

Department of Accounting & Finance

**An Analysis of Corporate Insider Trading
in the UK**

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Abstract

This thesis examines the impact of corporate insider trading on the financial markets in the UK. Several issues are examined and empirically tested in this context. Corporate insiders are found to earn significantly higher returns from their trading decisions than other investors in the market. Moreover, it appears that regulation which has been imposed by the London Stock Exchange in the form of a model code is ineffective in curtailing the performance of corporate insider trades, although it has definitely affected the timing of their trades. A trading rule was developed based on a simple model and motivated by results in the first two chapters of the thesis. It was found that a strategy using this trading rule (even if there is a delay of five days from the initial insider trade to the mimicking trade) would be profitable.

Given the share price performance of firms who have experienced insider trading activity, the relationship between seasonalities in corporate insider trading and stock return seasonalities in the form of the turn-of-the-year effect and the tax-year-end effect was explored. However, no relationship between the two factors was detected. Finally, the inventory control behaviour of dealers around corporate insider trading was examined. It was found that dealer inventory control changed subsequent to insider trades. In addition, the large price movements associated with insider trading activity is found to be as a result of the increase in trading volume because of the market reacting to the trade and not through the information being released by the trade itself.

Finally, the analysis has uncovered two main benefits from corporate insider trading that has not yet been mentioned in the literature: arbitrage activity and supplying liquidity. This should enhance the debate on whether corporate insider trading should be as heavily regulated as it currently is.

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1 Corporate Insider Trading

This thesis investigates the issue of corporate insider trading using a sample of all trades undertaken by UK directors during the period 1991 - 1997. The findings are summarised as follows: corporate insiders consistently outperform the market when they decide to trade. Corporate insiders trade when mispricing is at its greatest, particularly in periods when less informed investors are trading heavily in the opposite direction. In this context, corporate insider trading around earnings announcements is investigated and it is found that insiders trade strategically around this event. In addition, the analysis provides evidence that insider trading is not a cause of the turn-of-the-year effect or the tax-year-end-effect found in the UK. Dealer inventory control behaviour is analysed around insider trading. It is found that insiders trade when dealer inventory levels are at an extreme. This suggests that insiders time their trades to coincide with the point in time when dealers are most conducive to trading with them. Another important insight from this study is that the significant price changes associated with corporate insider trading do not arise from information effects but from the impact of trading volume in the shares of the insider's firm subsequent to the trade. This finding adds support to the inventory control hypothesis which argues that the price setting behaviour of dealers is more a consequence of inventory considerations than adverse selection risk. Finally, a trading strategy is devised based on the insider trading signals developed in this thesis and it is found to be significantly profitable even if the rule is implemented up to five days after the corporate insider trade date.

The rest of this chapter introduces the issue of insider trading and motivates the analysis carried out in later chapters. It is hoped that the insights gained from this analysis will enhance and contribute to the existing body of literature on insider trading and add to the debate on whether insiders should be regulated in their activities.

1.1 Introduction

Corporate insider trading has long been a source of controversy in financial markets research and two contrasting perspectives are common when the topic is discussed. The focus of the argument centres on the effect of insider trading on the informational efficiency of the market and the ordinary investor.

Manne (1966) initiated the case for the defence when he suggested that the agency problems facing managers and shareholders would be mitigated if corporate insiders were allowed to trade and benefit from their activities. This would lead to improved corporate decision making, resulting in an overall increase in the value of the firm (Jensen and Meckling (1976)). In addition, it has also been argued that insider trading increases the informational efficiency of markets by contributing to the existing information set held by investors (Ross (1978), John and Mishra (1990), John and Lang (1991)). Corporate insiders use their trades as signals to confirm or contradict the information in public corporate announcements. Investors view the dual signals as complimentary and act accordingly. Another reason for allowing insider trading is provided by Carlton and Fischel (1983) who contend that if insider

trading reduces the value of a firm, investors would demand more stringent regulation than is currently imposed. They also argue that there is no relationship between the value of a firm and the level of trading activity of corporate insiders in that firm. The trading of corporate insiders, it is argued, thus enhances the informational efficiency of the market. Empirical research is strongly supportive of this notion with consensus findings of significant price changes subsequent to insider trading, and in particular insider buying activity.¹

In opposition to this argument is the belief that insider trading harms investor confidence. This leads to a fall in liquidity trading, thus resulting in a decrease in market efficiency (Fishman and Hagerty (1992)). The fall in outsider activity as a consequence of insider trading can be due to several factors. Insider trading deters outside investors from paying to acquire information from research and trading. Investors will hold their orders until they are sure they will not be 'picked off' by other traders more informed than themselves. They may also place too much weight on the trades undertaken by insiders. Even though the level of information is greater in aggregate, the overall proportion of uninformed traders is lower because the presence of informed traders deters others from participating. Another contributing factor to a loss in market efficiency is due to the distribution of information among traders. Corporate insider trading means that information will be concentrated around several few individuals, giving an information advantage to insiders. This

¹ Examples are Lorie and Neiderhoffer (1968), Pratt and DeVere (1970), Jaffe (1974b), Finnerty (1976a), Baesel and Stein (1979), Givoly and Palmon (1985), Seyhun (1986a), King and Roell (1988), Reinganum (1988), Pope, Morris and Peel (1990), Meulbroek (1992), Garfinkel and Nimalendren (1995), Datta and Iskander-Datta (1996). Only a handful of papers have found that insider trading does not precipitate price changes. These include Rozeff and Zaman (1988) and Eckbo and Smith (1998).

has a detrimental effect on the enthusiasm of less informed investors leading to a fall in the trading activity of this group. Scott (1980) and Manove (1989) have argued that insider trading can also discourage corporate investment when self-serving managers are allowed to profit from a firm's changing fortunes. Corporate insiders are more likely to choose riskier investments for their firm so as to benefit from both increases and decreases in share value whichever state occurs. Shareholders who are aware of this would have less support for corporate investment causing firm level direct investment to fall below its economically optimal level. The final argument relates to the effect of an insider trade on the counterparty, and the personal loss that is involved (Leland (1992)). Even as share prices may change to reflect the information contained in an insider trade, the buyer of an insider sell decision and the seller to an insider buy decision would be personally affected by the trade. As the proportion of insiders increase in the market, the number of uninformed investors losing out will also increase causing a corresponding fall in overall investor confidence. The aggregate efficiency of the market would fall because of the accumulation of individual sentiments resulting from bad experiences in the past. The empirical evidence relating to the superior ability of corporate insiders to detect mispricing in their company's shares indicates that there are information asymmetries in the market and that corporate insiders are benefiting from their privileged position vis-à-vis the information flow.² However, unfortunately it is difficult to generalise these findings to argue that the market is indeed less efficient as a result of insider trading. Accordingly, there is sparse empirical literature directly testing this hypothesis.

² See Footnote 1.

1.2 Empirical Research into Insider Trading

The empirical literature on Insider Trading is usually characterised by two themes. These are one, an assessment of the performance of insider trading and two, the trading behaviour of insiders around firm specific information events. The respective research hypotheses can be viewed as asking "Do insiders earn abnormal returns from their trading?" and "Do insiders trade as if they know this is happening?"

The first hypothesis was the only focus of early research into insider trading. The first wave of these studies (Lorie and Neiderhoffer (1968), Pratt and DeVere (1970), Jaffe (1974b) and Finnerty (1976a)) simply measured the return or risk adjusted return on insider trades for a period of several months afterwards.³ As a consequence of using different definitions of insider trades however, the results were mixed. Table 1.1 provides a summary of their findings.

Although the methodologies employed in earlier studies are unsophisticated in comparison to similar, more recent work, much insight was provided into the performance of insider trading. Irrespective of whichever method was used in categorising insider trades, it is clear that corporate insiders are skilled at detecting

³ The exception is Lorie and Neiderhoffer (1968) and Finnerty (1976b). Lorie and Neiderhoffer (1968) examined the relationship between large price jumps (defined as 8% or more per month) and the incidence of insider trading in the previous month. Their results provided evidence that an corporate insider trade during the month is a significant predictor of large price changes in the shares of that firm in the next month. Finnerty (1976b) carried out a multivariate study using factor analysis

and exploiting mispricing in their company's securities. The pioneering work of early researchers into insider trading provided a springboard for later studies in the 80s to re-examine the issue with more comprehensive data sets, more sophisticated methodologies and enhanced computing power.

The second generation of empirical research into the performance of insider trading is characterised by much larger amounts of data and more focussed testing. Seyhun (1986a) examined the performance of different categories of insiders within a firm and found that directors were more informed about a firm's prospects than other insiders. In addition, his results indicated for the first time that firm size and insider returns were negatively related.⁴ Rozeff and Zaman (1988) attempted to decompose the performance of insider trading into information held by corporate insiders and the characteristics of the securities they were trading in. After factoring out the size effect and that due to a firm's earnings yield, they found that once transaction costs were taken into account, insiders were unable to earn abnormal profits. Rozeff and Zaman (1988) confirmed the propensity of insiders of small firms to buy and insiders of large firms to sell. This is consistent with the argument that insiders buy when their firm is trading cheaply and sell after the share price has risen.

In a study similar to Lorie and Neiderhoffer (1968), Seyhun (1986b) examined the relationship between insider trading activity and the market return in the subsequent two months. He found a significant and positive relationship between the two

to determine the causes of insider trading activity. From a list of 39 variables, he found that firm size, earnings and dividend level have strong explanatory power in predicting insider trading.

⁴ Gregory, Matatko, Tonks and Purkis (1994) have argued that this finding may be a result of the size effect.

measures. To test whether this information would lead to profitable trading, Seyhun (1986b) carried out a switching strategy between the market portfolio and government treasury bills respectively for each month that an insider bought or sold. However, even ignoring transaction costs it was found that such a trading strategy was unprofitable. Chowdhury, Howe and Lin (1993) extended the analysis of Seyhun (1986b) by re-examining the issue using a vector autoregressive regression model. Their findings contradict the earlier paper by showing that market movements actually influence the direction of insider trading instead of the other way around as hypothesised by Seyhun (1986b). Moreover, their findings suggest that insider trading cannot predict future market movements and that outsiders cannot use aggregate insider trading information to predict future market returns over the subsequent eight weeks.

More recent studies into the performance of insider trading have sought to identify the effect of different methodologies or samples on previous results. Lin and Howe (1990) analysed the performance of insider trading in firms traded on the OTC/NASDAQ market. Using three different measures of abnormal performance, they report conflicting evidence on abnormal returns accruing to insiders after they trade. They also confirm the results of Seyhun (1986a) in that insiders closer to the firm appear to earn greater profits from their trades. That is, corporate directors earn significantly more from their trades than other insiders in the firm. In a seminal article and one which has come closest to testing the strong form of the efficient markets hypothesis, Meulbroek (1992) examined the performance of *illegal* insider

trades.⁵ She found that on the day of an illegal insider trade, insiders earned an abnormal return of 3% and almost half of the price run-up occurring before takeovers were on insider trading days. In a related paper, Petit and Venkatesh (1995) investigated whether insiders traded on long term private information in order to avoid detection by exchange authorities. They found a significant positive relationship between insider trading and the direction of returns one and two years into the future. They also report that subsequent to abnormal returns, insiders tend to reverse their trades which is indicative of both a long-term anticipatory and a reactive component in insider trading activity. Finally, Eckbo and Smith (1998) have reignited the insider trading debate by carrying out an analysis of the performance of insider trading on the Oslo Stock Exchange using a methodology that is drawn from the investment fund performance measurement literature. They find zero or negative abnormal performance for their sample shedding doubt on the validity of previous work.

A branch of work examining a variation of the hypothesis, "Do insiders earn abnormal returns from their investment decisions?" analyses the effect of regulation changes on the performance of insider trading. Jaffe (1974b) carried out the first comprehensive study of regulatory changes in the US by analysing the effect of three such changes on the profits and volume of insider trading.⁶ He found that there were no significant changes in any insider trading characteristic (abnormal returns and volume) as a result of the new regulation. Seyhun (1992) extended the work of Jaffe

⁵ Illegal insider trades were defined as those trades investigated by the Securities and Exchange Commission and subsequently cited in legal proceedings.

⁶ The new regulations were The Cady-Roberts decision in 1961, the Texas Gulf Sulphur indictment in 1965 and the Texas Gulf Sulphur decision in 1966.

(1974b) by investigating the impact of new regulation in the US during the 1980s.⁷ Similar to Jaffe (1974b), Seyhun (1992) found that regulation had no effect on the volume or profitability of insider trading. In fact, the volume of insider trades in the US quadrupled during the period. In the most recent study of this kind, Garfinkel (1997) examined the impact of the Insider Trading and Securities Fraud Enforcement Act (ITSFEA) passed in 1988. Contrary to previous studies, Garfinkel's (1997) results suggest that the timing of insider trades were affected by the imposition of the new law. Insiders in the US now tend to postpone their trades as a result of the new regulation until after earnings announcements to avoid investigation by the SEC. The only other study outside of the US to examine the impact of corporate insider trading regulations is Kabir and Vermaelen (1996). They investigate the effect of the introduction of insider trading restrictions in 1987 on the Amsterdam Stock Exchange. Their results indicate that securities became less liquid (as measured by trading volume) during those periods when insiders were banned from trading. A subsidiary finding is that the efficiency of the market was also impaired in that the price adjustment of shares to positive earnings figures took longer than pre-regulation.

The second major theme of insider trading research is concerned with an analysis of the *timing* of insider trades around firm specific information events and the interaction between the insider trade and the announcement. The literature is large and is summarised in table 1.2. The findings from this body of research are mixed with no consistent insight being provided.

⁷ The two main regulatory changes were brought about by the Chiarella case in 1980 and the Insider Trading Sanctions Act (ITSA) of 1984.

A large branch of research into this hypothesis concerns insider activity around merger announcements. Keown and Pinkerton (1981) examined the effect of insider trading before merger announcements and found significant information leakage in the run-up to the event. Because of a lack of data however, they were unable to develop the analysis further. Elliot, Morse and Richardson (1984) extended the work of Keown and Pinkerton (1981) and found that insiders bought more shares and sold less, twelve months prior to a merger. In a case study analysis of Nestle S.A takeover of Carnation Company, Chakravarty and McConnell (1997) examined the individual trades of Ivan Boesky in Carnation stock.⁸ They reported a significant relationship between Ivan Boesky's transactions in Carnation and changes in its share price. Their work has been extended by Meulbroek and Hart (1997) who report that the takeover premia on target securities is on average 10 percentage points higher when illegal insider trading is taking place. It thus appears that illegal insider trading has a significant impact on the prices of securities around mergers and acquisitions but not legal corporate insider trading. One of the reasons for this is that corporate directors may be avoiding possible investigation by the exchange authorities and thus trading in other periods. Illegal insider trading clearly ignores this threat.

The trading activities of insiders in relation to earnings announcements have also been the focus of a large proportion of the literature in this area. Penman (1982) found that insiders purchased before good management earnings forecasts and sold prior to bad forecasts. However Elliot, Morse and Richardson (1984), Givoly and Palmon (1985) and Park, Jang and Loeb (1996) report that insiders do not time their

trades around earnings announcements. In contrast to these results, Allen and Ramanan (1990), Sivakumar and Waymire (1994), Lustgarten and Mande (1995) and Udpa (1996) find that insider trading and earnings surprises are strongly related.

The remainder of the literature into the timing of insider trading around firm specific events is likewise very mixed in its conclusions. The discrepancies between the results are indicative of sample differences that may be related to institutional or time specific factors. It is thus important that a comprehensive study of insider trading in a different institutional setting and time period is undertaken in order to provide greater insight into the issues described above. This thesis is a partly a report of my undertaking by analysing insider trading in the UK institutional setting.

1.3 Insider Trading Research in the UK

Empirical research into UK corporate insider trading has lagged considerably behind corresponding US studies. To the best of my knowledge, there have been only four research papers examining insider trading in the UK and all have been concerned with assessing the performance of insider trades. King and Roell (1989) were the first to investigate the profitability of UK insider trades and found (using a very selective sample of trades recorded in *The Financial Times* and highlighted to be of particular interest) that insiders earned abnormal returns of 53% when they bought shares in their own firm and 7% when they decided to sell.

⁸ Ivan Boesky was later charged with illegal insider trading by the SEC.

In a more academically robust study, Pope, Morris and Peel (1990) used a sample of 564 insider transactions⁹ to examine the profitability of UK corporate insider trading. Similar to the earlier King and Roell (1989) study, they found that insiders earned a positive abnormal return from buying and a negative abnormal return from selling. However the magnitude of the returns earned were much smaller with insiders earning 4.85% from their buy trades over six months and 6.69% for their sell trades over a similar period. Pope et al (1990) also examined the performance of insider trades over three sub-periods determined by changes in UK insider trading regulation or monetary policy.¹⁰ In an important finding they report that there is a substantial time sampling effect with UK insider trading data and in some periods insiders did not earn any abnormal returns while in others their trades were significantly more profitable than other investors in the market.

Gregory, Matatko, Tonks and Purkis (1994) have argued that insider abnormal returns are more a statistical artefact than a real effect. They report that the abnormal returns accruing to insider trades in the UK tend to be concentrated in smaller firms. When an appropriate size-adjusted benchmark is used to control for this fact, the abnormal returns that insiders are supposed to earn disappear.

In the most recent UK insider trading paper, Gregory, Matatko and Tonks (1997) argue that the cause of the different results reported from earlier UK studies is due to the inconsistent definition of an insider trading signal. They carry out an analysis

⁹ These consisted of 275 insider buy decisions and 289 insider sales.

¹⁰ The sub-periods were 1977-1979, 1979-1981 and 1983-1984 corresponding to the publication of the London Stock Exchange model code, a new government being elected and the introduction of the Companies Act.

replicating the definitions found in the previous studies on a homogeneous sample of insider trades. In a similar vein to their previous paper, they also find that there is a substantial size effect present in UK insider trading data.

As is clear, research into insider trading in the UK is still in an embryonic stage and further analysis is required to provide a greater insight into the strategies and performance of insiders. The UK, however, is an interesting system in its own right to carry out insider trading research.

The UK regulatory system is unique in that corporate insiders are banned from trading in four months of their firm's financial year.¹¹ This undoubtedly has an effect on the strategies of insiders and the overall efficiency of the market during this time. The trading system in the UK for the period of this study was completely quote driven and market makers were the only counterparty to insider trades. This is in contrast to almost all US studies¹² that relate to firms trading on the NYSE which is an order driven system. Undoubtedly, the activities of insiders and the effect of their trading have a different impact in an order driven system than in a quote driven system. The UK provides an excellent setting in which research can be carried out to examine such issues.

¹¹ With the exception of the Netherlands who recently introduced a similar regulation.

¹² The exception is Lin and Howe (1990) who studied the performance of insider trading in OTC/NASDAQ securities.

1.4 Relevant UK Insider Trading Regulation¹³

The definition of "insider" in the UK has a different definition from the US and should be clarified. In the US, the most important law which defines an insider, is section 10-b of the SEC 1934 Act. An insider is defined to be someone who is in possession of non-public information by virtue of his or her employment within an organisation. It also applies to any person who has procured non-public information using illegal means (such as theft) or by inducing an employee of a firm who has a fiduciary responsibility to shareholders to supply him with non-public information.

In the UK, the definition of insider is different in a subtle but important way. A person is considered to be an insider if and only if:

1. He has inside information
2. He knows the information is inside information
3. He has the information from an inside source
4. He knows the source is an inside source

Inside information must:

1. Relate to particular securities or to a particular issuer of securities or to particular issuers of securities and it must not relate to securities generally or to issuers of securities generally.
2. It must be specific or precise

¹³ Much of the source information for this section is taken from the original regulatory documents.

3. It must not have been made public
4. If it were made public it would be likely to have a significant effect on the price of any securities.

Finally, the insider must have the inside information at the time of dealing and must have actual knowledge that the information was inside information.

In the UK an insider may be anyone who possesses non-public information from any source, whereas in the US the insider must have some formal or informal connection to the company. By definition, the scope of the insider definition in the UK is much broader than the corresponding US definition and as a result, the UK definition is argued to be superior in form to that defined by US law (Tridimas (1991) and Watson (1995)).

The vast majority of all empirical research in the UK and the US has dealt with corporate insiders. Corporate insiders are those persons who are employed by a firm and who may or may not have fiduciary responsibilities to the shareholders of the firm. This definition encompasses all employees within the firm from the simple labourer to the executive directors or chairman of the firm. In both the US and UK all employees with a fiduciary responsibility must report any dealings in their own firm to the respective stock exchange. These transactions have formed the basis of the data sets used in all modern empirical insider trading research.

The UK regulation relates primarily to the action of corporate directors since it is thought that persons holding such a post are most likely to be in possession of private information. The regulation concerning director dealings is determined by the stock exchange as it has a right to require member firms to disclose relevant information. Corporate insider trading is viewed to be important and as a result the stock exchange require the disclosure of all director trades.

In general, the London Stock Exchange requires that a company must notify without delay its Company Announcements Office (CAO) of:

1. Any information necessary to enable holders of the company's listed securities and the public to appraise the position of the company and avoid the creation of a false market in its listed securities.
2. Any major new developments in the company's sphere of activity which are not public knowledge which may:
 - a. by virtue of the effect of those developments on its assets and liabilities or financial position or on the general course of its business, lead to substantial movements in the price of its listed securities.
 - b. In the case of a company with debt securities listed, by virtue of the effect of those developments on its assets and liabilities or financial position or on the general course of its business, lead to substantial movements in the price of its listed securities or significantly affect its ability to meet its commitments.

Information that is to be provided to the CAO must not be supplied to anyone else before it has been announced by the exchange. The specific information that must be reported to the stock exchange includes:

1. Changes in capital structure
2. Acquisitions or disposals
3. Transactions between a listed company and a related party (that is, directors or substantial shareholders)
4. Preliminary statements of annual results
5. Announcement of interim results
6. Dividend decisions
7. Board changes
8. Changes in directors' interests in securities (corporate insider trades).

In relation to corporate insider trading, the stock exchange drew up The Model Code in 1977 to guide companies on their actions when directors wished to trade in their own firm's securities. The full reproduction of The Model Code can be found in the Listing Rules for the London Stock Exchange.

According to The Model Code, a company must take all proper and reasonable steps to ensure that it complies with a code of dealing in terms no less exacting than those of The Model Code. This means that the code is a *minimum* level of conduct that should be followed by companies and firms are encouraged to have more stringent codes of conduct for its employees.

More specifically,

1. A director must not deal in any securities of the listed company (which includes all derivatives) during a 'close period' subject to exceptional circumstances.
2. A director must not deal at any time (whether a close period or not) where he has inside information.
3. All dealings by a director in his company's securities must be cleared in advance by the chairman or a designated director.

The Model Codes defines the 'close period' to be:

1. The period of two months immediately preceding the preliminary announcement of the company's annual results or if shorter, the period from the relevant financial year-end up to and including the time of the announcement.
2. If the company reports on a half-yearly rather than a quarterly basis, the period of two months immediately preceding the announcement of the company's half-yearly results or, if shorter, the period from the relevant financial period-end up to and including the time of the announcement.
3. If the company reports on a quarterly basis, the period of one month immediately preceding the announcement of the quarterly results or, if shorter, the period from the relevant financial period-end up to and including the time of the announcement.

The Model Code states that a director must not be given any clearance to deal in any securities of the listed company during a prohibited period. A prohibited period is:

1. Any close period
2. Any period when there exists any matter which constitutes unpublished price-sensitive information in relation to the company's securities (whether or not the director has knowledge of such matter) and the proposed dealing would (if permitted) take place after the time when it has become reasonably probable that an announcement will be required in relation to that matter
3. Any period when the person responsible for the clearance otherwise has reason to believe that the proposed dealing is in breach of The Model Code.

If a company is found to be in breach of The Model Code, the Stock Exchange may censure the company and publish the fact that the company has been censured. The stock exchange may also suspend or cancel the listing of the company's securities if it so desires. If a particular director systematically acts in breach of The Model Code, the exchange may state publicly that in its opinion the director's continued employment may not be in the shareholders' best interest. If the director were to remain in office, the exchange has the power to suspend or delist the company's securities.

1.5 Issues Investigated in this Thesis

In this thesis, several issues are examined concerning insider trading. These are:

1. To what extent do corporate insiders profit from their trades and what are the main trading characteristics that may differentiate an informed insider trade from an uninformed one?
2. Do corporate insiders in the UK adhere to the guidelines set out in The Model Code?
3. Are corporate insiders affected by regulatory attempts to restrict their activities?
4. Can a trading strategy be formed based on the insights developed in the previous three chapters?
5. Can insider trading activity be the cause of the turn-of-the-year and tax-year-end effect?
6. How do dealers act in periods of insider trading activity?

Each issue will be briefly discussed in turn.

1.5.1 To what extent do corporate insiders profit from their trades and what are the main trading characteristics that may differentiate an informed insider trade from an uninformed one?

Many studies have found that corporate insiders tend to earn abnormal returns from their trades. In the US, where the study of insider trading was initially developed, Jaffe (1974b) and Seyhun (1986a, 1986b) have reported that insiders bought shares

in their own company after consistently poor share price performance and sold shares in their own company after sustained above normal share price performance. In the UK, these findings have been extended by King and Roell (1989), Pope et al (1990) and Gregory et al (1994, 1997).

In chapter two, the prior analyses are extended in several ways. First, these studies have used monthly returns to detect the profitability of insider trading. The research definition is sharpened by using daily return data. With daily data, a more precise insight is gained on the timing and extent of the price reaction to insiders' trades. Second, extensive tests are carried out to investigate the relationship between trade characteristics and the level of abnormal share price performance. Third, the data source that is used in this thesis is richer than previously used data sources as it includes information on insider post-trade holdings.

Consistent with previous studies, insiders are found to earn abnormal returns from their trades. Moreover, the abnormal performance occurs within twenty working days of the insider's trade. Interestingly, share prices react on the day of the insider trade. Given that an insider's trade does not need to be reported to the stock exchange for up to five days, this raises questions concerning the anonymity of traders' identities in a quote driven market. A second important finding from this study is that the level of performance subsequent to an insider's trade is related to the characteristic of the trade. A large price reaction on the day of the trade is found to be most strongly related to those cases where insiders more than doubled their holdings in the company and/or when they split their orders and traded more than

once within a working month. However, approximately fifty percent of all insider trades exhibit no abnormal performance whatsoever. This result is investigated further in chapter four.

1.5.2 Do corporate insiders in the UK adhere to the guidelines set out in The Model Code?

The London Stock Exchange Model Code has been in operation since 1977. The Code is not obligatory but simply a code of conduct by which companies are expected to adhere. Given that the exchange can take several steps to ensure that the model code is followed, it is interesting to determine whether corporate directors do actually follow the code.

Chapter three examines the extent of adherence to the code and finds that it is followed almost universally by the directors of all listed companies in the UK. This result is valid for both interim and final earnings announcements. These findings are a basis for the analysis in chapter four on the activities of insiders around earnings announcements.

1.5.3 Are corporate insiders affected by regulatory attempts to restrict their activities?

The continual interplay between the activities of traders who are privileged with respect to the information flow and regulatory authorities who aim to promote a fair

and efficient market has led to an intricate network of legalities affecting the trading of all players in a market.

Two main types of regulation affecting the trading of market participants in the UK are the Criminal Justice Act (1993) and The London Stock Exchange Model Code (1977). The Criminal Justice Act (CJA) is regulated by statute and follows the Company Securities Act (1985) in defining an informed trader (insider) and the situations in which that trader may or may not trade. However, the London Model Code is fundamentally different from the CJA in that it is voluntary and specifies periods during a company's financial year when an insider (defined by the CJA) is banned from trading in the shares of their own company.

Chapter four focuses on the London Stock Exchange Model Code and examines the theoretical assumptions on which it is based. Additionally, the whole issue of insider trading strategies is examined and the activities that insiders follow in an attempt to bypass the effects of the Model Code are investigated.

Using an event study methodology, it is found that although the Model Code is correct in its hypothesis that the period around a company's earnings announcement is an important time in which an informed trader would wish to trade, it fails in its ultimate objective of removing the abnormal profits that insiders earn from their trades. Moreover, insiders appear to exploit the information uncertainty around earnings announcements and in particular tend to follow a contrarian trading strategy (namely, buy after bad news or sell after good news).

The findings from this analysis add to the debate on the effect of and need for regulation in financial markets that constrains the activities of corporate insiders who hold privileged positions vis-à-vis the order flow.

1.5.4 Can a trading strategy be formed based on the insights developed in the previous three chapters?

The findings from the first three empirical chapters have provided several insights. Arguably, the most important of these is the fact that

- a. there are regularities in the characteristics of trades that are associated with the corporate insider being in possession of private information,
- b. not all trades earn abnormal returns for insiders and
- c. insiders tend to trade when the market is moving in the opposite direction from their expectations.

The purpose of chapter five is therefore whether these insights can be used to develop a profitable trading strategy. This is of interest because even though approximately fifty percent of all corporate insider trades are not associated with complementary price movements, on average insiders significantly outperform the market when they decide to trade. If any stratification can be carried out to sharpen the trading signal, it is possible that a profitable trading strategy can be devised.

In order to further motivate the choice of inputs into the trading strategy, a very simple analytical model is developed which proxies the expectations of market

outsiders when corporate insider trading signals are detected. Three main factors are suggested to be of importance:

- a. The probability that the corporate insider had information when they traded.
- b. The probability that the information was good or bad news.
- c. The general level of profitability of insider trading in the firm.

Using readily observed proxies, I find that a trading strategy based on these factors is significantly profitable even when the rule is implemented five days after the actual insider trade. This is even when transaction costs are incorporated into the analysis. Applying the strategy after this point, would lead to positive but insignificant returns.

1.5.5 Can insider trading activity be the cause of the turn-of-the-year and tax-year-end effect?

The turn-of-the-year effect that has been widely studied for US securities has also been detected for UK equities (Reinganum and Shapiro (1987)). Two main hypotheses have been tested with respect to this anomaly in the US, namely the tax-loss-selling hypothesis and the transaction costs hypothesis. The tax-loss-selling hypothesis posits that traders reduce their holdings in poorly performing securities prior to the tax year-end to realise a tax gain from their capital loss. When the new tax year begins the excess supply of these securities dries up and excess returns are realised (Lakonishok and Smidt (1984), Keim (1989), Brailsford and Easton (1991) and Griffiths and White (1993)). In contrast, the transaction costs hypothesis argues that the spreads of smaller companies are larger in January of each year because of insider trading. This would increase the transaction costs that investors have to pay

causing large gross returns in January (Stoll and Whaley (1983), Schultz (1983), Seyhun (1988), Bhardwaj and Brooks (1992) and Clark, McConnell and Singh (1992)).

In chapter six another hypothesis explaining the turn-of-the-year effect is proposed which is driven by the findings in the insider trading literature. The majority of all insider trading performance studies have estimated that insiders earn abnormal positive returns from their buy trades and abnormal negative returns from their sell trades. If seasonalities are present in insider trading activity, it could be argued that this may be a cause of the return seasonality in small securities, especially if, as has been found by Seyhun (1986b) and Gregory, Matatko, Tonks and Purkis (1994), insiders earn their abnormal profits only in small securities.

Contrary to US studies, it is found that the turn-of-the-year effect is equally significant over all firm sizes but is not persistent over time. The effect of tax-loss-selling on stock returns¹⁴ is significant but not as strong as the January effect. In addition, it does appear that there are seasonalities in insider trading, however it is found that this does not contribute to the January effect or the tax year-end effect.

In the next chapter, the study of insider trading is approached from a different perspective to the traditional security return methodologies.

¹⁴ The tax year-end in the UK for ordinary investors is April 5, whereas in the US it is December 31.

1.5.6 How do dealers act in periods of insider trading activity?

In chapter seven, the impact of insider trading on the inventory control behaviour of dealers in a competitive dealership market is investigated. Whilst there is substantial evidence indicating that the arrival of new information can affect prices in dealer markets, recent research has found that the price setting behaviour of dealers can also be affected by inventory considerations (Snell and Tonks (1995) and Hansch, Naik, and Viswanathan (1998)). However, no study has as yet empirically investigated the dynamic interaction between new information arrival, dealer inventory control and quote setting behaviour.

The main focus of the chapter centres on the reaction of dealers to unanticipated information events (corporate insider trading) through their inventory control, and how they incorporate that information into their quote setting behaviour. Several testable hypotheses are investigated in this context. Upon the unexpected arrival of new information, the adverse selection and inventory risks facing dealers would arguably increase because of the presence of skilled and informed investors. This would result in greater information asymmetries in the market. To protect themselves against losing out to better informed traders, it has been suggested that dealers change their inventory control strategies by increasing spreads and decreasing market depth (Lee, Muchlow and Ready (1993)). In addition, inflated volatility of returns and/or trading volume may also increase inventory risks facing dealers. In chapter seven, it is argued that these factors would directly contribute to a predictable change in the inventory control strategies of dealers. The extent to which these risks are circumvented may also depend upon the existence of alternative risk

management mechanisms such as traded American Depository Receipts (ADR) or exchange traded options. The potential for offloading some of the risk in dealer portfolios through taking positions in these instruments may affect the inventory control behaviour of dealers and as such, the effect each mechanism may have is investigated.

The results indicate that dealers change their inventory control behaviour subsequent to insider trading. Trades by company insiders are accompanied by large changes in dealer inventories in the direction of the trade. That is, inventories significantly increase after a sell trade and significantly decrease after a buy trade. Dealers react to the information by “tightening” their inventory control as evidenced by greater mean reversion of inventories in the ten days after an insider trade. The extent to which dealers use the inter-dealer market as a risk sharing mechanism does not appear to change after the arrival of information. Further, consistent with Chakravarty and McConnell (1997) the insider trade does not precipitate any change in market depth. Finally, the share price movements as a result of insider trading (quoted in many previous studies), disappear once inventory effects are taken into account. These results are consistent with previous research which shows that inventory control is actively managed by dealers and provides further evidence on the debate concerning the information content of insider trades.

1.6 Structure of Thesis

The thesis is set out as follows, chapters two through seven will investigate each of the issues discussed in this chapter respectively. Chapter eight closes the thesis with a summary of its findings and implications for future research.

Table 1.1**Summary of Results from Early Insider Trading Studies**

This table presents a summary of insider trading abnormal performance estimates from early studies into the area. Unless otherwise stated, all studies in this table refer to insider trading in firms listed on NYSE.

Authors	Buy	Sell	Definition of buy/sell trades
Pratt and DeVere (1970)	19.5% over 6 months (raw return)	8.4% over 6 months (raw return)	A month with 3 or more buy/sell trades
Jaffe (1974b) ^a	0.70% combined buy and sell transactions (excess return)		All Trades
	1.84% combined buy and sell transactions (excess return)		All trades > \$20,000
	4.94% combined buy and sell transactions (excess return)		3 more buys(sells) than sells(buys) in same security
	4.64% combined buy and sell transactions (excess return)		6 more buys(sells) than sells(buys) in same security
Finnerty (1976a)	8.61% over 11 months (excess return)	-4.72% over 11 months (excess return)	All trades
Baesel and Stein (1979) ^b	7.2% over 12 months (excess return)	Not measured	All insider buys

^a Jaffe combined insider buy and sell trades by premultiplying the returns on all insider sell transactions by -1.

^b Canadian data.

Table 1.2**Summary of Insider Trading Timing Studies**

This table presents a summary of research into the trading behaviour of insiders around firm specific information events. Unless otherwise stated, all studies in this table refer to insider trading in firms listed on NYSE.

Authors	Information Event	Main Findings
Keown and Pinkerton (1981)	Merger Announcements.	Information leakage prior to announcement. No insider trading data so can only infer that insiders may be trading in this period.
Penman (1982)	Earnings Forecasts.	Insiders buy(sell) before good(bad) forecasts.
Elliott, Morse and Richardson (1984)	Earnings changes; dividend changes; bond rating changes; merger announcements; bankruptcy announcements.	No significant relationship between timing of insider trading and information announcements.
Givoly and Palmon (1985)	Earnings; dividends; earnings forecasts; acquisitions; new products; contract of awards; project cancellations; labour disputes; stock splits and repurchases; litigation; layoffs.	No relationship between timing of insider trading and subsequent announcements.
Gupta and Misra (1988)	Takeovers.	No relationship between insider trading and price run-ups prior to takeover announcements.
Loderer and Sheehan (1989)	Bankruptcy.	Insiders do not sell before bankruptcy.
Netter and Mitchell (1989)	Stock-Repurchases	Insiders buy after fall in prices and sell after price increases. Firms repurchase shares after fall in prices.
Hirschey and Zaima (1989)	Sell-offs	Insider buying accompanied by corporate sell-offs result in very large positive abnormal returns.
Hirschey, Slovin and Zaima (1990)	Sell-offs	Insider buying accompanied by corporate sell-offs and bank debt result in very large abnormal returns
John and Lang (1991)	Dividend Announcements	Insider trading and dividend announcements act as joint signals.
Karpoff and Lee (1991)	New Issue Announcements	No relationship between insider trading and new issue announcements

Continued on next page.

Table 1.2 (continued)**Summary of Insider Trading Timing Studies**

This table presents a summary of research into the trading behaviour of insiders around firm specific information events. Unless otherwise stated, all studies in this table refer to insider trading in firms listed on NYSE.

Authors	Information Event	Main Findings
Gosnell, Keown and Pinkerton (1992)	Bankruptcy (NYSE and NASDAQ)	Insiders sell before bankruptcy in OTC firms but not NYSE firms.
Lee, Mikkelson and Partch (1992)	Stock Repurchases	Insiders buy before stock repurchases.
Sivakumar and Waymire (1994)	Quarterly Earnings Announcements	No relationship between insider trading and quarterly earnings announcements.
Allen and Ramanan (1995)	Earnings Announcements	Relationship between prior insider buying (selling) and positive (negative) earnings surprises.
Lustgarten and Mande (1995)	Financial Analysts' Earnings Forecasts	Insiders buy (sell) before good (bad) earnings news.
Radd and Wu (1995)	Stock Repurchases	Insider buying causes abnormal returns to be greater at stock repurchase announcements.
Pettit, Ma and He (1996)	Stock Repurchases	Below normal level of insider sales before event.
Park, Jang and Loeb (1996)	Earnings Announcements	Evidence of insider selling after good news.
Udpa (1996)	Earnings Announcements	Earnings announcements less informative when insiders trade beforehand.
Chakravarty and McConnell (1997)	Nestle S.A takeover of Carnation Company	Positive relation between Ivan Boesky's trading and share price changes. No change in spreads.
Seyhun and Bradley (1997)	Bankruptcy	Selling by insiders before bankruptcy petitions.
Gombola, Lee, and Liu (1997)	Seasoned Equity Offerings	Insider selling month after issue.
Meulbroek and Hart (1997)	Takeover	Illegal insider trading causes increases in takeover premia.
Harlow and Howe (1998)	Leverage Buyouts	Increased trading before leveraged buyouts.

2 The Performance and Characteristics of Corporate Insider

Trading

Many empirical studies have provided evidence that on average corporate insiders outperform other investors when trading in their own firms' securities.¹ It appears that the market perceives these trades to be important information events and that security prices adjust to reflect this. However, such a simple interpretation is hazardous since many empirical studies on insider trading provide contrary evidence on the private information (if any) that insiders use when they trade. On the one hand, there is statistical evidence that insiders trade before major firm specific events in the direction of the event (i.e. buy before good news and sell before bad news).² However, other studies have shown that insiders trade in the opposite direction to an event and also do not appear to lose out on their trades.³ Consequently, the signal imparted by insider trades is ambiguous. One possible reason for the mixed results is the differing methods of classifying insider trades and the failure to examine the

¹ For US evidence see Lorie and Niederhoffer (1968), Pratt and DeVere (1968), Jaffe (1974a, 1974b), Finnerty (1976a, 1976b), Nunn et al, (1983), Givoly and Palmon (1985) and Sivakumar and Waymire (1994). Pope et al, (1990) and Gregory et al, (1994) provide evidence for the UK and Baesel and Stein (1979) use Canadian data. A comprehensive survey is given in chapter 1.

² See Keown and Pinkerton (1981) for merger announcements, Penman (1982) for firm's voluntary earnings forecast announcements, Netter and Mitchell (1989) and Lee, Mikkelson and Partch (1992) for stock-repurchase announcements, Meulbroek (1992) and Meulbroek and Hart (1997) for take-over announcements, Park et al (1995) for earnings announcements and Seyhun and Bradley (1997) for bankruptcy petitions, among others. A comprehensive survey is provided in chapter 1.

³ See Elliot et al (1984) and Givoly and Palmon (1985) for a variety of information events, Loderer and Sheehan (1989) for corporate bankruptcy and Sivakumar and Waymire (1994) for earnings announcements.

actual information content of the trade. This chapter attempts to provide an insight into the issue by considering various measures of an informed insider trade.⁴

The analysis makes four main contributions to the literature. First, it examines the performance of insider trading from an outsider's perspective. A debate continues on whether insiders trade on private valuable information and if so, whether outsiders can earn superior returns by mimicking these trades. The importance of this debate is evidenced by the market for information on corporate insiders' trading, with professional analysts and the financial press being major providers of this information. Moreover, when an insider trades, there is usually no explanation given by the insider on the reasons for the trade. As a result, outsiders need to interpret the informativeness of the trade from the characteristics of the trade alone. An empirical examination of the issues and difficulties outsiders may face has not been explored in any previous literature. Second, evidence of the ability to earn superior returns based on corporate insider trading has implications for the efficiency of securities markets. The speed of the price reaction to insider trading is examined and the revealing trade characteristics that may drive it is determined. Although the abnormal performance of firms around insider trading has been well documented, no study has actually examined the speed of the market reaction or how the market determines an informed insider trade. Third, the analysis presents for the first time using UK data, the performance of firms before and after cases of insider trading.⁵ Pre-trade

⁴ Another problem with the simple interpretation of insiders earning abnormal returns is that it is unclear whether the market reacts to information contained in the trades or to the trades themselves. This Hypothesis is studied in chapter seven.

performance can provide many insights into the reasons why insiders trade. It is also important in generating a complete picture of insider trading to determine the similarities and differences in the performance of insider trading in the UK, United States and other countries. Finally, the theoretical models of insider trading contain a number of suggestions about the behaviour of insiders. As a result, the relationship between the performance of insider trades and the characteristics implicit in these models is considered.

2.1 Empirical Measures of Corporate Insider Trading

Most empirical studies to date have concentrated on 'intensive' insider trades. A common approach is to net out aggregate transactions occurring within one calendar month and to take the resulting direction to be the insider trading signal with the proviso that there are more than 'x' purchase (sales) transactions than sales (purchases).⁶ However, this measure is flawed in several important ways. One problem is with the use of an arbitrary period such as a calendar month. If the timing of corporate insider trades is random during any one month, the measure will frequently be misspecified in its classification of buy or sell signals. It is also biased towards including only large firms in the sample since it is likely that large firms have more insiders and thus are able to meet the inclusion criterion more readily.

⁵ All other UK studies have examined only the post trade performance of firms. This is in direct contrast with studies of US insider trading that usually examine both post and pre insider trading performance.

⁶ Penman (1982), Elliot, Morse and Richardson (1984), Seyhun (1986a,198b), Rozeff and Zaman (1988), Hirschey and Zaima (1989), Pope, Morris and Peel (1990), John and Lang (1991), Karpoff and Lee (1991), and Udpa (1996) all use variations on this measure. The popularity of this method is obviously connected with the use of monthly return data in the event studies.

Moreover, the netting process ignores the magnitude of each trade as large trades are given the same weighting as very small trades resulting in a loss of information in the measure. Finally, the information contained in each insider's trade is lost. There are many different reasons that could motivate an insider to trade and these are not all based on the future performance of the firm. For instance, insiders, like other investors, may hold a portfolio of securities and liquidity or portfolio rebalancing considerations may motivate some trades. The netting process treats each trade as equally important with the effect that the information content resulting from net measures is possibly less precise than the individual trades themselves.

Other measures of the signal imparted by insider trades have been based on the volume of shares traded (Seyhun 1986a), the proportion of the firm traded (Seyhun, 1986a; Elliot, Morse and Richardson 1994; Gregory, Matatko, and Tonks, 1997), the monetary value of the trade purchased and sold per company (Lee Mikkelson and Partch 1992), the number of purchases and sales in a month (Lee, Mikkelson and Partch, 1992) and the position of the corporate insider in the company (Seyhun, 1986a). The main reason for such a wide variety of measures is that there has been no overriding empirical or theoretical reason for choosing any one measure above another.

2.2 Theoretical Motivation for Measures of Corporate Insider Trading

Theoretical models have approached the modelling of insider trades in one of two ways. The thrust of models developed by Glosten and Milgrom (1985), Kyle (1985),

Admati and Pfleiderer (1988, 1989), Glosten (1989), Laffont and Maskin (1990) and Bernhardt, Hollifield and Hughson (1995) are that insiders hold information unknown to the market and trade on their own accounts, using private information to maximise profits. Other market participants (uninformed investors and market makers) lose out directly to the insider causing the market to be less liquid. Various implications arise from these models. For example, corporate insiders will attempt to mask their trades in order to keep the market price favourable (Laffont and Maskin, 1990); in a competitive dealer market, the bid-ask spread will increase in proportion to the accuracy of the private information known by the insider (Glosten, 1989); as the amount of corporate insider trading increases, the market will become less liquid and consequently less informationally efficient (Glosten and Milgrom, 1985) and if market makers recognise an informed order they will impose a cost, usually in the form of less favourable quotes or execution prices on that trade as insurance. Thus insiders may strategically disguise their trade by splitting it up into several smaller trades (Kyle, 1985; Easley and O'Hara, 1987).

The second approach to modelling insider trading is that of a signalling equilibrium. Under this paradigm, insiders use their trades as a signal to market participants to increase the efficiency of prices (John and Mishra, 1990; John and Lang, 1991). When insiders trade prior to an important firm specific event, outsiders view the trade and the event as a joint signal and trade on the combined information. Insider trading has the effect of increasing the amount of information available in the marketplace and thus makes prices more efficient. John and Lang (1991) reported empirical results consistent with this model.

The common element in all insider trading models is the strategic interplay between the insider and the outside market participant. Under the asymmetric information paradigm, insiders attempt to mask the information contained in their trades, while simultaneously, outsiders try to detect and discover information contained in the insiders' trades. The signalling equilibrium paradigm is more explicit in that outsiders use insiders' trades in conjunction with other events as information to form their own expectations. However, not all insider trades contain the same level of information. Some trades may genuinely be driven by important, as yet publicly unknown information⁷ while others may simply be due to liquidity reasons or portfolio diversification. Outsiders view each trade and must come to a conclusion about the information imparted by the trade.

2.3 Information on Trade Characteristics and Levels of Abnormal Performance

The main purpose of this chapter is to investigate the information contained in insiders' trades. I examine the performance of firms around insider trading and study the relationship between several trade characteristics and the abnormal returns earned by insiders. The performance of insider trading is considered, taking into account the characteristics of specific insider trades.⁸ There is theoretical justification for considering these characteristics and the providers of this information to outsiders

⁷ This is illegal in many countries, including the US and the UK.

⁸ Gregory et al (1997) examine two trading measures (number of shares traded and volume of shares traded) with respect to trading performance.

argue that these are crucial factors in the decision of outsiders on whether to mimic the trading of insiders.⁹

Using data on trades undertaken by insiders of companies trading on the London Stock Exchange from September 1991 to March 1997, strong statistical evidence of incremental information content in corporate insider trades is found. Further, there appears to be consistencies in the types of trades corporate insiders undertake when in possession of valuable information. Post trade abnormal performance when insiders purchase is found to be positively related to trades where insiders have increased their holdings significantly and where several insiders have traded close together. For sales, the relationship is different. After a large increase in price, insiders tend to sell together. However, this does not affect the price performance of the security after the trade. There also appears to be a positive relationship between the size of a decrease in insider holdings and positive abnormal performance. Further, there is a significant positive reaction on the day of a buy trade in cases where corporate insiders substantially increase their holdings. As expected, most of the abnormal performance of insiders is concentrated in smaller firms where information would be at a premium.

In the next section, descriptive information is provided for the dataset used in this analysis. Following this, the various insider trading measures used in this study are

⁹ For example, “*Our experience tells us what to look out for: buying must be meaningful in relation to director’s existing holdings... several directors dealing in unison is particularly significant*” (The Inside Track publicity brochure). Also, “*Looking at just the size [of the insiders’ trades] can be misleading. The biggest sales in absolute terms...the shares have continued upwards since... at the time this accounted for less than 10% of the holding and should not have been taken as a sale signal*” (The Financial Times 23rd/24th March 1996 p.6).

discussed and justified. The basic results of the study are then presented. Robustness checks follow and in the final section I present my conclusions and thoughts on future research in this area.

2.4 Data Description

The data source is supplied by Investorcare Publications who operate a service called *Directorwatch*.¹⁰ It provides a weekly update, listing every director transaction that has been reported to the London Stock Exchange within the previous seven days.¹¹ The *Directorwatch* service supplements this information with details on the traded companies as well as providing data on the director that undertook the trade.¹²

For this study, a sample of 7,796 transactions in 1,350 companies over the six-year period 17 September 1991 to 31 March 1997 is used. All director transactions listed by *Directorwatch* are included in the sample apart from some exceptions where a

¹⁰ In the UK, the only corporate insiders required to report their trades to the London Stock Exchange are company directors and in line with other UK insider trading studies I only consider directors' trades as the insider sample. This is a subset of the whole universe of possible insiders within a company. However, previous studies in the US (e.g. Seyhun, 1986a) have reported that trades undertaken by directors contain more information than any other subgroup of insider. I do not believe this constraint will bias my results.

¹¹ The London Stock Exchange Model Code currently requires that company directors notify their company at the latest five days after they trade in their own company's equity. The company must then notify the stock exchange of the trade within one day of being notified by the director. Current proposals published by the London Stock Exchange in May 1997 have stated that they wish to reduce the period of notification by company directors from five days to two days to increase market efficiency. However, this is unlikely to have any impact since most companies in the UK require an insider to notify the board of directors *prior* to the insider trading. In addition, the empirical results later in this chapter show that the market actually reacts on the day of the trade.

¹² The following data is given for each transaction: company name, date of transaction, director name, transaction marker (bought/sold), number of shares traded, price per share, total value of transaction, class of share (ordinary, preference, etc.), director's holding after trade and industry sector of company.

small number is lost due to the unavailability of daily return data. The sale of equity subsequent to the exercise of warrants and options by shareholders are also excluded.¹³ I believe that the trading decision concerning these instruments is not based on the same information that insiders use when trading in their own companies' shares and as a result, these trades were excluded from the sample.¹⁴ Transactions involving preference shares have also been excluded, since these securities have debt characteristics and their trading may be motivated by different factors from the trading in ordinary shares.

Firm specific market values and daily returns adjusted for dividend payments were collected from Datastream.¹⁵

2.5 Corporate Insider Trade Measures

Finance theory does not provide a definitive explanation of how an insider will trade when in possession of private information. This causes difficulty in empirical studies in terms of defining informed corporate insider trading (in contrast to uninformed corporate insider trading). The only real insights from theory are that insiders will either attempt to disguise the information content in their trades by splitting them up (Kyle, 1985; Easley and O'Hara, 1987, Laffont and Maskin, 1990) or in contrast,

¹³ These trades are probably motivated by the profit that can be made on expiration of the instrument.

¹⁴ This is consistent with previous studies in the UK and US. Gregory et al. (1994) did in one test include option related trades in combination with actual trades. They found that in the majority of cases, including options did not change their results.

¹⁵ This service has been provided by Datastream since 1995. All adjusted returns series are backdated to 1968.

will attempt to trade as much as possible to exploit any mispricing due to lack of information (Easley and O'Hara, 1987).¹⁶

Previous empirical studies have been somewhat arbitrary in their choice of corporate insider trading measures. Aside from net trading (purchases minus sales), other measures have served as proxies for the absolute size of a trade (number of shares traded, dollar volume of shares traded, proportion of firm value traded). These suffer from measuring the 'magnitude' with respect to the firm and not with respect to the insider. Given that insiders do not have unlimited wealth or borrowing facilities, the amount they can trade will be finite. In addition, individual insiders have different levels of wealth and their own financial interest in their firm (e.g. in the form of share holdings) will be different. It thus follows that a trade measure which captures the importance of a trade with respect to the insider will be better defined than one with respect to the firm.

One metric that satisfies this criterion is the percentage change in the insider's holdings.¹⁷ It measures the importance of the trade with respect to the insider. It is still a "noisy" estimate of information since the insider may be increasing or decreasing their holdings because of some non-information motivation. However, large values of this measure would be uncommon unless the insider has a very small

¹⁶ Easley and O'Hara (1987) model two equilibrium conditions. In their semi-separating equilibrium, insiders trade in large amounts whereas in their pooling equilibrium, insiders trade in small amounts. Gregory, Matatko and Tonks (1997) test this model using two trading signals: net value of shares purchased/sold and net number of purchases/sales. However, their metrics suffer from the same problems as the netting measures described previously.

¹⁷ Formally, this is measured as $(\text{Number of shares traded} / \text{Number of Shares held by insider prior to trade})$ multiplied by 100.

initial holding.¹⁸ Even then, such a large relative change in inventory would attract attention from analysts and other market participants because of the apparent shift in the preferences of the insider.

A measure which is strongly motivated by theory (Kyle, 1985; Easley and O'Hara, 1987, Laffont and Maskin, 1990) is the number of corporate insider trades within a period. This could be a result of an insider splitting their trade, several insiders trading together or both. Each of these factors can be associated with information trading, especially when the multiple trades are in the same direction. In addition to these measures we also examine other popular trading metrics that have been used in prior insider trading studies namely, the number of shares traded by the insider, the volume of the insider's trade¹⁹ and the insider's trade as a proportion of firm market value.²⁰

The major disadvantage to these latter measures is that they are valued with respect to the size of the firm and not the insider's holdings *per se*. In any case, all measures that have been discussed are interrelated and it should be stated that any trade that is important with respect to the firm must automatically be important with respect to the insider, given that the insider holds only a subset of the shares traded by the firm.

¹⁸ This would only occur for insider purchase transactions.

¹⁹ This is measured by *(Number of shares traded x transaction price)*.

²⁰ This is measured by *(Number of shares traded x transaction price) / (The market value of the firm)*. It would have been preferential to have also used the percentage traded by an individual director as a percentage of the total directors holding in the company and consider companies which are "closely held" compared to "widely held". However, although this information is available in the annual financial statements, it is not available in an empirically usable form on Datastream or Extel.

2.6 Preliminary Results

An examination of table 2.1 provides some insight into the difference between corporate insider purchases and corporate insider sales. Insiders predominately purchase equity in firms that are smaller in value than when they sell.²¹ Further, as with most US studies there were more insider purchases than sales during the sample period.

From the number of shares traded and the trade size as a percentage of firm market value, it is clear insiders tend to trade in smaller blocks when buying shares than when selling. There could be several reasons for this. Capital constraints may preclude a large purchase transaction for many insiders, causing them to purchase in smaller amounts over time. In addition if corporate insiders act as value traders (i.e. sell when prices rise above a certain value or buy when they fall below a certain level), they may sell a large portion of their holdings with the outcome that the number of shares traded when they sell may be larger than when they purchase. The behaviour is also consistent with insiders attempting to mask their trades.

The volume of shares traded provides an insight into the price at which insiders trade. Overwhelmingly, the evidence confirms that insiders purchased when the share price was low and sold when the share price was high. From table 2.1, a crude

²¹ It should be noted that the average size of the companies in the sample is smaller than the average on the London Stock Exchange, indicating that the sample contains a proportionately higher number of small companies.

measure of the total profit earned by insiders over the sample period is £2.19 billion or £398 million per year.

A measure of multiple trading by corporate insiders was also created where the number of insider purchases (sales) over one working month²² subsequent to an initial insider purchase (sale) in a firm was tallied. It can be seen from table 2.1 that there were more multiple purchase transactions than multiple sales although the vast majority of insider trades were single, one-off trades. The multiple trade measures may be caused by insiders splitting up their trades or by several insiders trading together.

To summarise, corporate insider purchase and sale transactions are fundamentally different from each other. When insiders purchase, they do so at a lower price than when they sell. They buy a smaller number of shares and have a greater tendency to split their purchases and trade together. Insider sales, on the other hand, tend to be one-off transactions that involve a large number of shares

It is clear that each of the metrics that has been examined in this section contain information on the characteristics of insiders' trades. However, it does not necessarily follow that they provide any information on the performance of insider trading. In the next section, univariate tests are carried out to investigate this issue.

²² It is important to note that this is not a calendar month but a twenty day period subsequent to the first trade.

2.7 Univariate Tests

2.7.1 Abnormal performance of corporate insider trading

The abnormal returns that were earned by corporate insiders during the sample period are measured through the use of an event study methodology that controls for firm size and risk. Risk adjusted abnormal security returns are derived from the conventional market model:

$$UAR_{it} = R_{it} - (\alpha_i + \beta_i R_{mt}) \quad (2.1)$$

Thin trading may be a problem affecting many of the companies in the sample.²³ Some UK insider trading studies²⁴ have incorporated lead and lagged market terms in their return-generating model to control for thin trading. However, Hillier and Yadav (1998) have shown that such an adjustment can at worst lead to a serious misspecification and bias in the market model prediction errors and at best reduce the efficiency of the methodology. In addition, they show that the simple market model prediction errors dominate any model that incorporates additional lead and lagged market returns under the mean square error criterion.

The methodology of Dimson and Marsh (1986), Agrawal et al (1992) and Gregory et al (1994, 1997) is followed in adjusting the market model prediction errors for a time varying size effect. Each month, all firms are ranked on their market capitalisation

²³ Trading on the London Stock Exchange is concentrated in the largest 30% of companies with volume tailing off rapidly for smaller firms.

²⁴ Gregory et al, (1994, 1997).

and sorted into ten equally weighted portfolios. Daily returns are then generated for each portfolio to construct a continuous time series of returns for the whole sample period. Size and risk adjusted abnormal returns are defined as:

$$AR_{it} = R_{it} - R_{i(p)t} - (\alpha_i - \alpha_{i(p)}) - (\beta_i - \beta_{i(p)})R_{mt} \quad (2.2)$$

where $R_{i(p)t}$ is the size control portfolio return corresponding to security i and $\alpha_{i(p)}$ and $\beta_{i(p)}$ are the size control market model parameters. The market model parameters for both the security and size control portfolios are based upon approximately two years daily return observations beginning 600 days through to 121 days before the insider transaction. The event period ranges from 120 days before the trade to 120 days after the trade.

Abnormal return test statistics are taken from Boehmer et al (1991) and are estimated as follows: the size and risk adjusted abnormal returns are first standardised to remove the effect of outliers from the estimate of the abnormal return variance.

$$SAR_{it} = AR_{it} / \hat{\sigma}_i \sqrt{1 + \frac{1}{T_i} + \frac{(R_{mt} - \bar{R}_m)^2}{\sum_{E=-600}^{-121} (R_{mE} - \bar{R}_m)^2}} \quad (2.3)$$

where $\hat{\sigma}_i$ is security i 's standard deviation of the size and risk adjusted abnormal return during the estimation period.

T_i is the number of trading days in the estimation period of security i .

\bar{R}_m is the average market return during the estimation period. For the tests in this analysis, I use the return on the Financial Times All Share index.

For each day in the event period, the cross-sectional standard deviation of the standardised abnormal returns is then calculated. This can be written as:

$$\sigma_{SAR_t} = \sqrt{\frac{\sum_{i=1}^N \left(SAR_{it} - \frac{\sum_{i=1}^N SAR_{it}}{N} \right)^2}{N(N-1)}} \quad (2.4)$$

The standardised cross-sectional test statistic is thus:

$$Z = \frac{\sum_{i=1}^N SAR_{it} / N}{\sigma_{SAR_t}} \quad (2.5)$$

The individual standardised abnormal returns are assumed to be cross-sectionally independent and distributed normally. By the central limit theorem, the distribution of the sample average standardised abnormal returns is normal. Boehmer et al (1991) report that the test is correctly specified especially when there is a variance increase in the event period which is likely for our insider trading sample. This is justified since many of the firms in the sample are small and the insider trading event itself may cause an increase in the volume of trades thus causing an increase in return volatility around this time.²⁵

From figure 2.1 it can be seen that insiders earn abnormal returns from their trades. Insiders purchase shares in their own company only after a prolonged period of poor performance and sell after a period of good performance. Subsequent to the trade, the trend is reversed. After an insider purchase, abnormal returns are strongly positive, whereas after a sale, the abnormal returns of the insiders' firms are negative.²⁶ A noteworthy aspect of these results is the speed of the market reaction to

²⁵ This assumption is supported by results in chapter seven of this thesis.

²⁶ See Seyhun (1986) for a similar pattern using US data.

the insiders' trade. On the day of the trade and for several days thereafter, share prices move in the same direction as the trade. The market appears to react to the signal of the insider trade despite not knowing the information on which the trade is based.

Tables 2.2a and 2.2b provide details of the abnormal returns on insiders' firms around insider trading. Average firm performance is consistently negative prior to an insider's purchase. From 120 days before through to the day prior to the transaction, insiders' firms generally underperform in the market. Further, the trend sharpens two weeks prior to the trade leading to highly significant negative abnormal returns over this period. On the day of the buy transaction, the corporate insider's company begins to outperform the market. The reaction is initially very strong and lasts for several days. After approximately twenty days, the market appears to have fully impounded the information contained in the insider's buy trade. Abnormal returns of firms around corporate insider sales transactions exhibit essentially the opposite pattern. Before the trade, insider firms outperform the market. This period lasts for roughly twenty days when insiders proceed to sell at the optimum time. Subsequent to the sale, the performance of the firm is negative for a period.

2.7.2 Probability of abnormal performance of corporate insider trading

I also examine the proportion of abnormal returns that are positive for each day as an additional check and the results are consistent with the previous analysis. From table

2.2a, it can be seen that there is a significant proportion of positive abnormal returns on the day of a buy trade and a significant proportion of negative abnormal returns on the day of an insider sale. Whereas abnormal returns on firms gradually return to a normal if slightly negative level after insider buys, there is a greater probability they are negative before and after insider sales.²⁷

Although the proportion of abnormal returns is different from that expected in terms of statistical significance, there does not appear to be any significant difference in economic terms. An outsider hearing of an insider's trade would not necessarily be guaranteed abnormal performance if they mimicked every trade. For example, an outsider that has received information on a corporate insider's buy trade one day late would have a 40% chance of earning zero or negative abnormal returns on the day of the trade. This probability increases monotonically for the next nine days until the probability of earning positive abnormal returns is approximately equal to the probability of earning negative abnormal returns. The intuition is different for sales transactions in two respects. First, the probability of earning negative abnormal returns was consistently higher than average before and after the insider's sale and second, the outsider would have had to have held shares in the insider's company to take advantage of the trade.

Examining the proportion of unadjusted price changes occurring around an insider's trade can extend the analysis further.²⁸ For this purpose, the proportion of positive,

²⁷ This may be a result of biases in the estimation period market model parameters. However, robustness checks failed to provide any insight into the cause of such a pattern.

²⁸ A disadvantage of using event study methodology to investigate the performance of trading strategies is that the actual profit earned by traders cannot be estimated. In an event study, the

negative and zero raw dividend adjusted returns around insider trading is examined.²⁹ Table 2.3 provides information on the share price behaviour of firms around insider trades. Several insights are gained from these results. With the exception of only a few days around an insider's trade, over half of all company returns in the event period are zero. Thus many insider trades elicit no price reaction at all. It can also be seen that share prices react very quickly to the insider's trade. On the day of an insider's purchase transaction (day 0), 40.81% of all trades resulted in a price increase, up 15% on the day before (day -1). On the same day (day 0), only 25.16% of all trades resulted in a price decrease, a fall of 5% from the previous day. Furthermore, the occurrence of positive share price returns remains significantly higher than negative returns for ten days after the trade. Prior to the corporate insider's buy trade, there was a greater preponderance of negative returns for up to 100 days before the trade.

The shares of companies where insiders sold do not exhibit any major price changes after the trade apart from a two day period immediately subsequent to it. However, for almost the whole 120 days prior to the insider sale, there are a significantly greater number of positive returns than negative returns. This result strongly supports the event study results provided earlier.

performance of a firm is usually measured with respect to some risk adjusted benchmark, such as the market model. However, it is not improbable that a firm may be underperforming with respect to the model but still earning positive returns. This would result in negative abnormal returns.

²⁹ In contrast to the NYSE, trading on the London Stock Exchange under the period of analysis was quote driven. The effect of this is that a market maker may keep quotes constant after an insider trade resulting in a relatively large proportion of trades where share prices do not change.

2.7.3 *Information content of corporate insiders' trades*

Given that many corporate insider trades do not appear to contain any information at all, I now investigate which trades are informative. When a corporate insider buys or sells, sophisticated outsiders could be expected to have information on the details of the trade. Without any knowledge of the insider, a market maker will have information on the number of shares traded, the transaction price, and the market value of the company. From this, the outsider could measure the importance of the trade with respect to the firm. However, it is possible that the identity of the corporate insider may be also known to the market maker.³⁰ In such an instance, extra information including the position of the insider in the company, the pre-trade holdings in the insider's firm, and the possible motivation for trading would be possible to obtain, especially if the trade was not informationally motivated. In some cases a statement will be made to the effect that a sale is due to the director leaving the company or for tax reasons etc.

Trading measures based on this information from a theoretical viewpoint have been justified earlier in the chapter. From a practical consideration they are also important, not only for their information content but also because it is likely that they would be the only information available to market participants for several days. In table 2.4, details of the abnormal returns earned by insiders for increasing levels of the trade measures discussed previously are provided. For each trading measure, all

³⁰ This could occur if the corporate insider's broker and the market maker have a special working relationship. In many UK companies, an insider must obtain permission from the board of directors before they can trade. It is possible that the information may leak out prior to the trade itself.

corporate insider transactions were ranked according to the size of the measure and then sorted into ten portfolios. The cumulative abnormal returns for the sixty day period before the trade and after the trade were then calculated for each portfolio. A sixty day event window was chosen since most of the price movements were recognised to occur within a concentrated period around the insider trade. Reported cumulative abnormal returns are size and risk adjusted and the test statistics are based on Boehmer et al (1991).

An examination of the market value deciles from table 2.4 shows that the abnormal performance of the insider trades was concentrated in smaller companies. For purchases, statistically significant positive abnormal returns were earned after the trade for four of the five smallest market value deciles. No abnormal performance is found for the largest firms. However, prior to the corporate insider buy decision, there is consistent negative performance for firms in all market value deciles. It thus appears that insiders in firms of all sizes tend to buy after poor performance but that the market reacts differently to the trade depending on the size of the insider's company. For sales, good pre-trade performance is consistent through all size deciles with the exception of the smallest decile. After an insider sells, performance is significantly negative for all companies with the exception of one portfolio (decile 2).

One possible reason for the differential price reaction to insider trading is the various levels of information in the market. With smaller firms, information is at a premium and any information about a company is valuable whereas for larger firms it appears

that insider purchases do not add to the information set available in the market. This is not the case with sales transactions where significant negative abnormal performance occurs for almost all firms. The anomalous performance of corporate insider trade (purchase and sale) in the smallest market value decile cannot be explained by the inclusion of firms that died subsequent to the trade.³¹

For every insider trading measure, the poor performance of firms prior to insider purchases and the good performance of firms prior to insider sales is consistent throughout all trading measure deciles. In addition, there appears to be no relationship between post-selling performance and any of the trading measures used in the analysis. The average performance of firms following an insider purchase does exhibit some correlation with the trading measures. The reaction to insider buy transactions increases in strength as the number of shares the insider bought increases. Post trade abnormal performance over sixty days increases from 1.88% for those transactions where the number of shares purchased was very small to 14.50% for the largest transactions.

There is no post purchase transaction relationship between abnormal performance and the volume trading measure. Through all trading measure deciles there are constant levels of positive abnormal performance. This is surprising given that trading volume is derived from the "number of shares traded" measure. The other component of volume, transaction price, appears to have a negative effect on abnormal performance, which is consistent with the results from the market value

³¹ As a consistency check, corporate insider trading in firms that later died (336 transactions) were omitted from the sample. The results were the same.

deciles. An implicit result from the volume trading measure deciles is that positive abnormal performance for insider purchases seems to be concentrated in those firms which have lower share prices.³² When the trading volume is measured as a percentage of firm market value, the pattern as evident in the number of shares traded deciles re-emerges. Abnormal performance over sixty days increases from 1.71% for the smallest portfolio to 15.99% for the largest portfolio. Thus there does appear to be a relationship between abnormal performance and trading measures with respect to the firm. It could be argued however, that we are simply seeing a block trade effect that is independent of the insider. This contention is a valid criticism of studies that utilise these measures.

The percentage change in holding measure also incorporates the number of shares traded but is instead with respect to the holdings of the insider. Again, the usual pattern of increasing performance through the trading measure deciles is evident. However, it does not appear to be as strong as the other measures. Post trade abnormal performance for the smallest change in holdings is only 0.75% over sixty days. This increases fairly steadily to 7.77% for the largest decile.

The final measure is the number of insider trades within 20 days of the first transaction. Outsiders will only be able to perceive this measure through time and as a result abnormal performance over sixty days may not be evident. Post-trade abnormal returns are positive through all portfolios but there does not appear to be

³² In a later section in this chapter, I investigate the possible problem of measuring abnormal returns from companies with low share price values using the same methodology but with buy and hold abnormal returns. The results were quantitatively the same.

any relationship between the number of insiders trading and the level of abnormal performance.

From these results it is clear that there are relationships between corporate insider trading performance and the trades themselves. It is possible that outsiders could construct a trading strategy based on the findings above by imitating insider purchases in small sized companies where the insider bought a large number of shares either with respect to the firm or if possible, with respect to his own holdings. Unfortunately, many of the trading measures are strongly interrelated and it is still not clear which trade characteristics are important to outside market participants. In the next section this problem is overcome by carrying out a multivariate analysis of the trading measures.

2.7.4 Multivariate analysis

The correlation matrix in table 2.5, panel A, provides information on the interrelationships among the corporate insider trading measures. Logarithmic transformations were taken for two specific reasons. Many of the variables are nonlinearly related and the imposition of the log form ensures linearity. Furthermore, some measures exhibit very high values (e.g. market value) that could contribute to heteroskedasticity in a multivariate analysis. In natural logarithm form, this problem is reduced. The multiple trade dummy takes on a value of 0 when the insider transaction is a single one-off trade, and 1 when there is more than one trade

within twenty working days of the first insider transaction. The transaction price is also included since it is a component of trading volume.

As expected, several trading measures exhibit substantial interactions. After the log transformation, the matrix of trading measures ceases to be of full rank because of linear dependence among some of the variables. Together with the inclusion of $\ln(\text{transaction price})$ in the analysis, two of the trading measures (volume of shares traded and volume/market value) become redundant.

Ordinary Least Squares regressions are used to examine for consistencies between abnormal insider trading performance and the trading measures by constructing the model:

$$CAR = \alpha + \gamma_1 \ln(\text{MarketValue}) + \gamma_2 \ln(\text{No.SharesTraded}) + \gamma_3 \ln(\text{Trans.price}) + \gamma_4 (\% \text{ChangeInHoldings}) + \gamma_5 (\text{MultipleTradeDummy}) + \mu \quad (2.6)$$

The analysis is run separately for corporate insider purchase and sale transactions for two distinct periods: the day of the transaction and sixty days after the transaction.

Estimated parameter coefficients are provided in table 2.5, panel B and it appears that when insiders with price sensitive information trade, they tend to purchase more than once and in smaller amounts. This is entirely consistent with the insider trading models of Kyle (1985), Easley and O'Hara (1987) and Laffont and Maskin (1990). There is a price reaction on the day of the insider buy transaction and it is stronger the smaller the company. Further, the market appears to be able to detect when an

insider has significantly increased their holdings in their company and reacts accordingly. The greatest price reaction after the insider's purchase transaction is reserved for those times when insiders traded together in addition to substantially increasing their holdings. However, this effect is dampened for large companies.

For sales transactions, the results are ambiguous. When insiders sell shares, they tend to do it as a group. The significant negative share price effect is interesting. A possible interpretation may be that informed selling in smaller companies is a cause. It is possible that insiders purchase in firms with low share prices and sell later after the share price has increased but is still low. With the exception of the share price effect, the market does not appear to react to the insider sale transaction on the day of the trade. In the period after the trade, abnormal performance tends to be poor, however there is a significant positive effect associated with the number of shares traded and the percentage change in holdings.³³

From the preceding analysis, it is obvious that there are differences between corporate insider buy and sale transactions. Insiders exhibit different trading strategies for buying and selling and the market appears to view corporate insider trading as material events. In particular, insider purchases are viewed to be particularly informative as evidenced from the price reaction in the same day. The significant effect of a large increase in insider holdings on the performance of the firm on the same day as the trade shows that the market is aware of private information.

³³ I have tested for the possibility of insiders selling out as part of a merger or take-over or as an insider leaving the company. The conclusions did not change.

2.8 Robustness checks

2.8.1 Year by year analysis

Table 2.6a presents cumulative abnormal returns from insider trading for each year of the sample. The same pattern is persistent through every time period. It is clear that insiders buy shares when they are at their lowest and sell when performance has reached a peak. Although insiders consistently timed their trades as presented in figure 2.1, the level of abnormal performance varied from year to year. Insiders who traded in 1992 seemed to be particularly successful with sixty day post transaction abnormal returns averaging 9.29% whereas in 1994 they only averaged 3.82%.

2.8.2 Confounding events

It could be argued that the exceptional performance of corporate insiders was a result of other events occurring in the same period as the insider trading but not determined by it. One such possibility could be the case of annual and interim earnings announcements. As mentioned previously some studies have examined the propensity of insiders to trade around earnings announcements and have found evidence that they do time their trades with respect to the earnings announcement date.

I partitioned the sample into two according to whether or not a corporate insider traded in the 5 days after an interim or annual earnings announcement. An examination of table 2.6b shows that the same pattern is again clear in the sixty day cumulative abnormal returns. In addition, the cumulative abnormal returns are not significantly different. This is explored further in chapters three and four.

2.8.3 Buy and hold returns

In table 2.6c, I report results using buy and hold abnormal returns instead of cumulative abnormal returns. A comparison with table 2.2b shows that there is no quantitative difference between either method.

2.8.4 Alternative methodologies

In addition to the simple market model, I also carried out the analysis using the market adjusted model and the mean adjusted model. Neither method produced significantly different results.

2.9 Conclusions

There are many commercial services in existence that provide information on the dealings of corporate insiders. These enterprises operate on the basis that corporate insider trading is informative and can assist in the analysis of a firm's future

prospects. Many investors and institutions subscribe to these services in the hope that the information they provide will give them an advantage when trading in the stock market.

However, not all corporate insider trading is informative and there are many trades which are motivated for purely liquidity reasons or portfolio diversification. Outside market participants need to be able to filter out uninformed trades from informed trades if they wish to use insider trading data, but given the scarcity of information they hold about very recent insider trades, this is a difficult task.

In this chapter, I examined the performance of corporate insider trading and consistent with the majority of other studies, report that on average company insiders outperformed the market. However, upon investigation it was found that approximately fifty percent of all corporate insider trades actually exhibited performance which was either zero or opposite to that expected. It is thus important to determine, if possible, any characteristics of those trades which exhibited abnormal performance.

It was found that there were regularities in the characteristics of informed trades. Consistent with theoretical models on insider trading, corporate insiders appeared to split their trades into smaller blocks and traded together when purchasing shares of their own company. Subsequent to the trade, abnormal performance was related to large increases in the holdings of corporate insiders and where insiders split up their trades or traded together. The information contained in corporate insider sales

transactions was found to be generally unrelated to observable trade characteristics, although there was evidence that after above average performance, corporate insiders sold their shares in unison or split up their trades to disguise their existence.

A finding which requires more detailed market microstructure research was that the market appeared to react on the day of an insider trade to large increases in the holding of the insider. This would imply that the market recognises the trade as an informed trade and quickly absorbs the information content. This indicates that the UK market is not strong form efficient with respect to trading by UK company directors. This analysis is carried out in chapter seven.

Many issues remain unresolved. Previous studies on corporate insider trading have used general measures of insider activity to examine the relationship between corporate insider trading and firm specific announcements. Given that as many as half of all corporate insider trades do not seem to be related to price sensitive information it is of interest to determine how informed insider trades are related to firm announcements. This would be a valuable innovation that would assist both academics and market regulators alike.

Table 2.1

Descriptive Statistics of Sample

Market Value of Firms is defined as the market value of the company at the time of the insider trade; *No. of Shares Traded* is defined as the number of shares the insider buys or sells; *Volume of Shares Traded* is defined as the number of Shares traded multiplied by the transaction price; *% Change in Portfolio* is defined as the number of shares traded divided by the number of shares held by the insider prior to the trade; *Trading Volume As Percentage of Firm Market Value* is defined as (Number of Shares traded x Transaction Price) / The Market Value of Firm; *Distribution of Multiple Trades by Insiders* is defined as the number of insider trades in the same direction (buys or sells) within a twenty day period subsequent to the first trade.

No. Companies	1,350
No. Trades	7,796
No. Buys	4,088
No. Sells	3,708

Buy Sample Sell Sample

Market Value of Firms (£mill)

Mean	543.30	554.13
Median	61.46	99.53

No. Shares Traded

Mean	103,714	356,793
Median	20,000	50,000

Volume of Shares Traded

Mean (£)	70,004	667,973
Median (£)	20,000	92,125

% Change in Portfolio

Mean	+∞ *	55.11%
Median	50.00%	18.81%

Trading Volume as Percentage of Firm Market Value

Mean	0.1857%	0.6101%
Median	0.0319%	0.1126%

Distribution of Multiple Trades by Insiders

Frequency of Director Trades within one working month (20 days) of First Trade	1 trade in month (1st trade)	More than one trade in month
Buy Sample	1071	916
Sell Sample	1502	797
Net Purchases/Net Sales	975/1393	866/752

Table 2.2a

Size and Risk Adjusted Average and Cumulative Abnormal Returns Around Insider Trading

Reported abnormal and cumulative abnormal returns are in % form. Reported test statistics are generated from standardised cross-sectional standard errors. As a result, there may be some discrepancy in the signs of the test statistics and abnormal returns. 95% C.I. about 50% positive residuals = (48.47% , 51.53%) for purchase transactions and (48.39% , 51.61%) for sales transactions.

Day	BUY TRANSACTIONS					SELL TRANSACTIONS				
	AAR%	t-stat.	% +ve ARs	CAR%	t-stat.	AAR%	t-stat.	% +ve ARs	CAR%	t-stat.
-120	0.07	0.34	48.71	0.07	0.34	0.09	2.32	44.08	0.09	2.32
-110	-0.04	-1.32	48.96	-0.53	-5.07	0.03	-0.58	40.76	0.58	3.93
-100	0.03	-1.42	48.38	-1.02	-7.98	0.04	0.46	44.88	0.72	2.56
-90	-0.08	-3.19	45.80	-1.61	-10.77	0.06	1.22	44.58	0.81	1.40
-80	-0.15	-4.01	47.28	-2.67	-13.68	-0.02	-1.91	39.92	0.74	-0.24
-70	-0.10	-3.91	45.58	-3.05	-14.38	-0.04	-1.47	42.77	1.06	-0.24
-60	-0.01	-1.04	48.54	-3.40	-14.62	-0.03	-1.59	42.33	1.22	-0.48
-50	-0.02	-1.43	47.51	-3.93	-16.39	0.05	0.95	42.80	1.66	0.64
-40	-0.07	-3.13	46.09	-4.95	-18.8	0.10	2.63	42.73	2.21	2.82
-30	-0.12	-2.63	47.87	-6.00	-20.64	0.11	2.44	41.99	2.79	4.81
-20	-0.09	-2.31	46.25	-7.27	-23.37	0.07	1.87	41.43	3.32	6.39
-15	-0.24	-4.72	44.83	-7.83	-24.6	0.02	1.26	41.00	3.59	7.13
-10	-0.36	-6.08	44.41	-9.24	-27.27	0.12	4.28	45.65	4.20	8.98
-9	-0.25	-5.18	47.58	-9.49	-27.72	0.15	3.19	45.95	4.35	9.32
-8	-0.28	-6.23	47.06	-9.77	-28.3	0.06	2.40	42.34	4.41	9.51
-7	-0.25	-4.19	47.19	-10.01	-28.6	0.14	4.93	44.54	4.55	9.97
-6	-0.35	-5.11	44.18	-10.36	-29.04	0.12	4.46	45.05	4.67	10.34
-5	-0.37	-7.97	43.22	-10.73	-29.76	0.19	5.89	45.31	4.86	10.90
-4	-0.46	-7.02	43.83	-11.19	-30.44	0.20	5.93	48.13	5.06	11.45
-3	-0.45	-7.09	45.61	-11.64	-31.16	0.25	7.51	48.82	5.32	12.23
-2	-0.48	-6.69	47.32	-12.12	-31.82	0.22	6.23	48.46	5.54	12.90
-1	-0.52	-6.06	48.96	-12.65	-32.37	0.25	6.90	47.55	5.79	13.59
0	0.60	1.25	59.75	-12.04	-30.51	0.03	0.10	43.74	5.82	13.47
1	1.13	14.87	60.71	-10.91	-28.35	-0.15	-3.81	40.02	5.67	12.94
2	0.66	9.52	57.75	-10.25	-27.21	-0.08	-4.58	39.88	5.59	12.49
3	0.48	7.59	55.65	-9.77	-26.26	-0.04	-1.92	40.56	5.54	12.28
4	0.30	6.17	56.52	-9.46	-25.63	-0.03	-2.00	41.99	5.51	12.09
5	0.33	7.66	55.42	-9.14	-24.9	-0.07	-3.56	41.03	5.44	11.78
6	0.36	7.10	54.65	-8.78	-24.15	-0.02	-1.08	42.06	5.42	11.67
7	0.31	6.72	43.75	-8.47	-23.59	0.01	0.90	42.03	5.44	11.70
8	0.37	5.50	54.45	-8.09	-22.94	-0.12	-2.60	40.89	5.32	11.43
9	0.42	7.07	51.19	-7.68	-22.17	-0.08	-2.31	42.07	5.24	11.20
10	0.33	6.18	51.09	-7.35	-21.55	-0.07	-3.20	41.39	5.17	10.90
15	0.14	3.41	48.96	-6.69	-20.21	-0.06	-1.56	41.33	4.74	9.32
20	0.07	1.61	48.03	-6.31	-19.52	-0.05	-2.33	42.97	4.45	8.36
30	-0.01	-0.43	48.58	-6.24	-19.08	-0.03	-1.93	41.43	3.84	6.17
40	-0.04	-1.45	46.00	-6.22	-18.91	-0.08	-3.80	39.52	3.15	3.71
50	-0.06	-0.49	48.68	-6.47	-19.3	-0.02	-1.93	41.11	2.78	2.09
60	0.05	1.28	48.71	-6.26	-18.84	-0.09	-3.67	40.82	2.39	0.73
70	0.02	-0.40	46.29	-6.20	-18.54	-0.02	-1.55	41.10	2.01	-0.69
80	0.05	0.63	47.74	-5.90	-17.67	-0.11	-3.98	40.53	1.49	-2.64
90	0.09	0.67	47.29	-5.44	-16.88	0.01	-0.27	42.60	1.12	-3.77
100	0.01	-0.30	48.58	-5.17	-16.4	-0.08	-3.44	42.10	0.70	-4.61
110	0.08	0.47	51.35	-4.81	-15.95	-0.05	-0.97	42.71	0.21	-5.83
120	-0.01	0.31	46.77	-4.62	-15.53	-0.01	-0.98	42.20	-0.47	-7.30

Table 2.2b**Breakdown of Size and Risk Adjusted Abnormal and Cumulative Abnormal Returns on Firms around Insider Trading**

Reported abnormal and cumulative abnormal returns are in % form. Reported test statistics are generated from standardised cross-sectional standard errors. As a result, there may be some discrepancy in the signs of the test statistics and abnormal returns.

Period (days)	Buy Transactions			Sell Transactions		
	%CAR	Stand. CAR	Stand. T-statistic	%CAR	Stand. CAR	Stand. T-statistic
(-120 , -61)	-3.34	-2.71	-14.59	1.25	-0.04	-0.27
(-60 , -1)	-9.26	-6.64	-30.01	4.54	3.04	17.90
(1 , 60)	5.78	2.37	11.65	-3.43	-2.81	-19.02
(61 , 120)	1.65	0.43	2.18	-2.86	-2.55	-14.25
(-120 , -81)	-2.52	-1.87	-13.20	0.76	0.01	0.08
(-80 , -41)	-2.35	-2.11	-13.13	1.35	0.42	3.32
(-40 , -1)	-7.77	-5.37	-27.72	3.68	2.57	18.21
(1 , 40)	5.82	2.76	17.14	-2.67	-2.07	-17.61
(41 , 80)	0.32	-0.29	-1.70	-1.66	-1.69	-12.69
(81 , 120)	1.28	0.34	2.13	-1.96	-1.60	-10.71
(-60 , -41)	-1.49	-1.27	-11.88	0.87	0.47	4.99
(-40 , -21)	-2.30	-1.59	-14.87	1.14	0.79	7.96
(-20 , -1)	-5.47	-3.78	-23.40	2.54	1.78	17.71
(1 , 20)	5.74	2.90	24.86	-1.37	-1.02	-12.52
(21 , 40)	0.08	-0.15	-1.34	-1.31	-1.05	-12.40
(41 , 60)	-0.04	-0.39	-3.11	-0.77	-0.74	-8.26
(-20 , -16)	-0.42	-0.38	-7.00	0.32	0.21	4.12
(-15 , -11)	-1.28	-0.87	-11.84	0.52	0.34	7.95
(-10 , -6)	-1.49	-1.04	-11.96	0.58	0.44	8.50
(-5 , -1)	-2.29	-1.49	-14.76	1.11	0.79	14.52
(1 , 5)	2.91	1.50	21.17	-0.38	-0.32	-7.16
(6 , 10)	1.78	0.91	14.45	-0.27	-0.16	-3.74
(11 , 15)	0.66	0.34	6.55	-0.43	-0.34	-9.19
(16 , 20)	0.39	0.16	3.59	-0.29	-0.20	-5.25

Table 2.3

Percentage of Price Changes in Event Period that are Positive, No change or Negative

* - Significant at 95% significance level; ** - Significant at 99% significance level

Day	BUY TRANSACTIONS				SELL TRANSACTIONS			
	% trans. With zero return	% trans. With +ve return	% trans. With -ve return	% +ve return minus % -ve return	% trans with zero return	% trans. With +ve return	% trans. With -ve return	% +ve return minus % -ve return
-120	54.76	22.78	22.46	0.33	56.36	25.88	17.76	8.11**
-110	58.30	20.94	20.76	0.18	57.71	21.94	20.34	1.60
-100	57.38	19.93	22.69	-2.77**	56.45	24.06	19.48	4.58**
-90	56.84	20.79	22.37	-1.58*	57.25	23.72	19.02	4.70**
-80	55.47	22.13	22.40	-0.27	58.30	21.85	19.85	2.00**
-70	55.92	19.90	24.18	-4.28**	55.90	24.06	20.04	4.03**
-60	58.39	20.32	21.30	-0.98	57.04	23.97	18.99	4.98**
-50	59.10	18.92	21.98	-3.06**	56.58	23.72	19.70	4.03**
-40	57.76	19.54	22.69	-3.15**	56.64	24.86	18.50	6.36**
-30	57.41	19.21	23.38	-4.16**	55.29	25.05	19.67	5.38**
-20	56.81	18.44	24.75	-6.31**	55.96	24.83	19.21	5.62**
-15	54.82	18.68	26.50	-7.82**	55.35	24.55	20.10	4.46**
-10	56.75	16.21	27.04	-10.83**	53.41	27.20	19.39	7.81**
-9	53.60	19.51	26.89	-7.38**	52.27	28.92	18.81	10.11**
-8	54.40	19.04	26.56	-7.53**	53.47	26.21	20.31	5.90**
-7	55.21	18.95	25.85	-6.90**	52.55	28.95	18.50	10.45**
-6	51.99	18.29	29.71	-11.42**	51.48	28.86	19.67	9.19**
-5	52.59	18.95	28.47	-9.52**	49.69	30.12	20.19	9.93**
-4	52.62	20.26	27.13	-6.87**	49.48	32.11	18.41	13.71**
-3	51.28	18.74	29.98	-11.24**	51.57	29.53	18.90	10.63**
-2	48.42	21.39	30.19	-8.80**	50.15	30.64	19.21	11.43**
-1	43.28	25.88	30.84	-4.97**	48.40	31.35	20.25	11.09**
0	34.03	40.81	25.16	15.65**	41.00	30.92	28.09	2.83**
1	41.43	38.43	20.14	18.29**	44.35	25.51	30.15	-4.64**
2	46.13	32.42	21.45	10.98**	50.46	22.86	26.67	-3.81**
3	48.48	30.43	21.09	9.34**	52.70	23.66	23.63	0.03
4	48.84	30.22	20.94	9.28**	51.91	24.74	23.36	1.38
5	51.55	27.84	20.61	7.23**	52.61	23.69	23.69	0.00
6	52.56	27.25	20.20	7.05**	54.52	24.09	21.39	2.70**
7	52.91	27.01	20.08	6.93**	54.24	24.15	21.60	2.55**
8	52.23	27.72	20.05	7.67**	53.35	23.69	22.96	0.74
9	51.70	27.57	20.73	6.84**	52.09	24.49	23.42	1.08
10	53.09	26.47	20.43	6.04**	53.53	23.60	22.86	0.74
15	53.75	23.35	22.90	0.45	53.53	23.82	22.65	1.17
20	55.44	23.94	20.61	3.33**	55.50	22.59	21.91	0.68
30	56.04	21.48	22.49	-1.01	56.36	22.62	21.02	1.60*
40	57.05	21.21	21.74	-0.54	57.04	20.87	22.10	-1.23
50	54.55	21.06	24.39	-3.33**	55.96	21.45	22.59	-1.14
60	56.60	22.01	21.39	0.62	55.87	22.00	22.13	-0.12
70	54.94	21.65	23.41	-1.75**	54.30	23.11	22.59	0.52
80	53.57	23.53	22.90	0.62	54.33	22.62	23.05	-0.43
90	54.70	22.61	22.69	-0.09	54.43	24.03	21.54	2.49**
100	55.53	23.11	21.36	1.75**	52.61	24.15	23.23	0.92
110	53.51	23.44	23.05	0.39	55.01	22.77	22.22	0.55
120	57.20	20.73	22.07	-1.34	54.61	24.49	20.90	3.60**

Table 2.4

Cumulative Abnormal Returns for Different Trade metrics

First line t-60:t-1, second line t+1:t+60. Standardised t-statistics in parenthesis. *Market Value of Firms* is defined as the market value of the company at the time of the insider trade; *No. of Shares Traded* is defined as the number of shares the insider buys or sells; *Volume of Shares Traded* is defined as the number of Shares traded multiplied by the transaction price; *% Change in Portfolio* is defined as the number of shares traded divided by the number of shares held by the insider prior to the trade; *Trading Volume As Percentage of Firm Market Value* is defined as (Number of Shares traded x Transaction Price) / The Market Value of Firm; *Distribution of Multiple Trades by Insiders* is defined as the number of insider trades in the same direction (buys or sells) within a twenty day period subsequent to the first trade.

Decile	1 (Smallest)	2	3	4	5	6	7	8	9	10
Market Value Deciles										
BUY	-2.19 (-2.75)	-13.41 (-12.45)	-10.51 (-10.10)	-2.66 (-5.24)	-5.55 (-8.39)	-14.64 (-10.92)	-13.20 (-14.84)	-5.46 (-8.90)	-5.92 (-7.05)	-2.94 (-4.32)
	-3.11 (-4.87)	7.78 (5.27)	8.16 (7.37)	8.66 (7.72)	3.52 (3.24)	1.18 (0.45)	0.27 (-0.80)	1.20 (0.42)	2.79 (1.19)	0.31 (-0.27)
SELL	-4.57 (-5.20)	11.26 (6.53)	5.01 (4.07)	6.78 (6.24)	4.33 (7.09)	4.40 (7.20)	1.69 (3.19)	2.55 (5.72)	4.76 (8.45)	3.50 (5.61)
	-1.92 (-6.97)	4.71 (2.68)	1.65 (0.80)	-4.16 (-7.61)	-7.42 (-11.72)	-3.93 (-5.64)	-4.97 (-11.71)	-4.25 (-9.34)	-2.71 (-5.63)	-2.49 (-4.46)
No. of Shares Traded Deciles										
BUY	-5.62 (-8.37)	-10.22 (-11.77)	-10.48 (-17.31)	-11.68 (-14.26)	-10.82 (-18.15)	-10.20 (-10.64)	-9.47 (-13.84)	-7.93 (-10.62)	-9.78 (-8.79)	-10.61 (-6.88)
	1.88 (1.90)	0.86 (-0.02)	2.66 (2.93)	3.15 (2.04)	3.41 (3.97)	5.21 (2.97)	6.84 (6.46)	7.58 (5.42)	13.01 (9.05)	14.50 (8.26)
SELL	4.80 (10.11)	4.01 (8.33)	2.56 (4.69)	3.80 (5.00)	4.13 (6.58)	5.70 (7.06)	4.22 (4.08)	3.23 (3.69)	5.28 (6.24)	8.67 (7.75)
	-4.06 (-9.87)	-5.38 (-12.07)	-5.28 (-10.70)	-4.67 (-7.85)	-3.04 (-6.39)	-3.20 (-5.96)	-2.18 (-4.14)	-2.38 (-4.18)	-1.27 (-2.78)	-2.91 (-2.54)
Volume Traded (Total Amount) Deciles										
BUY	-17.25 (-13.33)	-13.95 (-12.06)	-13.82 (-13.12)	-10.27 (-9.41)	-7.31 (-8.52)	-10.55 (-9.22)	-4.17 (-7.33)	-3.80 (-5.89)	-7.17 (-8.41)	-3.61 (-5.75)
	6.75 (3.51)	4.44 (2.58)	8.31 (5.61)	5.69 (4.21)	6.51 (4.10)	7.79 (5.21)	4.18 (2.10)	4.35 (1.70)	5.98 (5.45)	3.86 (2.73)
SELL	4.97 (7.19)	4.51 (7.17)	5.79 (7.15)	3.50 (3.94)	4.76 (3.95)	6.65 (8.64)	3.92 (4.44)	2.26 (2.78)	3.07 (4.58)	5.92 (7.11)
	-2.02 (-5.53)	-5.63 (-9.83)	-5.17 (-8.83)	-2.50 (-5.93)	-3.65 (-6.55)	-2.27 (-4.84)	-3.07 (-4.87)	-3.67 (-5.26)	-2.91 (-4.87)	-3.46 (-3.80)
Percentage Change in Holdings Deciles										
BUY	-8.37 (-8.60)	-8.24 (-9.07)	-5.98 (-6.52)	-7.87 (-7.37)	-9.47 (-9.30)	-12.75 (-9.62)	-8.68 (-7.78)	-7.01 (-5.98)	-11.54 (-9.95)	-14.52 (-10.54)
	0.75 (-0.40)	3.03 (2.27)	5.66 (2.64)	5.95 (4.61)	6.47 (4.27)	6.00 (4.44)	4.79 (2.58)	9.00 (5.02)	9.80 (4.65)	7.77 (5.35)
SELL	3.59 (4.19)	5.17 (6.51)	4.61 (6.72)	4.38 (5.41)	5.30 (6.51)	4.11 (5.92)	4.29 (5.78)	5.43 (6.35)	4.45 (4.92)	3.00 (2.74)
	-3.19 (-9.05)	-2.99 (-6.22)	-3.10 (-6.13)	-4.31 (-6.70)	-1.96 (-3.57)	-2.16 (-3.08)	-2.61 (-5.27)	-3.35 (-5.07)	-5.58 (-8.02)	-5.37 (-7.93)
Proportion of Market Value Deciles										
BUY	4.75 (5.56)	-7.68 (-8.89)	-11.47 (-8.97)	-12.52 (-12.08)	-11.05 (-9.11)	-8.85 (-7.91)	-11.21 (-10.29)	-9.44 (-9.96)	-8.65 (-8.03)	-6.25 (-5.05)
	1.71 (0.31)	1.06 (-0.06)	2.54 (0.95)	-0.19 (-1.52)	3.57 (1.95)	7.63 (5.71)	4.38 (3.36)	7.64 (3.79)	12.36 (8.90)	15.99 (10.08)
SELL	-3.58 (-5.50)	4.17 (7.39)	5.01 (8.92)	2.53 (2.74)	3.82 (4.46)	3.37 (2.72)	5.29 (4.88)	4.39 (3.99)	5.20 (5.40)	6.43 (6.13)
	0.33 (-0.71)	-4.08 (-8.22)	-4.56 (-8.41)	-4.70 (-9.15)	-5.17 (-6.30)	-5.51 (-8.33)	-3.88 (-6.50)	-2.21 (-4.00)	-2.93 (-3.23)	-0.92 (-2.78)
Distribution of Multiple Trades by Insiders within one working month (20 days) of First trade										
	1 trade in month. 1 st trd	2 within one month	3 within one month	4 within one month	5 within one month	6 within one month	7 within one month	8 within one month	9 within one month	> 9 within one month
BUY	-3.46 (-8.14)	-5.41 (-10.76)	-6.33 (-11.18)	-13.19 (-13.18)	-24.60 (-17.05)	-19.66 (-11.83)	-8.41 (-3.85)	-27.04 (-8.15)	-7.78 (-0.26)	-11.67 (-7.37)
	1.98 (1.73)	5.66 (7.57)	8.70 (6.99)	6.40 (5.53)	10.01 (4.45)	7.91 (3.58)	1.74 (0.85)	13.18 (1.55)	4.21 (0.69)	3.92 (2.25)
SELL	3.18 (7.64)	5.55 (10.67)	4.84 (7.37)	3.43 (5.52)	4.08 (4.85)	13.07 (6.72)	12.76 (7.95)	4.36 (1.71)	-3.76 (-4.31)	23.02 (2.38)
	-3.11 (-11.88)	-3.82 (-11.06)	-3.21 (-3.54)	-7.87 (-11.90)	-4.94 (-4.58)	-1.22 (-1.78)	-4.21 (-4.34)	-3.35 (-5.17)	-1.41 (-2.95)	17.29 (2.72)

Table 2.5

Cross-Sectional Regression Coefficients of Event Period Abnormal Returns on Insider Trading Metrics

Market Value of Firms is defined as the market value of the company at the time of the insider trade; *No. of Shares Traded* is defined as the number of shares the insider buys or sells; *Volume of Shares Traded* is defined as the number of Shares traded multiplied by the transaction price; *% Change in Portfolio* is defined as the number of shares traded divided by the number of shares held by the insider prior to the trade; *Trading Volume As Percentage of Firm Market Value* is defined as (Number of Shares traded x Transaction Price) / The Market Value of Firm; *Distribution of Multiple Trades by Insiders* is defined as the number of insider trades in the same direction (buys or sells) within a twenty day period subsequent to the first trade.

Panel A: Correlation Matrix of Independent variables

	ln (MV)	ln (No. Shares)	ln (Vol. Shares)	ln (Vol /MV)	% change	Mult. Trade Dum.	Ln (Share Price)
ln(Market Value)	1	-0.27	0.18	-0.78	0.00	-0.08	0.60
ln (No. Shares)	-0.27	1	0.69	0.69	0.21	-0.08	-0.50
ln (Vol. Shares)	0.18	0.69	1	0.48	0.11	-0.21	0.26
ln (Vol /MV)	-0.78	0.69	0.48	1	0.08	-0.06	-0.37
% Change in holdings	0.00	0.21	0.11	0.08	1	-0.03	-0.14
Multiple Trade Dummy	-0.08	-0.08	-0.21	-0.06	-0.03	1	-0.15
ln (Transaction Price)	0.60	-0.50	0.26	-0.37	-0.14	-0.15	1

Panel B: Sample Decomposed into Purchases and Sales

Model	PURCHASES			SALES		
	60 Day Pre Event CAR	Event Day AAR	60 Day Post Event Car	60 Day Pre Event CAR	Event Day AAR	60 Day Post Event Car
Intercept	-0.2649 (-5.53)*	0.0052 (0.36)	0.0066 (0.19)	0.0379 (1.59)	0.0034 (0.85)	-0.0731 (-3.21)*
ln (Market Value) (£mill)	-0.0024 (-0.64)	-0.0030 (-2.71)*	-0.0105 (-3.95)*	-0.0009 (-0.38)	-0.0002 (-0.52)	0.0013 (0.59)
ln (No. Shares)	0.0239 (5.42)*	0.0012 (0.87)	0.0060 (1.90)	0.0018 (0.89)	-0.0001 (-0.36)	0.0049 (2.60)*
ln (Transaction Price)	0.0655 (9.18)*	-0.0051 (-2.36)*	-0.0417 (-8.14)*	-0.0217 (-5.58)*	-0.0015 (-2.24)*	-0.0110 (-2.94)*
% change in holdings	-0.0305 (-4.13)*	0.0051 (2.29)*	0.0184 (3.48)*	0.0065 (1.38)	0.0002 (0.26)	0.0177 (3.91)*
Multiple Trade Dummy	-0.0564 (-4.31)*	-0.0005 (-0.12)	0.0386 (4.11)*	0.0247 (4.06)*	0.0009 (0.96)	-0.0058 (-0.99)
Adjusted R ²	2.1%	6.9%	11.8%	0.4%	2.7%	1.3%
F-Statistic	36.232*	10.415*	65.449*	15.962*	2.245*	7.538*

t-statistics in parenthesis. * - Significant at the 95% level.

Table 2.6a**Consistency of Insider Trading Performance - year by year analysis***Purchase Transactions*

Year	60 Day Pre Event CAR	Event Day AAR	60 Day Post Event CAR
1991	-8.38% (-6.09)	0.16% (0.39)	3.77% (3.69)
1992	-21.05% (-19.71)	-0.38% (-1.22)	9.29% (11.74)
1993	-5.22% (-3.65)	1.83% (4.43)	5.28% (4.98)
1994	-3.60% (-2.94)	0.66% (1.86)	3.82% (4.21)
1995	-9.25% (-7.96)	1.18% (3.51)	5.81% (6.74)
1996	-2.32% (-1.79)	0.67% (1.79)	4.98% (5.17)

Sale Transactions

Year	60 Day Pre Event CAR	Event Day AAR	60 Day Post Event CAR
1991	7.19% (6.43)	-0.17% (-0.95)	-3.38% (-3.28)
1992	3.98% (5.78)	-0.06% (-0.55)	-3.76% (-5.94)
1993	3.04% (4.48)	0.10% (0.89)	-4.06% (-6.48)
1994	3.75% (4.96)	-0.07% (-0.62)	-6.58% (-9.46)
1995	5.48% (7.79)	0.24% (2.09)	-2.70% (-4.16)
1996	5.43% (7.70)	0.03% (0.30)	-0.40% (-0.62)

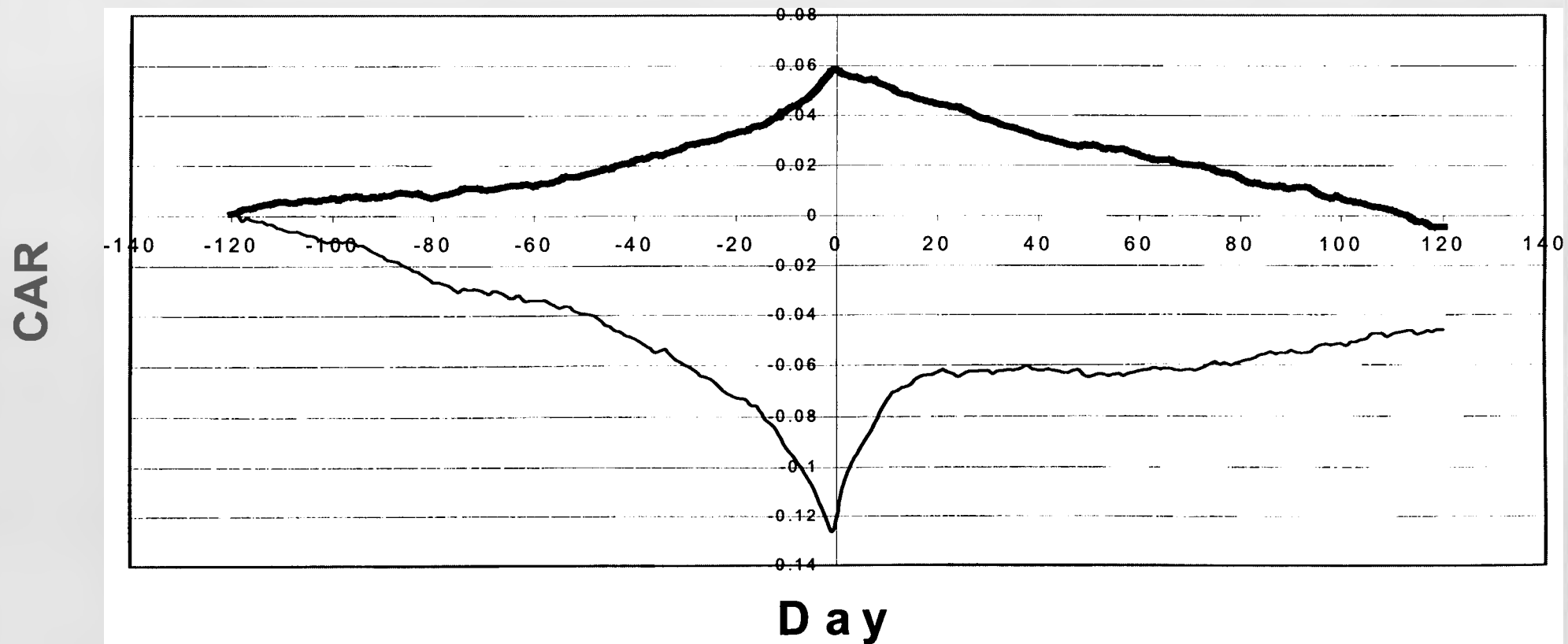
Table 6b**Consistency of Insider Trading Performance - Confounding Events**

Event	60 Day Pre Event CAR	Event Day AAR	60 Day Post Event CAR
Within 5 days of Final or interim results (Purchases)	-12.01% (-12.85)	0.25% (0.96)	6.90% (10.23)
Within 5 days of Final or interim results (Sales)	3.10% (4.78)	0.06% (0.55)	-4.99% (-8.50)
Not Within 5 days of Final or interim results (Purchases)	-7.93% (-12.21)	0.78% (4.34)	5.24% (11.24)
Not Within 5 days of Final or interim results (Sales)	4.98% (14.29)	0.02% (0.47)	-2.95% (-9.06)

Table 6c**Consistency of Insider Trading Performance - Buy and Hold Abnormal Returns**

Period (days)	Buy Transactions	Sell Transactions
(-120 , -61)	-2.72% (-8.12)	1.97% (8.74)
(-60 , -1)	-7.00% (-18.47)	5.20% (21.48)
(1 , 60)	6.32% (18.41)	-2.92% (-13.39)
(61 , 120)	2.56% (7.55)	-2.25% (-8.91)

Fig. 2.1: Cumulative Abnormal Returns on Firms Around Insider Trading



— Purchases — Sales

3 Corporate Insider Trading and The London Stock Exchange Model Code

This chapter considers the distribution of corporate insider dealings in the shares of their companies. An insider dealing in his or her own company's securities is not illegal. In fact, it is often considered desirable that insiders of listed companies should hold their firm's shares and, as part of a remuneration package, directors are often given share options which enable them to acquire shares in their company. However, when corporate insiders decide to sell shares, acquired through share options or not, or buy more, their trading is governed by legislation on insider *dealing*.¹ Corporate insiders commit an offence if they trade on information that they appreciate has come into their possession from being a director or through having access to information by virtue of their employment. For instance, if the corporate insider has access to information on future earnings figures, security issues, asset disposals and purchases, etc. it is illegal for them to trade on this information. In other words, insiders can trade in the shares of their own company but this trading must not be based on any specific inside information.²

Corporate insider trading in their own companies' shares is closely scrutinized by both regulators, seeking evidence of illegal insider activity, and the market, who

¹ Insider *dealing* is using material non-public information on company shares to make a profit or avoid a loss.

² It has been argued by those supporting restrictions on corporate insider trading that this type of trade is not possible. They suggest that all corporate insider trading must be based on some kind of private information.

follows the trading strategies of corporate insiders with the view that these trades contain useful information on the future prospects of the companies whose shares are being traded.³ Regulations governing the trading of corporate insiders of UK companies are contained in government legislation and a number of non statutory regulations, such as codes of conduct.⁴ In this context, directors are considered to be “primary corporate insiders” which means that they cannot pass any inside information on to other parties to trade.⁵

The focus of this chapter is on the timing of corporate insider trades during the company year. In particular, the distribution of insider trading in relation to one of the most significant and influential sources of information on the company - earnings announcements is estimated. The motivation for such an analysis arises from studies that have shown that earnings announcements have a significant impact on share prices⁶ and would be an obvious source of information on which a corporate insider could profit.⁷ This has also been of concern to regulators. For example, there are

³ The empirical evidence indicates that insiders can earn abnormal profits from their dealings. See Lorie and Neiderhoffer (1968), Pratt and DeVere (1970), Jaffe (1974a), Finnerty (1976a), Baesel and Stein (1979), Givoly and Palmon (1985), Seyhun (1986a), King and Roell (1988), Reinganum (1988), Pope, Morris and Peel (1990), Meulbroek (1992), Garfinkel and Nimalendren (1999), Datta and Iskander-Datta (1996).

⁴ The main UK legislation is contained in the Company Securities (Insider Dealing) Act 1985 and the Criminal Justice Act 1993 (Part V.). Non statutory codes of conduct include; The Securities and Investments Board Statements of Principles, The City Code on Takeovers and Mergers, The Securities and Futures Authority’s Conduct of Business Rules and the Stock Exchange Yellow Book (See Ashe and Counsell (1994) and Hannigan (1994) for further details on the statutory and non-statutory regulations).

⁵ If directors do pass on this information the recipients are called secondary insiders or tippees and their trading on this information is also illegal.

⁶ It has been shown in numerous studies that earnings announcements contain information about the company’s prospects which affects the share price, see for example, Ball and Brown (1968), Beaver (1968), Beaver, Clarke and Wright (1979), and the recent papers of Atiase and Bamber (1994), Collins et al (1994) and Kross et al (1994).

⁷ A number of US studies have examined insider trading (including directors’ trading) and earnings announcements, particularly earnings surprises which are unexpected increases or decreases in earnings. The results have been mixed. Givoly and Palmon (1985) and Allen and Ramanan (1995)

specific guidelines imposed on UK company directors by the London Stock Exchange on the timing of their private trading prior to earnings announcements.⁸ The Model Code imposes three fundamental restrictions on persons connected with listed companies dealing in those companies' securities. Firstly, the director must not deal if they are in possession of price sensitive information in relation to those securities. Secondly, dealing should be prohibited during a "close period" - which is the period preceding an earnings announcement. Finally, written clearance on the trade should be received from the chair or the director in charge of authorising clearance for directors' trading.

In this chapter, a number of issues generated from this restriction are examined; do directors, in fact, adhere to this guideline? If so, are the majority of trades prior to the beginning of the close period or are most directors trading after the earnings announcement has been made? Are there any differences between the trading distributions of directors' purchases and directors' sales? Finally, has the slight change in the Model Code in 1993 affected the timing of directors' trades?

found in general, selling (buying) activity did not precede negative (positive) earnings announcements. On the other hand, Lustgarten and Mande (1995) and Park et al (1995) do provide some evidence that insider trading is based on non-public information preceding an earnings announcement. Also, Elliot et al (1984) provide weak evidence consistent with the use of private information contained in earnings announcements.

⁸ As far as is known, the UK and the Netherlands are unique in issuing this guidance, despite the fact that most countries with developed capital markets have some insider trading legislation and in the vast majority of cases criminal sanctions are imposed. In Europe much of this legislation is fairly recent and has been required following the issue of Directive 85/592 of 13th November 1989 "Co-ordinating Regulations on Insider Trading" which provided a minimum standard of rules on corporate insider trading by the European Union to be implemented by June 1st 1992. Although the US does not have such formal guidelines as the UK, Sivakumar and Waymire (1994) report that several US companies have adopted policies that restrict insider trading to time periods following news events, such as earnings announcements. The intention of these policies is an attempt to "level the playing field" (p. 23) between corporate insiders and external investors. Three US studies have considered the distribution of directors trades and have found similar results, the volume of trades declines as the earnings announcement approaches and then increases afterwards, see Sivakumar and Waymire (1994), Park et al (1995) and Lustgarten and Mande (1995).

The chapter is organised as follows: section 3.1 outlines the guidance from the London Stock Exchange Yellow Book, the Model Code on corporate insider dealings. Section 3.2 describes the sample of director transactions and the methodology employed in the study. In section 3.3, the results from the analysis are presented. Conclusions and implications for further research are discussed in section 3.4.

3.1 The London Stock Exchange Yellow Book - The Model Code

As well as the statutory provision on corporate insider trading, the London Stock Exchange believes that special considerations apply to directors of listed companies. The restrictions imposed are in addition to and beyond those imposed by the law and are set out in the Appendix to Chapter 16 of the Yellow book. The first form of the Model Code was published in 1977 and the London Stock Exchange recently changed the listing rules on the 1st of December 1993, which included a new definition of the "close period". The Model Code is strictly "voluntary" and is a set of guidelines rather than rules,⁹ however a large number of public limited companies have developed their own rules based on it, which in some cases are more rigorous in the restrictions they impose on directors.¹⁰

⁹ There has been one case dealing with the Model Code, which does demonstrate its importance between company directors and the company but not to outsiders. In *Chase Manhattan Equities Ltd. v. Goodman*, the High Court held that the Model Code placed obligations upon directors to their companies but did not place a duty on them to other persons in the market to comply with the Code (See Ashe and Counsell 1994 p. 130).

¹⁰ For more details see Ashe and Counsell (1994), Gee (1994) and Hannigan (1994).

The period of time when directors are effectively barred from dealing in their company's shares is called the "prohibited period". It has three main parts; firstly, the "close period"¹¹, secondly, any period when there exists any matter which constitutes unpublished price sensitive information¹² in relation to the company's securities (whether or not the director has knowledge of such matter) and the proposed dealing would (if permitted) take place after the time when it has become reasonably probable that an announcement will be required in relation to that matter and, finally, any period when the person responsible for the clearance otherwise has reason to believe the dealing is in breach of the code.

Other guidelines suggested include: directors are advised not to engage in short term dealing in company's shares. This is an interesting restriction as it is meant to prevent the short term buying and selling of shares by company directors to take quick profits. Directors must also seek to prohibit dealings by or on behalf of any connected person, such as a husband, wife or child, during the close period or when the director has unpublished price information and the proposed dealing (if it were permitted) would take place after a time when it has become reasonably probable that an announcement would be required in relation to that matter (Practical Company Law

¹¹ A "close period" is defined as:

- (a) the period of two months immediately preceding the preliminary announcement of the company's annual results or, if shorter, the period from the relevant financial year end up to and including the time of the announcement; and
- (b) if the company reports on a half-yearly rather than a quarterly basis, the period of two months immediately preceding the announcement of the half-yearly results or, if shorter, the period from the relevant financial period end up to and including the time of the announcement; or
- (c) if the company reports on a quarterly basis, the period of one month immediately preceding the announcement of the quarterly results or, if shorter, the period from the relevant financial period end up to and including the time of the announcement.

¹² A definition of price sensitive information is given in chapter one.

1994).¹³

In summary, directors are always thought to be in possession of more information than can at any particular time be published. Accordingly, the London Stock Exchange suggests that directors cannot feel free to deal in their companies' securities and effectively bar, through the Model Code, any dealing in their company shares for up to two months prior to an earnings announcement. The Model Code is seen as a code of good practice to protect the company and the director against the criticism of abusing inside information that they may have, or be thought to have, especially in periods leading up to the announcement of results.

3.2 Sample and Methodology

The data source used in this analysis is the same as that used and described in chapter two of this thesis. It is supplied by Investorcare Publications who operate a service called *Directorwatch*. This provides a weekly update, listing every director transaction that has been reported to the London Stock Exchange within the previous seven days.¹⁴ For this analysis, the number of observed directors' trades had to be reduced to those for which could be ascertained an annual and interim earnings

¹³ Under the Model Code the director must advise the connected persons of the close periods during which they cannot deal and of any other periods when the director knows they are not themselves free to deal in the securities of the company unless their duty of confidentiality to the company prohibits them from disclosing such periods.

¹⁴ The Companies Act (1985) requires that directors inform the company within five days of the trade and the Stock Exchange "Yellow Book" requires that the company must inform the exchange by the following day.

announcement from the Extel data source.¹⁵ For the period between 17th September 1991 and 31st December 1994, 2,534 trades (1302 sales and 1232 purchases) in the one-hundred and sixty days surrounding an annual earnings announcements and 3,163 trades (1389 sales and 1774 purchases) in the same period surrounding an interim earnings announcement were collected.¹⁶ In this analysis, the numbers of trades per day and the percentage of total trades per day in the period +80 days and -80 days surrounding the announcement day 0 are measured.

3.3 Results

3.3.1 Overall trading distribution

There is a similar distribution for the total trades surrounding annual and interim earnings announcements, as shown in figures 3.1 and 3.2. In the period -80 to -41 days for both annual and interim, an average of 16 trades (0.65% of total trades) and 21 (0.66% of total trades) are observed respectively per day. However, this drops to almost zero for annual earnings and an average of just over 1 trade per day (0.04%) for interim in the period -40 to -1 days. This indicates that the vast majority of companies in the sample observe the Model Code and there is little trading in the two months prior to an earnings announcement. There is a very small amount of trading prior to interim earnings announcements which is in breach of the Model Code.¹⁷

¹⁵ There were not a sufficient number of quarterly earnings announcements to analyse separately.

¹⁶ Note each day is a trading day and there are approximately twenty trading days in a month.

¹⁷ This may not necessarily be evidence of trading on the information contained in the earnings announcement. This small number of trades could be, for instance, directors retiring and liquidating their holdings as they leave the company, or selling for liquidity reasons such as tax payments etc.

Despite being non-statutory the Model Code is complied with by the vast majority of directors. This would indicate that, despite the fact there has been very few prosecutions for insider trading by UK company directors¹⁸, the directors are very wary of drawing regulatory attention to their trading by trading in the “close period”. Also this could verify the claims that the boards of many companies will not approve directors trading within the “close period” and some companies have even more stringent restrictions on the timing of directors’ trades than are contained in the code.

A significant finding is the very marked increase in trading on the earnings announcements days. On the annual earnings announcement day there were 98 trades (3.8%)¹⁹ and heavy trading continues for the next ten days (a total of 555 trades, 22%). The distribution is even more marked around interim earnings announcements. On the day of the announcement there were 212 trades (6.7%)²⁰ and for the next ten days there were a total of 737 trades (23.3%). This indicates that large numbers of corporate insiders trade as soon as they possibly can after the close period and place their trading order on the earnings announcement day. Earnings announcements are therefore followed by a period of increased trading by insiders and others who may follow the trading activity of corporate insiders.²¹ After this period of heavy trading surrounding the earnings announcement, in the period +10 to +80 the distribution is very similar to the “normal” trading in the period -80 to -41 (for annual results an average of 18 trades per day (0.74%) and for interim 22 trades

¹⁸ See Hannigan (1994)

¹⁹ Using a simple chi-squared test methodology it was found that trading on day 0 of the annual earnings announcement was significantly different from the normal level of trading ($z=13.33$).

²⁰ $z=20.70$

²¹ Beaver (1968) finds that the volume of trading increases following an earnings announcement for US data. If the same is true of the UK, a factor in this increase in volume could be due to the trading of

per day (0.69%).

This behaviour by corporate insiders needs further investigation as there could be a number of explanations for this type of trading pattern. Firstly, it could be consistent with the corporate insiders' perception that the London Stock Exchange (and possibly their board) views this as the most appropriate time in which to trade, due to the prohibition in trading before the announcement.²² Similarly, it could simply indicate that this is the first opportunity that the directors have to trade after a two month prohibited period and there has been a build up of prohibited trades. The large number of trades could simply be for liquidity reasons or portfolio diversification. For sales, corporate insiders may want to trade as soon as possible to raise cash for liquidity reasons. A simple test of this is to consider the average trade per day prior to the close period and sum these average trades for the forty trading days missed through the close period. The trades on day 0 should be the equal to the sum of the average trades prohibited (640 for annual and 840 trades for interim). From the figures, it is clear that the trades on day 0 are not forty times the average number of trades in the period preceding the close period.²³ Consequently, although the number of trades are high at time 0 they are not simply an accumulation of the trades barred in the preceding period.

corporate insiders and those outsiders who follow corporate insiders.

²² Interestingly, in the Singaporean and Malaysian stock exchanges there are non-statutory guidelines that insiders should not deal following the publication of material information, including the release of financial statements. This is to allow the public time to absorb the information. The period of the restriction depends on the nature of the press release and is for a minimum of 24 to a maximum of 48 hours (Kian and Chandra (1995).

²³ Even if one week is taken after the end of the close period, the number of trades still does not reach these levels.

Alternatively, corporate insiders could be trading on the information that is released by the earnings announcement. According to the efficient market hypothesis the information from the earnings announcement should be incorporated automatically into the share price and corporate insiders (or anyone else) should not be able to profit from this information. The directors may view however, that the consequences of this new information has not yet been fully absorbed by the market and they want to trade before the market adjusts to the new information or to exploit the empirically observed post earnings announcement drift, which indicates that the market takes some time to react to earnings announcements.²⁴

Another possibility, is that corporate insiders' are not trading on the information released by the earnings announcement but on other information. The information from the earnings announcement is only a subset of the total information available on a company, some of which corporate insiders may know but will be unknown to the market. Insiders may be trading on this unknown information and the earnings announcement acts to screen their trade or maximise their potential gain.²⁵

These possibilities are also interesting in light of the results from chapter two, where

²⁴ See Bernard and Thomas (1989) and Strong, Walker and Xu (1997) for evidence that share prices do not instantaneously adjust to information in earnings announcements. The evidence indicates after a favourable (unfavourable) earnings announcement the share price continues to drift upwards (downwards). This would indicate that a corporate insider who wanted to sell (buy) after a favourable (unfavourable) announcement and believed the market was systematically inefficient due to post announcement drift should not trade on the day on the announcement but wait until the market has had time to adjust. However, a corporate insider who wanted to sell (buy) after an unfavourable (favourable) announcement and believed the market was systematically inefficient due to post announcement drift should trade on the day on the announcement.

²⁵ A corporate insider who knows more about the long term prospects of the company can benefit by trading with external investors who are simply basing their information on the earnings announcement. This is beyond the scope of this chapter but is investigated in the next chapter.

it was showed at least for purchases and especially for informed trades, that corporate insiders make abnormal profits when trading. If this result is taken together with the trading distributions in figures 3.1 and 3.2, the results suggest that the Model Code is adhered to and does change the normal trading pattern of corporate insider trades, but it does not eliminate their returns from trading.

It is also noticeable that the distribution is magnified for the interim announcement. Interim reports are widely regarded to be useful for analysts, especially to predict the annual earnings for the current period.²⁶ Corporate insiders may feel that the interim earnings announcement is more difficult to predict and therefore may create more opportunities in which exploit their superior information set. Also it may take the market longer to adjust to the consequences of an interim earnings announcement, while the annual earnings figures are more predictable given the interim announcement. Consequently, corporate insiders may be able to profit by trading when this information is released. Finally, less information is released around the interim earnings announcement in comparison to the annual earnings announcement and the figures do not have to be audited. This may create more uncertainty than the annual announcement and corporate insiders may know more about the future prospects at the interim stage than is released to the market.

It was also investigated whether the change in the Model Code rules on the 1st of

²⁶ All listed companies must provide shareholders with an interim report which usually covers the six month period since the last annual report. This report must include an abbreviated profit and loss account. Empirical evidence indicates interim reports are used to predict the full years figures and are considered very useful by investors (see Brown and Kennelly (1972), Kiger (1972), Stickney (1975) and Lee and Tweedie (1981)).

December 1993, had any noticeable affect on the trading distributions. The sample was split into two sub-sample periods, pre-rule change and post change. There was not a noticeable change between the two periods and the distributions were almost identical to figures 3.1 and 3.2. Similarly, based on results in chapter two, the distribution of informed insider trades was measured, as classified as trading greater than or equal to the corporate insider's current holding. The distribution for these trades was very similar to the overall result.

3.3.2 Trading Distributions - Purchases versus Sales

Since in chapter two it was found that corporate insiders' purchases showed significant abnormal returns but their sales did not, it is interesting to consider the pattern of trading surrounding an earnings announcement split between purchases and sales. Corporate insider sales around the annual and interim earnings announcements are shown in figures 3.3 and 3.4 respectively, and insider purchases around annual and interim are shown in figures 3.5 and 3.6 respectively.

It can be seen from these figures that they have very similar distributions to the overall trading distribution. For instance, there is light trading between -80 days and -40 days, dropping off to almost zero in the two months prior to the earnings announcement, rising dramatically on the day of the announcement and then falling back to normal trading levels. However, there are a number of interesting differences between sales and purchases. When corporate insiders purchase following an earnings announcement they will tend to do so on the day of the announcement or the

following day. Also there appears to be more of a drift in sales over the one month period following an announcement. For instance, 9.3% (5.4%) and 12.8% (6.7%) of directors' purchases (sales) were made in day 0 and day 1 of the annual and interim earnings announcement respectively. Sales remain at a higher than “normal” level for up to one month after the earnings announcement which is different from the overall distribution and the purchases distribution (sales for both interim and annual were 40% and 43% respectively, in the period +2 to +40 which compares to 35% of total purchases for both interim and annual over the same period).

Again, there could be a number of explanations for these differences. For purchases, the spike in day 0 and day 1 could be caused by corporate insiders buying as soon as possible before the share price reacts to any favourable information released from the earnings announcement. Alternatively, there could be an over-reaction to the earnings announcement and corporate insiders may be buying the shares of their company cheaply, given that they feel they are undervalued in the long term. Here, corporate insiders are trading on information not released in the earnings statement. The sales drift after the announcement may be caused by corporate insiders giving the market time to react to favourable information released from the earnings announcement in an attempt to achieve the best price they possibly can (possibly due to earnings drift). Alternatively, the market may overreact to an unfavourable earnings announcement and it may take for up to one month for the share price to return to its “true” level. The drift in sales over the one month period does indicate that the overall peak in trading on the day of the announcement is not completely driven by liquidity transactions.

3.4 Conclusions

This chapter examines the timing of corporate insider trades in the UK around earnings announcements. The motivation for the study comes from the importance of both interim and annual earnings announcements in providing information on the company's prospects and from the Model Code issued by the London Stock Exchange which, uniquely to the UK (and Netherlands), restricts trading for up to two months prior to an earnings announcement. The distribution of corporate insider trades surrounding the annual and interim earnings announcements for listed companies in the UK during the period 1991 to 1994 was determined.

From the analysis it was found that UK corporate insiders, overwhelmingly, adhere to the Model Code. Trading drops off from a normal level to almost zero in the two months prior to an earnings announcement. The compliance of corporate insiders to the non-statutory code may be indicative of the fear of being accused of insider dealing by regulatory authorities or by internal company restrictions. There is a tremendous increase in the incidence of trading on the day of the earnings announcement and in the following days. This was especially the case for the interim earnings announcement. From then on the level of trading returns to its normal volume. It was found that the change in the Model Code in 1993 has had little noticeable effect on this pattern and when informed trades were considered, it was found that they were similarly distributed. However, there were some differences between purchases and sales. Although the basic shape was the same as for total

trading most purchases occurred on the day of the announcement or the following day and then dropped back to normal trading levels, whilst for sales the number of trades on the announcement day was not as great and the level of sales remained above normal for up to one month following the announcement.

Possible explanations for the peaks in activity after the earnings announcements were suggested including: the perception that this is when the London Stock Exchange wants corporate insiders to trade; insiders trading quickly for liquidity reasons or portfolio diversification; trading before the market fully reacted to the earnings announcement and corporate insiders trading on information not released in the earnings announcement. These hypotheses are discussed and investigated further in more detail in chapter four.

Figure 3.1

Directors' Transaction Distribution - Annual Earnings Announcement

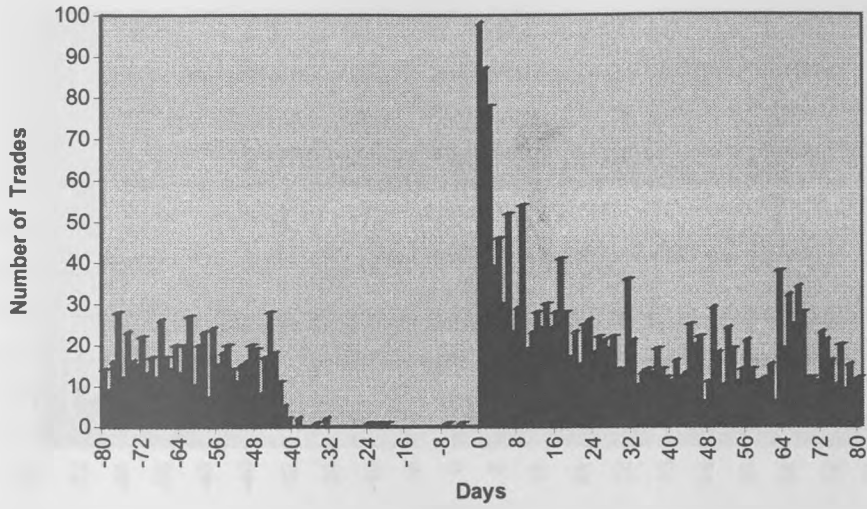


Figure 3.2

Directors' Transactions Distribution - Interim Earnings Announcement

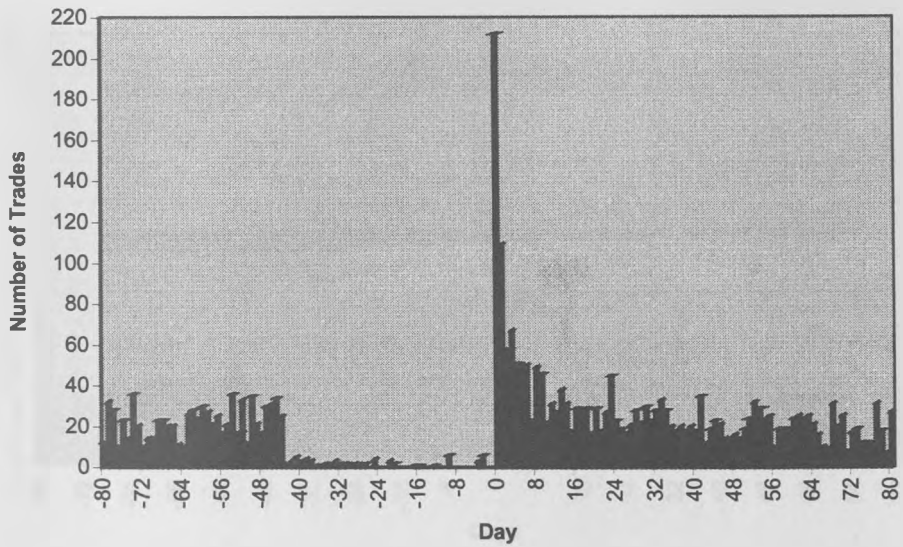


Figure 3.3

Directors' Sales - Annual Earnings Announcement

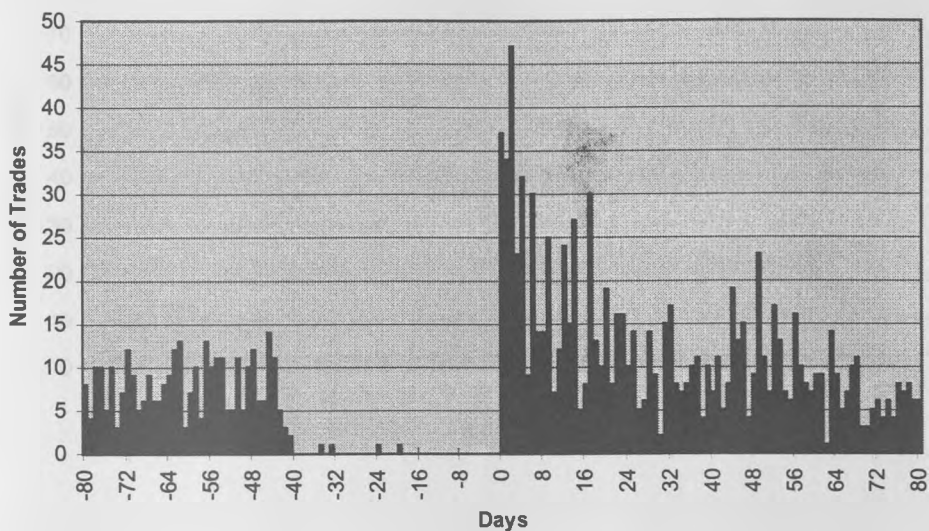


Figure 3.4

Director Sales - Interim Earnings Announcement

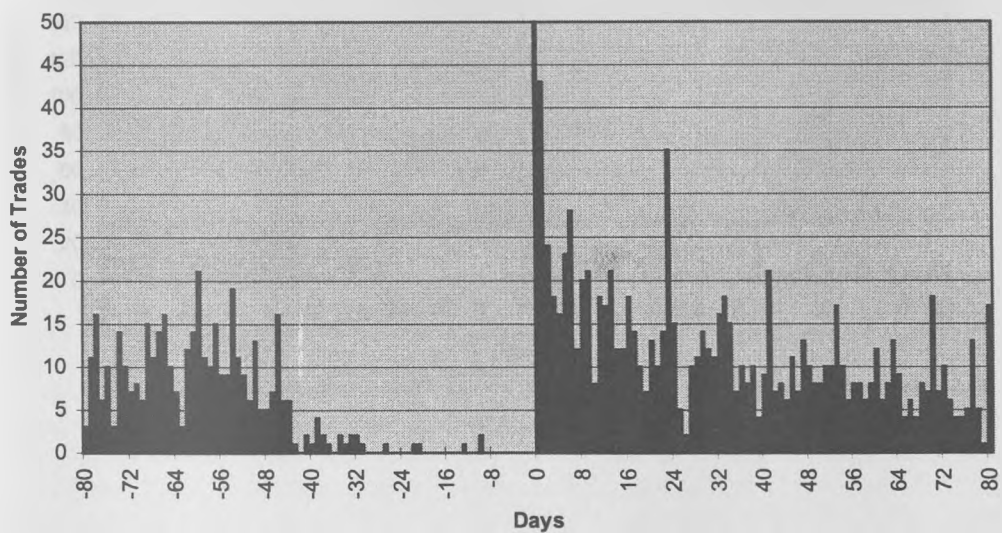


Figure 3.5

Directors' Purchases - Annual Earnings Announcement

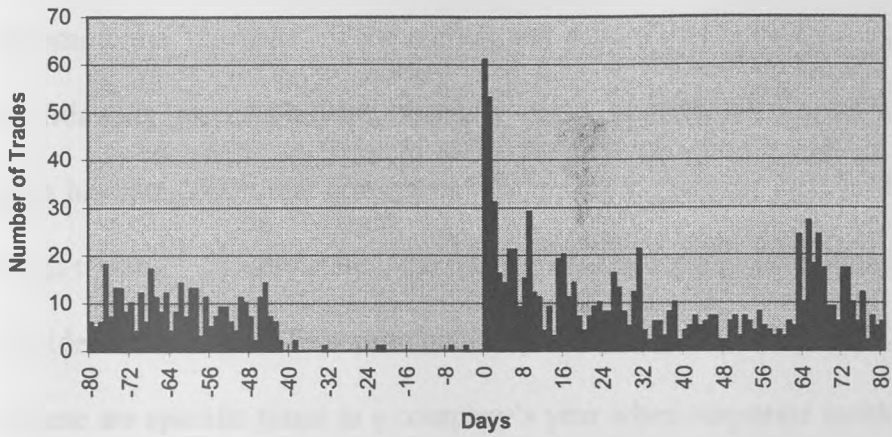
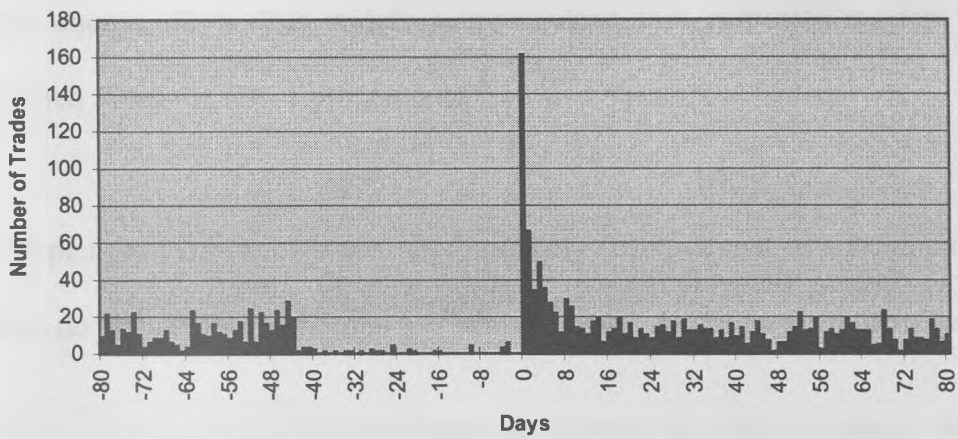


Figure 3.6

Directors' Purchases - Interim Earnings Announcement



4 To Ban or not to Ban? - Exchange Regulation and Corporate Insider Trading

To promote the “fairness” of the market and ensure that corporate insiders adhere to their fiduciary responsibilities, virtually every country with a developed security market has legislation that constrains insiders from abusing their privileged position through trading.¹ Simply stated, the trading of corporate insiders should not be based on inside information. In some countries, including the UK, it has been suggested that there are specific times in a company’s year when corporate insiders are likely to have access to specific inside information and as a consequence, regulations have been imposed to prohibit those insiders from trading during these times. Nonetheless, many studies, including those using UK data, have reported that corporate insiders earn higher returns than other investors from trading in their own firm's equity. It is thus widely acknowledged that corporate insiders are more informed about the future prospects of their firm than are outsiders.²

In chapter two, it is shown that approximately fifty per cent of all corporate insider trades do not achieve abnormal performance over the average trade. One possible

¹ There are two basic arguments surrounding the regulation of inside information. Proponents of regulation argue in terms of the promotion of a fair and orderly market and increased investor confidence. The deregulators state that insider trading makes the market more liquid and informationally efficient. There has been a great deal of literature in both financial economics and law on this debate. Examples of proponents of regulation include Goodhart (1987) and Campbell (1996). The most widely quoted statement of the case against regulation is Manne (1966). Recent work supporting the benefits of insider trading improving the accuracy of prices includes Meulbroek (1992). McVea (1995) and Campbell (1996) provide good examples of the debate surrounding insider trading legislation considering many other pro and anti regulation arguments.

² See Lorie and Niederhoffer (1968), Pratt and Devere (1970), Jaffe (1974), Finnerty (1976) and Seyhun (1986) for evidence in the US and Pope et al. (1990) and chapter two of this thesis for similar findings in the UK. Several recent papers have found that excess returns earned by insiders are reduced once transaction costs, size and price/earnings effects have been taken into account (Rozeff and Zaman (1988) and Gregory et al (1994) are examples).

explanation for the under-performance of these trades is the effect of UK restrictions on the timing of trades by corporate insiders. If insiders use private information on forthcoming earnings announcements in their trading strategies these restrictions may impose opportunity costs since, for at least four months of any accounting year, UK corporate insiders are prohibited from trading in their companies' securities. Consequently, in terms of the performance of insiders who trade on the information content of earnings announcements, the timing of the trade may be crucial to its subsequent performance.

In the UK, corporate insiders have restrictions in their trading beyond those imposed by law and are prevented from trading prior to earnings announcements. The purpose of the London Stock Exchange Model Code (1977) is that insiders do not abuse, and do not place themselves under suspicion of abusing, price sensitive information that they may have or are thought to have, especially in the periods leading up to the announcement of results (Ashe and Counsell 1994). Consequently, stock market regulators view that corporate insiders will periodically have access to important inside information on the forthcoming announcement. It is generally accepted that earnings announcements are one of the most important and influential information events in the company year and the information is valuable to investors as it has a significant impact on share prices.³ As UK companies usually make two earnings announcements, an interim and a final, during any accounting year insiders

³ Ball and Brown (1968) have shown that annual earnings announcements contain information about the company's prospects which affect the share price. Since then researchers both in the UK and US have shown that interim and quarterly earnings announcements also have information valued by investors (see Beaver 1968, Kiger 1972, Morse 1981 for US evidence and Firth 1981, Brookfield and Morris 1992, Rippington and Tafler 1995 for UK evidence)

would have two opportunities to profit by trading on private earnings announcement information.⁴ Consequently, UK regulators suggest that prior knowledge of this information would provide opportunities for a corporate insider to profit unfairly and have thus removed this perceived advantage through the Model Code.

A number of papers have examined insider trading and earnings announcements. Three main areas have been investigated; the timing of trades around announcements, whether pre-announcement trading is linked to the content of the forthcoming announcement (be it good or bad news) and the effect of changes in regulation on insider trading surrounding earnings announcements. Sivakumar and Waymire (1994), Park et al (1995) and Lustgarten and Mande (1995) have found that the volume of corporate insider trading declines as an earnings announcement approaches and then increases afterwards, citing reasons such as individual company restrictions on trading and insider concerns about being accused of insider dealing.⁵ The evidence on the linkage between corporate insider trading and the contents of earnings announcements has been mixed and there is no clear picture on whether insiders use prior knowledge of earnings announcement information in their trading or other information to trade. Givoly and Palmon (1985), Allen and Ramanan (1995) and Sivakumar and Waymire (1994) provide evidence that insider trading is not linked to the contents of forthcoming earnings announcements. In contrast, Lustgarten and Mande (1995) and Park et al (1995) find that the direction of

⁴ Some large UK companies that are listed in overseas markets, especially in the US, also produce quarterly reports. The two stock exchange systems provide an interesting comparison on the debate on regulating insider trading. The US system seems to favour frequent disclosure to remove the possible insider advantages while the UK system prefers less frequent disclosure accompanied by a ban on trading.

corporate insider trading is linked to the contents of earnings announcements. In the final major area examined, regulation and corporate insider trading, Garfinkel (1997) finds that increases in the amount of regulation in the US has affected the timing of directors' trades around earnings announcements for both informed and liquidity trades. This supports the findings on the decline in volume of corporate insider trading prior to earnings announcements. However, Sivakumar and Waymire (1994) find that company in-house restrictions on trading prior to earnings announcements of some US companies do not impose significant opportunity costs on the performance of corporate insiders' trading after the earnings announcement.

The first contribution of this chapter is to add to the debate on the regulation of corporate insider trading by examining the effect of an institutional restriction, The London Stock Exchange Model Code, on the buy and sell patterns of insider trading and the performance of corporate insiders who trade at various times over the accounting year. The UK presents an opportunity to add to the mainly US insider trading literature since restrictions on trading prior to earnings announcements apply to all listed companies and are in force for a much longer period than the individual restrictions imposed by US companies. Corporate insider trading research in the UK is based on the trading of company directors. The focus of this analysis is to determine whether the Model Code imposes opportunity costs on insiders by comparing trades in different periods throughout the accounting year. Potential profits may be foregone for insiders using private earnings information by being unable to trade for significant periods prior to an earnings announcement. Second, I

⁵ Unlike the results from chapter two of this thesis, in the US the volume of trading does not decline to

add to the literature on the information content of earnings announcements as, although US studies have considered the content of the earnings announcement they have not analysed differences in the type of earnings announcements.⁶ The UK provides the opportunity to study two different types of earnings announcements (interim and final), and compare trading behaviour and the performance of trades surrounding both. Finally, since the Model Code is defined in terms of the earnings announcement there may be opportunities for corporate insiders to trade on the information in the earnings announcement after the accounting period end. The patterns and performance of insiders who exploit this opportunity is thus examined.

In this chapter, I find that approximately 23% of all trades by company insiders took place within ten days post earnings announcement. Moreover, in the same period, the incidence of corporate insider trading is more than 400% greater than in the ten-day period prior to the beginning of the close period. From this it can be concluded that the Model Code has affected the timing of corporate insiders' trades. The direction of insider trading appears to be negatively related to the surprise element in the earnings announcement. Corporate insiders tended to buy after a poor earnings result and sell after a good earnings result. This distribution of insider trading is consistent with, and a possible explanation for, the findings from many insider trading studies (Finnerty 1976 and Seyhun 1986) which conclude that insiders buy low and sell high thus earning abnormally high returns. Similar patterns of insider

zero prior to the announcement.

⁶ In the US, publicly traded companies file quarterly reports (10-Q) and an annual report (10-K) with the SEC within 45 days of the quarter and 90 days of the fiscal year. US studies have considered either annual earnings announcements or quarterly earnings announcements separately, i.e. Park et al (1995), investigate quarterly earnings announcements while others (Garfinkel, 1997) consider annual announcements.

trading were observed after both the interim and final earnings announcements, however, there were more buying and less selling after the interim result. Although the timing of corporate insider trades was affected by the restrictions of the Model Code, the performance of their trades was not. In almost all periods, insiders earned abnormal positive returns after buying while firms suffered abnormal negative returns after insiders sold. Finally, the relation between the accounting year-end, the earnings announcement and the two-month close period had no effect on the timing and performance of insider trading.

The remainder of the chapter is organised as follows. In section 4.1, the requirements of the London Stock Exchange Model Code is summarised. This is followed in section 4.2 by a description of the two main earnings announcements made by UK companies. Founded on these discussions, in section 4.3 I set out the hypotheses tested in this chapter. Data and methodology are described in section 4.4. In section 4.5, the results are presented and conclusions are provided in section 4.6.

4.1 The Model Code

Restrictions on the timing of trading by corporate insiders in the UK are contained in a voluntary Model Code (London Stock Exchange, 1977).⁷ Basically, company insiders, or their associates, who have access to “price sensitive” information should not trade in their company’s securities prior to a “price sensitive” announcement. In

⁷ In addition to adhering to the Model Code, it is expected that all listed companies adopt their own rules governing insider dealings in listed securities that are at least as restrictive as that contained in the Model Code

particular, the Model Code specifies a “prohibited period” (called the close period) prior to periodic announcements, such as final and interim earnings statements.⁸ The Model Code also requires that a director receives clearance to trade from the chair (or designated director for this purpose). Chapter three of this thesis showed that overwhelmingly, UK company directors adhere to this guidance as trading by corporate insiders drops to zero in the two months prior to an interim and final earnings announcement. This is followed by an abnormally high level of trading in the days subsequent to the announcement. Therefore, despite the fact there has been very few prosecutions for insider trading in the UK (Fishman 1993), it appears that insiders are wary of drawing regulatory attention to their dealings by trading in the close period.

Although the US Securities and Exchange Commission does not have such a code, Garfinkel (1997) reports that the Insider Trading and Securities Fraud Enforcement Act (1988) specifically mentions inside knowledge that a company was about to issue a surprising earnings report as an example of the type of behaviour it would investigate. Using the same reasoning as UK regulators, it suggests this prior knowledge gives the insider tremendous advantages. Also, as previously mentioned, Sivakumar and Waymire (1994) report that many US companies have their own policies restricting company insiders from trading until after an earnings announcement date.

⁸ Insiders are prohibited from trading two months prior to a final or interim earnings announcement and one month prior to a quarterly earnings announcement. Since 1987 the Amsterdam Stock Exchange has adopted a similar prohibition to the UK in trading prior to annual earnings announcements (See Kabir and Vermaelen, 1996). Interestingly, this is in contrast to ideas of semi-strong form market efficiency in the Singaporean and Malaysian stock exchanges where there are non-

4.2 *Interim and Final Earnings Announcements*

Listed UK companies are required to provide shareholders with both the interim (which usually covers the six month period since the last annual report) and final earnings announcements. Differences in trading patterns between these two announcements are interesting for a number of reasons. First, the nature and content of the reports are different. The interim report is required for all listed companies by the London Stock Exchange, however, unlike the final report there is no legal requirement. Also, although the London Stock Exchange require the interim report to include an abbreviated profit and loss account it is much less detailed in comparison to the final report and is unaudited by external accountants.⁹ This may mean that there are greater concerns about the reliability of the information in the interim in comparison to the final.¹⁰ Second, although both earnings announcements are important for forecasting purposes, from discussions with analysts and from survey evidence (Lee and Tweedie 1981), it seems interim reports are used to update forecasts made at the previous annual report for the earnings for the current period. Third, the observed pattern of corporate insider trading (see chapter three) of the very marked increase in trading on the earnings announcement day and continuing for the next ten days was magnified for the interim announcement. This could indicate some difference in trading strategies surrounding interim and final earnings. Finally, in

statutory guidelines that insiders should not deal *following* the publication of material information, including earnings announcements (Kian and Chandran, 1995).

⁹ Only since 1996 has the UK Accounting Standards Board in the UK produced any guidance on the contents of interim reports in the form of an exposure draft. However, this is non-mandatory.

terms of the Model Code, the two month close period applies to both interim and final earnings announcements, however, the final earnings announcement typically takes longer after the accounting year end (approximately 12 weeks) than interim announcements after the six month accounting period (approximately 9 weeks). This may allow the insider to have an information advantage on the final earnings announcement prior to the beginning of the close period.

4.3 The Effect of the Model Code on the Timing and Performance of Insider Trades

The purpose of the Model Code is to prevent corporate insiders from using any specific information they may have to profit on a forthcoming earnings announcement in the period leading up to it. This chapter examines whether the Model Code impacts upon the buy and sell patterns and performance of corporate insiders' trades that could explain the finding of differences in performance between some insider trades reported in chapter two. Figure 4.1 illustrates the trading periods available to a director in a typical UK company. Over a twelve month period the insider will be prohibited from trading in two periods each lasting two months. This example will be used to illustrate the tests on corporate insider trading.

For all trading periods and strategies the data is differentiated between interim and final earnings announcements. As stated in section 4.2, there are a number of

¹⁰ However, consistent with the evidence in the US for quarterly earnings statements it has been shown that interim statements in the UK convey substantial new information to investors (see Firth 1981 and Brookfield and Morris 1992)

differences between interim and final earnings announcements and these may provide opportunities for insiders to trade strategically.

4.3.1 Hypothesis 1: “Announcement” and “Non-Announcement” trades

A number of studies have shown that the volume of trading increases around earnings announcements (Beaver (1968), Kiger (1972), Bamber (1986) and Ziebart (1990)). I begin by examining whether this increase in trading is replicated in the corporate insider trading sample by comparing trades that were related to the earnings announcement due to their proximity, with trades at other times. If insiders are trading on the content of earnings announcements they will trade as close as possible to the announcement. For instance, they may trade immediately prior to the beginning of the close period.¹¹ Alternatively, they may trade as soon as possible after the earnings announcement when they would view that the market has not fully absorbed its information content.¹² These proximity trades (pre-and post earnings announcement) will be defined as “announcement trades”. All other corporate insider trades are defined to be “non-announcement trades”.¹³

¹¹ This assumes that they are trading on private information concerning the forthcoming earnings announcement. I do not comment on whether this information is specific or precise which would be viewed as illegal insider dealing. Since the insider is adhering to the Model Code they may feel the costs of detection are low. However, in a recent case it was stated that a former chairman of Queens Moat Houses brought attention to his dealing by selling shares the day before the close period.

¹² If the insider is profiting from the public information content in the earnings announcement by trading as soon as possible after the earnings announcement then this is evidence that the market is inefficient in the semi-strong form.

¹³ A ten working-day period on either side of the prohibited period and the announcement date was selected to ensure that the trading periods did not overlap in the analysis of interim and final earnings announcements and motivated by the heavy trading observed in these periods by the findings in chapter three. As a robustness check, the study was replicated using the one month periods without finding any changes in the main results.

In the case of the example given in figure 4.1, the “announcement trades” would be those trades taking place in the last two weeks of January, the first two weeks of April, the last two weeks of June and the first two weeks of September. “Non-announcement” trades are in all other periods of the year. The distribution of buy and sell transactions and the performance of these trades are compared in hypothesis 1.

Hypothesis 1A

H0: - There is no difference in the distribution of “Announcement Trades” and “Non-Announcement Trades”.

Hypothesis 1B

H0: - There is no difference in the performance of “Announcement Trades” and “Non-Announcement Trades”.

4.3.2 Hypothesis 2: “Active” and “Passive” trades

I build upon the work of Sivakumar and Waymire (1994), who investigated whether voluntary restrictions in US companies imposed opportunity costs on insiders' trading. In this section, the impact of the Model Code on the differences in the performance of those corporate insider trades that pre-empt the close period in comparison to those trades post earnings announcement is examined. The focus is solely on “announcement trades” where trading in the ten day period prior to the close period are defined as “active trades”. All insider trades in the ten day period

after the earnings announcement are defined as “passive trades” (these are the same definitions as used by Lustgarten and Mande 1996).

The motivation for corporate insiders to trade immediately prior to the close period (active trading) is based on an information advantage over the market. Corporate insiders may actively trade when they are certain of the “true” value of the company’s equity given the information contained in the earnings announcement. Consequently, the extent of mispricing of the equity is known without error and the insider can purchase or sell with less risk.¹⁴ The presence of a close period means the insider must choose which strategy to follow more than two months prior to the information announcement. At this time, the information may not be fully available to corporate insiders and their expectations could be based on an incomplete information set. Although adhering to the Model Code, the “active” strategy could also expose the insider to the possibility of being accused of “insider dealing” prior to the beginning of the close period.

If the uncertainty is too great in the active period or the costs of detection are too high, the corporate insider may follow a “passive” strategy and delay trading until the impact of the information is observed (see Garfinkel, 1997). If insiders trade on the information contained in earnings announcements and the market is semi-strong form efficient, the close period would impose significant opportunity costs on their

¹⁴ In practice, the corporate insider will have only an indefinite expectation of the future value of their holdings and any “active” strategy would be exposed to market risk conditional on the accuracy of the insider’s expectations.

trading.¹⁵ A successful Model Code would effectively reduce the profits that corporate insiders (who want to trade on the contents of the earnings report) are able to earn thus promoting a fairer market to outsiders. In terms of the company in figure 4.1, “active trades” are in the last two weeks of January and the last two weeks of June. “Passive trades” are in the first two weeks of April and the first two weeks of September.

Hypothesis 2A

H0: There is no difference in the distribution of “Active trades” in comparison to “Passive trades”.

Hypothesis 2B

H0: There is no difference in the performance of “Active trades” in comparison to “Passive trades”.

4.3.3 Hypothesis 3: “Information” and “Non-Information” trades

The results in the US on corporate insider trading and the direction of earnings announcements have been inconclusive, consequently I focus further on “active trades” and “passive trades” and consider in particular the direction of the trade and the contents of the earnings report. An “information trade” is defined to be a transaction that anticipates the surprise component in the annual earnings figure. A

¹⁵ It should be noted that the other possibility is that corporate insiders may trade in the opposite direction from what would be expected after the earnings announcement (i.e. buy after good news and sell after bad news) and this trading may not be related to the earnings announcement but to information the insider has accumulated in the two month prohibition on trading. This is investigated further in the next hypothesis.

purchase prior to good news and a sale prior to bad news would be viewed as an information trade. An “information trade” may also be one that *reacts* in an opposite direction to the surprise component in the earnings figure. A trade of this type would be a buy transaction after a poor earnings figure or a sell transaction after an earnings result that is better than expected. “Non-information” trades are trades in the opposite direction of “information” trades both in the active and passive periods. It could be argued that these trades are based on other information not contained in the earnings announcement. If “information trades” earn abnormal returns, it could be argued that this provides evidence that insiders are drawing on private information on the earnings announcement in the direction of their trades. These trading strategies are compared in the next hypothesis.

Hypothesis 3A

H0 There is no difference in the distribution of “Information” and “Non-Information” trades.

Hypothesis 3B

H0 There is no difference in the performance of “Information” and “Non-Information” trades.

4.3.4 Hypothesis 4: Trading around the accounting year end

A feature of the close period is that it is defined with reference to the earnings announcement date and not the accounting period end date. It therefore assumes that

the close period will remove any information advantage on future earnings the insider may have prior to the beginning of the close period. However, if the earnings announcement is greater than two months after the accounting period end, insiders who receive information on the performance of the company could have a “window of opportunity” to trade on this inside information before the beginning of the close period. If insiders are able to take advantage of this operational loophole, it is possible that their trades in this period will be more profitable than other “active trades” when the accounting year end is within the close period, i.e. an earnings announcement within two months of the accounting period end. In this test, the uncertainty caused by trading more than two months prior to an earnings announcement is ignored and it is assumed that the corporate insider has no knowledge of the earnings performance prior to the accounting year end but receives perfect information at the accounting year end date.¹⁶ All trades that take place after the accounting year end date but before the close period are defined to be “period end trades”. In the case of the company in figure 4.1, “period end trades” would occur only in the last two weeks of January.¹⁷ For hypothesis 4A, the characteristics of “Period end trades” with “non-period end trades” are compared.

¹⁶ Nonetheless, the insider would likely receive a number of internal financial reports continually throughout the accounting year. Consequently, “non-period end trades” could also be based on the forthcoming earnings announcement. According to the Park et al (1995) model of insider trading around earnings announcements, the optimum time for an insider to trade is as soon as possible after the accounting year end when insiders receive the earnings information, assuming that they receive perfect information and have no prior information. As the announcement approaches, their information advantage will decrease and the costs of detection will rise. They show that this trade-off results in a peak of trading two weeks prior to the earnings announcement. They do not say when the insider receives the information only that it will be randomly distributed after the year end but prior to the earnings announcement.

¹⁷ Note in figure 4.1, since the interim earnings announcement is less than two months after the interim year end there is no “window of opportunity” for this accounting period. This is not always the case as

Hypothesis 4A

H0: There is no difference in the distribution of “Period End Trades” and “Non-Period End Trades”.

Hypothesis 4B

H0 There is no difference in the performance of “Period End Trades” and “Non-Period End Trades”.

4.4 Data and Methodology

UK legislation requires that directors report to their board any dealings they have had in the company’s securities within five days of a trade.¹⁸ The company must then in turn notify the Exchange within one day of receiving the information from the director.¹⁹ Each week, the London Stock Exchange Weekly Official Intelligence publishes information on all director trades reported in the previous seven days. There is a market for this information and several agencies promptly release it to subscribers for a fee. The data is collected from one such service, Directorwatch (*Investorcare Publications*). For each director’s trade the following information is provided: name of company, name of director, date of trade, number of shares traded, transaction price, the post trade holdings of the director, the type of security traded

some interim announcements are greater than two months after the interim year end. However, “period end trades” sample will be biased towards final earnings announcements.

¹⁸ To improve the information flow to the market the London Stock Exchange has recently proposed to reduce this period to two days (London Stock Exchange May 1997).

¹⁹ As previously mentioned under the Model Code, UK company directors must clear their potential trade with the chairman (or a member of the board of directors appointed for this purpose) prior to trading. Consequently, the company will normally be aware of the trade before it actually happens and has the opportunity to notify the Stock Exchange immediately of the insider’s trade. Anecdotal evidence from manually inspecting the Director Share Dealings page of British Sky Broadcasting teletext news service suggests that this does not happen.

(ordinary, preference, etc.) and the industry sector of the company. The data set spans the period 1 January 1992 to 31 December 1996. There is no concentration in any company, industry or period although the number of trades have increased in each year. To maintain comparability with other studies, all transactions involving the exercise of warrants, options, preference shares and other non-ordinary equity are excluded.²⁰ Sale transactions occurring within one week of an exercise of company options are also extracted to avoid any possible bias from these trades.²¹ After excluding warrants, options, preference shares and other non-ordinary shares, the sample consisted of 7,392 transactions of which 3,871 were purchases and 3,521 were sales. Security returns adjusted for capital changes and dividends were collected from Datastream.

In order to construct statistics to measure the performance of corporate insider trades around earnings announcements, an event study methodology is utilised incorporating the simple market model. The abnormal return on security j in day t is defined as:

$$(1) AR_{jt} = R_{jt} - \alpha_j - \beta_j R_{mt}$$

where R_{jt} = the return on security j in day t

²⁰ Consistent with the majority of previous studies it is suggested that the exercise of options and warrants, and trading of preference shares are not motivated by the same information involved in trading ordinary equity.

²¹ The comprehensiveness and accuracy of the data was checked manually with records from two other data sources: Extel Company Research and articles published every week in the Financial Times which publish information on directors trades. Both sources were consistent with my dataset although Extel and the Financial Times contain an incomplete history of all director trades (the Extel records were sparse for earlier years of the sample and the Financial Times highlights only certain trades). However, coverage improved substantially in later years and the records were similar for the last 30 months of the data.

α_j, β_j = market model parameter coefficients estimated from an OLS regression in the period t-600 to t-120 days prior to the insider trade and

R_{mt} = the return on the market portfolio, proxied by the return on the FT All Share index.

To avoid the possibility that only a few observations may have an in-proportionate weight in the analysis, the abnormal returns are standardised. A standardised abnormal return is defined as:

$$(2) \quad SR_{jt} = \frac{AR_{jt}}{S_{jt}}$$

and the estimated standard deviation of the abnormal return is:

$$(3) \quad S_{jt} = \sqrt{\hat{\sigma}_j^2 \left[1 + \frac{1}{U} + \frac{(R_{mt} - \bar{R}_m)^2}{\sum_{t=-600}^{-121} (R_{mt} - \bar{R}_m)^2} \right]}$$

where

$\hat{\sigma}_j^2$ = security j 's estimated variance of abnormal return during the estimation period.

\bar{R}_m = average market return during the estimation period.

U = number of trading days in security j 's estimation period. U is equal to 480 if there are no missing returns.

A standardised cross-sectional t-statistic (see Boehmer et al. 1991) is used to estimate the significance of the abnormal return. This is defined as:

$$(4) T = \frac{\frac{\sum_{j=1}^N SR_{jt}}{N}}{\sqrt{\frac{\sum_{j=1}^N \left(\frac{\sum_{j=1}^N SR_{jt}}{N} \right)^2}{N(N-1)}}$$

where N = the number of insider transactions in relevant sample.

A cumulative abnormal return between time 1 and k is defined as:

$$(5) CAR_{jk} = \sum_{t=1}^k SR_{jt}$$

and the corresponding test statistic is:

$$(6) CT = \frac{\frac{\sum_{j=1}^N CAR_{jk}}{N}}{\sqrt{k} \left[\frac{\sqrt{\sum_{j=1}^N \left(\frac{\sum_{j=1}^N SR_{jt}}{N} \right)^2}}{N(N-1)} \right]}$$

4.5 Results

4.5.1 Hypothesis 1: A comparison of “Announcement Trades” with “Non-Announcement Trades”.

Table 4.1, panel A reports the number of trades undertaken by directors in the “announcement” period and the “non-announcement” period. First, more insiders

trade in the 20 day period around the earnings announcement than at any other equivalent time. This would indicate that the earnings announcement is an important trading period for corporate insiders.²² The purchase to sale ratio is higher for “announcement trades” than for “non-announcement trades”. In the five-year period tested, there were 30% more purchase transactions in the “announcement” period than sales transactions.²³ This compares with an equal number of purchases and sales in the “non-announcement” period. As a consequence, the null hypothesis of equal insider buy/sell distributions for announcement and non-announcement periods can be rejected.

A breakdown of “announcement” and “non-announcement” corporate insider trading into final and interim periods shows that the excess insider buying in the announcement period is driven by the activities of insiders around interim announcements. The incidence of insider buy trades is almost 58% greater than sales transactions around the interim announcement whereas around the final earnings announcement, the number of insider purchases is only slightly greater than the number of sales. This difference is highly significant ($> 1\%$).

²² The result is consistent with other studies mentioned previously which document increased trading volume around earnings announcements. However, a number of recent studies have suggested that this increase in volume may be driven by large transactions (presumably institutions) and not small transactions (presumably retail investors) and the news released by the earnings announcement may not necessarily have the same value to heterogeneous investor types, see Cready (1988) Lee (1992) and Kim et al (1997). The vast majority of the insider trading sample would be considered small to moderately sized transactions under any of the classification systems used. Consequently, from my results it can be suggested that all retail investors, if small trade size is a credible proxy for individual activities, are not homogenous and insiders may behave differently from other types of retail investors.

²³ This is consistent with Lee (1992) who finds that there is a propensity of small trades (retail investors) to be buyers during the earnings announcement periods.

If insiders are trading on the contents of earnings announcements, the high number of purchase transactions around the interim announcement could be explained by the fact that interim announcements provide an exploitable trading opportunity. Interim results give an early indication of the prospects of the insider's firm for the forthcoming period and due to their unregulated nature may take a longer time for the market to absorb. However, this does not explain the low incidence of corporate insider selling at this time. In general, corporate insiders do appear to trade differently around interim and final earnings announcements and this may be due to differences in the content and form of the information provided.

Table 4.1, panel B shows a similar performance trend for purchases and sales, irrespective of the time interval in which trades take place. Corporate insiders usually purchase their own firm's equity only after it has performed poorly for a sustained time period, compared to the market as a whole. Subsequent to the purchase transaction, the shares perform better than the market. These results are consistent through all time periods, "announcement" and "non-announcement". The time series trend of abnormal returns around an insider sales transaction is opposite to the pattern around a buy trade. Before the insider sale, the equity has normally performed significantly above expectations whereas after the trade, the equity's performance is poor (this is the same result as reported in Seyhun (1986) for US insider trading and in chapter three for the UK). From these findings, I cannot reject the null hypothesis that the performance of "announcement" and "non-announcement" trades is equal ($t = 0.96$ for insider buys and $t = -1.39$ for insider sales).

4.5.2 Hypothesis 2: A comparison of the distribution and performance of “Active” and “Passive” insider trades

From table 4.2, panel A the large number of “announcement trades” is caused by high corporate insider trading in the ten days after an earnings announcement (passive trading). Moreover, this pattern is evident around both interim and final announcements. Although passive insider trading greatly outnumbers active insider trading, the distribution of buy and sell trades was similar in each period. Accordingly, the null hypothesis of an equal insider trading distribution of buy and sell trades in both active and passive periods could not be rejected (full, interim or final). Although the timing of corporate insider trading has been affected by the Model Code, the distribution of corporate insider trading around the earnings announcement has not changed.

Hypothesis 2B examines whether there was a significant opportunity cost to corporate insider trading imposed by the Model Code close period. Table 4.2, panel B presents the abnormal profits earned by corporate insider trading in the ten days prior to the close period (active trading) and in the ten days after the earnings announcement (passive trading). If the Model Code was successful in preventing insiders from abusing their privileged position, insiders would not be able to earn abnormal profits from passive trading as they would be forgoing profitable trading opportunities. Clearly this has not been borne out in practice. In every period

(except for insider buying in the active period before interim announcements) corporate insiders have earned statistically significant abnormal returns from their trades. Around each earnings announcement type, the abnormal performance of insider trading in active periods was insignificantly different from passive periods. Again, poor insider trading performance in the active period before the interim announcement was the only exception.²⁴

In general, the hypothesis that there was no difference in the performance of active and passive corporate insider trades could not be rejected. Coupled with the fact that insider buying and selling distributions were unaffected by the Model Code, it would appear that corporate insiders have not been constrained in their activities by the imposition of a close period prior to their firm's earnings announcement. It is clear that there has been no opportunity cost imposed by the Model Code on insider trading.

4.5.3 Hypothesis 3: A comparison of the distribution and performance of "Information" and "Non-Information Trades".

An examination of information trading by corporate insiders provides an insight into the way that they react to new information about their company. Many studies of the unconditional performance of insiders have reported that they buy when their firm is performing poorly and sell when it is performing well. In each case, corporate insiders appear to have superior forecasting ability concerning their own firm's future

²⁴ Test statistics were: Interim Active versus Interim Passive: $t = -2.34^{**}$ (buy) and $t = -0.34$ (sell).

prospects (Seyhun (1986) and chapter three of this thesis are examples). In this section the performance and distribution of corporate insider trading is examined, conditional on good or bad earnings figures. There are several approaches to classifying good or bad earnings news. Two methods are used in this chapter: a market determined measure and the Beaver et al. model (1979).

The market determined measure is simply the security's standardised return on the day of the earnings announcement. For each security, the mean and standard deviation of returns over a one year period prior to the earnings announcement date are calculated. The earnings announcement day return is then standardised as follows:

$$SR_i = \frac{R_i - \mu_i}{\sigma_i}$$

where R_i is the return on security i on the earnings announcement day and μ_i and σ_i are the mean and standard deviation of returns respectively. The standardised earnings announcement day returns are ranked and sorted into three equally numbered portfolios. The portfolio of the most positive standardised returns is termed the good news portfolio, the portfolio of the most negative standardised returns is called the bad news portfolio and the remaining portfolio is the neutral news portfolio. This method of classifying earnings announcements is useful as it is not conditional on an earnings model.²⁵

Final Active versus Final Passive: $t = 0.46$ (buy) and $t = -0.46$ (sell).

²⁵ This technique is used by Gajewski (1997).

In the second approach, ‘good’, ‘neutral news’ or ‘bad’ earnings announcements are defined according to the mean adjusted earnings model of Beaver et al. (1979). For each earnings announcement, the mean adjusted abnormal earnings change is given by:

$$AE_{it} = \frac{\Delta EPS_{it} - \frac{\sum_{k=1}^5 \Delta EPS_{i,t-k}}{5}}{\frac{\sum_{k=1}^5 \Delta EPS_{i,t-k}}{5}}$$

where

ΔEPS_{it} = change in earnings per share (adjusted for scrip issues, etc.) of company i from time $(t-1)$ to time t , collected from Datastream.

$$\frac{\sum_{k=1}^5 \Delta EPS_{i,t-k}}{5} = \text{mean change in earnings per share over the last five years.}$$

For every company in the insider trade sample, the abnormal earnings are calculated for each year from 1992 to 1996. All abnormal earnings for each company are ranked and sorted into three portfolios. The portfolio with the most positive abnormal earnings values corresponds to ‘good news’ and the portfolio with the most negative abnormal earnings corresponds to ‘bad news’. All other abnormal earnings changes are in the ‘neutral news’ group. For brevity, only results from the market determined measure are discussed in detail.²⁶

²⁶ The results from both models were consistent with each other. The Beaver et al. (1979) model results are not reported. Full tables of results from using the Beaver et al (1979) model are available on request.

The distribution of insider trades around “good”, “bad” and “neutral news” earnings announcements are presented in table 4.3, panel A, from which are highlighted the “information” and “non-information” trades. Active strategies do not appear to exhibit any tendency toward information trading for either earnings news model. For all earnings news classifications, insiders were net purchasers during the active period. An interesting finding was the large number of insider buys in relation to sells for the ‘neutral news’ active portfolio and as a consequence of this, the null hypothesis of equal distribution of insider trades was rejected ($\chi^2 = 7.66$) at a significance level of 5%. However, this test may be misleading because the neutral news portfolio is not directly related to information trading. With the neutral news classification omitted, the null hypothesis cannot be rejected. In contrast, the distribution of insider trading in the ten days post earnings announcement displayed strong evidence of information trading. After good earnings figures, 7% more insiders sold rather than bought shares. However, a more striking pattern is exhibited after bad earnings figures, where more than twice the number of insiders bought shares in their company than sold. Thus for passive periods, the null hypothesis of equal distributions between information and non-information trading was rejected at the 1% level of significance ($\chi^2 = 57.77$).

Table 4.3, panel B shows that “informed” insider trading for every earnings classification earned abnormal returns. Even when insiders bought shares after bad earnings news or sold after good earnings news, they were able to outperform other investors. In general, the performance of insider trading was relatively invariant to

the earnings news with only insider buying prior to poor earnings announcements earning negative abnormal returns.

Drawing on the results of the tests in this section, clearly many corporate insiders exploit private information when trading. The high incidence of contrarian trading within ten days of an earnings announcement that earn abnormal returns is clear evidence of informed insider trading. The fact that it exists and is successful is further indication that the provisions of the Model Code in the form of a close period are ineffectual in removing insiders' advantages.

4.5.4 Hypothesis 4: A comparison of the distribution and performance of "Period End Trades" and "Non-Period End Trades"

At the accounting period end, company insiders are likely to have access to the unaudited company accounts for the period. If this date is prior to the beginning of the close period, insiders may have a window to trade on the private information contained in the forthcoming earnings announcement. These trades are defined as "period end trades". Other active period trading is termed "non-period end trades". Table 4.4, panel A reports the distribution of insider trading for the two trading groupings. Although there are more period end trades than non-period end trades, the distribution of insider buys and sells are not significantly different and the null hypothesis 4A cannot be rejected. Likewise, an analysis of the performance of insider period end and non-period end trades also shows that the performance of period end and non period end trades are insignificantly different from each other

(buy: $t = 0.86$, sell: $t = -0.23$). The performance of period end and non period end trades for the interim and final earnings announcements is not reported because the small number of observations would give low power to any statistical tests.

As a result, the null hypotheses of no difference in the performance or distribution of insider period end and non-period end trading is rejected.

4.6 Conclusions

This chapter provides a contribution to the mainly US literature on corporate insider trading and exchange regulation by considering results for the UK. The UK provides an interesting environment to test for strategic trading due to the institutional restrictions on trading contained in the Model Code and the different types of earnings announcements, interim and final, made by UK companies. Strong evidence is found indicating that although the Model Code impacts upon the timing of corporate insider trading, it is ineffectual in reducing the well-documented abnormal performance of insiders. Moreover, corporate insiders do not appear to suffer an opportunity cost when trading after earnings announcements. However, one cannot measure whether the potential profits earned by insiders would be greater if no close period existed. It appears from this study that corporate insiders do follow strategies when trading, especially as regards interim and final and good or bad earnings announcements. Consequently, I add to the literature on earnings announcements by showing that strategically corporate insiders view interim and final earnings announcements as providing different trading opportunities. From the

results it is clear that insiders use more information than that released by the earnings announcement and/or earnings announcements do not capture all useful information on the company.

This study adds to the current debate on the need to regulate corporate insider trading as the imposition of a ban in certain periods of the company year does not appear to curtail the performance of insider trading. This raises important questions about the effectiveness or need for regulation constraining the activities of corporate insiders. Although the Model Code has affected the timing of the trades, insiders use of private information may be subtle and consequently very difficult to regulate.

Table 4.1 - Insider Trading: Announcement Trades vs. Non-Announcement Trades

Announcement trades are classified as all insider transactions in the ten-day period immediately prior to the close period and all insider transactions in the ten-day period post earnings announcement. All other insider trades are classified as Non-Announcement trades.

Panel A - Distribution of Insider Transactions

	Number of Purchase Transactions	Number of Sale Transactions	Total Number of Transactions
Full Sample – Announcement	1215	930	2145
Full Sample - Non-Announcement	2656	2591	5247
		$\chi^2 = 22.15^{**}$	
Final – Announcement	535	499	1034
Final – Non-Announcement	2656	2591	5247
		$\chi^2 = 0.43$	
Interim – Announcement	680	431	1111
Interim – Non-Announcement	2656	2591	5247
		$\chi^2 = 41.20^{**}$	
<i>Goodness of Fit Test</i>			
Announcement: Final vs. Interim		$\chi^2 = 19.53^{**}$	

* : Significant at 0.05 level ($\chi^2 > 3.84$)

** : Significant at 0.01 level ($\chi^2 > 6.63$)

Table 4.1 - Insider Trading: Announcement Trades vs. Non-Announcement Trades

Cumulative abnormal returns are given in the first line of each box. Test statistics are provided in parenthesis. Bold entries denote statistical significance. Announcement trades are classified as all insider transactions in the ten-day period immediately prior to the close period and all insider transactions in the ten-day period post earnings announcement. All other insider trades are classified as Non-Announcement trades.

Panel B - Insider Transactions Abnormal Return

Sample	$CAR_{t-120:t-1}$	$AAR_{t=0}$	$CAR_{t+1:t+12}$ 0
Full Sample - Announcement (Purchase)	-10.30 (-16.62)**	0.96 (2.81)**	8.31 (8.07)**
Full Sample - Announcement (Sale)	3.94 (4.67)**	0.09 (1.09)	-7.37 (-12.42)**
Full Sample - Non-Announcement (Purchase)	-13.40 (-27.74)**	0.43 (0.49)	7.02 (6.56)**
Full Sample - Non-Announcement (Sale)	6.48 (13.27)**	0.01 (0.85)	-5.91 (-19.62)**
Final - Announcement (Purchase)	-4.96 (-7.03)**	1.86 (7.07)**	10.78 (7.77)**
Final - Announcement (Sale)	3.34 (3.81)**	0.33 (3.07)**	-5.62 (-5.82)**
Interim - Announcement (Purchase)	-14.45 (-15.60)**	0.27 (0.10)	6.40 (4.05)**
Interim - Announcement (Sale)	4.61 (2.74)**	-0.18 (-1.61)	-9.37 (-11.94)**

** rejected at $\alpha=0.05$ level

Table 4.2 - Insider Trading : Active Trades vs. Passive Trades

Active trades are classified as those insider trades that take place in the ten-day period immediately prior to the close period. Passive trades are classified as those insider trades that take place in the ten-day period immediately post earnings announcement.

Panel A - Distribution of Insider Transactions

	Number of Purchase Transactions	Number of Sale Transactions	Total Number of Transactions
Full Sample - Active	262	183	445
Full Sample - Passive	964	736 $\chi^2 = 0.68$	1700
Final - Active	101	97	198
Final - Passive	434	402 $\chi^2 = 0.05$	836
Interim - Active	159	88	247
Interim - Passive	525	339 $\chi^2 = 1.06$	864
<i>Goodness of Fit Tests</i>			
Active : Final vs. Interim	$\chi^2 = 8.07^{**}$		
Passive : Final vs. Interim	$\chi^2 = 13.53^{**}$		

* : Significant at 0.05 level ($\chi^2 > 3.84$)

** : Significant at 0.01 level ($\chi^2 > 6.63$)

Table 4.2- Insider Trading : Active Trades vs. Passive Trades

Cumulative abnormal returns are given in the first line of each box. Test statistics are provided in parenthesis. Bold entries denote statistical significance. Active trades are classified as those insider trades that take place in the ten-day period immediately prior to the close period. Passive trades are classified as those insider trades that take place in the ten-day period immediately post earnings announcement.

Panel B - Insider Transactions Abnormal Return

Sample	CAR_{t-120:t-1}	AAR_{t=0}	CAR_{t+1:t+120}
Full Sample - Active (Purchase)	-3.34 (-5.81)**	1.56 (3.44)**	4.79 (0.87)
Full Sample - Active (Sale)	1.35 (1.36)	0.07 (0.13)	-8.47 (-5.99)**
Full Sample - Passive (Purchase)	-11.25 (-15.17)**	0.91 (2.13)**	9.59 (8.67)**
Full Sample - Passive (Sale)	4.61 (4.52)**	0.10 (1.09)	-7.08 (-10.90)**
Final - Active (Purchase)	-1.95 (-2.79)**	2.55 (2.87)**	12.08 (3.72)**
Final - Active (Sale)	-2.25 (-0.29)	0.01 (0.66)	-6.71 (-3.23)**
Final - Passive (Purchase)	-5.57 (-6.45)**	1.71 (6.49)**	10.51 (6.87)**
Final - Passive (Sale)	4.68 (4.15)**	0.41 (3.01)**	-5.36 (-5.00)**
Interim - Active (Purchase)	-4.61 (-5.35)**	-0.25 (-1.27)	1.82 (1.02)
Interim - Active (Sale)	4.96 (1.93)	0.13 (-0.34)	-10.22 (-5.06)**
Interim - Passive (Purchase)	-16.20 (-14.31)**	0.25 (-0.29)	9.13 (5.72)**
Interim - Passive (Sale)	4.52 (2.04)**	-0.27 (-1.57)	-9.13 (-11.33)**

** rejected at $\alpha=0.05$ level.

Table 4.3 - Insider Trading: Information and Non-Information Trades

Information trades are those that imply the insider had private information (buy [sell] before good [bad] news and buy [sell] after bad [good] news). An active strategy is classified as those trades that occur in the ten-day period immediately before the closed period. Passive strategies are those trades that take place in the ten-day period immediately post earnings announcement. An earnings announcement is classified as good news, neutral news or bad news dependent on the standardised earnings announcement day (SEAD) return. The most positive SEAD returns (top 1/3) are classified as good news, the most negative SEAD returns (bottom 1/3) are classified as bad news and the remaining SEAD returns are classified as neutral news.

Panel A - Distribution of Insider Transactions

	Number of Purchase Transactions	Number of Sale Transactions
Full Sample - Active Strategies		
Good News	82 [INFORMATION]	65 [NON-INFORMATION]
Neutral News	95	44
Bad News	85 [NON-INFORMATION]	74 [INFORMATION]
		$\chi^2 = 7.66^*$
Full Sample - Passive Strategies		
Good News	304 [NON-INFORMATION]	325 [INFORMATION]
Neutral News	225	210
Bad News	435 [INFORMATION]	201 [NON-INFORMATION]
		$\chi^2 = 57.77^{**}$

* : Significant at 0.05 level ($\chi^2 > 5.99$)

** : Significant at 0.01 level ($\chi^2 > 9.21$)

Table 4.3 - Insider Trading: Information Trading

Information trades are those that imply the insider had private information (buy [sell] before good [bad] news and buy [sell] after bad [good] news). An active strategy is classified as those trades that occur in the ten-day period immediately before the closed period. Passive strategies are those trades that take place in the ten-day period immediately post earnings announcement. An earnings announcement is classified as good news, neutral news or bad news dependent on the standardised earnings announcement day (SEAD) return. The most positive SEAD returns (top 1/3) are classified as good news, the most negative SEAD returns (bottom 1/3) are classified as bad news and the remaining SEAD returns are classified as neutral news. Cumulative abnormal returns are given in the first line of each box. Test statistics are provided in parenthesis. Bold entries denote statistical significance.

Panel B - Insider Transactions Abnormal Return

Sample	$CAR_{t-120:t-1}$	$AAR_{t=0}$	$CAR_{t+1:t+120}$
Full Sample - Active Good News (Purchase): <i>[INFORMATION TRADE]</i>	7.78 (0.55)	2.31 (2.71)**	21.69 (6.89)**
Full Sample – Active Good News (Sale)	2.79 (1.65)*	0.25 (1.25)	2.49 (0.96)
Full Sample – Active Bad News (Purchase)	-2.71 (-2.78)**	1.72 (1.78)*	-10.34 (-4.58)**
Full Sample – Active Bad News (Sale): <i>[INFORMATION TRADE]</i>	-1.46 (-0.48)	-0.26 (-1.86)*	-16.67 (-7.43)**
Full Sample – Passive Good News (Purchase)	-0.18 (-2.09)**	4.33 (7.48)**	16.07 (10.50)**
Full Sample – Passive Good News (Sale): <i>[INFORMATION TRADE]</i>	6.69 (6.18)**	0.89 (6.22)**	-3.86 (-4.59)**
Full Sample – Passive Bad News (Purchase): <i>[INFORMATION TRADE]</i>	-17.99 (-14.33)**	-1.79 (-4.05)**	5.79 (3.27)**
Full Sample – Passive Bad News (Sale)	4.58 (0.45)**	-1.28 (-4.30)**	-12.36 (-9.96)**

** rejected at $\alpha=0.05$ level.

Table 4.4 - Insider Trading : Period End Trades vs. Non-Period End Trades

Period End trades are classified as those trades that take place in the ten-day period prior to the close period but after the company accounting period end. Non-Period End trades are classified as those trades that take place in the ten-day period prior to the close period but before the company accounting period end.

Panel A - Distribution of Insider Transactions

	Number of Purchase Transactions	Number of Sale Transactions	Total Number of Transactions
Full Sample - Period End	119	98	217
Full Sample - Non-Period End	67	39	106
		$\chi^2 = 0.09$	

* : Significant at 0.05 level ($\chi^2 > 3.84$)

** : Significant at 0.01 level ($\chi^2 > 6.63$)

Table 4.4 - Insider Trading : Period End Trades vs. Non-Period End Trades

Period End trades are classified as those trades that take place in the ten-day period prior to the close period but after the company accounting period end. Non-Period End trades are classified as those trades that take place in the ten-day period prior to the close period but before the company accounting period end. Cumulative abnormal returns are given in the first line of each box. Test statistics are provided in parenthesis. Bold entries denote statistical significance.

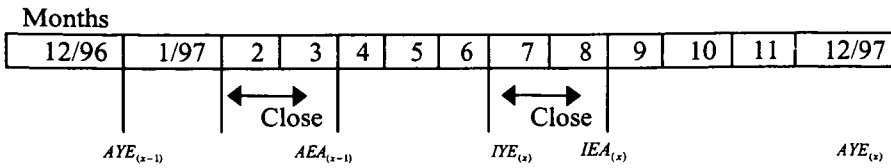
Panel B - Insider Transactions Abnormal Return

Sample	CAR _{t-120:t-1}	AAR _{t=0}	CAR _{t+1:t+12} 0
Full Sample - Period End (Purchase)	-6.11 (-3.44)**	3.41 (4.41)**	10.33 (1.57)
Full Sample - Period End (Sale)	3.16 (1.40)	0.05 (0.62)	-8.18 (-4.09)**
Full Sample - Non-Period End (Purchase)	-7.39 (-4.31)**	0.17 (0.48)	6.46 (1.51)
Full Sample - Non-Period End (Sale)	-0.02 (-0.96)	-0.16 (-1.21)	-6.98 (-4.37)**

** rejected at $\alpha=0.05$ level.

Figure 4.1 - The Impact of the Close Period on the Timing of Trades in the UK.

Consider a company with an accounting year end on 31/12/1996 and corresponding interim accounting year end. If it makes an interim earnings announcement two months after the interim accounting period and a final earnings announcement three months after the annual accounting year end. The following diagram illustrates the impact of the close period over the accounting year.



- AYE - Annual year end
- IYE - Interim year end
- AEA - Annual earnings announcement
- IEA - Interim earnings announcement

5 An Analysis of Investment Returns around Corporate Insider Trading

Theoretical models of insider trading argue that when in possession of private information, investors trade in order to fully realise the benefits accruing from their information. Uninformed order flow is assumed to be exogenous and held to be based on non-market factors such as liquidity considerations and changes in investor risk preferences. With respect to the pricing of securities, the combined informed and uninformed order flow creates an ambiguity which must be solved by the price setting mechanism imposed by the market. Moreover, informed traders acting strategically in order to minimise the risk of detection contribute to prices being inefficient estimates of the true value of the underlying asset.

In practice, investors who do not have private information, use all possible means to obtain that information through research. In this regard, one particularly useful item which is followed by both financial analysts and the financial press is trading activity by investors perceived to be advantaged vis-à-vis the information flow. This group, more commonly known as corporate insiders, are assumed to trade on information which is unavailable to other market participants as a result of their day to day operational activities within their firm.

The vast majority of empirical literature on corporate insider trading has found that when the employees of a firm choose to trade, they do so at a time most advantageous to them. Moreover, the success of their trading decisions has been

quite striking.¹ Several factors have been suggested for corporate insiders' apparent skill in forecasting future price movements of their firm. These range from superior skill in synthesising information (Seyhun (1986a)) to knowledge of forthcoming events (Givoly and Palmon (1985)).

Seyhun (1986a) examined the position of corporate employees in relation to the performance of their trades and reported that senior officers who were involved in the day to day running of a firm, tended to have better trading performance than other employees or shareholders holding in excess of 10% of the company's shares. With respect to timing, there is no empirical consensus on whether corporate insider trading is directly related to forthcoming firm-specific events. Whereas Keown and Pinkerton (1981), Penman (1982), Hirschey and Zaima (1989), Allan and Ramanan (1990), Lee, Mikkelsen and Partch (1992), Lustgarten and Manade (1995) and Petit, Ma and He (1996) have found some relationship between insider trading and forthcoming corporate announcements, other studies have not. For example, Elliot, Morse and Richardson (1984) and Givoly and Palman (1985) found no relationship between the timing of corporate insider trades and a variety of news announcements. More specifically, the following studies have reported no relationship between corporate insider trading and particular events: Loderer and Sheehan (1989) for bankruptcy announcements, Karpoff and Lee (1991) for new issue announcements and Sivakumar and Waymire (1994) for quarterly earnings announcements.

¹ Research which has found significant price changes subsequent to insider trading are Lorie and Neiderhoffer (1968), Pratt and DeVere (1970), Jaffe (1974), Finnerty (1976), Baesel and Stein (1979), Givoly and Palmon (1985), Seyhun (1986), Reinganum (1988), Garfinkel and Nimalendren (1999) and Datta and Iskander-Datta (1996). Only a handful of papers have found that insider trading does not precipitate price changes. These are Rozeff and Zaman (1999) and Eckbo and Smith (1998).

Irrespective of the true reason why corporate employees earn excess returns from their trades, the fact remains that in general, they do so. The question is then, how do other investors use this information to augment their own investment decisions? There are a wide range of sources from which followers of corporate insider trading information can gather data. Many commercial and regulatory sources² provide up-to-date news on corporate insider dealings including trade characteristics such as the number of shares traded, the transaction price and the transaction date. In addition, further information concerning the insider's firm can be gleaned from sources such as Compustat.

This chapter postulates that followers of corporate insider trading activity will be concerned with three main factors relating to insider trading. These are: whether the insider had private information when they traded, whether the information was good or bad and the general performance of corporate insider trading in the firm. I construct a simple model that explicitly takes into account these factors from a follower's perspective and show that the probability of compatible price movements subsequent to a corporate insider trade (positive return after insider buy and negative return after insider sell) is increasing in the strength of the trading signal and the past performance of insider trading in the firm and decreasing in the pre-insider transaction price performance of the firm.

My empirical tests largely verify the main points of the model. In particular I find that the model is extremely successful at explaining share price movements subsequent to insider buy trades but is less impressive when explaining share price

² Examples include Wall Street Journal and the SEC's regulatory news service.

movements after insider sales. Substantial interaction effects exist, particularly in relation to pre-trade stock price performance and the other two variables in the model. Insider buy trades that are most associated with subsequent significant price increases are those which are large in relation to the insider's holdings and where other insiders in the firm have also had positive returns from their trades. Moreover, the strength of these variables is increasing in the level of negative share price performance in the six month period immediately preceding the insider buy decision. For insider sales, it appears that only the performance of other insider sell trades in the firm has information for price changes after the trade. There is an interaction effect however, which suggests that the strength of the performance signal of other insider trades in the firm is increasing in transaction size. To close the analysis, I carry out a simple trading strategy using the model for a variety of investor response lags and trade characteristic combinations. The main findings are that abnormal returns can be earned from following insider trading when using the signals that have been introduced in this chapter.

This study makes three main contributions to the literature. First, I develop a model of the performance of corporate insider trades from the perspective of uninformed traders. Whereas theoretical models view informed trading and uninformed trading to be independent or semi-independent, I explicitly model investor expectations with respect to the insider trading signal. Second, the analysis explores the reasons which directly provide information on the strength of the insider trading signal. In this regard, three factors are introduced which to date have not been investigated in connection with the performance of corporate insider trades. Finally, the chapter provides new insights on the interactions between trading activity characteristics and

the way in which the market interprets this information. The approach that is followed in this chapter can also be applied to other voluntary information events and their effect on the expectations of investors in the market as a whole

The remainder of the chapter is as follows: section 5.1 presents the theoretical model, section 5.2 discusses the main hypotheses arising from the model. Section 5.3 presents the results and section 5.4 concludes the chapter.

5.1 The Model

In this section, I develop a very simple model of uninformed investor decisions when corporate insiders trade. Most theoretical literature in this area models the pricing of securities by dealers as being solely determined by an informed component in addition to exogenous uninformed order flow originating from liquidity or noise traders. Kyle (1985, 1989), Easley and O'Hara (1987), Admati and Pfleiderer (1988) and Easley, O'Hara and Srinivas (1998) among others focus on the role of informed traders and their effect on the pricing dynamics of a security. I augment this literature by exploring the ways in which uninformed investors react to informed trading. This model is not a pricing model. In fact a model of this sort is not required for the analysis since only the returns that can be made from trading in the equity markets subsequent to insider activity are examined. The model is closest in spirit to Easley and O'Hara (1987) and Easley, O'Hara and Srinivas (1998) in that the probability of an insider's buy or sell decision is viewed to be dependant on the probability of an information signal, the probability of good or bad news and the probability of the insider actually trading given information.

In the model, there is a security (a share of stock) that is traded in the market. The security currently has a value, S_0 , and will have a terminal value $S_T \in \{\underline{S}, \bar{S}\}$ symmetric around S_0 at some time T in the future. At time $t = 0$, the security may experience an information event with probability, η which is detected by company insiders only. The information event will be either good or bad news relating to a terminal value \bar{S} or \underline{S} respectively. The probability that the signal will be bad news is δ and the probability of good news is $(1 - \delta)$. If no information event occurs, δ is equal to $(1 - \delta)$ and the expected value of the security to insiders is simply $E[S_T] = \delta \underline{S} + (1 - \delta) \bar{S} = S_0$. The information event is an accurate and precise forecast of the terminal value of the security.

This is a fairly realistic representation of what actually occurs in a listed company. During the day to day operations of a firm, new information will arise that will initially only be available to company insiders. This information need not pertain to an actual event but instead could be an accumulation of smaller information pieces that contribute to a fuller picture of the future value of the insider's firm. Upon receipt of information, corporate insiders have two choices. They can either trade in their firm's securities or do nothing. Although trading appears to be the more sensible strategy for informed insiders, in many cases they will choose to remain silent concerning their information. If the information signal relates to a specific event in the future that will affect prices, the insider may decide not to trade in order to avoid any possibility of stock exchange investigation. In addition, for the case of bad news, short selling restrictions may disallow insiders from selling when they do

not hold any shares. Finally, there may be house rules forbidding them from trading during certain periods of the company's financial year.

If insiders receive good news, they will either buy the equity of their firm or do nothing. If they receive bad news, they will either sell the equity or do nothing. The probability of an insider buying when in receipt of good news is $\alpha_{\bar{S}}$ and the probability that an insider will sell when in receipt of bad news is $\alpha_{\underline{S}}$. If the insider receives no information, they can take one of three decisions: buy, sell or do nothing with probability τ_1, τ_2 and $(1 - \tau_1 - \tau_2)$ respectively. In practice, the probability of insiders buying or selling when in receipt of no information, τ_1 and τ_2 , will be less than the respective insider trading probabilities, $\alpha_{\bar{S}}$ and $\alpha_{\underline{S}}$ although this is not necessary for development of the model. Each period, uninformed investors are faced with a choice to respond to observed insider actions. If an insider sale is observed, the uninformed follower may either sell equity or do nothing. If an insider buy is observed, the follower may buy the equity or do nothing. Standard application of Bayes' Theorem provides us with the probabilities of terminal values to the uninformed given observed insider actions. Proof of proposition 1 is given in the appendix.

Proposition

The probability that the terminal value of a security is \bar{S} to an uninformed investor given an insider buy trade is:

$$P(\bar{S} | +ve) = \frac{\eta(1 - \delta)\alpha_{\bar{S}}}{\eta(1 - \delta)\alpha_{\bar{S}} + (1 - \eta)\tau_1} \tag{1}$$

The probability that the terminal value of a security is \underline{S} to an uninformed investor given an insider sell trade is:

$$P(\underline{S} | -ve) = \frac{\eta \delta \alpha_{\underline{S}}}{\eta \delta \alpha_{\underline{S}} + (1 - \eta) \tau_2} \quad (2)$$

Thus for insider buy trades, the probability of a high terminal value is increasing in the probability of an information event occurring and the insider actually trading given information and decreasing in the proportion of uninformed or liquidity trading by the insider. Similar reasoning applies to low terminal values following insider sells.

The proposition provides several insights into a follower's decision process. For each instance of an insider trade, uninformed investors are required to arrive at an estimate of the future value of the insider's equity. The main inputs into this process are the past uninformed trading activity of the insider (τ_1 and τ_2), other new information releases concerning the insider's firm, η , the size of the insider trade, (δ and $1 - \delta$), and the past forecasting performance of the insider ($\alpha_{\bar{S}}$ and $\alpha_{\underline{S}}$). Past trading activity of an insider is important to determine whether the insider trades frequently but not successfully or only trades when in possession of information. Frequent liquidity trading by the insider will decrease the signal to noise ratio of the trading signal and will consequently lessen the probability of compatible terminal values given an insider decision (i.e. high equity values after positive trades and low equity values after negative trades). Other information regarding the insider's firm is necessary to confirm or contradict the supposed signal from the trade. For example,

followers would examine recent news on the activities and performance of the insider's firm for additional evidence in generating their forecasts. Finally, the past trading performance of insiders is important to determine how well their trades forecast the future value of the insiders' equity. Some firms may have strict rules concerning the activities of corporate insiders whereas other firms may not be so concerned with the activities of insiders.

5.2 Hypotheses Tested

The proposition in section 5.1 posits certain factors of insider trading activity which uninformed followers use to determine the information content of a trade and ultimately the future value of an insider's firm. These are: the probability that an information event occurs, the probability that the information is positive or negative, the probability that an insider will trade given information and the probability that an insider will trade having no information. To determine whether our model correctly predicts market activity around insider trading, unbiased proxies of these factors are required. However, given the difficulty in obtaining reliable estimates, we instead estimate investor reactions indirectly by utilising variables related to the factors developed in the model.

Previous research on the performance of insider trading (Lorie and Niederhoffer (1968), Pratt and DeVere (1968), Jaffe (1974a, 1974b), Finnerty (1976a, 1976b), Nunn et al, (1983), Givoly and Palmon (1985), and Sivakumar and Waymire (1994) are examples) has shown that insiders generally perform better in investment decisions concerning their own firm than other market participants. What is more,

they appear to time their trades so that they buy after sustained poor share price performance and sell subsequent to strong performance. A relevant measure for the probability of an information event could thus be the share price performance for a period immediately preceding the actual transaction. Buy trades following poor share price performance and sell trades after strong price performance can be taken to occur as a result of new information being received by the insider. The greater the returns pre-trade (negative returns preceding a buy trade and positive returns preceding a sell trade) would indicate a greater probability of an information event occurring.

When insiders trade, followers need to determine whether the insider is in receipt of good news or bad news. Although sparse information is available to market participants concerning the information set of the insider, followers can gauge whether the insider has good news or bad news by examining the characteristics of the insider trade itself. I take the strength of an information signal to be increasing in the size of the trade. There are many different measures of transaction size that can be used in this analysis.³ For this purpose, transaction size is ranked by the percentage change in insider holdings. This measure is a better estimate of the strength of insider expectations since, unlike other measures, it is with respect to the insider and not the insider's firm.

Finally, I estimate the probability of insiders trading when they have information and when they have no information by collecting the past trading performance of

³ Examples are the volume of shares traded (Seyhun 1986), the proportion of the firm traded (Seyhun, 1986; Elliot, Morse and Richardson 1994), the monetary value of the trade purchased and sold per

insiders. The measure used in this study is the abnormal share price performance over all other insider trades in a firm for 10 days post trade over the whole sample period. If insiders of a firm tended to trade without information, this variable would be near zero whereas if the insiders of the firm always used information when they traded, the proportion would be greater or less than zero depending on whether the trade was a buy or sell respectively. For those companies that have no other insider trading activity, the value is equal to zero. In addition, firms with strict rules pertaining to employees trading the securities of their firm would lead to a dominance of poor or zero cumulative abnormal returns for insider trades in the firm. In contrast, a firm with lax house rules may be more associated with strong insider trading performance.

Ordinary least squares is used to test proposition 1 separately for insider buy and sell trades. The model specification is of the form:

$$\begin{aligned}
 CAR_{t:t+10} = & \alpha + \beta_1 CAR_{t-120:t-1} + \beta_2 DCAR_{t-120:t-1} + \gamma TradeSize + \delta Performance \\
 & + \phi_1 (DCAR_{t-120:t-1} * TradeSize) + \phi_2 (DCAR_{t-120:t-1} * Performance) \\
 & + \phi_3 (TradeSize * Performance) + \phi_4 (DCAR_{t-120:t-1} * TradeSize * Performance) + \epsilon
 \end{aligned}$$

where $CAR_{t:t+10}$ and $CAR_{t-120:t-1}$ is the cumulative abnormal return on the insider's equity in the ten days post trade and one hundred and twenty days pre trade respectively. $DCAR_{t-120:t-1}$ is a multiplicative dummy variable corresponding to the cumulative abnormal return for each insider trade over the time period t-120 to t-1 days before the trade multiplied by 1 if $CAR_{t-120:t-1}$ is greater (less) than one standard

company (Lee Mikkelson and Partch 1992), the number of purchases and sales in a month (Lee,

deviation away from the mean abnormal return for insider buy (less) trades and zero otherwise. *TradeSize* is the percentage change in insider's holdings as a result of the trade and *Performance* is the average cumulative abnormal returns for ten days after an insider trade over all trades (excluding the observation) within a firm in the sample period. ε is a white noise term. A threshold term for the pre-trade cumulative abnormal return is included to strengthen the information signal term, β_2 . Interaction effects are also included to detect any non-linear impacts of the variables on post-trade cumulative abnormal returns.

Formally, the model makes three predictions as follows:

1. $\beta_2 < 0$; the probability of price increases(decreases) after an insider buy(sell) is decreasing in the level of pre-trade share price performance.
2. $\gamma > 0$; the probability of price increases(decreases) after an insider buy(sell) is increasing in the strength of the trading signal.
3. $\delta > 0$; the probability of price increases(decreases) after an insider buy(sell) is increasing in the level of other insider trading performance in the firm.

In addition, if interaction effects are present the following predictions are made:

4. $\phi_1 < 0$; the probability of price increases(decreases) after an insider buy(sell) is greater when large insider trades follow strong negative(positive) pre-trade share price performance.

Mikkelson and Partch, 1992) and the position of the corporate insider in the company (Seyhun, 1986).

5. $\phi_2 < 0$; the probability of price increases(decreases) after an insider buy(sell) is greater when insider trading performance in the firm is positive(negative) and the trade follows strong negative(positive) pre-trade share price performance.
6. $\phi_3 > 0$; the probability of price increases(decreases) after an insider buy(sell) is greater when large insider trades occur in firms where insider trading performance in the firm is positive(negative).
7. $\phi_4 < 0$; the probability of price increases(decreases) after an insider buy(sell) is greater when large insider trades follow strong negative(positive) pre-trade share price performance in firms where insider trading performance in the firm is positive(negative).

In the next section, the data used to empirically test the propositions of the model is described.

5.3 Description of Data

Data on corporate insider transactions are taken from the Directorwatch service⁴ which provides complete information on dealings undertaken by every director for every company listed on the London Stock Exchange. Information includes the name of the company, name of the director who traded, the date of the transaction, the number of shares traded, the transaction price, the industry in which the director's firm operates and the number of shares held by the director after the trade. This dataset is supplemented by adding the market value of the firm's equity on the date

⁴ Directorwatch is published by Investorcare Publications.

of the trade which is taken from Datastream. The director trade dataset spans approximately 7 years from September 1991 to March 1997.

Director's dealings are only a subset of a whole host of insiders that can be defined within a firm. In the US, corporate insiders are defined to be any officer, manager or director of the firm in addition to investors holding more than 10% of the company's shares outstanding. The focus in the UK is particularly on directors whom the stock exchange believe to be in the most advantageous position for receiving firm specific information before others (London Stock Exchange Model Code 1977). For the most part, this has been confirmed in the US through a study by Seyhun (1986) who finds that directors' trading performance in their own firm is substantially stronger than other officers of a firm.

Table 5.1, panel A provides summary statistics of the director trading data. It can be seen that directors of firms are not frequent traders with approximately seven trades in each firm over the entire sample period. However, transaction size is considerably larger than would be expected given previous findings on trade sizes on the London Stock Exchange (see Hansch, Naik and Viswanathan (1999)). Finally, equity returns are collected from Datastream, and the market index we use is the FT All Shares Index which consists of approximately the 500 largest companies by market value on the London Stock Exchange.

5.4 Results

My first test concerns the linkage between returns to corporate insider trading and three distinct and independent factors taken from the perspective of an uninformed investor. The factors are: the probability of an insider having information when they trade, the probability of the information being good or bad, the probability of insiders trading when they have information and also when they do not. As explained in section three, direct measures of probabilities are difficult to assess and as a result indirect measures are used.

Before an analysis of any linkage is carried out, it is useful to ascertain how insiders perform in general for our sample of trades. Table 5.2, panel A provides cumulative abnormal returns of insider buy and sell trades around the transaction date for the full sample period. A standard market model event study is carried out on daily firm returns for the period 120 days before an insider trade to ten days after a trade. A longer event window prior to the transaction (120 days) than after (10 days) is required. This is because of the pre-event window being used as an explanatory variable proxying for information in the first test. The established pattern of insiders buying after poor firm performance and selling after positive performance is clearly evident in our results. Moreover, insiders are shown to earn substantial abnormal returns from their investment decisions. When the sample is split into two distinct periods, the same pattern is present as for the full sample period. The only exception is that post-trade performance of insider sales is negative (and significant) during the period January 1994 to March 1997.

To test the proposition, a cross-sectional regression of post trade performance on three explanatory variables is carried out. The dependent variable is taken to be the cumulative abnormal return spanning the day of the trade to ten days after. A short window is used because of previous evidence in chapter two on the performance of insider trading indicating that the market reacts swiftly to insider trading activity. Three independent variables are included in the model. The first variable, the probability of an insider having private information when they trade, is proxied by the cumulative abnormal returns on the insider's firm 120 days to 1 day before the trade. Insiders, who are exploiting informational advantages, would be likely to trade in an opposite direction to market trends if these are in disagreement with the insiders' beliefs. Therefore, it could be argued that insiders who buy after bad performance and sell after a period of strong performance are doing so on the basis of private information. To strengthen the information signal, I also include a multiplicative dummy variable that is equal to the pre-trade cumulative abnormal return if it is greater than one standard deviation away from the mean cumulative abnormal return of the sample and zero otherwise. This allows for the fact that insider trading which takes place after strong negative or positive share price performance is more likely to be informed. The second explanatory variable in the model is trade size. This is defined as the percentage change in the insider's pre-trade holdings. I use this measure to proxy for information being good or bad because of its connotations with insider beliefs. If an insider changes his or her holdings by a large proportion, it is likely that their information is stronger than one that only slightly adjusts their holdings. The third variable is based on an estimate of past insider trading performance in their own company. The measure used is the

average post-trade abnormal performance over all insider trades in the sample period for the insider's firm. The use of a sample period to estimate performance is based on an assumption that insider trading performance is constant in a firm. In some firms, insiders may trade frequently on information whereas in other firms, house rules affecting employee trading in company securities may constrain the opportunities open to insiders. The correlation matrix of the explanatory variables is provided in table 5.3 for insider purchase and sale transactions separately. All the measures appear to be linearly independent of the others with the exception of buy trades where post-trade performance is negatively related to the pre-trade performance multiplicative dummy variable.

In table 5.4, results are presented for a cross-sectional ordinary least squares regression on post trade performance (for the period spanning September 1991 to December 1993) against the three factors determined to be most significant in predicting performance in addition to non-linear interaction effects. For insider buy trades, the model correctly predicts the signs of five from seven coefficients discussed in section 5.2. Moreover, two of the original variables (trade size and insider trading performance in the firm) are significant to at least the 5% level using whitened standard errors. The interactive effects provide further insight. The pre-trade price performance variable combines with the two other original variables to become significant at explaining post trade cumulative abnormal returns in the direction postulated by the model. The picture that the model depicts for insider buy trades is that the most informed decisions can be detected by examining the performance of other insider trading in the firm and the size of the trade with respect to the insider's holdings. The signal can be further sharpened when these variables

are analysed with respect to the cumulative abnormal returns on the firm's equity in the months prior to the trade. The more negative the cumulative abnormal returns, the more likely that in conjunction with large trade size and other insider trading performance in the firm, the post trade returns will be positive.

The results for insider sales are disappointing. Although the model correctly predicts the signs of five from seven coefficients, only one explanatory variable with the correct sign is effective at explaining the post-insider sale performance. In addition, an interactive effect (trade size times performance of other insider trades in the firm) is significant at the 10% level but with the opposite sign to that predicted. Similar to insider buy trades, the performance of other insider trades in the firm is significant in the model. How can these results for insider sell trades be explained? The only satisfactory reason for the poor performance of the model with insider sales, concerns the nature of post trade performance subsequent to sell trades in general. When investors sell shares, their investment decision is with respect to how much their investment has appreciated in relation to the price at which they acquired their holding. As such, the performance of the firm's shares after the sell trade may not be important to an investor. In addition, with the short sale constraints that are present in UK, even if insiders had information they would not be able to take advantage of their position if they had not enough shares. Thus the preponderance of insider sells in the UK are likely to be liquidity motivated causing the model to be less accurate than would otherwise be the case without short sale constraints.

In the final part of the analysis, I devise an investment strategy based on insider trading signals to determine whether abnormal returns can be earned from using this

type of information when trading. Given the model parameters estimated in section 5.4 and presented in table 5.4, I take a signal to buy or sell as dependant on criteria being met by specific insider trades. For insider buy transactions, a follower should buy if cumulative abnormal returns for six months before the trade were less than the mean abnormal return for the sample minus one standard deviation. This is based on the variable $DCAR_{t-120:t-1}$, and represents insiders buying after sustained negative share price performance in the firm. The second criteria that must be met is for the holdings of the insider to be at least doubled as a result of the trade. This is to proxy for the strength of the signal and corresponds to the *TradeSize* variable in the model. The third and final criteria is for all insider trading activity in the firm during the estimation period (1991 to 1993) to experience, on average, positive cumulative abnormal returns over ten days following each trade. This last decision is constructed around the *Performance* variable and based on insiders in firms having good track records from their trades. For insider sale trades, an investor should sell after sustained positive performance over the six month period immediately prior to the insider trade ($DCAR_{t-120:t-1}$); when the holdings of the insider have more than halved as a result of the trade (*TradeSize*) and the average performance of all insider trades in the firm during the estimation period (1991 to 1993) is negative (*Performance*).

Table 5.5, panel A presents the ten-day cumulative abnormal returns to trading strategies where the follower is able to react on the day of the insider trade. When investors follow insider buy trades using any of the variables we predict to be important, the trading strategy earns quite striking abnormal returns. Even when incorporating the interaction effects as suggested by the estimated model, abnormal

returns can still be earned. All returns are significant for each criteria. As expected, insider sell trades are not associated with such large returns. Consistent with the model constructed in the estimation period, the only factor that appears to be significant is the average performance of insider sales during 1991 to 1993. This would indicate that the overall level of insider performance in firms is more important than previously suspected.

The cumulative abnormal returns earned from the trading strategy in panel A are effectively the returns that insiders would earn from their own trades. Usually, corporate insider dealings are reported to the market with a lag of between one and five days. Regulation in the UK requires that directors notify their company within five days of trading in their company's securities who must then notify the stock exchange with one day of being notified by the director. Thus, it is possible that followers may not know of an insider trade until several days after the trade itself. Panels B and C report cumulative abnormal returns to trading strategies where the follower trades on insider trading information with a lag of five days and ten days respectively. Even with the imposed lags, the trading strategy earns significant cumulative abnormal returns. However, in general the magnitude of the returns earned from the strategy is decreasing with the lag in reacting to the trade. In addition, transaction costs have not been incorporated into the analysis and it is possible that with the ten-day lagged strategy (panel C) the cumulative abnormal returns would be insignificant or even negative once these costs were accounted for.

5.5 Conclusions

The model of investment returns following corporate insider trading which has been developed in this chapter shows that the post-trade share price performance is increasing in the probability of an insider having information when they traded, the strength of the information and whether it is good or bad, and the tendency of the insider to trade when they have information and when they do not. The model suggests that given knowledge of these factors, excess returns can be earned from strategies mimicking the trade.

Empirical results using a sample of director trades in companies listed on the London Stock Exchange in the period between September 1991 to December 1993 strongly support the main predictions of our model. In addition, I document significant interaction effects between the three explanatory variables. Differences exist in the success of the model explaining post-trade cumulative abnormal for buys and sells. While the model is extremely good at explaining price movements after insider buy trades (adjusted R^2 is equal to 0.3) it is less impressive with sales. The main reason for this is possibly the short-sale constraints that are in place on the London Stock Exchange and as a result most sales are liquidity motivated.

I then devised a trading strategy based on the model and tested it using director transactions data for the period January 1994 to March 1997. The determinants of insider trading performance were found to be stable between the two periods and with insider buy trades, significant positive abnormal returns were earned for various

combinations of the three variables postulated in the model as being important. Even when response lags were introduced, the trading strategy was still profitable.

The main contribution of this chapter is that I have developed a model which explicitly takes into account the factors that uninformed investors perceive as being important with respect to insider trading activity. In this context, three new variables have been introduced to the literature based on the model. These are the pre-trade price performance of the firm, the trade size with respect to the insider's own holdings and the performance of other insider trades in the firm. They are particularly effective in explaining price movements subsequent to insider buy trades.

5.6 Appendix

Proof of Proposition 1.

Taking the first situation of the probability of a high terminal value following positive insider trading, Bayes' rule states:

$$P(\bar{S} | +ve) = \frac{P(+ve | \bar{S})P(\bar{S})}{P(+ve)} \quad (A1)$$

The unconditional probability of a high terminal value is $P(\bar{S}) = \eta(1 - \delta)$ and the conditional probability of a positive insider trade given good news is $P(+ve | \bar{S}) = \alpha_{\bar{S}}$. The unconditional probability of a positive insider trade is

$P(+ve) = \eta(1 - \delta)\alpha_{\bar{S}} + (1 - \eta)\tau_1$. This leads to:

$$P(\bar{S} | +ve) = \frac{\alpha_{\bar{S}}\eta(1 - \delta)}{\alpha_{\bar{S}}\eta(1 - \delta) + (1 - \eta)\tau_1} \quad (A2)$$

A similar argument applies to deriving the probability of a low terminal value following negative insider trading.

$$P(\underline{S} | -ve) = \frac{P(-ve | \underline{S})P(\underline{S})}{P(-ve)}; \quad (A3)$$

$$P(\underline{S}) = \eta\delta; \quad (A4)$$

$$P(-ve | \underline{S}) = \alpha_{\underline{S}}; \quad (A5)$$

$$P(+ve) = \eta\delta\alpha_{\underline{S}} + (1 - \eta)\tau_2. \quad (A6)$$

$$\text{It follows that } P(\underline{S} | -ve) = \frac{\alpha_{\underline{S}}\eta\delta}{\alpha_{\underline{S}}\eta\delta + (1 - \eta)\tau_2}. \quad (A7)$$

Table 5.1 – Sample Description*Panel A - Corporate Insider Trading Data^a*

	Full Sample	
Number of Companies	1,350	
Mean Market Value (£m)	548	
Mean Daily Volume (£m)	699	
	<i>Insider Buy</i>	<i>Insider Sell</i>
Number of Transactions	4,088	3,708
Mean Transaction Value	70,004	667,973
Median Transaction Value	20,000	92,125
Average Transaction Price	£1.74	£3.21

^a Insider trading data is collected from Directorwatch database and consists of all trades by UK company directors in the equities of their own firm. The full sample consists of all insider trades whereas the option sample consists of all insider trades in firms that have traded options.

Table 5.2 – Insider Trading Performance for Sample*Panel A:**Cumulative abnormal returns around insider trading – Period September 1991 to March 1997^a*

	$CAR_{t-120:t-1}$	$CAR_{t:t+10}$
Insider Buy Trades	-10.38% (-11.39*)	6.34% (19.79*)
Insider Sell Trades	12.53% (20.63*)	-0.24% (-1.61)

*Panel B:**Cumulative abnormal returns around insider trading – Period September 1991 to December 1993^a*

	$CAR_{t-120:t-1}$	$CAR_{t:t+10}$
Insider Buy Trades	-11.68% (-8.15*)	7.21% (13.84*)
Insider Sell Trades	15.31% (17.32*)	0.20% (0.94)

*Panel C:**Cumulative abnormal returns around insider trading – Period January 1994 to March 1997^a*

	$CAR_{t-120:t-1}$	$CAR_{t:t+10}$
Insider Buy Trades	-6.97% (-8.58*)	5.04% (19.50*)
Insider Sell Trades	9.40% (14.46*)	-0.47% (-2.69*)

^a Standard event study methodology is carried out to determine insider trading abnormal returns before and after transaction date. For each insider trade, a market model regression is carried out on insider's company returns for the period 480 days to 121 days before the trade. The market model parameters are then used to estimate abnormal returns for the period 120 days before to 10 days after the insider trade. Test statistic, in parenthesis, is the standardised cross-sectional t-test of Boehmer, Musumeci and Poulsen (1992). * denotes statistical significance at the 5% level.

Table 5.3 – Correlation tables for trade variables used in regression analysis of insider trading performance

	$CAR_{t-120:t-1}$	$DCAR_{t-120:t-1}$	% Change in Holdings	Mean $CAR_{t:t+10}$ over all insider trades in firm
<i>Panel A: Insider Buy Trades^a</i>				
$CAR_{t-120:t-1}$	1			
$DCAR_{t-120:t-1}$	0.700	1		
% Change in Holdings	-0.015	0.005	1	
Mean $CAR_{t:t+10}$ over all insider trades in firm	-0.043	-0.173	0.003	1
<i>Panel B: Insider Sell Trades^a</i>				
$CAR_{t-120:t-1}$	1			
$DCAR_{t-120:t-1}$	0.759	1		
% Change in Holdings	0.051	0.083	1	
Mean $CAR_{t:t+10}$ over all insider trades in firm	0.071	0.029	-0.012	1

^a The variables are the cumulative abnormal return in the insider's firm between 120 days to 1 day before the insider trade, $CAR_{t-120:t-1}$; a multiplicative dummy variable, $DCAR_{t-120:t-1}$, that is equal to the cumulative abnormal return in the insider's firm between 120 days to 1 day before the insider trade if the pre-trade cumulative abnormal return is greater than one standard deviation away from the mean sample cumulative abnormal return and zero otherwise; the percentage change in holdings of the director as a result of the trade and the mean cumulative abnormal return of all insider trades in the firm in the period beginning on the day of the insider transaction to ten days after the trade.

Table 5.4 – Determinants of Insider Trading Performance*Panel A: Determinants of post insider trading performance – Period January 1994 – March 1997^a*

Coefficient	Insider Buy Trades	t-ratio	Insider Sell Trades	t-ratio
α	0.035	5.91**	-0.004	-1.22
β_1	0.020	1.50	0.014	1.30
β_2	-0.023	-1.09	0.018	1.03
γ	0.002	1.94**	0.009	1.02
δ	0.324	6.12**	0.189	2.43**
ϕ_1	-0.015	-2.21**	-0.005	-0.14
ϕ_2	-0.432	-6.28**	-0.186	-1.08
ϕ_3	-0.017	-1.52	-0.266	-1.81*
ϕ_4	0.016	0.619	-0.133	-0.41
	<i>Adj – R² = 30.3%</i>		<i>Adj – R² = 2.1%</i>	
	<i>F = 54.01**</i>		<i>F = 3.46**</i>	

^a This panel gives parameter estimates of a cross-sectional regression using ordinary least squares. The model specification is as follows:

$$\begin{aligned}
CAR_{t,t+10} = & \alpha + \beta_1 CAR_{t-120:t-1} + \beta_2 DCAR_{t-120:t-1} + \gamma TradeSize + \delta Performance \\
& + \phi_1 (DCAR_{t-120:t-1} * TradeSize) + \phi_2 (DCAR_{t-120:t-1} * Performance) \\
& + \phi_3 (TradeSize * Performance) + \phi_4 (DCAR_{t-120:t-1} * TradeSize * Performance) + \varepsilon
\end{aligned}$$

where $CAR_{t,t+10}$ is the cumulative abnormal return for each insider trade over the time period t to $t+10$ days after the trade,

$CAR_{t-120:t-1}$ is the cumulative abnormal return for each insider trade over the time period $t-120$ to $t-11$ days before the trade,

$DCAR_{t-120:t-1}$ is a multiplicative dummy variable corresponding to the cumulative abnormal return for each insider trade over the time period $t-120$ to $t-11$ days before the trade multiplied by 1 if $CAR_{t-120:t-1}$ is greater (less) than one standard deviation away from the mean abnormal return for insider buy (less) trades and zero otherwise,

$TradeSize$ is defined as percentage change in holdings and is estimated as the number of shares traded divided by the pre-trade share holding of the dealer and

$Performance$ is the mean abnormal performance for all insider trades (excluding observation) in the insider's firm between t to $t+10$ days.

Standard errors are whitened heteroskedasticity consistent and *,** denotes statistical significance at the 10% and 5% level respectively.

Table 5.5 – Cumulative abnormal returns to followers of insider trades by trade characteristic grouping

<i>Panel A: Trade on Same day as insider, 10 day holding period^a</i>					
Strategy	Insider Buys	t-ratio	Strategy	Insider Sells	t-ratio
$CAR_{t-120:t-1} < \mu_{CAR} - \sigma_{CAR}$	7.46%	7.24*	$CAR_{t-120:t-1} > \mu_{CAR} + \sigma_{CAR}$	0.67%	-1.09
% Change in Holdings > 0.5	7.02%	11.89*	% Change in Holdings > 0.5	-1.31%	-1.95
Mean $CAR_{t:t+10}$ over all insider trades in firm > 0	4.80%	11.17*	Mean $CAR_{t:t+10}$ over all insider trades in firm < 0	-0.80%	-2.92*
$CAR_{t-120:t-1} < \mu_{CAR} - \sigma_{CAR}$ AND % Change in Holdings > 0.5	11.06%	5.09*	$CAR_{t-120:t-1} > \mu_{CAR} + \sigma_{CAR}$ AND % Change in Holdings > 0.5	-3.38%	-1.60
$CAR_{t-120:t-1} < \mu_{CAR} - \sigma_{CAR}$ AND Mean $CAR_{t:t+10}$ over all insider trades in firm > 0	5.90%	4.45*	$CAR_{t-120:t-1} > \mu_{CAR} + \sigma_{CAR}$ AND Mean $CAR_{t:t+10}$ over all insider trades in firm < 0	-0.32%	-0.41
<i>Panel B: Trade five days after insider, 10 day holding period^a</i>					
Strategy	Insider Buys	t-ratio	Strategy	Insider Sells	t-ratio
$CAR_{t-120:t-1} < \mu_{CAR} - \sigma_{CAR}$	4.42%	5.25*	$CAR_{t-120:t-1} > \mu_{CAR} + \sigma_{CAR}$	-0.90%	-1.79
% Change in Holdings > 0.5	3.92%	10.62*	% Change in Holdings > 0.5	-0.69%	-1.79
Mean $CAR_{t:t+10}$ over all insider trades in firm > 0	4.45%	14.13*	Mean $CAR_{t:t+10}$ over all insider trades in firm < 0	-1.00%	-5.01*
$CAR_{t-120:t-1} < \mu_{CAR} - \sigma_{CAR}$ AND % Change in Holdings > 0.5	3.72%	2.69**	$CAR_{t-120:t-1} > \mu_{CAR} + \sigma_{CAR}$ AND % Change in Holdings > 0.5	-3.10%	-2.06*
$CAR_{t-120:t-1} < \mu_{CAR} - \sigma_{CAR}$ AND Mean $CAR_{t:t+10}$ over all insider trades in firm > 0	5.00%	3.52**	$CAR_{t-120:t-1} > \mu_{CAR} + \sigma_{CAR}$ AND Mean $CAR_{t:t+10}$ over all insider trades in firm < 0	-1.04%	-1.60

Panel C: Trade ten days after insider, 10 day holding period^a

Strategy	Insider Buys	t-ratio	Strategy	Insider Sells	t-ratio
$CAR_{t-120:t-1} < \mu_{CAR} - \sigma_{CAR}$	1.48%	2.24*	$CAR_{t-120:t-1} > \mu_{CAR} + \sigma_{CAR}$	-0.78%	-1.86
% Change in Holdings > 0.5	2.15%	6.51*	% Change in Holdings > 0.5	-0.50%	-1.62
Mean $CAR_{t:t+10}$ over all insider trades in firm > 0	2.45%	9.08*	Mean $CAR_{t:t+10}$ over all insider trades in firm < 0	-0.93%	-4.52*
$CAR_{t-120:t-1} < \mu_{CAR} - \sigma_{CAR}$ AND % Change in Holdings > 0.5	1.20%	0.83	$CAR_{t-120:t-1} > \mu_{CAR} + \sigma_{CAR}$ AND % Change in Holdings > 0.5	-2.12%	-1.98*
$CAR_{t-120:t-1} < \mu_{CAR} - \sigma_{CAR}$ AND Mean $CAR_{t:t+10}$ over all insider trades in firm > 0	2.94%	3.37*	$CAR_{t-120:t-1} > \mu_{CAR} + \sigma_{CAR}$ AND Mean $CAR_{t:t+10}$ over all insider trades in firm < 0	-1.54%	-2.00*

^a This table shows cumulative abnormal return to followers of insider trading for different lags in reacting to insider trading activity. Standard event study methodology is carried out to determine follower cumulative abnormal returns for different lags after the insider transaction date. For each insider trade, a market model regression is carried out on insider's company returns for the period 480 days to 121 days before the trade. The market model parameters are then used to estimate abnormal returns for various ten day periods after the insider trade. T-ratio, is the standardised cross-sectional t-test of Boehmer, Musumeci and Poulsen (1992). * denotes statistical significance at the 5% level.

6 Corporate Insider Trading, Tax-Loss Selling and the Turn-of-the-Year Effect

The purpose of this study is to examine the turn-of-the-year effect (also known as the January effect) that is documented for US stocks, on equities listed in the UK. Two main hypotheses have been tested with respect to this anomaly in the US. The most common is the tax-loss-selling hypothesis where traders reduce their holdings prior to the tax year-end in poorly performing firms so that they can realise a tax gain from their capital loss¹. When the new tax year begins, the excess supply of those equities is reduced with the effect that prices revert to their equilibrium levels causing positive abnormal returns in the period. Unfortunately, because of the coincidental clustering of the calendar year-end and the tax year-end in the US, all tests are joint tests of the two year-ends. In the UK, the tax year-end for investors is 5th April.² Thus, the confounding problem that is present in tests of US data can be circumvented and the calendar year-end effect can be separated from the tax year-end effect.

Another explanation for the turn-of-the-year anomaly in the US is the increase in bid-ask spreads of smaller companies caused by a higher level of insider trading in January.³ Insider trading forces market makers to widen the spreads they quote on securities. Consequently, this action would result in an increase in transaction costs that investors are required to pay. Conflicting evidence on the return, bid-ask spread

¹ Lakonishok and Smidt (1984), Keim (1989), Badrinath and Lewellen (1991), Brailsford and Easton (1991) and Griffiths and White (1993) have tested this hypothesis and found a significant turn-of-the-year effect for US stocks.

² This compares with 31st December in the US.

relationship in January has been reported. Whereas Stoll and Whaley (1983) concluded that there was an implied correlation between security returns and bid-ask spreads (and thus increased insider trading), many other studies do not (Schultz, 1983, and Clark, McConnell and Singh, 1992, are examples).

I propose another possible factor for the January effect that is driven by findings in many insider trading studies.⁴ Corporate insiders in both the UK and US are known to outperform other market participants in their trades. Various figures have been reported on the abnormal returns insiders earn on their trades and all, with the exception of Seyhun (1986b) and Lin and Howe (1990) find that they are positive and significant.⁵ In addition, abnormal returns can persist for up to one working month after the trade. As a result, it is possible that the turn-of-the-year effect may be due to increased insider purchasing and decreased insider selling in December. If this occurred, many stocks would exhibit an abnormally high return in January of each year.

The results in this chapter show that there is a significant turn-of-the-year effect in UK equities. Contrary to the US, this effect is equally significant over all firm sizes but is not persistent over time. The effect of tax-loss selling on stock returns is significant but is still less than the January effect. I also test the December insider

³ See Stoll and Whaley (1983), Schultz(1983), Seyhun (1988), Bhardwaj and Brooks (1992), Clark, McConnell and Singh (1992).

⁴ See for example, Lorie and Niederhoffer (1968), Pratt and Devere (1970), Finnerty (1976a, 76b), Baesel and Stein (1979 Canadian evidence), Nunn, Madden and Gombola (1983), Givoly and Palmon (1985), Seyhun (1988b), Lin and Howe (1990), Sivakumar and Waymire (1994), Petit and Venkatesh (1995) and Hillier and Marshall (1997) among others.

⁵ Seyhun (1988b) and Line and Howe (1990) find that insiders earn positive abnormal returns but that they are insignificant.

trading hypothesis and show that there is a greater propensity for insiders to purchase shares in their own company in December with a simultaneous decrease in insider selling in this month. However, insider trading in December appears to have no impact on January returns whatsoever. In short, there appears to be a turn-of-the-year effect for UK equities that is not related to the incidence of corporate insider trading or to tax-loss selling. The anomaly is a calendar year-end effect that is strong but not persistent through time. Together, returns earned in January and the twenty day period subsequent to the tax year-end contribute to over 90% of the returns earned over the whole year.

In the next section, the data used in this study is described. In section 6.2, results from the tests are reported and in section 6.3, I provide a summary of the main findings.

6.1 Data Description

The dataset consists of all company equities traded on the London Stock Exchange from 1st January 1986 to 31st March 1997. Companies that have ceased trading on the exchange have been included in the dataset to ensure that survivorship bias is kept at a minimum. Daily dividend adjusted returns⁶ and firm market values were collected from Datastream.

⁶ Datastream initiated this service in early 1995. All return series were backdated to 1968.

Corporate insider trading data is collected from Directorwatch, a service maintained by Investorcare Publications Ltd. The dataset consists of every transaction undertaken by company insiders⁷ in their own firms from 29th September 1991 to 31st March 1997. Table 6.1 shows that the sample is homogeneous in terms of the average firm size of corporate insiders. The average market value of corporate insiders' firms was £543.30million for purchase transactions and £554.13million for sales transactions. However, it appears that insiders tended to purchase a larger number of shares at lower prices than that which they sold. For example, the average monetary amount of shares purchased by insiders was £70,004 whereas insiders sold a much larger average of £356,793.⁸

6.2 Empirical Results

6.2.1 Seasonality of stock returns

I begin the analysis by testing for a turn-of-the-year effect in UK stock returns. On the first trading day of every month in the test period (1st January 1986 to 31st March 1997) all listed companies are ranked by market value and sorted into ten portfolios. For each monthly size portfolio, the equally weighted daily returns are calculated for the month in which the portfolio was constructed. For example, consider a portfolio of equities formed on 1st March 1997. The daily returns are thus calculated from 1st March to 31st March. The daily returns for each monthly size portfolio are then

⁷ In the UK, the only corporate insiders required to disclose their trades are company directors. Seyhun (1986) reported that of the universe of insiders, company director trades had the most information content. We do not believe that this will cause any bias in our results.

⁸ A more comprehensive and in-depth analysis of the insider trading dataset is given in chapter two.

merged to construct a time series of daily returns for each market value decile for the full period.

For each size decile portfolio, the following model is estimated:

$$R_{it} = \alpha_i + \gamma_i JANDUM + e_{it} \quad (1)$$

where R_{it} is the return on size decile i on day t and $JANDUM$ is equal to 1 if the return observation is in January and 0 in other months. Table 6.2 presents the regression results for each size decile.

It is clear that there is a significant January effect in UK equities and that this effect permeates all firm sizes. However, there appears to be no systematic relationship between firm size and the January effect. For instance, January daily returns for the smallest size companies are on average 0.0909% higher than in other months. This compares with an increase of 0.1083% for the largest size firms. Interestingly, when the month of January is omitted, average daily returns are insignificant for all size portfolios with the exception of the smallest and largest size deciles.

The adjusted R^2 values for the dummy variable regressions are very low and consistently smaller than comparable US studies.⁹ However, the regression F-statistics are significant for each size portfolio. This would imply that although January returns are significantly higher than in other months, there is a substantial amount of noise in the return measurements. Moreover, this analysis uses daily

⁹ As an example, Seyhun (1988a) reports adjusted R^2 values ranging from 17.7% to -0.1%. Their study used size quintiles and monthly returns whereas we use size deciles and daily returns.

returns whereas other studies have used monthly returns which would have a direct impact on the corresponding R^2 values.

It is also of interest to determine whether the turn-of-the-year effect occurs every January or is manifested in only a subset of years in the sample period. Table 6.3 provides results on the turn-of-the-year effect for each size decile over time. OLS regressions were carried out on each size portfolio with the following model:

$$R_{it} = \alpha_i + \gamma_{i1}J86 + \gamma_{i2}J87 + \gamma_{i3}J88 + \gamma_{i4}J89 + \gamma_{i5}J90 + \gamma_{i6}J91 + \gamma_{i7}J92 + \gamma_{i8}J93 + \gamma_{i9}J94 + \gamma_{i10}J95 + \gamma_{i11}J96 + \gamma_{i12}J97$$

where $J\#$ equal to 1 if return observation is in January of year ‘#’ and 0 in all other months. $\# = 86,87,\dots, 96,97$.

It appears that the January effect does not persist every year. In the twelve year sample period, five of the twelve years exhibit the anomaly. In one year, 1991, the turn-of-the-year effect is actually reversed with significantly smaller returns in January. It is also interesting to note that in the last three years of the test period, there appear to be no significant excess January returns in most firms. In addition, the regression model for the largest size portfolio shows that there is a January effect in only two years of the test period and that they occurred near the beginning of the test period. From the general trend exhibited in table 6.3, there appears to be very slight evidence that the turn-of-the-year anomaly is related to firm size. However,

this is anecdotal and in no way approaches the magnitude of the relationship exhibited for US firms.

The adjusted R^2 statistics (not reported here) for the annual January regressions are slightly larger than the full period January regression adjusted R^2 values and vary around 1%. However, there is still a significant level of noise unexplained by the regression parameters. Model F-statistics are significant for each size portfolio.

6.2.2 *Tax-loss selling hypothesis*

In the UK, the financial tax year-end is 5th April. If the tax-loss selling hypothesis is true, investors would sell poorly performing stocks prior to this date. After the year-end date has passed, excess supply would fall to a normal level causing prices to rise quickly to equilibrium levels. The section tests the tax-loss selling hypothesis using regression analysis to examine the stock return behaviour of firms, one working month after the tax year-end. For each size decile portfolio, the following model is estimated:

$$R_{it} = \alpha_i + \gamma_{i1}JANDUM + \gamma_{i2}TAXDUM + e_{it}$$

where $TAXDUM$ is equal to 1 when the return observation is within twenty working days after the tax year-end date and 0 on all other days.

$JANDUM$ is equal to 1 when the return observation is in January and 0 on all other days.

Results from the analysis are provided in table 6.4. In eight out of the ten market value portfolios, the tax year-end dummy is significantly positive and there appears to be excess returns in the twenty days after the tax year-end. This result is consistent with the hypothesis that investors reduce their holdings in poorly performing stocks to realise a tax gain. However, the anomaly affects all firm sizes with the exception of the largest firms.

Interestingly, the calendar turn-of-the-year effect remains significantly positive and has a stronger impact on average returns than the tax year-end effect. For each size decile, average returns are larger in January than in the twenty working days after the tax-year end. Moreover, January returns are significantly higher than other months for every size portfolio. The only portfolio where average daily returns outwith the two test months are significantly positive is that consisting of the smallest companies in the market. F-statistics and adjusted R^2 values are similar to the simple January dummy variable model reported in table 6.2.

These results are consistent with studies in the US that have tested the tax-loss selling hypothesis. However, whereas US tests suffer from a confounding effects problem due to a coincidental clustering of the tax year-end and the calendar year-end, this study is able to separate both anomalies.

6.2.3 December insider trading hypothesis

I now investigate whether increased insider purchasing and decreased insider selling in December causes January excess returns. Since the insider trading database only covers the years 1991 through to 1997, the analysis in this section is constrained to this period.

The distribution of corporate insider trades throughout the year is reported in table 6.5. In the period under investigation, insiders purchased more than sold shares in their company in the later months of the year. In December there are on average twenty percent more insider purchases than sales. In January, insider purchases fall to 20% lower than sales. This dramatic change in the distribution of insider purchases and sales could be a factor in the large calendar year-end effect.

The hypothesis that insiders are causing the January excess returns is tested by estimating the parameters of the following model through regression analysis:

$$R_{it_1} = \alpha_{it_1} + \gamma_{it_1} ITDUM + e_{it_1}$$

where R_{it_1} is the January monthly return of firm i in year t . $t = 92,93,94,95,96,97$.

$ITDUM$ is equal to 1 when insiders have purchased shares in the month of December immediately preceding the month of January in year t and $ITDUM$ is equal to 0 when there has been no insider purchases in the preceding December.

In January of each year, all firms are ranked by market value and sorted into deciles giving sixty (6 years x 10 deciles) portfolios in total. For each *firm*, the January monthly return in each year is calculated together with the corresponding value of *ITDUM*. Model (4) is then estimated for each size decile.

The results in table 6.6 suggest that there is no December insider trading effect. After incorporating insiders' purchases that occurred in December, there is still a large and significant turn-of-the-year effect on equity returns. In no size portfolio, with the exception of the smallest companies, is there even a significant impact from corporate insider trading. Thus insider buying in December appears to have no power in explaining excess returns in January.

This is surprising given the pronounced seasonality in corporate insider trading around the turn of the year. However, several factors may be causing the lack of significance in the insider trading dummy. The length of the insider trading period may be too short. In the years that corporate insider trading data is available, the January effect is in evidence for only two years (1993 and 1994). In addition, the number of insider buy transactions may be low in each market value decile causing the significance of the dummy variable to be deflated. From table 6.5, the mean number of firms where there were insider purchases in the month of December is 40. This would average to approximately 24 insider buy observations (4.0x6 years) per regression.

6.3 Summary and Conclusions

In this chapter, several hypotheses are tested concerning the turn-of-the-year effect in UK equities. The study is important in that the calendar year-end effect was separated from the tax year-end effect to determine if the January excess returns, as recorded in the US, were due to tax-loss selling. If tax related trading was the only factor causing the January effect in the US, then there should be no excess returns at the turn of the year in the UK since their tax year-end is in April.

I found that there was a January effect in the UK that influenced all companies' returns in the market. However, it was not persistent and occurred in only five years between 1986 and 1997. Thus the hypothesis that tax-loss selling was the sole determinant of the January effect was rejected. However, I did find evidence of excess returns in the twenty day period after the UK tax year-end that was consistent with the hypothesis.

A new hypothesis that is driven by the insider trading literature was also tested. It posited that the turn-of-the-year effect on security returns was caused by abnormal insider buying activity in December. Although there was substantial evidence of a turn-of-the-year seasonality in corporate insider trading, the December insider trading hypothesis was convincingly rejected for all companies in the sample. Corporate Insider trading activity in December had only a negligible effect in excess January returns. A caveat is connected to the testing of this hypothesis however because of

the limitations of the corporate insider trading dataset. With a longer record of insider transactions, tests would be considerably stronger.

To conclude, there is a turn-of-the-year effect in company returns that is unrelated to either tax-loss selling or corporate insider trading activity. Although it is still unknown what causes the anomaly, this study has provided some insight into what does not cause it. Future research should now discount these factors and look to other explanations for the puzzle.

Table 6.1. Corporate Insider Trading Sample Descriptive Statistics

	Insider Purchases	Insider Sales
Number of Trades	4,088	3,708
Mean Market Value of Insiders' Firms	£543.30million	£554.13million
Mean Number of Shares Traded	103,714	356,793
Mean Volume of Shares Traded	£70,004	£667,973

Table 6.2. OLS Regression Results of Daily Stock Returns on a January**Dummy Variable.**

The estimated equation is:

$$R_{it} = \alpha_i + \gamma_i JANDUM + e_{it}$$

where R_{it} is the return on size decile i on day t and $JANDUM$ is equal to 1 if the return observation is in January and 0 in other months. Every month in the test period (1st January 1986 to 31st March 1997), all equities were ranked on market value and sorted into ten equally numbered portfolios. Equally weighted daily returns were calculated for the month in which the portfolio was constructed to generate a continuous time series of daily returns for each size decile. Test statistics are in parenthesis. ** rejects null hypothesis of parameter = 0 at 5% level of significance, * rejects null at 10% level of significance.

Market Value Decile	α_i	γ_i	Adjusted R^2	F-Statistic	p-Value
Smallest	0.0385% (4.04)**	0.0918% (2.91)**	0.36%	8.419	0.004
2	0.0148% (1.48)	0.0936% (2.82)**	0.35%	7.935	0.005
3	0.0085% (0.81)	0.1095% (3.15)**	0.37%	9.896	0.002
4	0.0107% (1.00)	0.1262% (3.56)**	0.43%	12.657	0.000
5	0.0085% (0.83)	0.1282% (3.80)**	0.54%	14.423	0.000
6	0.0106% (1.22)	0.1172% (4.04)**	0.66%	16.300	0.000
7	0.0124% (1.25)	0.1327% (4.03)**	0.65%	16.214	0.000
8	0.0126% (1.22)	0.1412% (4.09)**	0.67%	16.757	0.000
9	0.0178% (1.55)	0.1327% (3.47)**	0.47%	12.039	0.001
Largest	0.0286% (1.86)*	0.1083% (2.12)**	0.24%	4.506	0.034

Table 6.3. OLS Regression Results of Daily Stock Returns on Annual January Dummy Variables.

The estimated equation is:

$$R_{it} = \alpha_i + \gamma_{i1}J86 + \gamma_{i2}J87 + \gamma_{i3}J88 + \gamma_{i4}J89 + \gamma_{i5}J90 + \gamma_{i6}J91 + \gamma_{i7}J92 + \gamma_{i8}J93 + \gamma_{i9}J94 + \gamma_{i10}J95 + \gamma_{i11}J96 + \gamma_{i12}J97$$

where R_{it} is the return on size decile i on day t and $J\#$ is equal to 1 if the return observation is in January of year ‘#’ and 0 in other months. Every month in the test period (1st January 1986 to 31st March 1997), all equities were ranked on market value and sorted into ten equally numbered portfolios. Equally weighted daily returns were calculated for the month in which the portfolio was constructed to generate a continuous time series of daily returns for each size decile. Test statistics are in parenthesis. ** rejects null hypothesis of parameter = 0 at 5% level of significance, * rejects null at 10% level of significance.

Market Value Decile	α	J86	J87	J88	J89	J90	J91	J92	J93	J94	J95	J96	J97
Smallest	0.0385% (4.06)**	0.1082% (1.03)	0.1726% (1.64)*	0.2390% (2.23)**	0.2095% (2.00)**	-0.0310% (-0.30)	-0.2356% (-2.29)**	-0.0305% (-0.30)	0.3746% (3.49)**	0.4227% (3.94)**	-0.0543% (-0.52)	-0.0385% (-0.38)	0.0335% (0.33)
2	0.0148% (1.49)	0.1438% (1.31)	0.2696% (2.45)**	0.2892% (2.57)**	0.2490% (2.26)**	-0.1022% (-0.95)	-0.2811% (-2.61)**	-0.1360% (-1.26)	0.2464% (2.19)**	0.4027% (3.58)**	-0.0821% (-0.75)	0.0565% (0.52)	0.1334% (1.24)
3	0.0085% (0.81)	0.1459% (1.26)	0.3008% (2.60)**	0.2849% (2.41)**	0.2649% (2.29)**	0.0432% (0.38)	-0.2190% (-1.94)*	-0.0343% (-0.30)	0.2367% (2.00)**	0.3547% (3.00)**	-0.1076% (-0.93)	0.0168% (0.15)	0.0822% (0.73)
4	0.0107% (1.00)	0.1413% (1.20)	0.2965% (2.52)**	0.2387% (1.98)**	0.3162% (2.69)**	-0.0289% (-0.25)	-0.2261% (-1.96)**	-0.0487% (-0.42)	0.2988% (2.48)**	0.3872% (3.21)**	-0.0325% (-0.27)	0.0799% (0.69)	0.1490% (1.29)
5	0.0085% (0.83)	0.1089% (0.97)	0.3931% (3.51)**	0.2527% (2.20)**	0.2732% (2.44)**	-0.0131% (-0.12)	-0.1988% (-1.81)*	-0.0464% (-0.42)	0.2973% (2.59)**	0.3509% (3.06)**	-0.0571% (-0.51)	0.0804% (0.73)	0.1516% (1.38)
6	0.0106% (1.22)	0.0491% (0.51)	0.2934% (3.05)**	0.3223% (3.27)**	0.2773% (2.88)**	-0.0186% (-0.20)	-0.1727% (-1.83)*	0.0007% (0.01)	0.2307% (2.34)**	0.3273% (3.32)**	-0.1228% (-1.28)	0.0951% (1.01)	0.1717% (1.82)*
7	0.0124% (1.26)	0.1258% (1.15)	0.3125% (2.86)**	0.2418% (2.16)**	0.3590% (3.28)**	0.0158% (0.15)	-0.2066% (-1.93)*	0.0040% (0.04)	0.2568% (2.29)**	0.3410% (3.05)**	-0.0737% (-0.67)	0.0797% (0.74)	0.1834% (1.71)*
8	0.0126% (1.22)	0.1743% (1.52)	0.3258% (2.84)**	0.2470% (2.11)**	0.3917% (3.42)**	-0.0097% (-0.09)	-0.1476% (-1.32)	0.0437% (0.39)	0.2649% (2.26)**	0.3103% (2.65)**	-0.1180% (-1.03)	0.1029% (0.92)	0.1524% (1.36)
9	0.0178% (1.55)	0.1116% (0.88)	0.3372% (2.65)**	0.2470% (1.90)*	0.4494% (3.53)**	-0.0953% (-0.77)	-0.1355% (-1.09)	0.1343% (1.08)	0.1302% (1.00)	0.3147% (2.42)**	-0.1148% (-0.90)	0.1127% (0.91)	0.1371% (1.10)
Largest	0.0286% (1.86)*	0.0826% (0.49)	0.3792% (2.23)**	0.2045% (1.18)	0.5047% (2.97)**	-0.1453% (-0.88)	-0.0392% (-0.24)	0.1450% (0.87)	0.0209% (0.12)	0.2229% (1.28)	-0.1560% (-0.92)	0.0578% (0.35)	0.0499% (0.31)

Table 6.4. OLS Regression Results of Daily Stock Returns on January and Tax year-end Dummy Variables.

The estimated equation is:

$$R_{it} = \alpha_i + \gamma_{i1}JANDUM + \gamma_{i2}TAXDUM + e_{it}$$

where R_{it} is the return on size decile i on day t . $JANDUM$ is equal to 1 if the return observation is in January and 0 in other months and $TAXDUM$ is equal to 1 if the return observation is within twenty working days after the tax year-end date and 0 on all other days. For every month in the test period (1st January 1986 to 31st March 1997), all equities were ranked on market value and sorted into ten equally numbered portfolios. Equally weighted daily returns were calculated for the month in which the portfolio was constructed to generate a continuous time series of daily returns for each size decile. Test statistics are in parenthesis. ** rejects null hypothesis of parameter = 0 at 5% level of significance, * rejects null at 10% level of significance.

Market Value Decile	α_i	γ_{i1}	γ_{i2}	Adjusted R ²	F-Statistic	p-Value
Smallest	0.0326% (3.27)**	0.0976% (3.08)**	0.0667% (1.99)**	0.42%	6.189	0.002
2	0.0080% (0.77)	0.1004% (3.01)**	0.0773% (2.19)**	0.44%	6.376	0.002
3	0.0003% (0.03)	0.1177% (3.37)**	0.0925% (2.50)**	0.57%	8.091	0.000
4	0.0044% (0.39)	0.1325% (3.72)**	0.0925% (2.50)**	0.65%	8.130	0.000
5	0.0035% (0.33)	0.1332% (3.93)**	0.0569% (1.59)	0.66%	8.474	0.000
6	0.0042% (0.46)	0.1236% (4.24)**	0.0732% (2.37)**	0.72%	10.976	0.000
7	0.0057% (0.55)	0.1394% (4.21)**	0.0761% (2.17)**	0.72%	10.479	0.000
8	0.0049% (0.45)	0.1489% (4.30)**	0.0877% (2.40)**	0.83%	11.262	0.000
9	0.0111% (0.92)	0.1394% (3.63)**	0.0768% (1.89)*	0.56%	7.814	0.000
Largest	0.0217% (1.35)	0.1152% (2.25)**	0.0785% (1.45)	0.26%	3.303	0.037

Table 6.5. Distribution of insider trades by year and month

No. Firms	1350			
	Full Sample	Buy Trades	Sell Trades	% Buy of Total
No. Transactions	7796	4088	3708	52.44%

Distribution of Insider Trades by Year

1991 (from 17/09)	774	529	245	68.35%
1992	1479	810	669	54.77%
1993	1133	454	679	40.07%
1994	1213	657	556	54.16%
1995	1297	663	634	51.12%
1996	1485	747	738	50.30%
1997 (to 31/03)	415	228	187	54.94%

Mean No. Insider Transactions per Month

January	102.50	47.67	54.83	46.50%
February	89.00	36.00	53.00	40.45%
March	145.67	76.50	69.17	52.52%
April	126.00	46.20	79.80	36.67%
May	88.00	32.40	55.60	36.82%
June	111.40	53.40	58.00	47.94%
July	86.40	52.60	33.80	60.88%
August	78.20	43.40	34.80	55.50%
September	125.17	73.17	52.00	58.46%
October	127.17	73.33	53.83	57.67%
November	141.67	85.83	55.83	60.59%
December	159.67	98.83	60.83	61.90%

Mean No. Firms Traded by Insiders per Month

Buy/Sell ratio

January	49.67	25.17	30.83	0.8164
February	40.83	17.00	28.00	0.6071
March	57.67	31.33	35.33	0.8867
April	61.80	25.00	42.00	0.5952
May	45.80	17.20	32.40	0.5309
June	52.80	26.80	31.60	0.8481
July	40.00	22.00	20.00	1.1000
August	37.80	19.80	20.80	0.9519
September	59.50	34.50	32.17	1.0724
October	64.33	35.50	34.83	1.0192
November	61.67	37.50	30.83	1.2163
December	65.83	40.67	32.67	1.2449

Table 6.6. OLS Regression Results of January Returns on a December Insider Purchasing Dummy Variable.

The estimated equation is:

$$R_{it} = \alpha_i + \gamma_i ITDUM + e_{it}$$

where R_{it} is the monthly return on firm i in January of year t and $ITDUM$ is equal to 1 if an insider traded in company i in the month of December in year $t-1$. On the 1st of January of each year in the test period (1st January 1986 to 31st March 1997), all equities were ranked on market value and sorted into ten equally numbered portfolios. Test statistics are in parenthesis. ** rejects null hypothesis of parameter = 0 at 5% level of significance, * rejects null at 10% level of significance.

Market Value Decile	α_i	γ_i	Adjusted R ²	F-Statistic	p-Value
Smallest	4.07% (7.20)**	-11.12% (-2.12)**	0.53%	4.487	0.034
2	3.17% (6.95)**	-4.59% (-1.41)	0.23%	1.984	0.159
3	3.31% (7.87)**	2.93% (1.07)	0.16%	1.149	0.284
4	3.64% (8.25)**	-0.19% (-0.05)	0.09%	0.003	0.960
5	3.73% (8.36)**	0.23% (0.08)	0.07%	0.007	0.932
6	3.81% (9.10)**	7.18% (1.83)*	0.34%	3.362	0.067
7	3.28% (9.29)**	0.82% (0.30)	0.04%	0.092	0.761
8	3.87% (10.23)* *	-1.12% (-0.48)	0.05%	0.235	0.628
9	4.63% (13.09)* *	-1.62% (-0.79)	0.13%	0.631	0.427
Largest	4.09% (13.10)* *	0.62% (0.41)	0.06%	0.171	0.68

7 Dealer Inventory Control When Corporate Insiders Trade

The purpose of this study is to examine the impact of an unanticipated event (corporate insider trading) on the inventory control behaviour of dealers in a competitive dealership market. Whilst there is substantial evidence indicating that the arrival of new information can affect prices in dealer markets, recent research has found that the price setting behaviour of dealers can also be affected by inventory considerations [Snell and Tonks (1995), Hansch, Naik, and Viswanathan (1998)]. However, no study has as yet empirically investigated the dynamic interaction between new information arrival, dealer inventory control and quote setting behaviour. This is the focus of the analysis carried out in this chapter.

The main tests centre on the reaction of dealers to unanticipated information events through their inventory control, and how they incorporate that information into their quote setting behaviour. I investigate several testable hypotheses in this context. Upon the unexpected arrival of new information, the adverse selection and inventory risks facing dealers would arguably increase because of the presence of skilled and informed investors. This would result in greater information asymmetries in the market. To protect themselves against losing out to better informed traders, it has been suggested that dealers change their inventory control strategies by increasing spreads and decreasing market depth [Lee, Muchlow and Ready (1993)]. In addition, inflated volatility of returns and/or trading volume may also increase inventory risks facing

dealers. It is expected that these factors would all directly contribute to a predictable change in the inventory control strategies of dealers. The extent to which these risks are circumvented may also depend upon the existence of alternative risk management mechanisms such as traded American Depository Receipts (ADR) or exchange traded options. The potential for offloading some of the risk in dealer portfolios through taking positions in these instruments may affect the inventory control behaviour of dealers and as such I investigate the effect each mechanism may have.

The dynamic inventory control strategies of dealers subsequent to new information arriving in the marketplace may be investigated in several ways. Madhavan and Smidt (1993) and Hasbrouck and Sofianos (1993) for NYSE specialists, and Hansch, Naik and Viswanathan (1997) for LSE market makers, have reported systematic mean reversion in dealer inventories. Their tests are extended by investigating the change in mean reversion subsequent to new information arrival. Greater mean reversion in dealer inventories after new information flows into the market is symptomatic of higher perceived inventory risks by dealers and is consistent with the theoretical models of Amihud and Mendelson (1980), Ho and Stoll (1981, 1983) and Biais (1993).

The notion that dealers actively adjust their inventory control strategies to avoid higher inventory risks can be developed further by examining their activities in the inter-dealer market. Inter-dealer trading is an important aspect of the LSE (representing about one-quarter of total turnover) however, relatively little is known about why dealers participate in this market. Two recent studies [Reiss and Werner (1997); Hansch, Naik

and Viswanathan (1998)] have provided some insight by reporting that inter-dealer trading occurs when dealers have higher than normal inventories. Given that the inter-dealer market could also be used to share risks in periods of high asymmetric information, I investigate whether the proportion of inter-dealer trades to public trades increases when unexpected information arrives in the market.

Another technique that dealers may use is the active manipulation of bid and ask quotes [Morse and Ushman (1983); Venkatesh and Chiang (1986); Skinner (1991); Lee, Muchlow and Ready (1993); Rubio and Tapia (1996); Gajewski (1996); Amin and Lee (1997)]. When inventory risks are large and/or asymmetric information is evident, the depth of a market may decrease and prices become more sensitive to the size of an order [Kyle (1985); Glosten and Harris(1987); Brennan and Subramanyam (1997)]. I directly test this proposition by estimating the change in market depth as measured by a modified Kyle's lambda in the period around the arrival of new information.

The specific information event that is investigated is cases of trading by company insiders. This is a particularly interesting event to study in connection with dealer inventory control behaviour for several reasons. First, there is substantial evidence that insiders outperform other investors and earn abnormal profits when they trade in the securities of their own company [Jaffe (1974); Seyhun (1988); and chapter two of this thesis]. Moreover, in chapter two, I have reported that prices are likely to change on the day of a corporate insider trade even though it is not reported to the public until the next day at least. It could be argued that adverse selection risks and inventory risks will grow

as a result of the trade. Second, the corporate insider trade is not an exogenous event. An insider's decision to buy or sell may be just as likely to be driven by current mispricing as by long term factors. Thus, the timing of the trade vis-à-vis the dealers' inventory positions and subsequent change in inventory control may be significant. Third Gregory, Matatko, Tonks and Peel (1994) and in chapter two, I report that the majority of profits earned by insiders are by those employed in smaller companies. An analysis of dealer inventories in small and large firms may provide further insight into this finding. Fourth, although corporate insider trades are usually of similar size in comparison to institutional trades [Barclay and Warner (1993) and chapter two of this thesis], the subsequent reaction to the trade by uninformed followers may result in large inventory changes. This proposition has not been investigated in the empirical literature and may provide further insights into the factors motivating price changes subsequent to insider trading. Fifth, corporate insider trading around earnings announcements can provide a double signal to investors on the financial position of the firm. John and Mishra (1990) and John and Lang (1991) develop a model of signalling by corporate insiders around an information event (dividend announcements) and report price changes consistent with their model. I further their research by examining changes in dealer inventories around double signals of corporate insider buy/sell trades and good/bad/neutral earnings announcements. If investors view corporate insider trading in conjunction with earnings announcements as double signals, this will also impact upon dealers' inventories. The extent to which dealers view it as a double signal is also of interest.

The results indicate that dealers change their inventory control behaviour subsequent to unanticipated events (corporate insider trading). Trades by company insiders are accompanied by large changes in dealer inventories in the direction of the trade. That is, inventories significantly increase after a sell trade and significantly decrease after a buy trade. Dealers react to the information by “tightening” their inventory control as evidenced by greater mean reversion of inventories in the ten days after an insider trade. The extent to which dealers use the inter-dealer market as a risk sharing mechanism does not appear to change after the arrival of information. Further, consistent with Chakravarty and McConnell (1997) the insider trade does not precipitate any change in market depth. Finally, the share price movements as a result of corporate insider trading (quoted in many previous studies), disappear once inventory effects are taken into account. The results are consistent with previous research which show that inventory control is actively managed by dealers and provides further evidence on the debate concerning the information content of corporate insider trades.

The remainder of the chapter is organised as follows: section 7.1 discusses the motivation for the empirical tests. In section 7.2, I describe the sample and the data employed. Section 7.3 contains the main tests and reports the sensitivity analyses performed on the results. The conclusions are in section 7.4.

7.1 Background and Motivation

Research into dealer behaviour has commonly fell under the ambit of one of two paradigms. Adverse selection models [Copeland and Galai (1983); Glosten and Milgrom (1985); Kyle (1985); Easley and O'Hara (1987) and Pichler (1991)] view the quote setting behaviour of dealers as a dynamic interplay between informed traders and market makers. To avoid losing out to better informed investors, dealers increase their spreads and recoup their losses by gaining from other less informed investors or liquidity traders. An alternative group of models (known as the inventory control hypothesis) has been developed by Stoll (1978), Amihud and Mendelson (1980), Ho and Stoll (1981, 1983) and Biais (1993). They propose that dealers wish to maintain an optimal inventory level and deviations from this cause them to change their quotes. If dealers have a large positive(negative) deviation in inventory level, they will potentially make their quotes more(less) competitive at the ask and less(more) competitive at the bid.

Substantial interest has been shown in empirically distinguishing between the two competing paradigms. A common thrust of tests have involved the estimation of the components of the bid-ask spread in normal trading conditions [see Glosten and Harris (1988), Stoll (1989), George, Kaul and Nimalendran (1991) and Affleck-Graves, Hegde and Miller (1994)]. The change in dealers' spreads during periods of potential information asymmetry has also been investigated [examples are Morse and Ushman (1983), Venkatesh and Chiang (1986), Lee, Muchlow and Ready (1993), Kim and

Verrechia (1994), Rubio and Tapia (1996), Paperman (1996), Gajewski (1997) and Amin and Lee (1997) for a variety of firm specific announcements].

Studies that have directly examined the inventory control hypothesis are Stoll (1976, 1985), Madhavan and Smidt (1993) and Hasbrouck and Sofianos (1993) for NASDAQ dealers, Ho and Macris (1984) for AMEX option dealers, Working (1977), Silber (1984) and Manaster and Mann (1996) for futures markets, Lyons (1995) for a major foreign exchange dealer and Snell and Tonks (1995) and Hansch, Naik and Viswanathan (1998) for London Stock Exchange dealers. Although these studies make significant contributions, none address the issue of inventory control in periods of information flux. This study aims to plug this gap in the literature and provide empirical evidence on the inventory control of dealers around information events.

Information that is released to the market can be either anticipated beforehand because it is periodic or expected, or unanticipated because it is released without warning. Dealer inventory strategies for each scenario may potentially differ because of the opportunity, or lack of, to anticipate information in the announcement. In this study, I specifically examine unanticipated information events where the event under consideration is taken to be occasions of trading by company insiders.

The analysis of dealer inventories around unexpected information arrival can provide many valuable insights into market microstructure issues. With information that is periodically released to the market - examples are earnings figures or dividend

announcements - dealers have the opportunity to alter their inventory control strategies and incorporate or pre-empt the information contained in the announcement. Although this is an interesting issue and can provide many valuable insights, a more defined analysis of the interaction between information, pricing and inventory control can be undertaken when dealers have not had the opportunity to anticipate the information and act accordingly.

Trading by corporate insiders is chosen to investigate this issue for several reasons. First, there is an abundance of evidence showing that insiders can earn abnormal profits from their trades [see for example Baesel and Stein (1979), Seyhun (1988), Lin and Howe (1990), Meulbroek (1992), Petit and Venkatesh (1995), chapter two of this thesis]. By definition, periods when insiders trade are periods of high asymmetric information. Inventory control strategies and any concomitant changes in strategy as a result of new information arriving in the market can provide important insights into the effect of asymmetric information on the inventory control of dealers.

The only studies to date that have examined the effect of insider trading on any microstructure issue are Lin and Howe (1990) and Chakravarty and McConnell (1997). Lin and Howe (1990) measure the relative spread of stocks in periods before, during and after insider trades for NASDAQ securities and find that they decreased in the two months during and after insider trades. These findings are anecdotally contradicted by Chakravarty and McConnell (1997) who carried out a case analysis of spreads and market depth around trading by Ivan Boesky in Carnation Company stock just prior to

its acquisition by Nestlé S.A. They report that spreads were at most marginally larger for several hours after Boesky traded and market depth actually increased during this time. A potential explanation could be the empirically observed increases in trading volume generally observed prior to mergers and takeovers. This would dominate any effect on spreads or market depth arising from increased adverse selection risks as a result of insider trading. Given the relationship between spread formation and inventory control, an analysis of dealer inventory strategies around corporate insider trading may shed light on these results as well as the more general evidence on large price changes associated with insider trading.

7.2 Sample Description

Aggregate daily inventory data are generated for all stocks traded on the London Stock Exchange for the period 1 August 1994 to 30 June 1996 using transactions and quotes data provided by the exchange.¹ Each transaction record includes the name of the traded stock, the transaction price, the date and time of the trade, the number of shares traded and the dealing capacity of the buyer and seller (i.e. whether they acted as an agent representing an order from the public or as a principal in the transaction.)²

Following Hansch, Naik and Viswanathan (1998), I do not report results based on the use of pound sterling value of inventories but instead use standardised measures. The

¹ Other studies that have used this data are Reiss and Werner (1993), Board and Sutcliffe (1995), Tonks and Snell (1995), Lai (1996), Gemmill (1996), Hansch, Naik and Viswanathan (1996), Neuberger and Hansch (1996), Reiss and Werner (1996) and Naik and Yadav (1996, 1997).

risk aversion of dealers in holding a particular pound value of sterling will vary according to the market value of each security. Dealers are more willing to hold a higher level of inventory for large market value securities relative to the same level of inventory for small market value securities. The process of standardising the time series of inventories controls for these differences in risk aversion and allows for the aggregation and comparison of inventories across stocks. It also captures the notion that dealers perceive the inventory risk of different securities in a similar fashion when inventory is measured in terms of the distance in standard deviations from the respective sample means.

Dealer inventory levels are standardised as follows: Let Q_t^j denote the aggregate level of inventory over all dealers in stock j at time t . Following this convention, denote the aggregate inventory of stock j at the start of the sample period ($t = 0$) as Q_0^j . For every stock, all public trades are considered in which any dealer executes as a principal in the trade. I also define q_t^j to be positive (negative) when a public trader sells (buys) q shares of stock j to (from) any dealer at time t . Thus at any time t , $Q_t^j = Q_0^j + \sum_{s=1}^{s=t} q_s^j$. In this way, a time series of aggregate dealer inventory level is constructed in each stock j from the start to the end of the sample period. To generate daily dealer inventories, I take the aggregate dealer inventory level at the end of each day between 1 August 1994 and 30 June 1996 and combine them into a time series. For each inventory series, the mean daily inventory level and standard deviation over the whole period are calculated

² This is an explicit identifier unlike the inferred identifier developed by Lee and Ready (1996).

and used to create a standardised daily inventory measure: $I_t^j = (Q_t^j - \bar{Q}^j) / \sigma^j$. In this way, a standardised inventory series is created which has a zero mean and unit standard deviation. For notational convenience I hereafter refer to standardised daily inventories as inventories.

The sample of insider trading data is drawn from the Directorwatch database, an information service that provides data on all trades by UK company directors. The data consists of the name of the firm, the date of the trade, whether it was a buy or sell, the name of the director, the number of shares traded, the transaction price and the post-transaction holding of the director in the firm. The sample of corporate insider trades spans the time period 1 September 1994 to 31 May 1996.³ In the UK, any director of an exchange listed firm is required to notify their company within five days of trading in the company's securities. The company in turn, must notify the London Stock Exchange within one day of notification of trading by the director. Thus there is a potential lag in the announcement of the insider trade by up to six days. My datasource allows me to bypass this problem by using the date of the transaction instead of the announcement date.

The range of corporate insiders that are required to report their dealings in a firm is considerably narrower in the UK than in the US and other countries. US studies of insider trading [Finnerty (1976a); Keown and Pinkerton (1981); Rozeff and Zaman

³ Note that this is two months less than the corresponding inventory time series to allow for the analysis of inventory changes twenty working days before and after any insider trade.

(1988); Seyhun (1986a,b); Loderer and Sheehan (1989); Lin and Howe (1990); Lee, Mikkelsen and Partch (1992)] have defined insiders to be any corporate employee (in addition to investors that hold greater than 10% of all outstanding shares). However, because of reporting restrictions UK insider trading studies [Pope, Morris and Peel (1990); Gregory, Matatko, Tonks and Purkis (1994)] have defined an insider to consist only of directors in a company.⁴ As a result, the number of insider transactions used in UK studies is considerably smaller than in similar US papers. However, Seyhun (1986) has analysed the performance of US insider trades by class of insider, and found that directors' trades appeared to contain the most information relevant for share revaluation. Consequently, I believe that my sample of directors' trades can be used to draw comparisons with other insider trading studies.

Table 7.1 provides some descriptive statistics of the insider trade sample. Because of potentially confounding information effects around earnings announcements [Elliot, Morse and Richardson (1984), Barclay and Dunbar (1996), chapter four of this thesis], I separate all insider trades into those that take place within twenty days of an earnings announcement and those that do not. It can be seen from a comparison of panel A and panel B that on average, the characteristics of insider trades are not considerably different in either period. Moreover, the average number of shares traded by insiders are of medium size and comparable to similar US insider trade sizes [see Barclay and Warner (1993)]. However, there is strong evidence of clustering in the timing of trading. From panels A and B, just under 50% of all corporate insider trades take place

⁴ Recently, Eckbo and Smith (1998) have studied the performance of insider trades in the Norwegian stock

within 20 days of an earnings announcement (736 insider trades around earnings announcements compared to 1643 in other periods). To avoid any problems with confounding events, the main tests focus on those corporate insider trades that do not take place around earnings announcements.

7.3 Tests and Results

7.3.1 Dealer inventory levels around corporate insider trading

In this section, I examine the effect of corporate insider trading on the level of dealer inventories. Several issues arise in this context. An insider trade in isolation will have only a marginal impact on the level of dealer inventories.⁵ Significant changes in inventories around corporate insider trading are consistent with the notion that other investors view an insider trade to be valuable information and modify their expectations accordingly. To mitigate the effect that other information events may have on our analysis, all insider trades that take place within twenty days of an earnings announcement are omitted from the analysis.

The timing of a corporate insider trade in relation to the current level of dealer inventories can also provide further insight into the factors that encourage insider trading. Legislation in most countries require that corporate insider trades be motivated

exchange. Their definition of insider is similar to US studies.

⁵ In all tests, the insider trade is included in the calculation of the time series of dealer inventories.

Excluding the insider trade from the time series of inventory levels has a negligible impact on the results.

by long term considerations. Insider trading in periods when dealer inventories have deviated from normal levels is inconsistent with this notion and is evidence that insiders trade the securities of their firm to exploit temporary errors in investor expectations.

A standard event study methodology is adopted to test these hypotheses. The day of the insider trade is labelled as day 0, and the event period is defined as being 10 days on either side of the event, in addition to the event day itself. For each insider trade, the standardised dealer inventories of the insider's firm in each of the 21 days in the event window are stacked to generate a 1,643 x 21 matrix of standardised dealer inventories.⁶

That is:

$$\mathbf{I} = \begin{bmatrix} I_{-20}^1 & \dots & I_0^1 & \dots & I_{+20}^1 \\ I_{-20}^2 & \ddots & I_0^2 & \ddots & I_{+20}^2 \\ \vdots & & I_0^n & & \vdots \\ I_{-20}^{1642} & \ddots & I_0^{1642} & \ddots & I_{+20}^{1642} \\ I_{-20}^{1643} & \dots & I_0^{1643} & \dots & I_{+20}^{1643} \end{bmatrix}$$

The mean of each column in \mathbf{I} is thus the average standardised dealer inventory for each day in the event period.

There is a vast literature on the specification of test statistics for abnormal returns [examples are Corrado and Zivney (1992), Campbell and Wasley (1993), Cowan and Sergeant (1996), Barber and Lyon (1997) and Kothari and Warner (1997)]. However clearly there is very little published work on the distribution of standardised inventories. In anticipation of potential non-normality, lack of symmetry and event date variance increases, I report the results of two tests normally used in event studies to control for

these problems: the Corrado Sign Test (1992) and the Boehmer, Musumeci and Poulsen (1991) cross-sectional standardised test statistic.

The average standardised inventories in table 7.2 show that corporate insiders trade when inventory levels are extreme in the opposite direction. That is, insiders buy (sell) shares of their own company when dealers have excess positive (negative) levels of inventory. At least twenty days prior to the insider buy decision, dealer inventories are significantly positive. In contrast, dealer inventories are significantly negative prior to insider sell decisions. When taken in combination with the empirical literature [Baesel and Stein (1979), Seyhun (1988), Lin and Howe (1990), Meulbroek (1992), Petit and Venkatesh (1995), chapter two of this thesis] which reports that insiders buy when the share price is low and sell when the share price is high, these results add to the evidence that corporate insiders trade to exploit mispricing in their company's securities.

With the exception of the acute event day changes in dealer inventories, subsequent changes are considerably smaller. After an insider buy transaction, dealer inventories fall over a four day period to normal levels. This is different to insider selling where inventories do not move following the event day increase. Although the sale has resulted in an increase in inventory levels, these are still significantly negative ten days after the trade. This result is consistent with previous studies that find a stronger reaction to insider buy transactions than insider sales.

⁶ This corresponds to 1,643 insider trades and 21 days in the event window.

7.3.2 *Miscellaneous tests*

There is strong empirical motivation for separately analysing the trading of corporate insiders in different size firms. Gregory, Matatko, Tonks and Purkis (1994) and in chapter two of this thesis, I have reported that the performance of corporate insider trading is concentrated in smaller companies. Small firms have less analyst coverage and low trading frequency. As a result, the information set is likely to be smaller for these companies. It could be argued that the potential for corporate insiders to exploit inefficiencies in the market would be greater for small, thinly traded securities than for large, liquid stocks.

To test this proposition, I separated all insider trades into four portfolios based on the size of the insiders' firm at the start of the sample period and repeated our analysis. The size classifications were: top 100, next 250, greater than £30million but smaller value than previous portfolio and less than £30million. The results indicate that this is not a valid hypothesis.⁷ For all market value portfolios, insiders trade when inventory levels are extreme. Investor reaction to the trade is similar for all size portfolios.

The presence of alternative risk mechanisms available to dealers may affect the extent to which corporate insider trades affect inventory levels. Several large market value securities in the UK have associated American depository receipts and/or traded options. A large body of empirical evidence has reported that the existence of these instruments

can affect the speed and efficiency of the price discovery process [Jennings and Starks(1986), Skinner (1990), Amin and Lee (1997)]. In the context of corporate insider trading, the probability of mispricing may be less for these securities. However, it could also be argued that dealers will allow their inventories of stocks with ADRs or options to vary by more. I separated all insider trades according to whether their firms had ADRs or traded options and repeated our event study analysis. Although the power of the tests are low because of the very small number of observations (19 buys and 9 sells for ADR securities and 38 buys and 21 sells for securities with traded options) casual inspection indicates that alternative risk mechanisms have no impact on the baseline results.⁸

John and Mishra (1990) and John and Lang (1991) have modelled insider trading as a signalling process in which corporate insiders use the trade as a mechanism to inform the market of their expectations concerning their firm's prospects. The existence of dealer inventory data allows a direct test of their model by examining changes in inventories around double signals of insider trading and surprise earnings announcements. If the model's propositions are correct, insider trading in combination with surprise earnings announcements can lead to predictable patterns in dealer inventory levels. After a surprisingly positive (negative) earnings figure, dealer inventories are on average significantly below (above) normal [Hillier, Naik and Yadav (1998)]. An insider trade subsequent to an earnings announcement will either verify the earnings figure or contradict it. According to the signalling hypothesis, a contradictory signal will dampen the effect of the announcement and dealer inventories should revert

⁷ Tables are available on request

to more normal levels. If the two signals verify each other, the overall signal is stronger and dealer inventories should drift to more extreme levels.

In these tests I have classified earnings news in a similar fashion to Amin and Lee (1997). For each security, the mean and standard deviation of dividend adjusted two-day returns are calculated over the one year period immediately prior to the earnings announcement date.⁹ A standardised two-day earnings announcement (SEAD) return is calculated from this mean and standard deviation. All SEAD returns greater (less) than 1.96 (-1.96) are classified as good (bad) news. All corporate insider trades occurring within 20 days of their firm's good or bad SEAD returns are allocated to a good news or bad news portfolio respectively.

Tables 7.3a and 7.3b provide the results from the tests. For good news earnings announcements, results are strongly consistent with the signalling hypothesis. Prior to the insider trading event, dealer inventories are significantly negative. However, after insiders buy, dealer inventories fall to even lower levels whereas subsequent to sale trades, inventories increase. Both test statistics become less negative after insider sales, although the parametric test still reports significantly negative coefficients for this case. Corresponding tests of the signalling hypothesis with bad earnings news provides less clear results. Although dealer inventories are largely positive prior to the insider trading

⁸ Tables are available on request.

⁹ Daily return series data are collected from Datastream to generate the two-day returns. This is a relatively new datatype (RI).

event¹⁰ and inventories change in the predicted manner after the trade, these changes are insignificant and small. Thus it appears that in general, the signalling hypothesis may be valid and investors view corporate insider trading as information signals that can be used in conjunction with other information events.

7.3.4 Tests of Mean Reversion in Dealer Inventory Levels

Inventory models of dealership markets predict that the time series of inventories will display mean reversion. If the inventories of dealers go above (below) target levels, they will potentially change their quotes to make them more competitive, resulting in public order flow in a direction which returns inventory levels back to normal. Most empirical studies investigating inventory control of dealers have examined mean reversion in the inventory time series around an explicit or implicit preferred level which may or may not be time invariant [Hasbrouck and Sofianos (1993), Madhavan and Smidt (1993), Lyons (1995), Manaster and Mann (1996), Hansch, Naik and Viswanathan (1998)]. In this context, one of the ways in which I measure the tightness of inventory control is through the analysis of mean reversion in inventory levels.

My tests add to the literature by modelling a dynamic component in the mean reversion of dealer inventories. If dealers perceive there to be high inventory or adverse selection risks and as a result more actively manage their inventories, one manifestation would be an increase in the strength of inventory mean reversion. This may occur because dealers

¹⁰ The exception is negative average standardised dealer inventories for two days prior to insider sale transactions after bad earnings announcements. However, these are statistically insignificant using both

would post more competitive quotes in order to reduce the probability of providing a free trading option to the market.

The simplest specification for empirically estimating mean reversion in dealer inventories is to assume that mean reversion does not depend on the deviation of inventory from some target level. This would impose a linear model to the hypothesis. However, Hansch, Naik and Viswanathan (1998) have argued that mean reversion in dealer inventories would increase with the deviation of inventory from target levels. Hasbrouck and Sofianos (1993) and Madhavan and Smidt (1993) have modelled dealer inventories as following a time varying target level and by using spectral analysis and intervention analysis respectively, report results consistent with their models. On the other hand, this could also be consistent with a threshold type inventory control model where the mean reversion in dealer inventories grows stronger as absolute inventory levels exceed higher thresholds.

The specification for such a model is inherently non-linear. Within certain bounds dealers are unconcerned about the level of inventories. However, if inventories go beyond these bounds, dealers will begin to actively manage their portfolios by unwinding their positions causing mean reversion in inventory levels. Thus it may be more appropriate to use a threshold autoregressive type model as described by Yadav, Pope and Paudyal (1994). Instead of testing for a linear relationship between price changes and inventory changes [Hasbrouck and Sofianos (1993), Madhavan and Smidt

test statistics.

(1993)], it is necessary to investigate for the presence of a threshold type piecewise linear relationship. In this model, the coefficient of the price response to inventory changes is a step function dependent on lagged inventory levels, and dealer specific step function level shifts.

I follow Hansch, Naik and Viswanathan (1998) and estimate a piecewise linear model for mean reversion in inventories with the thresholds pre-specified as corresponding to a distance of one and two standard deviations from the mean on either side. Specifically, five regimes are defined based on the one-period lagged standardised inventory I_{t-1} as follows: $\{I_{t-1} \leq -2\}$, $\{-2 < I_{t-1} \leq -1\}$, $\{-1 < I_{t-1} \leq +1\}$, $\{+1 < I_{t-1} \leq +2\}$ and $\{+2 < I_{t-1}\}$. I then define five corresponding dummy variables $D_{i,t}$ which take the value 1 when I_{t-1} is within the above regimes, and the value 0 otherwise.

In normal trading periods (in the absence of any information intensive event) the mean reversion in inventories can be modelled for any security as:

$$\Delta I_t = \alpha + \sum_{i=1}^5 \phi_i D_{i,t} I_{t-1} + \sum_{j=1}^p \gamma_j \Delta I_{t-j} + \varepsilon_t$$

where I_t is standardised inventory at time t

ΔI_t is the change in standardised inventory from day $t-1$ to day t

$D_{i,t}$ is a dummy variable ($i = 1,2,3,4,5$) which takes the value 1 when I_{t-1} is in regime i

and 0 otherwise, where the regimes are defined as: **1**: $I_{t-1} \leq -2$, **2**: $-2 < I_{t-1} \leq -1$,

3: $-1 < I_{t-1} \leq +1$, **4**: $+1 < I_{t-1} \leq +2$ and **5**: $+2 < I_{t-1}$

ϕ_i is the mean reversion coefficient corresponding to regime i

p is the number of lags in the autoregressive term chosen as to minimise the Akaike information criterion coefficient (AIC) and

ε_t is the white noise disturbance term.

The mean reversion model can be easily extended to incorporate a dynamic component to allow for changes in dealer behaviour subsequent to a new event. For this purpose, four further dummy variables are defined:

$E_{1,t}$ is equal to 1 when the insider trade is a buy decision and the standardised inventory observation occurs in the time period 10 days before to 1 day before the trade, and 0 otherwise.

$E_{2,t}$ is equal to 1 when the insider trade is a sell decision and the standardised inventory observation occurs in the time period 10 days before to 1 day before the trade, and 0 otherwise.

$E_{3,t}$ is equal to 1 when the insider trade is a buy decision and the standardised inventory observation occurs in the time period 1 day after to 10 days after the trade, and 0 otherwise.

$E_{4,t}$ is equal to 1 when the insider trade is a sell decision and the standardised inventory observation occurs in the time period 1 day after to 10 days after the trade, and 0 otherwise.

To incorporate change in dealer inventory control around corporate insider trades (an information intensive event), the mean reversion equation can be augmented to:

$$\Delta I_t = \alpha + \sum_{i=1}^5 \phi_i D_{i,t} I_{t-1} + \sum_{k=1}^4 \delta_k E_{k,t} I_{t-1} + \sum_{j=1}^p \gamma_j \Delta I_{t-j} + \varepsilon_t$$

where δ_k is the difference between the “normal” mean reversion coefficient corresponding to lagged inventory regime I , and the mean reversion coefficient corresponding to insider trade/time period characteristic k within that regime i . All other terms and parameters are defined as before.

The augmented mean reversion model allows a separate test for the presence of a threshold process in the mean reversion of dealer inventories in addition to changes in this process because of the presence of asymmetric information and/or inventory risks. Formally, I wish to test the null hypothesis that the mean reversion coefficients in each regime are equal to 0. The second hypothesis is that the insider trade mean reversion coefficients are equal to 0 which would be consistent with a static inventory mean reversion process. Although, the insider trade is unanticipated, two pre-event dummies ($E_{1,t}$ and $E_{2,t}$) are included to test whether the insider trade is in reaction to other factors which may be causing inventories to change. Insignificant coefficients for these dummies would indicate that trading conditions were normal prior to the trade.

The results from the analysis are presented in table 7.4. It is clear from the first five rows that the strength of mean reversion in dealer inventories increases significantly with positive and negative deviations from the target level. Inventory levels that are

within 1 standard deviation of the mean exhibit strong mean reversion with 78.4% of all mean reversion coefficients in the sample less than zero and significantly different from zero at the 1% level of significance. However, the average coefficient is only -0.025 indicating that on average only 2.5% of the deviation from mean inventory is eliminated in a day.

As dealer inventories deviate to much greater levels away from the mean, the degree to which mean reversion occurs grows. For both positive and negative deviations the average mean reversion coefficient increases monotonically. At extreme positive inventory levels ($I > +2\sigma$), nearly 20% of the deviation is cancelled out in a day and at extreme negative inventory levels ($I \leq -2\sigma$) this figure is 11.1%. An analysis of the number of negative coefficients shows that at positive and negative extreme inventories, approximately 95% mean reversion coefficients in the sample are negative. These findings allow us to strongly reject the hypothesis that there is no mean reversion in inventories.

Table 7.4 also provides evidence on the possibility of dynamic inventory control strategies. For 10 days prior to corporate insider trading, inventory mean reversion is not significantly different from normal. However, subsequent to the event mean reversion significantly increases. After an insider buy or sell trade, dealers employ a tighter inventory control strategy. In the 10 day period after any insider trade, mean reversion increases and an additional 2% deviation of inventories from target levels is

eliminated per day. Thus, the null that dealers follow a static inventory policy can also be rejected.

To summarise the results from this test, dealer inventory control strategies are consistent with a threshold process where inventory levels are actively controlled. The greater the deviation of inventories from target levels, the more likely that inventory control strategies will be implemented to return inventories to normal levels. Further, dealers appear to maintain a tighter inventory control policy in periods of high asymmetric information and/or inventory risks. For the example of insider trading for ten days after, inventory control was stronger thus resulting in stronger mean reversion of inventories.

7.3.4 Tests of risk sharing among dealers in periods of information flux

Ho and Stoll (1983) and Vogler (1997) suggest that inter-dealer trading is driven by inventory differences and by the need of risk averse dealers to share their inventory risk. However, if order flow carries information and if markets are not fully transparent, then additional factors such as informational differences among market makers become important. The only studies to explicitly model and test inter-dealer trading in markets are Reiss and Werner (1997) and Naik, Neuberger and Viswanathan (1997) but neither investigate the issue of inter-dealer trading in the presence of asymmetric information. The tests in this section aim to plug this gap by examining the proportion of inter-dealer trading in relation to public trading around trades by corporate insiders. An increase in this measure subsequent to an information event is consistent with the hypothesis that

dealers use this market to share inventory risks arising from asymmetric information. In this context I investigate non-anonymous and anonymous inter-dealer trading separately.

For each security, a time series of daily pound sterling volume is constructed for inter-dealer trades and public trades to generate a proportional trading volume measure. The mean and standard deviation of the daily proportional measures are then used to produce a standardised measure of the fraction of inter-dealer trading to public trading. In the same vein as section 7.3.1, I use an event study methodology to examine this measure around corporate insider trading.

Table 7.5 shows that to a large extent inter-dealer trading is not used by dealers to share risks arising from corporate insider trades. With anonymous inter-dealer trading, there is no change in proportionate volume on the day of the trade or up to two days after for either insider buy or sell decisions. There are then significantly low levels of inter-dealer trading in days five to seven for buy trades and on day three for sell trades. Non-anonymous inter-dealer trading is slightly different where for insider buy decisions, proportionate volume is significantly greater than usual one day before and on the day of the insider trade. This then falls to significantly low levels on day one and day four. There are no changes in non-anonymous inter-dealer trading around sale decisions.

Some caveats should be made about these results. The analysis on the timing of corporate insider trading (section 7.3.1) showed that insiders traded when dealer inventories were at an extreme level. A consequence of the insider trade was that

inventories reverted to normal levels. Thus, the extent to which dealers would wish to utilise the inter-dealer market would be lessened in this situation. Obviously this would not be the same around earnings announcements where inventories are likely to be at normal levels beforehand. Thus I am unable to reject the null hypothesis that dealers use the inter-dealer market to share risks although these results have to be qualified because of the correlation between dealer inventory levels and the timing of insider trading.

7.3.5 Changes in market depth during information intensive periods

My tests now focus on the pricing of securities subsequent to new information and how inventory considerations affect those prices. Following the seminal paper of Kyle (1985) there have been several attempts to understand the process through which price formation is affected by the depth of a market (Kyle's λ). Glosten and Harris (1989) and Brennan and Subramanyam (1997) have empirically modelled market depth by regressing changes in prices on volume. The coefficient on the volume variable is an estimate of Kyle's λ . Small values of Kyle's λ are indicative of a liquid security whereas large values correspond to low market depth.

I extend their tests in several ways. First, previous studies [Glosten and Harris (1989), Brennan and Subramanyam (1997)] have used volume as the main proxy for estimating liquidity whereas our measure is more direct in that we use signed changes in standardised dealer inventories (net volume). Such a variable explicitly captures the effect of inventory control on the formation of prices in addition to providing extra

information on the public order flow. Second, I additionally model the effect of new information on market depth and directly test the model with corporate insider trading events. In this context, the only study to examine market depth is Chakravarty and McConnell (1997). They carry out a case analysis of average bid and ask depths surrounding the illegal trading of Ivan Boesky in 1984 and report that depths actually increased at this time. However, doubt must be cast on their findings because of the effect of additional volume arising from high trading prior to the potential merger between Carnation and Nestlé SA.

My model is based on Glosten and Harris (1989) in that market depth is modelled by estimating the slope coefficient on a regression of price change on a volume measure. However, I also incorporate a dynamic component to model the change in market depth around corporate insider trading. Specifically, I estimate the following equation for every security:

$$\Delta P_t = \alpha + \lambda \Delta I_t + \sum_{j=1}^4 \gamma_j E_{j,t} \Delta I_t + \varepsilon_t$$

where ΔP_t is the change in the standardised price of security from day $t-1$ to day t

ΔI_t is the change in standardised inventory from day $t-1$ to day t

$E_{j,t}$ is equal to 1 when the insider trade is a buy decision and the standardised inventory observation occurs in the time period 10 days before to 1 day before the trade, and 0 otherwise.

$E_{2,t}$ is equal to 1 when the insider trade is a sell decision and the standardised inventory observation occurs in the time period 10 days before to 1 day before the trade, and 0 otherwise.

$E_{3,t}$ is equal to 1 when the insider trade is a buy decision and the standardised inventory observation occurs in the time period 1 day after to 10 days after the trade, and 0 otherwise.

$E_{4,t}$ is equal to 1 when the insider trade is a sell decision and the standardised inventory observation occurs in the time period 1 day after to 10 days after the trade, and 0 otherwise.

λ is a estimate of market depth. In this model a low market depth corresponds to a large negative coefficient because the relevant measure is change in dealer inventory level and γ_j is the difference between the normal market depth coefficient and the market depth coefficient corresponding to insider trade/time period characteristic j .

This specification allows a test of the hypothesis that market depth changes around corporate insider trading. The results are presented in table 7.6. From the mean Kyle's lambda coefficient (row 2) it is clear that the model captures the market depth measure well. Approximately 80% of the coefficients are negative and the cross-sectional test statistic for the mean coefficient is significantly negative at the 1% level with a value of -10.03 . An examination of the dummy variable coefficients shows that there is no change in market depth around insider trading. Either before or after the event, market depth coefficients are insignificantly different from average. Thus I cannot reject the

null hypothesis that market depth is affected by new information arrival, specifically trading by corporate insiders.

7.3.6 The information content of corporate insider trades

Many empirical studies have reported substantial changes in the price performance of companies around corporate insider trading [Baesel and Stein (1979), Seyhun (1988), Lin and Howe (1990), Meulbroek (1992), Petit and Venkatesh (1995), chapter two of this thesis]. Subsequent to buy decisions, share prices usually increase whereas after sales, prices decline. The usual explanation given for these findings is that the information set of corporate insiders is superior to that of other investors, and that their trading performance reflects this. Several authors have argued that uninformed market participants could profit from mimicking the activities of corporate insiders [for example Bettis, Vickrey, and Vickrey (1997)]. If this occurs in practice, the analysis of the information content of insider trades becomes difficult as there is a possibility that the price changes associated with corporate insider trading are not due to information but to inventory considerations.

In this section, I develop and test a basic model that decomposes price changes into two components: the effect of new information and the effect of inventory changes on prices. In a market with no transaction costs, any price change, ΔP_t , can be caused by new information, e_t , or sentiment related excess demand, u_t . That is:

$$\Delta P_t = e_t + u_t$$

The sentiment related excess demand for a security in any period is explicitly measured as the difference between pound sterling purchases and pound sterling sales. However, because of liquidity differences security prices have varying sensitivities to the excess demand. Hence the demand related component can be expressed as:

$$u_t = \alpha \Delta I_t + \varepsilon_t$$

where ΔI_t is the difference between pound sterling purchases and pound sterling sales and is equivalent to the change in dealer inventories at time t and α is the sensitivity of a security's price changes to changes in dealer inventories and is known as Kyle's lambda.

Combining the previous two equations gives:

$$\Delta P_t = e_t + \alpha \Delta I_t + \varepsilon_t$$

To model the effect of inventory on changes in price around insider trading I utilise a dummy variable event study methodology:

$$\Delta P_t = e + \alpha \Delta I_t + \sum_{j=-10}^{+10} D_j + \varepsilon_t$$

where D_j is equal to 1 when observation occurs on day j relative to the insider trade and 0 otherwise.

This model allows the decomposition of security price changes into an information related component and a demand component. If price changes are caused by the information content of corporate insider trading the dummy coefficient on the day of the trade should be significant. Additional dummies before and after the insider trade are included to determine whether the insider trade is related to other information events.

Results from the estimation of the model are presented in tables 7.7a and 7.7b. For comparative purposes, a simple model of price changes excluding any inventory effects is also included. In table 7.7a, the conventional pattern of price changes (simple model) around corporate insider buying is clear. Prior to an insider purchase transaction, prices are falling with 8 from 10 days experiencing a price decrease. However the trend changes dramatically subsequent to the buy decision with significant increases in price consistently over the next ten days. In contrast, there are 8 from 10 days now experiencing a price increase after the trade. This price trend has consistently been reported in previous corporate insider trading studies. When inventory effects are incorporated into the model (extended model), the significant price changes before and after the insider purchase disappear. In only one day during the whole event period, prices significantly change. In addition, the distribution of positive and negative prices change significantly with negative coefficients in 7 from 10 days before the trade and 9

from 10 days after the trade. On the day of the trade, price changes due to information are now insignificant.

An analysis of table 7.7b for insider sales provides similar insights. With the simple model of price changes, there are significant positive dummy coefficients in days -3, -2 and -1 implying large positive price changes at this time. Subsequent to the trade, there are no large changes in price. This is the conventional pattern reported for insider sales in previous studies.¹¹ When inventory is incorporated, the significant price patterns are no longer evident and in only 1 day during the whole event period is there a significant price change unrelated to inventory effects (day -8).

The results in this section suggest that inventory control is the dominant factor in the price setting behaviour of dealers. In periods when asymmetric information is evident price changes appear to be solely caused by fluctuations in dealer inventory levels.

7.4 Conclusions

Using a sample of trades by UK company directors, I find that the inventory control strategies of dealers are affected by the arrival of new information. Insiders trade when dealer inventories are at extreme positions. That is, insiders buy when inventory levels have deviated in a positive direction from normal levels and they sell when inventories have deviated in the opposite way. I carry out several tests of various inventory control

strategies and find that dealers appear to tighten their inventory control causing strong mean reversion in inventories subsequent to the trade. There is no evidence however that dealers use the inter-dealer market or decrease market depth as a result of corporate insider trading.

Many insights have also been gained on the performance of corporate insider trading. Insiders appear to time their trades in an optimal way to exploit temporary deviations of market sentiment from fundamental values. However, it appears that the trade is taken as a signal by less informed investors to revise expectations and thus has a subsidiary effect of causing net public trading volume to be in the same direction of the trade. There is also some evidence that investors view an insider trade/earnings announcement as complementary signals that can strengthen or correct their expectations on the information contained in company results. Finally, once inventory considerations are taken into account, there does not appear to be any incremental information contained in the trades of insiders.

The results in this chapter have implications for the current debate surrounding the relative merits and validity of the adverse selection and inventory control models of dealer behaviour. In addition, the study has also provided a broader picture of the factors motivating the significant price movements surrounding corporate insider trading.

¹¹ Some have reported significant negative performance subsequent to the trade in addition to the positive price performance beforehand.

Table 7.1 – Descriptive Statistics of Corporate Insider Trades

Sample consists of every transaction undertaken by UK company directors during the period 1 September 1994 to 31 May 1996. The London Stock Exchange Model Code (1977) requires that directors report any trade in their company within three days of execution. The company must then notify the Stock Exchange within one day. Mean percentage change in portfolio is the percentage change in an insider's pre-trade holdings as measured by the number of shares held.

Panel A: *All insider trades executed in sample period that are not within 20 days of an earnings announcement*

No. Companies: 600	Purchases	Sales
No. Trades	805	838
Mean No. Shares Traded	109,328	298,930
Median No. Share Traded	25,000	50,000
Mean Volume of Shares Traded	£90,693	£594,328
Median Volume of Shares Traded	£29,500	£102,450
Mean % Change in Portfolio	6.45%	7.08%

Panel B: *All insider trades in sample period that are executed within 20 days of an earnings announcement*

No. Companies: 309	Purchases	Sales
No. Trades	403	333
Mean No. Shares Traded	109,942	375,947
Mean Volume of Shares Traded	16,475	48,000
Mean Volume of Shares Traded	£60,919	£552,761
Median Volume of Shares Traded	£22,350	£93,922
Mean % Change in Portfolio	6.84%	7.02%

Table 7.2 – Standardised Dealer Inventories around Corporate Insider Trading

For each security, standardised inventories are calculated from the end-of-day pound sterling value of aggregate inventories held by all market makers by subtracting the mean and dividing by the standard deviation. An event study is undertaken with Day 0 as the insider trading day, Day-10 to Day+10 as the event period, and all days within the date range 1/9/94 to 31/5/96 as the estimation period. Test statistics are based on the Sign test and the cross-sectional standardised t-test (Boehmer et al, 1991). Bold denotes statistical significance. Insider trades taking place within 20 working days after an earnings announcement are excluded from the sample of insider trades.

Day	<i>Buy Trades (805 obs)</i>			<i>Sell Trades (838 obs)</i>		
	Stand. Inventory	Sign Statistic	Cross sect. t-test	Stand Inventory	Sign Statistic	Cross sect. t-test
-10	0.186	4.65**	5.05**	-0.234	-5.54**	-6.42**
-9	0.155	3.38**	4.20**	-0.231	-4.96**	-6.33**
-8	0.143	3.68**	3.91**	-0.250	-5.32**	-6.95**
-7	0.152	4.20**	4.15**	-0.272	-5.03**	-7.32**
-6	0.171	3.38**	4.64**	-0.278	-4.81**	-7.36**
-5	0.224	3.60**	5.16**	-0.275	-5.46**	-7.29**
-4	0.229	4.88**	5.25**	-0.268	-5.82**	-7.11**
-3	0.225	4.28**	4.89**	-0.272	-5.54**	-7.13**
-2	0.215	3.30**	5.05**	-0.301	-6.19**	-7.86**
-1	0.186	3.68**	4.87**	-0.312	-6.19**	-8.11**
0	0.125	2.18**	3.51**	-0.131	-3.44**	-3.55**
1	0.112	1.58	3.19**	-0.134	-3.80**	-3.63**
2	0.074	1.50	2.05**	-0.130	-3.44**	-3.57**
3	0.082	1.80*	2.09**	-0.126	-3.08**	-3.50**
4	0.024	2.10**	0.64	-0.136	-3.00**	-3.73**
5	-0.033	0.08	-0.94	-0.126	-2.86**	-3.49**
6	-0.007	0.83	-0.20	-0.129	-3.15**	-3.52**
7	-0.013	0.60	-0.36	-0.136	-3.65**	-3.71**
8	-0.005	0.38	-0.14	-0.131	-3.58**	-3.52**
9	0.018	1.35	0.46	-0.116	-3.15**	-3.11**
10	-0.004	0.38	-0.10	-0.131	-3.22**	-3.55**

** : Significant at 5% level. * : Significant at 10% level

Table 3a – Standardised Dealer Inventories around Insider Purchase Transactions within 20 days of an Earnings Announcement

For each security, standardised inventories are calculated from the end-of-day pound sterling value of aggregate inventories held by all market makers by subtracting the mean and dividing by the standard deviation. An event study is undertaken with Day 0 as the earnings announcement day, Day-10 to Day+10 as the event period, and all other days within the date range 1/9/94 to 31/5/96 as the estimation period. Test statistics are based on the sign test and the cross-sectional standardised t-test (Boehmer et al, 1991). Earnings news classifications (Good and bad) are generated as follows. For each security, the mean and standard deviation of dividend adjusted returns is calculated over the one year period immediately prior to the earnings announcement date. The standardised earnings announcement 2-day (SEAD) return is then calculated from these parameters. All SEAD returns measures are ranked and sorted in three portfolios. The portfolio containing SEAD returns greater than or equal to 1.96 (less than or equal to -1.96) is termed the Good (Bad) News portfolio. Bold denotes statistical significance.

Day	<i>Good News (122 obs)</i>			<i>Bad News (75 obs)</i>		
	Stand. Inventory	Sign Statistic	Cross sect. t-test	Stand Inventory	Sign Statistic	Cross sect. t-test
-10	-0.010	-0.63	-0.14	0.032	1.39	0.28
-9	-0.057	-0.63	-0.73	0.104	1.15	0.94
-8	-0.107	-0.27	-1.34	0.136	0.92	1.28
-7	-0.182	-2.26**	-2.26**	0.157	1.62	1.45
-6	-0.199	-2.81**	-2.43**	0.118	1.39	1.05
-5	-0.214	-2.81**	-2.62**	0.049	-0.92	0.44
-4	-0.216	-2.81**	-2.60**	0.118	0.92	1.02
-3	-0.221	-3.17**	-2.69**	0.105	1.15	0.94
-2	-0.235	-3.53**	-2.77**	0.066	0.69	0.58
-1	-0.217	-1.00	-2.49**	0.086	0.46	0.78
0	-0.435	-2.44**	-5.11**	-0.025	0.00	-0.21
1	-0.486	-3.53**	-5.62**	0.008	0.23	0.07
2	-0.286	-2.44**	-2.87**	0.002	0.69	0.02
3	-0.277	-2.26**	-2.79**	-0.051	0.00	-0.49
4	-0.405	-2.08**	-4.71**	0.068	0.00	0.62
5	-0.468	-2.08**	-5.67**	0.087	0.00	0.81
6	-0.458	-2.44**	-5.48**	0.091	0.00	0.83
7	-0.476	-2.26**	-5.83**	0.076	0.00	0.69
8	-0.473	-2.44**	-6.13**	0.045	-0.23	0.44
9	-0.495	-2.44**	-6.54**	-0.076	0.23	-0.80
10	-0.494	-2.81**	-6.39**	-0.146	-0.23	-1.63

** : Significant at 5% level. * : Significant at 10% level

Table 7.3b – Standardised Dealer Inventories around Corporate Insider Sale Transactions within 20 days of an Earnings Announcement

For each security, standardised inventories are calculated from the end-of-day pound sterling value of aggregate inventories held by all market makers by subtracting the mean and dividing by the standard deviation. An event study is undertaken with Day 0 as the earnings announcement day, Day-10 to Day+10 as the event period, and all other days within the date range 1/9/94 to 31/5/96 as the estimation period. Test statistics are based on the sign test and the cross-sectional standardised t-test (Boehmer et al, 1991). Earnings news classifications (Good and bad) are generated as follows. For each security, the mean and standard deviation of dividend adjusted returns is calculated over the one year period immediately prior to the earnings announcement date. The standardised earnings announcement 2-day (SEAD) return is then calculated from these parameters. All SEAD returns measures are ranked and sorted in three portfolios. The portfolio containing SEAD returns greater than or equal to 1.96 (less than or equal to -1.96) is termed the Good (Bad) News portfolio. Bold denotes statistical significance.

Day	<i>Good News (95 obs)</i>			<i>Bad News (39 obs)</i>		
	Stand. Inventory	Sign Statistic	Cross sect. t-test	Stand Inventory	Sign Statistic	Cross sect. t-test
-10	-0.865	-4.16**	-5.17**	0.530	2.87**	1.85
-9	-0.907	-3.52**	-5.27**	0.372	2.87**	1.69
-8	-0.883	-3.52**	-5.12**	0.218	2.87**	1.98*
-7	-0.915	-3.52**	-5.32**	0.119	2.26**	1.05
-6	-0.886	-3.84**	-5.01**	0.132	1.23	1.18
-5	-0.885	-3.52**	-5.04**	0.132	1.44	1.23
-4	-0.897	-3.84**	-5.01**	0.064	1.03	0.58
-3	-0.796	-2.24**	-4.23**	0.023	0.82	0.20
-2	-0.725	-2.56**	-3.88**	-0.047	1.03	-0.39
-1	-0.448	-2.24**	-2.68**	-0.121	0.41	-1.02
0	-0.529	-3.20**	-3.73**	0.110	1.44	1.05
1	-0.407	-1.60	-2.66**	0.313	2.87**	3.17**
2	-0.378	-1.28	-2.40**	0.270	1.85*	2.75**
3	-0.378	-0.64	-2.41**	0.268	3.28**	2.53**
4	-0.392	-1.60	-2.47**	0.233	3.49**	2.21**
5	-0.352	-0.96	-2.29**	0.188	3.49**	1.88*
6	-0.339	-0.64	-2.20**	0.104	2.05**	1.00
7	-0.311	-0.32	-2.14**	0.098	2.26**	0.95
8	-0.297	-0.32	-2.06**	0.125	2.26**	1.26
9	-0.337	-0.32	-2.27**	0.071	2.05**	0.66
10	-0.411	-1.28	-2.78**	0.077	1.85*	0.69

** : Significant at 5% level. * : Significant at 10% level

Table 7.4 – Dealer Inventory Mean Reversion around Corporate Insider Trading

For each security, the following regression was run:

$$\Delta I_t = \alpha + \sum_{i=1}^5 \phi_i D_{i,t} I_{t-1} + \sum_{k=1}^4 \delta_k E_{k,t} I_{t-1} + \sum_{j=1}^p \gamma_j \Delta I_{t-j} + \varepsilon_t$$

where ΔI_t = The change in the value of market makers' inventory in security from day t-1 to day t,

I_{t-1} = The value of market makers' inventory at day t-1,

$D_{i,t}$ is a dummy variable ($i = 1,2,3,4,5$) which takes the value 1 when I_{t-1} is in regime i and 0 otherwise, where the regimes are defined as: $\{1 : I_{t-1} \leq -2\}$, $\{2 : -2 < I_{t-1} \leq -1\}$, $\{3 : -1 < I_{t-1} \leq +1\}$, $\{4 : +1 < I_{t-1} \leq +2\}$ and $\{5 : +2 < I_{t-1}\}$

ϕ_i is the mean reversion coefficient corresponding to regime i

$E_{1,t}$ is equal to 1 when the insider trade is a buy decision and the standardised inventory observation occurs in the time period 10 days before to 1 day before the trade, and 0 otherwise.

$E_{2,t}$ is equal to 1 when the insider trade is a sell decision and the standardised inventory observation occurs in the time period 10 days before to 1 day before the trade, and 0 otherwise.

$E_{3,t}$ is equal to 1 when the insider trade is a buy decision and the standardised inventory observation occurs in the time period 1 day after to 10 days after the trade, and 0 otherwise.

$E_{4,t}$ is equal to 1 when the insider trade is a sell decision and the standardised inventory observation occurs in the time period 1 day after to 10 days after the trade, and 0 otherwise.

p is the number of lags in the autoregressive term chosen as to minimise the Akaike information criterion coefficient (AIC) and

ε_t is the white noise disturbance term.

Inventory series ranges from 1st Sep 1994 to 30th June 1996 excluding ten day period before and after each earnings announcement. The coefficients were then averaged over the full sample. The cross-sectional t-statistic is calculated from the average of the coefficients. The average t-statistic is the average t-statistic for the coefficients over all regressions.

Variable	Mean coeff	Cross Sect t-stat for mean	Cross.sec p-value for mean	Quart.1	Median	Quart.3	% -ve Coeffs
$I \leq -2\sigma$,	-0.111	-11.12	<< 0.001	-0.127	-0.054	-0.024	94.3
$-2\sigma < I \leq -\sigma$	-0.042	-14.54	<< 0.001	-0.060	-0.033	-0.012	86.7
$-\sigma < I \leq \sigma$	-0.025	-5.71	<< 0.001	-0.052	-0.028	-0.006	78.4
$\sigma < I \leq 2\sigma$	-0.050	-7.50	<< 0.001	-0.067	-0.033	-0.011	84.4
$2\sigma < I$	-0.199	-13.00	<< 0.001	-0.242	-0.080	-0.032	95.5
T < tdate, buy	-0.006	-1.17	0.244	-0.022	0.000	0.015	51.6
T < tdate, sell	-0.006	-0.61	0.543	-0.021	0.000	0.018	47.4
T > tdate, buy	-0.022	-3.31	0.001	-0.027	-0.001	0.014	54.1
T > tdate, sell	-0.021	-2.18	0.030	-0.033	-0.001	0.015	54.8

Table 7.5 – Anonymous Inter-Dealer Trading around Trades by Corporate Insiders

For each security, standardised anonymous inter-dealer trades are calculated from the end-of-day pound sterling value of aggregate trades by all market makers on the London Stock Exchange Inter-Dealer Broker system by subtracting the mean and dividing by the standard deviation. An event study is undertaken with Day 0 as the insider trading day, Day-10 to Day+10 as the event period, and all days within the date range 1/8/94 to 30/6/96 as the estimation period. Test statistics are based on the cross-sectional standardised t-test (Boehmer et al, 1991). Bold denotes statistical significance.

Day	<i>Anonymous Trades</i>				<i>Non-Anonymous Trades</i>			
	<i>Buy Trades</i>		<i>Sell Trades</i>		<i>Buy Trades</i>		<i>Sell Trades</i>	
	Prop. Volume	Cross sect. t-test	Prop. Volume	Cross sect. t-test	Prop. Volume	Cross sect. t-test	Prop. Volume	Cross sect. t-test
-10	0.041	0.82	0.040	1.01	-0.027	-1.10	0.152	2.54*
-9	0.098	1.89*	-0.046	-1.68	-0.033	-1.80	0.022	0.55
-8	-0.016	-0.60	0.076	1.18	0.002	0.04	-0.004	-0.15
-7	-0.072	-3.76**	0.053	0.95	-0.084	-6.55**	0.135	2.75
-6	0.003	0.05	0.015	0.41	0.008	0.24	0.020	0.52
-5	-0.044	-1.51	0.133	2.05**	0.048	0.82	0.042	0.98
-4	-0.100	-6.86**	-0.014	-0.43	-0.034	-0.91	0.012	0.33
-3	-0.013	-0.44	-0.015	-0.32	0.042	0.86	-0.040	-2.00**
-2	-0.098	-4.18**	-0.026	-0.71	0.011	0.30	0.134	2.65**
-1	-0.009	-0.38	-0.001	-0.03	0.107	2.08**	0.045	1.43
0	-0.008	-0.23	-0.028	-1.10	0.084	1.92*	0.039	1.13
1	0.008	0.14	-0.012	-0.45	-0.064	-4.53**	0.059	1.40
2	-0.025	-1.32	0.108	1.18	0.036	0.81	0.084	1.93
3	-0.024	-1.25	-0.057	-3.01**	0.010	0.27	-0.021	-0.98
4	-0.065	-3.40**	-0.026	-1.30	-0.069	-4.60**	0.001	0.03
5	-0.069	-3.54**	0.117	1.70*	0.032	0.78	0.014	0.39
6	-0.058	-2.98**	0.010	0.33	-0.023	-1.02	0.061	1.29
7	-0.019	-0.40	0.069	1.11	-0.006	-0.24	-0.026	-1.16
8	0.147	1.55	0.000	-0.01	0.063	2.26**	0.135	2.90**
9	-0.033	-0.96	0.055	1.10	0.089	2.04**	-0.021	-0.80
10	0.015	0.49	-0.010	-0.37	-0.027	-0.76	0.020	0.67

** : Significant at 5% level. * : Significant at 10% level

Table 7.6 – Market Depth around Corporate Insider Trading

For each security, the following regression was run:

$$\Delta P_{i,t} = \alpha + \lambda \Delta I_{i,t} + \sum_{j=1}^4 \gamma_j E_{j,t} \Delta I_{i,t} + \varepsilon_{i,t}$$

where $\Delta P_{i,t}$ = the change in the standardised price of security from day t-1 to day t

$\Delta I_{i,t}$ = The change in market makers' standardised inventory in security i from day t-1 to day t,

$E_{1,t}$ is equal to 1 when the insider trade is a buy decision and the standardised inventory observation occurs in the time period 10 days before to 1 day before the trade, and 0 otherwise.

$E_{2,t}$ is equal to 1 when the insider trade is a sell decision and the standardised inventory observation occurs in the time period 10 days before to 1 day before the trade, and 0 otherwise.

$E_{3,t}$ is equal to 1 when the insider trade is a buy decision and the standardised inventory observation occurs in the time period 1 day after to 10 days after the trade, and 0 otherwise.

$E_{4,t}$ is equal to 1 when the insider trade is a sell decision and the standardised inventory observation occurs in the time period 1 day after to 10 days after the trade, and 0 otherwise.

λ is a estimate of market depth. In our model a low market depth corresponds to a large negative coefficient because our measure is change in dealer inventory level and

γ_j is the difference between the normal market depth coefficient and the market depth coefficient corresponding to insider trade/time period characteristic j.

$\varepsilon_{i,t}$ = white noise disturbance term.

Inventory series ranges from 1st August 1994 to 30th June 1996 excluding ten day period before and after each earnings announcement. The coefficients were then averaged over the full sample. The cross-sectional t-statistic is calculated from the average of the coefficients. The average t-statistic is the average t-statistic for the coefficients over all regressions.

Variable	Mean coeff	Cross Sect t-stat for mean	Cross.sec p-value for mean	Quart.1	Median	Quart.3	% -ve Coeffs
Intercept	0.001	1.54	0.124	-0.003	0.000	0.003	47.6
$\Delta I_{i,t}$	-0.128	-10.03	0.000	-0.256	-0.148	-0.045	80.0
T < edate, buy	0.001	0.41	0.679	0.000	0.000	0.001	41.4
T < edate, sell	-0.016	-1.12	0.263	-0.001	0.000	0.001	56.6
T > edate, buy	-0.004	-1.48	0.139	-0.001	0.000	0.001	55.7
T > edate, sell	0.005	0.70	0.481	-0.001	0.000	0.001	48.8

Table 7.7a – Information Flows around Corporate Insider Purchases

Results for the simple model and the extended model are given below.

Simple Model:

For each security, the following regression was run:

$$\Delta P_{i,t} = \alpha_i + \sum_{k=-10}^{10} \gamma_k E_k + \varepsilon_{i,t}$$

where $\Delta P_{i,t}$ = the change in the standardised price of security from day t-1 to day t

E_k = an intercept dummy for each day in the event period t-10 to t+10.

$\varepsilon_{i,t}$ = white noise disturbance term.

Extended Model:

For each security, the following regression was run:

$$\Delta P_{i,t} = \alpha_i + \sum_{k=-10}^{10} \gamma_k E_k + \lambda \Delta I_{i,t} + \sum_{j=1}^n \phi_j D_{j,t} \Delta I_{i,t} + \varepsilon_{i,t}$$

where $\Delta I_{i,t}$ = The change in market makers' standardised inventory in security i from day t-1 to day t,

$D_{j,t}$ = A dummy variable that takes the value of 1 under the intersection of two criterion: Ten day period before insider trade date or ten day period after but not including trade date; insider buy or sell trade

All other terms are the same as in the simple model.

Inventory series ranges from 1st August 1994 to 30th June 1996 excluding ten day period before and after each insider trade. The coefficients were then averaged over the full sample. The cross-sectional t-statistic is calculated from the average of the coefficients. The average t-statistic is the average t-statistic for the coefficients over all regressions.

Model				$\Delta P_{i,t} = \alpha_i + \sum_{k=-10}^{10} \gamma_k E_k + \varepsilon_{i,t}$			
Variable	Mean coeff	Cross Sect t-stat for mean	% -ve Coeffs	Mean coeff	Cross Sect t-stat for mean	% -ve Coeffs	
Intercept	0.000	-0.50	51.9	-0.025	-0.79	50.2	
$\Delta I_{i,t}$	N/A	N/A	N/A	-0.168	-1.98**	74.4	
T < edate	N/A	N/A	N/A	-0.920	-0.96	40.0	
T > edate	N/A	N/A	N/A	-0.760	-1.83*	51.9	
-10	-0.062	-1.04	55.2	-1.047	-1.48	56.2	
-9	-0.011	-0.15	53.3	-0.144	-0.46	49.5	
-8	-0.129	-1.64*	54.2	-0.305	-0.54	48.1	
-7	-0.071	-1.09	50.9	-0.259	-0.43	47.1	
-6	-0.237	-3.18**	60.8	0.228	0.49	50.5	
-5	0.020	0.27	50.9	-1.586	-1.60	45.7	
-4	0.025	0.35	53.8	1.675	1.72*	50.0	
-3	-0.230	-2.20**	61.8	-0.882	-1.55	52.9	
-2	-0.264	-2.06**	55.2	0.109	0.07	51.9	
-1	-0.253	-1.86*	53.8	-2.533	-0.56	49.0	
0	0.166	1.60	46.7	-0.502	-0.52	48.6	
1	0.389	5.18**	39.2	-1.934	-1.21	45.2	
2	0.276	3.74**	42.9	-0.809	-1.16	49.5	
3	0.141	1.27	48.1	-0.282	-0.19	50.0	
4	0.026	0.27	45.3	-0.521	-0.32	46.2	
5	-0.125	-1.93*	51.4	2.102	1.04	50.5	
6	0.192	2.25**	45.3	-0.468	-0.60	46.2	
7	0.040	0.47	52.4	-0.357	-0.57	48.6	
8	-0.002	-0.02	46.2	-0.472	-0.63	49.0	
9	0.218	4.02**	40.1	-0.218	-0.43	41.9	
10	0.154	1.52	45.3	-0.261	-0.67	47.1	

** : Significant at 5% level. * : Significant at 10% level

Table 7.7b – Information Flows around Corporate Insider Sales

Results for the simple model and the extended model are given below.

Simple Model:

For each security, the following regression was run:

$$\Delta P_{i,t} = \alpha_i + \sum_{k=-10}^{10} \gamma_k E_k + \varepsilon_{i,t}$$

where $\Delta P_{i,t}$ = the change in the standardised price of security from day t-1 to day t

E_k = an intercept dummy for each day in the event period t-10 to t+10.

$\varepsilon_{i,t}$ = white noise disturbance term.

Extended Model:

For each security, the following regression was run:

$$\Delta P_{i,t} = \alpha_i + \sum_{k=-10}^{10} \gamma_k E_k + \lambda \Delta I_{i,t} + \sum_{j=1}^n \phi_j D_{j,t} \Delta I_{i,t} + \varepsilon_{i,t}$$

where $\Delta I_{i,t}$ = The change in market makers' standardised inventory in security i from day t-1 to day t,

$D_{j,t}$ = A dummy variable that takes the value of 1 under the intersection of two criterion: Ten day period before insider trade date or ten day period after but not including trade date; insider buy or sell trade

All other terms are the same as in the simple model. Inventory series ranges from 1st August 1994 to 30th June 1996 excluding ten day period before and after each insider trade. The coefficients were then averaged over the full sample. The cross-sectional t-statistic is calculated from the average of the coefficients. The average t-statistic is the average t-statistic for the coefficients over all regressions.

Model	$\Delta P_{i,t} = \alpha_i + \sum_{k=-10}^{10} \gamma_k E_k + \varepsilon_{i,t}$			$\Delta P_{i,t} = \alpha_i + \sum_{k=-10}^{10} \gamma_k E_k + \lambda \Delta I_{i,t} + \sum_{j=1}^n \phi_j D_{j,t} \Delta I_{i,t} + \varepsilon_{i,t}$		
Variable	Mean coeff	Cross Sect stat for mean	% -ve Coeffs	Mean coeff	Cross Sect t-stat for mean	% -ve Coeffs
Intercept	-0.001	-1.02	53.6	0.014	1.17	48.2
$\Delta I_{i,t}$	N/A	N/A	N/A	-0.159	-6.53**	77.0
T < edate	N/A	N/A	N/A	2.141	1.50	48.2
T > edate	N/A	N/A	N/A	0.550	0.98	45.9
-10	0.067	1.27	53.2	0.023	0.41	53.2
-9	0.013	0.25	51.4	1.044	1.08	49.5
-8	0.033	0.56	52.3	-1.477	-1.81*	52.7
-7	0.084	1.34	45.9	1.284	1.68*	44.1
-6	-0.006	-0.10	50.0	-0.184	-0.46	44.5
-5	0.001	0.02	52.3	1.472	1.53	43.6
-4	0.005	0.07	49.5	-0.952	-0.83	50.0
-3	0.113	1.92*	46.4	-0.131	-0.39	50.9
-2	0.135	1.74*	46.4	0.514	0.67	45.9
-1	0.115	1.82*	49.1	1.219	0.65	45.9
0	-0.107	-1.20	52.7	-6.615	-1.21	52.3
1	-0.016	-0.21	50.0	-0.276	-0.66	47.7
2	-0.119	-1.14	58.6	-2.753	-0.89	54.1
3	0.058	0.57	46.8	0.211	0.61	48.6
4	-0.040	-0.74	55.9	0.064	0.34	55.0
5	-0.076	-1.27	53.6	-0.276	-0.94	52.7
6	-0.049	-1.02	54.5	-0.224	-1.43	52.7
7	0.014	0.26	53.2	-1.967	-1.13	49.1
8	-0.078	-1.25	60.8	-0.500	-1.08	55.0
9	0.019	0.34	49.1	-0.009	-0.09	47.7
10	-0.029	-0.64	57.2	0.025	0.15	55.0

** : Significant at 5% level. * : Significant at 10% level

8 Conclusions and Implications for Future Research

Corporate insider trading has been a contentious issue in the UK with several high profile cases occurring in recent years.¹ Surprisingly, empirical research in this area has lagged behind debate in legal journals, with the effects of corporate insider trading on the efficiency and ‘fairness’ of the market in general being the main concern. Several reasons may be the cause of this. Whereas the ethics concerning corporate insider trading and the perceived effects of undeserved rewards through the exploitation of inside information will always be subject to controversy, its impact on the efficiency of markets and on the pricing of securities is more difficult to assess. One of the major obstacles to empirical financial research in this area has been the paucity of ‘good’ data and the length of time over which this data spans. With respect to UK corporate insider trading research, several notable examples exist of a significant contribution to the literature. In this regard, King and Roell (1989), Pope, Morris and Peel (1992) and Gregory, Matatko, Tonks and Purkis (1994) have been the major contributors who, using independent data sources of varying quality and over different time periods have found that corporate insider trading decisions tend to outperform the market and other investor trades over a wide range of holding periods. However, performance studies like the ones mentioned above basically constitute the extent of research into insider trading in the UK.

In my opinion there is great need for a deeper understanding of the factors affecting the performance and timing of insider trading not only in the UK but also in other

¹ A topical example is the Jeffrey Archer insider trading case concerning his associate’s trading of Anglia Television shares while his wife was a director of the company. Although Archer was found innocent of abusing his privileged position, the media has continually brought the case up since.

developed markets such as Europe and Asia. As in most other areas of financial research, the US is far ahead of the UK in studies of corporate insider trading. This thesis has aimed to redress the balance by carrying out a gamut of tests on the performance, strategies and effect of insider trading in the UK. Many insights have been gained from the analysis and in the next section the findings from each chapter will be summarised.

8.1 Summary of Findings

8.1.1 Chapter 2 – The performance and characteristics of corporate insider trading

Chapter two, which examined the performance and characteristics of corporate insider trades, explored the various signals that investors can synthesise from the actual trades of insiders themselves. Motivated by theoretical predictions of how an informed trader would act when in receipt of private information, I have examined the informativeness of various trading signals to determine whether any held information pertaining to future price movements of the insider's firm. The trading signals were all observable to market participants soon after the trade and consist of different measures of the 'strength' of the insider trade. The measures that were examined are: the number of shares traded, the monetary value of shares traded, the percentage change in insider holdings, the trade size with respect to the market value of the firm, and the number of different insider trades within twenty days of the first insider trade. Using daily returns data (which is a first for UK studies of this type), it is clear that insiders buy shares after a sustained period of poor performance and sell

subsequent to above average share price performance. The performance of the insiders' shares after the trade were strongly supportive of the argument that corporate insiders have a deeper information set from which to draw on when they trade. In a twenty day period after an insider buy transaction, insider shares experienced a cumulative average abnormal return of 5.74% using a size and risk adjusted measure of expected return. For sale transactions the cumulative average abnormal return was -1.37% using the same methodology.

Further investigation suggested that the insider performance was driven by extreme price movements on a subset of insider trades. For example only 40% of all insider buy transactions resulted in an increase in the price of the insider's firm on the day of the trade with only 38% of all trades having a price increase in the day after the trade. Following on from this finding, chapter two then examined the differential returns to increasing levels of insider trade strength based on the signals discussed earlier. Several factors were found to be important. Larger price movements subsequent to insider trades were commonly associated with those trades which resulted in a large change in insider holdings. In addition to this, more than one insider trade in a month was also an indicator of large price movements subsequent to insider trading.

Given that share prices reacted on the same day as the insider trade, the insights gained from the chapter could be construed (because of reporting delays) to have relatively little practical significance for followers of this information. However, even though the delay in the public announcement of the insider trade could hypothetically be up to six days after the trade itself, in a large majority of cases the

trade was announced to the market on the same day as the trade or one day after. Therefore market participants who follow corporate insider activity should be able to exploit the information gained from the trade and thus realise a substantial profit from their activity.

Corporate insiders are not free to trade whenever they wish to. In most established economies, legislation exists to constrain corporate insider activity in order that potential abuses of the insider's informational advantage is minimised. Chapters three and four explore whether regulation can affect the behaviour of corporate insiders using the UK as a specific case study.

8.1.2 *Chapter 3 – Insider trading and the London Stock Exchange Model Code*

In the UK, the main regulation that affects corporate insider trading is the London Stock Exchange Model Code (1977). Whereas other acts (i.e. Companies Securities Act (1985) and Financial Services Act (1993)) define an insider and whether a person actually has inside information, the Model Code specifies a code of conduct which *company directors* must follow irrespective of their having inside information or not. The Model Code is not statute or part of the laws of the country. Instead it is a code which the London Stock Exchange expects its members and all companies listed on it to follow at the very minimum.

The Model Code prohibits directors of firms that are listed on the London Stock Exchange to trade at certain points in their company's financial year. To be more specific, directors may not buy or sell the securities of their firm in the two month

period before an interim and a final earnings announcement. In addition to this, directors also may not trade in their company's securities when in receipt of private information. Finally, a director must obtain permission from the chairman or a designated director before they trade. In effect, the Model Code effectively bars a director from trading for at least four months in the company's financial year.

No study has yet determined whether directors actually adhere to the Model Code. Directors who contravene the code would trade within the two month period before an earnings announcement. Given that the Model Code is voluntary, it could be argued that directors may disregard its main tenets when rewards from trading are greater than the penalties imposed by the Exchange. Chapter three examines this issue by measuring the distribution of director trades around the firm's two earnings announcement dates.

The results clearly indicate that UK company directors overwhelmingly adhere to the Model Code for both interim and final earnings announcements. The striking fall in corporate insider trading activity is shown in the figures presented in chapter three. Violations of the code do occur during the sample period. However, tests of the performance of these trades (not reported) indicate no abnormal performance attributed to them and in many cases explanations have been provided for the director's trade.²

The findings in chapter three would suggest that the Model Code was successful in deterring corporate insiders from trading when they are suspected to be in possession

of private information. However, they provide no light on whether the Model Code affects the performance of insider trades which is ultimately the more important issue. This is the topic of chapter four.

8.1.3 *Chapter 4 – To ban or not to ban? Exchange regulation and corporate insider trading*

In chapter four, the analysis in the previous chapter is extended by investigating in greater depth how the directors of a firm act around the trading bans that are in force before earnings announcements. Ultimately, if the London Stock Exchange Model Code is successful, post insider trade share price performance will be less than would be the case if the Model Code was not in force. While I do not have a period in my sample which allows me to directly test this issue (pre versus post Model Code), an analysis can indirectly be carried out by investigating the strategies that corporate insiders follow in the periods before, after and not around the imposed 'close period'.

The first test that was performed was on the distribution of corporate insider trades during a firm's financial year. If the earnings announcement was important to corporate insiders (as the Model Code assumes), the distribution of insider trades would be clustered around this period. The two month period which bans trading by directors obviously has affected this (see chapter three), however it is interesting to determine when corporate insiders trade when allowed to do so. I classified the financial year into two periods: announcement and non-announcement. The announcement period was the ten-day window before and after the earnings

² Examples include retirement (Sir Bernard Ashley from Laura Ashley Holdings plc), the purchase of

announcement when insiders are allowed to trade. As a result of the close period, the ten-day window before the earnings announcement is actually the ten days prior to the start of the close period which is two months before. The non-announcement period spans all other times. Because a firm has two earnings announcements in its financial year, the total size of the announcement period is forty days (two before periods and two after periods). The size of the non-announcement period is thus approximately one hundred and twenty working days (six months). If the earnings announcement was unimportant, the distribution of announcement to non-announcement trades would be in the ratio of three to one. The ratio is nearer 2.45 to one which indicates a larger than expected level of trading around the earnings announcement. An examination of the performance of announcement versus non-announcement corporate insider trading in general shows a similar level of cumulative abnormal returns irrespective of period and whether the earnings announcement was interim or final.

Given the higher level of trading around the earnings announcement, I further split the announcement period sample of trades into those occurring in the ten-day period prior to the close period and in the ten-day period after the earnings announcement. If the timing of the trades with respect to the earnings announcement was insignificant, the distribution of trades would be roughly equal between the two periods. This is most definitely not the case with the ratio of trades occurring after the announcement to before the announcement at a massive 3.82 to one. In comparison to those trades taking place not around the earnings announcement (non-announcement trades), the ratio is 3.08 to one against an expect ratio of six to one

a yacht, a daughter's wedding and the payment of a tax bill.

(120 days to 20 days). Thus the ten day period subsequent to an earnings announcement is a period of heavy corporate insider trading. An examination of the performance of corporate insider trades in the two periods again show similar cumulative abnormal returns.

Finally, I examined whether insiders traded on private information outside of the earnings results or whether they traded on the earnings figures. I did this by comparing those trades which were in the opposite direction to the news in the earnings announcement (an example is buying after bad news and selling after good news) and those which were consistent with the earnings figures. The distribution of trades (table 4.3) strongly suggest that corporate insiders traded on information not included in the earnings announcement. Moreover, the increased level of general market activity around this time which was in the opposite direction to their trade allowed corporate insiders to earn significant abnormal returns from their trades. However, this level of performance was not very different from that in other periods.

The conclusions that can be made from this analysis is that although the trading ban had definitely affected the timing of insider trades it had in no way impacted upon the performance of insider trades. Irrespective of the timing of their trades, corporate insiders on average outperformed the market. This result stood during announcement and non-announcement periods as well as active and passive periods.

What do these findings suggest with respect to the success of the London Stock Exchange Model Code? Several comments can be made on this issue. The objective of the Model Code is to ensure that directors, as a result of their privileged position

within a firm, do not abuse their position by trading on information that is unavailable to other investors. One period that is viewed to be particularly important is that prior to a firm's earnings announcement. Although it is voluntary, The Model Code has definitely changed the timing of corporate insider trades. However, it has not dampened the performance of those trades. Thus it appears that the Exchange has misunderstood the nature and type of information that corporate insiders use when trading. My results suggest that insider trading activity is most acute when there is a greater element of mispricing and when market sentiment is most out of sync with the expectations and more informed views of corporate insiders. Insiders exploit this information differential when they trade. With respect to an earnings announcement, the market is reacting to information that is approximately two months old. Thus, corporate insiders can actually use the announcement to their advantage and trade on more recent information when others are reacting to old news. It would seem therefore, that a more sensible approach would be to ban corporate insider trading for a period after an earnings announcement in addition to the period before in order for the market to be able to fully digest the information in the earnings report. Although this would in all probability not affect the profits earned by insiders when they do trade, it would reduce the number of times in which they would be able to exploit this information.

An alternative view to the findings in this chapter is that the insider trades in the post earnings period is actually a necessary mechanism for the directors of a firm to realign erroneous views of investors who are reacting to old information which is now possibly obsolete. By allowing corporate insiders to signal to the market at this volatile time, the informational efficiency of the market is enhanced and prices

become more accurate representations of the true value of the firm. While corporate insiders obviously make a profit from their trading activity, this is a due reward for the services that they provide.

In chapter five, my analysis draws from the results in chapter two and this chapter in constructing a trading strategy based on the signals developed here.

8.1.4 Chapter 5 – An analysis of investment returns around corporate insider trading

In chapter two, several factors were shown to be correlated with large price movements subsequent to corporate insider trading. Principally, these were the percentage change in holdings as a result of the insider trade and multiple insider trades within any twenty day period. Many financial institutions claim to use corporate insider trading information as a component in their investment decision making. However, without some criterion which filters out those insider trades containing little or no information pertaining to future price movements, strategies using this information are bound to fail. Two reasons can be provided for this argument. One, chapter two has shown that prices react on the day of the insider trade and move significantly for up to twenty days post trade for buy transactions. However, delays in reporting, publication and synthesis of insider trading information decreases the possible return that can be generated from strategies that simply mimic insider trading activity. Secondly, there is low proportion of corporate insider trades that actually lead to the extreme price movements commonly associated with insider trading. With only forty percent of all insider trades showing

a price increase on the day of the trade and an even lower proportion recording positive price changes in the days after a trade, the likelihood that a simple trading strategy would actually profit would be very low.

Therefore, it would seem reasonable that for a trading rule founded on insider trading to be profitable some filtering must occur. Chapter five develops a very basic model using standard Bayesian probabilities which approaches this issue from the perspective of an outsider wishing to use insider trading in their investment decisions. The model posits three factors that will influence an outsider's expectations concerning future price performance given an insider trade. These are:

1. The probability that the corporate insider had information when they traded.
2. The probability that the information was good or bad news.
3. The proportion of informed insider trading to uninformed insider trading in the firm.

To empirically test the model, indirect proxies of the first two factors are required since these variables are essentially unobservable. The variables we use are the pre-trade price performance and the strength of the trading signal as measured by the percentage change in insider holdings respectively. The pre-trade price performance is used to proxy for the probability of the insider having information based on the assumption that insiders who buy after extremely bad price performance and sell after sustained good price performance are likely to be trading on private information. This is verified to an extent by the findings of chapter four that insiders tend to buy after bad earnings announcements and sell after good announcements. The percentage change in insider holdings is used to proxy for the probability that

the information was good or bad news because large changes in holdings are suggestive of changes in the expectations of the insider, especially when the insider has bought shares, which would only occur if they had new information. In addition, the trade signal is with respect to the insider and not the firm and is thus a more direct measure of signal strength.

Empirical testing provides support for the validity of the model. In particular, there appears to be interactions between the three variables that provide further information concerning the future movements of the share price of the insider's firm. In addition trading strategies based on the model, show it to be profitable up to at least five days subsequent to the insider trade date. Thus, even with a delay the use of a trading strategy which filters out uninformed insider trades would lead to profitable returns to the investor.

Given the importance of corporate insider trading on the price movements of a firm, the thesis then examined its effect on security return seasonality and the inventory control behaviour of dealers around insider trading. Each of these issues are important in their own right. However, by including an insider trading aspect I hope to have provided an even greater insight into the factors affecting security return seasonality and dealer inventory control.

8.1.5 *Chapter 6 – Insider trading, tax-loss selling and the turn-of-the-year effect*

Stock return seasonalities have attracted a whole host of research attempting to explain or even detect these pricing phenomena. In chapter six, I have contributed to

this body of research by examining whether corporate insider trading seasonalities are the reason for the return seasonalities observed in the UK. As observed in chapter two, the performance of corporate insider trades is much stronger than other investor trades. Moreover, chapter four has recorded that there are clustering of insider trades in a company's *financial* year. It is thus of interest to determine whether this seasonality translates into a *calendar* year seasonality and whether the average returns to stocks are affected by this seasonality.

Initially, the existence of a turn-of-the-year effect for UK stocks was determined. All firms listed on the London Stock Exchange were ranked on size (market capitalisation of equity) and sorted into decile portfolios. A time series regression using daily data was run with a January dummy as the only regressor. For each size portfolio, the January dummy was significant. However, unlike US evidence the effect was equal across all firms. A study of the year to year January effect indicated that the turn-of-the-year seasonality was not a consistent phenomena. However, in five out of ten years the effect was significant and in one year (1991) the seasonality reversed with significantly negative returns in January.

To further the analysis, I also included an investor tax-year end dummy which corresponded to twenty working days from April 4th of each year. This was in addition to the January dummy of the previous analysis. The analysis suggested that returns in these two months explained (with the exception of the smallest firms) the positive returns over the whole year. In one portfolio, the amount of variation in returns explained by the two months highlighted in the analysis reached a maximum of 83%.

Given that stock return seasonalities are prevalent in the UK, I then focussed on the impact of insider trading on the return seasonality. An examination of insider trading clustering in calendar time showed that more insider buying took place in December of each year than at any other time in the year. In addition to this, there is a heightened level of insider trading in the March of each year. This would indicate that there may be a connection between insider trading activity and stock return seasonalities in the UK. Unfortunately, empirical testing of this hypothesis showed no relationship between the two seasonalities for the whole sample of firms.

8.1.6 *Chapter 7 – Dealer inventory control when corporate insiders trade*

The last chapter of empirical testing in this thesis pertains to the activities of dealers when insiders trade. Market microstructure has many theories concerning the pricing of securities and the inventory control of dealers under asymmetric information. However, whereas much empirical research has been devoted to the effect of asymmetric information on spreads and the pricing of securities, there is very little empirical work on the effect of asymmetric information on the inventory control of dealers.

The findings from the research reported in chapter seven indicate that dealers change their inventory control behaviour subsequent to corporate insider trading. Trades by insiders are accompanied by large changes in dealer inventories in the direction of the trade. That is, inventories significantly increase after a sell trade and significantly decrease after a buy trade. Dealers react to the information by

“tightening” their inventory control as evidenced by greater mean reversion of inventories in the ten days after an insider trade. The extent to which dealers use the inter-dealer market as a risk sharing mechanism does not appear to change after the arrival of information. Further, the insider trade does not precipitate any change in market depth. Finally, the share price movements as a result of insider trading which have been reported in chapter two, disappear once inventory effects are taken into account. These results are consistent with previous research which shows that inventory control is actively managed by dealers and provides further evidence on the debate concerning the information content of corporate insider trades.

8.2 General Discussion

The findings in each of the seven empirical chapters in this thesis have individually provided many insights into the strategies, performance and impact of corporate insider trading. However, when each chapter is viewed in relation to the other, a very clear picture is developed of insider trading that goes against many conventional views of this activity.

In chapter two, corporate insiders were found to earn abnormal returns from their trading decisions. However, decomposition of the trades which moved prices showed that only a subset of corporate insider trades contained any information. Several factors were found to be important with respect to informed trades. If the insider changed their holdings of their firm by a significant proportion and when more than one insider traded in any month empirical testing showed that prices were likely to move as a result.

When regulation is incorporated into the analysis, it is shown that insiders trade around the constraints imposed by the regulation and still manage to significantly profit from their trades. This is the case even though corporate insiders are banned from trading for at least four months of the year. It thus appears that insiders do not trade on specific information events per se, but instead on a larger and more abstract information set that is unobservable to most other market participants. This allows them to exploit any mispricing that may be inherent in the market estimate of their company's shares.

The findings from chapter two, four and seven also suggest some benefits that may arise from corporate insider trading activity. The activity of exploiting mispricing is similar to the activity theoretically taken by arbitrageurs in the market. When the market perception of the value of a firm is erroneous, corporate insiders may step in and trade to bring the price back to more representative levels. The findings in chapter seven suggest that corporate insider trading also supplies liquidity to the market through the volume of trading that tends to follow their trades. Insiders trade when aggregate dealer inventories are extreme levels. The market reaction to the trade brings the inventories back to normal levels reducing the inventory risk of dealers in the market. The benefits provided by corporate insider trades have not until now been explicitly recognised in the finance literature and do provide support for calls to lessen the stringent laws facing corporate insiders.

In addition to the services provided by corporate insider trading, new factors which have been found to be extremely important in this area have been put forward in this

thesis. In particular, the concept of a track record of insider trading in firms is particularly appealing (chapter five). Whereas the Model Code specifies a minimum level of constraints imposed on insiders, it also encourages firms to take action over and above that. There will be some firms who only allow corporate insider trading when there is no information content in the trade and there will be others that impose no additional constraints. It is likely that the latter grouping will be the firms that contain informed insider trades.

In the next and final section of this thesis, I will conclude the analysis and discuss the areas of future research that would make a contribution to the literature.

8.3 Conclusions and Areas of Future Research

This study has established that the analysis of corporate insider trading is a worthwhile and valuable contribution to empirical finance research. However, much more work can be carried out in this area especially as regards the UK. The following topics would be interesting and are future avenues of research I aim to pursue.

8.3.1 Lack of insider trading

The London Stock Exchange Model Code not only imposes a trading ban for four months of a firm's financial year on corporate insiders, but also bans them from trading when in possession of price-sensitive information. Given that a corporate insider must obtain clearance from the board or a designated chairman when wishing

to trade the shares of their firm, there will be periods when the request will be declined because of potential firm activity that causes price movements. In addition, a company will not wish to be the victim of bad publicity at this time if the London Stock Exchange wishes to investigate the issue.

Therefore, an interesting empirical study would construct probabilities of insider trading and use abnormally low levels of trading as signals for firm information. In addition, trading strategies that involve options (an example is a straddle) could exploit potential future price movements.

8.3.2 *Insider trading around firm specific announcements*

In the UK, the only study to examine insider trading activity around firm specific events is my own in chapter four. There is obviously much greater scope for this type of research that could involve all the various issues that were discussed in the literature review in chapter one.

8.3.3 *The impact of options markets on insider trading*

If the market is incomplete, the introduction of options into a portfolio can actually change the pricing the underlying assets on which the option value is based. How this affect the performance of insider trades is uncertain. In addition, insider and investor strategies may change because of the additional hedging and speculative characteristics of options.

8.3.4 *Market microstructure and insider trading*

In chapter seven, I carried out a preliminary analysis of the inventory control behaviour of dealers around corporate insider trading. However, this is only one part of the equation. The dynamics of pricing and the intra-day behaviour of market maker quotes as well as the behaviour of dealers who actually trade with the corporate insider is of great interest. In effect, the dealer who trades with the insider becomes an insider themselves.

8.3.5 *The impact of different trading systems on insider trading performance*

In October 1997, the London Stock Exchange moved from a quote driven system to an order driven system for its largest equities. Whether this would have an impact on the performance of corporate insider trades is uncertain. Insiders are now able to interact with the market anonymously through the placing of orders in the order book. However, the dynamics between the order book and the still existent dealers who are now called retail service providers is still unclear. A study of this nature would also provide many insights into the effect of trading systems on the efficiency of a market in general.

8.3.6 *Closing Remarks*

The thesis has drawn on many different data sources and dipped into several areas of finance. However, my hope is that not only has the research on insider trading been developed from my analysis but also the understanding of the various finance issues

that were also examined. The efficiency of markets, the impact of regulation, the effectiveness of regulation, seasonalities in stock returns, inventory control of dealers and the profitability of trading rules have all been examined in conjunction with insider trading.

In the future, I plan to study the other issues that have been mentioned in this chapter and new ideas will develop from this work too. As well as the financial markets constantly changing, research in this area will continue to develop as new laws and a greater understanding of finance is developed. In addition, as data sets become more accessible for different countries' markets and markets become more integrated, the type of research that will be carried out on insider trading will change and become more international. The opportunities that will face corporate insiders will also change with increases in the informational efficiency of the markets worldwide. Whether this impacts upon the profitability of their trading remains to be seen.

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