related study Loughran and Ritter (1995) examine the long run performance of 4,753 firms that went public in the US between 1970-1990. They find that those firms underperform compared to non-issuing firms up to five years after they issue equity. Particularly, the average annual return during the five years after equity issuance is 5% per annum whereas for non-issuing firms it is 12% per annum. They also find that, the firms which issue equity in high volume period underperform badly, whereas the firms issue equity in the low volume period do not underperform.

The US evidence of the long run underperformance seems to extend to other countries. For example, Levis (1993) use 712 IPOs from London Stock Exchange over the period 1980-88. He shows that IPOs underperform in 3 year period following IPO. Depending on the benchmark used he finds a 3-year underperformance ranging between -8.31% to -22.96%. For Latin American countries (Brazil, Chile, Mexico), Aggarwal, Leal and Hernandez (1993) report that IPOs underperform in the long run by -47.0%. Keloharju (1993) documents that 79 Finnish IPOs also underperform during the 36 months after IPO by -21.1%. Cai and Wei (1997) provide evidence of long run underperformance for 180 IPOs listed on the Tokyo Stock Exchange over the period of 1971-1992 by -26.0%. Table 2-2 summarises international evidence on long-run IPO performance.

More recently, Ritter and Welch (2002) show that the 3-year abnormal underperformance of US IPOs listed in 1980-2001 is -23%, with -34.3% in the later period of 1999-2000. They also show that the results are highly sensitive to the method used to compute the abnormal returns. For example, Ritter and Welch (2002) document that the style adjusted returns methodology results in an average underperformance of only -5.1%, but over the 1999-2000 period it amounts to -61.2%. Using the Fama and French (1993) three-factor model, they show that the sign and significance of alpha, which measures the excess performance, are not consistent across sample periods and when they use lagged values of the factors.

Table 2-2 Cross country evidence on long run IPO performance

Country	Study	Sample Period	Sample size	Window (years)[1]	Return (%)[2]
Australia	Lee et al.(1996)	1976-89	266	3	-51.0
Brazil	Aggarwal et al. (1993)	1980-90	62	3	-47.0
Canada	Shaw (1971)	1956-63	105	5	-32.3
Chile	Aggarwal et al. (1993)	1982-90	28	3	-23.7
Finland	Keloharju (1993)	1984-89	79	3	-21.1
Germany	Ljungqvist (1997)	1970-90	145	3	-12.1
HongKong	McGuiness (1993)	1980-90	72	2	-18.3
Italy	Giudici and Paleari(1999)	1985-95	84	3	-2.6
Japan	Cai and Wei (1997)	1971-92	180	5	-26.0
Korea	Kim et al. (1995)	1985-88	99	3	+91.6
Malaysia	Paudyal et al. (1998)	1984-94	62	3	+9.0
New Zealand	Firth (1997)	1979-87	143	5	-17.9
Singapore	Lee et al (1996)	1973-92	132	3	+9.0
Sweden	Loughran et al. (1994)	1980-90	162	3	+1.2
Switzerland	Kunz and Aggarwal (1994)	1983-89	34	3	-6.1
Turkey	Kiymaz (1998)	1990-95	138	3	+44.1
UK	Levis (1993)	1980-88	712	3	-8.1
UK	Espenlaub et al. (2000)	1985-92	588	5	-42.77
US	Ritter (1991)	1975-84	1526	3	-29.1
US	Loughran (1993)	1967-87	3656	6	-33.3
US	Loughran and Ritter (1995)	1970-90	4753	5	-30.0

[1] Window is the number of years over which IPO performance is calculated.
[2] Returns are calculated over the investment window and are not annualized, excluding the first day return. Generally the returns are market-adjusted but not risk adjusted. Some authors use a range of benchmarks and obtain different results; I present only the representative results. Computation methodologies vary.

Similarly, in the context of UK, Espenlaub, Gregory and Tonks (2000) show that the long run returns vary with the choice of methodology. They find that, using event studies, there is substantial amount of underperformance in the first three years of listing irrespective of the benchmark used. For example, they report -

15.90%, -16.24%, -8.12% and -28.15% cumulative abnormal returns for CAPM, size adjusted, Hoare-Govett, and Fama-French model adjusted returns respectively. However, when the abnormal returns are measured for five years, the choice of methodology shows higher amount of variation. While Hoare-Govett index adjusted return finds performance of -4.30%, Fama-French adjusted returns show -42.77%. Fama-French calendar time regressions find an alpha of -0.00673 only, which is equivalent to -40.38%.

2.4.2 Reasons for Underperformance

On theoretical grounds, there are some rationales which assert that IPOs are expected to generate positive long-term returns. Firstly, the newly floated companies are typically more risky than the average market, demonstrating a high exposure to market risk.[21] Secondly, the asymmetric models, particularly the signalling theories suggest that IPOs are underpriced to signal the quality of the firm and thus subsequently be able to sell further shares at a higher price, and as a result, the long-run returns should be high. If firms underprice to signal their quality, high quality firms should perform better than low quality firms (Jenkinson and Ljungqvist (2001)). Likewise, Benveniste and Spindt (1989) develop a book building model under which underpricing pay offs better-informed investors for truthfully revealing their information before the issue price is confirmed, therefore reducing the expected money left on the table. These investors may reveal a noisy signal, which indicates the direction and extent of the revision in the offer price

[21] For example, Ritter and Welch (2002) find that the average beta of their sample IPOs over 1980 to 2001 is 1.73. We find an average beta of 1.60 which is closer to Ritter and Welch (2002).

relative to the price range, and may result in subsequent performance to correlate positively with the initial price revision.

The long-run underperformance emanates from a combination of extreme differences of opinion amongst investors, costly short selling, and small public floats on many IPOs (Ritter and Welch (2002) for a review). In an early study Miller (1977) and Morris (1996) investigate the effect on asset pricing by relaxing the standard assumption of homogenous expectations. Allowing investors to have diverse opinions about the future cash flows and growth potential of an enterprise introduces an element of realism which can explain long run underperformance. As the divergence in opinion gets smaller, the marginal investor's assessment of the IPOs and consequently the trading price are lowered. These arguments are based on the proposition that the heterogeneity is maximum at floatation but declines through time with the arrival of new information. As a result, a number of once optimistic investors adjust their beliefs about the value of the company, and drive the price down, even though the average belief might never have changed. It is worth pointing out that the new information does not have to be negative: any information that reduces the spread of opinion about a firm will lead to a lower price.

Researchers argue that there are crazes in the IPO market, with over-optimistic investor's presence about the prospects of newly listed companies and bidding up initial trading prices away from fair value (Aggarwal and Rivioli (1990)). The arguments of behavioural timing theories are similar. Firms go public at the time when investors are over-optimistic about the growth prospects of IPOs (Loughran and Ritter (1995)). As a result, investors initially pay too much but prices come down as more information becomes available. Hence, the expected long-run return declines with the change in initial investor sentiment. Another line of argument put forward by Ljungqvist (1996) is that the greater the fraction of equity initial owners retain at floatation, the lower their incentive to take advantage of over-optimistic investors, since the value of their retained shares would fall as and when new investors become less optimistic. Therefore, expected long run returns increase with the retention rate.

Ritter (1991), Lerner (1994), Loughran and Ritter (1995, 2000), Baker and Wurgler (2000) and Hirshleifer (2001) extend these behavioural explanations and advocate that stock prices intermittently deviate from fundamental values and managers and investment bankers take advantage of overvaluation by selling stock to excessively optimistic investors. Largely, under these arguments, the long-term returns originate from high divergence of opinion, pushing up the initial market price, this disagreement declines over time and the valuation by the marginal investor comes closer to that of the average investor.

Schultz (2003) asserts that even if there is no ex ante abnormal performance expected, any research involving event studies is likely to find negative abnormal performance ex post. If IPOs under- (over-) perform in an earlier period, there will be fewer (more) IPOs in the future and so the average performance will be weighted heavily towards the early IPOs that under- (over-) performed. This tendency, referred to as pseudo market timing, results in negative expected performance when all IPOs are weighted equally, even if ex ante there is no expected underperformance. But, time series regressions, such as Fama-French (1993) three-factor model, mitigate this problem. On top of that, Eckbo et.al.,

(2007) report that, pseudo market timing is true for small samples, but in large samples it is unlikely to be a problem.

Previous studies also focus on IPO fundamentals to explain the observed long-term returns. For example, Eckbo et al. (2000) assert that leverage is significantly reduced following equity offerings, while liquidity is increased, resulting in a reduction in risk. As a result, IPOs are less sensitive to interest and inflation shocks and require a lower liquidity premium than benchmark firms, and thus, should have lower returns. Other studies find that large IPOs (Brav et al. (2000)), backed by venture capitalists (Brav and Gompers (1997) and Levis (2008)), and underwritten by prestigious underwriters (Carter et al. (1998)) underperform less, while those with wide initial spread, a late opening trade, and a high proportion of institutional flipping, have lower returns (Houge et al. (2001)). Studies based on agency costs theory (Jensen and Meckling (1976)), which stipulates that the long-term returns should be negative when insiders decrease their holdings, as agency costs worsen, are mixed. For example, Mikkelson et al. (1997) show that the long-run returns are unrelated to ownership structure, but Jain and Kini (1994) find a positive relationship between post-IPO operating performance and equity retention by original shareholders.

2.4.3 Measurement Problems

A growing literature questions the methodology used in many of the earlier studies. These relate mainly to the measurement of the abnormal returns over the long event windows.[22] The three main methodological building blocks used in these studies is (i) the choice of benchmark return, (ii) the measurement of investor returns over long horizons, and, (iii) the test statistics for accepting or rejecting null. Fama (1998) calls benchmark related issues as bad model problem. Any long run performance is a joint test of the validity of the chosen benchmark and of sample performance relative to that benchmark. Since, there is no benchmark model that correctly prices all securities all of the time,[23] the bad model problem is unavoidable. Several long run performance studies have acknowledged this problem clearly.

Beginning with Ritter (1991), long run studies of US IPOs have estimated abnormal return by matching issuing and non-issuing firms. Ritter (1991) used size and industry matched firms to evaluate IPO performance in the long run. Later studies used size and book-to-market matching instead of size and industry (Loughran and Ritter (1995) and Brav and Gompers (1997)). Ritter (2003)[24] showed that when size and book-to-market matching is used the 3–year underperformance is 3.1% per year. As an alternative to the matching firm approach some studies use the Fama-French (1992) three factor model to assess the long run performance. In an attempt to better understand the underlying economic rationale for the book-to-market effect, Eckbo and Norli (2000) add two further factors to this: leverage and liquidity. They document that IPOs in the US are less

[22] See the methodology section for a comparison of short-run and long-run event studies.
[23] See Fama and French (1992) for a critique of capital asset pricing model.
[24] Ritter (2003) measured underperformance using 7437 IPOs in the US market from 1970-2000 during the first five years after issuing. He finds compared to size matching non-issuing firms IPOs underperform 4.7% on a 3-year holding period.

risky and more liquid than non-issuing firms. Failure to control this will tend to lead spurious estimates of the IPO underperformance.

Loughran and Ritter (1995) find that IPOs underperform size matched control firms in 1970-1990 period in US. However, Fama and French (1993) show that the average returns during the same period were subject to book-to-market effects, in the sense that small growth stocks performed poorly. Not controlling this fact in IPOs—where most of the IPO stocks fall into this a category—might therefore produce biased results. Consistent with prediction, Brav and Gompers (1997) document that Loughran and Ritter's (1995) IPO underperformance anomaly disappears entirely when control firms are selected on the basis of book-to-market[25] in addition to size. Brav, Geczy and Gompers (2000) document the same effect with respect to the apparent long run underperformance following SEOs. This suggests that there is no new issues puzzle[26]. Later, Ritter (2003) showed that when size and book-to-market matching is used the underperformance is 3.1% per year after 3 years of IPO. Also, Kang, Kim and Stultz (1999) use Japanese SEOs to find significant underperformance, even after controlling for size and market-to-book.

Where do we stand today regarding long run event studies? Fama (1998) concluded that 'the apparent (long run performance) anomalies are methodological illusions' (p 285). He argues that even little change to the methodology can change the empirical results. Loughran and Ritter (2000), in contrast, argue that abnormal performance should be sensitive to methodology because different methodologies

[25] Loughran and Ritter (1995) used size and industry matching when assessing the performance of IPOs.
[26] The title of Loughran and Ritter (1995) paper was 'The new issues puzzle'.

have different power. Overall, most previous studies agree that IPOs do not generate positive returns despite their high risk, as, on average their beta is relatively high. For example, Ritter and Welch (2002) report an average beta of 1.73 for IPOs. In this thesis, I focus on the impact of insider trading on long run performance of IPOs.

2.4.4 Insider trading in explaining long run IPO performance

The long run IPO performance is a long standing puzzle in the empirical corporate finance literature. Corporate insiders are the owners of the company who bring it to the market and their trading activity can provide a plausible explanation as to why IPOs perform badly in the long run. This thesis examines whether corporate insiders act opportunistically in the first few years of their IPOs. Since they have more knowledge of their firm's operations, their actions on their own stock positions should reflect their beliefs regarding the future prospects of the firm. Previous studies (e.g., Ritter (1991), Spiess and Affleck-Graves (1995) and Loughran and Ritter (1995)) explain significant underperformance of new issues in the aftermarket by suggesting that issuers act opportunistically and time their offering in order to cash in on temporary misvaluations in the IPO market ('windows of opportunity' hypothesis). In this study, I test whether insiders knowingly issue overvalued equity (in IPOs) by following their personal trades in company stock and whether this contributes to the poor performance in IPOs.

Failing IPOs provide a natural setting to analyze the motivation behind an entrepreneur's decision to take a firm public. Following the high IPO volume in the hot-issue market and its subsequent bust, there are many IPO which performed poorly. This raises concerns regarding the motivation of insiders in taking these firms public in the first place. Did they take these firms public to exploit the irrational sentiment present in the market during this period, or did they truly believe that their firm was of good quality? This study is an attempt to shed some light on this issue by analyzing the insider trading behaviour in IPOs.

Although the literature on insider trading is vast and well-developed, most of the studies have focused mainly on insider trading activities around specific events such as earnings announcements, takeovers or bankruptcies. It is possible that looking at insider behaviour at just one point in time may not be entirely indicative of the private information of insiders since insiders may have incentives to hide their private information when they believe that there is a high level of scrutiny on their trading activities. Instead, analyzing insider activities from the time of the offer, until some time has passed should give us useful insight regarding the information that insiders possess and when they choose to act on it.

I test the hypothesis whether insiders signal in IPOs through their trades. Insiders convey negative signal when selling shares. However, in case of a seasoned company insider sell may convey less information if they sell for liquidity reasons (Lakonishok and Lee, 2001). For IPOs, Leland and Pyle (1977) develop a model where insiders signal there quality through share retentions. Brau and Fawcett (2006) survey evidence shows that selling insider shares in IPOs is a strong negative signal to the market. If this is the case insider selling will have some predictive power for the long run performance of IPOs. Conversely, by purchasing shares in a company insiders communicate a positive signal about the future value of their firm. The signal is costly as insiders are committing more of their wealth to the company and remain undiversified.

The relationships between insider ownership and corporate performance have gained much attention in theoretical and empirical investigation. Theoretical works have shown that there is a irrefutable case for the proposition that insider ownership can have an important influence on the way the firm is managed and, therefore, on the firm's observed market value (Baumol (1959), Jensen and Meckling (1976), Demsetz (1983), Stulz (1988)). Empirical works by Morck, Shleifer, and Vishny (1988), McConnell and Servaes (1990, 1995), Hermalin and Weisbach (1991), Holderness, Kroszner and Sheehan (1999) and others document a statistically significant correlation between share ownership by corporate insiders and corporate performance. The case of insider ownership changes and corporate performance has been extended in this paper in context of IPOs. The idea is simple, if insiders are buying, there interests will be aligned with the general investors thus mitigating agency problems, and the share price performance will be better. In contrast, when insiders sell which exacerbates agency problems and thus companies underperform.

Chapter 3

3 Data and Methodology

3.1 Introduction

The purpose of this chapter is to discuss the individual and aggregate insider trading measures and the empirical methodologies used in this thesis. Since, insider trading data is used throughout the remaining chapters, it is better to have a detailed discussion here.[27] Specifically, this chapter discusses the insider trading and IPO data collection and screening procedure, aggregate measures for insider trading and event studies methodology. I also present my sample firms used in each chapter.

When this thesis assesses the information content of insider trading, individual insider trades are treated as separate events. However, when a firm is categorised based on insider trading measure, the firm may have multiple transactions some of which may be buy and some of which are sell trades. To avoid

[27] In the following chapters, a brief and relevant description of data and methodology will appear.

this problem, the study uses the aggregate insider trading measure for that firm and determines whether that firm is a *Net Buyer* or *Net Seller*. This thesis follows Lakonishok and Lee (2001) and develops net purchase ratio for each individual firm.

The major empirical method used in this study is event studies, which is one of the pioneering methodologies to analyse any corporate events. Most of the research questions addressed in this thesis are in the form of an event. Specifically, while analysing the information content of insider trades, individual trades are the events. When addressing the empirical puzzles in the IPO literature, several events are considered: the IPO date, the lockup expiration date and insider trading around (within) the lockup period[28]. The assessment of the stock market reaction to a particular announcement requires a measure of stock returns around those events.[29] This study uses event studies methodology, which is extensively used in previous studies.[30]

3.2 Insider Trading Data

3.2.1 Definition of Insider and Insider trading

The UK definition of insiders is confined to a small group. They include the members of the board of directors (both executive and non-executive), but exclude

[28] If there are multiple lockups this thesis focuses on the first lockup period, which is the strict lockup period where insiders are not allowed to sell their shares.
[29] Here I discuss event studies relating to measuring the effect on stock return only. Though I have used an event studies relating to trading volume in Chapter 5, the methodology is described in the relevant chapter.
[30] Kothari and Warner (2007) did a census of event studies published in 5 leading journal: *Journal of Business, Journal of Finance, Journal of Financial Economics, Journal of Financial and Quantitative Analysis and the Review of Financial Studies* from 1974-2000 and they identify 565 papers used event studies.

other key employees and large shareholders. In the US, insiders are defined as officers, directors, other key employees and shareholders holding more than 10% of any equity class (Lakonishok and Lee (2001)). The term 'officer' covers the Company President, principal financial officer, principal accounting officer, Vice President and any other employees, who perform policy making functions in the company (Bettis et al. (2000)). All of the above are prohibited from trading in undisclosed 'material' information. Insider trading occurs when a person trades in his or her company's shares using material, current, reliable, not available to the market and qualified as new, fresh and price-sensitive information according to UK law.

The definitions of insider trading (in the US) and directors' share dealings (in the UK) often cause confusion. According to the UK Misuse of Information Act, insider information is defined as 'material, current, reliable and not available to the market' and is legally qualified as 'new and fresh'. The Criminal Justice Act makes trading on insider information (information not regularly available and obtained through insiders) a legal offence. This study does not deal with illegal insider trading, but focuses on legal trading by directors as defined in the listing rules of the London Stock Exchange (Source Book, August 2002, Chapter 16). Whereas in the UK there is a distinction between (illegal) insider trading and (legal) directors' dealings, the US regulation does not make such a distinction. However, many insider trades are legal. When an insider trades in his or her own firm for liquidity reasons, without using any private and price sensitive information, and reports the trade, then such a trade is not considered illegal. In this study, I use the term directors' dealings to refer to the (legal) insider trading or share transactions by directors in the UK. As usual, I adopt the UK definition of a director. In the UK, the term director covers both non-executive and executive board members. On the other hand, in the US, executives are normally referred to as officers and non-executives as directors.

3.2.2 Regulations relating to Insider Trading[31]

Insider trading is regulated in the UK as specified mainly in the 1985 Companies' Act. These regulations concentrate primarily on unlawful use of non-publicly disclosed price sensitive information. In the UK the law imposes trading ban periods on insiders before any price sensitive information is released. For example, insiders are prevented from trading two months before preliminary, interim or final earnings announcements and a month before quarterly earnings announcements (Hillier and Marshall, 1998). Outside this ban period, insiders need permission from the chairman of the board before trading. Fidrmuc et al. (2006) argue that US regulations favour more frequent news disclosure to avoid misuse of any significant information, whereas UK law directly prohibits insiders from trading before price sensitive news announcement.

Under the 1985 Companies' Act and the London Stock Exchange (LSE) Listing Rules, companies listed on the LSE are required to report any directors' trades in their own firms' securities. UK disclosure requirements specify that directors must inform their companies without delay of any transaction carried out personally, no later than the fifth business day after the trading date. Subsequently the company must inform the Stock Exchange by the end of the following business

[31] The details are in Appendix I.

day and also enter this transaction in the Company Register. The information on insider trading is disseminated immediately to the Stock Exchange via the online Regulatory News Service (RNS). According to the most recent UK law, violation of insider trading regulations would result in civil and/or criminal law procedures. Potential penalties and sanctions include up to seven years in jail and an unlimited fine.

3.2.3 Individual Insider Trading Sample

This study uses *Directors Deals*, a large database of all UK firms' directors' trades spanning from January 1999 to December 2007, to collect data on trades undertaken by insiders. The database includes news items on directors' trades disclosed by all UK firms to the Regulatory News Service (RNS). A number of observations that are not likely to be driven by private information, such as exercise of options or derivatives, script dividends, bonus shares, rights issues, awards made to directors under incentive plans or reinvestment plans, are excluded. Also excluded are all directors' transactions in investment companies.[32] After this screening, there were 36,943 insiders' trades from the UK market. The data was checked for errors and exclude 2,952 (8%) trades as the difference in

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

announcement and transaction date is more than 5 days. The final sample includes 33,991 directors' trades in 2,664 listed companies, split into 26,268 (77%) purchases and 7,723 (23%) sell trades. This insider-trading database includes: transaction price, amount, and value, the post-transaction holding, change in holding, name and position of the insider; and announcement and transaction dates, as UK insiders can delay up to five days the announcement of their trade, but most report their trades on the RNS on the transaction date (Korczak and Lasfer (2009)).

Table 3-1 shows the summary statistics for sample insider trading activities. The variables include number of trades, number of shares, value of shares, percentage holding, trade size as a percentage of market capitalization, and market capitalization at the time of trade. While the average number of trades per company is much higher for buy compared to sell trades, the results indicate that insiders sold much more in terms of value. The number (value) of shares is very low for buy trades compared to sell trades, suggesting that, in terms of values, insiders are net sellers. The results also imply that the shares they buy have to be cheap in monetary value and they sold when the shares attain high value.

The value of shares can be misleading because for large companies the figure will naturally be higher than small companies. When the value of trades are scaled by market capitalization, this study also finds that the sell trades are higher than the buy trades. The average buy trades as a percentage of market capitalization is 0.15% while for sell trades the number is 0.79%. The market capitalization is also higher for sell trades compared to buy trades.

Insiders send numerous signals through their trading activities. They do more small purchases compared to sells. When they buy, they put their own money at stake, they seem to be careful not to take too much risk. In contrast, when insiders sell, they diversify to a great extent by selling large amount of shares.

Table 3-1 Summary statistics

	10th percentile	Median	Mean	90th percentile
Panel A: Buy Trades				
Number of trades	1	6	10.46	25
Number of Shares	1,408	12,000	128,829	160,000
Value of shares(£)	2,967	14,250	90,376	100,000
Percentage Holding (%)	0.002	0.094	2.904	8.19
Trade as % of market cap	0.0004	0.016	0.15	0.23
Market capitalization (£ mil)	7.64	105.29	2536.72	3705.59
Panel B: Sell Trades				
Number of trades	1	3	5.22	12
Number of Shares	2,949	49,471	783,681	1000,000
Value of shares (£)	9,948	119,750	1,334,806	1,860,605
Percentage Holding (%)	0.002	0.347	4.034	11.66
Trade as % of market cap	0.0017%	0.0618%	0.7887%	1.4846%
Market capitalization (£ mil)	15.80	202.96	3191.82	4560.36

I obtain insider holdings data for the period January 1999 to December 2007 from the Directors Deals. Percentage Holding is the percentage of total shares traded which is owned by the director. Market capitalization is at the time of trade.

Table 3-2 reports year-by-year summary statistics for insider trading. Both buy and sell trades show a steady increase from 1999 to 2007. The only exception is 2002, as the amount of buy is quite high which might be due to the lower valuation level in 2002. The percentage of buy, which is calculated as dividing the value of all buy trades by the total trades in that particular year, shows considerable increase between 2001 and 2003 periods, in which the market was in bearish state. Apart from these three years, the buy trades ranges from 11% to 20% of the total traded amount by insiders. Also, the numbers of buy trades are higher compared to sell trades, but the value of sell trades outweigh the buy trades. As well as 2006 and 2007 show a higher amount of insider trading both for the buy and sell trades.

The structure of executive compensation has changed over the years. More emphasis is being placed on aligning the interests of managers and shareholders. It is expected that over time a higher percentage of managers' wealth will be in their own company's stock (Lakonishok and Lee, 2001). Since the buys are small the insiders must have got these shares from IPO allocations, or from the company in the form of options[33]. Therefore, insiders would have incentive to diversify their portfolios, which will result in an increase of sell over time. This is the overall picture that we see in Table 3-2. Managers' sell trades increase from 503 million to 2.20 billion over the nine year study period.

Table 3-2 Year-by-year Summary Statistics

	Buy				Sell			
	£Value (Percent)	No. of shares	No. of trades	No. of companies	£Value (Percent)	No. of shares	No. of trades	No. of companies
1999	122.96 (0.20)	141.07	2775	801	503.01 (0.80)	241.37	886	379
2000	171.90 (0.15)	176.22	2820	772	994.50 (0.85)	316.57	867	383
2001	112.69 (0.37)	181.74	2120	750	192.93 (0.63)	89.03	476	254
2002	247.37 (0.33)	758.42	3408	1045	507.76 (0.67)	471.73	531	285
2003	190.20 (0.28)	460.78	2723	926	487.02 (0.72)	1031.17	787	363
2004	139.86 (0.18)	250.98	2659	925	627.56 (0.82)	1021.98	777	409
2005	167.37 (0.11)	356.38	2710	951	1322.41 (0.89)	1133.78	945	429
2006	613.50 (0.19)	419.29	3078	1067	2550.87 (0.81)	949.59	1284	496
2007	375.42 (0.15)	639.45	3974	1191	2204.17 (0.85)	797.93	1171	500

This table reports year-by-year summary statistics of insider trading for all London Stock Exchange during 1999-2007 periods. The value is the shares traded in millions Pound Sterling in 2008 constant terms. Percentage is the amount of buy (sell) divided by the total share trades by insiders. The number of shares is reported in millions. The number of companies for buy (sell) are not mutually exclusive, meaning a company can be simultaneously buying and selling shares.

[33] I have excluded options from insider trading data.

3.2.4 Aggregate Measure of Insider Trading

This thesis uses net purchase ratio (NPR) which is the ratio of net purchases to total insider transactions, as an aggregate measure of insider trading activities. In line with Lakonishok and Lee (2001)[34] I define NPR as follows. Each month starting from January 1999 to December 2007, I calculate the total number (and the total Pound Sterling volume) of insider purchases and sells. I then calculate the NPR by dividing the net aggregate number of insider purchases by the total aggregate number of insider transactions.

$$NPR = \frac{Purchases - Sells}{Total\ Trades}$$

If the NPR is positive (negative) it means insiders in that particular month are *Net Buy*ers (sellers).

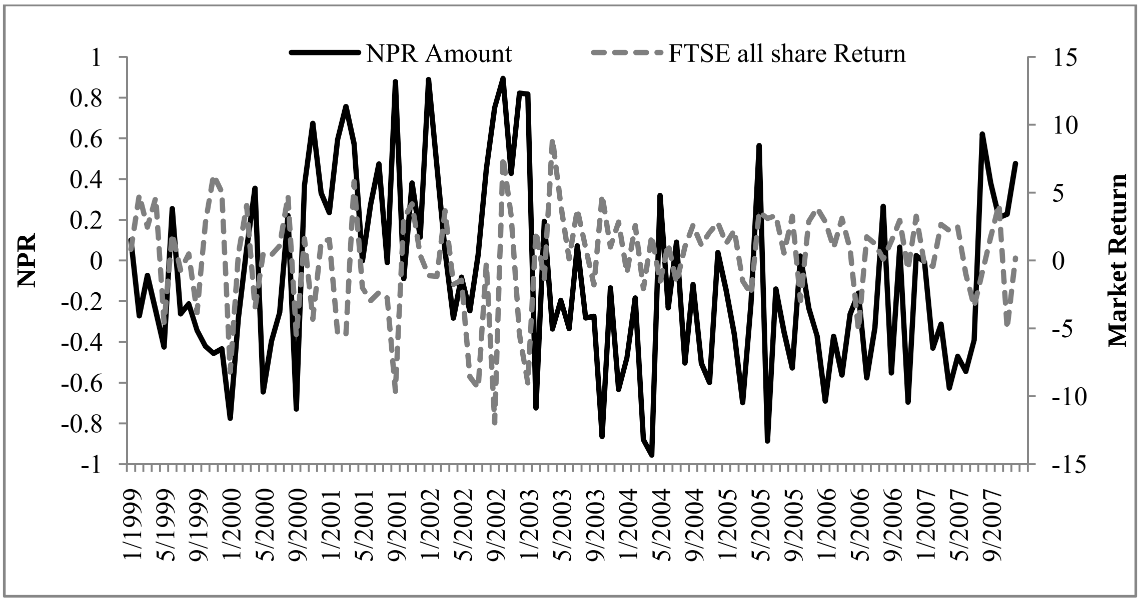
For analysing the long run performance of IPOs I use the NPR for each company over the three year post-IPO period. During this period, there may be multiple buy and sells for a single firm. John and Narayanan (1997) show that the disclosure rules generate incentives for an informed trader to manipulate the stock market from time to time by trading in the wrong direction (i.e. buying when she has bad news and selling when she has good news about the firm). Trading in the wrong direction may lessen the informativeness of her subsequent trade disclosure because the market is no longer convinced whether an insider buy (sell) indicates

[34] Seyhun (1992) uses another measure of aggregate insider trading based on the number of transactions. I think that the number of transactions may be misleading if insiders trade in the wrong directions. For example, if an insider has bad news about the company and she did a series of small buys and a huge amount of sell, the number of transaction measure will classify her as a *Net Buy*er, which is wrong.

good (bad) news. Consequently, the insider maintains her information superiority over the market for a longer period of time and uses it to reap large profits in later periods by trading in the right direction. Therefore, in order to categorise firms and avoid the wrong signals sent by insiders, I use NPR to determine the insider trading activity in a firm. If NPR is positive, the firm is categorised as *Net Buy*er and if the NPR is negative, the firm is categorised as net seller.

Figure 3-1 shows that insiders are contrarians as there is a negative relationship between aggregate insider trading and market return. When market goes down (up) insiders buy (sell) shares as the NPR is positive. Interestingly, when market movements are large, insiders increase or decrease their holdings by huge amounts as the NPRs are larger when market moves are larger.

Figure 3-1 Aggregate Insider Trading and Market Return



This figure represents a time series of net purchase ratio and FTSE All Share index return for each moth from January 1999 to December 2007. Each month starting from January 1999 to December 2007, I calculate the total number (and the total Pound sterling volume) insider purchases and sells. I then calculate the NPR by dividing the net aggregate number of insider purchases by the total aggregate number of insider transactions.

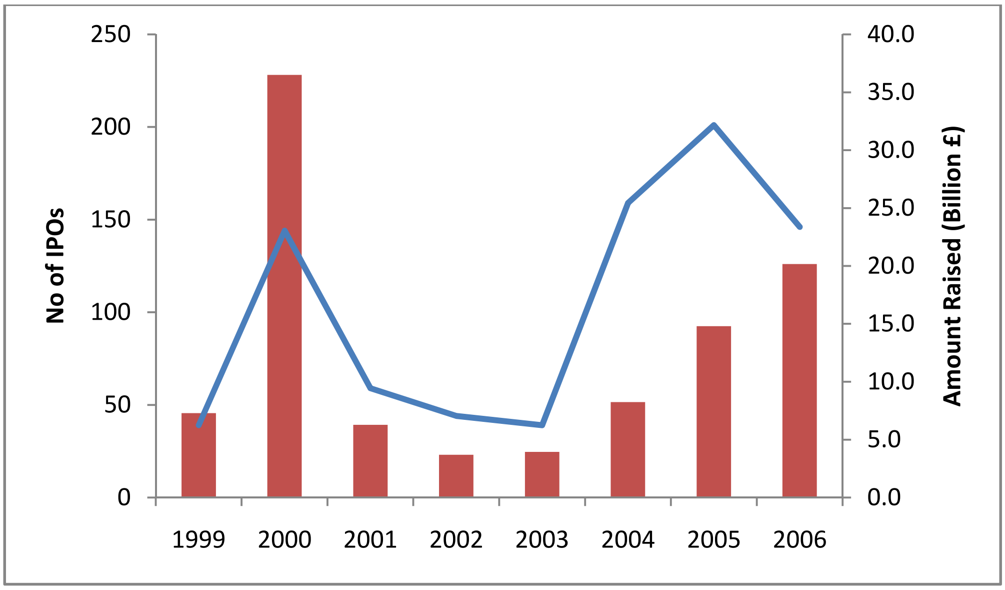
3.3 IPO Sample

This study starts with all the 1,117 IPOs that went public on AIM and London main market between January 1999 and 2006. The following filters were used to construct final sample. 76 companies were excluded for which the prospectuses cannot be found in *Perfect Filings* database. Further 15 companies were excluded with missing share price data on *DataStream*, and 195 firms with missing lockup date or ownership data from the prospectuses. Final sample includes 831 (74%) IPOs with complete data.

The LSE database is used to collect data on the quotation market (AIM or Main market), admission date, country of incorporation, issue price, market value, money raised, name of the broker, and for AIM IPOs, the advisor. I download all prospectuses from *Perfect Filings* database and hand-collect all information relating to lockup arrangements, including lockup dates, percentage of shares locked-up, fraction of insider shares locked up, directors' ownership before and after IPO, percentage sold in the IPO, institutional ownership, and venture capital backing. I further use *DataStream* to collect any delisting dates, and accounting and market data, which includes daily stock prices and indices, to compute the stock returns, market capitalization and turnover, which is used as proxy for size, accounting return on assets to measure profitability, and price-to-book ratio to proxy for growth.

Figure 3-2 shows the trend in IPO volume and amount raised in London Stock Exchange. It shows that in 2000 there is sudden jump in number of IPOs mostly driven by technology IPOs. The total amount raised is highest in 2005 followed by 2006.

Figure 3-2 Trends in IPOs and Amount Raised



The above figure shows the number of IPOs over 1999-2006 periods which issued equity in LSE. Total money raised in the right scale. Final sample includes 831 IPOs with complete data.

3.4 Event Study methodology

3.4.1 Background and Structure of Event Studies

Event studies examine the market reaction to the announcement of corporate events.[35] For example, the announcement of a merger between two business entities/firms can be analyzed to see whether investors believe the merger will create or destroy value. The basic idea is to find the abnormal return attributable to

[35] In this section I focus on the effects on stock prices. Other types of event studies includes event studies on return variances (Beaver (1968) and Patell (1976)), trading volume (Beaver (1968), Cambell and Wasley (1996), Field and Hanka (2001)), Operating performance (Barber and Lyon (1996) and earnings management via discretionary accruals (e.g. Dechow, Sloan and Sweeny (1995) and Kothari, Leone and Wasley (2005)).

the event being studied by adjusting for the expected return. Event studies have been used in a large variety of studies, including insider trading, initial public offerings, seasoned equity offerings, mergers and acquisitions, earnings announcements, corporate reorganizations, investment decisions and corporate social responsibility (MacKinlay (1997) McWilliams and Siegel (1997)).

Over the last few years, particularly since the mid 1980's, following the publication of Brown and Warner (1985), the event study methodology has become very popular. Prior to that, "there was little evidence on the central issues of corporate finance. Now we are overwhelmed with results, mostly from event studies" (Fama, 1991, p.1600). The number of published articles in the top 5 business journals[36] exceeds 500 and the literature continues to grow (Kothari and Warner (2007)).

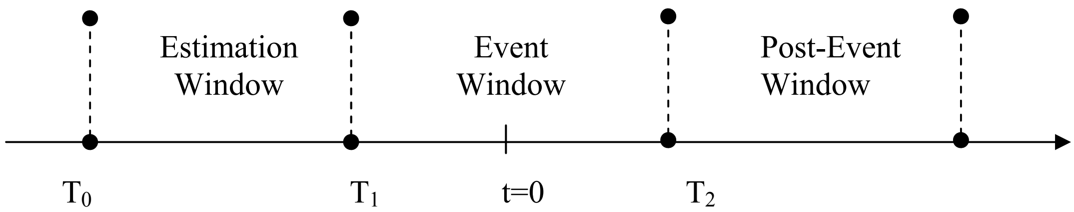
A. *Event Window*

The event window is when the event of interest took place. In other words, it is the period over which the security prices of the firms involved, around a specific event, will be examined. For example, if an insider purchases shares, the announcement date is the event. It is common to define the event window as larger than the specific date of interest. In particular, the period of interest is often expanded to 2 or 3 days around the event date.

It is also likely to include days before and after the event into the period of interest, which may capture the price effects of the announcement around the event date. For example, in the case of insider trading announcement, the information may leak and be known to the market before the announcement is made. Furthermore, if the announcement is made after the stock market closes on the recorded announcement day, which is quite common for SEOs, the event window including the day of and the day after the announcement can capture the price effects.

Figure 3-3 Timeline for an event study

This figure represents timing sequence for an event study. Defining t=0 as event date, (T_1, T_2) represents the event window. (T_0, T_1) is the estimation (pre-event window). (T_2, T_3) is defined as the post-event window.



The estimation window, sometimes referred to as the clean period, is the period prior to the event window for estimating the market model parameters that will be used to define the expected returns. As a matter of principle, the event period itself is not included in the estimation period, to prevent the event from influencing the normal estimation of the parameters. With the parameters estimated in the estimation window (T_0, T_1), the abnormal returns can be calculated for the event window (T_1, T_2).

B. Modelling Abnormal Return

An event study examines the share price behaviour for a group of firms which had undergone the same corporate events (e.g., IPOs). The event might take place at different point in calendar time, or they might be clustered at a particular date (e.g., a regulatory event affecting an industry or a subset of a population of firms). Let t=0 represent the time of the event. For each sample security *i*, the return on security for time period *t*, R_{it} is:

$$R_{it} = E(R_{it}) + e_{it},$$

Where $E(R_{it})$ is the normal (i.e., expected or predicted return given a particular model of expected returns), and e_{it} is the return which is abnormal or unexpected, which is attributed to that event.[37] Given this return decomposition, the abnormal return, e_{it}, is the difference between observed return and the predicted return.

$$e_{it} = R_{it} - E(R_{it})$$

Equivalently, e_{it} is the difference between the return conditional on the event, and the expected return unconditional on the event. Thus, the abnormal return is a direct measure of the (unexpected) change in security holder's wealth associated with the event. The security is typically a common stock, although some event studies looked at wealth changes for debt or preferred equity claims.

A model of normal returns (i.e., expected returns unconditional on the event but conditional on the information) must be specified before the model for abnormal return can be defined. A variety of expected return models (e.g., market model, constant expected return model, capital asset pricing model, Fama-French three factor model, Carhart four factor model) have been used in event studies.[38] The most common ones for short term event studies are market model, market

[37] This framework is from Brown and Warner (1980) and Campbell, Lo and MacKinlay (1997).
[38] For descriptions on market model, constant expected return model, capital asset pricing model see Brown and Warner (1985) or Campbell, Lo and MacKinlay (1997). The gains from using multifactor models like Fama-French or Carhart model are very limited; so they are not heavily used in the literature. See MacKinlay (1997) for treatments of such models.

adjusted model, mean adjusted model and return on control firms. Across alternative models, both the bias and precision of the expected return measure can differ, affecting the properties of the abnormal return measures. Properties of the different methods have been studied extensively and discussed in Kothari and Warner (2007).

However, in the literature, the constant expected return model is not widely used as a market model or market adjusted model. I will now briefly explain the two models that are used in this thesis: market model and market adjusted model. These two are the most common methods used in the corporate finance literature. Sometimes, market adjusted model can be used, when the researcher does not have data on the pre-event period, where the parameters can be estimated. This is the case for my IPO sample.

3.4.2 Market Model

The market model is frequently used in empirical studies to measure the reaction of security returns to new information, which represents the event-specific information. The model arises as an implication of the assumption that the joint distribution of returns on the securities is multivariate normal. To investigate the announcement effect of events, the market model is constructed by the following steps. First, the rate of return on a security over a particular holding period (estimation window T_0 to T_1) is measured as:

$$R_{it} = \alpha_i + \beta_i R_{mt} + \epsilon_{it} \qquad (3)$$

Where,

$R_{it} = rate\ of\ return\ \ in\ security\ i\ for\ period\ t$

$R_{mt} = rate\ of\ return\ on\ market\ index\ for\ period\ t.$

$\alpha_i, \beta_i = \ regression\ coefficients\ for\ security\ i$

$\varepsilon_{it} = stochastic\ error\ term$

Model (3) is estimated on a set of data relative to the event date, which is normally referred to as estimation window. It is common practice that pre-event window is used as estimation window. Under standard assumptions, ordinary least squares (OLS) is a consistent estimation procedure for market model parameters. Thus OLS is used to estimate α_i and β_i. They are calculated by regressing daily returns of security *i* on market index over the estimation window period. Given the estimated market model parameters, the abnormal return of the firm i for period t (event window T_1 to T_2) is calculated as follows:

$AR_{it} = R_{it} - (\hat{\alpha}_i + \hat{\beta}_i R_{mt})$

Where,

$AR_{it} = abnormal\ returns\ of\ security\ i\ for\ period\ t$

$R_{mt} = rate\ of\ return\ on\ market\ index\ for\ period\ t.$

$\hat{\alpha}_i, \hat{\beta}_i = \ estimated\ OLS\ \ coefficients\ for\ security\ i$

The abnormal returns are then aggregated over the event window and across observations of the event to examine the event announcement effects. The aggregation can especially be done along two dimensions: through time and across securities.

The average abnormal return (AAR) for a particular time *t* relative to the zero event date is calculated as the sum of the abnormal returns at time *t* in the event window, divided by the number of securities in the sample. In particular, for the event time, t=T_1, T_2, and N firms, the average abnormal return for time t is:

$$AAR_{it} = \frac{1}{N}\sum_{i=1}^{N} AR_{it} \quad (4)$$

The average abnormal returns can then be aggregated over the event window. The cumulative average abnormal return (CAR) is measured as the sum of the average abnormal returns over a specific time period (event window) relative to the event date:

$$CAR_{(T_1,T_2)} = \sum_{t=T_1}^{T_2} AAR_t \quad (5)$$

Equivalently, the CAR can also be calculated by cumulating through time for each security, over event window. The average abnormal returns are then aggregated through the securities in the sample. Define $\widehat{CAR}_{i(T_1,T_2)}$ as the sample CAR from T_1 to T_2 for firm i. The CAR from T_1 to T_2 is the sum of the abnormal returns in the event window for security i,

$$\widehat{CAR}_{i(T_1,T_2)} = \sum_{t=T_1}^{T_2} AR_{it} \quad (6)$$

For all the events, then $CAR_{(T1,\ T2)}$ is the sum of $\widehat{CAR}_{i(T_1,T_2)}$ for the event window divided by the number of securities in the sample,

$$CAR_{(T_1,T_2)} = \frac{1}{N}\sum_{i=1}^{N} \widehat{CAR}_{i(T_1,T_2)} = \frac{1}{N}\sum_{i=1}^{N}\sum_{t=T_1}^{T_2} AR_{it} \quad (7)$$

3.4.3 Market Adjusted Model

Another popular model is the market adjusted return where it is assumed that the alpha is zero and beta is one. The use of the market adjusted return is mostly driven by the availability of data. When the pre-event estimation period for an event does not exist, the market model cannot be used. This is particularly the case of IPOs as the event date is the IPO date. Also, for some event announcement samples, such as takeovers and seasoned equity offerings, there are repeated event announcements over time. Multiple events can be carried out by the same firm within a short period of time. Therefore, it is difficult to find a clean period where the market model parameters can be estimated. Moreover, Brown and Werner (1980) show that, for short-window event studies, weighing the firms return by beta does not significantly improve the estimated results.

The abnormal returns by using market adjusted model can be calculated by deducting the return of the market index from the stock return:

$$AR_{it} = R_{it} - R_{mt} \qquad (8)$$

Where,
$AR_{it} = abnormal\ returns\ of\ security\ i\ for\ period\ t$

$R_{it} = rate\ of\ return\ on\ security\ i\ for\ period\ t.$

$R_{mt} = rate\ of\ return\ on\ market\ index\ for\ period\ t.$

Again the AARs and CARs can be calculated similarly as described above for the market model. The CARs can be calculated based on time series aggregation or cross-sectional aggregation. It is important to note that, both market model and market adjusted model assume that return on market is a good proxy for expected return.

3.4.4 Hypothesis Tests and Test statistics

For a given model, a test statistic is computed for CAR and compared to its assumed distribution under the null hypothesis that the mean abnormal performance is equal to zero. The null hypothesis is rejected if the test statistics exceeds a critical value, typically corresponding to the 5% and 1% tail region. The test statistic is a random variable because the abnormal returns are measured with error. According to Kothari and Werner (2007) two factors contribute to this error: first, predictions about securities unconditional expected returns are imprecise. Second, individual firms' realised returns at the time of an event are affected for reasons unrelated to that event, and this component of the abnormal return does not average to zero in cross-section.

Based on the discussion on aggregate abnormal returns, two methods can be employed to cumulate AR_{it} into $CAR_{(T1,\ T2)}$. Although it is obvious that the CARs generated under both methods are the same, the test statistic results are different. When the CAR is calculated by first aggregating AR_{it} across securities then cumulating through time, the time series standard deviation test is used. When the CAR is calculated by first cumulating AR_{it} through time then aggregating across securities, cross sectional standard deviation test is used.

A. Time series Standard Deviation Test

The test statistics for any event time *t* is the ratio of AAR in the event time *t* to its estimated standard deviation, where the standard deviation is estimated from the series of the portfolio's AAR over the estimation period (usually the pre-event period). The time-series standard deviation test uses a single variance estimate for the entire portfolio. Therefore, the time series standard deviation test does not take account of unequal return variances across securities. Additionally, it avoids the potential problem of the correlation of security returns.

The test statistics for any event time *t* AAR_t is:

$$t_{AAR_t} = \frac{\overline{AAR}_t}{\hat{\sigma}_{AAR}} \tag{9}$$

where,

$$\overline{AAR}_t = \frac{1}{N}\sum_{i=1}^{N} AR_{it} \tag{10}$$

$\hat{\sigma}_{AAR}$ is the estimated variance of AAR_t.[39] N is the number of securities that are available in the sample. M is the estimation period defined as $M=T_1-T_0+1$. T_0 and T_1 are the beginning and ending time of the estimation period respectively.

The test statistics that assess the statistical significance of abnormal return performance over a multi-day period $T=T_2-T_1+1$ is:

$$t_{CAR} = \frac{CAR_{(T_1,T_2)}}{\hat{\sigma}_{AAR} * \sqrt{T}} \tag{11}$$

Equation 11 assumes time-series independence of the one period mean abnormal return. The test statistic is typically unit normal in the absence of abnormal

[39] Many other alternative have been examined in the literature. See, for example, Campbell, Lo and MacKinlay (1997).

performance. This is only an approximation since estimates of the standard deviation are used (Kothari and Werner (2007)).

The test statistics in equation 11 is well specified provided the variance of one period mean abnormal return is estimated correctly. Event time clustering renders the independence assumption for the abnormal returns in cross-section incorrect (Peterson (2005)). This would bias the estimated standard deviation downward and the test statistic upward.

B. Cross-sectional Standard Deviation Test

In a cross-sectional standard deviation test, the portfolio test statistics for time t in event period is:

$$t_{AAR_t} = \frac{AAR_t}{\hat{\sigma}_{AAR_t}/\sqrt{N}} \qquad (12)$$

And the test statistics for $CAR_{(T1,\ T2)}$ is:

$$t_{CAR} = \frac{CAR_{(T_1,T_2)}}{\hat{\sigma}_{CAR_{(T_1,T_2)}}/\sqrt{N}}$$

Where $\hat{\sigma}_{AAR_t}$ and $\hat{\sigma}_{CAR_{(T_1,T_2)}}$ are the estimated variance of AAR_t and $CAR_{(T_1,T_2)}$, respectively.

C. Summary of Event Studies

Table 3-3 highlights some of the known properties of abnormal returns. The table shows the characteristics of event study methods along three dimensions: Specification, Power against specific types of alternative hypothesis, and sensitivity of specification to assumptions about return generating process. The table also shows the difference in results between short run and long run studies.

Table 3-3 Summary of event studies

Criterion	Length of Event Window	
	Short (<12 months)	Long (12 months or more)
Specification	Good	Poor/Moderate
Power when abnormal performance is:		
Concentrated in event window	High	Low
Not concentrated in event window	Low	Low
Sensitivity of test statistic specification to assumptions about return generating process:		
Expected returns, unconditional on event	Low	High
Cross-sectional dependence of sample abnormal returns	Low	Moderate
Time series dependence of sample abnormal returns	Moderate	High
Variance of abnormal returns, conditional on event	High	High
Sensitivity of power to:		
Sample size	High	High
Firm Characteristics (size, industry)	High	High

Source: Kothari and Werner (2007).

Horizon length has a large impact on the event study test properties. First, short horizon event study methods are generally well specified, but long horizon methods are sometimes poorly specified. While much is understood about how to reduce misspecification in long horizon event studies, researchers do not have complete confidence in any of them. Second, short-horizon methods are quite powerful if the abnormal performance is concentrated in the event window. In contrast to the short horizon tests, long horizon event studies (even when they are well specified) generally have less power to detect abnormal performance, both when it is concentrated in the event window and when it is not. Third, with short horizon methods the test statistic specification is not highly sensitive to the benchmark model of the returns or assumptions about the cross sectional and time series dependence of abnormal returns. This contrasts with long horizon methods, where specification is quite sensitive to assumptions about the return generating process.

However, the short and long horizon test shows some similarities. First, a common problem for short and long horizon tests is that when the variance of a securities abnormal return conditional on the event increases, test statistics can easily be misspecified, and reject the null hypothesis too often. Though this problem was first studied in the context of short horizon studies by Brown and Werner (1985) and Corrado (1989), this issue is likely to be relevant in long horizon studies. Second, power is higher with sample size, regardless of horizon length. Third, power depends on the characteristics of the event firms.

Like any other methods, event studies have many limitations. However, event study methodology is examined heavily in the previous literature and most notably we know lot about the limitations of event studies. Fortunately, it is also known that how to address most of the problems in event studies. Probably, that is the reason, notwithstanding the limitations of event studies that it is “the” most commonly used method in corporate finance literature.

3.4.5 Cross-sectional Tests

This focus of this section so far has been on the analysis of mean abnormal return following an event. These tests represent the more standard class of tests underlying event studies. To provide a more complete picture of the event related tests, I briefly describe here the cross-sectional tests that can be used to further analyse an event. These tests examine how the event affects firm's stock price conditional on the characteristics of the firm. For a cross-section of firms, abnormal returns are compared to (e.g., regressed against) characteristics of the firm. This might help to confirm or investigate the hypothesis being tested.

$$AR_{it} = X_{it} + \varepsilon_{it}$$

Where,

AR_{it} = abnormal return of firm i for time t

X_{it} = set of regressors

ε_{it}= random error term.

Cross-sectional tests are employed in almost every event study. They are relevant when the average abnormal performance of an event is zero. In addition, they can be applied, irrespective of the horizon of the event study (short vs long). They are simple to do, but as discussed below, "one must be careful in interpreting the results" (Capmbell, Lo and MacKinlay (1997), p 174).

One reason why the abnormal returns vary cross sectionally is the event affect which is different in different firms. For such as case, Sefcik and Thompson (1986) examine the statistical properties of cross-sectional regressions. They are concerned with the effects of cross-sectionally correlated abnormal returns and heteroskedasticity in the abnormal returns. They argue that accounting for each appears to be important in context of the inferences, and they suggest procedures to deal with the issues.

Abnormal returns can also vary cross-sectionally because the extent to which the event is anticipated may be different for different firms. For example, the abnormal returns earned by larger firms are lower compared to the smaller firms, because smaller firms are riskier all else being equal. Further, events are endogenous, reflecting a firm's self-selection to choose an event. For example, insider purchases can be self-selection events. Recognizing these factors and that it is the unexpected information provided by an event that determines the reaction of stock prices, which has numerous consequences.

Some event studies focus not only on the affect of the event on stock prices but also predicting the event (the probability of merger, the probability of insider's purchases versus sells), using sometimes past stock prices as one of the independent variable. These tests are broadly categorised as cross sectional methods, as the sample includes both event and non-event firms. Typically, discrete choice models (e.g., logit, probit models) are used to analyse the characteristics that significantly influence the event firms. This seems intuitive since my interest is what factors are likely to drive the event, such as insider buy or sell trades.

Consider the following logit model, where D is the insider trading dummy.

$$D = X_{it} + \varepsilon_{it}$$

Where,

$$D\begin{cases} Y = 1, if\ Insider\ trade \\ \quad 0\ Otherwise \end{cases}$$

X_{it} = set of regressors

ε_{it}= Random error term

The above model is estimated by the maximum likelihood estimators and can answer several important questions. I estimate logit models to further analyse the event and answer the questions: Is there significant relationship between pre-trade share price performance and insider trading? In the context of information content of insider trading, are market-to-book and size important factors?

3.4.6 Conclusion

In this thesis, I use a large sample of firms to test the proposition that insider trading predicts stock returns and mitigate information asymmetry, particularly in the case of IPOs. I test various relevant hypothesis using large samples of UK companies from 1999 to 2007 and the event study methodologies. Particularly, market reactions to insider trading, lockup expiration returns and long run IPO performance are used as specific events. I employ market adjusted model and market model to calculate short and long window abnormal returns. Also, I use matching firm approach to examine the long run IPO performance. As robustness checks, I employ buy-and-hold abnormal returns and Fama-French calendar time regressions to analyse the long run IPO performance. Further analyses of the abnormal returns are done by cross-sectional regressions and discrete choice models.

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Chapter 4

4 Market Sentiment, Timing, Predictability, and Information Content of Individual and Aggregate Insider Trading [40]

Abstract

This chapter analyses the drivers of market reaction to insider trading. I find that insiders are contrarians as they buy after significant price increases and sell after price declines, suggesting that they are likely to be informed. Consistent with this hypothesis, this study finds that the buy trades are preceded by significant positive returns, and thus convey information about future performance. However, the positive event and post-event performance is limited to mainly small firms. This study also shows that this excess performance is strongly affected by the stock and market volatility, but it is relatively evenly distributed across the bear and bull periods. For the sell trades, there is no excess performance in the post-event period. The results suggest that the information content of insider trading is weaker than previously documented.

Keywords: Insider Trading, UK, information content, Contrarian Strategy, managerial timing.

JEL classification: G14.

[40] This chapter was presented in Advanced Corporate Finance Course, Aarhus, Denmark in spring 2008. I thank participants of that course and Jay Ritter for valuable comments. Any remaining errors in this chapter are my own.

4.1 Introduction

Previous studies show that insiders are contrarians as they buy after price decline and sell after price run up, but the extent to which such trades convey information is mixed. For example, in the short run, while Lakonishok and Lee (2001) find that insider trades are not informative, Fidrmuc et al. (2006) find they do convey information to the market as subsequently to their buy (sell) trades share price increases (decreases). There are other related studies of managerial decisions that also suggest that insiders are better informed about their firms' prospects. For instance, Loughran and Ritter (1995) show that firms issue equity when they are overvalued, Ikenberry, Lakonishok and Vermaelen (1995) show that firms repurchase equity when they are undervalued.[41] Managers use valuation levels to trade on their personal accounts as well as take corporate level decisions. Notwithstanding the enormous literature on insider trading, this paper expands the earlier literature in several ways. Whilst previous studies document that insiders are contrarians, this study assesses whether insiders buy (sell) in the bear (bull) period with the expectation of price reversals. This chapter also assesses whether the market reaction to insider trading differs across bull (bear) market conditions, firm size and value (growth) stocks.

This study contributes to the literature in several ways. First, this research investigates whether managers use market sentiment as a platform to act like contrarians. According to Seyhun (1988), insiders sell after significant stock price

[41] In this thesis I focus on insider trading in existing companies and IPOs. Different corporate decisions are outside the scope of this study.

increases and buy after price declines. Other studies find similar trend in aggregate insider trading (Seyhun (1992) and Lakonishok and Lee (2001)). Similar results are documented for the aggregate insider trading, meaning that they sell (buy) after a price run-up (decline). In line with this, Jiang and Zaman (2010) assert that contrarian strategy implies insider trading as a reaction to market returns. I use market states to test the contrarian behaviour of insiders. If managers use the market platform to act like contrarians, it is expected that purchases to dominate in bear periods, and inversely, insiders are expected to sell in the bull period. I define the bull market as January 1999 to March 2000 and January 2004 to December 2007 and bear period as April 2000 to December 2003.

A related question is whether there is differential market reactions to insider trades in different market conditions. In the institutional trading literature, Chiyachantana, Jain, Jiang and Wood (2004) claim that differential market reaction to buy and sell trades depend on market conditions. They argue that in bullish markets the suppliers of liquidity will not push down prices following a sell order, because it is easy to find a buyer. In contrast, in bearish markets institutions have to offer discounts to find buyers for their sell orders, which results in buy (sell) trades to have a bigger and permanent price impact in bullish (bearish) markets. It is well established in the previous literature that insider buy and sell trades trigger different market reactions.[42] The uneqivocal result, so far, is that purchase transactions produce higher market impact than sell trades (see Fidrmuc et al. (2006) for short

[42] Director purchases convey positive signal to the market. Conversely, directors signal negative news when selling shares. Nevertheless, this signal is less informative as liquidity may be a reason for sell rather than changes in their expectations about the firm's future cash flows may force them to sell shares (Lakonishok and Lee (2001), Friedrich et al. (2002)).

run, Lakonishok and Lee (2001) for long run). This asymmetry has been attributed to more informed trading in purchases than in sells. In this paper, I test whether there is asymmetric price response of buy and sell trades in bull and bear periods.

Second, this study tests whether the insider's view differs systematically from market valuations, and they try to take advantage of misvaluation. Previous research on insider trading finds that insiders try to take advantage of perceived mispricing, suggesting market timing (Jenter (2005), Lakonishok and Lee (2001) and Rozeff and Zaman (1998)). There is evidence that insider trading is not random in value and glamour stocks (Rozeff and Zaman (1998)). It has been documented that insider buying increases as stock changes from growth to value categories. Similarly, Lakonishok and Lee (2001) show that insiders tend to buy value stocks and sell glamour stocks. They also show that contrarian strategies are useful in market timing. I carry an out-of-sample test for managerial timing by corporate insiders under UK institutional setting.

Third, this study investigates whether insiders are actively involved in small companies, and whether their timing skill is confined to small companies. There may be a considerable amount of information asymmetry in the case of smaller firms that lead the insiders to signal to the market through their trading (Aboody and Lev (2000)). Previous work has empirically established the importance of factor "size" in the context of insider trading literature. For instance, in the US, Lakonishok and Lee (2001) find that insiders have an advantage in timing of the future performance of smaller companies than larger companies. In addition, Loughran and Ritter (2000) argue that undervaluation on which behavioural timing relies, is likely to be more common, and higher in small firms than large ones: for any given mispricing, 'there will be a stronger force pushing the price towards fundamental value (and thus limiting the magnitude of any misvaluation) for big stocks'(p. 363).

Fourth, recent evidence shows that trading by insiders does not convey information after controlling for M/B and size (Jenter, 2005). Similarly, Lakonishok and Lee (2001) find that after controlling for M/B and size, insider trades in most firms do not predict subsequent stock returns. This research tests whether insider trades in the UK are informative after controlling for size and M/B. On the other hand, it is possible that insiders mechanistically react to value (growth) strategies. Value strategies might produce higher returns because they are contrarian compared to "naïve" strategies followed by other investors. Size is also critical in event studies. Therefore, I assess whether insider trading is informative after controlling for value (growth) strategies and size.

This study identifies a total of 33,991 directors' trades in 2,664 listed companies, split into 26,268 (77%) buy and 7,723 (23%) sell trades. The sample covers two interesting sub-periods: the bull period (January 1999 to March 2000 and January 2004 to December 2007) and the bear period (April 2000 to December 2003) in the stock markets. This allows me to test whether insiders time their trades differently under different market conditions. This study measures aggregate insider trading activity by net purchase ratio (NPR), as used in Lakonishok and Lee (2001) and relate this ratio to market conditions. This research finds that NPR is positive (negative) in bear (bull) market, which implies that insiders purchase (sell) in the bear (bull) market. The conclusion holds after controlling for insiders' contrarian behaviour in the regressions. In general, the aggregate insider trading is consistent with contrarian behaviour. However, the aggregate insider trading does not predict market return.

This study uses the standard event study methodology (Brown and Warner, 1985) to compute the abnormal returns around the announcement day (day 0) of the trade as disclosed in the RNS. Overall, the results suggest that the buy trades are informative and the sell trades do not convey much information to the market. I find event day return of 1.02% and -0.13% for buy and sell trades, respectively. While the coefficient for buy trade is statistically significant and economically meaningful, the coefficient for sell trade is not statistically, or economically, significant. The results are in line with Fidrmuc et al. (2006) who find an immediate market reaction of 1.16% and -0.26% respectively. My results are in direct contrast with Lakonishok and Lee (2001) who report a market reaction of 0.13% and -0.23% for buy and sell respectively when measured around reporting period.[43] This might be due to the fact that in the US it takes a minimum of 10 to a maximum of 40 days for the information to reach the market. Moreover, the information might have been leaked and is already reflected in stock prices. The definition of US insiders is much wider compared to UK. It is possible that some insiders (key employees or large shareholders) might have less inside information compared to directors. Thus these factors are likely to explain the relatively smaller market reaction in the US.

This research reports, in the bear market, share prices decline more before insiders buy them. The market reaction is higher in the bear market for buy trades,

[43] Lakonishok and Lee (2001) report a trading period abnormal return for buy and sell trades of 0.59% and 0.17% respectively.

which is in contrast with Chiyachantana et al. (2004), who find that in bullish market institutional buys have a bigger price impact. This may be due to the fact that, since the market is in bearish state, insiders' purchases convey more positive signal to the market. In the bull market, share price increase more, compared to bear market, before insiders sell them. Also, the share price declines more in the bull market after insider sells, as they convey a more negative signal to the market. However, in both buy and for sell trades, this study does not find any significant difference in price response in bull and bear periods; the only exception is the pre-event window for buy trades. So, the behaviour and price response of insider trades is not symmetric in bull (bear) markets.

This research finds that the perceived mispricing by managers, as measured by market-to-book ratio, affects significantly the market reaction to the trades. For the buy trades, I find clear indication of contrarian behaviour by insiders in value stocks (lowest M/B quintile), as they buy after a large decline in price (CAR -7.18, t=-11.87). For such trades, the immediate market reaction is larger (CAR of 1.41, t=8.43). Such trades are driven by information as the price reversal in the post-event window is higher. However, in the case of glamour stocks (high M/B), the contrarian behaviour is less pronounced. The difference between "value" and "glamour" stocks is statistically significant. The results for sell trades also show some evidence of managers' systematic trading based on their perceptions about the company. The insiders are able to sell after a significant price rise. The regression results confirm the univariate analysis, suggesting that insiders are able to time their trades.

To test the effect of size on the information content of insider trading, size quintiles are formed. The univariate results on size quintiles show that there is evidence of market timing by insiders on their own trades for small stocks. The information content of the buy trades for small companies is much higher compared to the large ones. More interestingly, the event day abnormal return for the largest quintile is negative, though statistically insignificant. This evidence is consistent with Rozeff and Zaman (1998) and Lakonishok and Lee (2001) who show that market reaction is significantly higher for small stocks. The results suggests that managers buy stock after a significant price decline, and sell after significant run up, and the behaviour is more pronounced in the case of small stocks, implying that insiders are more likely to be able to time their trades in small companies.

Insider purchase conveys information to the market, as this study finds economically and statistically significant returns around the announcement period. However, these returns vary with size and M/B. My results are consistent with insiders trading based on the perception of mispricing as the market reaction of insider trades vary with the M/B ratio, which might imply that insiders mechanistically buy (sell) value (glamour) stocks. Furthermore, insiders are likely to buy in small companies where the information asymmetry is higher. The finding that most of the abnormal returns vary with M/B and size is consistent with the view that insiders trade based on perceived mispricing and smaller companies.

This chapter proceeds as follows. Section 2 discusses existing literature, and sets up the hypothesis. Section 3 describes the data. In section 4, this study tests the relationship between market return and aggregate insider trading. Section 5 presents the results of the event period returns. Section 6 concludes.

4.2 Related Literature and Hypothesis

Bhattacharya and Daouk (2001) state that insider trading is regulated in most countries. However, the essence of regulation and enforcement is not homogenous across countries. Insider trading in the UK is regulated by the 1977 Model Code of the London Stock Exchange (LSE) and the 1985 Companies Act.[44] In the US insider trading is regulated by the Securities Exchange Commission (SEC). The 1934 Securities and Exchange Act and its amendments impose restrictions on insider trading. The main differences between the two countries are: (i) the definition of an insider (ii) the definition of (illegal) insider trading, (iii) the essence of the regulation, (iv) the time within which insiders have to report their trades and (v) the level of enforcement of the regulation. I expect that UK insider trades are likely to be more informative than US trades for the following reasons: (i) A trade must be made public within at most 6 business days in the UK, compared with up to 40 days[45] in the US (Fidrmuc et al. (2006)). (ii) Lakonishok and Lee (2001) and McConnell et al. (2005) report that the information on insiders' trades enters the public domain in the US only several days after it is released by the SEC. Fidrmuc

[44] Detail of these regulations are in Appendix I.
[45] After the Sarbanes-Oxley (2002) Act the reporting environment has changed. The definition of insider covered under Section 16 of the Exchange Act, and the types of transactions which are reportable, have not changed. What has changed is the filing deadline for Form 4 has been dramatically shortened. It has changed from within 10 days after the close of the calendar month in which a reportable transaction occurred to within two business days after the day the transaction took place. However, most of the insider trading studies in US is done before the Sarbanes-Oxley Act.

et al. (2006) show that no such delay occurs in the UK. (iii) In the UK, mandatory reporting by insiders is limited to top management and to the non-executive directors only. In contrast, US insiders (legally) comprise a much larger group: insiders are large shareholders, (non-executive) directors and managers (officers). Officers include not only the top management with board seats, but also a wider group of managers (e.g. any vice president in charge of any principal business unit, division, or function such as sells, administration, or finance), who may de facto possess less information about their firm's prospects (iv) The UK regulator has opted for trading bans in price-sensitive periods whereas the US regulator favours more frequent disclosure. All these arguments suggest that directors' trades in the UK are more informative. Therefore,

Hypothesis 1: Market reactions to insider trades are higher in the UK compared to US.

Previous research unanimously shows that insiders are contrarian traders. For example, Seyhun (1986, 1992) shows that insiders are more likely to sell (purchase) shares following periods of significant price appreciation (declines), consistent with insiders trading in anticipation of subsequent price reversals. If markets consist of two types of traders, informed and uninformed (noise), and stock prices are affected by the trading of both types of traders, then prices can move away from fundamental values (Shiller (1984), De Long et al. (1990)). It is possible that noise traders may drive market prices away from intrinsic values even in the absence of new information. Hence, a stock that was trading roughly at its intrinsic value could decline (rise) significantly because of such noise trading. Corporate insiders may then perceive the stock to be undervalued (overvalued) and buy (sell) it. Such a relationship would be viewed as insiders following a contrarian investment strategy. Brennan and Cao (1996) show that poorly informed agents are ‘trend chasers’, purchasing more risky security when its price rises and selling when price falls, while better informed agents acts like contrarians, selling on a price rise and buying on a fall. These arguments lead me to set up the following hypothesis.

Hypothesis 2: Insiders are expected to buy (sell) after a significant decrease (increase) in price, and, after the trade, there should be price reversal.

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

Hypothesis 3: There is no difference in buying (selling) between bear vs. bull period.

A related question would be whether there is any difference in the market reaction to insider trading in bull (bear) market. Chiyachantana et. al. (2004) consider this question in the context of institutional trading. They claim that differential market reactions to buy and sell trades depend on market conditions. They argue that in bullish markets the suppliers of liquidity will not push down prices, following a sell order, as it is easy to find a buyer, while in bearish markets institutions have to offer discounts to find buyers for their sell orders, which results in buys (sells) having a bigger and permanent price impact in bullish (bearish) markets. On the other hand, Friederich et. al. (2002) assert that an additional reason for contrarian trades to be informative, is that in bearish markets there is a high demand for good stocks which depress the price of smaller stocks. Corporate insiders may see this as the time to buy cheap stocks if they have 'inside' information about the stocks. Korczak and Lasfer (2009b) examine the differential patterns of insider trading in bull (bear) markets. To my knowledge, no study considers this impact in the case of insider trading. Therefore, I set up the following hypothesis:

Hypothesis 4: There is no difference in price impact between the bull and bear market condition of buy and sell trades.

Rozeff and Zaman (1998) show that insider transactions are not random across growth and value stocks. Insider buying increases as stocks change from growth to value categories. If value stocks are undervalued and growth stocks are overvalued and investors can profitably trade based on this information, then corporate insiders, who have superior information about the company, have incentives to take advantage of misvaluations. Particularly, insiders buy heavily in value stocks and sell growth stocks. In line with this argument, Lakonishok and Lee (2001) find that insiders tend to buy value stocks and sell growth stocks. While Ke, Huddart and Petroni (2003) document that insider stock sells are greater for growth firms, Pitroski and Roulstone (2005) find that insider purchases are positively related to book-to-market ratios, and future earnings performance. Pitroski and Roulstone (2005) also document that superior information about future cash flow changes explains a small portion of insider purchases, than do proxies for security misvaluation. Jenter (2005) finds that top managers have contrarian views on firm value. He also asserts that the managers' perceptions of fundamental value diverge systematically from market valuation, and the perceived mispricing seems to be an important determinant of managers' decision making. I, therefore, set up the following hypothesis.

Hypothesis 5: Insiders are expected to buy undervalued shares and sell overvalued shares.

Previous literature clearly demonstrates that insiders trade in small companies, and earn higher abnormal returns. In contrast, when they trade in large companies excess returns are relatively small. For instance, in the US, Lakonishok and Lee (2001) find that insider trades in small companies convey more information compared to large companies, when measured around the reporting period. In the UK, Gregory, Matatko, Tonks and Purkis (1994) find that the abnormal returns are concentrated in smaller firms. After the seminal work by Fama and French (1993), the variable size becomes important in event studies. In the insider trading literature, the importance of size cannot be overlooked (e.g., Gregory, Matatko and Tonks (1997)). Moreover, there is evidence that the buy trades of insiders are mainly concentrated in small firms (Seyhun (1986), Rozeff and Zaman (1988)). In addition, Loughran and Ritter (2000) argue that the behavioural timing depends on undervaluation, and it is easier to take advantage of any undervaluation in small firms, because if the stocks are mispriced, the arbitrage forces will push the prices towards their fundamental values, and thus correct the misvaluations for any large firms compared to a small firm. These arguments suggest the following hypothesis.

Hypothesis 6: The market evaluation of insider trading is expected to be dependent on the size of the company to reflect the level of asymmetric information and riskiness.

Jenter (2005) finds little evidence that managers use inside information in their trades. The excess returns after controlling for size and book-to-market effects are indifferent from zero. However, these results do not suggest that managers never use valid inside information when making private and corporate decisions. He argues that his results are consistent with Lakonishok and Lee (2001) who document that insider trading does not predict subsequent returns, once size and book-to-market effects are controlled for. There is some predictability of excess returns in the case of equity purchases in small firms, but no predictability of excess returns is found for the sell trades. On the other hand, recent research using UK data shows that insider buy and sell trades trigger an immediate market reaction of 1.16% and -0.26% respectively (Fidrmuc et. al. (2006)). I test whether insider trades in UK convey information after controlling for M/B and size effects.

Hypothesis 7: After controlling size and M/B, the excess returns of insider trades are not different from zero.

4.3 Data

This research uses *Directors Deals*, a large database of all UK firms' directors' trades spanning from January 1999 to December 2007, to collect data on trades undertaken by insiders of my sample companies. The database includes news items on directors' trades disclosed by all UK firms to the Regulatory News Service (RNS). I exclude a number of observations that are not likely to be driven by private information, such as exercise of options or derivatives, script dividends, bonus shares, rights issues, awards made to directors under incentive plans or reinvestment plans. Also all directors' transactions in investment companies are excluded. After this screening, I obtain 36,943 insiders' trades from the UK market. I check the data for errors and exclude 2,952 (8%) trades as the difference in announcement and transaction date is more than 5 days. The final sample includes 33,991 directors' trades in 2,664 listed companies, split into 26,268 (77%) purchases and 7,723 (23%) sell trades. This insider-trading database includes transaction price, amount, and value, post-transaction holding, change in holding, name and position of the insider, and announcement and transaction dates, as UK insiders can delay up to five days the announcement of their trade, but most report their trades on the RNS on the transaction date (Korczak and Lasfer (2009b)).

The sample period covers two interesting sub-periods: the bull period (January 1999 to March 2000 and January 2004 to Decemeber 2007) and the bear period (April 2000 to December 2003) in the stock markets, which allows me to test whether insiders time their trades differently under different market conditions. Adjusted daily share prices, data on FTSE All Share Price Index, market capitalization, market- to-book ratio are taken from *DataStream*.

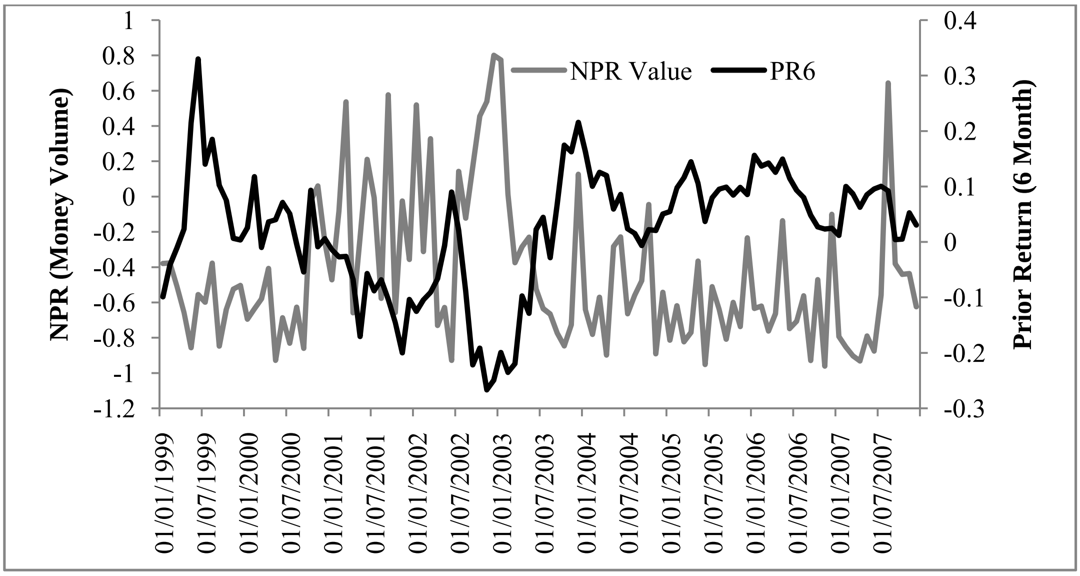
4.4 Market Return and Aggregate Insider Trading

4.4.1 Methodology

It is expected that insiders to react to market returns if they are contrarians (Jiang and Zaman (2010)). Also, I expect market returns to 'predict' aggregate insider transactions (See Rozeff and Zaman (1998), Chowdhury, Howe and Lin (1993) and Lakonishok and Lee (2001)). Such a relationship is consistent with the proposition that insiders follow a contrarian investment strategy. This chapter tests whether insiders are contrarians by using aggregate insider transactions. While the aggregate insider trading activity measure is similar to Lakonishok and Lee (2001), the objectives are different. Lakonishok and Lee (2001) test the predictive power of aggregate insider trading in predicting market returns. This study addresses the contrarian behaviour of aggregate insider trading. If insiders are contrarians, it is expected that market returns to affect aggregate insider trading. In other words, increase (decrease) in market price will lead insiders to sell (buy). I then relate insider sell (buy) to market conditions as measured by bull (bear) markets. Since, in the bull market prices are up, higher insider sells are expected. In contrast, since in bear market, prices are down, higher insider purchases are expected.

This research uses net purchase ratio (NPR) which is the ratio of net purchases to total insider transactions, to measure the aggregate insider trading activities. Each month starting from January 1999 to December 2007, the total numbers of insider purchases and sells are calculated. Pound Sterling volume of insider trading are also computed. I then calculate the NPR by dividing the net aggregate number (volume) of insider purchases by the total aggregate number (volume) of insider transactions. I use market returns for 6, 12 and 24 month horizons as predictor of insider trades. Return on FTSE All Share price index is used as a proxy for market return. Figure 4-1 shows that there a negative relationship between NPR and market returns, which supports the contrarian behaviour.

Figure 4-1 Monthly NPR and Market Returns



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

The following regression model is estimated to examine the relationship between aggregate insider trading and return on market:

$$\mathrm{NPR}_t = \alpha + \beta \mathrm{PR}\ (k)_t$$

Where, NPR is the aggregate insider trading activity in month t, PR $(k)_t$ is the prior k-holding period return on market at time t. A negative relationship is expected between NPR and prior-return as contrarian strategy imply a buy (sell) after a price decline (rise). Since, NPR is positive (negative) if insiders are net buyer (seller) then I expect prior-return (PR) should be negatively related to NPR.

4.4.2 Regression results

4.4.2.1 Impact of pre-event returns on aggregate insider trading

I use 6-, 12-, 24- month prior return to examine whether the insiders buy (sell) as a reaction to market returns. Table 4-1, Panel-A and Panel-B, reports regression results based on NPR number of transactions and NPR money volume, respectively. In all the regressions, it is found that prior-return over k-period is statistically and economically significant. The negative sign of PR implies that insiders are contrarians and suggest that insiders sell after a price rise, and they buy after a price decline. The results are consistent with Lakonishok and Lee (2001) and Jiang and Zaman (2010).

Table 4-1 Aggregate Insider Trading and Market Return

Prior Return(months)	Constant	PR	$\overline{R^2}$
Panel A: Number of transactions			
6	-0.04	-2.02***	23.7
	(-1.03)	(-4.44)	
12	-0.04	-1.32***	18.2
	(-0.73)	(-3.36)	
24	-0.04	-0.55***	8.0
	(-0.92)	(-3.06)	
Panel B: Money Volume			
6	-0.39***	-2.08***	29.6
	(-10.14)	(-4.71)	
12	-0.39***	-1.26***	19.5
	(-7.26)	(-3.48)	
24	-0.37***	-0.76***	18.8
	(-5.72)	(-3.03)	

This table reports the regression results from the following model.

$NPR_{i,t} = \alpha + \beta PR(k)_{i,t} + \varepsilon_{i,t}$

Where, NPR of aggregate insider trading activity in month t, $PR(k)_{i,t}$ is the prior k-period holding period return on market at time t. I predict market returns for 3, 6, 9 and 12 month horizons. Each month starting from January 1999 to December 2007, I calculate the total numbers of (and the total Pound sterling volume) of insider purchases and sells. I then calculate the NPR by dividing the net aggregate number (volume) of insider purchases by the total aggregate number (volume) of insider transactions. The Newey-West autocorrelation and heteroskedasticity adjusted t-statistics are in the parenthesis. ***,**,* represent significant at 1, 5 and 10 percent level respectively.

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

4.4.2.2 Aggregate insider trading in bear and bull markets

After examining the relationship between market return and aggregate insider trading activity, this study follows a similar methodology to test whether insiders' trading is related to market conditions. Net purchase ratio (NPR) is used as aggregate measure of insider trading activity. The following model is estimated:

$$NPR_t = \alpha + \beta \, \mathrm{BB} + \gamma \mathrm{PR(k)}_\mathrm{t}$$

BB is a dummy equal to one for two periods: January 1999 to March 2000 and January 2004 to December 2007. Bear market is from April 2000 to December 2003. $\mathrm{NPR}_\mathrm{t}^\mathrm{i}$ is the NPR of aggregate insider trading activity in month t, $\mathrm{PR(k)}_\mathrm{t}$ is the prior k holding period return on market at time t.

Table 4-2 shows the mean and median net purchase ratios in the bull and bear markets. I calculate the NPR based on amount of shares traded and Pound Sterling value of trades. The mean NPR (value) for bull and bear market is -0.59 and -0.23, respectively. It shows that the NPR is more negative when the market is in bullish state compared to bearish state. The medians are very closer to means. NPR (amount) shows that in bull market it is negative while in bear market it is positive, suggesting that insiders are net sellers in bull market and net buyers in bear market.

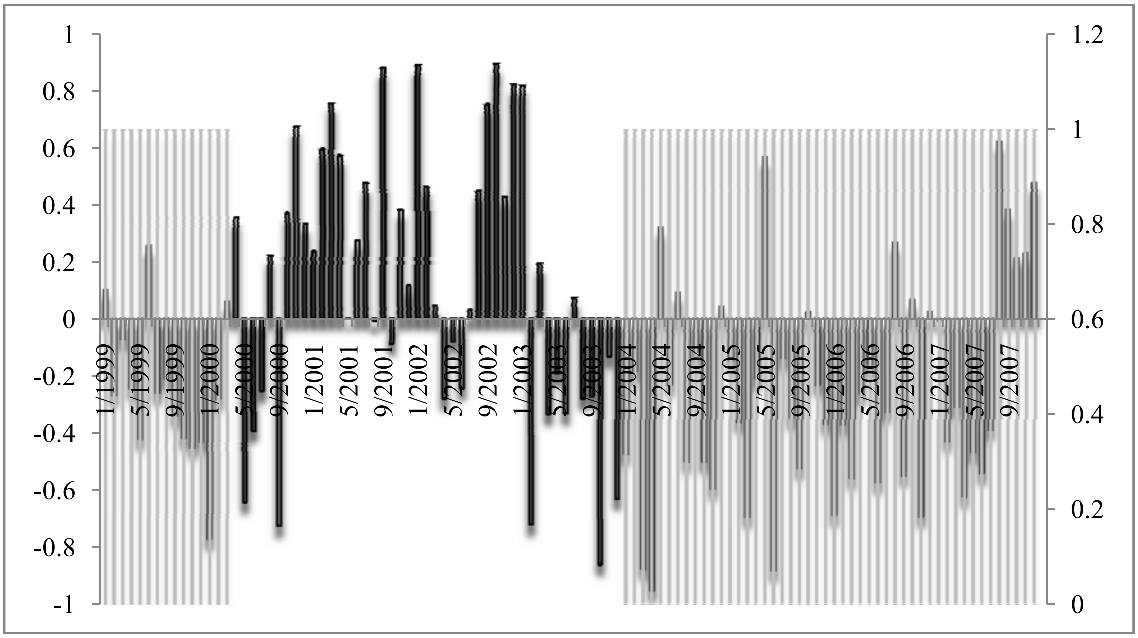
Table 4-2 Mean Differences in NPR between Bull and Bear Markets

	Mean		Median		
	Bull	Bear	Bull	Bear	P-value of mean diff. (bull-bear)
NPR (amount)	-0.25	0.12	-0.28	0.11	0.00
NPR (value)	-0.59	-0.23	-0.62	-0.28	0.00

This table represents mean (median) of net purchase ratio for each month from January 1999 to December 2007. The bull market and contains two periods (January 1999 to March 2000 and January 2004 to December 2007). For each month, I calculate the total numbers of (and the total Pound Sterling volume) insider purchases and sells. I then calculate the NPR by dividing the net aggregate number of insider purchases by the total aggregate number of insider transactions.

Figure 4-2 shows that in bear market most of the NPRs are positive suggesting that insiders are net buyers. In bull market (shaded area) most of the NPRs are negative, meaning insiders are net sellers.

Figure 4-2 Aggregate Insider Trading and Bull (Bear) Market



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

Table 4-3 reports (both panel A and B) the results for regressions. In first regression, I only use the BB dummy as an independent variable to examine the effect of bull (bear) market on NPR. In the other regressions, I use 6-, 12-, 24-month prior returns with the BB. The results are consistent with the notion that insiders buy trades increases in bear market and insider sell trades is higher in the bull market. Both the NPR measures are negatively related to BB dummy, suggesting that insider buy in the bear market with an expectation to sell in the bull market. Table 4-3, Panel A and Panel B, shows that insiders use the bull (bear) markets as a platform to act like contrarians. The evidence holds even after controlling for the contrarian behaviour of the insiders by incorporating prior-returns. After controlling for contrarian strategies, it is shown that insiders further use bull (bear) market to time the market. For example, in Panel A, the second regression shows that after controlling for 6-month prior returns insiders use bull (bear) market to sell (buy) securities.

Table 4-3 Aggregate Insider Trading and Bull/Bear market

Prior return (Months)	Constant	BB Dummy	PR	$\overline{R^2}$
Panel A: Number of transactions				
	0.12	-0.37***	--	16.1
	(1.18)	(-3.27)		
6	0.04	-0.17*	-1.57***	25.3
	(0.63)	(-1.89)	(-3.12)	
12	0.03	-0.16	-0.89*	18.7
	(0.43)	(-1.17)	(-1.80)	
24	0.12	-0.37***	0.00	15.3
	(1.18)	(-2.45)	(0.00)	

Panel B: Money Volume				
	-0.22**	-0.37***	--	18.1
	(-2.09)	(-3.24)		
6	-0.32***	-0.15*	-1.70***	31.0
	(-4.54)	(-1.65)	(-3.20)	
12	-0.30***	-0.18	-0.79*	20.6
	(-3.84)	(-1.51)	(-1.99)	
24	-0.28	-0.20*	-0.46**	20.9
	(-3.85)	(-1.90)	(-2.04)	

This table reports the regression results from the following:

$$\mathrm{NPR}_{i,t} = \alpha + \beta\,\mathrm{BB\ Dummy} + \gamma \mathrm{PR(k)}_{i,t}$$

Bull Market, *BB*, includes two periods: January 1999 to March 2000 and January 2004 to December 2007. Bear market is from April 2000 to December 2003. NPR_t^i is the NPR of aggregate insider trading activity in month t, $\mathrm{PR(K)}_{i,t}$ is the prior two year holding period return on market at time t. Each month starting from January 1999 to December 2007, I calculate the total numbers of (and the total Pound sterling volume) of insider purchases and sells. I then calculate the NPR by dividing the net aggregate number (volume) of insider purchases by the total aggregate number (volume) of insider transactions. I use 6, 12 and 24 –month prior returns. The Newey-West autocorrelation and heteroskedasticity adjusted t-statistics are in the parenthesis. ***, **, * represent significant at 1, 5 and 10 percent level respectively.

4.4.3 Predictability of post trade returns

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

$$\prod_{t=k}^{t+T}(1 + \mathrm{R}_{\mathrm{M,k}}) - \prod_{t=k}^{t+T}(1 + \mathrm{R}_{\mathrm{f,k}}) = \alpha + \beta\,\mathrm{NPR}_t + \gamma \mathrm{PR24}_t$$

Where, $R_{\mathrm{M,k}}$ is the market return in month k, $\mathrm{R}_{\mathrm{f,k}}$ is the monthly treasury bill rate in month k, NPR_t is the NPR of aggregate insider trading activity in month t, $\mathrm{PR24}_t$ is the prior two year holding period market return at time t. I include the prior two year holding period return in the regressions to control for the fact that insiders are contrarians, following Lakonishok and Lee (2001). I also control for the momentum factor documented in previous studies, as stocks that perform the best (worst) over a 3 to 12 month period tend to continue to perform well (poorly) over the subsequent 3 to 12 months (Jagadeesh and Titman (2002)). I control for the fact that the current market return is affected by the previous market returns. By doing this, it would be possible to separate out the insider's information from simple contrarian strategy/momentum effect.

Table 4-4 reports the regression results for 3, 6, 9 and 12 months holding period. In contrast to my expectations, the coefficient of NPR is negative and significant in most regressions. For example, Panel A, Table 4-4 shows that the coefficient of NPR is -0.05 (t=-3.28) for 3-month holding period, which suggests that insider trading predicts stock prices, but I expect the coefficient of NPR to be positive, as purchases should lead to positive market reaction if insider trading signals future performance. For other holding periods, the results are qualitatively similar. I obtain similar results when I analyse money volume for holding period 3 and 9, although, for holding period 6 and 12 the coefficient is not significant. The negative coefficient of NPR is in contrast with the earlier studies done in the US market where, for example, Lakonishok and Lee (2001) find significant positive coefficient. The differences in the results may be related to institutional settings. In particular, since in the UK insider trades are disclosed shortly (up to 5 days) after their execution, their information content is likely to be compounded in stock prices in the short, rather than in the long run.

Table 4-4 Predictive Ability of Post-trade Returns

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

This table reports the regression results from the following model.

$$\prod_{t=k}^{t+T}(1+\mathrm{R}_{\mathrm{M,k}}) - \prod_{t=k}^{t+T}(1+\mathrm{R}_{\mathrm{f,k}}) = \alpha + \beta\,\mathrm{NPR}_t + \gamma \mathrm{PR24}_t$$

Where, $R_{\mathrm{M,k}}$ is the return on market in month k, $\mathrm{R}_{\mathrm{f,k}}$ is the monthly treasury bill rate in month k, NPR_t is the NPR of aggregate insider trading activity in month t, $\mathrm{PR24}_t$ is the prior two year holding period return on market at time t. Each month starting from January 1999 to December 2007, I calculate the total numbers of (and the total Pound sterling volume) of insider purchases and sells. I then calculate the NPR by dividing the net aggregate number of insider purchases by the total aggregate number of insider transactions. I predict market returns for 3, 6, 9 and 12 month horizons. The Newey-West autocorrelation and heteroskedasticity adjusted t-statistics are in the parenthesis. ***, **, * represent significant at 1, 5 and 10 percent level respectively.

4.5 Event Period Returns

4.5.1 Methodology

The previous section provides evidence that insiders are contrarians at the aggregate basis. However, the aggregate insider trading measure cannot predict market returns. This section explores individual insider trades to examine the contrarian behavior and information content of insider trades. Daily net purchase ratios are used to define the individual insider trading signals. This study uses the standard event study methodology based on the market model (Brown and Warner

(1985)), with the parameters α and β computed over the estimation window [-240, -41] days relative to the event day to investigate the stock price reaction to directors' trades. The event period is [-40, +40]. I use the FTSE All share index, which covers 800 UK listed firms (about 50% of the companies listed in the main market and more than 97% market value of equity), as the market index because my sample includes small as well as large firms. I define event dates as the dates when the insider trades are announced.[46]

I use the univariate methodology, which includes tests of differences between bull-bear periods, to examine whether insiders time the market according to market conditions. Also, I form quintiles according to M/B ratios to test whether insiders buy undervalued shares, and sell overvalued shares and whether they time their trades. A major difference between the current study and Rozeff and Zaman (1998) and Lakonishok and Lee (2001) is in forming those quintiles. Rozeff and Zaman (1998) rank their companies into deciles each year by annual book-to-price ratios. Similarly, Lakonishok and Lee (2001) divide their sample into three book-to-market (B/M) groups based on the B/M ratio at the end of April of each calendar year. The annual measures are not likely to be good proxies for market mispricing and timing by the insiders in the context of individual insider trades where the announcements are made daily. Lakonishok and Lee (2001) examine whether value and/or growth strategies adopted by insiders can earn different returns in the long run. However, in this thesis, my objective is to examine whether there is any significant difference in market reactions of insider trades in the short run in value

[46] The date is the day the director's transaction is released to the RNS.

and growth stocks, and for such an analysis, it is better to compute the M/B ratios closer to the insider trading dates to evaluate the extent to which the insider trading decision is driven by firm's immediate past misvaluation. Therefore, I compute the market-to-book ratios 5 days just before the insider trading announcement dates to form M/B quintiles. M/B ratios for all trades are obtained for t-5 days'; the companies are sorted in quintiles each year by M/B ratios. Similar procedures are applied to form quintiles based on size. I calculate chi-square statistics to test whether the cumulative abnormal returns across quintiles are different. The chi-square statistics is given by the following equation:

$$\chi 2 = \sum_{i=1}^{n} \frac{\left(CAR_{ith\ quintile} - CAR_{overall}\right)^2}{\sigma_{ith\ quintile}}$$

In a multivariate framework, a set of regressions are estimated to control for different variables. I follow Chan and Lakonishok (1993, 1995) and Bozcuk and Lasfer (2005) in context of institutional trading, and control for firm size, level of over-(under)valuation as measured by M/B. I also include variables to account for stock and market volatility effects, following Grinblat and Keloharju (2001). According to Huddart and Ke (2006) the prior variance of stock price (i.e., a measure of the uncertainty surrounding firm value prior to the insider's trade), and the magnitude of the mispricing affects insider trading. Also industry effects are controlled for following Jenter (2005). Therefore, I estimate the following model seperately for the buy and sell trades:

$$\begin{aligned} CAR_j = {} & \alpha + \beta_1 Ln(Size)_j + \beta_2 M/B_j + \beta_3 StockVol_j + \beta_4 MktVol_j + \kappa BBDum \\ & + \sum_{k=1}^{5} \gamma_k Year_j + \sum_{k=1}^{35} \phi_k Industry_j \end{aligned}$$

where,

Ln(size)= Log of firm size measured as market value of equity 5 days before the trade

M/B= Market-to-book ratio, where market value of equity is taken 5 days before the trade and the book value is the book value of equity at balance sheet date.

Stock Vol= standard deviation of stock returns over -240 to-41 days.

Mkt Vol= standard deviation of market returns over -240 to-41 days.

BB Dum= Dummy equal to 1 for Bull Market

Year=Year dummies

Industry=Industry dummies

4.5.2 Empirical Results

4.5.2.1 Descritive Statistics and Information Content of Insider trades

Table 4-5 presents the descriptive statistics and t-tests for differences in means. Panel A presents the mean differences for company fundamentals. I measure size as the market value of equity before 5 days of the trade, M/B as the market value to book value of equity before 5 days of the trades, Stock volatility as standard deviation of stock measured from -240 to -41 days window relative to the trade, and market volatility as standard deviation of market index over the same window. The results show strong differences between buy and sell trades. The average company size for buy and sell trades are different, and, a t-test of differences in means shows that they are statistically different. This is an early indication that the stocks insiders buy and they sell are different, which is consistent with previous literature (for example, see Lakonishok and Lee (2001)). The average M/B is also different for buy and sell trades. Furthermore, the mean difference t-test shows that they are statistically different.

Table 4-5, Panel B, reports event studies results. For the whole sample the cumulative abnormal returns for buy trades over the pre-event periods [-40, -2] is negative and highly significant. In contrast, before the sell trades the abnormal returns are positive and significant. These trends are plotted in Figures 4-3 and 4-4. The results clearly indicate the contrarian strategies adopted by insiders, the impact of the trades on the announcement dates and post-trade performance.

The event day return and post-event day returns for buy trades are positive and significant. In contrast, for the sell trades, the event day returns are negative, but not significant. Interestingly, the post-event day abnormal returns are not negative and not significant for sell trades. After the buy trades, share prices recover to a certain extent. However, after the sell trades, share prices do not decline, rather the trend stops and share prices level off. These results support the earlier findings that the buy trades convey information, but the sell trades are not informative (Lakonishok and Lee (2001)). The t-test of differences in mean shows that the buy and sell trades are different.

Table 4-5 Descriptive Statistics and Market Reaction of Insider Trades

Panel A: Fundamentals

	Buy trades		Sell trades		(p Buy-sell)
	Mean	Median	Mean	Median	
Size (Market Cap)	5073.86	403.1	6817.81	403.34	0.02
M/B	2.28	1.46	3.94	2.34	0.00
Stock Volatility	0.023	0.021	0.022	0.019	
Market Volatility	0.012	0.011	0.012	0.011	
Number of Observations	26,268		7,723		

Panel B: Market Reaction of Insider trades

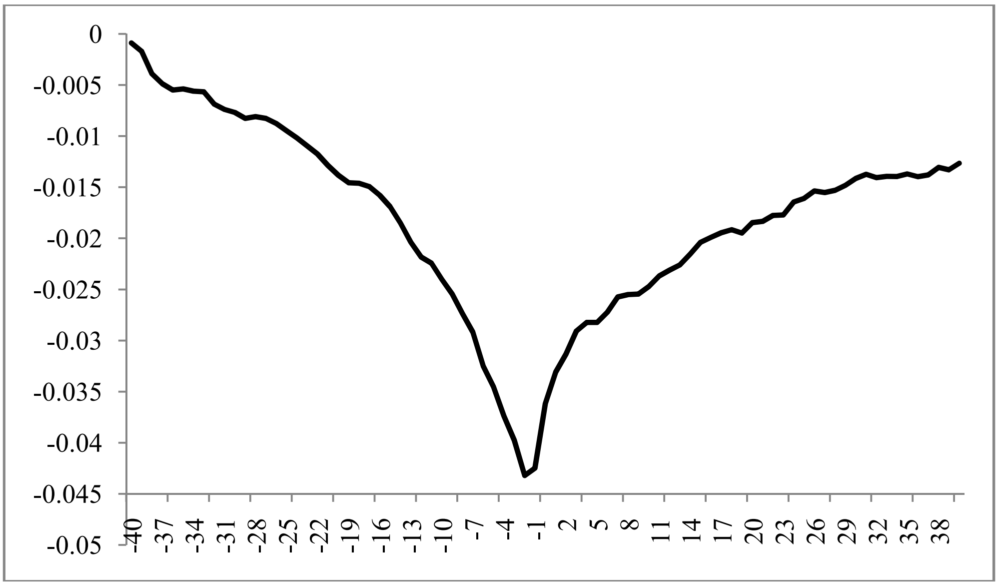
	Buy trades		Sell trades		(p Buy-Sell)
	Mean	Median	Mean	Median	
CAR(-40,-2)	-4.32***	-2.16	5.60***	4.90	0.00
	(-15.37)		(10.05)		
CAR(-1,+1)	1.02***	0.42	-0.13	-0.17	0.00
	(13.11)		(-0.83)		
CAR(+2,+40)	2.13***	2.04	0.24	0.64	0.00
	(7.59)		(0.44)		

This table represents descriptive statistics of the companies in my sample and event study results. Panel A represents company fundamentals. Size is the market value of equity before 5 days of the trades, M/B is the market value to book value of equity before 5 days of the trades, Stock volatility is standard deviation of stock measured from -240 to -41 days window, and market volatility is standard deviation from market from the same window. Panel B presents cumulative average abnormal returns around directors' share trading events computed using event study methodology. The market model coefficients α and β are estimated over days -240 to -41 relative to the event, with FTSE All Share Index as the proxy for market portfolio. All results are reported relative to directors' share trading announcement day, i.e., the date of the public announcement of directors' share trading. T-statistics are reported in parenthesis. ***, **, * denote significant at the 0.01, 0.05 and 0.1 level, respectively.

Figure 4-3 Excess Return of Insider Purchases

Abnormal Return

Cumulative Abnormal Return

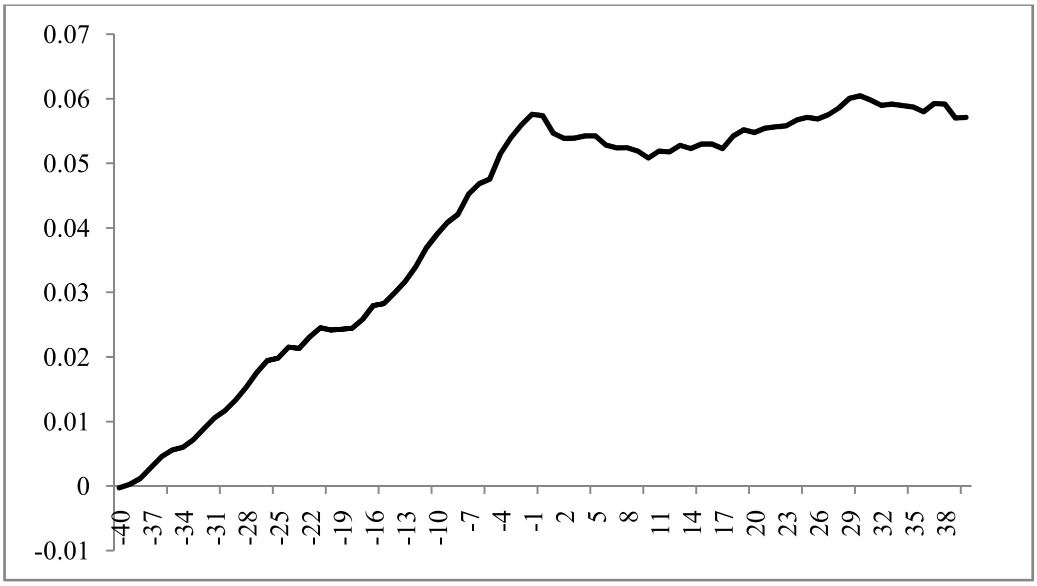


The figure presents average abnormal return and cumulative average abnormal returns, respectively around directors' share trading events computed using event study methodology. The market model coefficients α and β are estimated over days -240 to -41 relative to the event, with FTSE All Share Index as the proxy for market portfolio. The full sample includes 33,991 directors' trades in 2,664 listed companies, split into 26,268 purchases and 7,723 sell trades. All results are reported relative to directors' share trading announcement day, i.e., the date of the public announcement of directors' share trading.

Figure 4-4 Excess Return of Insider Sells

Abnormal return

Cumulative Abnormal Return



The figure presents average abnormal return and cumulative average abnormal returns, respectively around directors' share trading events computed using event study methodology. The market model coefficients α and β are estimated over days -240 to -41 relative to the event, with FTSE All Share Index as the proxy for market portfolio. The full sample includes 33,991 directors' trades in 2,664 listed companies, split into 26,268 purchases and 7,723 sell trades. All results are reported relative to directors' share trading announcement day, i.e., the date of the public announcement of directors' share trading

Lakonishok and Lee (2001) note that the abnormal returns around the reporting dates are not economically meaningful, though, statistically significant. For example, they report abnormal returns of 0.13% and -0.23% for purchases and sells, respectively around reporting day. These results are in contrast with my results where I find abnormal returns of 1.02% and -0.13% for buy and sell trades, respectively. I find that the abnormal returns for the buy trades are statistically and economically significant when measured around announcement date. An important question is, why are the abnormal returns higher in the UK compared to the US? One possibility is that this may be due to the faster reporting practice in the UK market regarding insider's trade. In the UK, it can take up to 6 days for the information to be revealed to the market. In the US, insiders' trades are announced at the earliest 10 days and at the latest 40 days after the transaction. Furthermore, Lakonishok and Lee (2001) and McConnell et al. (2005) argue that even after a trade has been reported, it takes few days for outsiders to obtain the information.

A second reason why the UK CARs may be higher than those in the US is that, the UK insiders trade under certain trading restrictions (such as blackout period before earnings announcements), whereas in the US, regulation does not impose such trading bans. As a result, UK insiders trade less frequently, and, therefore, their transactions may contain more information. The third reason that might explain the differences in the market reaction related to the definition of insiders is much broader in the US compared to the UK. In the US insiders include of officers (comparable to U.K. executives), directors (comparable to U.K. nonexecutives), and other key employees and large shareholders that own more than 10% of the firm's stocks. Indeed, while in the U.K. insiders are defined as executives and nonexecutives, U.S. insiders comprise (i) officers including the company president, principal financial officer, principal accounting officer, and any vice president in charge of any principal business unit, division, or function (Fidrmuc et al. (2006)), (ii) directors and other persons who perform a policy-making function within the company (Bettis et al. (2000)), as well as (iii) other key employees. It is plausible that some insiders (key employees and large shareholders) may have less inside information than officers or directors. Thus, given more the wide-ranging definition of insiders in the US, I expect that US insider trades are less informative and hence the price reaction is smaller.

4.5.2.2 Market Sentiment and Price Impact of Insider Trades: Univariate Results

This study examines price impact asymmetry and hence test for market timing by splitting the sample period into bull (01/1999 to 03/2000 and 01/2004 to 12/2007) and bear (04/2000 to 12/2003) periods. It is found that the behaviour of share prices following buy and sell trades does not depend on the market conditions (Table 4-6). The mean difference t-tests show that behaviour of CAR’s over different event windows are not significantly different. The only exception to this is: buy trades over the estimation window [-40,-2] in bull and bear market show significant differences. My results are in line with Korczak and Lasfer (2009), who find that the behaviour of share prices following buy and sell trades does not depend on market conditions. These findings are in contrast with Chiyachantana et al. (2004) who assert that in a bull market, suppliers of liquidity are suspicious of buy orders, and run up the prices in the face of a strong buying interest.

Table 4-6 Cumulative Abnormal Returns in Different Market Condition

Event window	Full Sample	Bear Period	Bull Period	$P_{Bear\text{-}Bull}$
		Panel A: Buy		
No of observations	26,268	10,274	15,994	
-40,-2	-4.32***	-5.53***	-3.14***	0.00
	(-15.37)	(-13.87)	(-7.39)	
-1,+1	1.02***	1.12***	0.92***	0.41
	(13.11)	(10.14)	(7.83)	
+2,+40	2.13***	2.23***	2.03***	0.71
	(7.59)	(5.60)	(4.77)	
		Panel B: Sell		
No of observations	7,723	2,312	5,411	
-40,-2	5.60***	5.06***	6.11***	0.27
	(10.05)	(7.12)	(8.17)	
-1,+1	-0.13	-0.26	-0.001	0.39
	(-0.83)	(-1.30)	(-0.01)	
+2,+40	0.24	0.76	-0.26	0.20
	(0.44)	(1.08)	(-0.35)	

The table presents cumulative average abnormal returns around directors' share trading events computed using event study methodology. The market model coefficients α and β are estimated over days -240 to -41 relative to the event, with FTSE All Share Index as the proxy for market portfolio. The full sample includes 33,991 directors' trades in 2,664 listed companies, split into 26,268 purchases and 7,723 sell trades. All results are reported relative to directors' share trading announcement day, i.e., the date of the public announcement of directors' share trading. The bull period covers from January 1999 to March 2000 and January 2004 to December 2007 and the bear period covers April 2000 to December 2003. The last column represents the p-values from mean difference t-test. T-statistics are reported in parenthesis. ***, **, * denote significant at the 0.01, 0.05 and 0.1 level, respectively.

Chiyachantana et al. (2004) assert that suppliers of liquidity are not so cautious about the institutional sell orders in a bullish environment and do not run down prices so much when they face a selling interests. In bearish markets the situation is exactly the opposite. In bullish market buys have a bigger price impact, and in bearish markets sells have a bigger price impact. I find evidence which is almost the other way round. The absolute magnitude of CARs for buy trades in bear periods are higher than the bull period trades [-5.53 vs -3.14, 1.12 vs 0.92, 2.23 vs 2.03 over the event window (-40,-2), (-1, +1), (+2, +40) respectively]. The only evidence which is consistent with Chiyachantana et al. (2004) is the absolute magnitude of CAR of sell trade in the bear period, which is higher than sell trade [-0.26 vs -0.001 over the event window (-1, +1)]. However, in both the cases, buy and sell trades, I did not find any significant difference in price response in bull and bear periods.

4.5.2.3 Market-to-book Quintiles: Univariate Analysis

The previous section examines price impact asymmetry in bull (bear) markets. This section assesses whether there are any connections between company fundamentals and the timing of insider trades. By following Rozeff and Zaman (1998), Lakonishok and Lee (2001) and Jenter (2005), I hypothesize that insiders perceptions of fundamental value diverge systematically from market valuations, and the perceived mispricing is an important determinant of the insiders decision making. The tests in this section are also consistent with value strategies, where investors buy low M/B stocks, which have performed poorly in the past and sell stocks with high M/B which performed well in the past.

In recent years, value strategies have attracted much academic attention. De Bondt and Thaler (1985, 1987) argue that extreme losers outperform the market over the subsequent several years. Chan, Hamao, and Lakonishok (1991), and

Fama and French (1992) show that stocks with high earnings/price ratios earn higher returns. Certain types of value strategies, then, appear to have beaten the market. It is also possible that value strategies generate higher returns because they are contrarian to usual strategies followed by other investors (Lakonishok, Shliefer and Vishny (1994)). In this section, I analyse whether the superior returns of insiders' trade are due to value strategies, or as a result of insider's private information.

This study tests the hypothesis that insiders buy (sell) shares in their own company if they perceive that their company is under- (over-) valued. I analyse the short-term abnormal returns in the pre-trade (-40, -2) and post-event (+2, +40) periods. I then split the sample into quintiles based on each firm's market-to-book ratios of the companies. The market-to-book is taken prior 5 days to the trade, to capture the decisions taken by the insiders. If their decision to trade based on market-to-book, it should be as close as possible to the announcement date of the trade, not the beginning of the year, as done in previous studies (e.g. see Rozeff and Zaman (1998), and Lakonishok and Lee (2001)). Low (high) M/B companies are expected to generate higher (lower) abnormal returns in the post-trade periods, if insider trading signals under- (over-) valuation, and the market revalues these companies after the trade. The pre-event return will be higher as we move from low M/B to high M/B quintile. On the other hand, the event and post event returns will be smaller as we move from low to high M/B quintile.

Table 4-7 Distribution of Cumulative Abnormal Returns by Market-to-Book

	Market to Book Quintiles						
	Low	**2**	**3**	**4**	**High**	**P $_{High-Low}$**	$\chi^2(5)$
				Panel A: Buy			
-40,-2	-7.18***	-6.82***	-4.58***	-1.76***	-1.11	0.00	82.06***
	(-11.87)	(-12.02)	(-7.06)	(-3.03)	(-1.59)		
-1,+1	1.41***	0.97***	0.83***	0.78***	1.01***	0.38	7.17
	(8.43)	(6.16)	(4.61)	(4.86)	(5.33)		
+2,+40	3.46***	3.08***	1.33**	1.95***	0.79	0.00	12.43**
	(5.72)	(5.42)	(2.06)	(3.34)	(1.08)		
				Panel B: Sell			
-40,-2	3.30***	4.70***	5.64***	6.88***	7.33***	0.01	7.72
	(2.57)	(4.10)	(5.40)	(6.83)	(6.35)		
-1,+1	-0.07	0.14	0.09	-0.37	-0.44	0.37	2.83
	(-0.19)	(0.46)	(0.33)	(-1.36)	(-1.39)		
+2,+40	0.03	0.58	0.99	-0.60	0.22	0.89	1.18
	(0.02)	(0.50)	(0.95)	(-0.61)	(0.19)		

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

Figure 4-5Abnormal returns of insider purchases by growth quintiles

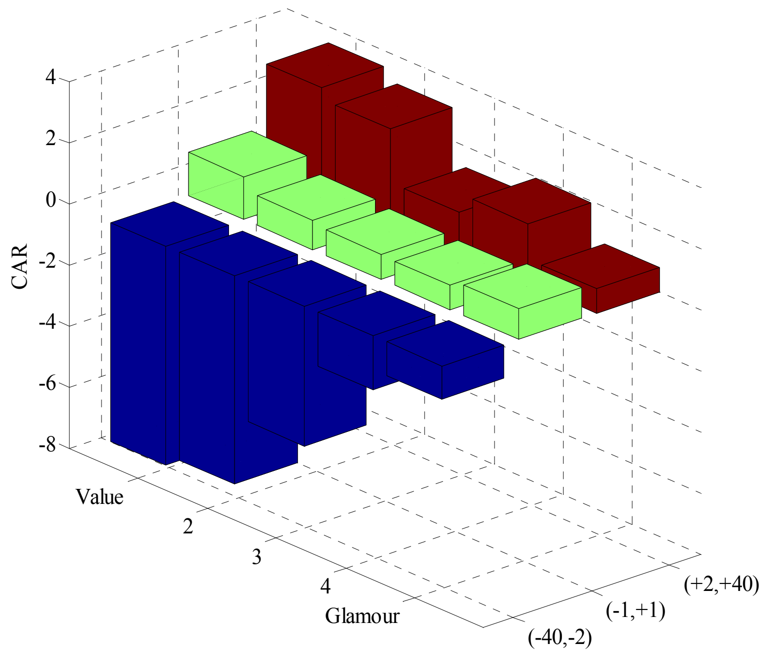
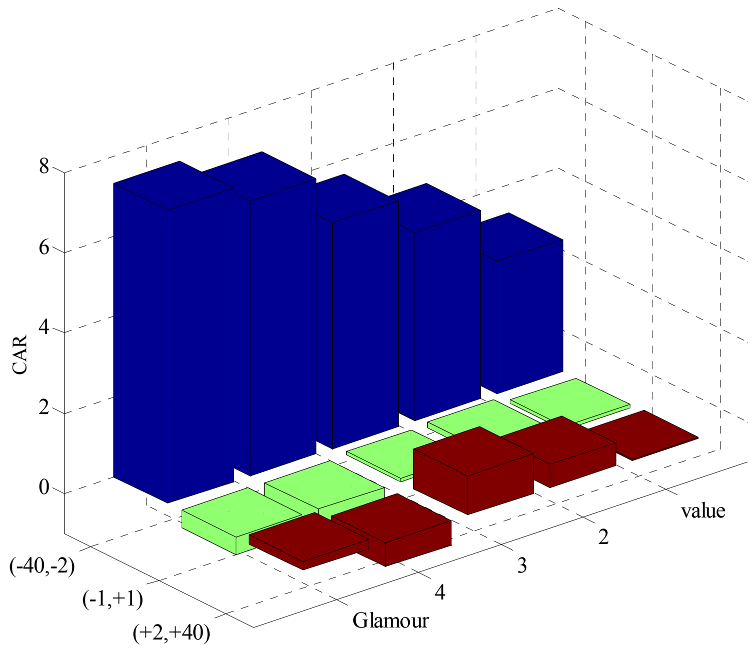


Figure 4-6 Abnormal returns of insider sells by growth quintiles



The analysis of M/B quintiles show evidence of signalling over- (under-) valuation (Table 4-7, Panel A and Figure 4-5). Low M/B companies (value stocks) are companies that are undervalued. I expect insiders in these companies to signal undervaluation when they purchase shares, resulting in positive post-event abnormal returns. As expected, for buy trades, as we move from low M/B to high M/B stocks, the post event abnormal returns are getting smaller. For example, the CAR for quintile 1 is 3.46 (t=5.72) and for quintile 5 is 0.79 (t=1.08) in the post event window. The mean difference t-test indicates that quintile 1 is statistically different from quintile 5. Also, the chi-square test for differences among the means reject equality of means. The pre-event returns also show results which were expected. As we move from low M/B to high M/B stocks, the pre event abnormal returns are larger. The mean of 'value' (low M/B) and 'glamour' (high M/B) stocks are different. Moreover, the chi-square test shows differences among the mean. When insiders buy in low M/B companies, the immediate price reaction of trades and price recovery is much higher, compared to high M/B companies. This is consistent with value strategies.

In contrast, high M/B stocks are glamour stocks, which are likely to be over-valued. The post-sell trades' abnormal returns in these companies should be negative. Table 4-7, Panel B and Figure 4-6 show that for sell trades do not show very strong evidence of signalling over-valuation. Only, the pre-event window CARs show some evidence of insiders' systematic trading based on their perceptions about the company. For example, the CARs are getting higher as we move from value stocks to glamour stocks in the pre-event period, which is consistent with theory. There are also differences in mean between value and glamour stocks. However, the chi-square test does not indicate that there are significant differences among the quintiles. The event-day and post-event day returns are not fully consistent with predictions. None of the CARs across the M/B quintiles are statistically significant. The mean difference t-test is not significant and the chi-square test shows there are no significant differences among the means. Overall, insiders sell after a significant rise in prices and the trend stops after they sell. It suggests weak evidence of timing. Therefore, my results suggest that insiders are able to time their trades, but they are not fully capable of changing the perception of the market regarding the full value of their companies. The results provide partial support for the proposition insiders follow growth strategies when they sell their shares.

4.5.2.4 Size Quintiles: Univariate Results

Table 4-8, Panel A and Figure 4-7 show the univariate results on size quintiles. The results show that there is evidence of market timing by the insiders for small stocks. If managers have timing abilities in small companies, I expect the pre-event cumulative abnormal returns to be higher as we move from small to large companies. Also, the event and post-event abnormal returns will be lower as we move from small to large companies. In case of buy trades, the pre-event returns do not increase as expected, but the signs are as predicted. For instance, for smallest size quintile CAR is -2.25 (t= -2.69) compared to -2.93 (t= -4.87) for large size quintile stocks. The mean difference t-test between small and large companies is statistically insignificant, but the chi-square test for the differences in means for different quintiles is highly significant.

Table 4-8 Distribution of Cumulative Abnormal Returns by Size

	Size Quintiles						
	Small	**2**	**3**	**4**	**Large**	**P $_{small-large}$**	$\chi^2(5)$
				Panel A: Buy			
-40,-2	-2.25***	-4.89***	-7.79***	-3.76***	-2.93***	0.53	43.79***
	(-2.69)	(-7.53)	(-12.42)	(-6.75)	(-4.87)		
-1,+1	3.02***	1.22***	0.76***	0.15	-0.12	0.00	156.47***
	(13.03)	(6.77)	(4.37)	(1.03)	(-0.70)		
+2,+40	2.95***	3.47***	2.36***	0.94*	0.48	0.00	57.33***
	(3.52)	(5.34)	(3.76)	(1.68)	(0.81)		
				Panel B: Sell			
-40,-2	4.62***	5.65***	6.67***	5.58***	5.45***	0.58	1.55
	(3.40)	(6.14)	(6.25)	(4.54)	(5.76)		
-1,+1	0.20	-0.44	-0.28	0.28	-0.40	0.27	5.02
	(0.53)	(-1.73)	(-0.95)	(0.82)	(1.54)		
+2,+40	3.00**	-0.83	-0.08	-0.46	-0.42	0.00	6.39
	(2.21)	(-0.89)	(-0.08)	(-0.38)	(-0.45)		

The above table represents cumulative average abnormal returns around directors' share trading by using event study methodology. The market model coefficients α and β are estimated over days -220 to -41 relative to the event, with FTSE All Share Index as the proxy for market portfolio. The full sample includes 33,991 directors' trades in 2,664 listed companies, split into 26,268 purchases and 7,723 sells. All results are reported relative to directors' share trading announcement day, i.e., the date of the public announcement of directors' share trading. The size quintiles were formed 5 days before the announcement dates. If I define t as event date then I use t-5 days' size to form quintiles based on the size. In forming the quintiles CARs are first sorted by year according to size. Each year CARs are then sorted in quintiles by size. Finally, they are sorted in quintiles. By doing so, the year effect from Market-to-book quintiles has been removed. P $_{small-large}$ reports the p value of mean difference test between CARs from highest market-to-book versus lowest market-to-book quintiles. The last column reports chi-square test for differences in means across size quintiles. T-statistics are reported in parenthesis. ***, **, * denote significant at the 0.01, 0.05 and 0.1 level, respectively.

Figure 4-7 Abnormal returns of insider purchases by size quintiles

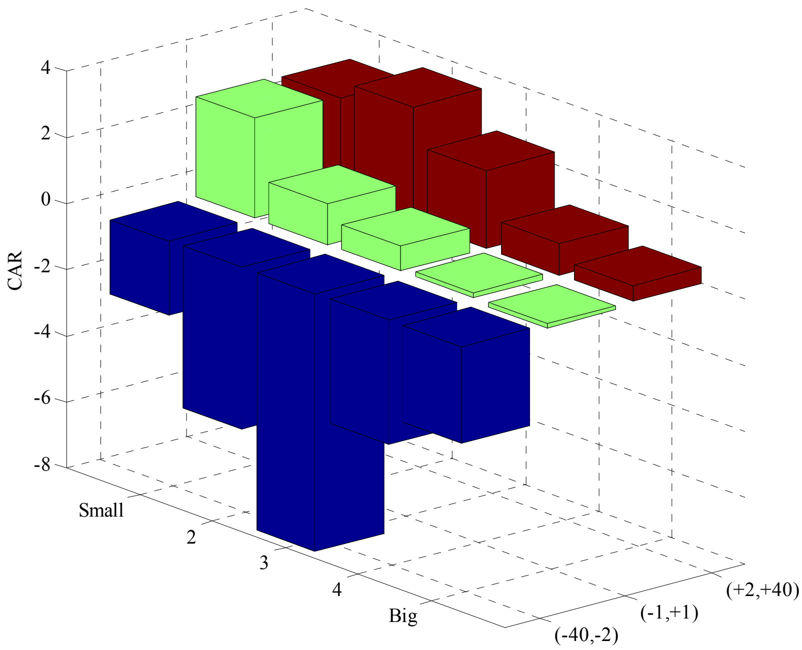
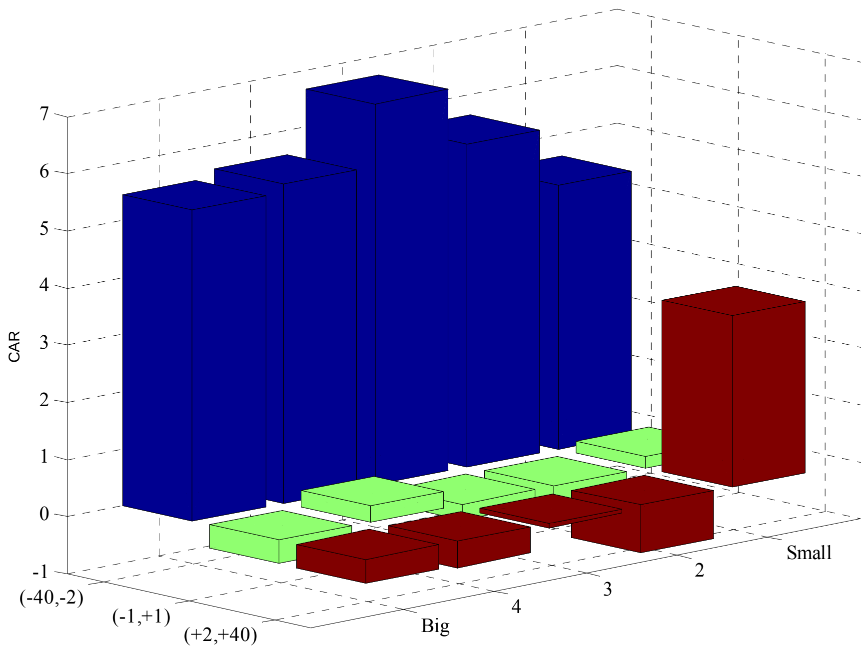


Figure 4-8 Abnormal returns of insider sells by size quintiles



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

The results for the sell trades do not show very strong evidence of market timing in the case of small companies (Table 4-8, Panel B and Figure 4-8). Only the pre-event window CARs show some mixed evidence of managers' systematic trading based on their perceptions about the company. For example, the CARs are getting higher as we move from quintile 1 to quintile 3 and then decline again. There are also no significant differences in mean between small and large stocks. The chi-square test indicates that the differences across the quintiles is not statistically significant. The event-day and post-event day returns are not fully consistent with predictions. None of the CARs across the size quintiles are statistically significant, except the post-event return for quintile 1. The mean difference t-test is not significant for event-day returns and the chi-square test shows that there are no significant differences among the means. Overall, insiders sell after a significant rise in prices and the trend stops after they sell. This shows weak evidence of timing. Therefore, the results indicate that insiders are able to time their buy trades but not sell trades in the case of small companies. This is consistent with Lakonishok and Lee (2001) who find that insiders timing ability is much pronounced in small stocks.

My results are in line with the view that insider trading in small companies conveys more information as abnormal returns are higher for small companies compared to large ones. For instance, Lakonishok and Lee (2001), in the context of US, find that the abnormal returns are higher for small stocks while there is no immediate market reaction for large stocks. In the context of UK, similar findings were reported in Gregory, Matatko, Tonks and Purkis (1994) who find that the abnormal returns are concentrated in smaller firms. Gregory, Matatko and Tonks (1997) conclude that the variable size can be of fundamental importance in an event study where a large number of smaller companies are included in the sample. These results are consistent with higher information asymmetry for small firms (e.g., Aboody and Lev (2000) and the view that small firms are risky (e., g., Fama and French (1993)).

4.5.2.5 M/B and Size Sorting of Abnormal Returns

This section provides two-way sorting based on M/B and size. The purpose of two-way sorting is to examine the effect of M/B and size simultaneously. Jenter (2005) shows that insiders trade in US hardly convey any information after controlling for

M/B and size. I examine in this section whether this is the case in UK. I find interesting results. In the case of buy trades, most of the results in earlier analysis were driven by small companies and low M/B companies (Table 4-9). For example, the event period returns show that all the returns across M/B quintiles are significant only for small company quintile. None of the event period returns are significant for big company quintile. Also, the post-event returns are significant in small company quintile and all the post-event returns are insignificant in large company quintile.

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

Table 4-9 Distribution of Abnormal Returns of Buy Trades by Size & M/B

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

The above table represents cumulative average abnormal returns around directors' share trading by using event study methodology. The market model coefficients α and β are estimated over days -220 to -41 relative to the event, with FTSE All Share Index as the proxy for market portfolio. The full sample includes 33,991 directors' trades in 2,664 listed companies, split into 26,268 purchases and 7,723 sells. All results are reported relative to directors' share trading announcement day, i.e., the date of the public announcement of directors' share trading. The M/B and size quintiles were formed 5 days before the announcement dates. If I define t as event date, then I use t-5 days' M/B and size to form quintiles based on M/B and size. In forming the quintiles the CARs were first by year according to M/B and size. Each year then the CARs were sorted in quintiles first by M/B and then by size. By doing so, the year effect have been removed from quintiles. T-statistics are reported in parenthesis. ***, **, * denote significant at the 0.01, 0.05 and 0.1 level, respectively

Table 4-10 Distribution of Abnormal Returns of Sell Trades by M/B and Size

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

The above table represents cumulative average abnormal returns around directors' share trading by using event study methodology. The market model coefficients α and β are estimated over days -220 to -41 relative to the event, with FTSE All Share Index as the proxy for market portfolio. The full sample includes 33,991 directors' trades in 2,664 listed companies, split into 26,268 purchases and 7,723 sells. All results are reported relative to directors' share trading announcement day, i.e., the date of the public announcement of directors' share trading. The M/B and size quintiles were formed 5 days before the announcement dates. If I define t as event date, then I use t-5 days' M/B and size to form quintiles based on M/B and size. In forming the quintiles the CARs were first by year according to M/B and size. Each year then the CARs were sorted in quintiles first by M/B and then by size. By doing so, the year effect have been removed from quintiles. T-statistics are reported in parenthesis. ***, **, * denote significant at the 0.01, 0.05 and 0.1 level, respectively

4.5.2.6 Cross Sectional Variation in Abnormal Returns

This section runs cross-sectional regressions to control for a number of factors simultaneously. The overall results of univariate analysis show that insiders buy (sell) undervalued (overvalued) stocks as measured by M/B and find evidence of market timing in the purchase of small company stocks. In particular, as we move from low to high M/B quintile and small to large quintile the pre-event, event and post-event abnormal return varies. Clearly, these provide evidence that the abnormal returns vary with M/B and size. Thus the same variables are used in the regressions for the pre-, post- and event day abnormal returns. It is also standard in the literature to control for M/B and size effects (for example, see Lakonishok and Lee (2001) and Jenter (2005)). Also variables are included to account for stock and market volatility effects following Grinblatt and Keloharju (2001).

In order to isolate the pure cross-sectional component of the M/B and size effect on insider trading, a set of regressions are estimated using the whole sample period from 1999 to 2007. The M/B effects are negative and signifiacnt in case of buy trades, suggesting that managers buy undervalued stocks (Table 4-11). These results are consistent with the M/B quntile analysis. Therefore, it appears that insider trading decisions are related to relative market valuations. I also examine the effect of size in market timing by insiders. The coefficient is negative and significant for the buy trades, which is consistent with the evidence that insiders try to time the market in case of small companies. In the case of buy trades, the stock volitility and market volitility are positive and significant in most cases, suggesting that risky stocks earn higher returns, and high market volitility is related to higher returns. This is consistent with Huddart and Ke (2006), who assert that for companies where information assymetry is higher, the abnormal return is higher. Overall, the results suggest that insiders time their buy trades.

Table 4-11 Regression Results: Buy Trades

	Buy Trades					
	$CAR_{-40,-2}$		$CAR_{-1,+1}$		$CAR_{+2,+40}$	
	Model 1	**Model 2**	**Model 1**	**Model 2**	**Model 1**	**Model 2**
Intercept	-0.103***	-0.048	0.003	-0.005	0.003	-0.085***
	(-2.66)	(-1.03)	(0.79)	(-0.37)	(0.11)	(-2.39)
Ln (Size)	-0.002	-0.001	-0.003***	-0.003***	-0.004**	-0.004**
	(-0.88)	(-0.79)	(-5.27)	(-5.09)	(-2.23)	(-2.23)
Market to book	-0.001	-0.002	-0.001*	-0.003*	-0.007	-0.007*
	(-0.15)	(-0.42)	(-1.94)	(-2.36)	(-1.61)	-(1.80)
Stock Volatility	-0.750	-0.79	0.518***	0.510***	0.840***	0.789***
	(-1.43)	(-1.53)	(4.80)	(3.13)	(2.52)	(2.36)
Market Volatility	0.21***	0.89***	0.353	0.838	0.29***	0.523***
	(4.52)	(2.52)	(0.60)	(1.06)	(3.17)	(5.42)
BB Dummy	0.038***	--	0.001	--	0.008	--
	(4.29)		(0.44)		(1.25)	
Industry Dummy	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummy	--	Yes	--	Yes	--	Yes
$\mathbf{R^2_{adjusted}}$	0.06	0.06	0.053	0.053	0.042	0.033
F (Probability)	6.55 (0.00)	6.15(0.00)	5.72 (0.00)	5.40(0.00)	3.53(0.00)	3.73(0.00)

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

$$CAR_j = \alpha + \beta_1 Ln(Size)_j + \beta_2 M/B_j + \beta_3 StockVol_j + \beta_4 MktVol_j + \kappa BBDum + \sum_{k=1}^{5}\gamma_k Year_j + \sum_{k=1}^{35}\phi_k Industry_j$$

where, $CAR_{j,t}$ is the CAR of insider trades for the (-40,-2), (-1,+1) and (+2,+40) event windows. Model 1 is the model with bull (bear) dummy and industry dummy and model 2 is model with year dummy and industry dummy. *Ln(size)* is the log of size of the company measured as market value of equity, *M/B* is the market-to-book ratio. It is standard in the insider trading literature to control for size and M/B. For instance, Lakonishok and Lee (2001) found that after controlling for size and market-to-book effects the magnitude of abnormal performance declines. *Stock Vol* is volatility of stock measured by standard deviation over 180 days prior to the event and *Mkt Vol* is volitility of market measured by standard deviation over the same estimation period. The BB dummy is one if the trade is from bull period (January 1999 to March 2000 and January 2004 to December 2007) and zero otherwise. White heteroscedasticity consistent t-statistics is reported in parenthesis. The last row reports F-statistics with p-values in the parenthesis next to it. ***, ** and * indicates significant at 1%, 5% and 10% levels, respectively.

Table 4-12 Regression Results: Sell Trades.

	Sell Trades					
	$CAR_{-40,-2}$		$CAR_{-1,+1}$		$CAR_{+2,+40}$	
	Model 1	**Model 2**	**Model 1**	**Model 2**	**Model 1**	**Model 2**
Intercept	0.105***	0.103***	0.003	0.002	-0.052*	-0.048*
	(3.05)	(2.94)	(0.25)	(0.29)	(-1.76)	(-1.89)
Ln (Size)	-0.002	-0.002	-0.005	-0.006	-0.004***	-0.004**
	(-0.64)	(-0.72)	(-0.84)	(-0.74)	(-2.92)	(-2.25)
Market to book	0.001	0.001	-0.001	-0.003	0.002*	0.001*
	(1.44)	(1.55)	(-0.57)	(-0.64)	(1.74)	(1.65)
Stock Volatility	0.594*	0.601*	0.075	0.073	0.553	0.353
	(1.77)	(1.68)	(0.25)	(0.31)	(0.54)	(0.46)
Market Volatility	-0.856*	-0.921*	0.414	0.264	0.852***	0.912***
	(-1.85)	(-1.72)	(0.45)	(0.41)	(4.54)	(4.52)
BB Dummy	0.005	--	0.003	--	0.002	--
	(0.44)		(0.57)		(0.52)	
Industry Dummy	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummy	--	Yes	--	Yes	--	Yes
$R^2_{adjusted}$	0.025	0.021	0.035	0.020	0.022	0.022
F (Probability)	3.64 (0.00)	3.55(0.00)	0.46 (0.81)	0.38(0.85)	5.06 (0.00)	4.59 (0.00)

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

$$CAR_j = \alpha + \beta_1 Ln(Size)_j + \beta_2 M/B_j + \beta_3 StockVol_j + \beta_4 MktVol_j + \kappa BBDum + \sum_{k=1}^{5}\gamma_k Year_j + \sum_{k=1}^{35}\phi_k Industry_j$$

where, $CAR_{j,t}$ is the CAR of insider trades for the (-40,-2), (-1,+1) and (+2,+40) event windows. Model 1 is the model with bull (bear) dummy and industry dummy and model 2 is model with year dummy and industry dummy. *Ln(size)* is the log of size of the company measured as market value of equity, *M/B* is the market-to-book ratio. *Stock Vol* is volatility of stock measured by standard deviation over 180 days prior to the event and *Mkt Vol* is volitility of market measured by standard deviation over the same estimation period. The BB dummy is one if the trade is from bull period (January 1999 to March 2000 and January 2004 to December 2007) and zero otherwise. White heteroscedasticity consistent t-statistics is reported in parenthesis. The last row reports F-statistics with p-values in the parenthesis next to it. ***, ** and * indicates significant at 1%, 5% and 10% levels, respectively.

In the case of sell trades, the coefficient of M/B is positive but not significant (Table 4-12). The sign is consistent with the predictions suggesting that insiders sell overvalued stocks. The sign of size is negative in all equations but it is only significant in case of CAR(+2,+40). The negative sign is consistent with the finding in univariate size quintile analysis. Stock volatility is significant in case of CAR(-40,-2) only. Market volitility is significant in all the equations. Overall, the results suggest that M/B and size significantly affect market reaction of insider trading.

Finally, the documented pattern of insider purchases and sells across M/B quintiles and size quintiles could be due to some omitted variable measuring an unobserved heterogeneity across the firms in different quintiles. One crude measure of heterogeneity across the firms is the industry in which it operates. It is well established that the market-to-book ratios in the same industry tend to move together and that several industries are characterized by extreme valuations. Some particular businesses need huge amount of investment, and the size of the companies of that particular industry can be larger than others. To determine whether the market-to-book and size effect on insider trading is simply an industry effect, I incoporate industry dummies in the regressions. To assess whether the results are not time dependent, I also include year dummies in my regressions. In none of the cases the industry dummies or year dummies are significant, suggesting that results are not driven by industry or any particular year.

4.6 Conclusion

This study employs a unique data set to test whether insiders time their trades or not. I examine first whether insider trading is related to market sentiment as measured by bull (bear) market. Previous studies on insider trading almost unanimously find that insiders are contrarians. This research tests whether insiders use market sentiment to act like contrarians. The aggregate insider trading activity shows a relationship between market timing by insiders, and market sentiment as measured by bull (bear) periods. This provides evidence that insiders use market sentiment as a platform to act like contrarians. However, I did not find any significant difference in price response in bull and bear periods.

This study documents that the magnitude of the abnormal returns of insider trades is higher in the UK compared to the US, in line with Fidrmuc et al. (2006). I provide several explanations for the greater market reactions of UK insider trades. There is a considerable difference in institutional settings and insider trading regulations between the UK compared to the US and I attribute the greater market reaction in the UK to these factors. It is possible that the wide-ranging group of insiders in the US may have less information compared to executive and non-executive directors in the UK. Also, in the US, insider trading is disclosed in the market between 10 and 40 days compared to a maximum of 6 days in the UK.

This study then examines whether there are any relationships between company fundamentals and timing of insider trades, as addressed in Rozeff and Zaman (1998), Lakonishok and Lee (2001) and Jenter (2005). Insiders tend to buy stocks with poor past performance, and those that are cheap according to the measures, such as M/B. They tend to purchase value stocks which underperform in the past, and sell glamour stocks which perform well in the past. The results suggest that insiders tend to have contrarian views with regard to their own company's stock. Their disagreements with the market are not randomly distributed across firms, but seem instead to be described by insiders in low valuation firms evaluating their stocks as undervalued and insiders in high valuation firms evaluating their stocks as overvalued. Therefore, it appears that the perception of mispricing is an important factor behind the market timing behaviour by the corporate insiders.

Consistent with the previous literature, the ability of insiders to time their trades is not uniform across all market capitalization groups. Insiders have a relative advantage in timing in the case of small stocks than large stocks. Also, results show that insider purchases are useful, while sells are not associated with low returns. Insiders have many reasons to sell shares but the main reason to buy shares is to make money; the results are consistent with this view. The evidence that price does not decline after sell trades implies that the party who bought the shares is not hurt by the sell trades of insiders. Thus, this should not be a cause of great regulatory concern.

The results call into question as to whether insiders are able to earn excess returns with their trades once the size and M/B effects are controlled for. Recent insider trading literature confirms the finding that most excess returns to insider trades can be explained by the size and M/B effects, and suggests that the economically significant excess returns in older studies is due to the lack of control for these observable firm characteristics (Jenter, 2005). The most comprehensive study of insider trading by Lakonishok and Lee (2001) shows that most of the return predictability through insider trades vanishes once size and M/B are controlled for. There is some predictability of excess returns left using equity purchases in small firms, but no predictability of excess returns at all is found on the sell side. In line with the recent literature, I find that equity purchases in small firms are informative while the sell trades do not convey any information in the short-run.

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Chapter 5

5 IPO Lockup Arrangements and Trading by Insiders[47]

Abstract

This chapter analyses the insider trading behaviour within the lockup period. I find that prestigious underwriters and the length of the lockup drive these trades. However, while insiders sell in over-performing, large, and low institutional holding IPOs, they buy in underperforming IPOs with lower underpricing and proportion of shares locked. On the lockup expiry dates, there is significant price drop for early buy but not for early sell IPOs. This early trading activity is likely to reflect the underwriters' power over managers, not venture capitalists, to mitigate the information asymmetries of newly listed firms.

Key words: Initial public Offering, Lockup, insider trades, information asymmetry, London Stock Exchange.

JEL Classification: G12, G14, G24.

[47] This chapter formed the basis for Hoque, H. and M. Lasfer (2009), "Insider trading around IPO lockup arrangements", which was presented at the 2009 EFA Bergen Meetings, and the EFMA Milan Meetings. I thank Huainan Zhao, Arie Melnik, Scott Hsu (discussant in EFA), John Doukas (discussant in EFMA) and seminar participants at the 2009 EFA conference in Bergen, 2009 EFMA conference in Milan, and Cass Business School for their helpful comments. All remaining errors are my own responsibility.

5.1 Introduction

Most of the IPOs contain lockup agreement where insiders are restrained from selling their holdings before a certain date. The ban on insider sells for a certain period of time is frequently alleged to be a necessary commitment device to induce the public to buy shares at the offering. Because insiders have better information about the firm's future prospects, they may try to take advantage of that information at, or soon after, the initial public offering. If insiders knew that the price immediately after the offering was excessively high, they might wish to cash out at a high price. The lockups are likely to act as a commitment device to alleviate the moral hazard problem. In this case, the level of the information asymmetries regarding the actions of the managers is important. A firm which have higher moral hazard problem would have to accept a longer lockup in order to convince investors to buy stock in the offering (Brav and Gompers (2003)). During the period of time when insiders are prohibited to sell shares, the information regarding firm's future prospects will be revealed and will reduce the chances that insiders will act opportunistically. Hence, the lockup provision would be a commitment device. If the lockups are commitment device, and, therefore, insiders are not expected to sell shares within the lockup period. Insider trading (if any) within the lockup period is the central theme of this chapter.

Underwriters set, in almost all IPOs, lock-up options to mitigate the information asymmetries between issuing firms and investors, and to reduce their reputation risk. These are voluntary agreements with corporate insiders not to sell shares without their written consent during a specified post-IPO period. A typical lock-up may specify that insiders should not offer, issue, sell, contract to sell, issue options in respect of or otherwise dispose of, directly or indirectly, ordinary shares or any securities of the company that are substantially similar to the ordinary shares or any other securities exchangeable for or convertible into ordinary shares.[48] These agreements contained in the prospectuses indicate clearly the number (or proportion) of shares locked and the length (or the expiry date) of the lockup period. Despite the popularity of lockups, their potential monitoring costs and constraints on insiders' holding risks, the IPO literature has not fully covered a number of questions, namely, how do underwriters enforce them? Do they allow some insiders to sell, but make others increase their commitments by buying additional shares during the lockup period? When do they do so, and what is the impact of these early trades on stock prices? In this paper, I construct a unique data set of 831 UK IPOs containing all lockup information from prospectuses and insider trading over the period 1999-2006 to answer these questions.

This chapter is partially motivated from observed differences in institutional settings between the UK and the US. For example, the relationship between IPOs and their underwriters is likely to be long-term in the UK, since all quoted firms need to have a corporate broker, usually the IPO underwriter, as an interface with the London Stock Exchange and shareholders, and arranges insider trades, seasoned equity offerings and share buybacks. This requirement implies that lockups are likely to be more binding in the UK, and insiders are not expected to

[48] The analysis of the prospectuses shows that this agreement is not binding only in limited circumstances, when the consent of the underwriter should not be unreasonably withheld or delayed. These include the event of an intervening court order, a takeover offer relating to the company's shares becoming or being declared unconditional, the death of the insider, transfers to relatives and family trusts and to beneficiaries of such trusts, and transfers to companies in the same group as the shareholder. We were not able to identify these specific events.

break them for fear of incurring costs of finding new brokers or risk of delisting, particularly for AIM firms. At the same time, the rent seeking potential is likely to be higher as insiders have to use their corporate broker to undertake their trades.[49] Chambers and Dimson (2009) also argue that in the UK, investment bankers have increased their market power through time, because of the erosion of trust. The purpose of this chapter is to look for evidence on this power, through underwriters' impact on lockups and their enforcement, as it examines whether insiders are released before the lockup expiry dates, and whether insiders are pushed to increase in commitments in some IPOs.

I focus on the insider trading activity within the lockup period. It is shown that, interestingly, while both the buy and sell trades undertaken by insiders occur in IPOs with longer lockup periods, and the presence of prestigious underwriters, the stock price performance on the trading and lockup expiry dates is significantly different across the early buy and early sell IPOs. I find that in the 40 days preceding the trade, IPOs subject to insider early sells generate significant positive abnormal returns of 9.72%, compared to -8.43% for early buy IPOs. These results suggest that this early trading activity is likely to be pre-arranged with the underwriters, as while the sell trades are early releases following good performance, the buys are likely to be undertaken to signal an increase in

[49] All UK listed companies retain a corporate broker, usually the underwriter of the IPO, as a pre-requisite for their listing on the London Stock Exchange. The corporate broker acts as a long-term retained adviser and is specifically responsible for managing the day-to-day relationship with the corporate client and provides equity market-related advice, and new issues, co-ordinates institutional investor relations services, and liaises with the London Stock Exchange and UK Listing Authority on regulatory issues facing listed companies. In addition to primary equity issuance, corporate brokers execute equity related transactions, including insider trades, share buybacks, stake building in target companies. See, for example Financial Times 28 April 2009 p. 21 and Wall Street Journal Europe 4 May 2009 p. 23 for a listing and concentration of major corporate brokers.

commitments and to support the price of underperforming IPOs. I also find that stock prices increase by 2.49% on the announcement date of buy trades, but the post-event period abnormal returns are not significant, implying that the information content of these trades and the price support are short-lived. For early sell IPOs, the resulting negative signal is confined mainly to the event and the short-term post-event period, as share prices recover to generate positive returns in the period leading up to the lockup expiry date.

The chapter also analyses insider trading on the lockup expiry date. In line with previous evidence (e.g., Brav and Gompers (2003) and Field and Hanka (2001)), I find significant price decline for the whole sample on the lockup expiration dates of -1.85% (t = -3.70), and for the IPOs with actual sell trades, the abnormal returns of -2.5% (t = -3.55) are significantly lower than the remaining IPOs. Interestingly, no IPO with actual sell is from my two subsamples of early buy and sell IPOs. However, early sell IPOs generate significant positive abnormal returns in the pre-event and no negative returns in the post-event period. In contrast, the early buy IPOs underperform significantly on and during the lockup expiry date. These results hold even after controlling for other effects, as regressions show that the abnormal returns on the lockup expiry dates are significantly lower for IPOs with early buys and actual sell trades on the lockup expiry dates, but positive, though not significant, for early sell IPOs. Insiders are divided into executive managers and venture capitalists (non-executives). I find that while the dummy for sell trades executed by executives is not significant, that for buy trades is negative and significant, suggesting that IPOs where executive directors are buying, are the worst performers.

This chapter also analyzes the determinants of the lockup lengths (Brav and Gompers (2003), Brau, Lambson, and McQueen (2005)). They argue that lockup contracts may emanate from the agency costs, information asymmetries between managers and shareholders, signalling of firm's quality, rent seeking by underwriters, and, commitment hypothesis. This research finds that lockups are likely to serve as commitment devices to overcome potential adverse selection at the offering and to signal firm's quality. Although the average lockup is relatively larger than the US, I find that the drivers of the lockup lengths are similar, as they are relatively shorter when IPOs are large, underwritten by prestigious investment banks, backed by VCs, held by institutions, and issued in hot market and in the main market rather than the Alternative Investment Market (AIM). When two markets are separated, relatively similar results were found, except that size and shares locked are significant in the main market, while hot market dummy is significant in AIM. This study does not find support for the rent-seeking hypothesis, as the gains from such trades are relatively small and IPOs did not raise additional capital during the lockup period.

I find that, during the study period, nearly 90% of all UK IPOs have lockups. The average (median) length of the lockup of the sample firms is 391 (365) days, significantly longer than the 180 days reported in the US (Bradley et al. (2001)). Although it is found that lockup lengths range between 86 and 1096 days, they are, consistent with Bradley et al. (2001), relatively standardized, as about 70% of lockups are exactly one year, but only 3% are below 180 days and less than 10% are above 18 months. Compared to previous UK evidence, the lengths appear to be shortened as the respective figures reported by Espenlaub et al. (2001) are

561 (730) ranging between 158 and 1095 days for 52 IPOs in 1992-1998.[50] I show that the longer lockup periods in the UK are likely to be related to the fact that lockups are usually divided into two periods; the first when insiders cannot sell at all, and the second when insiders can do so with the underwriter's agreement.[51] However, even if I consider only the 53% of sample firms with only one lockup, I find that the average length is more than one year.

Finally, this study reports that, while the average lockup length is evenly distributed across sample period, the early buy and sell trades are relatively new phenomenon, as about 80% occur in the period 2004 to 2006, and the vast majority are in lockups longer than or equal to the average of one year. However, I find strong differences between the early sell and early buy samples. First, the frequency of early buys of 31% of my sample IPOs is larger than the 14% of firms that have insider sells prior to the lockup expiration date. On average, insiders undertake two sell trades and three buy trades and they occur about half way the lockup period. Moreover, the proportion of shares sold is significantly higher than those bought. The analysis of the drivers of these trades shows that while insiders sell in large, and low institutional holding IPOs, they buy in IPOs with lower

[50] However, these results are likely to be firm specific as Chambers and Dimson (2009) identify more than 10 times (558) UK IPOs issued during the period 1992-98. Lockup contracts were also compulsory during their sample period (1992-2000) for mineral and scientific research companies with trading records of less than three years

[51] For example, the prospectus of Proactis Holdings PLC, listed on 2 June 2006 states: "The Directors have undertaken that, subject to certain limited exceptions, they will not sell or otherwise dispose of, or agree to sell or dispose of, any of their interests in Ordinary Shares held by them respectively until the expiry of 12 months after First Admission. In addition, the Directors have agreed that they will not sell or otherwise dispose, agree to sell or dispose of any of their interests in Ordinary Shares held by them without the prior written consent of Teather & Greenwood [underwriter] for a period of 12 months following the end of the above period."

underpricing and proportion of shares locked. Overall, my results of the buy trades provide support for the commitment hypothesis.

The rest of the chapter is organized as follows. Section 2 describes the UK institutional features, reviews the literature and sets up the hypotheses. Section 3 presents a discussion of my data. Section 4 provides the empirical results, and the conclusions are in Section 5.

5.2 Theoretical Background

5.2.1 Lockup Agreements in the UK Markets

Companies listed in both markets (Main market and AIM) are required to maintain a corporate broker, or sponsor, who is usually the underwriter. The Financial Services Authority (FSA), equivalent to SEC in the US, requires an approved sponsor to act as advisers and provide certain services. This regulatory model, similar to Hong Kong, has the most defined and extensive role for an advisor to a listed company to act as an intermediary between the company and the regulator. In contrast, in the US, the investment bank has no direct obligations to the SEC (FSA Listing Rules (2007)). The sponsor is particularly responsible for any transaction the company undertakes, such as raising capital, share buybacks and trades undertaken by insiders. For AIM companies, the sponsor, referred to as NOMAD (Nominated Adviser), has relatively similar functions as the advisors of companies listed on the Main Market.

In both markets, companies need to specify clearly the lockup contract in their prospectuses. If this is not the case, they need to specify the reasons. Companies state the lockup expiry date as a definite calendar date (e.g., 7 June 2007) as in the US, or it may be related to a specific corporate event, such as the earnings announcement or the publication of the annual report. Finally, lockups may be staggered if the locked up shares are only gradually released before the expiry date. I find that the lockup lengths are relatively more standardized compared to the Espenlaub et al. (2001) who report that in the UK lockup periods and characteristics are not homogeneous during their study period of 1992-98.

Some examples of lockup agreements are presented below, which clearly show that insiders are not allowed to sell shares before lockup expirations. The first two lockup agreements are mentioned in terms of calendar date. Though the last lockup expiry date is different for different shareholders, for my purpose, I took end of first year as lockup expiry date as 27.1 percent of the shares become available to the market.

Knowledge technology

"Following the Offer assuming the Offer is fully subscribed, the Directors will hold 40,666,667 Ordinary Shares representing a maximum of 48.7 percent of the enlarged issued share capital of the Company and may be issued with a further 40,000,000 Ordinary Shares following the exercise of the Founder Warrants. In accordance with the AIM Rules, the Directors have agreed not to dispose of any shares held by them in the twelve months following Admission, except in a number of exceptional circumstances and furthermore not to dispose of any shares issued to them under the Founder Warrants within six months of such issue without the consent of Beaumont Cornish."

Punch Tavern

"Certain of the Directors and Existing Shareholders have agreed that, during a period of 180 days from the date of Admission, they will not, without the prior written consent of Merrill Lynch, sell any Ordinary Shares (or any right or option in respect thereof) other than sells to affiliates or by way of acceptance of a takeover offer for the Company, and certain of the Existing Shareholders have also agreed that, during a further period of 360 days thereafter, any such Existing Shareholder wishing to sell Ordinary Shares will do so in accordance with arrangements designed to ensure an orderly market in the Company's shares."

Customvis

"The Directors and Novamed Limited (a company controlled by Simon Gordon, one of the directors) have undertaken to the Company and Collins Stewart not to dispose of any interest which they have in the share capital of the Company for a period of two years after Admission or, if earlier, until such date as the Company announces an interim profit for the six month period to 31 December 2004. The Directors and Novamed Limited have also given orderly marketing undertakings to the Company and Collins Stewart for the 12 months following the end of the lock-in arrangements.

Jennifer van Saarloos, Custom Lasers Inc, Asian Lasers Inc and Moksh Pty Ltd, who together hold approximately 27.1 per cent. of the issued share capital of the Company following the Placing, have each entered into a lock-in agreement with the Company and Collins Stewart pursuant to which they have agreed not to dispose of any of the Ordinary Shares held by them for a period of 12 months after Admission. These Shareholders have also agreed to orderly marketing undertakings to the Company and Collins Stewart for the 12 months following the end of the lock-in arrangements."

The analysis of the prospectuses shows that this agreement is not binding only in limited circumstances, when the consent of the underwriter should not be unreasonably withheld or delayed. These include the event of an intervening court order, a takeover offer relating to the company's shares becoming or being declared unconditional, the death of the insider, transfers to relatives and family trusts and to beneficiaries of such trusts, and transfers to companies in the same group as the shareholder.

While in the US there are no legal rules about lockup periods (Ofek and Richardson (2000)), in the UK certain types of companies are subject to compulsory lockups.[52] Until January 2000, lockup agreements are mandatory for UK mineral and scientific research-based companies that did not satisfy the standard minimum-age requirement of three years. More specifically, the directors and other key employees of these companies are not allowed to sell shares either in the IPO or during the period of two years commencing with the first day of listing. Shareholders holding at least 10% of the securities are not allowed to sell during the first six months following the IPO or until the publication of the semi-annual results, whichever is longer, and they could not sell more than 40% of their holdings during the first two years following the IPO. In January 2000, the new listing rules scrapped these compulsory lockups, but companies with less than three years of trading records are now required to include a statement in their prospectus detailing the lockup arrangements or provide reasons for their absence. An additional chapter on innovative high-growth companies was included to the Listing Rules in January 2000 making lockup agreements not compulsory for innovative high-growth companies, but if these firms do not satisfy the three years minimum age requirement, they have to include a lockup statement in their prospectus, if not specify the reasons.

[52] See Espenlaub et al. (2001, 2002) for details.

5.2.2 Review of the Literature

To the best of my knowledge, no previous study analyse in detail insider trading within the lockup period. There are a limited number of studies that analyse only insider sells, not buys, within the lockup period. For example, Brav and Gompers (2003) test the commitment hypothesis by using insider selling activities within the lockup period and report that the companies where there are less information asymmetry, insiders are allowed to sell their shares. Field and Hanka (2001) test the hypothesis that the negative abnormal returns around the lockup expiry date is driven by worse than expected insider selling. They find that when insiders are selling, the abnormal returns are more negative. However, the lockup expiry returns are not solely driven by aggressive insider selling as stock prices decline even in the absence of actual insider sell trades.

Espenlaub et. al. (2002) analyse the directors trading around lockup expiration using 94 IPOs from UK. They find that companies with a good stock price performance, before lockup expiry dates are more likely to have directors sells. However, most of their sample firms have a relative lockup date, which made it difficult to estimate the expiry date. They also report that directors selling activity increases significantly following the lockup expirations. They measure the cumulative abnormal returns for -4 to +4 weeks relative to the lockup expiration week. They report insignificant lockup expiration returns. They also report that, firms with directors' sells have lower abnormal returns,[53] compared to firms

[53] The abnormal returns were measured weekly basis. The mean difference t-test also shows that there is no difference between these two abnormal returns.

without directors' sells. However, most of the abnormal returns are statistically insignificant.

Previous studies argue that lockup contracts reduce the information asymmetry and mitigate the agency problems between the insider-managers and the outside shareholders (Brau et al. (2004)). Ibbotson and Ritter (1995) argue that investors are ready to pay more for a firm with a lockup agreement for two reasons: (i) any negative information being withheld is likely to be revealed before the locked-up shares can be sold, reducing the benefit of withholding information, and (ii) as long as insiders retain large holdings, their incentives are aligned with outsiders' incentives. Empirically, a large number of studies provide support for these arguments as insiders refrain from selling shares during the lockup period for fear of conveying negative signals to the market (e.g., Brau and Fawcett (2006)). Since significant selling activity occurs after lockup expiry (e.g., Brav and Gompers (2003)), insiders do wait until lockup agreement is expired to reduce the holding in their IPO.

Brav and Gompers (2003) develop three additional competing hypotheses to explain the existence and length of the lockup period (i) signalling firms' quality, (ii) commitment hypothesis, and (iii) rent seeking by underwriters. They find that lockups are driven by the commitment hypothesis, but reject the signalling and the rent seeking hypotheses. However, Brau et al. (2005) contradict these results and provide support for the commitment and signalling hypotheses. They show that Brav and Gompers (2003) evidence of an inverse relationship between transparency and lockup length supports the signalling model at least as much as the commitment explanation. They also report that the length of the lockups is positively associated with high information asymmetries, low idiosyncratic risk and high potential for moral hazard.

On the lockup expiry dates share prices, in general, tend to decline independently of whether insiders do actually trade (e.g., Brau et al. (2004), Brav and Gompers (2000, 2003), Bradley et al. (2001), Ofek and Richardson (2000), Field and Hanka (2001)). These results are puzzling as, since lockups are well-known agreements at the time of the IPO and all their parameters are specified in the IPO prospectus, the price reaction on their expiry dates will normally be zero, unless if insiders sell their holdings. This phenomenon is related to several explanations.

Brau et al. (2004) argue that since, lockup expiration dates provide an opportunity for insiders to sell their holdings, the potential for un-alignment of objectives and agency conflicts increases, resulting in a potential decrease in investors' demand for shares. They find a significantly positive relationship between the percentage of management ownership after the IPO, their proxy for agency costs, and the five-day cumulative abnormal returns. Another related explanation is the information content of insider trading when insiders sell on the lockup expiry date. These arguments are in line with previous studies on insider trading that report significant price decline on the announcement of sell trades (e.g., Seyhun (1986, 1988)) as the market considers that such trades reflect negative private information. Field and Hanka (2001) provide alternative hypotheses that may explain the observed pattern in the returns around the lockup expiration. Consistent with the downward-sloping demand curve hypothesis, they find that the abnormal returns are more negative when the trading volume is abnormally high.

Other studies focus more on market micro-structure factors, such as the bid-ask bounce, liquidity effects and biased expectations of supply shocks. Overall, the empirical support for the drivers of the negative lockup expiry date abnormal returns is mixed (e.g., Ofek and Richardson (2000)). This is most probably due to the difficulties in distinguishing between IPOs that are actually subject to sell trades, and others with potential sells, because of the lack of data on the actual insider selling trades around the lockup expiry dates.

The only study, to the best of my knowledge that analyse UK lockups is Espenlaub et al. (2001). They analyse a small sample of 188 firms that raise equity on the London Stock Exchange during 1992-1998. They examine the characteristics of the lockup agreements in the UK and report that lockup agreements in the UK firms are much more complex, varied and diverse as compared to the US contracts. They analyse the market reaction of lockup expiration and find evidence of negative share price movements around the lockup expiry dates, though, statistically not significant. The drop in stock returns around the expiry date is particularly pronounced for high-tech companies.

5.2.3 Testable Hypotheses

The previous two sections highlighted the differences between the US and the UK institutional settings, and the controversies surrounding lockups. The existence of corporate brokers, the lockup requirements for IPOs with less than three years trading activity, and the UK insider trading disclosure rules, which specify that any trades should be disclosed on or within five working days after the actual trade,[54] allow to assess further the main hypotheses underlying lockups, and to expand more previous evidence. I first start by analysing the existence and the determinants of the lockup lengths. In the US, the informational asymmetries between insiders and outsiders is mitigated to a lesser extent, since their periods are relatively short, and firms disclose little information between their IPO and the lockup expiration date. Given the UK institutional setting, particularly, the existence of corporate brokers and the disclosure requirements of any insider trades, stricter lockup contracts are expected, and the information production to be higher within the lockup period, to reduce the information asymmetry between insiders and outside shareholders. Thus, I contrast my results with previous predominantly US evidence (e.g., Brav and Gompers (2003)) and provide evidence on lockup lengths under different institutional settings. This study tests the hypothesis that the lockup lengths reflect the firms' quality, asymmetric information and agency problems. The focus particularly is on the potential role and power of underwriters in setting up lockups and enforcing them. Moreover, I assess whether the institutional holding, which is relatively large in the UK, affects lockup lengths and the probability of early trades. In the US, Chen, Jegadeesh and Wermers (2000), Chen, Hong and Stein (2002) and Ben Dor (2003) report that

[54] The UK Model Code prescribes much faster reporting of directors' dealings. The directors must inform their company as soon as possible after the transaction and no later than the fifth business day after a transaction for their own account or on behalf of their spouses and children (Hillier and Marshall (2002)). In turn, a company must inform the LSE without delay and no later than the end of the business day following receipt of the information. This implies that the information about insider transaction reach market as late as 6 days after transaction. In contrast, in the US, during the pre-Sarbanes-Oxley period, insiders have to report their trades on the 10th of the month following the transaction, resulting in a maximum delay of between 10 and 42 days, depending on the trading date. As a result, most previous studies could not analyse insider-trading event on or before the lockup expiry date.

institutional ownership is positively related to performance while in the UK they appear to be passive (e.g., Franks et al. (2001), and Faccio and Lasfer (2000)).

In the second stage, this study assesses the observed relatively significant insider selling as well as buying activity during lockup periods, and determines the characteristics of IPOs that are subject to early insider sell or buy trades. I test the hypothesis that insiders are likely to be able to sell their locked up shares before the expiry dates if the post-IPO performance is abnormally positive. Such price performance will be consistent with the mitigation of the information asymmetry problem, and a reduction in the commitment of insiders (Brau et al. (2005)). In addition, if the post-IPO share prices are high, underwriters can extract rent from the execution of trades by insiders, and, as shown in previous studies, insider sell trades are likely to occur after stock price run-ups (e.g., Seyhun (1986)). Therefore, it is expected that insider sells before the lockup expiry dates to be consistent with the four main hypotheses underlying the existence of lockups, i.e., information asymmetry, signalling firm quality, commitment, and rent seeking hypotheses (Brav and Gompers (2003)). In contrast, insiders are likely to increase their holdings before the lockup expiry dates if stock prices decline in the post-IPO period. I also analyse the market reaction to such trades, and assess whether the event period abnormal returns are similar to conventional insider trading returns, as, in the UK, companies have to announce any insider trades to the market when they are undertaken.

Finally, this study analyses the stock market behaviour around the lockup expiry dates and assess whether the actual sell trades and the pre-lockup early trades affect the well-documented stock prices decreases. This research contributes to this literature in several ways. First, it is assessed whether, as in the US, stock prices drop on the lockup expiry dates. Second, actual and expected sell trades are differentiated by analysing separately IPOs where insiders sell on the expiry dates. Third, I relate the actual sell trades, if any, and lockup expiry dates abnormal returns to the trading behaviour of insiders before the lockup expiry dates. I expect a higher propensity to sell on the expiry dates in IPOs where insiders increase their holding, i.e., early buy trades IPOs, leading to significantly lower returns than the remaining IPOs. In contrast, for IPOs with early sells, the expiry dates abnormal returns are expected to be positive, as insiders have already sold before the lockup expiry dates. The commitment and signalling hypotheses suggest that firms that have bad (good) news, or are less (more) subject to moral hazard, and potential agency conflicts, should have lower (higher) lockup expiry dates abnormal returns. Overall, I expect the sign and the magnitude of abnormal returns to be lower (higher) in IPOs where insiders buy (sell) before lockup expiry dates.

5.3 Data Sources

This study starts with all the 1,117 IPOs that went public on AIM and London main market between January 1999 and 2006. The following filters were used to construct final sample. 76 companies were excluded for which the prospectuses cannot be found in *Perfect Filings* database. Further 15 companies were excluded with missing share price data on *DataStream*, and 195 firms with missing lockup date or ownership data from the prospectuses. Final sample includes 831 (74%) IPOs with complete data.

The LSE database is used to collect data on the quotation market (AIM or Main market), admission date, country of incorporation, issue price, market value, money raised, name of the broker, and for AIM IPOs, the advisor. I download all prospectuses from *Perfect Filings* database and hand-collect all information relating to lockup arrangements, including lockup dates, percentage of shares locked-up, fraction of insider shares locked up, directors' ownership before and after IPO, percentage sold in the IPO, institutional ownership, and venture capital backing. I further use *DataStream* to collect any delisting dates, and accounting and market data, which includes daily stock prices and indices, to compute the stock returns, market capitalization and turnover, which is used as proxy for size, accounting return on assets to measure profitability, and price-to-book ratio to proxy for growth.

Finally, I use *Directors Deals*, a large database of all UK firms' directors' trades spanning from January 1999 to December 2007, to collect data on trades undertaken by insiders of the sample IPOs. The database includes news items on directors' trades disclosed by all UK firms to the Regulatory News Service (RNS). A number of observations that are not likely to be driven by private information, such as exercise of options or derivatives, script dividends, bonus shares, rights issues, awards made to directors under incentive plans or reinvestment plans, are excluded. All directors' transactions in investment companies are also excluded. After this screening, 36,943 insiders' trades from the UK market are obtained. I check the data for errors and exclude 2,952 (8%) trades as the difference in announcement and transaction date is more than 5 days. The final sample includes 33,991 directors' trades in 2,664 listed companies, split into 26,268 (77%)

purchases and 7,723 (23%) sell trades. This insider-trading database includes transaction price, amount, and value, post-transaction holding, change in holding, name and position of the insider, and announcement and transaction dates, as UK insiders can delay up to five days the announcement of their trade, but most report their trades on the RNS on the transaction date (Korczak and Lasfer (2009)).

This study matches the IPO sample with the insider trading data and found 4,762 transactions in 657 IPOs, split into 3,513 (74%) buy and 1,249 (26%) sell trades. The remaining 358 IPOs do not have any insider transactions. This study then matches the dates of the trades with the lockup expiry dates. I include in sample of early sells and buys, any trade that occurs during the period spanning from the IPO date to one day before the lockup expiry date. If the company have a staggered lockup contract I consider any insider trading activity as early trades if it happens within the first lockup expiry date. I exclude any events when both buy and sell trades occur to eliminate any sells from the post-IPO buys. My final sample includes 186 early sell and 694 early buy trades in 116 and 254 IPOs, respectively.

This study uses the standard event study methodology to assess the market reaction on the insider trading events and lockup expiration dates. The market adjusted model is used to compute the abnormal returns over the event window [-42, +42] relative to these events. The market adjusted abnormal returns are calculated against the corresponding market indices, the AIM all share price,[55] and FTSE All share indices, for AIM and main market companies, respectively.

[55] As an alternative to AIM all share price index, we used the Hoare Govett Smaller Companies (HGSC) Index as the market index. My results are qualitatively similar.

5.4 Empirical Results

5.4.1 The Distribution of Lockups and Early Insider Trades

Table 5-1 provides the descriptive statistics of sample firms. Panel A. reports the lockup and fundamental characteristics of the data, with mean, 10th, 50th and 90th percentiles. Interestingly, the average (median) length of the lockup is 391(365) days, more than double that in the US, where, for example, Brav and Gompers (2003) and Field and Hanka (2001) find a median of 180 days. The sample IPOs offered 38.6% (32.9%) of their shares in the market, and the mean (median) shares locked amounts to 29.5% (24%) of the shares outstanding. The average underpricing of 22.5 % is close to Chambers and Dimson (2009) of 24.9% over the period 1999-2006, but higher than the 14.7% reported by Brav and Gompers (2003), although this is mainly due to differences in sample periods.[56]

[56] We use Chambers and Dimson (2009), Table 3, column 1 Number of IPOs, and column 2 EW (equally weighted) mean return, to estimate their average underpricing. We find that in 1988 to 1996, Brav and Gompers (2003) report average US underpricing of 14.7%, but Chambers and Dimson (2009) UK data implies 10.78%.

Table 5-1 Descriptive Statistics

Panel A. Descriptive statistics of the lockup and fundamental characteristics

	10th Percentile	*Median*	*Mean*	*90th Percentile*
Days locked	306	365	391	548
Shares locked (%)	1.50	24.00	29.40	68.00
Percent of offering as primary shares	12.6	32.90	38.60	78.00
Underpricing (%)	-1.50	9.90	22.50	51.30
Market value of equity(2008 £m)	3.20	21.60	140.20	204.10
Market-to-book	0.88	3.01	3.88	11.15
Return on Assets	-52.6	-2.60	-34.6	11.10

Panel B. Annual distribution of the sample IPOs

Year	*1999*	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*
IPOs	39	144	59	44	39	159	201	146
Average money raised (£m)	187.2	253.5	106.8	84.1	100.0	51.6	73.6	138.4
Days Locked	427	374	410	437	404	392	388	375
Early sell (%)	3	9	6	6	3	12	21	41
Early buy (%)	0	2	3	2	7	15	26	44

Panel C. Lockup ranges

Lockup days	*<89*	*90-180*	*181-364*	*365*	*366-550*	*551-720*	*721-1096*
Observations	7	25	80	560	79	19	61
Percent of observations	0.84	3.00	9.63	67.38	9.50	2.28	7.34
Early sell (%)	0	5	19	38	15	10	13
Early buy (%)	0	4	7	56	13	2	18

Panel D. Means [Medians] of lockup days, shares locked up and underpricing

Sample	N	Days Locked	Shares locked (%)	Underpricing (%)
Market value>median	416	387[365]	26.0[18]***	26.4[10.7]***
Market value<median	415	395[365]	32.8[30]	18.6[9.0]
p-values for differences in means		0.23	0.00	0.00
Prestigious underwriter	166	338[365]***	25.2[18]***	9.1[6.7]***
Other underwriter	665	403[365]	30.4[25]	26.0[10.5]
p-values for differences in means		0.00	0.00	0.00
Venture-backed	116	357[365]***	19.7[15]***	28.8[9.0]
Non-venture-backed	715	396[365]	30.6[25]	21.5[10.0]
p-values for differences in means		0.00	0.00	0.13
Main Market	141	334[365]***	23.3[16]***	18.6[7.7]
AIM	690	402[365]	30.6[25]	23.5[10.0]
p-values for differences in means		0.00	0.00	0.21
Institutional holding	504	379[365]***	25.4[20]***	22.8[9.2]
No Institution holding	327	411[365]	36.0[31]	22.1[10.5]
p-values for differences in means		0.00	0.00	0.28
Bubble period	183	380[365]	35.2[33]***	32.1[9.7]***
Non-bubble period	648	388[365]	27.0[21]	16.4[10.0]
p-values for differences in means		0.20	0.00	0.00

Hot market	676	412[365]***	28.5[23]***	27.1[10.0]
Cold market	155	381[365]	33.7[29]	18.9[7.1]
p-values for differences in means		0.00	0.00	0.12

The sample includes 831 IPOs from January, 1 1999 to 31 December 2006, for which I could find lockup information. *Days locked* is the length of lockup period, *Shares locked* is the ratio of shares locked to shares outstanding. *Percentage of offering as primary shares* is the fraction of offering that is new shares. *Underpricing* is the percent return on the first day from the offering price to the closing price. *Market value* is the offering price times shares outstanding in 2008 millions of Pound Sterling constant terms. *Market-to-book* is the ratio of market capitalization at the IPO divided by the book value of the equity in the first reporting period after IPO. *Return on assets* is the net income divided by total assets in the first reporting period after the IPO. *Average Money Raised* is the ratio of money raised in 2008 £bn over the number of IPOs. *Early sells (buys)* are trades that occurred prior to the lockup expiration dates. *Prestigious underwriters* are the global underwriters defined in Derrien and Kecskes (2007). *Venture-backed* is dummy equal to one if the IPO is backed by venture capitalists. *AIM* is for Alternative Investment Market and *Main market* is the Official List. *Institutional holding* refers to any institutional investors who hold more than 3% share at the time of IPO. *Bubble period* is defined as 1999-2000 period following Levis (2008). *Hot market* is when the IPO volume increases significantly and includes two periods January 1999 to March 2001 and January 2004 to end of 2006. *Cold market* is the remaining sample period. ***, **, * significant at 0.01, 0.05, and 0.1 levels, respectively.

In terms of fundamentals, the results indicate that, while the average market value of equity of sample firms is £140m (about $210m), the sample includes small as well as large firms. Consistent with Brav and Gompers (2003), the sample IPOs are high growth and make losses, as the average (median) market-to-book ratio is 3.88 (3.01), and return on equity is -34.6% (-2.6%).

In Panel B., I report the annual distribution of IPO sample and the lockup lengths. The volume of IPOs is relatively high in 2000, the 'Bubble' period, followed by a relatively quiet period 2001-2003, and then a heavy IPO activity period of 2004-2006. These results are in line with Chambers and Dimson (2009). In terms of money raised, IPOs appear to be relatively larger in 1999-2000 with an average of £200m per issue, compared to £88m in the post-2001 period. The most interesting results relate to the distribution of the average lockup lengths. The results show that the maximum of 437 days is reached in 2002 and the minimum of 374 is in 2000. However, I note that the distribution is relatively homogeneous, higher than the median of 365 days and in no single year is the average close to the 180 days documented in the US. Finally, I report the annual distribution of insider trades that occur before the lockup expiry dates. Interestingly, the results indicate that 74% of early sells, and 85% of early buys occur in 2004-2006, indicating that the early trades are relatively more recent, and probably reflecting the increase in IPO volume. During the internet boom and early 2000s, very few IPOs have early insider trades. These results suggest that, while the early trading activity is sample period dependent, which I account for in my analysis below, the lockup lengths are relatively constant across the sample period.

Panel C. reports the distribution of the lockup length by ranges and shows that more than 67% (560 companies) of the sample firms have lockups of one year. It is interesting to note that less than 1% of IPOs have lockups lower than 3 months (89 days) and only about 4% have lockups less than 180 days. In contrast, 19% have lockups above one year, and more than 7% lockups are higher than 2 years (721 days). The concentration of lockups in the 365 days period suggests that they appear to be more standardised than Espenlaub et al. (2001).[57] Similarly, Field and Hanka (2001) and Brav and Gompers (2003) also find clustering of the lockup lengths in the US, but closer to relatively shorter period of 180 days.

Panel C also shows the distribution of the early buy and sell trades. I note that the vast majority (56%) of the buy trades occur in lockups of one year, and 33% in lockups higher than one year, and thus, only 11% are in lockups lower than

[57] Espenlaub et al. (2001) find that only 54 out of their 188 IPOs (29%) have a fixed expiry date. In addition, the directors set expiry dates in 'absolute' terms, i.e. by specifying (a period after) a calendar date. The remaining firms set expiry dates relative to other, more or less predictable, events such as the publication of results.

one year. In contrast, the sell trades are relatively more evenly distributed, as 38% of the trades occur in lockups of either one, or more than one year and 24% are in lockups lower than one year. It is interesting to note that only 5% of the sell trades occur in lockups of less than 180 days, suggesting that, on an average, the holding period of UK insiders in their IPO shares is relatively longer than that in the US.

Panel D reports the distribution of lockup length, percentage of shares locked and underpricing, split into various categories. I find that the average lockup length is independent of the IPO size and the bubble period,[58] but it is lower in IPOs with prestigious underwriters,[59] venture capitalist backing, main market quotation, institutional holding, and those issued in cold market. However, the median lockup length across these groups of 365 days is relatively constant. In addition, the lower means are relatively close to 365 days than the 180 days in the US. In particular, Brav and Gompers (2003) report the average (median) lockup lengths of IPOs with prestigious underwriters of 193 (180) days in the US, compared to my findings of 338 (365) days, suggesting that, in the UK underwriters are able to exert more power to lock insiders over a longer period. I also note that their prestigious underwriters represent about 50% of their sample, while my data shows 20% (166/831).

The second column reports the proportion of shares locked. The results indicate that this proportion is significantly lower in IPOs that are large, underwritten by prestigious investment banks, backed by venture capitalists, held

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[58] We define bubble period as 1999-2000 period, following Levis (2008).

[59] We follow Derrien and Kecskes (2007) and include in prestigious underwriters global investment banks such as ABN AMRO, Cazenove & Co., Credit Lynnais Securities, Dresdner Kleinwort Wassertein, HSBC Securities, Credit Suisse, KBC Securities, Lehman brothers, Nomura International, Schroder Salomon Smith Barney, SG securities, UBS, West LB, Merrill Lynch International, Goldman Sachs.

by institutional investors, and issued in the main market (as opposed to AIM), and in non-bubble and hot periods. My results are not consistent with Brav and Gompers (2003). First, their average (median) proportion of shares locked of 57.0% (60.9%) is much larger than my 29.4% (24.0%). Second, they find that this proportion is positively related to IPO size, prestigious underwriters and venture-backed IPOs. It is interesting to note that IPOs underwritten by prestigious underwriters have relatively shorter lockup lengths but also smaller proportion of shares locked than the remaining IPOs.

The last column shows that while the level of underpricing is unaffected by venture capitalist backing, market of quotation, institutional holding and hot market period, it is lower in IPOs that are small, underwritten by prestigious investment banks, and issued in non-bubble periods. These results are also not fully consistent with Brav and Gompers (2003) who show that venture capitalists and prestigious underwriters do not affect their underpricing, but it is higher in larger IPOs.

5.4.2 The Determinants of Lockup Lengths

The results in the previous section are based on univariate analysis. This section explores further the determinants of lockup lengths by running a set of regressions to account for simultaneous effects of all the potential factors, and contrast my results with US evidence. The dependent variable is the logarithm of lockup lengths in days. The independent variables are similar to previous studies (e.g., Brav and Gompers, 2003) for comparative purposes. They include a set of dummy variables to capture venture capitalist backing, *Venture-backed;* underwriting by prestigious/global investment bank, *Prestigious underwriter;* the presence of large institutional investors, *Institutional holding;* issuance of the IPO during the period when the IPO volume increases significantly, namely, January 1999 to March 2001 and January 2004 to end of 2006, *Hot market;* industry impact, i.e., if the IPO is in the following industries: computer manufacturing, electronic equipment, computer and data processing services, and optical, medical and scientific equipment, *High-tech Dummy;* and finally, listing on AIM as opposed to the main market, *AIM Dummy*.

IPO fundamentals and other lockup characteristics are controlled for by including *Size*, the log of market value of equity in 2008 constant terms, *Market-to-book*, the ratio of market value at the IPO divided by the book value of the equity in the first reporting period after IPO, *Shares locked,* the fraction of insider shares subject to lockup restrictions, *Shares issued*, the ratio of shares issued and fully traded over number of shares outstanding and, *Cash Flow Margin,* the ratio of operating cash flows to sells. I replace observations whose values are either lower than the 1st or higher than 99th percentiles by the sample median to eliminate any effect of outliers for each variable. I show separate results for the main market and AIM to capture any other unobservable legal and institutional differences across the two markets.

Table 5-2 reports the results. For the sample as a whole, the lockup lengths are negatively related to venture capital backing, prestigious underwriter, institutional holding, size and hot market dummy, but positively related to shares locked. In the second regression, I include AIM dummy instead of size to overcome the multicollinearity problem. As expected, AIM IPOs have longer lockups than those listed on the main market. I find similar results when I split my sample into the two markets, with the exception of size and shares locked up that are significant in the main market but not on AIM, and the hot market dummy that affects more AIM IPOs.

Consistent with Brav and Gompers (2003), the results indicate that larger firms, underwritten by prestigious underwriter, backed by venture capitalist, and firms with institutional investors all have, on average, shorter lockups. These factors are associated with less informational asymmetry about the IPO's aftermarket value and future prospects. For example, insiders in firms with high quality underwriters, or venture capital backing, are less likely to refrain from disclosing private information to outside investors, and, therefore, have less need for commitment of a longer lockup. The presence of institutional investors in the firm is also an alternative proxy for a reduction in the information asymmetries and an increase in monitoring of insiders, resulting in shorter lockups.

Table 5-2 Determinants of the Length of the Lockup

	Full Sample	Full Sample	Main Market	AIM
Constant	13.04***	23.7***	6.54***	6.02***
	[12.44]	[12.28]	[9.7]	[4.45]
Venture-backed	-0.07***	-0.06**	-0.19**	-0.03**
	[-2.01]	[-1.98]	[-2.14]	[-1.99]
Prestigious underwriter	-0.16***	-0.13***	-0.04***	-0.11***
	[-4.28]	[-3.43]	[-3.38]	[-2.71]
Institutional holding	-0.03***	-0.03***	-0.02**	-0.03**
	[-2.26]	[-2.15]	[-2.02]	[-1.86]
Size	-0.02***		-0.17***	-0.01
	[-2.49]		[-5.64]	[-1.34]
Market-to-book	0.0007	0.001	0.001	0.005
	[0.45]	[0.95]	[0.55]	[0.93]
Shares locked	0.001**	0.001	0.005***	0.0001
	[1.71]	[1.13]	[3.11]	[0.19]
Shares issued at IPO	-0.002	-0.002	-0.001	-0.002
	[-0.46]	[-0.26]	[-0.25]	[-0.31]
Cash flow margin	-0.007	-0.002	-0.07*	-0.007
	[-0.93]	[-0.43]	[-1.71]	[-1.40]
Hot Market Dummy	0.05**	0.05***	0.12	0.07***
	[1.72]	[2.01]	[0.11]	[2.43]
High-tech Dummy	-0.05	-0.04	-0.03	-0.03
	[-1.35]	[-1.15]	[0.28]	[-0.68]
AIM Dummy		0.17***		
		[3.70]		
Adjusted R^2	10.9	12.1	7.2	9.8
Number of Observations	831	831	141	690

The sample includes 831 IPOs from January 1 1999 to 31 December 2006, for which I could find lockup information and other market data. The dependent variable is the log of the lockup days. *Venture-backed* is dummy equal to one if the IPO is backed by venture capitalists. *Prestigious underwriter* is dummy variable equal to one if global underwriter is the underwriter for the float. *Institutional Holding* is a dummy variable equal to one if institutional investors hold more than 3% share at the time of IPO. *Size* is the log of market value of equity in 2008 constant terms. *Market-to-*book is the ratio of market capitalization at the IPO divided by the book value of the equity in the first reporting period after IPO. *Shares locked* is the fraction of insider shares that are subject to lockup restrictions. *Shares issued at IPO* is the ratio of shares issued and fully traded over number of shares outstanding. *Cash Flow Margin* is the ratio of operating cash flows over sells. *Hot market* is a dummy equal to one if the IPO is during the period when the IPO volume increases significantly and includes two periods January 1999 to March 2001 and January 2004 to end of 2006. *High-tech Dummy* is equal to one if the IPO is in the following industries: computer manufacturing, electronic equipment, computer and data processing services, and optical, medical and scientific equipment. *AIM Dummy* is equal to one if the IPO is listed on the Alternative Investment Market. To eliminate the possible effect of outliers, for each variable, I replace observations whose values are either lower than the 1st or higher than 99th percentiles by the sample median. *t* statistics are in the brackets. ***, **, * significant at 0.01, 0.05, and 0.1 levels, respectively.

In line with Brav and Gompers (2003), shares issued at IPO, and cash flow margin do not affect the lockup length. I also include high tech dummy as I expect high-tech companies to have longer lockup lengths as they are more risky, but the coefficient is negative and not significant. However, unlike Brav and Gompers (2003), market-to-book is not significant, suggesting that high-growth companies do not necessarily have high lockup periods. Such companies are likely to have high-risk, and, therefore, should have longer lockup lengths. Although the coefficient is positive, it is not significant. Nevertheless, overall results of this chapter are relatively similar to US evidence as reported by Brav and Gompers (2003) and suggest that institutional setting has relatively smaller effect on the design of lockups.

5.4.3 Insider Trading Prior to Lockup Expiration

This section explores the behaviour of insider equity selling from IPO allocation and buying prior to the lockup expiration. Since the UK financial regulator, the Financial Services Authority (FSA), does not mandate lockups, as they are only an agreement between the underwriter and the IPO firm, insiders can sell their stock prior to lockup expiration if the underwriter chooses to free them from the obligation to hold shares until the lockup expiration. Since lockups are a commitment mechanism, I consider that insiders are likely to be released from lockup restrictions if their potential to take advantage of outside shareholders is reduced. Following Brav and Gompers (2003) and Brau et al. (2005), the commitment and signalling hypotheses predict that insiders in high quality IPOs are more likely to be released early from lockup contracts. I, therefore, expect these firms to have higher post-IPO abnormal returns, as well as prestigious underwriters, and to be backed by venture capitalists.

For the buy trades, this study considers two hypotheses: (i) the IPO is a good company and insiders want to increase their holdings, and (ii) the company is doing badly and insiders buy to support the price, and to increase the commitment and the signalling effects. In the first case, the test is consistent with the asymmetric information hypothesis put forward in the context of trading literature. For example, Brennan and Cao (1996) argue that informed investors are contrarians while uniformed investors are trend followers. In this case, I expect insider purchases to be driven by only the decline in share prices, and other variables such as venture capital backing, the presence of institutional investor, and the quality of underwriters are not likely to be important. The post-event CARs are expected to be positive and significant. In contrast, if the objective of insiders' purchases is to support the price following price decline, then it is possible that they are driven by the underwriters, and the locked-in venture capitalists, by making insiders increase their commitments, and the signalling of the firm's quality. In this case, I expect the insider purchases to be related to the presence of venture capitalists, high quality underwriters, shares locked, and length of the lockup. The post-event CARs may not be significant if the signal is not credible.

5.4.3.1 Univariate Analysis

Table 5-3 presents a summary of insider trading prior to the lockup expiry dates. Panel A. shows that the average and median number of early insider sells amount to two. The average lockup period of such companies is 423 days. Since the average for the sample as a whole is 391 days, as reported in Table 1, Panel C., the results imply that the sell trades are likely to occur in longer lockups. The average (median) sells occur 58% (62%) of the way from the IPO to the lockup date, i.e., about 245 days after the IPO date. The average (median) proportion of shares locked relative to shares outstanding is 33% (30%), but these shares locked represent 95% (100%) of the holdings of insiders, out of which they sold 5.63% (0.51%). In relation to the shares outstanding, the average (median) sell trades represent 2.54% (0.23%). Interestingly, before they sell, share prices increase by an average (median) of 9.72% (8.15%), suggesting that such sells occur in IPOs that appear to have done very well.

Panel B. reports the results for the buy trades. The results are qualitatively similar to Panel A., with the exception of the proportion of shares bought and the pre-trades share price behaviour. On average, insider buys represent a smaller proportion of the shares locked (0.91%), and shares outstanding (0.21%). In contrast to the sell trades, the buy trades are more likely to occur in underperforming IPOs, as the mean (median) abnormal stock returns are -8.47% (-4.64%).

Table 5-3 Summary Statistics of Insider Trading prior to Lockup Expiration Dates

	10th percentile	Median	Mean	90th Percentile
Panel A. Early sell trades				
Number of trades	1	2	2	4
Days Locked	184	365	423	730
Sell time as fraction of lockup length (%)	15	62	58	95
Shares locked relative to shares outstanding	7	30	33	73
Shares locked relative to insider shares	70	100	95	100
Shares sold early relative to shares locked	0.06	0.51	5.63	10.25
Shares sold early relative to shares outstanding	0.02	0.23	2.54	6.78
$CAR_{-42,-2}$	-6.15	8.15	9.72	25.48
Panel B. Early buy trades				
Number of trades	1	2	3	5
Days Lockup	360	365	438	731
Buy time as fraction of lockup length (%)	9	43	61	93
Shares locked relative to shares outstanding	10	26	30	65
Shares locked relative to insider shares	66	100	93	100
Shares bought early relative to shares locked	0.035	0.27	0.91	1.69
Shares bought early relative to shares outstanding	0.005	0.045	0.213	0.345
$CAR_{-42,-2}$	-38.5	-4.64	-8.47	13.38

I obtained insider holdings data for the period January 1999 to December 2007 from the Directors Deals and match it with my constructed lockup dataset. The early sells (buys) are trades that occurred prior to the lockup expiration dates. The sample includes 186 sell trades by 116 IPOs (Panel A) and 694 buy trades by 254 IPOs (Panel B). *Sell (buy) time as a fraction of lockup length* is the ratio of the number of days from the IPO date to the trade date over the lockup length. $CAR_{-42,-2}$, the cumulative abnormal return 40 day pre-event window. I use the standard event study methodology to compute the abnormal returns with α and β based on regression of stock returns on the FTSE All Share Price Index for main market companies and AIM All Share Price Index for AIM companies.

Table 5-4 presents a comparative analysis of early trades firms against the remaining IPOs. Panel A. reports summary statistics of the 116 firms that are released from lockups compared to the 715 with no early sell trades. The early sell trades represent 14% out a total sample of 831 IPOs, in line with US evidence of 17% and 15% reported by Field and Hanka (2001) and Brav and Gompers (2003) respectively. Interestingly, the vast majority (85%) of these companies released are from AIM. Insiders sold an average of 16.42% (with a maximum, not reported of

56.8%) of their shares locked. These companies are also more likely to have longer lockups (423 days vs. 389), a larger proportion of shares held, a smaller proportion with institutional presence, and they are larger, not from high-tech industry and backed by venture capitalists. Compared to the remaining 715 IPOs, early sell IPOs generate significantly larger returns prior to the insider sells (9.72% vs. 0.52% for the remaining IPOs),[60] and they had significantly lower underpricing at the time of IPO (9.53% vs. 23.09%). These results appear to suggest that the early sell trades are more likely to occur in lower moral hazard and information asymmetry firms, and imply that underwriters do not allow early sells in low-liquidity firms, those not backed by venture capitalist and with low returns because of the higher level of asymmetric information. Consistent with previous evidence on insider trading (e.g., Korczak and Lasfer (2009)), the announcement and post-announcement abnormal returns are negative and significant, suggesting that the sell trades provide negative information to the market.

IPOs where insiders sell prior to lockup expiration are underpriced by 9.53% (Table 5-4). This is consistent with asymmetric information models of Rock (1986). The underpricing is also consistent with Holmstrom-Tirole (1993) who asserts that when stockholders realize that they will lose money on trades with speculators, they pay less for the shares they buy when the firm issues them. In the post-IPO period, the adverse selection problem induced by insiders' sells is mitigated by the share price run-up during that time period. Since, underwriters allow insiders to sell shares in firms with recent share price run-ups, it mitigates the

[60] For the no insider trade sample, we measure the 40-day abnormal return as the abnormal return over the whole lockup period standardised to 40 days.

adverse selection, and, at the time of lockup expirations, investors are not affected, as the early sell IPOs do not experience a significant price drop around lockup expirations. On the other hand, the IPOs where insiders buy early are underpriced even more (18.87%). Insiders' early buy trades occur in IPOs where the share price declines in the post-IPO period. Given that early buy IPOs perform badly in the post-IPO period, investors pay even less for them at the offering stage.

Table 5-4 Characteristics of IPOs with and without Early Insider Trades

Insider trading prior to lockup expiration	Yes	No	p-value of diff. in mean
Panel A. Early sell trades			
Number of IPOs	116	715	
AIM companies (%)	85	15	
Number of trades	186	–	
% Shares sold relative to shares locked	16.42	–	
Average Lockup (days)	423***	389	0.00
% Shares locked relative to shares outstanding	33***	29	0.00
% Shares locked relative to insider shares	95**	90	0.05
$CAR_{-42,-2}$	9.72***	0.52	0.00
$CAR_{-1,+1}$	-1.78***		
$CAR_{+2,+42}$	-5.96***		
Underpricing	9.53***	23.09	0.00
Size	274***	125	0.05
Prestigious underwriter (%)	23.2	19.6	0.18
Venture-backed (%)	19.22**	11.49	0.05
Institutional Holding (%)	48.38***	62.63	0.00
High-tech (%)	3.7***	10.6	0.00
Panel B. Early buy trades			
Number of IPOs	254	577	
AIM companies (%)	94	6	
Number of trades	694	–	
% Shares bought relative to shares locked	4.83	–	
Average Lockup (days)	438***	388	0.00
% Shares locked relative to shares outstanding	30	31	0.11
Shares locked relative to insider shares	93***	97	0.05
$CAR_{-42,-2}$	-8.47***	-3.01	0.00
$CAR_{-1,+1}$	2.43***		
$CAR_{+2,+42}$	1.02		
Underpricing	18.87	22.99	0.23
Size	169.45	151.16	0.26
Prestigious underwriter (%)	20.74	20.81	0.85

Venture-backed (%)	15.85**	10.72	0.04			
Institutional Holding (%)	64.69	61.48	0.13			
High-tech (%)	10.66	10.27	0.25			
Panel C. Abnormal Returns Around Insider Trades relative to All UK Insider Trades						
	Early sell	All	p-val	Early buy	All	p-val
N	116	7,723		254	26,268	
CAR $_{-42,-2}$	9.72***	5.60***	0.00	-8.47***	-4.32***	0.00
CAR $_{-1,+1}$	-1.78***	-0.13	0.00	2.43***	1.02***	0.00
CAR $_{+2,+42}$	-5.96***	0.24	0.00	1.02	2.13***	0.00

CARs are the cumulative abnormal return over various windows. For the no trade sample, I measure the 40-day abnormal return as the abnormal return over the whole lockup period standardised to 40 days. *Underpricing* is the percent return on the first day from the offering price to the closing price. *Size* is the market value of equity in 2008 constant terms. *Prestigious underwriter* is defined if the global investment bank has underwritten the issue. *Venture-backed* is the proportion of IPOs backed by venture capitalist. *Institutional Holding* is the proportion of companies where institutions hold more than 3%. *High-tech Dummy* is equal to one if the IPO is in computer manufacturing, electronic equipment, computer and data processing services, and optical, medical and scientific equipment. I report *p*-values for the mean difference test between early trade and no trade. ***, **, * significant at 0.01, 0.05, and 0.1 levels, respectively.

Panel B. reports the results for the 694 buy trades undertaken in 254 IPOs. The number of IPOs with buy trades represents 31% of total sample firms, and as far as I know, no previous study considers such trades. Interestingly, nearly all the 254 IPOs with buy trades (94%) are quoted on AIM, and as a result, only 6% of the remaining 577 companies without insider buy trades are from the AIM. Insiders bought an average of 4.83% (with a maximum, not reported of 28.2%) of their shares already locked. In line with the sell trades reported in Panel A., the buy trades appear to occur in IPOs with longer lockup days, high proportion of shares locked relative to shares held, and those with high venture capitalists backing. Unlike the early sell trades reported in Panel A., the buy trades do not appear to occur in large and IPOs with low institutional block ownership. The most interesting findings relate to the level of underpricing and the share price performance around the event dates. Unlike the early sell trades IPOs, the average underpricing of the 254 early buy IPOs of 18.87% is statistically higher than that of early sell IPOs (Panel A.), but similar to the 22.99% of the remaining 577 IPOs. In addition, the results indicate that early buy trades IPOs underperform significantly in the pre-event period, as the $CAR_{-42,-2}$ of -8.47% are statistically significant and lower than the -3.01% observed for the remaining 577 IPOs. On the event period, the abnormal returns increase by 2.43%, but this positive share price performance appears to be limited, as the post-event abnormal returns of 1.02% are not significant. These results suggest that early insider buys are more likely to be undertaken to support prices for underperforming IPOs rather than to convey private information about future performance.

Table 5-4 (Panel C) compares insider trading within lockup period and insider trading in all companies in the UK during the sample period. The information content is higher for the trades undertaken within the lockup period compared to all insider trades. For example, the event-period return for early sell trades is -1.78%, compared to -0.13% for all sells. For early buys, the immediate market reaction is 2.43% compared to 1.02% for all buys. The mean differences are significant at 1% level for both sell and buy trades for pre-event, event and post-event periods. These results are consistent with the view that information asymmetry is higher in IPOs.

Fishman and Hagerty (1992) assert that insider trading might have two adverse effects on stock price efficiency. First, with insider trading the number of informed traders in the market is lower and insiders hinder non-insiders from acquiring information and trading. Second, with insider trading, the information in the market is not evenly distributed, i.e., insiders have information advantage. Since insiders have informational advantage, lockup restricts insiders from selling shares after IPO. The existence (lack) of insiders may discourage (stimulate) information production by the analysts, hence negatively (positively) affecting the efficiency of stock prices.

5.4.3.2 Multivariate Analysis

Logit regressions are estimated to determine which firms are more likely to have insider trades prior to lockup expiration. The results are reported in Table 5-5. The dependent variable is a dummy equal to one if the early insider sell (Panel A.) or buy (Panel B.) occur prior to lockup expiration, and zero otherwise. As predicted by the commitment and signalling hypothesis, Panel A. shows that firms with reduced information asymmetry problems are more likely to have early insider sells. The abnormal returns over the preceding 40-day period are positively related to the probability of early sells, suggesting that investors are less likely to be concerned with the insiders cashing out in firms that have done well in the past. Interestingly, the probability of early sell trades is not affected by venture capitalist backing, underpricing and the proportion of shares locked. Instead, it is positively related to prestigious underwriter, lockup length, and size, but negatively related to institutional holding. These results suggest that underwriters are likely to be behind the insiders' decision to sell shares before the lockup expiry dates. Since these

IPOs are doing well, they suggest that underwriters release insiders when there is no need for signalling, and the potential agency costs that might arise from insiders selling are likely to be small. Since these IPOs have a lower institutional ownership, and the coefficient of venture-backing is not significant, my results suggest that underwriters do not face constraints from these two investors when they decide to release insiders from their lockup commitments.

Panel B. reports the results for early buy trades. Unlike the results for the early sell trades, the coefficient of the pre-trade cumulative abnormal returns ($CAR_{-42,-2}$) is now negative and significant, suggesting that insiders buy in underperforming IPOs. The probability of insider buy trades is also affected by the IPO under-pricing, venture capitalists backing, and the proportion of shares locked. In addition, institutional holding, size and high tech dummy are now not statistically significant. However, in line with the results for the sell trades, prestigious underwriters and the lockup lengths are significantly related to the

Table 5-5 Logit analysis of early trades by insiders

	Estimate	Standard Error	*p*-value
Panel A. Early sell trades			
Intercept	-1.561**	0.730	0.032
$CAR_{-42,-2}$	5.127***	0.867	0.000
Underpricing (%)	-0.004	0.003	0.139
Venture backed	-0.590	0.435	0.175
Prestigious Underwriter	1.970***	0.390	0.000
Institutional Holding	-0.982***	0.212	0.000
Days Locked	0.0016***	0.0005	0.006
Size	0.0002*	0.0001	0.066
Shares locked	0.003	0.006	0.668
High-tech Dummy	-0.784*	0.426	0.065
Year Dummies		YES	
Pseudo R^2		19.29	
Panel B. Early buy trades			
Intercept	-0.176	0.414	0.673
$CAR_{-42,-2}$	-2.006***	0.335	0.000
Underpricing (%)	-0.004***	0.001	0.005
Venture backed	0.298*	0.165	0.071
Prestigious Underwriter	0.294*	0.152	0.054
Institutional Holding	0.065	0.081	0.419
Days Locked	0.003***	0.0004	0.000
Size	0.0001	0.0001	0.154
Shares locked	-0.007*	0.004	0.082
High-tech Dummy	-0.0002	0.185	0.999
Year Dummies		YES	
Pseudo R^2		17.43	

The dependent variable is a dummy equal to one for early insider sell (buy) trades. Insider sell sample includes 186 events by 116 IPOs and 715 IPOs with no sell trades. Insider buy sample includes 694 trades by 254 IPOs and 577 IPOs with no buy trades. $CAR_{-42,-2}$, the cumulative abnormal return 40 day pre-event window. For the no trade sample, I measure the 40-day abnormal return as the abnormal return over the whole lockup period standardised to 40 days. *Underpricing* is the percent return on the first day from the offering price to the closing price. *Venture backed* is dummy variable equal to one venture capitalist is present. *Prestigious underwriter* is defined if the global investment bank has underwritten the issue. *Institutional Holding* is a dummy variable equal to one if institutions hold more than 3% share at IPO date. *Days locked* is the log of the lockup period. *Size* is the log of market value of equity in 2008 constant terms. *Shares locked* is the number of shares locked over the holdings of insiders. *High-tech Dummy* is equal to one if the IPO is in computer manufacturing, electronic equipment, computer and data processing services, and optical, medical and scientific equipment. Year dummies are included in both regressions to control for time effects. ***, **, * significant at 0.01, 0.05, and 0.1 levels, respectively.

probability of insider early buy trades. In line with the commitment hypothesis, my results suggest that underwriters are likely to play a significant role in insiders' decision to increase their holdings before the lockup expiry dates to support the price of underperforming IPOs, probably with the help of venture capitalist, but not institutional investors, as their holding is not statistically significant. This implies that insiders increase their holdings to support the price of their IPOs, and increase their stakes when their proportion of shares locked up is low and probably not sufficient to reduce the information asymmetries.

Similar qualitative results are obtained in robustness checks. In particular, the coefficient of $CAR_{-42,-2}$ is always positive for early sell and negative for early buy trades and statistically significant. I also find that *Prestigious Underwriter* is correlated with *Under-pricing* (-0.106) and *Venture-Backed* (0.040), in line with Brav and Gompers (2003). When I exclude these two variables, I find that for both the buy and sell trades *Prestigious Underwriter* is positive and significant (coefficient = 1.48, *p*-value = 0.00 for sell, and for the buy trades 0.161, 0.01, respectively). When I exclude this variable, I find that for both early sell and buy trades, underpricing is negative and venture-backed is positive, and both variables are statistically significant. The remaining results are qualitatively similar.

Finally, the rent-seeking hypothesis is tested. As in Brav and Gompers (2003), I consider that investment banks may request lockups to commit insiders to maintain the IPO underwriters in future seasoned equity offerings (SEOs). As argued above, this commitment is likely to be stronger in the UK as companies need to maintain their underwriters throughout their quotation life. I first look through all the news announcements of sample IPOs to assess whether they had any SEOs. I find only seven out of the 116 early sell trade IPOs (6%) and 15 out of 254 early buy trades (5.9%) had SEOs over the sample period. These results suggest that investment bankers' gains from underwriting the relatively small number of SEOs are likely to be insignificant. I further estimate the gains from insider dealing as in the UK companies have to use their underwriters in any insider transactions. I find that the average (median) market making fee for sell trades are £35610.8, equivalent to about $ 50,000 (£1101.6, $1,500), and £2944.2, $4100 (£97.2, $136) for the buy trades. I consider that these gains are very small to provide support to the rent-seeking hypothesis.

5.4.4 Market Reaction on Lockup Expiration Dates

This section explores the market reaction on the lockup expiration dates. As stated in Section 5-1, previous studies provide mixed evidence on the drivers of the puzzling price drop on the lockup expiry dates. This study contributes to this literature by isolating the impact of IPOs where insiders actually sell on the lockup expiry dates and assess whether the early insider buy/sell trades affect this drop. In particular, I test the proposition that the price drop is higher (lower) in IPOs with early buy (sell) trades as investors may expect a higher selling probability from early buy than early sell IPOs.

In line with previous evidence (e.g., Brav and Gompers (2003)), I compute the abnormal returns for each IPO over the event window-10 to +10, where day 0 is the lockup expiry date. I compute the abnormal returns using the market model with the FTSE AIM All Share Price Index[61] and the FTSE All Share Price index as the corresponding market returns for AIM and main market IPOs, respectively. Table 5-6 reports the results of the cumulative abnormal returns over various event windows. Panel A. shows that for the sample as a whole, the average event date abnormal returns of -1.85% are statistically significant (t = -3.7). This negative performance extends to the seven days post event period, as share prices decrease abnormally by -0.95% in the +3 to +10 days. In the pre-event period and on the event date zero, the abnormal returns are not significant. Overall, my results are relatively consistent with previous evidence. For example, Brav and Gompers (2003) and Field and Hanka (2001) report event date abnormal returns of -1.5%, and -2.0%, respectively, and suggest that lockup expiry dates are likely to increase the agency conflicts between managers and outside investors and opens up ways for trading on insider information.[62] However, it is not clear as to whether this negative abnormal performance is driven by the actual sell trades of insiders or market expectations.

This study expands previous evidence in several ways. First, the sample IPOs are divided into early buy and early sell trade IPOs. Contrasting results are found. In particular, the abnormal returns of IPOs with early sell trades are significantly higher than the early buy trade IPOs. For the early sells sample, share prices increase substantially in the pre-event period as the $CAR_{-10,-3}$ of 4.13 are positive and statistically significant. During the event period, the $CAR_{-2,+2}$ of -1%

[61] Similar results were found using the Hoare Govett Smaller Companies (HGSC) Index.

[62] Insiders should not trade up to two months before earnings and one before any other news releases. However, Korczak and Lasfer (2007) report that they trade strategically on news announcements during these restricted periods. Internationally, insider trading rules are not enforced (Bhattacharya and Daouk (2002)).

are significant, but only 42% observations are negative. In the post-event period and on the event date zero, the abnormal returns are not significant. Overall, the results indicate that IPOs with early sell trades are not affected significantly by the lockup expiry dates.

In contrast, IPOs with early buy trades generate significantly lower abnormal returns on the lockup expiry dates. The pre-event abnormal returns of -0.01% are not statistically different from zero, but on the event and post-event periods, the abnormal returns are all negative and significant. These abnormal returns are also significantly lower than the corresponding abnormal returns for the early sell trade sample, as reflected in the *p*-value of differences in means reported in the last column of Table 5-6. These results appear to imply that the market is expecting more sell trades from early buy IPOs, as insiders increased their holdings in the pre-lockup expiry period, which may be reduced in the post-lockup expiration dates.

This study checks further these results by identifying IPOs where insiders actually sold their stakes during the lockup expiry dates. Given the requirements of insiders to report their trades up to five days after the actual transaction, I select days -5 to day +5 around the lockup expiry dates. I also use the transaction date as opposed to the announcement date of insider trades. I find no trades before or after day zero, but I identify 10 trades on the event date. None of these transactions is in early buy/sell sub-samples. Table 5-6, Panel B, presents the abnormal returns around the lockup expiry dates of IPOs without and with actual sell trades. The results of the former sub-sample are relatively similar to Panel A. However, as expected, the abnormal returns of IPOs with insider sells on the expiry date underperform significantly those without sells, particularly in the event and post-event periods, with 70% to 80% negative returns, compared to 57% and 52% for IPOs without actual sell trades.

Table 5-6 Cumulative Abnormal Returns around Lockup Expiration Dates

	All			*Early Sell*			*Early Buy*			*Mean difference p-value*
	CAR	t-stat	Percent Negative	CAR	t-stat	Percent Negative	CAR	t-stat	Percent Negative	
CAR $_{-10,-3}$	-0.09	-0.45	55	4.13***	8.27	41	-0.01	-0.04	56	0.00
CAR $_{-2,+2}$	-1.85***	-3.70	57	-1.00***	-2.00	42	-0.46***	-2.32	49	0.03
CAR $_{+3,+10}$	-0.95**	-1.90	52	-0.70	-1.41	42	-1.68***	-3.37	52	0.00
AR $_0$	-0.50	-1.25	49	0.16	0.32	44	-1.22***	-2.43	57	0.00

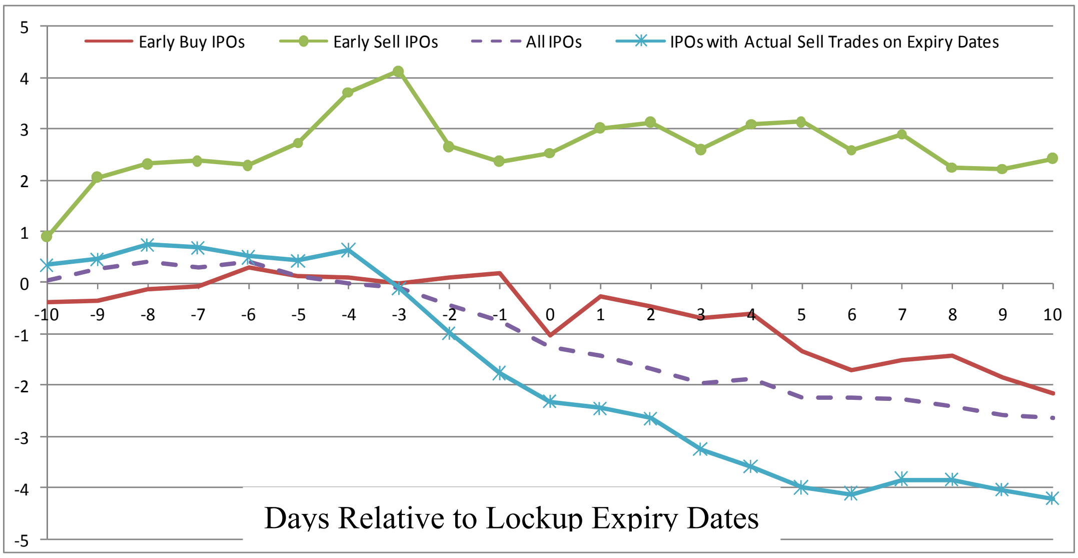
Panel B. Abnormal Returns of IPOs with and without Actual Sells on Expiry Dates

	IPOs without actual sells			IPOs with actual sells			Mean difference *p*-value
	CAR	t-stat	Percent Negative	CAR	t-stat	Percent Negative	
CAR$_{-10,-3}$	-0.09	-0.43	55	-0.10	-0.49	70	0.28
CAR$_{-2,+2}$	-1.84	-3.32	57	-2.50	-3.55	70	0.02
CAR$_{+3,+10}$	-0.85	-1.86	52	-1.50	-2.96	80	0.04
AR$_0$	-0.50	-1.24	49	-0.56	-1.26	80	0.20

The sample includes 831 IPOs over the period 1999-2006. I use the standard event study methodology to compute the abnormal returns with α and β based on regression of stock returns on the FTSE All Share Price Index for main market companies and AIM All Share Price Index for AIM companies. *Early sell* are IPOs where insiders sell before lockup expiration (116 companies with 186 trades). *Early buy* are IPOs where insiders buy before lockup expiration (254 companies with 694 trades). Panel B reports the differences in the cumulative abnormal returns over various event widows between IPOs with and without actual sell trades on the expiry dates. I do not divide the sample in this panel into early buy and early sell trades as none of these actual sells are from these two subsamples. ***, **, * significant at 0.01, 0.05, and 0.1 levels, respectively.

Figure 1 plots the daily average cumulative abnormal return (CAR) over the 21 event days. The results clearly indicate the dominance of early sell trade IPOs over the remaining IPOs throughout the whole period. These results confirm my early findings that early sell IPOs do very well, and, thus, underwriters do not need to commit further insiders to lockup contracts. For the remaining IPOs, while the pre-event CARs are relatively homogeneous, the event and post-event period abnormal returns are significantly lower for IPOs with actual sell trades, but they are also negative for IPOs with early buy trades. I also find that the -1.68% $CAR_{+3,+10}$ for the early buy IPOs are significantly lower than the -0.95% for the whole sample (p = 0.00), but relatively similar to the -1.50% for the actual sell trades IPOs (p = 0.77). These results provide further support to my earlier findings that insiders buy before the lockup expiry dates in underperforming IPOs and that they are likely to support the price, but such price support is likely to be short-lived.

Figure 5-1 Cumulative Abnormal Returns around Lockup Expiration Dates



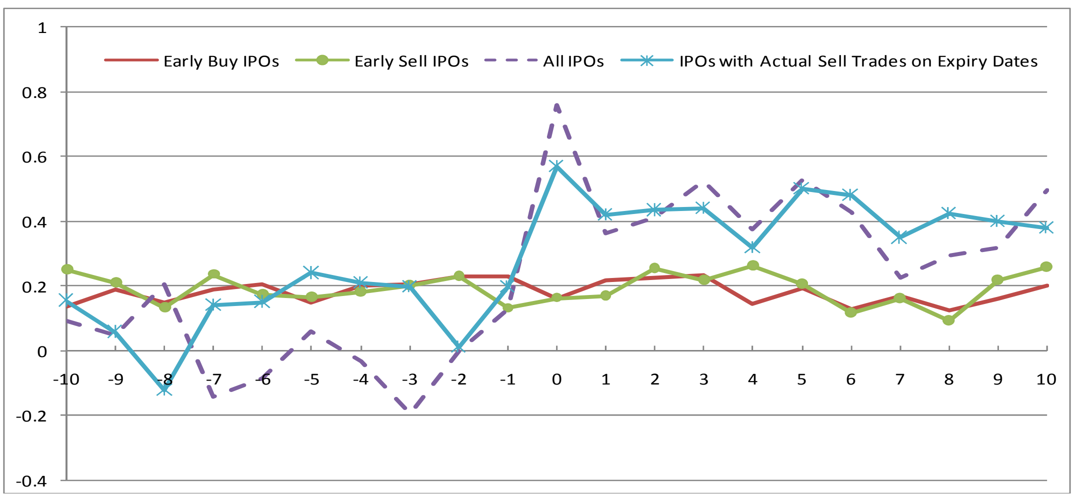
The sample includes 831 UK IPOs over the period 1999-2006. I compute the abnormal returns using the standard event study methodology with α and β based on regression of stock returns on the FTSE All Share Price Index for main market companies and AIM All Share Price Index for AIM companies. I obtain the daily share price and indices data from DataStream. *Early Sell IPOs* are IPOs where insiders sell before lockup expiration (116 IPOs with 186 trades). *Early Buy IPOs* are IPOs where insiders buy before lockup expiration (254 IPOs with 694 trades). *IPOs with Actual Sell Trades on Expiry Dates* represent the 10 firms where insiders have actually sold stakes on the expiry date.

The price drop on the lockup expiration leads me to examine whether the trading volume is abnormally high around the event period. The abnormal volume may partly reflect the shares sold for the first time in the market by insiders, but other investors may also sell by following the trading strategy of the insiders. The analysis of the trading volume will also allow to assess whether the price drop detected in the previous section is the result of actual sell trades or market makers' decrease in price. This study, therefore, assesses whether the price drop on the lockup expiration dates is associated with greater abnormal volume.

This study follows Field and Hanka (2001) methodology in calculating the abnormal volume. I, first, obtain the daily volume from DataStream. Then, I define normal volume as the mean daily volume in days t-71 to t-11 relative to the lockup expiry date. The abnormal volume is the daily volume divided by the mean daily volume minus 1. To eliminate the effect of outliers in my analysis I set observation greater than 99^{th} percentile in each event day equal to the median observation. For the sample as a whole, the abnormal trading volume before the lockup expiry dates is mainly insignificant but it starts picking up at date -3. The significant increases occur in day zero when the peak of 80% is reached and did not revert to zero, even when I increase the post event period, suggesting a permanent change in trading activity. My results are consistent with Field and Hanka (2001) and Brav and Gompers (2003) but the latter find that a peak of 56% on day +2.

Given the data availability on the actual trades in the UK market, this study is able to extend previous studies by stratifying the overall sample into sub-groups. Figure 5-2 indicates that the abnormal trading volume is not homogeneously distributed. The volume of IPOs with buy and sell trades is relatively random, with no significant change in the pre- and post-event period. In contrast, in the remaining IPOs, the abnormal volume is highly volatile. As expected, the volume of IPOs with actual sell trades increased significantly on day zero to reach about 60%. However, the figure implies that, since for the overall sample the increase is 80%, the remaining IPOs, i.e., those not subject to early buy/sell trades or actual sell trades on the lockup expiry dates appear to drive the higher abnormal trading volume. These results are surprising and suggest that the high volume reflects expectation of investors of potential, not actual, insider sell trades. As robustness check, I increase the post event window and find that the abnormal volume does not revert to zero, while the trend in IPOs subject to early buy/sell trades remains relatively random.

Figure 5-2 Abnormal Volume around Lockup Expiration Dates



Days Relative to Lockup Expiry Dates

The sample includes 831 UK IPOs over the period 1999-2006. The abnormal volume is the daily volume divided by the mean daily volume over t-71 to t-11 days relative to the lockup expiry date, minus 1. I obtain the daily volume from DataStream. To eliminate the effect of outliers in my analysis I set observation less than 1st or greater than 99th percentile in each event day equal to the median observation. *Early Sell IPOs* are IPOs where insiders sell before lockup expiration (116 IPOs with 186 trades). *Early Buy IPOs* are IPOs where insiders buy before lockup expiration (254 IPOs with 694 trades). *IPOs with Actual Sell Trades on Expiry Dates* represent the 10 firms where insiders have actually sold stakes on the expiry date.

These results of stock price performance around the lockup expiry dates are puzzling for two main reasons. First, it is expected that sell trades to occur more in IPOs where insiders purchase shares before the lockup expiry dates. Given that these IPOs underperform, insiders are expected to rush to sell when their lockup contract expired. I find no sell trades in these companies. Could it be that the underwriters extend further the lockup expiry dates in these IPOs? I could not find data to test this hypothesis. Second, consistent with previous evidence, the abnormal returns of all IPOs, independently of the actual sell transactions, decrease on the lockup expiry dates. Although the price decline may appear to be consistent with a simple downward sloping demand curve story, it is hard to explain the results in a rational expectations framework. In the case of lockups, investors already know that a higher amount of shares will be available after the lockup expiration day. The market is expected to foresee the number of shares sold at expiration accurately, and, thus, on average, the abnormal returns should be zero (Allen and Postlewaite (1984)). For the downward-sloping demand curves to explain the price decline that I observe, as in the case of Field and Hanka (2001), the market must hold consistently inaccurate prior beliefs about the fraction of equity that will be sold at expiration, and hence must be consistently surprised by how many shares actually come to the market.

Under the efficient market hypothesis, this temporary mispricing should be arbitraged away, as rational arbitrageurs will even leverage and drive the price to the fundamental level, and reap all the rewards of the arbitrage. In this case, I expect zero price reaction. However, various studies document possible cases where returns on the lockup expiry dates may be different from zero. For example, there may be limits to arbitrage, which may arise from the agency problems of investment managers. This is the case where noise trader risk gets worse in the short run and force fund managers, who cannot convince their investors they are skilled, to liquidate at a time when expected returns are the highest (Shleifer and Vishny (1997)). Pontiff (1996) discusses costly arbitrage, which might prevent investors from undertaking investments that would correct the temporary mispricing, even if they know how many shares were coming to the market. Investors may not want to gamble against the stock by selling it short, particularly if the stock is volatile. Finally, the expiry dates abnormal returns may be different from zero if the transaction costs are higher than the price drops, making any trading not profitable. Brav and Gompers (2003) estimate average transaction costs, as measured by the bid-ask spread, to be 6.3%, much higher than my reported abnormal returns.

5.4.5 Cross-sectional Differences in Lockup Expiry Dates Abnormal Returns

In this section, I provide further evidence on the drivers of the lockup expiry dates abnormal returns, and assess, in particular, the impact of the early buy and sell trades. This study also follows previous evidence and test whether cross-sectional differences in abnormal returns around the expiry dates can shed light on the competing hypothesis that can explain lockups. This study follows Brav and Gompers (2003) and to Field and Hanka (2001) and regress the $CAR_{-2,\ +2}$ around the lockup expiry dates on a set of explanatory variables.[63] In particular, in line with Brav and Gompers (2003), I use a set of dummy variables equal to one if (i) the abnormal return between IPO and the lockup expiration is above the median; (ii) insider sell occurs before lockup expiration; (iii) the firm is financed by a venture capitalist; and (iv) the underwriter is prestigious. In addition, a set of control variables are included to capture lockup characteristics and firms' fundamentals, including, the percentage of post-IPO insider shares locked, shares issued at IPO relative to shares outstanding, stock price volatility, cash flow margin, market-to-book ratio, and size as proxied by the log of market value of equity in 2008 constant Pound Sterling. However, I do not include SEO dummy before lockup expiry dates because none of my sample firms raised additional capital. Instead, I focus more on the impact of insider trading before and on the lockup expiry date and the UK institutional framework. I, therefore, add a set of dummy variables equal to one if (i) insiders buy stocks before the lockup expiry

[63] Brav and Gompers (2003) use buy-and-hold abnormal return from two days before to two days after lockup expiration as the dependent variable.

dates; (ii) insiders sell on the lockup expiry dates, (iii) institutions hold large stakes; and (iv) if the IPO is a high-tech company. The inclusion of insider sell dummy before lockup expiration controls for a reduced desire of insiders to sell after the lockup expiration. I present the results for the sample as a whole and for the main market and AIM separately to assess further the impact of the institutional differences between the two markets.

Table 5-7 Regression Results of CAR-2, +2 around the Lockup Expiration Dates

	Full Sample	Main Market	AIM
Constant	-0.06*	-0.05	-0.06
	[-1.66]	[-1.35]	[-0.75]
Insider early sell	1.10	0.47	0.51
	[0.69]	[0.24]	[0.42]
Insider early buy	-1.74***	-1.24***	-1.32*
	[-2.58]	[-2.20]	[-1.72]
Executive Sell Dummy	0.01	0.25	0.01
	[0.14]	[0.13]	[0.55]
Executive Buy Dummy	-0.32***	-0.34***	-0.30***
	[-3.49]	[-3.31]	[-3.37]
Actual sell trade on expiry date	-0.48	-0.51	-0.53
	[-3.45]***	[-2.96]***	[-1.98]**
Shares locked	-0.03***	-0.02***	-0.01***
	[-2.51]	[-2.40]	[-2.76]
Performance	1.71***	1.60**	1.85**
	[2.20]	[2.02]	[1.97]
Size	0.01	0.01	0.02
	[1.36]	[1.56]	[0.58]
Market-to-book	0.02	0.003	0.001
	[0.03]	[1.13]	[0.64]
Venture-backed	-1.07	-0.96	-0.03
	[-0.69]	[-1.54]	[-0.85]
Prestigious underwriter	-0.05	-0.008	-0.005
	[-0.60]	[-0.42]	[-0.31]
Institutional holding	-0.96	-0.18	-0.15
	[-0.99]	[-0.90]	[-1.50]
Shares issued at IPO	0.03***	0.01**	0.01***
	[2.59]	[2.25]	[2.82]
Cash flow margin	-0.01	-0.01	-0.01
	[-1.15]	[-0.31]	[-0.27]
Stock price volatility	-0.53***	-0.44**	-0.67**

	[-2.74]	[-1.96]	[-2.56]
High-tech Dummy	-0.50	-0.20	-0.20
	[-0.30]	[-0.23]	[-0.88]
Year Dummies	Yes	Yes	Yes
Adjusted R^2	2.35	2.90	2.20
N	831	141	690

The dependent variable is Cumulative abnormal return from -2 to +2 days around the lockup expiration date. *Insider early Sell* is a dummy variable taking the value of one if insiders sell prior to lockup expiration. *Insider early buy* is a dummy variable taking the value of one if insiders buy before lockup expiration. *Actual sell trade on expiry date* is a dummy equal to one if insiders actually sell on the lockup expiry date. *Shares locked* is the fraction of insider shares that are subject to lockup restrictions. *Performance* is a dummy variable equal to one if the cumulative abnormal return since the offering is higher than median. *Size* is the log of market value of equity in 2008 constant terms. *Market-to*-book is the ratio of market capitalization at the IPO divided by the book value of the equity in the first reporting period after IPO. *Venture-backed* is dummy equal to one if the IPO is backed by venture capitalists. *Prestigious underwriter* is dummy variable equal to one if global underwriter is the underwriter for the float. *Institutional Holding* is a dummy variable equal to one if institutional investors hold more than 3% share at the time of IPO. *Shares issued at IPO* is the ratio of shares issued and fully traded over number of shares outstanding. *Cash Flow Margin* is the ratio of operating cash flows over sells. *Stock price volatility* is the standard deviation of the daily returns of the firm's abnormal return in the period beginning one day after IPO and ending 11 days before lockup expiration. *High-tech Dummy* is equal to one if the IPO is in the following industries: computer manufacturing, electronic equipment, computer and data processing services, and optical, medical and scientific equipment. To eliminate the possible effect of outliers, for each variable, I replace observations whose values are either lower than the first or higher than 99^{th} percentiles by the sample median. *t* statistics are in the brackets. ***, **, * significant at 0.01, 0.05, and 0.1 levels, respectively.

The results, reported in Table 5-7, indicate that the incidence of the sell trades before the lockup expiry dates has no effect on the event dates abnormal returns for the full sample as well as when the two markets are separated. The coefficient of the sell dummy is positive but not significant. These results are consistent with Brav and Gompers (2003) and suggest that IPOs where insiders had early sell trades are less likely to engage in significant selling activity after the lockup expiry dates, thus mitigating the expiry dates' information asymmetry. In contrast, the coefficient of the buy dummy is negative and significant, suggesting that companies where insiders increase their holdings underperform significantly on the expiry dates, probably reflecting the increase in the level of information asymmetry about the likelihood of large sell trades of the original shares locked up and the additional shares acquired before the lockup expiry date. However, these results hold even when a dummy is included for actual sell trades on the lockup expiry dates, which is negative and significant. The dummy for the buy trades undertaken by executive directors is also negative while that of the sell trades is not significant, suggesting that executive directors, as opposed to non-executives who are the venture capitalists, are made to increase their holdings. These results, thus, imply that while the early buy trade strategy may result in positive returns on the transaction dates, its impact in the post-trade period is limited, as shown above, and becomes negative at the lockup expiry dates. I check for robustness by including each of these variables at a time and by excluding the other explanatory variables. Similar qualitative results were found.

Some of the remaining results are consistent with Brav and Gompers (2003), and provide support to the commitment and the signalling quality hypotheses. For example, the proportion of shares locked relative to shares outstanding is negative and significant. At the same time, the proportion of shares issued at IPO is positive and significant. These results suggest that the higher the number of shares locked, the higher the probability of selling after the lockup expiry dates, and, therefore, the higher the price drop, but the higher the proportion of shares sold at IPO, the lower the expected number of shares to be sold after the lockup expiry dates. Stock price volatility is negative and significant, suggesting that costly arbitrage limits the ability of the arbitrageurs to short sell before the lockup expiration dates, as volatility proxies for information asymmetry. Furthermore, cash flow margins, prestigious underwriters, growth as measured by market to book, and size, are not significant, and therefore, they do not appear to exert any impact on the lockup expiry dates abnormal returns.

However, in contrast to Brav and Gompers (2003), my results show that the pre-lockup expiry date performance is positive and significant, suggesting that companies that did well in the past are associated with lower price declines during the event date abnormal returns. I checked whether the early sell trades of insiders or their actual sells on the lockup expiry dates drive these results. This study finds that the coefficient of performance is positive and significant even if the remaining explanatory variables are excluded. I also find that the presence of venture capitalist does not explain the expiry dates abnormal returns, as its coefficient is negative but not significant. I also follow Brav and Gompers (2003) and test whether venture capitalist is significant in a reduced form regression. I find, but not report, that the coefficient is negative but significant at 0.10 level only in the main market. These results are driven by the relatively higher proportion of IPOs backed by venture capitalists on the Main market (45 IPOs, representing 32%) relative to AIM (71 IPOs, accounting for 10%). Finally, the presence of institutional investors does not appear to affect the expiry date abnormal returns. Overall, my results provide support to Brav and Gompers (2003) and indicate that IPOs that have less information asymmetries have smaller price declines on the lockup expiry dates than other IPOs.

5.5 Conclusion

This study analyses insider trading within lockup period using a unique sample of 831 UK IPOs from 1999 to 2006. I find that, compared to the US, lockups are relatively longer in the UK, but significant insider buy and sell trades occur before the expiry dates. I document that the probability of both these early trades is higher in IPOs with prestigious underwriters and longer lockups. However, insiders are more likely to be released early from the lockup agreements if their IPOs are doing exceptionally well, while they increase their holdings in IPOs that underperformed about 40 days before their trades. In addition, I find that insiders are more likely to sell in large, and low institutional holding IPOs, but they buy in IPOs with lower underpricing and proportion of shares locked. On the lockup expiry dates, there is significant price drop for early buy but not for early sell IPOs. Overall, these results suggest that the early trading activity by corporate insiders is consistent with the commitment as well as the signalling quality hypothesis.

However, the results highlight the relative discretion of underwriters in setting up and enforcing the relatively longer lockups in the UK, reflecting the power they are likely to exercise on insiders of newly released IPOs. Chambers and Dimson (2009) argue that in the post World War II, the increase in underpricing is likely to reflect the reduction in the levels of trust between managers and underwriters, and the increase in the power of investment banks relative to the IPO's managers and shareholders. The results of current study are likely to provide support for these propositions. First, the results suggest that investment banks play a significant role in the setting up of the observed relatively longer lockups in the

UK, which, consistent with US evidence, serve as a commitment device to overcome potential adverse selection at the offering as well as signal firms' quality. I find that IPOs with prestigious underwriters do not necessary have substantially lower lockup lengths. Although consistent with US evidence (e.g., Brav and Gompers (2003)), the variable prestigious underwriters is negatively related to lockup length, the median lockup of 365 days is independent of the quality of underwriters and it is significantly higher than the 180 days observed in the US. The average lockup length of 338 days is also not too far from the overall average of 391 days.

Second, my results highlight the underwriters' involvement in the lockup enforcements. They suggest that the early trades are likely to be pre-arranged with the underwriters rather than decided unilaterally by insiders. This study finds strong evidence that IPOs with early buy/sell trades are more likely to have prestigious underwriters. In addition, since the buy (sell) trades occur in under- (over-) performing IPOs, the results indicate that the underwriters appear to release insiders of over-performing IPOs from the lockup constraints but force those of under-performing ones to increase their holdings. This asymmetric impact on the lockup suggests that although lockups are relatively longer than in the US, underwriters enforce them and have the ability to amend them when necessary.

The impact of underwriters through their effect on early trades expands to the lockup expiry dates. This study finds that early sell IPOs carry on performing better and their stock price drop on the lockup expiry date is relatively small. In contrast, IPOs subject to buy trades continue underperforming and decrease substantially on the lockup expiry dates. I show that, surprisingly, insiders of these early buy/sell trades IPOs do not actually sell their shares on the lockup expiry dates. The question remains as to whether underwriters prevent insiders, particularly those of early buy IPOs, to sell on the lockup expiry dates and whether this impact extends to the post-lockup-expiry dates. Some of these issues are the subject of the next chapter.

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Chapter 6

6 Insider Trading and the Long-run Performance of IPOs[64]

Abstract

This chapter re-examines IPO performance in the long-run and assesses whether insider trading can explain the documented pattern of underperformance. Insider trading cannot explain the documented IPO long-run underperformance. IPOs where insiders are net sellers generate positive and significantly higher returns than those where they are net buyers or not subject to insider trading. The results hold even after controlling for all previously documented factors. The main drivers of insider trading are the pre-trade share price performance, the presence of prestigious underwriters, and the takeover probability. Overall, the results suggest that insider trading mitigates information asymmetries, and leads to a more efficient long-term valuation of IPOs, but do not provide support to the agency conflict, the signalling, and trading on private information hypotheses.

Key words: Long run IPO performance, insider trades, London Stock Exchange, market timing.

JEL Classification: G12, G14, G24.

[64] This paper was presented at Cass Business School. I gratefully acknowledge comments from seminar participants at Cass Business School. All remaining errors are my own responsibility.

6.1 Introduction

Long run performance of initial public offerings (IPOs) has been a puzzle for last three decades in the empirical finance literature. A large number of studies show that IPOs underperform, or at least do not generate positive returns despite having a high beta, 3 to 5 years after listing. Studies provide various explanations for this underperformance, including extreme differences of opinion amongst investors (Ritter (1991) and Loughran and Ritter (1995)), costly short selling and small public floats on many IPOs (Miller (1977) and Morris (1996)), behavioural timing (Loughran and Ritter (2000)), and pseudo market timing (Schultz (2003)). It is also possible that insiders knowingly sell overvalued equity at the time of IPO, and, as the mispricing get corrected through time, IPOs tend to underperform. On the other hand, insiders may be uninformed of this overvaluation. One way to gain insight into managerial motives for going public, as argued by Lee (1997) and Kahle (2000) in the context of secondary equity offerings (SEOs), is to examine trading by insiders on their own account. If insiders take advantage of windows of opportunity in selling new shares, then they might also sell on their own account in order to profit from their knowledge as soon as the lockup period is over. The motivation of this paper is to analyse insider trading activity over three years after IPO, to assess whether such trading activity explains the previously documented long run underperformance of IPOs.

Particularly, this study conjectures that, the trading activity of insiders reduces the information asymmetries and the differences of opinions across investors, and leads to a more efficient long-term valuation of IPOs. Information and non-information motives for insider trading are contrasted. I argue that since insiders, defined as board members, are closer to their firm, are able to have better forecasts of the future cash flows than the market, and they are likely to know its true value. From the viewpoint of information motivated trades, insiders are expected to convey information by buying shares if their company is undervalued, but selling if it is overvalued, resulting in a subsequent respective increase and decrease in share prices. Such post-trade share price behaviour will also be consistent with the agency theory, as an increase (decrease) in insider ownership is expected to lead to a mitigation (exacerbation) of the agency conflicts. On the other hand, if their trades are small and driven by non-information reasons, such as, liquidity, diversification and release from lockups, a weak relationship between insider trading and the long-term performance of IPOs is expected.

The relationships between insider ownership and corporate performance have been the subject of much theoretical and empirical investigation. Theoretical works have shown that there is a undeniable case for the proposition that ownership of shares by corporate decision makers (i.e., board of directors) can have an important influence on the way in which the firm is managed and, therefore, on the firm's observed market value (Baumol (1959), Jensen and Meckling (1976), Demsetz (1983), Stulz (1988)). Empirical works by Morck, Shleifer, and Vishny (1988), McConnell and Servaes (1990, 1995), Hermalin and Weisbach (1991), Holderness, Kroszner and Sheehan (1999) and others, document a statistically significant cross-sectional correlation between share ownership by corporate insiders and corporate performance.[65] The case of insider ownership changes and corporate performance has been extended in this chapter in context of IPOs. Though insider trading is heavily examined in the previous literature,[66] there is no study to my knowledge which link insider trading activities to the long run performance of IPOs.

Therefore, this chapter focuses on the following questions: can insiders affect the long-run performance of their IPOs through their trades? Is this effect consistent with the direction of their trades, and does it reflect changes in information asymmetries and agency conflicts? Are insiders contrarians or trend followers, and, more specifically, do they buy stocks to support the widely documented decline in stock prices in the post-IPO period, or to cash in IPOs with rising prices? Finally, in which IPOs are they likely to trade and adopt specific trading strategies? In order to address these questions, I construct a unique data set of 830 UK IPOs containing all of the information from prospectuses, insider trading events, and relevant accounting and stock price data over a three-year period following their IPOs, to answer these questions.

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[65]The relationship is non-linear, maximised at 40% ownership in US and UK (McConnell and Servaes, 1995, Lasfer, 2006).

[66]Previous studies analyse insider trading activities around certain events such as earnings announcements (Penman, 1982), takeovers (Seyhun, 1990), or bankruptcies (Seyhun and Bradley, 1997). There are studies which examine whether share buybacks and insider buying activity are driven by the undervaluation of the own company stocks (Lee, Mikkelson and Partch (1992)). Also, there are studies which examine whether insiders sell shares from their holdings and do SEOs at the same time and are they driven because the stocks are overvalued Kahle (2000). A recent study link insider trading activity with corporate events and have tested whether they time the market only on their personal transactions or they do it with the corporate transactions (Jenter, 2005). The timing skills of corporate insiders are already established in the corporate finance literature (e.g.,Lakonishok and Lee, 2001). Some recent studies examine the insider trading behaviour under institutional constraint, i.e, lockup agreements in IPOs (e.g. Field and Hanka, 2001 and Brav and Gompers, 2003).

Consistent with Ritter (2003) and Eckbo et. al. (2007), this study finds that IPOs underperform over the three years after issuing equity. I further split the sample to check whether the underperformance originates from any particular time period. While in the first six months, the cumulative abnormal returns are not significant, they start becoming negative and significant mainly one year after the IPO, i.e., after the lock up expiry date, which, in the UK, is on average 365 days after the IPO (e.g., Hoque and Lasfer (2009)). Furthermore, when the sample are divided, conditional on insider trading, the IPOs where insider's trade perform better than those where insiders do not trade. This might imply that insider trading increases stock price accuracy in IPOs and provides price discovery by moving stock prices significantly, which is consistent with Meulbroek (1992), Cornell and Sirri (1992) and Chakravarty and Mcconnell (1997). When I split the companies where they trade, into companies where insiders are net buyers and where insiders are net sellers interesting results are obtained. This study shows that IPOs where insiders buy perform badly in the long run, but those where insiders are net buyers, perform slightly better than all IPOs in the sample and much better compared to the IPOs with no insider trading. The results may imply extended price support[67] by the insiders in the case of companies which are performing badly. On the other hand, IPOs where insiders sell shares continue to perform well in the long run. I test for robustness using the Fama and French (1993) three-factor model. I show that for the full sample, alpha is negative and significant. However, I find that

[67] In general, underwriters can support prices by stimulating demand or by restricting supply in the aftermarket and in many countries temporary price support in IPOs is legal including the US (1934 Securities Act, Rule 10b-7,since replaced by Regulation M) and UK (Securities and Investment Board Rules, chapter III, Part 10)

while alpha of No Trade IPOs is more negative, it becomes positive, but not significant, for IPOs with insider trading. Within this last sample, *Net Sell* IPOs generate positive alpha while *Net Buy* firms have negative alpha. My overall results suggest that the insider trading affects IPO performances.

This study reports that, within three years after IPO, the average number of sell trades is 3.5 compared to 4.38 buy trades. The trade time after the IPO is similar for both trades and they occur roughly 1.5 years after IPO. These results imply most of the trades occur after the lockup expiration dates. I also show that, on average, the sell trades are 5 times larger than the buy trades. The mean (median) pre-trade cumulative abnormal return for the sell trades is 5.93% (4.57%) compared to -11.15%(-7.01%) for the buy trades. These results suggest that insiders are contrarians. The study finds that, the share price and prestigious underwriter are the driver of both the sell and buy trades.

I test whether insiders trade before news announcements. I focus on two main news types, the takeover activity and raising additional capital through seasoned equity offerings (SEOs). I argue that insiders may buy stocks if their own company is likely to be subject to a takeover. This study finds that both this probability and the actual takeover dummy do not affect the long-term stock returns. Although this probability is higher in *Net Buy*, compared to *Net Sell* IPOs, it is the highest in *No Trade* IPOs. The probability of raising capital through SEOs is homogeneous across the sample IPOs and does not have any impact on the long-run stock returns. Overall, it is not clear as to whether insiders trade when their company is likely to be subject to a takeover, and/or their company raises additional funds in the market.

This chapter is related to the enormous IPO literature which examined the price support, agency problems and adverse selection problems. The practice of the price support may well be consistent with both underpricing and poor long term returns (Jenkinson and Ljungqvist (2001)). I find that IPOs which are underpriced more have performed badly in the long run and they are likely to be issued in the hot (bubble) market. This study also finds that, consistent with the agency cost of Jensen and Meckling (1976), the greater the equity retained by the managers (proxy for agency costs) the better the long run performance. This evidence is also consistent with Mikkelson et al. (1997). The reputation of underwriters also increases this commitment and reduces the adverse selection, as Carter and Manaster (1990) find a negative correlation between investment banker reputation and IPO under-pricing. Brav and Gompers (1997) show that the underperformance is concentrated in non-venture backed IPOs. I relate the reputation of underwriters and VC backing with long run performance of IPOs.

This study finds first day return is negatively related to long term returns, which is consistent with heterogeneous beliefs at the time of IPO and as time passes the valuation get corrected; hence IPOs which underprice more suffer in the long run (Morris (1996)). I also report that percent of equity retained to equity sold (overhang) is negatively related to long run IPO performance, which is consistent with agency explanation of long run performance. In addition, I show that the higher the lockup expiry returns the higher the underperformance. Higher drop in the lockup expiration may imply higher agency problem and it may contribute to the under-performance of the IPOs in the long run. Lockup length is negatively related to long term performance. The firms that go public with prestigious underwriters and VC backed firms do not perform differently than other IPOs. Both bubble and hot dummy are statistically and economically significant, meaning that IPOs that are issued in the bubble (hot) period underperform.

Finally, this study relates the results to the market timing ability of the insiders in their trades and in corporate events. Lakonishok and Lee (2001) show that insiders are contrarians and simple contrarian strategy can be used to time the market. Jenter (2005) find that managers try to actively time the market both in their private trades and corporate level decisions. I provide new empirical evidence on trading by insiders in IPOs, and show that insiders in IPOs are also contrarians as they buy (sell) in stocks that under- (over-) perform, and they time the IPOs when the market sentiment is bullish. Though insiders time their trades and try to take advantage of temporary misvaluations in the market, I find that they do not trade opportunistically as the companies where insiders sell (buy) do not under- (over-)perform in the long run.

The rest of the paper is organized as follows. Section 2 describes reviews the literature and sets up the hypotheses. Section 3 presents a discussion of data and empirical methodology. Section 4 provides the empirical results, and the conclusions are in Section 5.

6.2 Theoretical Background

6.2.1 Review of Literature

A number of previous studies report that IPOs generate surprisingly low returns after issuing shares over the holding period 3-5 years as first shown by Ibbotson

(1975) and then confirmed by Ritter (1991). This long run return performance challenges the efficient market hypothesis and motivates the behavioural asset pricing models. Acting in response to this challenge, some researchers show that the low post-issue return is consistent with the multi-factor asset pricing models and, since IPOs are small growth stocks, it is consistent with the expectations (Brav and Gompers (1997), Brav, Geczy and Gompers (2000), Eckbo and Norli (2005)). Thus, the low post-issue returns may be a demonstration of the more general finding in Fama and French (1992) that small growth stocks show a poor performance. However, the issue of long run performance of IPOs is still controversial as Ritter (2003) states that "the long-run performance evidence shows that in general the market underreacts to the equity issue announcements" (p.262) .

The empirical evidence provided to date is mixed. A number of studies report that IPOs underperform various benchmarks for the first few years after the offering.[68] I classify the previous studies into two broad categories for comparative purpose: matching firm returns (BHR) and multifactor asset prices (α). It will facilitate the comparison across methodologies, and assess whether the findings of previous studies is only due to modelling the returns.

[68] In the literature review section of chapter two, these studies are described in detail. There are many studies that document the negative long-run performance, including Ritter (1991), Loughran (1993), Loughran and Ritter (1995), Servaes and Rajan (1997), Brav and Gompers (1997), Gompers and Lerner (1999), Teo, Welch, and Wong (1998) for the US market, Uhlir (1989) for Germany, Finn & Higham's (1988) for Australia, Kunz and Aggarwal (1994) for Swiss and Keloharju (1993) for Finland. See Jenkinson and Ljungqvist (2001), Ritter and Welsh (2002), and Ritter (2003) for a review.

Table 6-1 Previous studies on long run IPO performance

Study	N	Sample Period	Holding period	BHR	α
Brav and Gompers (1997) [a]	3,407	1972-1992	5 yrs	1.9%	-0.49%
Brav and Gompers (1997) [b]	934	1972-1992	5 yrs	16.5%	0.09%
Brav, Geczy, and Gompers (2000)	3,501	1975-1992	5 yrs	6.6%	-0.19%
Ritter and Welch (2002)	6,249	1980-2001	3 yrs	-5.1%	-0.21%
Ritter (2003)	3,993	1970-2000	3 yrs	-3.1%	
Eckbo and Norli (2005)	5,365	1972-1998	5 yrs	-2.4%	0.40%[c]
Eckbo, Masulis, and Norli (2007)	5,018	1980-2000	5 yrs	-18.0%	-0.16%[d]
Levis (2008)[e]	1,365	1992-2004	3 yrs	9.02%	0.04%
Espenlaub, Gregory and Tonks (2000)	562	1985-1992	5 yrs	-42.77%[f]	-0.0067%[g]

The above table represents the major, large sample US and UK studies on Long run performance of IPOs. BHR is the matching firm buy-and-hold returns for the IPO firms α represents Fama-French alpha.

[a] Sample of non-venture backed IPOs.

[b] Sample of venture backed IPOs.

[c] Pricing model with Fama-French, momentum and liquidity factors.

[d] Pricing Model with Fama-French factors.

[e] BHR is calculated relative to size matched firm and alpha is based on Fama-French three factor model.

[f] CAR is calculated based on Fama-French three factor model.

[g] Pricing model with Fama-French factors.

Brav and Gompers (1997) find that venture backed IPOs appear to overperform relative to matched firms (by size and book-to-market), and Fama and French industry portfolios. For non-venture-backed IPOs, however, the Fama and French (1993) three-factor regression model results in negative alphas. Brav, Geczy, and Gompers (2000) produce conflicting results based on the control firm approach and Fama-French alpha; while control firm approach yields over performance, Fama-French regressions provides negative alpha. Ritter and Welch (2002) show that IPOs underperform by applying matching firm and Fama-French alpha. Other studies also show that IPOs underperform (Ritter (2003), Eckbo and Norli (2005), Eckbo, Masulis, and Norli (2007)). While Espenlaub, Gregory and Tonks (2000) reports underperformance by employing a number of techniques, Levis (2008) reports overperformance based on matching (size) and Fama-French alpha.

The event studies involving long run returns have numerous limitations. For example, expected returns unconditional on events may be high, cross-sectional and time series dependence is high, and variance of abnormal returns conditional on event is high (Kothari and Warner (2007)). On top of that, the abnormal returns are highly sensitive to sample size and firm characteristics (e.g., firm size, industry). While Fama (1998) relates the long-term returns to 'methodological Illusions,'[69] Loughran and Ritter (2000) assert that different methodologies have different power. Ritter and Welch (2002) relate conflicting findings in long run IPO performance to a number of factors. First, any computation of long-term returns may suffer from statistical inference as returns on each firm overlap. Second, IPOs tend to be small and high growth and the benchmark may not reflect fully these characteristics. Fama and French (1993) three-factor model can overcome these problems to a certain extent, but Brav and Gompers (1997) argue that small high growth firms tend to have negative alpha, independently of whether they are IPOs or established companies. The growth and size characteristics of IPOs also affect the Fama and French factors, particularly SMB and HML, leading the intercept towards zero. The returns are also time specific, and, as a result, the underperformance is not likely to be homogeneous across sample periods. Furthermore, the long-term returns are noisy, resulting in difficulties in making any statistical interference.

[69] Fama (1998) concluded that "the apparent (long run performance) anomalies are methodological illusions" (p 285). He argues that even little change to the methodology can change the empirical results.

Different authors try to explain the underperformance of IPOs from different perspectives. Of the asymmetric models, only signalling and book building theories have something to say about long run performance (Jenkinson and Ljungqvist (2001)). Rather than predicting that newly floated companies will underperform in the long run, the signalling theories seem to require positive after market returns, given that firms underprice in order to subsequently be able to sell further shares at a higher price than in the absence of a signal. If firms underprice to signal their quality, high-quality firms should perform better than low quality firms (Jenkinson and Ljungqvist (2001)). Benveniste and Spindt (1989) model underpricing as a reward to better informed investors for truthfully revealing their information during the book-building phase. A noisy signal these investors reveal is the direction and extent of the revision in the offer price relative to the price range. Given that noisy signal, one might conjecture that subsequent performance will correlate positively with the initial price revision.

Another explanation is given within the context of heterogeneous beliefs among investors. Miller (1977) and Morris (1996) argue that with costly short selling and heterogeneous beliefs among investors, the most optimistic investors will determine the price in the market. As more information about a firm becomes available over time, the divergence of beliefs will decrease, and the marginal investor will no longer be overoptimistic. Others suggest that when excess returns are properly measured, the evidence for long-run underperformance following IPOs disappear. Eckbo et al. (2000) show that leverage and risk are significantly reduced following equity offerings, while liquidity is increased. They claim that as a result of these changes in leverage and liquidity, firms that have recently issued equity are less risky than benchmark firms.

Aggarwal and Rivioli (1990) argue that there are fads in the IPO market, with over-optimistic investors' presence reflect the prospects of newly listed companies, which bids up initial trading prices away from fair value. Firms go public at the time when investors are over-optimistic about growth prospects of IPO companies (Loughran and Ritter, 1995). As a result, investors overpay initially but prices come down as more information becomes available. Hence, the expected long run returns decline with the change in initial investor sentiment. Another line of argument put forward by Ljungqvist (1996) is that the greater the fraction of equity capital initial owners retain at floatation, the lower their incentive to take advantage of over-optimistic investors, since the value of their retained shares would fall as and when new investors become less optimistic. Therefore, the expected long run returns increase with the retention rate.

The operating performance literature has proposed explanations for poor long term performance based on Jensen and Meckling's (1976) agency costs. The reduction in managerial ownership as insiders sell shares, the agency costs are likely to increase. There might be a conflict of interest for the managers to maximise the firm value as opposed to the private benefits. As a result, firm performance might suffer post-floatation. Jain and Kini (1994) and Mikkelson, Partch and Shah (1997) investigate the relationship between the long run performance and ownership. Jain and Kini (1994) report a significant positive relationship between the post-IPO operating performance and equity retention by the original shareholders. However, Mikkelson, Partch and Shah (1997) find that the long run performance both within one year and during the first ten years of public trading is unrelated to the ownership structure. Since previous studies find contrasting results, I re-examine the issue of IPO underperformance conditional on insider trading. Insiders trading after the IPO may provide some insight into why IPOs underperform in the long run.

In another paper, Schultz (2003) coined the phenomenon of the 'pseudo market timing' and shows that it can explain the poor long-run performance of stocks that have recently issued equity. The assertion of the pseudo market timing hypothesis is that the higher amounts firms are able to receive for their equity, the more likely they are to issue stock even if the market is efficient and managers have no timing ability. In this case, equity sells will be concentrated at peak prices ex-post even though companies cannot determine market peaks ex-ante. As a result of this pseudo market timing, the probability of observing long-run underperformance ex-post may exceed 50 percent. Simulations using the distribution of market and IPO returns and the relation between the number of offerings and market levels over 1973-1997, reveal that underperformance of more than 25 percent in the five years following an offering is not surprising or unusual in an efficient market.

6.2.2 Testable Hypotheses

This study assesses whether the trading by insiders in their own IPOs affects the documented long-run underperformance. The focus of this study is on the signalling and the agency conflicts explanations. In terms of signalling, previous studies suggest that IPO underperform because of information asymmetries (Ritter and Welch (2002)). At the same time the insider trading literature finds that insiders convey information about their company through their trades, implying that insider trading makes prices more efficient as they reflect publicly available as well as private information (e.g., Meulbroek (1992), Cornell and Sirri (1992) and Chakravarty and Mcconnell (1997)). I, thus, test the proposition that insider trading increases stock price accuracy and discovery by mitigating the relatively significant information asymmetries inherent in IPOs. This study also tests informed trading by insiders. Both the price-taking model of Grossman and Stiglitz (1976) and the imperfect competition model of Kyle (1985) predict higher information asymmetry, resulting in (i) greater abnormal returns following purchases, (ii) smaller (i.e., more negative) abnormal returns following sells, and (iii) greater insider profits. While the price-taking model predicts the value of trade increases with information asymmetry, the imperfect competition model predicts no relationship. I determine where insiders are net sellers (buyers) and relate the direction and the magnitude of their trades to the long run performance of IPOs.

Lakonishok and Lee (2001) assert that insiders' ability to time the market is partially explained by the fact that insiders act as contrarian investors and that simple contrarian strategies have been useful in market timing. Jenter (2005) links manager's private portfolio decisions to change in corporate capital structures, suggesting that managers try to time actively the market both in their private trades and in corporate level decisions. This study tests the hypothesis whether insiders are contrarians and they time their trades in IPOs. It is also assessed whether insiders act opportunistically and their trades do affect outside shareholders. Finally, this research assesses the drivers of insider trading and tests their predictability through IPO characteristics. The market reaction on the announcement dates are also analysed, as insiders in the UK are required to inform their company and the market within a maximum of five days of trading, and such announcements are immediately disclosed in the *Regulatory News Service*.[70] Since insider trading has to be done through corporate brokers, i.e., the underwriters, I expect any such trades to occur after the lockup expiry dates.

The agency theory literature (Jensen and Meckling (1976)) suggests that insider purchases lead to an increase in share prices as the agency costs are mitigated, while the sell trades will result in an exacerbation of the agency conflicts, and a decrease in stock prices. These predictions are consistent with the signalling hypotheses. These effects are controlled for by using insider ownership, underpricing, prestigious underwriters and venture-capitalists.

6.3 Data and Methodology

This study first gathers the list of IPOs that went public on London Main Market and the Alternative Investment Market (AIM), a relatively less regulated market for smaller and younger companies, between January 1999 and 2006 from the London

[70] The UK Model Code prescribes much faster reporting of directors' dealings. The directors must inform their company as soon as possible after the transaction and no later than the fifth business day after a transaction for their own account or on behalf of their spouses and children (Hillier and Marshall (2002)). In turn, the firm must inform the LSE without delay and no later than the end of the business day following receipt of the information. This implies that the information reaches the market as late as 6 days after transaction. In contrast, in the US, during the pre-Sarbanes-Oxley period, insiders have to report their trades on the 10th of the month following the transaction, resulting in a maximum delay of between 10 and 42 days, depending on the trading date. As a result, most previous studies could not analyse insider-trading event on or before the lockup expiry date.

Stock Exchange (LSE) website, which amounts 1,117 IPOs. LSE database is used to collect data on the quotation market (AIM or Main market), admission date, country of incorporation, issue price, market value, money raised, name of the broker, and for AIM IPOs, the advisor. I then download all prospectuses from *Perfect Filings* database and hand-collect all information relating to lockup arrangements, including lockup dates, percentage of shares locked-up, fraction of insider shares locked up, directors' ownership before and after IPO, percentage sold in the IPO, institutional ownership, and venture capital backing. This study extracts any delisting dates, other accounting, stock market data, which includes daily stock prices and indices to compute the stock returns, market capitalization, which is used as proxy for size, accounting return on assets to measure profitability, and price-to-book ratio to proxy for growth from *DataStream*. I exclude 77 IPOs for which I could not find the prospectuses, 15 with missing share price data, and 195 with no lockup date or ownership data from the prospectuses. Final sample includes 830 (74%) firms with complete data. I obtain information on subsequent raising capital in the form of seasoned equity issues (SEOs), from London stock exchange and then match it with my IPO sample and then determine how many IPO firms raise more capital within three years of IPOs. Takeover announcement information is obtained from Thomson One Banker database. Then the merger sample is matched with IPO data to determine how many of them occur during three years of IPOs.

Finally, this study uses a Fifth database, *Directors' Deals*, which records all the trades undertaken by insiders in the UK market. A number of observations are excluded that are not likely to be driven by private information, such as exercise of options or derivatives, script dividends, bonus shares, rights issues, awards made to directors under incentive plans or reinvestment plans. I also exclude all directors' transactions in investment companies. After this screening, 36,943 insiders' trades from the UK market are obtained. The data are checked for errors and exclude 2,952 (8%) trades as the difference in announcement and transaction date is more than 5 days, the legal UK requirement (Korczak and Lasfer (2009)). Final sample includes 33,991 directors' trades in 2,664 listed companies, split into 26,268 (77%) purchases and 7,723 (23%) sell trades. The database includes news items on directors' trades disclosed by all UK firms to the Regulatory News Service (RNS), such as transaction price, amount, and value, post-transaction holding, change in holding, name and position of the insider, and announcement and transaction dates. I, then, match all insider trading event dates with the dates of the IPOs, and select all IPOs where insider trading occurs during the three year period of IPO. I find 287 firms without insider trading (35%), and 543 (65%) firms with at least one insider trade during 36 months period after IPO insider trading. I identify 822 sell trades by 231 IPOs and 2102 buy trades by 480 IPOs. Finally, I follow Lakonishok and Lee (2001) and define the *Net Purchases Ratio,* as:

$$NPR = \frac{Purchases - Sells}{Total\ Trades}$$

This study finds 190 (35%) IPOs with negative NPR, referred to as *Net Sells* sub-sample, and 353 (65%) with positive NPR, classified as *Net Buys* sub-sample. I use both number of transactions, *NPR transaction*, and value of the trades, *NPR value*. It is expected that insiders to buy in over-performing and sell in underperforming IPOs.

This study uses various methodologies to test various hypotheses. The standard market adjusted model event study methodology is used to compute the cumulative abnormal returns over 3 years after the first month of the IPO. The abnormal returns are the monthly returns on each IPO *less* the return on the *Financial Times All Share Index*, FTA, a more representative index that includes small as well as large companies. Both the equally- and value-weighted CARs, and the style-adjusted returns are computed, in line with Ritter and Welch (2002). I also use the AIM index for AIM IPOs, and FTA for IPOs on the main market. In addition, the market model is used to compute the abnormal returns over the event window [-40, +40] relative to the trading date and the lockup expiry date. The market model coefficients are obtained from the regression of the security returns against the corresponding market indices, the AIM all share price[71] and FTA, for AIM and main market companies, respectively, over the period [-290, -41] trading days relative to each event date. I focus on the pre-event period abnormal returns, $CAR_{-40,-2}$, to assess whether insiders adopt contrarian strategies in their trades. Finally, I estimate the abnormal performance based on the constant obtained from the Fama-French (1993) calendar time regressions. By following Ritter and Welch (2002) the following approach is used:

$$\begin{aligned} R_{pt} - R_{ft} = \alpha + \beta_t (R_{Mt} - R_{ft}) + \beta_{t-1}(R_{Mt-1} - R_{ft-1}) + \gamma_t SMB_t + \gamma_{t-1} SMB_{t-1} \\ + \delta_t HML_t + \delta_{t-1} HML_{t-1} + \varepsilon_{pt} \end{aligned}$$

where $R_{pt} - R_{ft}$ is the excess return over the risk free rate on a portfolio in time period t, $R_{Mt} - R_{ft}$ is the market risk premium, with R_{ft} proxied by FTA and R_{ft} the 3

[71] As an alternative to AIM all share price index, we used the Hoare Govett Smaller Companies (HGSC) Index as the market index. My results are qualitatively similar.

months Treasury Bill rate. SMB_t is the return on small firms minus the return on large firms, and HML_t is the return on high book-to-market return minus the return of the low book-to-market portfolio. To calculate SMB_t, FTSE 100 index is used as index for large firms and FTSE Small Cap Index is used for small companies' index. To calculate HML_t, FTSE 350 Index is used as a proxy for high book to market portfolio and FTSE 350 Growth is used as a proxy for low book to market portfolio. I compute β of sample firms as the sum of β_t and β_{t-1}. I use similar method to assess my firm's exposures to SMB and HML factors. Under the signalling and agency theory hypotheses, I expect $\alpha_{Net\ Buy}$ IPOs to be higher than $\alpha_{NetSell}$ IPOs.

This study also relates the CARs over 36 months after IPO dates to NPR after controlling for other factors defined in the previous literature, such as first day return, size, insider ownership (overhang), the underwriter reputation, venture capitalist backing, abnormal returns on the lockup expiry dates, lockup length, SEOs offerings and period dummies. In addition, following Brar et al. (2008), this study define the probability of being taken over as follows. I first build a two-way matrix by size and growth in turnover. I consider that companies that are large and high growth are less likely to be subject to a takeover bid, and thus assigned a value of 0. In contrast, those in small and low growth quadrant have a higher probability of a takeover, and they take a value of 1. Companies in the remaining two quadrants are undetermined. In the second stage, these undetermined samples are classified by dividend yield. Firms with high yield have a higher probability, and, thus a value of 1, while those with low yield have a value of 0.

Finally, a set of logit regressions are estimated to determine the characteristics of the *Net Sell* and *Net Buy* subsamples. In the first regression, the dependent variable is equal to one if IPO is in *Net Sell* sub-sample, and zero if no insider trading. Then I compare *Net Buy* and no insider trading samples. The last regression compares the *Net Sell* and *Net Buy* sub-samples.

6.4 Empirical Results

6.4.1 Descriptive Statistics

Table 6-1 provides the descriptive statistics of my sample firms. Panel A. reports the mean, median, and 10th and 90th percentiles of a set of fundamental variables. The results show that the average (median) length of the lockup is 391 (365) days,[72] more than double that in the US, where, for example, Brav and Gompers (2003) and Field and Hanka (2001) find a median of 180 days. The sample IPOs offered 38.6% (32.9%) of their shares in the market, the mean (median) shares locked amounts to 29.5% (24%) of the shares outstanding, and the level of underpricing of 22.5% (9.5%) is consistent with previous evidence (e.g., Chambers and Dimson, 2009). In terms of fundamentals, the results indicate that, while the average market value of equity of my firms is £140m (about $210m), my sample includes small as well as large firms. Consistent with US evidence (e.g., Brav and Gompers (2003)), the sample IPOs are high growth as the average market-to-book ratio is 3.88, close to the median of 3.01, suggesting that the mean

[72] Espenlaub et al. (2001) find mean lockup of 561 days and median of 730 days. The lockup contracts were compulsory during their sample period (1992-2000) for mineral and scientific research based companies with trading records of less than three years.

is not driven by outliers. The companies are also loss making as the average (median) return on equity is -34.6% (-2.6%).

Table 6-2 Descriptive Statistics

Panel A. Descriptive statistics of the IPO fundamental characteristics

	10th Percentile	*Median*	*Mean*	*90th Percentile*
Days locked	306	365	391	548
Shares locked (%)	1.50	24.00	29.40	68.00
Underpricing (%)	-1.50	9.90	22.50	51.30
Market value of equity(2008 £m)	3.20	21.60	140.20	204.10
Market-to-book	0.88	3.01	3.88	11.15
Return on Assets	-52.6	-2.60	-34.60	11.10

Panel B. Annual distribution of the sample IPOs

Year	*1999*	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*
IPOs	39	144	59	44	39	159	201	146
% Net Buy	2	20	7	5	6	20	23	17
% Net Sell	7	8	11	6	6	25	25	13
Average money raised (£m)	187.2	253.5	106.8	84.1	100.0	51.6	73.6	138.4
Days Locked	427	374	410	437	404	392	388	375

The sample includes 830 IPOs from January, 1 1999 to 31 December 2006, for which I have all necessary information. *Days locked* is the length of lockup period, *Shares locked* is the ratio of shares locked to shares outstanding. *Underpricing* is the percent return on the first day from the offering price to the closing price. *Market value* is the offering price *times* shares outstanding in 2008 millions of Pound Sterling constant terms. *Market-to-book* is the ratio of market capitalization at the IPO divided by the book value of the equity in the first reporting period after IPO. *Return on assets* is the net income divided by total assets in the first reporting period after the IPO. *Average Money Raised* is the ratio of money raised in 2008 £ bn over the number of IPOs.

In Panel B, I report the annual distribution of sample IPOs and the lockup lengths. Consistent with previous evidence (e.g., Chambers and Dimson (2009)), the volume of IPOs is relatively high in 2000, the ‘Bubble’ period, followed by a relatively quiet period 2001-2003, and then a heavy IPO activity period of 2004-2006. The most interesting results relate to the annual distribution of my *Net Sell* and *Net Buy* sub-samples. The results show a relatively similar frequency of the two samples throughout my sample period, with the vast majority of the trades occurring in the 2004 to 2006 period. I account for this time effect in my regressions. The next row reports the distribution of the amount of money raised. IPOs appear to be relatively larger in 1999 to 2000 period, with an average of £200m per issue, compared to £88m in the post-2001 period. In terms of the length of the lockup, the results show that the maximum of 437 days is in 2002 and the minimum of 374 is in 2000. However, I note that the distribution is relatively homogeneous, higher than the median of 365 days and in no single year is the average close to the 180 days documented in the US. Interestingly, these results suggest that neither the IPO waves nor the length of the lockup period drive the insider trading frequency.

6.4.2 The long-run performance of IPOs

Table 6-3 reports the long-run performance of my sample IPOs based on the cumulative abnormal returns (CARs) in the first month and then in the following 6, 12, 24 and 36 months after the IPO. Panel A. reports the equal weighted CARs. The first row reports the results for the sample as a whole and indicates that while in the first months the CARs are positive but not significant, they subsequently become negative. Up to month 6, the abnormal returns are negative but not significant. In the remaining months, the CARs are negative and highly significant. On average, my sample IPOs generate -36.5% abnormal returns in the first 36 months after their quotation. I split my sample IPOs into those with and without insider trading. The IPOs with insider trades serve as the test sample, and IPOs without insider trading is the control sample. This was done to compare stock price efficiency in IPOs with insider trading, and IPOs without insider trading (see, Fishman and Hagerty (1992)). Further, I classify my test sample IPOs with insider trades into IPOs with net sell and IPOs with net buy trades.

I find interesting trends when I split my sample into IPOs with and without insider trading. The results show that IPOs with insider trading also generate negative returns in month 36, however, they are significantly higher as they amount to -23.6%, and up to month 12, the CARs are positive, though not significant. In contrast, IPOs not subject to insider trading generate negative and significantly lower returns throughout the 36 months, reaching -67.9% in month 36. More interestingly, when I split my sample IPOs with insider trading into *Net Sell* and *Net Buy* sub-samples, I find contrasting and startling results: The *Net Sell* IPOs generate positive CARs throughout, reaching 13.3% in month 36, while *Net Buy* IPOs generate negative and significant CARs after their first year of quotation, reaching -48.3% in month 36.

Table 6-3, Panel B, reports the style adjusted returns. Previous studies using matching firm approach find that the underperformance disappears (for example, Brav and Gompers, 1997) or at least the abnormal performance shrinks (for example, Ritter and Welch, 2002). I, therefore, follow Ritter and Welch (2002) and compute Style-adjusted cumulative returns as the difference between the return on an IPO and a style-matched firm. For each IPO, a non-IPO matching firm that has been listed with the closest market capitalization and book-to-market ratio as the IPO is used. The control firm is selected only once, and if it is delisted prior to the

IPO return's ending date, a replacement matching firm is spliced in on a point-forward basis. My results indicate strong persistence in overperformance of *Net Sell* IPOs, and as in Panel A., the positive returns are concentrated mainly in months 2 to 17. *Net Buy* IPOs generate strong negative returns of -42% in the 36 months period, and in both subsample periods, the CARs are negative.

Table 6-3, Panel C, reports the results based on value-weighted returns. The trend in the CARs are relatively similar to the results in Panel A. In particular, while the CARs of the *Net Sell* sample are mostly not significant, those of all the remaining sub-samples are negative and significant. The underperformance is now much more pronounced for the *Net Buy* sample, as despite generating positive and significant returns in the first month after the IPO, they generate negative returns in the remaining periods, reaching -65.5% in month 36. The last two columns indicate that for the *Net Sell* sample, the $CAR_{2\text{-}18}$ and $CAR_{19\text{-}36}$ are both not significant, suggesting that insiders did not lose by selling. In contrast, for the *Net Buy* sample, both CARs are negative and significant, implying that even if the insiders trade to support the price of their firms, they do succeed in stopping the fall in stock prices.

Figure 6-1, 6-2 and 6-3 portray the trend in the CARs of sample firms. Figure 6-1 clearly indicates that for the sample as a whole, IPOs underperform significantly. Similar trend are observed for IPOs without insider trading and *Net Buy* IPOs. In contrast *Net Sell* IPOs overperform throughout the post-IPO period. The results are similar in Figure 6-2 where the style adjusted returns are reported. Figure 6-3 charts the value weighted CARs for my sample firms. While the overperformance of my *Net Sell* IPOs is not well pronounced as in Figure 6-1, the results clearly indicate that they do much better than all the remaining IPOs and the

Net Buy IPOs are the worst performers. The difference in the excess performance between my sample firms is particularly observed after the first year of trading. Appendix A provides details of the monthly returns for each of my sample IPOs using both the equally and value weighted returns.

Table 6-3 Long-run IPO Performance: CAR

	Months					Event windows	
	1	6	12	24	36	2-18	19-36
			Panel A: Equal weighted				
All IPOs	0.005	-0.023	-0.106**	-0.270***	-0.365***	-0.162***	-0.208***
	(0.36)	(-0.71)	(-2.33)	(-4.22)	(-4.66)	(-3.10)	(-3.75)
IPOs with Insider Trade	0.013	0.001	-0.059	-0.165***	-0.236***	-0.089*	-0.160***
	(1.00)	(0.03)	(-1.30)	(-2.58)	(-3.01)	(-1.71)	(-2.89)
No Trade	-0.016	-0.081***	-0.219***	-0.526***	-0.679***	-0.340***	-0.324***
	(-1.19)	(-2.52)	(-4.85)	(-8.22)	(-8.66)	(-6.50)	(-5.84)
Net sell	0.000	0.078***	0.120***	0.149***	0.133*	0.153***	-0.020
	(0.03)	(2.45)	(2.65)	(2.33)	(1.70)	(2.93)	(-0.37)
Net buy	0.022*	-0.051	-0.179***	-0.375***	-0.483***	-0.251***	-0.254***
	(1.65)	(-1.59)	(-3.95)	(-5.85)	(-6.16)	(-4.80)	(-4.57)
			Panel B. Style-adjusted				
All IPOs	0.022*	-0.002	-0.056	-0.175***	-0.261***	-0.123**	-0.161***
	(1.89)	(-0.05)	(-1.37)	(3.05)	(-3.72)	(-2.54)	(-3.23)
IPOs with Insider Trade	0.026**	0.022	-0.006	-0.073	-0.157**	-0.041	-0.143**
	(2.24)	(0.77)	(-0.16)	(-1.27)	(-2.23)	(-0.84)	(-2.87)
No Trade	0.012	-0.058**	-0.274**	-0.420***	-0.513***	-0.321***	-0.204***
	(1.02)	(-2.04)	(-6.76)	(-7.32)	(-7.30)	(-6.64)	(-4.10)
Net sell	0.027**	0.082**	0.145***	0.239***	0.239***	0.187***	0.024
	(2.33)	(2.85)	(3.45)	(4.17)	(3.40)	(3.88)	(0.49)
Net buy	0.026**	-0.017	-0.107**	-0.280***	-0.420***	-0.192***	-0.253***
	(2.19)	(-0.61)	(-2.64)	(-4.88)	(-5.97)	(-3.98)	(-5.10)
			Panel C: Value weighted				
All IPOs	0.028	-0.059	-0.256***	-0.399***	-0.351**	-0.303***	-0.076
	(1.16)	(-0.99)	(-3.05)	(-3.37)	(-2.41)	(-3.04)	(-0.74)
IPOs with Insider Trade	0.037	-0.058	-0.251***	-0.360***	-0.299**	-0.264**	-0.072
	(1.53)	(-0.98)	(-2.99)	(-3.03)	(-2.06)	(-2.65)	(-0.70)
No Trade	-0.003	-0.061	-0.274***	-0.537***	-0.530***	-0.436***	-0.092
	(-0.11)	(-1.03)	(-3.27)	(-4.53)	(-3.65)	(-4.38)	(-0.89)

Net sell	0.019	-0.081	-0.159*	-0.081	0.056	-0.041	0.079
	(0.76)	(-1.37)	(-1.89)	(-0.68)	(0.38)	(-0.41)	(0.77)
Net buy	0.056***	-0.036	-0.343***	-0.639***	-0.655***	-0.487***	-0.223**
	(2.29)	(-0.60)	(-4.09)	(-5.39)	(-4.51)	(-4.89)	(-2.17)

I compute the abnormal returns using the standard event study methodology of stock returns on the FTSE All Share Price Index for main market companies and AIM All Share Price Index for AIM companies. I obtain the monthly share price and indices data from DataStream. Panel A, B and C respectively reports equal weighted CARs, Style adjusted (M/B and size) CARs and Value weighted CARs. All IPOs includes 830 UK IPOs over the period 1999-2006. IPOs with insider trades (543 IPOs) includes any IPOs with at lease one insider trades during 36 months period after IPO. IPOs without insider trades (287 IPOs) include any IPOs without any insider trades during 36 months period after IPO. IPOs where insider are net buyers (sellers) are based on Net purchase ratio (NPR). If NPR is positive (negative) I define them as IPOs where insiders are net buyers (sellers). NPR is the difference between total value of purchases and sells divided by total value of shares traded over this 36 months period after IPO. I identify 190 *Net Sell* IPOs and 353 *Net Buy* IPOs. To remove the effect of first day return I compute the first month return without first day return. ***, ** * represent significant at 1, 5 and 10 percent respectively.

This study first focuses on the timing of their trades. It is shown that the median number of years from the IPO date to the trading date is 1.45 years for both the *Net Buy* and *Net Sell* samples. I, therefore, split my sample period into two subsamples: months 2 to 17 and months 18 to 36, and analyse the CARs in each sub-period. I show that for the *Net Sell* IPOs, the CARs in the first sixteen months after the IPO of 0.165, are positive and significant (t = 3.06). In contrast, in the following nineteen months, the CARs of -0.032 are negative but not significantly different from zero (t = -0.56). I find similar results with style-adjusted returns of 18.7% (t = 3.88) and 2.4% (t = 0.49), respectively. When value weighted returns are used, I find the CARs are not significant in both periods. These results suggest that insiders sell in IPOs that do well, but they time their trades, as they sell when they know that the price of their firm is stabilised and there are no more gains to achieve.

Figure 6-1 Equal weighted long-run IPO returns by insider trading categories

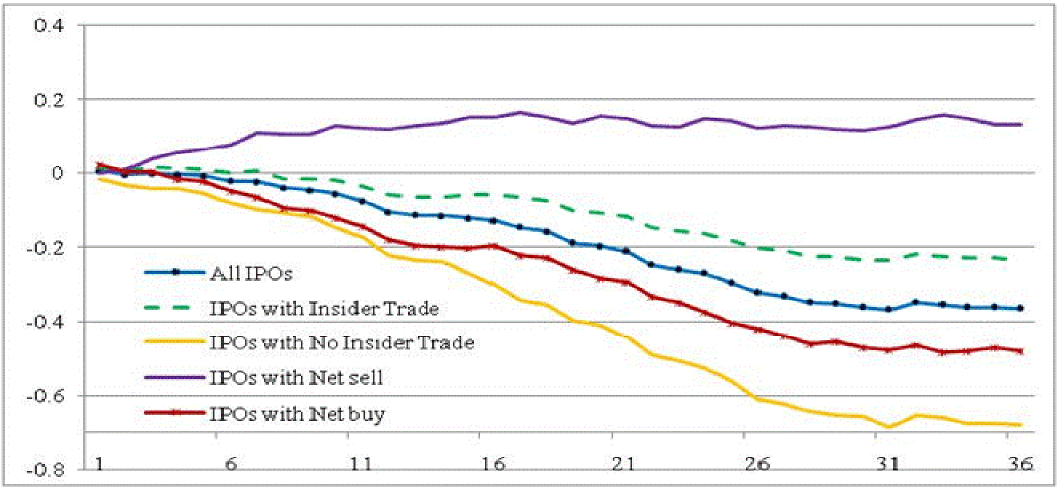


Figure 6-2 Style-adjusted long-run IPO returns by insider trading categories

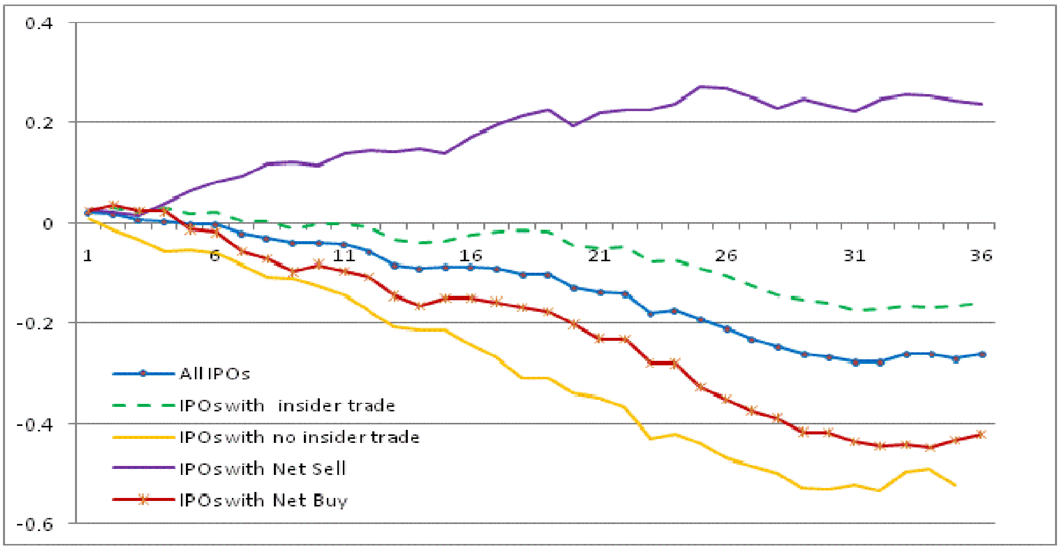
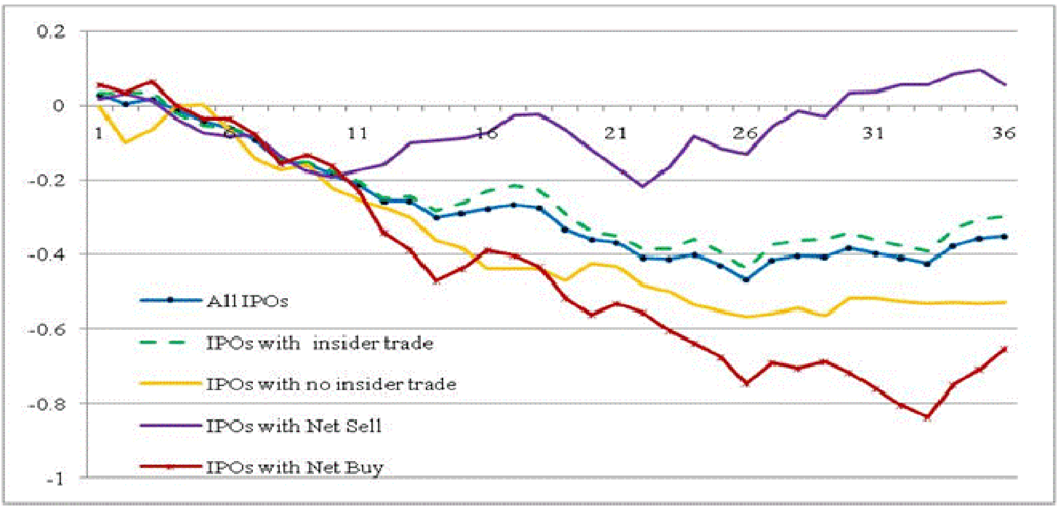


Figure 6-3 Value weighted long-run IPO returns by insider trading categories



The findings are broadly similar when I use the Fama-French (1993) regressions. Table 6-3, Panel A, reports the results based on equally weighted returns. For the sample as a whole, α is negative and significant and amounts to about -0.9% per month, equivalent to $CAR_{1, 36}$ of -36% reported in Panel A, Table 2. Interesting, the β of my IPOs is 1.01 in a simple CAPM model, but since the lagged value of β is also significant, the correct β is the sum of the two coefficients, i.e., 1.66, in line with Ritter and Welch (2002) findings of 1.73. This magnitude of β is relatively homogeneous across all my sub-samples, ranging between 1.45 for *Net Buy* and 1.66 for *Net Sell* samples. These results suggest that IPOs have relatively higher risk and, as a result, they should generate positive long-term returns. This is the case for all IPOs with insider trading, although α is not significant, and *Net Sell* IPOs where α is positive and significant in all the specifications. In contrast, IPOs without insider trading, and *Net Buy* IPOs generate negative and significant α. Overall, my results provide support to the CAR findings and suggest that IPOs where insiders are net sellers overperform all the remaining IPO categories.

The other Fama-French factors reveal interesting findings. The coefficient for SMB shows that IPOs with insider trades have a higher γ compared to the IPOs without insider trades. However, there is not much difference in γ coefficient between *Net Buy* and *Net Sell* IPOs. The HML factor shows that the δ coefficient is much smaller for IPOs with insider trades compared to IPOs without insider trades. More interestingly, it is even smaller for IPOs where insiders are net sellers compared to IPOs where they are net buyers. The coefficients of the lagged values of SMB and HML are predominantly non-significant.

Table 6-4 Fama French Three-Factor Regressions on Calendar-Time Portfolio Returns (36 Months)

$$R_{Pt} - R_{ft} = \alpha + \beta_t(R_{Mt} - R_{ft}) + \beta_{t-1}(R_{Mt-1} - R_{ft-1}) + \gamma_t SMB_t + \gamma_{t-1} SMB_{t-1} + \delta_t HML_t + \delta_{t-1} HML_{t-1} + \varepsilon_{pt}$$

Panel A. Equally Weighted Returns

	α	β_t	β_{t-1}	γ_t	γ_{t-1}	δ_t	δ_{t-1}	R^2
All IPOs	-0.009**	1.014***						0.41
	(-1.99)	(7.96)						
	-0.007*	1.046***	0.613***					0.56
	(-1.86)	(7.74)	(5.00)					
	-0.009**	0.883***		1.044***		-0.437**		0.70
	(-2.51)	(9.99)		(9.38)		(-1.99)		
	-0.009**	0.925***	0.317***	0.902***	0.175*	-0.415**	0.170	0.75
	(-2.56)	(9.93)	(3.68)	(8.13)	(1.67)	(-2.08)	(1.18)	
IPOs without Insider Trades	-0.021***	1.010***						0.36
	(-3.76)	(7.17)						
	-0.017***	1.002***	0.475***					0.44
	(-3.44)	(7.33)	(3.47)					
	-0.019***	0.909***		0.991***		-0.495**		0.59
	(-3.79)	(7.24)		(6.86)		(-2.17)		
	-0.018***	0.906***	0.203	0.868***	0.257**	-0.499**	-0.293	0.61
	(-3.75)	(7.09)	(1.56)	(5.65)	(2.02)	(-2.30)	(-0.093)	
IPOs with	0.002	1.145***						0.33

Insider Trades	(0.36)	(5.79)						
	0.005	1.144***	0.470**					0.38
	(0.85)	(5.95)	(2.50)					
	0.003	1.012***		1.219***		-0.952**		0.61
	(0.57)	(6.62)		(6.87)		(-2.54)		
	0.007	1.021***	0.156	1.125***	0.162	-0.957***	-0.525	0.63
	(1.09)	(6.39)	(0.956)	(6.65)	(0.76)	(-2.82)	(-1.32)	
IPOs where insider are net sellers	0.017**	1.279***						0.35
	(2.49)	(5.83)						
	0.020***	1.286	0.378*					0.39
	(2.84)	(5.88)	(1.97)					
	0.021**	1.197***		1.071***		-1.286***		0.58
	(2.40)	(8.38)		(4.18)		(-3.53)		
	0.024***	1.193***	0.122	0.975***	0.157	-1.278***	-0.474	0.59
	(2.93)	(6.11)	(0.716)	(5.01)	(0.702)	(-3.401)	(-0.97)	
IPOs where insider are *Net Buyers*	0.009*	1.053***						0.32
	(1.76)	(5.05)						
	0.011**	1.070***	0.385**					0.35
	(2.10)	(5.29)	(1.95)					
	-0.015***	0.887***		1.101***		-0.448*		0.61
	(-3.56)	(8.25)		(7.50)		(1.87)		
	-0.013**	0.896***	0.309***	0.975***	0.241	-0.532**	-0.125	0.65
	(-2.95)	(8.06)	(2.83)	(7.10)	(1.63)	(-2.44)	(-0.38)	

Panel B Value Weighted Returns

	α	β_t	β_{t-1}	γ_t	γ_{t-1}	δ_t	δ_{t-1}	R^2
All IPOs	0.000	1.678***						0.62
	(0.16)	(12.30)						
	0.002	1.697	0.380**					0.65
	(0.43)	(11.91)	(1.92)					
	-0.000	1.548***		1.009***		-0.23		0.75
	(-0.06)	(13.28)		(4.90)		(-0.79)		
	0.003	1.550***	0.173	0.936***	-0.121	-0.253	-0.518*	0.76
	(0.72)	(14.86)	(1.27)	(5.51)	(-1.00)	(-0.85)	(-1.80)	
IPOs without Insider Trades	-0.015*	1.603***						0.33
	(-1.72)	(5.05)						
	-0.011	1.593***	0.659*					0.38
	(-1.40)	(5.48)	(1.68)					
	-0.008	1.534***		1.168***		-1.457***		0.50
	(-1.22)	(5.20)		(4.83)		(-1.96)		
	-0.005	1.547***	0.409	0.963***	0.153	-1.499**	-0.088	0.51
	(-0.68)	(5.45)	(1.22)	(3.85)	(0.43)	(-2.08)	(-0.17)	
IPOs with Insider Trades	-0.000	1.833***						0.51
	(-0.06)	(8.92)						
	0.002	1.839***	0.463*					0.54
	(0.44)	(8.98)	(1.80)					
	0.000	1.715***		1.212***		-0.770**		0.66
	(0.10)	(9.21)		(4.84)		(-1.92)		
	0.002	1.725***	0.134	1.127***	0.107	-0.769**	-0.195	0.66
	(0.47)	(8.78)	(0.63)	(5.08)	(0.56)	(1.92)	(-0.59)	

IPOs where	0.014*	1.787***						0.40
insider are net	(1.73)	(6.22)						
sellers								
	0.017**	1.797***	0.388					0.43
	(2.23)	(6.15)	(1.21)					
	0.019**	1.732***		0.908***		-1.463***		0.52
	(2.39)	(6.16)		(3.62)		(-2.92)		
	0.020**	1.761***	0.156	0.824***	0.149	-1.475***	0.231	0.52
	(2.69)	(5.95)	(0.56)	(3.66)	(0.63)	(-2.99)	(0.408)	
IPOs where	-0.011*	1.910***						0.49
insider are *Net*	(-1.65)	(8.08)						
*Buy*ers	-0.008	1.912***	0.489*					0.52
	(-1.40)	(7.85)	(1.95)					
	-0.011**	1.697***		1.382***		-0.031		0.65
	(-1.95)	(9.05)		(4.41)		(-0.77)		
	-0.006	1.681***	0.215	1.279***	-0.138	-0.096	-0.63**	0.65
	(-0.98)	(9.72)	(1.11)	(4.61)	(-0.780)	(-0.24)	(-1.94)	

The table reports Fama and French (1996) three-factor model to assess long term performance of IPOs. In the model, $R_{pt} - r_{ft}$ is the excess return over the risk free rate on a portfolio in time period t, $R_{Mt} - R_{ft}$ is the market risk premium in period t, SMB_t is the return on small firms minus the return on large firms, and HML_t is the return on high book-to-market portfolio minus the return of the low book-to-market portfolio and R_{ft} is the 3 months Treasury bill rate. I follow Ritter and Welch (2002) and include also the lagged factors. The return on FTSE All Share Price Index serves as return on market. To calculate SMB_t, FTSE 100 index is used as index for large firms and FTSE Small Cap Index is used for small companies' index. To calculate HML_t, FTSE 350 Index is used as a proxy for high book to market portfolio and FTSE 350 Growth is used as a proxy for low book to market portfolio. IPOs with insider trades (543 IPOs) includes any IPOs with at least one insider trades during 36 months period after IPO. IPOs without insider trades (287 IPOs) include any IPOs without any insider trades during 36 months period after IPO. IPOs where insider are net buyers (sellers) are based on Net purchase ratio (NPR). If NPR is positive (negative) I define them as IPOs where insiders are *Net Buy*ers (sellers). NPR is the difference between total value of purchases and sells divided by total value of shares traded over this 36 months period after IPO. I identify 190 *Net Sell* IPOs and 353 *Net Buy* IPOs. To remove the effect of first day return I compute the first month return without first day return. ***, **, * represent significant at 1, 5 and 10 percent respectively.

The results based on value-weighted returns, reported in Panel B, are relatively similar. While α is not significant for the sample as a whole, IPOs with and without insider trading, it becomes positive and significant for *Net Sell* and negative and significant for *Net Buy* IPOs, even though their β is relatively higher.

The results are in direct contrast with the conventional wisdom that insider sell (buy) lead to stock price decline (increase) which is consistent with the moral hazard/ agency framework, which says that increase (decrease) of insider holdings mitigates (exacerbates) agency problems and hence affects the performance of the firm. The share price behaviour of Net Sell IPOs is more consistent with the view that insider sells are driven by liquidity rather than information considerations. Since share price of Net Buy IPOs show that they underperform, the results are puzzling in the light of agency/moral hazard framework.

6.4.3 The determinants of the long-run performance

The results in the previous section indicate that insider trading affect significantly the long-run performance of IPOs. However, the impact is asymmetric as IPOs where insiders sell overperform, while those where they buy generate significant negative returns. My results indicate that, in the case of *Net Sell* sample, insiders may be able to time their trades as, after they sell, the returns are not significant. In contrast, in the *Net Buy* sample, they try to support the price, but without success as their firms carry on generating negative return throughout the sample period. This section expands these results by contrasting further the fundamental characteristics of the IPOs in different samples. I also run a set of regressions to assess whether this difference in performance holds after controlling for differences in fundamental factors, as defined in the previous literature.

Table 6-5 Univariate Analysis of IPOs Insider Trades (within 3-years of IPO)

Panel A: Characteristics of IPOs with and without Insider Trades (within 3-years of IPO)

	IPOs with insider trades			No Trade	P-value of differences in Means			
	All (1)	Net Sell (2)	Net Buy (3)	(4)	(1)-(4)	(2)-(3)	(2)-(4)	(3)-(4)
No of IPOs	543	190	353	287				
Underpricing (%)	19.58	15.62	21.78	28.18	0.03	0.13	0.02	0.10
Days locked	388.45	378.47	395.00	398.3	0.20	0.07	0.06	0.41
Shares Locked (%)	93.98	92.2	94.95	95.5	0.18	0.29	0.01	0.29
Size (2008 £m)	149.23	175.33	135.53	123.25	0.27	0.20	0.13	0.40
Overhang (%)	3.82	4.41	3.51	3.99	0.39	0.14	0.31	0.23
Prestigious Underwriter (%)	23.38	27.36	21.30	13.93	0.00	0.05	0.00	0.00
Venture backed (%)	15.83	17.89	14.77	10.45	0.01	0.17	0.01	0.05
Institutional Holding (%)	60.7	58.9	59.94	63.41	0.22	0.31	0.16	0.33
$CAR_{(-40,-2)}$ (%)	1.01	5.88	-1.58	-3.29	0.00	0.00	0.00	0.04
Lockup Expiry Returns (%)	-1.59	-0.63	-2.10	-2.44	0.18	0.04	0.04	0.37
High tech Dummy (%)	11.23	10.00	11.89	8.34	0.09	0.21	0.27	0.07
Bubble Dummy (%)	19.33	14.70	21.18	27.18	0.00	0.02	0.00	0.05
Hot Dummy (%)	80.29	76.84	82.15	87.80	0.00	0.07	0.00	0.02
Takeover Probability (%)	23.38	18.94	25.77	41.46	0.00	0.04	0.00	0.00
SEO Dummy (%)	16.60	13.68	17.56	13.93	0.21	0.12	0.47	0.11

Panel B. Means [Medians] underpricing, long run performance and Net Buy and Net Sell

	N	Underpricing (%)	Equal weighted CARs (%)	Net Sell	Net Buy
Market value>median	416	26.4[10.7]***	-61.9[-50.5]**	334[138]***	261[60]***
Market value<median	415	18.6[9.0]	-45.1[-44.9]	16[13]	10[9]
p-value		0.00	0.05	0.00	0.00
Prestigious underwriter	166	9.1[6.7]***	-26.4[-0.002]	27.36***	21.12
Other underwriter	665	26.0[10.5]	-38.7[-32.7]	17.96	19.28
p-value		0.00	0.14	0.00	0.24
Venture-backed	116	28.8[9.0]	-46.4[-48.2]	17.89**	14.73
Non-venture-backed	715	21.5[10.0]	-34.5[23.2]	12.81	13.41
p-value		0.13	0.18	0.03	0.29
Main Market	141	18.6[7.7]	-25.4[-0.002]	87.65***	81.11**
AIM	690	23.5[10.0]	-38.4[-28.9]	68.42	86.11
p-value		0.21	0.14	0.00	0.03
Institutional holding	504	22.8[9.2]	-36.1[-20.8]	58.94	61.75
No Institution holding	327	22.1[10.5]	-36.4[-30.3]	62.50	61.63
p-value		0.28	0.48	0.19	0.48

Bubble period	183	32.1[9.7]***	-84.4[-79.1]***	14.73***	21.81
Non-bubble period	648	16.4[10.0]	-22.6[-13.7]	24.21	22.22
p-value		0.00	0.00	0.00	0.44
Hot market	676	27.1[10.0]	-44.3[-32.8]***	76.84***	82.15
Cold market	155	18.9[7.1]	7.4[18.9]	84.68	83.43
p-value		0.12	0.00	0.00	0.31

All IPOs with insider trade, *Net Sell* and *Net Buy* include 543, 190 and 353 IPOs, respectively. There are 287 IPOs without any insider trades. *Underpricing* is the percent return on the first day from the offering price to the closing price. *Days locked* is the length of lockup period, *Shares locked* is the ratio of shares locked to shares outstanding *Size* is the market value of equity in 2008 constant terms. *Overhang* is the ratio of proportion retained to proportion sold. *Prestigious underwriter* is defined if the global investment bank has underwritten the issue. *Venture-backed* is the proportion of IPOs backed by venture capitalist. *Institutional Holding* is the proportion of companies where institutions hold more than 3%. $CAR_{(-40,-2)}$ are the cumulative abnormal return over pre-event window. For the no trade sample, I measure the 39-day abnormal return as the abnormal return over the whole lockup period standardised to 39 days. *Lockup expiry returns* is the Cumulative abnormal return over -2 to+2 around lockup expiration. *High-tech Dummy* is equal to one if the IPO is in computer manufacturing, electronic equipment, computer and data processing services, and optical, medical and scientific equipment. *Bubble period* is defined as 1999-2000 period following Levis (2008). *Hot market* is when the IPO volume increases significantly and includes two periods January 1999 to March 2001 and January 2004 to end of 2006. *Cold market* is the remaining sample period. *Takeover Probability* is a Dummy constructed by following Brar et al. (2008). I first build a two-way matrix by size and growth in turnover. I consider that companies that are large and high growth are less likely to be subject to a takeover bid, and thus assigned a value of 0. In contrast, those in small and low growth quadrant have a higher probability of a takeover, and they take a value of 1. Companies in the remaining two quadrants are undetermined. In the second stage, I classify these undetermined samples by dividend yield. Firms with high yield have a higher probability, and, thus a value of 1, while those with low yield have a value of 0. *SEO Dummy* takes value of one if the IPO raised further Equity within 3-years of IPO. I report *p*-values for the mean difference test between different subsamples. ***, **, * significant at 0.01, 0.05, and 0.1 levels, respectively.

Table 6-4 reports the univariate analysis. I focus on differences between *Net Sell*, *Net Buy*, and no insider trading, *No Trade*, samples. The results indicate that *Net Sell* IPOs have lower lockup lengths, more likely to be underwritten by prestigious underwriters, higher pre-trade returns, less likely to be issued in bubble and hot periods and less likely to be taken over than the remaining IPOs. In addition, they have lower underpricing, lower fraction of shares locked, less likely to be backed by venture capitalists, and higher returns on the lockup expiry dates than IPOs in *No Trade* sample. The *Net Buy* IPOs are more likely to be underwritten by prestigious underwriters and backed by venture capitalists, more likely to be high tech but less likely to be issued in hot period, or to be taken over, and they generate relatively higher returns before the trades, $CAR_{(-40,-2)}$.

Panel B reports the distribution of the underpricing, the 36 months CARs, and the proportion of *Net Buy* and *Net Sell* IPOs by size, the presence of prestigious underwriters[73] and venture capitalists, market of quotation, institutional holdings, and market conditions.[74] In line with previous evidence (e.g., Brav and Gompers (2003)) the results indicate that the underpricing is higher in large firms, but the magnitude is larger, and it is not a function of the presence of venture capitalists. However, my results show that the underpricing is lower in IPOs underwritten by prestigious underwriters, and in non-bubble periods. Furthermore, while the long-term returns are not affected by prestigious underwriters, venture capitalists and the market of quotation, they are much lower in large firms and in IPOs issued in the bubble period. The size effect on the long-term returns is consistent with Levis (2008). The last two columns provide additional analysis of my IPOs in the *Net Buy* and *Net Sell* subsamples. The results indicate that insider trading in both the *Net Buy* and *Net Sell* IPOs occur mainly in larger firms. The results also indicate that *Net Sell* IPOs are likely to be underwritten by prestigious underwriters, backed by venture capitalists, and quoted in the main market, but less likely to be issued in bubble period and in cold market conditions. In contrast, the *Net Buy* IPOs are relatively homogeneously distributed across these characteristics, but unlike *Net*

[73] We follow Derrien and Kecskes (2007) and include in prestigious underwriters global investment banks such as ABN AMRO (including Hoare Govett), Cazenove & Co., Credit Lynnais Securities, Dresdner Kleinwort Wassertein, HSBC Securities, Credit Suisse, Investec Hendersen Crosthwaite securities, KBC Securities, Peel Hunt, Lehman brothers, Nomura International, Schroder Salomon Smith Barney, SG securities, UBS, West LB, Merrill Lynch International, Goldman Sachs.

[74] We split these conditions into bubble and non-bubble period and hot and cold market. We define bubble period as 1999-2000 period following Levis (2008). *Hot market* is when the IPO volume increases significantly and includes two periods 2000 and 2004 to 2006.

Sell IPOs, they appear to occur more in IPOs quoted on AIM than on the Main Market.

Table 6-5 reports the correlation matrix across variables. The results indicate a strong negative relationship between equally weighted CARs 36 months after IPO and first day returns, *Underpricing*, high tech, bubble and hot market dummies, and net purchase ratio as measured by transaction, *NPR_Trans*, or value, *NPR_Val*. are negatively related to underpricing. In contrast, the correlation with lockup expiry date returns is positive, suggesting that IPOs with low decrease in share prices on the lockup expiry date generate high returns. This positive correlation provides support to Brav and Gompers (2003) and Field and Hanka (2001) who suggest that lockup expiry dates are likely to increase the agency conflicts between managers and outside investors and opens up ways for trading on insider information. Since part of the negative returns on the lockup expiry dates is driven by the sell trades by insiders (Hoque and Lasfer (2009)), my results suggest that IPOs where insiders keep their holdings after the lockup expiry dates suffer less agency conflicts and, thus generate higher long-term returns.

Interestingly, the correlation between underpricing and the remaining explanatory variables is weak, as shown in column 2. Column 3 reports a positive correlation between size and prestigious underwriters, suggesting that large IPOs are more likely to be underwritten by prestigious investment banks. Large firms are also likely to be issued in bubble periods, but less likely to have longer lockup lengths. Column 4 shows that overhang is lower in hot markets. Column 5 shows a positive correlation between prestigious underwriters, venture capitalist, and bubble period, but negative relationship with lockup lengths, in line with venture capitalists in Column 6. The remaining columns indicate a negative correlation between takeover probability and returns on the lockup length (Column 7), and bubble period (Column 10). I account for these correlations in my regression results by including only one factor at a time and assess the impact on the standard error, and thus, t-statistics.

Table 6-6 shows the cross sectional regressions of 36 months IPO returns on several variables. I have estimated regressions (1-3) with bubble and hot market dummies and regressions (4-6) with year dummies to avoid multicollinearity problem. As a measure of insider trading activity in the IPOs I use net purchase ratio (based on number of transactions and value) and a dummy variable for no insider trading. The last three columns replicate Regression (1) for *Net Buy*, *Net Sell* and *No Trade* subsamples.

Table 6-6 Correlation Matrix

Correlation	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1.CAR36	1.00														
2.Underpricing	-0.13	1.00													
3.Size	-0.01	-0.02	1.00												
4.Overhang	-0.05	-0.01	-0.02	1.00											
5.Prestigous underwriters	0.03	-0.08	0.34	-0.01	1.00										
6.VC-backing	0.00	0.01	0.04	0.02	0.20	1.00									
7.Lockup expiry returns	0.14	-0.05	-0.01	-0.03	0.00	0.02	1.00								
8.Lockup length	-0.07	-0.03	-0.13	0.05	-0.20	-0.15	0.09	1.00							
9.High tech dummy	-0.13	0.02	0.01	-0.01	0.05	0.15	-0.05	-0.08	1.00						
10.Bubble dummy	-0.20	0.08	0.10	-0.05	0.13	0.09	-0.06	0.00	-0.01	1.00					
11.Hot dummy	-0.14	0.06	0.01	-0.10	0.08	-0.01	0.02	-0.10	-0.02	0.24	1.00				
12.NPR_Trans	-0.22	0.01	-0.02	-0.04	-0.07	-0.03	-0.08	0.07	-0.01	0.10	0.05	1.00			
13.NPR_Val	-0.27	0.04	-0.03	-0.06	-0.07	-0.04	-0.08	0.06	0.03	0.08	0.06	0.90	1.00		
14.NO_IT_Dum	-0.02	-0.02	-0.02	-0.03	0.00	-0.04	0.00	-0.01	0.04	0.01	-0.06	-0.06	-0.03	1.00	
15. Takeover Probability	0.03	0.04	0.00	-0.01	-0.06	-0.02	-0.12	0.02	-0.06	-0.11	0.03	0.04	0.06	0.05	1.00
16.SEO Dummy	0.02	0.01	-0.08	0.06	-0.09	0.07	0.07	0.07	-0.03	0.14	-0.10	0.07	0.05	0.08	0.00

Table 6-7 OLS Regressions of 36 Months IPO Performance

	(1)	(2)	(3)	(4)	(5)	(6)	Net Buy	Net Sell	No IT
Constant	2.35***	2.25***	1.79***	1.86**	1.78**	1.22*	2.94**	0.84	0.146
	(2.86)	(2.82)	(2.69)	(-2.33)	(2.27)	(1.92)	(2.42)	(0.54)	(0.09)
Underpricing	-0.002**	-0.002**	-0.002***	-0.002**	-0.002*	-0.002***	-0.002*	-0.002	-0.003**
	(-2.31)	(-2.11)	(-2.81)	(-1.97)	(-1.83)	(-2.48)	(-1.87)	(-1.53)	(-2.11)
Log(Size)	-0.026	-0.042	-0.011	-0.007	-0.006	-0.017	-0.038	-0.048	-0.011
	(-0.79)	(-1.23)	(-0.37)	(-0.23)	(-0.18)	(-0.65)	(-0.81)	(-0.67)	(-0.17)
Overhang	-0.009*	-0.010*	-0.011**	-0.011**	-0.011**	-0.011	-0.007	-0.012	-0.016
	(-1.67)	(-1.71)	(-2.17)	(-1.97)	(-1.97)	(-2.25)	(-1.02)	(-1.51)	(-1.58)
Prestigious Underwriter	0.13	0.16	0.16	0.04	0.07	0.09	0.11	0.25	0.15
	(1.12)	(1.37)	(1.41)	(0.41)	(0.66)	(0.88)	(0.68)	(1.01)	(0.55)
VC baking	0.000	-0.012	-0.07	-0.13	-0.13	-0.15	-0.074	0.16	-0.37
	(0.001)	(0.10)	(-0.65)	(-1.04)	(-1.11)	(-1.46)	(-0.41)	(0.65)	(-1.35)
Lockup expiry return	1.26***	1.23***	1.02**	1.48***	1.45***	1.01**	1.19**	1.63	0.56
	(3.10)	(3.05)	(2.15)	(3.80)	(3.76)	(2.12)	(2.08)	(1.56)	(0.97)
Log(Lockup length)	-0.31**	-0.30**	-0.29**	-0.39***	-0.37***	-0.30***	-0.46**	-0.03	-0.012
	(-2.45)	(-2.43)	(-2.42)	(-3.09)	(-3.03)	(-2.75)	(-2.39)	(-0.13)	(-0.05)
High tech dummy	-0.55***	-0.50***	-0.57***	-0.59***	-0.55***	-0.60***	-0.58***	-0.37	-0.58*
	(-3.19)	(-2.95)	(-4.00)	(-3.69)	(-3.48)	(-4.10)	(-2.99)	(-1.25)	(-1.92)
Bubble dummy	-0.49***	-0.48***	-0.52***	--	--	--	-0.46**	-0.58**	-0.39*
	(-3.47)	(-3.48)	(-4.75)				(-2.81)	(-2.19)	(-1.86)
Hot Dummy	-0.32***	-031***	-0.38***	--	--	--	-0.37**	-0.21	-0.54**
	(-2.62)	(-2.73)	(-3.34)				(-2.22)	(-0.97)	(-1.98)
Takeover Probability	0.007	0.022	0.13	0.06	0.07	0.16	0.03	0.002	0.32*
	(0.06)	(0.19)	(1.25)	(0.50)	(0.62)	(1.57)	(0.20)	(0.009)	(1.67)
SEO Dummy	0.18	0.16	0.09	0.04	0.04	-0.007	0.11	0.25	-0.12
	(1.17)	(1.10)	(0.69)	(0.32)	(0.28)	(-0.06)	(0.63)	(0.93)	(-0.47)
NPR_trans	-0.33***			-0.28***					
	(-4.20)			(-3.79)					
NPR_val		-0.34***			-0.27***				
		(-5.42)			(-4.77)				
No IT Dum			-0.39***			-0.33***			

			(-3.78)			(-3.36)			
Year Dummies	--	--	--	Yes	Yes	Yes	--	--	--
Adjusted R^2	12.8%	14.5%	10.9%	19.7%	20.6%	15.5%	8.4%	3.1%	6.5%

Dependent variable for all regressions is 36 months cumulative abnormal returns for 830 IPOs that went public in London stock exchange from 1999 to 2006. *Underpricing* is the percent return on the first day from the offering price to the closing price. *Overhang* is the ratio of proportion retained to proportion sold. *Size* is defined as market value which is the offering price times shares outstanding in 2008 millions of Pound Sterling constant terms. *Prestigious underwriters* are the global underwriters defined in Derrien and Kecskes (2007). *Venture-backed* is dummy equal to one if the IPO is backed by venture capitalists. *Bubble period* is defined as 1999-2000 period following Levis (2008). *High-tech Dummy* is equal to one if the IPO is in computer manufacturing, electronic equipment, computer and data processing services, and optical, medical and scientific equipment. *Hot market* is when the IPO volume increases significantly and includes two periods January 1999 to March 2001 and January 2004 to end of 2006. *Cold market* is the remaining sample period. *Takeover Probability* is a Dummy constructed by following Brar et al. (2008). I first build a two-way matrix by size and growth in turnover. I consider that companies that are large and high growth are less likely to be subject to a takeover bid, and thus assigned a value of 0. In contrast, those in small and low growth quadrant have a higher probability of a takeover, and they take a value of 1. Companies in the remaining two quadrants are undetermined. In the second stage, I classify these undetermined samples by dividend yield. Firms with high yield have a higher probability, and, thus a value of 1, while those with low yield have a value of 0. *SEO Dummy* takes value of one if the IPO raised further Equity within 3-years of IPO. *Lockup exp ret* is the cumulative abnormal return from -2 to +2 days around the lockup expiration date. *Lockup length* is the number of days of lockup. *NPR_trans* is the number of insider purchases minus the number of insider sells divided by the total number of insider transactions over 36 months after IPO. *NPR_val* is the pound sterling value of insider purchases minus insider sells divided by the total value of insider transactions over 36 months after IPO. *No IT dum* is a dummy variable if the IPO does not have any insider trades within 36 months of IPO. ***, **, * significant at 0.01, 0.05, and 0.1 levels, respectively.

The results indicate a strong negative relationship between CARs and underpricing in all my specifications, with the *Net Sell* subsample where this variable is negative but not significant. The negative relationship between the long-term returns and underpricing is consistent with previous empirical evidence (e.g., Levis (2008)) and suggest that IPOs with high undepricing generate lower long-term returns. My results do not provide support to the signalling models (Jenkinson and Ljungqvist (2001)). The variable overhang is significant in (3) to (5), but not in (6) and in the subsample IPOs. The results also indicate that the CARs are not affected by the presence of prestigious underwriters and the venture capitalists, in line with Levis (2008). The variable size is negatively related to long term performance but the coefficient is not statistically significant. These results are in contrast with Brav and Gompers (1997) who document that underperformance is concentrated in small, non-venture capitalists-backed firms. The results also indicate a positive relationship between long-term returns and stock price behaviour on the lockup expiry dates, suggesting that IPOs with high lockup expiry returns dates, are more likely to have higher long-term returns as insider are unlikely to have sold their holdings after the lockup, and, thus lower agency conflicts. In addition, the lockup length is negatively related to long term performance, implying higher agency conflicts. High-tech dummy is negatively related to long run underperformance. Bubble dummy is statistically and economically significant, suggesting IPO issued in the bubble period generate more negative long term performance. Levis (2008) reports a negative coefficient for bubble dummy, but it is not significant. Also, hot market dummy is negative and statistically and economically significant. The three insider trading variables are negatively related to IPO performance. All of them are economically and statistically significant. The variable NPR_trans and NPR_val have similar coefficients (-0.34) in the first set of regressions and -0.28 and -0.27 in the second set of regressions. The negative coefficients imply that if insiders are net buyers the IPO performs badly, which is consistent with the univariate results. No IT Dum coefficient is -0.41 and -0.30 respectively, both significant at 1% level of significance. The negative sign of this coefficient imply that when IPOs are not subject to insider trading, they underperform.

It is worth mentioning that the R^2 obtained varies between 10.9-14.5%, and 15.5-20.6%, respectively for first and second set of regressions. Similar studies using the standard variables like underpricing, size, overhang, prestigious underwriter, VC baking obtained R^2 of 4-6%. For example, Levis (2008) reports R^2 of 1.5%,[75] and Goergen, Khurshed and Mudambi (2007) 8.45%.[76] The additional explanatory powers in my regressions seem to come partly from the insider trading based measures and partially from the time effects. The insider trading activity explains a significant proportion of IPO long run performance. This may be due to the information production by the insider's trading activity or through the increase in liquidity by their trades. It seems that underwriters/managers time the market very well. When the market is doing well (hot market) many companies issue

[75] Levis (2008) obtained an R^2 of 1.4% for Non-private equity backed, 7.5% for venture capitalists-backed and 0.05% for boyout IPOs.
[76] Goergen, Khurshed and Mudambi (2007) report R^2 for all firms of 8.45%. However, they report R^2 of 6.38% and 13.58% for small firms and large firms respectively.

shares, and subsequently they underperform, which is consistent with Schultz's (2003) 'pseudo market timing' phenomenon.

6.4.4 Determinants of Insider Trading in IPOs

If insiders believe that the stock is overvalued and expect prices to revert quickly to fundamental values, managers try to sell a larger proportion of the company to the public. At the same time on individual account, the insider sell trades should increase on the lock-up expiration dates. But if they do not cash out of their holdings at either of the two stages, that would be evidence against insiders using their private information to take advantage of outside investors. The latter finding would be consistent with the idea that insiders truly believe that their stock is fairly priced, and take their firm public to raise the capital necessary to invest in what they believe are investment opportunities with positive net present value (NPV). On the other hand, buy trades by insiders suggest that their shares are undervalued. If the buy trades occur for the falling share prices, two cases are possible: first, the IPO is a good company, but the share is temporarily mis-valued, and insiders want to increase their holdings, and secondly, the company is doing badly and insiders buy to support the price, and to increase the commitment and signalling effects. In the first case, the test is consistent with the asymmetric information hypothesis put forward in the context of the trading literature. For example, Brennan and Cao (1996) argue that informed investors are contrarians while uniformed investors are trend followers. To my knowledge, there are no studies which looked at such insider trades in the context of IPOs.

Table 6-8 Summary Statistics of Insider trading (within 3-years of IPO)

	10th percentile	Median	Mean	90th percentile
Panel A: Sell Trades				
Number of trades	1.00	2.00	3.56	8.00
Number of Shares	19,510	200,000	858,945	1,590,000
Value of shares (£)	24,242	298,569	2,334,453	2,940,683
Percentage Holding	0.04	1.35	7.14	22.44
Trade as % of market cap	0.02	0.29	1.01	2.37
Market capitalization (mil)	9.00	112.35	537.60	1244.42
$CAR_{(-40,-2)}$	-12.80%	4.57%	5.93%	24.72%
Trade time after IPO(yr)	0.52	1.45	1.52	2.63
Panel B: Buy Trades				
Number of trades	1.00	3.00	4.38	9.10
Number of Shares	5,000	27,000	172,885	250,000
Value of shares(£)	2,808	13,300	231,605	99,139
Percentage Holding	0.01	0.63	5.27	15.65
Trade as % of market cap	0.005	0.05	0.21	0.41
Market capitalization (mil)	3.84	26.48	248.14	352.89
$CAR_{(-40,-2)}$	-44.44%	-7.01%	-11.15%	15.64%
Trade time after IPO(yr)	0.41	1.45	1.46	2.61

I obtain insider holdings data for the period January 1999 to December 2007 from the Directors Deals and match it with my constructed IPO dataset. The sells (buys) are trades that occurred within 3 years of IPO. The sample includes 822 sell trades by 231 IPOs (Panel A) and 2102 buy trades by 480 IPOs (Panel B). Percentage Holding is the percent of total shares traded which is owned by the director. Market capitalization is at the time of trade. $CAR_{-42,-2}$ is the cumulative abnormal return 40 day pre-event window. I use the standard event study methodology to compute the abnormal returns with α and β based on regression of stock returns on the FTSE All Share Price Index for main market companies and AIM All Share Price Index for AIM companies.

Table 6-7 provides the descriptive statistics of the insider trading sample (within 3-years of IPO). The results indicate that, on an average 3.5 insiders sell trades compared to 4.38 buy trades. The trade time after the IPO is similar for sell (buy) trades and they occur roughly after 1.5 years after IPO. The results imply that most of the trades occur after the lockup expiration, as the average lockup period is one year. The number of shares sold and the value of shares are quite large compared to shares bought. Trade size as a percentage of market capitalisation shows that the sell trades are much larger compared to the buy trades. On average, the sell trades are 5 times larger than the buy trades. The average market capitalization for sell trades is also much larger compared to that of buy trades. The mean (median) pre-trade share price runnup for sell trades is 5.93% (4.57%) and the mean (median) share price decline for buy trades is -11.15%(-7.01%), implying that insiders are contrarians.

Table 6-8 reports the results of the logit regressions to assess the probability of insider trading in the IPOs. I have estimated three separate regressions. In Panel A I estimate a model for *Net Sell* IPOs relative no insider trading, *No Trade*, IPOs. I find that the share price run-up drive insiders' decision to sell stakes in their own IPO. The coefficient of $CAR_{(-40,-2)}$ of 4.204 is statistically and economically significant. The results also indicate that insiders sell in IPOs underwritten by prestigious underwriter, backed by venture capitalists and when the probability of a takeover is low.

Table 6-9 Logit Analysis of Insider Trades within 36 Months of IPO

	Coefficient	Standard Error	Prob.
Panel A: Net Sell			
Constant	0.218	0.847	0.79
CAR $_{(-40,-2)}$	4.204^{***}	1.266	0.00
Underpricing	-0.002	0.002	0.43
Shares Locked	-0.003	0.007	0.68
Days locked	-0.001	0.001	0.08
Overhang	0.010	0.013	0.43
Prestigious Underwriter	0.967^{***}	0.302	0.00
VC baking	0.777^{**}	0.340	0.02
Institutional presence?	-0.340	0.239	0.16
Takeover Probability	-1.210^{***}	0.256	0.00
SEO Dummy	-0.032	-0.054	0.58
Year Dummies		Yes	
Pseudo R^2		19.60%	

Panel B:Net Buy			
Constant	0.356	0.718	0.61
CAR $_{(-40,-2)}$	1.215	0.830	0.14
Underpricing	-0.001	0.001	0.67
Shares Locked	0.001	0.006	0.85
Days locked	-0.001	0.001	0.49
Overhang	-0.016	0.010	0.11
Prestigious Underwriter	0.566**	0.232	0.01
VC baking	0.378	0.268	0.15
Institutional presence?	-0.099	0.181	0.58
Takeover Probability	-0.740***	0.184	0.00
SEO Dummy	0.066	0.053	0.21
Year Dummies		Yes	
Pseudo R^2		5.97%	
Panel C: Buy Vs Sell			
Constant	-0.698	0.695	0.31
CAR $_{(-40,-2)}$	-2.942***	0.971	0.00
Underpricing	0.001	0.002	0.64
Shares Locked	0.009	0.005	0.13
Days locked	0.002**	0.001	0.04
Overhang	-0.012	0.015	0.41
Prestigious Underwriter	-0.234	0.240	0.32
VC baking	-0.229	0.290	0.43
Institutional presence?	0.297	0.210	0.16
Takeover Probability	0.406*	0.237	0.08
SEO Dummy	0.064	0.055	0.24
Year Dummies		Yes	
Pseudo R^2		8.55%	

The dependent variable in Panel A is a dummy equal to one for IPOs if insiders are net sellers and zero for no trade IPOs. In Panel B dependent variable is a dummy equal to one for IPOs if insiders are net buyers, and zero for no trades. In Panel C, the dependent is dummy variable equal to one for IPOs if insiders are net buyers and zero for IPOs if insider sellers. Insider *Net Sell* sample includes 190 IPOs and Insider *Net Buy* sample includes 353 IPOs and 287 IPOs with no trades. $CAR_{(-40,-2)}$ are the cumulative abnormal return over pre-event window. For the no trade sample, I measure the 39-day abnormal return as the abnormal return over the whole lockup period standardised to 39 days. *Underpricing* is the percent return on the first day from the offering price to the closing price. *Venture backed* is dummy variable equal to one venture capitalist is present. *Prestigious underwriter* is defined if the global investment bank has underwritten the issue. *Days locked* is the log of the lockup period. *Size* is the log of market value of equity in 2008 constant terms. *Shares locked* is the number of shares locked over the holdings of insiders. *Overhang* is the ratio of shares retained to shares sold. *Institutional Holding* is the proportion of companies where institutions hold more than 3%. *Takeover Probability* is a Dummy constructed by following Brar et al. (2008). I first build a two-way matrix by size and growth in turnover. I consider that companies that are large and high growth are less likely to be subject to a takeover bid, and thus assigned a value of 0. In contrast, those in small and low growth quadrant have a higher probability of a takeover, and they take a value of 1. Companies in the remaining two quadrants are undetermined. In the second stage, I classify these undetermined samples by dividend yield. Firms with high yield have a higher probability, and, thus a value of 1, while those with low yield have a value of 0. *SEO Dummy* takes value of one if the IPO raised further Equity within 3-years of IPO. ***, **, * significant at 0.01, 0.05, and 0.1 levels, respectively.

Panel B, reports the results for the *Net Buy* versus *No Trade* IPOs. The results indicate that IPOs with prestigious underwriters and a lower probability of takeover are more likely to be subject to *Net Buy* trades by insiders. Finally, in Panel C, I model the probability of *Net Buy* vs. *Net Sell* IPOs. The results indicate that the decision to buy rather than to sell is affected by share price performance, days locked, and takeover probability.

6.5 Robustness Checks

6.5.1 Long run underperformance

In this section, I first check whether IPOs underperform in the long run by using Buy-and-hold abnormal returns (BHARs). BHARs are easy to interpret as it means buying the issuing firm's stock in the month following the issue, and holding the stock for time T. The time frame used for calculating BHARs is 3 years to make it comparable with the CARs and Fama-French alphas. In a sample of N issues, the average return over a holding period of T months is computed as the average cumulative returns, also referred to as $\overline{BHR}$:

$$\overline{BHR} \equiv \frac{1}{N}\sum_{i=1}^{N}\left[\prod_{t=1}^{T}(1+R_{it})-1\right]$$

Where R_{it} denotes the return of stock *i* over month t. The effective holding period for stock i is from t to T, which is 36 months. Kothari and Warner (1997), Barber and Lyon (1997) and Lyon, Barber and Tsai (1999) provide simulation based analysis of test statistics based on long run return metrics such as BHR.

The matching firm technique generates return to issuing firms compared to the non-issuing firm, usually matched on firm characteristics such as industry, size and market-to-book ratio. In this paper, the matching is done using size and market to book. The abnormal return BHAR is then:

$$BHAR_{IPO} = BHR_{IPO} - BHR_{Matched\ Firm}$$

To test the null hypothesis that the mean BHAR is equal to zero for sample of N firms, the conventional t-statistic method is employed:

$$t = \frac{\overline{BHAR}_{(t,T)}}{\hat{\sigma}(BHAR_{(t,T)}/\sqrt{N}}$$

Where, $\overline{\boldsymbol{BHAR}}_{(\boldsymbol{t},\boldsymbol{T})}$ is the sample mean of $\boldsymbol{BHAR}_{(\boldsymbol{t},\boldsymbol{T})}$ and $\boldsymbol{\hat{\sigma}}(\boldsymbol{BHAR}_{(\boldsymbol{t},\boldsymbol{T})}$ is the cross-sectional sample standard deviation of BHAR for the sample of N firms.

Table 6-9 reports the long-run performance of my sample IPOs based on the buy-and-hold abnormal returns (BHAR) in the first month and then in the following 6, 12, 24 and 36 months after the IPO to compare my results with the CARs in Table 6-3. The results of BHARs are broadly similar to the CARs. The results show that all IPOs start underperforming in month 12, and they underperform significantly in the 36 months holding period. While the *insider trade* sample does not show significant underperformance, the sample with *No insider trade* shows significant underperformance. Interestingly, the *Net Sell* sample starts over-performing from 6 months and overperforms for the 3-year holding period. On the contrary, the *Net Buy* sample starts underperforming from 6 months and continues underperforming during the 3-year holding period.

Table 6-10 Long-run IPO Performance: BHAR

	Months					Event window	
	1	6	12	24	36	2-18	19-36
All IPOs	-0.002	-0.016	-0.076**	-0.139***	-0.183***	-0.055	-0.226***
	(-0.27)	(-0.50)	(-2.02)	(-3.15)	(-3.43)	(-1.36)	(-2.62)
No trade	-0.023	-0.024	-0.133**	-0.340***	-0.361***	-0.229***	-0.438*
	(-1.46)	(-0.34)	(-2.38)	(-5.55)	(-5.26)	(-3.96)	(-1.89)
Insider trade	0.009	-0.011	-0.046	-0.033	-0.088	0.038	-0.113**
	(0.88)	(-0.38)	(-0.93)	(-0.55)	(-1.22)	(0.71)	(-2.39)
Net Sell	0.001	0.127***	0.212***	0.421***	0.371**	0.390***	0.055
	(0.11)	(2.89)	(2.75)	(4.08)	(2.49)	(3.95)	(0.70)
Net buy	0.012	-0.086**	-0.185***	-0.277***	-0.336***	-0.152***	-0.204***
	(0.93)	(-2.28)	(-2.95)	(-4.09)	(-4.50)	(-2.55)	(-3.49)

I compute BHAR of stock returns on the FTSE All Share Price Index for main market companies and AIM All Share Price Index for AIM companies. I obtain the monthly share price and indices data from DataStream. All IPOs includes 830 UK IPOs over the period 1999-2006. IPOs with insider trades (543 IPOs) includes any IPOs with at lease one insider trades during 36 months period after IPO. IPOs without insider trades (287 IPOs) include any IPOs without any insider trades during 36 months period after IPO. IPOs where insider are net buyers (sellers) are based on Net purchase ratio (NPR). If NPR is positive (negative) I define them as IPOs where insiders are *Net Buy*ers (sellers). NPR is the difference between total value of purchases and sells divided by total value of shares traded over this 36 months period after IPO. I identify 190 *Net Sell* IPOs and 353 *Net Buy* IPOs. To remove the effect of first day return I compute the first month return without first day return. ***, **,* represent significant at 1, 5 and 10 percent respectively.

6.5.2 Regression analysis of BHAR

I did the regressions of BHARs using the same set of variables for CARs. The results are in Table 6-10. The findings are broadly similar to the CAR regressions. All the insider trading measures are economically and statistically significant, suggesting that if insiders are net sellers the IPOs performance is better. Lockup expiry returns are positively related to IPO performance, and lockup length is negatively related to the 36-month BHAR.

Table 6-11 Regression Analysis for BHAR

	(1)	t	(2)	t	(3)	t	(4)	t	(5)	t	(6)	t	Net Buy	t	Net Sell	t	No IT	t
Constant	**2.307**	2.05	**2.179**	1.98	1.121	1.30	**1.902**	1.95	**1.782**	1.87	0.96	0.21	**2.180**	1.84	**2.230**	0.98	-1.245	-1.32
Underpricing	0.000	0.21	0.000	0.50	0.000	0.00	0.000	0.45	0.000	0.68	0.000	0.30	0.000	0.60	0.000	-0.19	0.000	0.04
Log(Size)	-0.033	-0.59	-0.052	-0.91	0.002	0.06	-0.019	-0.33	-0.040	-0.68	0.013	0.34	-0.016	-0.31	-0.149	-1.07	-0.023	-0.52
Overhang	**-0.013**	-2.21	**-0.014**	-2.25	**-0.007**	-1.82	**-0.015**	-2.33	**-0.016**	-2.33	**-0.008**	-2.00	-0.014	-1.29	**-0.013**	-2.21	0.004	0.72
Prestigious Underwriter	-0.229	-1.41	-0.195	-1.21	-0.129	-0.93	-0.252	-1.57	-0.210	-1.33	-0.143	-1.05	-0.184	-0.90	-0.090	-0.34	0.259	1.18
VC baking	-0.046	-0.33	-0.062	-0.45	-0.100	-0.85	-0.113	-0.83	-0.119	-0.88	-0.142	-1.19	-0.100	-0.60	0.272	1.30	-0.371	-1.59
Lockup expiry return	**2.299**	3.41	**2.255**	3.37	**1.227**	2.22	**2.308**	3.59	**2.241**	3.54	**1.206**	2.16	**1.937**	2.83	**3.285**	1.88	-0.022	-0.03
Log(Lockup length)	**-0.304**	-1.95	**-0.288**	-1.89	-0.164	-1.33	-0.318	-2.06	**-0.294**	-1.96	-0.183	-1.50	**-0.371**	-2.03	-0.186	-0.64	0.174	1.22
High tech dummy	**-0.310**	-2.04	**-0.250**	-1.64	**-0.286**	-2.11	**-0.338**	-2.28	**-0.279**	-1.88	**-0.280**	-2.09	-0.188	-1.05	**-0.652**	-2.38	-0.131	-0.54
Bubble dummy	0.093	0.63	0.099	0.69	0.090	0.87							**0.309**	2.17	**-0.549**	-1.85	0.224	1.63
Hot Dummy	-0.240	-0.98	-0.221	-0.90	-0.194	-0.89							-0.287	-1.33	-0.096	-0.19	-0.105	-0.34
Takeover Probability	0.268	1.33	0.288	1.42	0.192	1.35	0.312	1.47	0.331	1.56	0.215	1.48	**0.301**	1.78	0.370	0.64	0.050	0.30
SEO Dummy	-0.025	-0.11	-0.039	-0.18	-0.201	-1.13	-0.083	-0.41	-0.087	-0.43	-0.225	-1.36			0.094	0.18	-0.533	-1.90
NPR_trans	**-0.395**	-3.12					**-0.379**	-2.86										
NPR_val			**-0.410**	-4.46					**-0.397**	-4.07								
No IT Dum					**-0.313**	-2.91					**-0.313**	-2.96						
Year Dummies	NO		NO		NO		YES		YES		YES		NO		NO		NO	
Adjusted R^2	0.073		0.09		0.03		0.087		0.101		0.043		0.064		0.066		0.039	

Dependent variable for all regressions is 36 months BHAR for 830 IPOs that went public in London stock exchange from 1999 to 2006. *Underpricing* is the percent return on the first day from the offering price to the closing price. *Overhang* is the ratio of proportion retained to proportion sold. *Size* is defined as market value which is the offering price times shares outstanding in 2008 millions of Pound Sterling constant terms. *Prestigious underwriters* are the global underwriters defined in Derrien and Kecskes (2007). *Venture-backed* is dummy equal to one if the IPO is backed by venture capitalists. *Bubble period* is defined as 1999-2000 period following Levis (2008). *High-tech Dummy* is equal to one if the IPO is in computer manufacturing, electronic equipment, computer and data processing services, and optical, medical and scientific equipment. *Hot market* is when the IPO volume increases significantly and includes two periods January 1999 to March 2001 and January 2004 to end of 2006. *Cold market* is the remaining sample period. *Takeover Probability* is a Dummy constructed by following Brar et al. (2008). I first build a two-way matrix by size and growth in turnover. I consider that companies that are large and high growth are less likely to be subject to a takeover bid, and thus assigned a value of 0. In contrast, those in small and low growth quadrant have a higher probability of a takeover, and they take a value of 1. Companies in the remaining two quadrants are undetermined. In the second stage, I classify these undetermined samples by dividend yield. Firms with high yield have a higher probability, and, thus a value of 1, while those with low yield have a value of 0. *SEO Dummy* takes value of one if the IPO raised further Equity within 3-years of IPO. *Lockup exp ret* is the cumulative abnormal return from -2 to +2 days around the lockup expiration date. *Lockup length* is the number of days of lockup. *NPR_trans* is the number of insider purchases minus the number of insider sells divided by the total number of insider transactions over 36 months after IPO. *NPR_val* is the pound sterling value of insider purchases minus insider sells divided by the total value of insider transactions over 36 months after IPO. *No IT dum* is a dummy variable if the IPO does not have any insider trades within 36 months of IPO. ***, **, * significant at 0.01, 0.05, and 0.1 levels, respectively.

6.6 Conclusion

This study analyses the impact of insider trading on the long run performance of IPOs. First the previous finding is confirmed that IPOs underperform in the long run, using event studies and Fama-French regressions. This study partitions the IPOs into firms with insider trading and without Insider trading. I find that IPOs with insider trades underperform less than IPOs without insider trades. Also, this study finds that IPOs with Net Sell is the only group which overperform the benchmark index. Overall, the results show that IPOs where insiders sell (buy) over-(under-)perform relative to various benchmarks. The results are in direct contrast with the signalling, moral hazard/agency theories, which state that insiders buy (sell) aligns (misaligns) the interests of the managers with the interests of other shareholders. The results for Net Sell IPOs are more consistent with the view that the sells trades of insiders are driven by liquidity or other considerations, while the Net Buy IPOs are more consistent with the price support, though insiders do not achieve their targets.

This study examines the cross sectional variation of long run IPO performance by using several insiders trading measures. I use two measures based on net purchase ratio and another dummy for no trades. All the insider trading measures are highly significant and negatively related to IPO performance. No insider trading dummy is negative meaning that if there is no insider trade the IPO perform badly. Underpricing is negatively related to long-run performance, suggesting that the higher the underpricing the worst performance in the long run.

The higher drop at lock up expiry return is positively related to performance. If the shares are issued at bubble/hot market they perform badly, which is consistent with pseudo market timing of Schultz (2003). Finally, this study analyses the insider trading behaviour in the IPOs. It is found that there are more buy trades compared to sells. However, the sell trades involve more shares in terms of number of shares and value. The sell trades are larger in terms of trades as percentage of market capitalization at the time of trade. The pre-trade cumulative abnormal returns show that insiders are contrarians. The logit regression results show that the major driver of insider trading activity is the share price performance. Prestigious underwriter presence is related to insider trading activity, both for sell and buy. I find venture capitalist presence is only related to buy but not sell.

The analysis in this study is motivated by the presence in the UK companies of corporate brokers who are usually their underwriters, as a pre-condition of their listing on the London Stock Exchange, who may require insiders to buy shares when the IPO is underperforming. I find that IPOs with insider trading are more likely to be underwritten by prestigious underwriters.

As far as I am aware, this study is unique as it focuses mainly on insider trading behaviour for three years from IPO date in the UK market, which is different from the US. For example, it is shown that the relationship between IPOs and their underwriters is likely to be long-term in the UK, since all quoted firms need to have a corporate broker, usually the IPO underwriter, as an interface with the London Stock Exchange and the shareholders, and arranges insider trades, seasoned equity offerings and share buybacks. This requirement implies that it is possible for the underwriters to provide an extended price support through the insiders. Chambers and Dimson (2009) also argue that in the UK, investment bankers have increased their market power through time, because of the erosion of trust. Thus, I test whether UK underwriters provide an extended price support for the failing IPOs by analysing the IPOs where insiders buy shares. Moreover, the relatively stricter disclosure rules in the UK (e.g., Korczak and Lasfer (2009)) allows us to analyse the trading behaviour of insiders who are limited to directors, rather than in the US where officers, directors and shareholders holding more than 10% shares are included. These institutional differences between UK and US allow us to expand previous evidence in various ways.

Overall, the results in this study suggests that insider trading increases stock price accuracy and discovery by mitigating the relatively significant information asymmetries inherent in IPOs, and provide support to Meulbroek (1992), Cornell and Sirri (1992) and Chakravarty and Mcconnell (1997) proposition that insider trading is beneficial to the stock markets. The results are also consistent with Leland and Pyle (1977) who suggests that retaining insider shares signal quality of the firm, Brau and Fawcett (2006) who show that selling insider shares convey negative signal to the market, the agency theory arguments that stipulate that insider trading is affected by ownership (e.g., Ofek and Yermack (2000)), and the signaling models that predict that underpriced IPOs generate high long-run returns (Ljungqvist (2007)). Instead, we find that insiders sell when their IPO reaches it optimal pricing, and buy to support the prices of their falling IPOs, but their signal is weak. However, the data is not available to consider fully the trading of insiders just before news announcements, as in Korczak et al. (2010), the direct link between corporate brokers in the UK and trading by insiders, and the trading by insiders in the derivatives market to avoid the potential scrutiny by the regulators. The extent to which these factors will alter the results is subject of further research.

Appendix A. Monthly distribution of long-run IPO performance
Panel A. Equal weighted CARs

Months	All IPOs	t-stat	IPOs with Insider Trade	t-stat	IPOs with No Insider Trade	t-stat	IPOs where insiders are Net sellers	t-stat	IPOs where insiders are *Net Buyers*	t-stat
1	0.005	0.36	0.013	1.00	-0.016	-1.19	0.000	0.03	0.022	1.65
2	-0.005	-0.26	0.006	0.35	-0.032	-1.74	0.012	0.63	0.003	0.16
3	-0.001	-0.02	0.017	0.73	-0.042	-1.86	0.039	1.74	0.001	0.05
4	-0.004	-0.13	0.012	0.46	-0.041	-1.58	0.056	2.16	-0.018	-0.67
5	-0.008	-0.28	0.010	0.35	-0.054	-1.83	0.064	2.18	-0.025	-0.87
6	-0.023	-0.71	0.001	0.03	-0.081	-2.52	0.078	2.45	-0.051	-1.59
7	-0.024	-0.69	0.006	0.17	-0.096	-2.78	0.111	3.21	-0.065	-1.87
8	-0.042	-1.12	-0.015	-0.42	-0.105	-2.85	0.106	2.88	-0.097	-2.62
9	-0.046	-1.18	-0.018	-0.45	-0.116	-2.95	0.108	2.76	-0.102	-2.60
10	-0.058	-1.40	-0.021	-0.51	-0.147	-3.55	0.131	3.16	-0.123	-2.96
11	-0.077	-1.77	-0.038	-0.87	-0.173	-3.98	0.124	2.86	-0.146	-3.36
12	-0.106	-2.33	-0.059	-1.30	-0.219	-4.85	0.120	2.65	-0.179	-3.95
13	-0.114	-2.42	-0.065	-1.37	-0.235	-4.98	0.131	2.77	-0.195	-4.14
14	-0.116	-2.37	-0.066	-1.35	-0.238	-4.86	0.135	2.76	-0.201	-4.11
15	-0.122	-2.40	-0.061	-1.20	-0.271	-5.35	0.152	2.99	-0.202	-4.00
16	-0.128	-2.45	-0.058	-1.11	-0.300	-5.74	0.151	2.89	-0.197	-3.78
17	-0.147	-2.72	-0.066	-1.23	-0.343	-6.36	0.165	3.06	-0.221	-4.10
18	-0.157	-2.83	-0.076	-1.37	-0.355	-6.40	0.154	2.77	-0.230	-4.14
19	-0.188	-3.29	-0.102	-1.79	-0.398	-6.98	0.137	2.40	-0.261	-4.58
20	-0.196	-3.35	-0.108	-1.84	-0.411	-7.04	0.156	2.68	-0.284	-4.85
21	-0.211	-3.53	-0.117	-1.95	-0.442	-7.38	0.147	2.46	-0.294	-4.90
22	-0.246	-4.02	-0.147	-2.39	-0.490	-7.99	0.131	2.14	-0.332	-5.41
23	-0.260	-4.15	-0.158	-2.52	-0.509	-8.11	0.126	2.01	-0.348	-5.55
24	-0.270	-4.22	-0.165	-2.58	-0.526	-8.22	0.149	2.33	-0.375	-5.85
25	-0.295	-4.51	-0.184	-2.81	-0.564	-8.63	0.144	2.20	-0.403	-6.16
26	-0.322	-4.83	-0.203	-3.05	-0.611	-9.16	0.123	1.85	-0.421	-6.32
27	-0.331	-4.87	-0.211	-3.11	-0.624	-9.18	0.129	1.90	-0.438	-6.45
28	-0.348	-5.04	-0.227	-3.27	-0.645	-9.33	0.125	1.81	-0.461	-6.67
29	-0.350	-4.97	-0.226	-3.21	-0.653	-9.28	0.119	1.70	-0.456	-6.48
30	-0.359	-5.01	-0.236	-3.30	-0.659	-9.20	0.118	1.65	-0.473	-6.60
31	-0.367	-5.04	-0.236	-3.24	-0.687	-9.44	0.127	1.75	-0.478	-6.57
32	-0.347	-4.70	-0.221	-2.99	-0.655	-8.86	0.147	1.98	-0.466	-6.31
33	-0.353	-4.71	-0.227	-3.02	-0.662	-8.81	0.159	2.12	-0.485	-6.46
34	-0.360	-4.72	-0.229	-3.01	-0.678	-8.89	0.151	1.97	-0.483	-6.34
35	-0.360	-4.66	-0.230	-2.98	-0.677	-8.75	0.134	1.74	-0.474	-6.12
36	-0.365	-4.66	-0.236	-3.01	-0.679	-8.66	0.133	1.70	-0.483	-6.16

Panel B. Style-adjusted

Months	All IPOs	t-stat	IPOs with Insider Trade	t-stat	IPOs with No Insider Trade	t-stat	IPOs with Net sell	t-stat	IPOs with Net buy	t-stat
1	0.022	1.89	0.026	2.24	0.012	1.02	0.027	2.33	0.026	2.19
2	0.019	1.13	0.032	1.92	-0.012	-0.75	0.023	1.36	0.038	2.29
3	0.007	0.36	0.023	1.11	-0.030	-1.46	0.016	0.79	0.027	1.33
4	0.005	0.23	0.031	1.31	-0.055	-2.37	0.039	1.68	0.025	1.06
5	-0.002	-0.08	0.018	0.70	-0.051	-1.96	0.064	2.43	-0.012	-0.44
6	-0.002	-0.05	0.022	0.77	-0.058	-2.04	0.082	2.85	-0.017	-0.61
7	-0.020	-0.64	0.005	0.17	-0.080	-2.60	0.096	3.10	-0.055	-1.78
8	-0.028	-0.84	0.005	0.15	-0.107	-3.22	0.118	3.55	-0.070	-2.11
9	-0.038	-1.08	-0.009	-0.26	-0.108	-3.06	0.121	3.43	-0.095	-2.72
10	-0.038	-1.03	-0.002	-0.05	-0.125	-3.38	0.117	3.16	-0.081	-2.19
11	-0.042	-1.08	-0.001	-0.01	-0.141	-3.63	0.140	3.60	-0.094	-2.42
12	-0.056	-1.37	-0.006	-0.16	-0.174	-4.28	0.145	3.58	-0.107	-2.64
13	-0.082	-1.94	-0.030	-0.71	-0.207	-4.89	0.142	3.37	-0.144	-3.42
14	-0.089	-2.04	-0.038	-0.87	-0.212	-4.84	0.150	3.43	-0.163	-3.73
15	-0.087	-1.91	-0.034	-0.75	-0.213	-4.70	0.140	3.08	-0.149	-3.29
16	-0.086	-1.84	-0.020	-0.44	-0.244	-5.20	0.173	3.70	-0.149	-3.19
17	-0.089	-1.84	-0.015	-0.32	-0.265	-5.50	0.197	4.08	-0.157	-3.24
18	-0.101	-2.03	-0.014	-0.29	-0.309	-6.21	0.215	4.32	-0.166	-3.35
19	-0.102	-1.99	-0.015	-0.29	-0.309	-6.06	0.226	4.44	-0.176	-3.44
20	-0.130	-2.47	-0.043	-0.82	-0.338	-6.45	0.195	3.72	-0.201	-3.84
21	-0.137	-2.56	-0.049	-0.92	-0.349	-6.50	0.221	4.11	-0.229	-4.27
22	-0.141	-2.56	-0.046	-0.84	-0.367	-6.69	0.229	4.17	-0.229	-4.17
23	-0.180	-3.21	-0.076	-1.35	-0.430	-7.65	0.228	4.06	-0.278	-4.95
24	-0.175	-3.05	-0.073	-1.27	-0.420	-7.32	0.239	4.17	-0.280	-4.88
25	-0.190	-3.25	-0.087	-1.48	-0.438	-7.48	0.273	4.66	-0.326	-5.57
26	-0.210	-3.52	-0.103	-1.72	-0.468	-7.83	0.269	4.51	-0.351	-5.87
27	-0.229	-3.77	-0.123	-2.02	-0.485	-7.96	0.253	4.16	-0.373	-6.13
28	-0.247	-3.99	-0.142	-2.29	-0.500	-8.07	0.230	3.71	-0.388	-6.27
29	-0.261	-4.14	-0.150	-2.38	-0.528	-8.38	0.249	3.96	-0.415	-6.59
30	-0.266	-4.15	-0.155	-2.42	-0.533	-8.31	0.238	3.71	-0.416	-6.49
31	-0.275	-4.22	-0.171	-2.63	-0.525	-8.05	0.226	3.46	-0.435	-6.67
32	-0.275	-4.16	-0.167	-2.52	-0.536	-8.08	0.249	3.76	-0.444	-6.70
33	-0.260	-3.86	-0.162	-2.40	-0.496	-7.38	0.258	3.84	-0.441	-6.55
34	-0.261	-3.83	-0.166	-2.43	-0.490	-7.18	0.256	3.75	-0.447	-6.54
35	-0.268	-3.87	-0.162	-2.33	-0.525	-7.58	0.246	3.55	-0.432	-6.24
36	-0.261	-3.72	-0.157	-2.23	-0.513	-7.30	0.239	3.40	-0.420	-5.97

Panel C. Value weighted CARs

Months	All IPOs	t-stat	IPOs with Insider Trade	t-stat	IPOs with No Insider Trade	t-stat	IPOs with Net sell	t-stat	IPOs with Net buy	t-stat
1	0.028	1.16	0.037	1.53	-0.003	-0.11	0.019	0.77	0.056	2.30
2	0.004	0.11	0.033	0.97	-0.099	-2.89	0.033	0.96	0.034	0.99
3	0.015	0.37	0.039	0.92	-0.065	-1.55	0.013	0.32	0.064	1.53
4	-0.014	-0.30	-0.019	-0.39	0.001	0.03	-0.037	-0.76	-0.001	-0.03
5	-0.041	-0.76	-0.054	-1.00	0.003	0.06	-0.072	-1.34	-0.035	-0.65
6	-0.059	-1.00	-0.058	-0.99	-0.061	-1.04	-0.081	-1.37	-0.036	-0.60
7	-0.092	-1.44	-0.079	-1.23	-0.140	-2.19	-0.079	-1.24	-0.078	-1.22
8	-0.152	-2.22	-0.145	-2.13	-0.174	-2.54	-0.135	-1.98	-0.156	-2.28
9	-0.155	-2.14	-0.154	-2.13	-0.160	-2.21	-0.175	-2.41	-0.133	-1.84
10	-0.187	-2.44	-0.177	-2.32	-0.220	-2.87	-0.191	-2.50	-0.163	-2.14
11	-0.214	-2.67	-0.203	-2.53	-0.253	-3.15	-0.174	-2.18	-0.231	-2.88
12	-0.256	-3.06	-0.251	-3.00	-0.274	-3.27	-0.159	-1.90	-0.343	-4.10
13	-0.257	-2.95	-0.245	-2.81	-0.299	-3.44	-0.101	-1.16	-0.390	-4.48
14	-0.300	-3.32	-0.282	-3.12	-0.363	-4.02	-0.093	-1.03	-0.472	-5.22
15	-0.290	-3.09	-0.263	-2.81	-0.383	-4.09	-0.087	-0.93	-0.438	-4.68
16	-0.277	-2.86	-0.230	-2.38	-0.437	-4.53	-0.073	-0.75	-0.388	-4.01
17	-0.265	-2.66	-0.215	-2.15	-0.438	-4.40	-0.025	-0.26	-0.404	-4.06
18	-0.274	-2.68	-0.227	-2.21	-0.439	-4.28	-0.022	-0.22	-0.432	-4.21
19	-0.332	-3.15	-0.292	-2.77	-0.471	-4.48	-0.066	-0.62	-0.519	-4.92
20	-0.358	-3.31	-0.339	-3.14	-0.423	-3.91	-0.117	-1.08	-0.563	-5.21
21	-0.368	-3.33	-0.350	-3.16	-0.433	-3.91	-0.168	-1.52	-0.532	-4.80
22	-0.408	-3.60	-0.387	-3.41	-0.483	-4.26	-0.217	-1.92	-0.556	-4.91
23	-0.412	-3.55	-0.386	-3.33	-0.499	-4.31	-0.166	-1.43	-0.608	-5.24
24	-0.399	-3.37	-0.360	-3.04	-0.537	-4.53	-0.081	-0.69	-0.639	-5.40
25	-0.431	-3.57	-0.396	-3.28	-0.552	-4.57	-0.115	-0.95	-0.678	-5.61
26	-0.468	-3.80	-0.439	-3.56	-0.568	-4.61	-0.130	-1.05	-0.749	-6.08
27	-0.415	-3.31	-0.373	-2.97	-0.561	-4.46	-0.055	-0.44	-0.693	-5.52
28	-0.402	-3.14	-0.361	-2.82	-0.544	-4.25	-0.015	-0.11	-0.708	-5.54
29	-0.405	-3.12	-0.359	-2.76	-0.566	-4.35	-0.030	-0.23	-0.690	-5.30
30	-0.381	-2.88	-0.342	-2.59	-0.517	-3.91	0.034	0.26	-0.719	-5.44
31	-0.396	-2.94	-0.361	-2.68	-0.518	-3.85	0.038	0.28	-0.761	-5.66
32	-0.409	-2.99	-0.376	-2.75	-0.526	-3.85	0.055	0.40	-0.808	-5.91
33	-0.423	-3.04	-0.391	-2.81	-0.533	-3.84	0.056	0.41	-0.839	-6.04
34	-0.377	-2.67	-0.332	-2.36	-0.530	-3.76	0.085	0.60	-0.751	-5.33
35	-0.357	-2.50	-0.306	-2.14	-0.534	-3.73	0.097	0.68	-0.711	-4.97
36	-0.351	-2.42	-0.299	-2.06	-0.530	-3.66	0.056	0.39	-0.655	-4.52

I compute the abnormal returns using the standard event study methodology of stock returns on the FTSE All Share Price Index for main market companies and AIM All Share Price Index for AIM companies. I obtain the monthly share price and indices data from DataStream. All IPOs includes 830 UK IPOs over the period 1999-2006. IPOs with insider trades (543 IPOs) includes any IPOs with at least one insider trades during 36 months period after IPO. IPOs without insider trades (287 IPOs) include any IPOs without any insider trades during 36 months period after IPO. IPOs where insider are net buyers (sellers) are based on Net purchase ratio (NPR). If NPR is positive (negative) I define them as IPOs where insiders are *Net Buy*ers (sellers). NPR is the difference between total value of purchases and sells divided by total value of shares traded over this 36 months period after IPO. I identify 190 IPOs with *Net Buy* and 353 IPOs with *Net Buy*. To remove the effect of first day return I compute the first month return without first day return.

Chapter 7

7 Conclusion

This thesis addresses the information content of insider trading in the UK. Particularly, I address the following: aggregate insider trading and market reaction to trades by insiders, insider trading within the lockup agreements, and the impact of insider trading on the long run performance of IPOs. I test various hypotheses from the insider trading literature, namely, information asymmetry, agency theory, market timing and trading on insider information theories. I apply these concepts to individual insider trades, aggregate insider trading and to IPOs as they are likely to have specific characteristics to shed some further lights on these issues.

This study finds that insider purchases are informative in the short run, which is consistent with Fidrmuc et al. (2006). However, insider sells are not information driven; suggesting that the sell trades may be carried out for diversification or liquidity considerations. The results on the sell trades are consistent with Lakonishok and Lee (2001) who report that market basically ignores insider information when it is reported. The market reaction of insider buy trades in the UK is much higher than the US (for example, see Lakonishok and Lee (2001)). This study further relates the higher information content of buy trades to the differences in regulatory environment in the US and the UK. The faster reporting practice, the narrow definition of insiders in the UK may contribute to the higher market reaction of insider trades. The trading bans around the corporate earnings announcements in the UK also suggest that corporate insiders are expected to trade less frequently and likely to trade based on more information.

The immediate market reactions of insider trades depend on the firm's market-to-book, which implies that insider's trade on misvaluations. This result is in direct contrast to Lakonishok and Lee (2001) who report that market reaction in the short run does not vary with book-to-market. These results could also imply that insiders trade based on 'value' and 'growth' strategies, which is in line with Rozeff and Zaman (1998). Size is also an important factor as the market reaction varies with the size of the company, which is consistent with Gregory et al. (1994, 1997). However, a two-way sorting by M/B and size shows that after controlling for these factors the signal that insiders convey to the market is weaker than what has been documented in the previous literature. These results are consistent with Jenter (2005) who document that after controlling for B/M insider trades hardly convey any information.

After analysing the signals that insiders send to the market through their trades, this study examines the signalling in initial public offerings (IPOs). Under the signalling and the agency framework, I analyse the trading behaviour of insiders before the lockup expirations and in the 36 months after quotations. This thesis assesses whether insiders trade under the lockup constraints and whether the trades affect IPO performance during the lockup periods and in the long run. The lockup is interesting event as this is the opportunity for insiders to sell their shares after the IPO for the first time and diversify their holdings. The buy trades are also fascinating to analyse: why insiders increase their holdings while their IPO allocations are locked up. Finally, this study analyses insider trades within three years of IPOs, to examine the impact of insider trading on performance of IPOs. Here, I consider the possibility that, for short period of time, insiders can trade in the wrong direction to maintain information superiority, and, at a later period, trade in the right direction to achieve higher profit (see John and Narayanan (1997) for such a model).

This thesis documents that insider's do trade during the lockup period. In particular, I show that in some IPOs they buy, while in others, they sell their holdings. Their trading activity suggests that lockups may not be binding. They could also imply that insiders get permission from the underwriters to sell their holdings, while others are made to increase their stake, probably to support the prices. This study, therefore, assesses further the characteristics of these two sets of IPOs. I also relate the results with IPO characteristics (e.g., Underwriters, VC presence etc). The results suggest that this early trading activity is likely to be pre-arranged with the underwriters, and that, while the sell trades can be considered as an early release following good performance, the buy trades are likely to be undertaken to support the price of underperforming IPOs. However, I do not have data to test the price support hypothesis directly. This issue is subject to further research. The IPOs with insider trades are more likely to have longer lockup periods, larger proportion of shares locked up, and more likely to be backed by venture capitalists. The documented negative price reaction on lockup expiry dates is positively related to the probability of early buys of insiders, not early sells.

The information content of sell and buy trades are statistically and economically significant and much higher compared to a seasoned company. It means insiders trading under institutional constraint (e.g. lockup) provide strong signal compared to insider trading in existing company. These results are consistent with the view that information asymmetry is higher for newly floated companies and they trigger a higher market reaction (Huddart and Ke (2006)). Insiders selling (buying) after a significant price rise (decline) imply the contrarian strategy adopted by insiders, which, in turn, is consistent with the short run market timing by the insiders, in line with Friedrich et al. (2002).

While the insider trades under lockup agreement produce some interesting results, I expand the analysis of the impact of the insider trading on the long run performance of IPOs. Net purchase ratio (NPR) is used to classify the firm as either net buyer or net seller. If NPR is positive (negative), the IPO is classified as *Net Buy* (*sell*) firm. I find, overall, IPOs underperform in three years after issuing shares. Interestingly, this study reports that IPOs where insider trades perform better compared to where insiders do not trade. Furthermore, by splitting insider trading IPOs into *Net Buy* and *Net Sell*, I find, while *Net Sell* IPOs overperform, *Net Buy* IPOs underperform. These results hold for a wide spectrum of tests:

market adjusted CARs (equal and value weighted), style adjusted BHARs, and Fama-French three factor models. Insider sell shares when they feel that their IPOs have reached optimal value and not much gain can be achieved by holding the shares. Insider purchases in the failing IPOs suggest that their trades may be undertaken to support price. However, the evidence suggests that insiders do not achieve their target by purchasing their own company shares.

I find that IPOs with insider trades perform better than IPOs without insider trades, which is in line with Cornell and Sirri (1992) and Chakravarty and Mcconnell (1999) proposition that insider trading is beneficial for price discovery. The results are consistent with the disposition hypothesis put forward in behavioural finance that there is a tendency to sell winners too early and holding on to losers for too long. Although the immediate market reaction is positive and statistically significant for insider buy trades, abnormal returns are negative in the long run. The results imply that, the signals insiders send in the financial markets by purchasing shares in IPOs is not credible, thus, share price keep on falling after insiders buy, in the long run.

More work is needed in the future to fully understand the role of insiders in the context of IPOs. I do not have data to test further hypothesis of price support by insiders in long run, because price support, essentially, is a short term concept. As such, the legality of insider trades before lockup expirations could not be determined, because there is no legal requirement for the existence of the lockup agreements. Also, in some instances the lockup agreements are not binding and I don’t have data regarding those instances to determine whether insiders trade if the lockup becomes redundant. A recent paper show that insiders trade strategically before material news announcements (Korczak, Korczak and Lasfer, forthcoming). However, it is outside the scope of this thesis to determine whether insiders trade around material news announcements. I assume that insiders follow the rules which stipulate that they are not allowed to trade around the corporate earnings announcements. Further, the connection between corporate brokers in the UK and trading by insiders is not possible to analyse due to data availability. All these issues are subject to further research.

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Appendix I

Insider trading, in the UK, is regulated by the 1977 Model Code of the London Stock Exchange (LSE) and the 1985 Companies Act. In the US, insider trading is regulated by the Securities Exchange Commission (SEC). The 1934 Securities and Exchange Act and its amendments impose restrictions on insider trading. The main differences between the two countries are: (i) the definition of an insider (ii) the definition of (illegal) insider trading, (iii) the essence of the regulation, (iv) the time within which insiders have to report their trades and (v) the level of enforcement of the regulation.

In the US, insiders are defined as officers, directors, other key employees and shareholders holding more than 10% of any equity class (Lakonishok and Lee (2001)). The term 'officer' covers the company president, principal financial officer, principal accounting officer, any vice president, or any other employees who performs policy making functions in the company (Bettis et al. (2000)). All of these are prohibited from trading on undisclosed 'material' information. The UK definition of insiders is much confined. Insiders include the members of the board of directors (both executives and non-executives), but exclude other key employees and large shareholders.

The definitions of insider trading (in US) and directors' share dealings (in UK) often cause confusion. According to the UK Misuse of Information Act, insider information is defined as 'material, current, reliable and not available to the market' and is legally qualified as 'new and fresh'. The Criminal Justice Act makes trading on insider information (information not regularly available and obtained through insiders) a legal offence. This study does not deal with illegal insider trading because of data unavailability. Instead I will focus on legal trading by directors as defined in the listing rules of the London Stock Exchange (Source Book August 2002, Chapter 16). Unlike US legislation, UK laws distinguish between (illegal) insider trading and (legal) directors' dealings, the US regulation does not make such a distinction. In this study, I use the term directors' dealings to refer to the (legal) insider trading or share transactions by directors in UK. I adopt the UK definition of a director. In the UK, the term director covers both non-executives and executives. On the other hand, in the US, executives are normally referred to as officers and non-executives directors.

In general, the spirit of US rules on insider trading is that insiders must either abstain from trading on undisclosed information or release this information to the public before they trade (Hu and Noe (1997)). The UK approach is different. UK regulation contained in the 1977 Model Code of the London Stock Exchange (LSE) – which became effective in April 1979 – and the 1985 Companies Act is stricter than the US regulation (Hillier and Marshall (1998)). The directors of companies traded on the LSE cannot trade during the two months preceding a preliminary, final or interim earnings announcement and one month prior to a quarterly earnings announcement. Outside the trading ban periods, directors still require clearance to trade from the board's chairman. In general, there are no such restrictions in the US system which favours frequent disclosure to remove possible insider advantages rather than trading bans during price-sensitive periods.

There are also strong differences between US and UK in the reporting rules. The UK Model Code prescribes much faster reporting of directors' dealings. The directors must inform their company as soon as possible after the transaction and no later than the fifth business day after a transaction for their own account or on behalf of their spouses and children (Hillier and Marshall (2002)). In turn, a company must inform the LSE without delay and no later than the end of the business day following receipt of the information. This implies that the information about insider transaction reach market as late as 6 days after transaction. However, Fidrmuc et al. (2006) document that for 85% of the directors' dealings the announcement date coincides with the transaction day or is the following day. The LSE then disseminates this information immediately to data vendors by means of its Regulatory News Service (RNS). The company is also required to enter this information into its Register, which is available for public inspection, within three days of the reporting by the director. In contrast, in the US, insiders only have to report their holdings within the first ten days[77] of the month following the month of the trade (Persons (1997)). The capital gains US insiders make on short-term swings in prices (formally within six months) must be repaid to the company. Insider transactions are published in the SEC's online *Insider Trading Report*. Chang and Suk (1998) write that trades normally appear in the online report within the same day that the SEC is informed. Shortly afterwards, the information is

[77] After the Sarbanes-Oxley (2002) Act the reporting environment has changed. The definition of insider covered under Section 16 of the Exchange Act, and the types of transactions which are reportable, have not changed. What has changed is the filing deadline for Forms 4 has been dramatically shortened. It has changed from within 10 days after the close of the calendar month in which a reportable transaction occurred to within two business days after the day the transaction took place. However, most of the insider trading studies in US is done before the Sarbanes-Oxley Act.

published in the Wall Street Journal (WSJ) and other newspapers. Chang and Suk (1998) find that there is a significant share price reaction even after the announcement in the WSJ that the SEC online report is only read by a small number of investors, whereas the WSJ is read by a larger number of investors. This implies that not only is the reporting process in the US slower, but it also takes time for the information contained in the insider trades to be reflected in the share price.

The difference in the speed of reporting is also likely to have major implications for the magnitude of the abnormal returns calculated around the announcement of insider trading. Given that the period between the trading day and the announcement in the UK covers a maximum of 6 days compared to up to 40 days in the US, I expect insider trades in the UK to be highly informative whereas those in the US to be more likely based on stale information. Still, although the regulation in the UK may be stricter than in the US, what matters is its enforcement. Bhattacharya and Daouk (2002) showed that cost of equity declines after successful prosecution. According to Hillier and Marshall (1998), the UK regulation is well enforced as insider trading is virtually non-existent during the two-month period prior to the final and interim earnings announcements. Similarly, the regulator, the Financial Services Authority (FSA), argues that past and present regulation has been sufficiently strict and that there have only been few violations to the trading bans. In addition, the Financial Services and Markets Act (FSMA) of 2000 (effective from 1 December 2001) further refines the definitions of illegal insider trading and specifies a dual prosecution track which facilitates the procedures to bring insider trading violations to court. The lack of disclosure, violation of trading bans, or misuse of inside information can be prosecuted under the Misuse of Information Act using a civil law or a criminal law procedure. Given that the new procedures have only recently been introduced and that investigations take time, there has only been one conviction since 2001 (via a civil court procedure), namely that of the Company Secretary of Middlemiss who traded equity prior to earnings announcements.

In the US, the Insider Trading and Securities Fraud Enforcement Act (ITSFEA) of 1988 raised the maximum fine for insider trading to $1 million and 10 years of imprisonment as a reaction to frequent violations of existing insider regulation. The Act also placed the liability for illegal insider trading by any of the company's employees with the top management. Garfinkel (1997) documents that the Act has changed the timing of trading by US insiders. After the Act was passed by Congress, insider trading – especially selling – tended to happen after, rather than before earnings announcements. He also finds that the earnings surprise – defined as the difference between the actual earnings and the median analysts' forecast – increased after the Act. He states that this 'is consistent with less informed trading prior to earnings announcements during the post-Act period and the notion that informed trading encourages price discovery'.

To sum up, there are considerable differences between the UK and US regulation on insider trading. The differences pertain to the definition of an insider, the fundamental nature of the regulation, the enforcement and the delay within which trades have to be reported. I conclude that UK insider trades are likely to be more informative than US trades for the following reasons: (i) A trade must be made public within at most 6 business days in the UK, compared to up to 40 days in the US (Fidrmuc et al. (2006)). (ii) Both Lakonishok and Lee (2001) and

McConnell et al. (2005) report that the information on insiders' trades enters the public domain in the US only several days after it is released by the SEC. Fidrmuc et al. (2006) show that no such delay occurs in the UK. (iii) In the UK, mandatory reporting by insiders is limited to top management and to the non-executive directors only. In contrast, US insiders (legally) comprise a much larger group: insiders are large shareholders, (non-executive) directors and managers (officers). Officers include not only the top management with board seats, but also a wider group of managers (e.g. any vice president in charge of any principal business unit, division, or function such as sells, administration, or finance), who may de facto possess less information about their firm's prospects (iv) The UK regulator has opted for trading bans in price-sensitive periods whereas the US regulator favours more frequent disclosure. All these elements suggest that directors' trades in the UK are more informative. Since, UK insiders (directors) possess superior information their timing ability will be superior to what has been documented in context of US.