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"Do Insiders Time Their Trades? Evidence from Euronext Lisbon"

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GLOSSARY OF TERMS AND ABBREVIATIONS

AR - Abnormal return

CAR - Cumulative abnormal return

CMVM – *Comissão do Mercado de Valores Mobiliários*

CNMV - *Comision Nacional del Mercado de Valores*

CVM - *Código dos Valores Mobiliários*

EPS - Earnings per share

FTSE 100 - London Stock Exchange index

LSE - London Stock Exchange

OLS - Ordinary least squares

P/B - Price to book ratio

P/E - Price earnings ratio

PSI-20 - Portuguese Stock Index 20

SEC - Securities and Exchange Commission

TWSE - Taiwan Stock Exchange

$\sigma^2(\hat{AR}_{i\tau})$ - Abnormal return conditional variance

τ_1 and τ_2 - Cumulating periods

ε_{it} - Disturbance term of abnormal return

$\sigma^2_{\varepsilon_i}$ - Disturbance variance

τ - Event time

$R_{m\tau}$ - Log return in event period τ for the market portfolio

$R_{i\tau}$ - Log return in event period τ for security i

H_0 - Null hypothesis

N - Number of events

α_i, β_i, and $\sigma^2_{\varepsilon_i}$ - Parameters of the market model

θ_1 and θ_2 - Test statistics

$\sigma^2_i(\tau_1, \tau_2)$ - Variance of the cumulative abnormal return

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ABSTRACT

If an insider trades on privileged information, then one would expect to see insiders purchase in days before the security price increases and sell them in the days before the security price declines. This is the main study hypothesis on which we have based our investigation. Numerous studies in different countries have found that insiders do trade around events or news that influence firm value and that on average they do abnormal profits. We try to replicate those investigations in the Portuguese stock market.

Our investigation aims to detect and measure the existence of insider trading abnormal profits during the period from January 2001 to December 2005. It covers, when available, all insider transactions from companies belonging to the Eurolist from Euronext Lisbon. To decide whether or not insiders time their trades, we use the traditional methodology of event studies to test the existence of abnormal returns around the days when insiders purchase or sale their company shares. We also tested if the magnitude and duration of abnormal profits depend significantly on firm-specific and transaction-specific factors (such as industry classification, firm size, firm valuation and relative trading volume of the insider transactions).

The practical objective of our research is to answer the following question: Do insiders buy (sell) shares prior to stock price raise (decline)?

Keywords: insider trading; information and market efficiency; event studies; abnormal return; corporation and securities law; asymmetric and private information.

JEL Classification: G14, K22, D82.

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RESUMO

A questão subjacente a esta investigação é a de saber se os "insiders" das cotadas portuguesas usam informação privilegiada para negociarem acções das empresas às quais estão ligados. A investigação procura replicar, para Portugal, estudos académicos já realizados noutros mercados mundiais, muitos dos quais, mesmo em mercados regulamentados, chegaram à conclusão que os "insiders" lucram com a informação privilegiada de que dispõem ou a que podem ter acesso.

O objectivo final da tese é responder à seguinte questão: será que os designados "insiders" compram (vendem) acções das empresas a que estão ligados antes de uma subida (queda) das cotações dessas firmas?

Para isso iremos aplicar a metodologia do estudo de eventos e testar se o ganho "anormal" nos períodos à volta das transacções dos "insiders" é significativamente diferente de zero. A metodologia é aplicada às empresas admitidas à negociação no mercado regulamentado da Euronext Lisbon no período compreendido entre 2001 e 2005. Nesta investigação também procuramos testar se a magnitude e a duração da rendibilidade "anormal" dependem de factores específicos da empresa ou das transacções (tais como a classificação sectorial, a dimensão e a avaliação da empresa e o volume de transacções subjacente a cada compra ou venda por parte dos "insiders").

Palavras-chave: "insider trading"; informação e eficiência do mercado; estudo de eventos; retorno anormal; regulação; informação privada e assimétrica.

Código de classificação JEL: G14, K22, D82.

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1. INTRODUCTION

"*Unless [...] insiders just happened to possess superior analytical ability, their excess return must be due to the illegal exploitation of insider information*".[1]

Insider trading literature deals with the following question: do insiders make use of non-public information to earn profits larger than they would have had if they traded on the available public-information? Numerous studies in different countries have found that insiders do trade around events or news that influence firm value and that on average they do abnormal profits.

We investigate the profitability and information content of insider trading in the Portuguese stock market. The practical objective of our research is to answer the following question: Do insiders buy (sell) shares prior to stock price raise (decline)?

In our study we assume insiders to be those individuals who are compelled to inform the Portuguese Securities Market Commission (CMVM - *Comissão do Mercado de Valores Mobiliários*) about the purchase and disposal of shares from the company with which they are related. CMVM is responsible for the regulation and supervision of the Portuguese stock market and tries to guarantee its integrity and transparency. Therefore the regulator, through the Portuguese Securities Code (CVM - Código dos Valores Mobiliários) imposes a rule set to prevent insiders from using privileged information while trading stocks of their own firms. The Portuguese Securities Code (article 378. n.°3) describes privileged information as all non-public information that, being accurate and with respect to any issuer or securities or other financial instruments, would be capable, if it was given advertising, of influencing in a sensitive manner its price in the market.

1 Elton and Gruber (1995)

Notwithstanding, throughout our sample period CMVM has detected occasional suspicious situations in the days immediately preceding the disclose of information likely to have a significant effect on share prices.

Our investigation aims to detect and measure the existence of insider trading abnormal profits during the period from January 2001 to December 2005. It will cover, when available, all insider transactions on companies from Euronext Lisbon belonging to the Eurolist.

To decide whether or not corporate insiders time their trades, we use the traditional methodology of event studies to test the existence of abnormal returns around the days when insiders purchase or sale their company shares. According to MacKinlay (1997), a major success of this methodology is the implicit acceptance of event study by the U.S. Supreme Court for determining materiality in insider trading cases and for determining appropriate disgorgement amounts in cases of fraud. Following the literature, we also tested if the magnitude and duration of abnormal profits depend significantly on firm-specific and transaction-specific factors (such as industry classification, firm size, firm valuation and relative trading volume of the insider transactions).

Event studies also serve an important purpose in capital market research as a way of testing market efficiency. Systematically nonzero abnormal security returns that persist after the insider transaction are inconsistent with market efficiency.

The remainder of this work is organized as follows. Chapter 2 presents the literature review. Chapter 3 presents the problem identification, where we summarize the legal framework regarding insider trade activity in Portugal. Chapter 4 describes the data and provides the summary statistics and chapter 5 the methodology applied. Chapter 6 discusses the empirical results and chapter 7 concludes the study.

2. LITERATURE REVIEW

Many studies conclude that insiders can earn abnormal profits through trading stocks of their own firms. Nevertheless, the intensity, pattern, duration and significance of those profits have varied substantially across countries and markets. The magnitude of abnormal profits depends on firm-specific and transaction-specific factors (such as firm size, trading volume, etc.), and the conclusions may also depend on whether insiders are purchasing or selling shares. The conclusions can be affected by modifying the standard event study methodology assumptions, and the regulation and enforcement of insider trading laws can also play a major role. This particular aspect turns this research very market dependent since in each market a different regulation is applied.

Early investigations conducted in the U.S. showed that insiders are able to earn significant exceptional returns, around 5%, during the first five months after trading. Jaffe (1974) found evidence that insiders can predict price movements in their own securities, testing the information content of the Official Summary, the Securities and Exchange Commission (SEC) monthly report listing the transactions of corporate officials. For all the samples in his study, he concluded that SEC' publication contains information on the future stock price. However, after adjustment for transaction cost, only intensive trading samples (the only ones that possessed residuals greater than the cost of transaction) were earning statistically large returns.

Following Jaffe, Baesel and Stein (1979) tested the profitability of insider trading activities in Canada, but they chose to divide the trading activities into two subgroups: a set of trades by ordinary insiders and a set of insider trades made by bank directors. Their results also contrasted with the classically stated strong form of the efficient market hypothesis. Indeed, they found that both ordinary insiders and bank directors earned positive premium returns relative to an uninformed trading strategy. Bank directors earned larger premiums than ordinary insiders. This was particularly true for purchases, which the authors believe better represent trades relying on information. The reason,

according to the research, is the fact that bankers have information sets which contain those of ordinary insiders as subsets.

Also in Canada, Heinkel and Kraus (1987) went beyond the traditional event study approach and developed a portfolio performance measures for the aggregate insider and his/her trading partner (outsider) that measure portfolio return over the entire sequence of insider (and outsider) trades. They analysed just small companies where insiders account for a large fraction of ownership and transactions. According to their study, insiders will choose to trade on superior information only if they can earn abnormal profits (i.e., above a risk-adjusted market rate of return) by their trading. Any such abnormal profit may imply abnormal losses to the parties on the opposite sides of the trades. The latter parties were termed "outsiders". The major conclusion was that, despite being able to identify particularly profitable transactions, the insiders do not, over all their trades, outperform the outsiders. While cumulative abnormal return results indicate that some insider trades are profitable, the portfolio results do not support the hypothesis of superior insider.

Moss and Kohers (1990) chose to examine just those insiders trading in U.S. in events occurring prior to earning and dividend announcements. Their investigation tried to find if corporate insiders are able to profit enough from their transactions so as to outperform the stock market by buying their company's stock prior to favourable earning and dividend announcement of their firm. Similarly, they were expecting insiders to avoid losses by selling their company's stock prior to unfavourable earning and dividend news. Following Jaffe (1974), they used data from the Official Summary of Securities Transactions and Holdings published by SEC, during the years 1982 and 1983. Their results clearly indicate that insiders were able to outperform the market for each one of the four types of announcements examined. In the case of the two positive news announcements (earning greater than expected and dividend increases), they were able to generate risk-adjusted excess returns, while they used the negative announcement (earning lower than expected and dividend decreases) to time their selling in order to prevent significant losses in the market value of their stock holdings. The authors suggest that SEC has not been effective in bringing total efficiency to the market.

Kabir and Veanaelen (1996) also analysed the relationship between insider trading and earning announcements, but have used liquidity (measured by trading volume) rather than stock return to detect the existence of inside trading activity. From 1987 onwards, insiders at Amsterdam Stock Exchange were no longer allowed to trade two months before an annual earnings announcement. The study proposed to find if, as a result of the regulation, trading volume prior to the restricted period increased (since insiders might want to liquidate their positions prior to the start of the restricted period). The results demonstrate that stocks became less liquid when insiders were not allowed to trade. The study also found some evidence that the introduction of insider trading restrictions reduced the stock market's speed of adjustment to positive earnings news.

More recently, Calvo and Lasfer (2002) tested insiders' abnormal return using data from 203 U.K. companies listed on the London Stock Exchange (LSE), over the period from January 1997 to December 2001. Considering an event window of 10 days before and after the insider trading, they found that insiders' purchases (sales) are preceded by negative (positive) abnormal returns during the ten days before the transaction date. The cumulative abnormal returns over the [-10, -1] period amount to –2,18% for the buy transactions and to 1,74% for the sell trades. Over the [+1, +10] period, the buy transactions are followed by positive returns of 1,56% while after the sales share prices decrease by 1,94%.

2.1. Decomposing Insider Trading

Several authors show that the magnitude and duration of abnormal profits may also depend significantly on firm-specific and transaction-specific factors. Furthermore, profits may also depend on whether insiders are buying or selling their firm securities.

Some authors like Seyhun (1986) argue that the quality of information also varies from insider to insider. Insiders who are expected to be more knowledgeable with the overall affairs of the firm, such as chairmen of the boards of directors or officer-directors, are

more successful predictors of future abnormal stock price changes than officers or shareholders alone. Evidence also suggests that insiders can discern the differences in the value of their information and trade greater volumes of stock to exploit more valuable information. Two years latter, Seyhun (1988) discovered that insiders in small firms, who are more successful predictors of their firms' performance, tend to trade mostly on firm-specific information. Insiders in large firms, on the other hand, are more likely to trade on the basis of economywide factors rather than firm-specific factors.

Besides the traditional sample division between buying and selling activities, Jeng *et al.* (1999) decomposed insider trading along several dimensions: trade volume, size of the firm, insider's position in the firm, and whether the trade is executed directly for an insider or indirectly for another party. They first constructed a rolling "purchase portfolio" that holds all shares purchased by insiders for a six-month period; an analogous "sale portfolio" holds all shares sold by insiders for six months. The six-month horizon was chosen to coincide with the "short-swing" rule of the Securities and Exchange Act of 1934 (a rule that prohibits profit taking by insiders for offsetting trades within six months). The authors then employ performance-evaluation methods to analyse the returns to the purchase and sale portfolios. The results show that the purchase portfolio earns abnormal returns of more than 50 basis points per month. On the other hand, the sale portfolio does not earn abnormal returns. They also found that the abnormal returns to insider trades in small firms are not significantly different from those in large firms, and that top executives do not earn higher abnormal returns than do other insiders. The conclusions contrast with the Seyhun (1986) finding. The authors suggested a positive relationship between trade volume (fraction of firm equity traded in each insider transaction) and insider informativeness, showing that abnormal returns for the high-volume and medium-volume purchase portfolios are economically large and statistically significant. Performance measures for the sale portfolios are found to be economically small and statistically insignificant.

The pattern of stock prices being more dependent on purchases than sales is common in U.K. and U.S. insider trading literature. One possible explanation, advanced by

Friederich *et al.* (2000), is that block purchases convey more information than block sales. They argue that decisions to buy should, on average, be more information-based and decisions to sell should be more liquidity-based. They analysed data on the trades executed by executive directors for the period 1986-1990 in the LSE. It was chosen not to focus on the most liquid stocks (FTSE 100 companies) since previous work showed higher gross abnormal returns in less-liquid securities. It was found that for director purchases, abnormal returns are significantly negative in the twenty days before the net purchase, implying that directors purchase shares on average after a downward run in share price (of about 3%). After the insider transaction, the share price clearly recovers and abnormal returns are positive on most days, so that abnormal return over the 20 days after the director's trade averages a significant +1,9%. The patterns are symmetrical in the case of director sells, though the magnitude of abnormal returns is lower, as stated above. Directors typically sell shares after a run of positive price movements over twenty days of about +1,25%, and abnormal returns are predominantly negative after the directors' sale, so that excess returns have averaged about -1,5% twenty days after the event.

Calvo and Lasfer's (2002) findings also suggest that insider purchases convey more information into the market. Besides the examination of stock price abnormal performance around insider trading activity described early, they provided evidence of a relationship between insider trading and news released after each transaction. They searched all the news items over the period of four months (80 trading days) after the insider transaction, finding a total of 67 different types of news, which they have classified as good, bad or neutral according to prior market expectations. They found that most purchases are followed by good news while sales are not necessarily followed by bad news. The probability that an insider purchase is followed by firm-specific good news amounts to 70,9%. In contrast, insiders' sales followed by bad news represent only 24% of the cases.

Cheuk *et al.* (2006) reached different conclusions when studying price movements of legal insider transactions in Hong Kong. Contrary to the U.S. and U.K., where corporate

insiders make larger profits from their insider purchases than from sales, they found that Hong Kong insiders actually obtain more profits from sales. One possible explanation is that insider sales in Hong Kong are far less common than insider purchases. Therefore, it is understandable that when insiders sell, outsiders are more likely to perceive that the activities are driven by valuable private information than when insiders buy. They conjecture that since a larger proportion of Hong Kong insiders are owner–managers relative to the case of U.S. companies, they sell relatively less frequently for fear of losing corporate control. The abnormal performance of stocks traded by insiders in Hong Kong was examined according to industry classification, firm size, book to market ratio, price earnings ratio and relative trading volume of the insider transactions. The results show that some insider purchases produced large and persistent abnormal returns. These purchases have some common denominators: the firm concerned is usually a finance or industrial company, the firm is small in terms of market value, the book to market ratio of the firm is large, the price earnings ratio of the firm is small, and the relative trading volume of the purchase is large. This last result confirms Jeng *et al.* (1999) findings. For insider sales, the post-event cumulative average abnormal returns are significantly negative in the aggregate, as well as for sub-groups that are formed according to firm and transaction specific characteristics.

2.2. Differences in the Regulation

The results may also depend on the country and exchange under scrutiny, since different insider trading laws may affect the ability of insiders to take advantage of their privileged information. Many studies detecting abnormal profits from insiders suggest that insider regulations during the sample period were unable to curb insider abnormal profits. Different insider trading laws and enforcement of those laws throughout different countries and time can help explaining why not all investigations reached similar results.

Bhattacharya and Daouk (2002) made a survey on the existence and the enforcement of insider trading laws around the world. The study of the 103 countries (including Portugal) that have stock markets reveals that inside trading laws exist in 87 of them, but

enforcement – as evidenced by prosecutions – has taken place in only 38 of them. Before 1990, the respective numbers were 34 and 9. This led them to conclude that the existence and the enforcement of insider trading laws in stock markets is a phenomenon of the 1990s. The authors tried to find out if inside trading laws affect the cost of equity. To put it in another way, if insider trading is found to increase the cost of equity, corporations would pay stock exchanges a premium to limit insider trading, everything else being constant. If equity markets are informationally efficient, and if insider trading laws affect the cost of equity, it follows that there will be an immediate impact on trading statistics on the day insider trading laws are changed. Using the asset pricing model and the dividend discount model as an approximation method to compute the cost of equity, they found that the cost of equity in a country, after controlling a number of other variables, does not change after the introduction of insider trading laws, but decreases significantly after the first prosecution. Beny (2005) complemented Bhattacharya and Daouk's (2002) work. The author tested whether differences in specific legal elements of countries' insider trading laws are associated with differences in the structure and performance of their stock markets, using financial, legal, and institutional data from a cross-section of 33 countries. It was found that countries with more prohibitive insider trading laws have more diffuse equity ownership, more accurate stock prices and more liquid stock markets.

2.3. Differences in the Methodology

Event study methodology is typically applied to examine the profitability of insider transactions. This methodology, still in use today, has a long history and according to MacKinlay (1997) perhaps the first published study is Dolley (1933). In this work, he examines the price effects of stock splits, studying nominal price changes at the time of the split. Over the decades ranging from the early 1930s until the late 1960s the level of sophistication of event studies increased. In the late 1960s seminal studies by Ray Ball and Philip Brown (1968) and Eugene Fama *et al.* (1969) introduced the methodology that is essentially the same as the one in use today. Ball and Brown considered the information content of earnings, while Fama *et al.* studied the effects of stock splits.

The works published by Brown and Warner in 1980 and 1985 tested various methodologies used for calculating the normal or expected returns in the event studies. Given a sample based on randomly securities and event dates, a particular level of abnormal return was artificially introduced into the aforementioned sample, transforming the actual return data. The study hypothesis is based on the fact that randomly selected securities should not, on average, exhibit any abnormal return. The 1980 paper considers monthly data while the 1985 paper deals with daily security data. The 1980 investigation found that a simple methodology based on the market model performs well under a wide variety of conditions. In some situations, even simpler methods, which do not explicitly adjust for marketwide factors or for risk, perform no worse than the market model. They tried in 1985 to test the applicability of these conclusions to event studies using daily data. The results from simulations with daily data generally reinforce the findings of their previous work with monthly data: methodologies based on the ordinary least squares (OLS) market model and using standard parametric tests are well-specified under a variety of conditions. They also discovered that daily data generally present few difficulties in the context of event study methodologies, for instance in cases involving variance increases or unusually high autocorrelation.

More recently MacKinlay (1997), on which we have based our investigation, reviewed and summarized the event study methodology. The author also used the market model and found evidence strongly supporting the hypothesis that earning announcements do convey information useful for the valuation of firms.

Traditionally, the market model relating security returns to market portfolio returns is employed in the event study literature, and abnormal returns are residuals obtained from the market model around the event window. Notwithstanding, not considering a time-varying systematic risk property and autocorrelation in the return series may be an important drawback of the market model. Chiang *et al.* (2004), analysing performance of insider trading on the Taiwan Stock Exchange (TWSE) have chosen to follow the conditional Jensen's alpha approach proposed by Eckbo and Smith (1998) that considers a multi-factor model, instead of traditional market model. The multi-factor model

includes information and risk factors, and accounts for autocorrelation in the return series in the estimation using the generalized method of moments. Hence, this method is able to grab all those effects not accounted for in the market model. Chiang *et al.* (2004) have employed the conditional Jensen's alpha approach and the market model as well, but the results from both approaches were similar, showing that insider trading does not gain any abnormal returns in the TWSE.

Del Brio *et al.* (2002) also analysed whether the measure of abnormal returns is sensitive to changes in the return-generating model. They studied the profitability and information content of insider trading in the Spanish stock market. They estimated two different expected-returns models to measure the sensitivity of measured excess returns to changes in the model. They used the traditional market model and a modified market model adjusted by conditional-heteroskedasticity. This second model attempts to remove some of the deficiencies of the market model when describing the stochastic behaviour of asset returns. Conditional heteroskedasticity has widely been found when working with high frequency financial data. Therefore, efficient estimating methods must take such a phenomenon into account. In this sense, they modify the market model by incorporating an accurate measure of volatility through a GARCH model that also accounts for some specific characteristics of their study (i.e., large sample size, unknown transaction prices and relatively short estimation periods). The period under study ranged from January 1992 to December 1996, and the firms selected were all non-financial firms listed on the Madrid Stock Exchange and the Spanish continuous market. They found that return size is very similar and the conclusions drawn by the different models are very close, supporting Brown and Warner's (1985) findings. Nonetheless, Del Brio *et al.* (2002) found that in specific dates, the "traditional" market model underestimates the variance of the returns, favouring the acceptance of the null hypothesis[2]. Traditional test statistics assume stable variances, meaning that there is no change in variance between the estimation period and the event period.

[2] One possible solution is to use non-parametric tests that do not depend on the assumption of normality. Because non-parametric test do not use the return variance, this test can be more appropriate in case of event-induced variance.

3. THE PROBLEM IDENTIFICATION

If an insider trades on privileged information, then one would expect to see insiders purchase in days before the security price increases and sell them in the days before the security price declines. This is the main hypothesis on which we have based our investigation. If non-informed investors are aware of the wealth transfer induced by insider trading, they refrain from trading, resulting in illiquidity, and therefore inefficiency in the markets. Beny (2005) found that countries with more prohibitive insider trading laws have more accurate stock prices and more liquid stock markets. Thus, examining the profitability of insiders is both an examination of the usefulness of insider information and the effectiveness of the Portuguese Securities Code regulations regarding market abuse.

As a result, regulators tried to impose a rule set to enhance investor's confidence about the fairness of trading in the financial market. The Portuguese Securities Code (article 378, n.°1) imposes that whoever holds privileged information due to its capacity as member of a managing or supervisory body of an issuer or holder of a holding in the respective capital, and transmits this information to someone outside the regular scope of its functions or, based on this information, trades or advises someone to trade in securities or other financial instruments, or orders their subscription, acquisition, sale or exchange, directly or indirectly, for itself or someone else, should be punished by imprisonment for a maximum of three years or by a fine.

3.1. Legal Framework

In the Portuguese financial market there are two legal frameworks to control and prevent inside trading activities that compel companies to release information about insider trading data.

On one hand, companies must comply with the "Commercial Company Code" (Chapter VII – Publicity of Ownerships and Market Abuse, article 447. °). This code imposes that

board members and supervisor members of a public company should declare to the company the number of shares and bonds held, as well as all company shares and bonds sold and bought. This is also extended to those firms controlled by the company[3]. This communication must be done 30 days following the event and must be published as an appendix to the company annual report. The "Commercial Company Code" (Chapter VII – Publicity of Ownerships and Market Abuse, article 448. °) also establishes that if an insider buys or sells shares and bonds based on information about the company, which is not yet public and is susceptible of having an influence on the security value, he must compensate for the damages. In this situation, any shareholder could request for his judicial resignation.

On the other hand, inside trading is also regulated by the "CMVM Regulation N°. 7/2001 Corporate Governance (with the amendments introduced and re-published by CMVM Regulation N°. 11/2003)". According to the article 3 of this regulation, CMVM must be informed of the purchase and disposal of shares admitted for trade in a regulated market involving: a) Members of the board of directors of the company issuing the shares: b) Members of the board of management of a parent company of the issuer of the shares: c) A company controlled by one of the persons mentioned in items a) and b): and d) A person acting on behalf of the persons mentioned in items a) and b). In our investigation, we assume these individuals to be insiders. They are required to notify the invested company of the transactions within seven working days after the event. The invested company shall immediately notify CMVM of the information received. The notification mentioned above must include: i) The legal nature of the fact that originated the acquisition or disposal and the date when the transaction took place; ii) The number of shares purchased or disposed of and the number of shares held by the declarer after the trade; iii) The purchase or sale price of the shares. The items described on i) (date) and ii) (number of shares bought and sold) are the basis of our database research.

[3] The article 21° of the CVM establishes that control is deemed to exist between a natural or legal individual and a company when, regardless of whether the domicile or headquarters is located in Portugal or abroad, that said individual is capable of exerting, directly or indirectly, a dominant influence over said company.

Aside from those two "national" legal frameworks, there was a legislative authorization in 2005 in order to review the Portuguese Securities Code. This had in mind the transposition of the "Directive 2003/6/EC of the European Parliament and of the Council of 28 January 2003 on insider dealing and market manipulation (market abuse)". The "Directive 2003/6/EC" was transposed into Portuguese law on the 31st of March 2006. The "White Book about Corporate Governance in Portugal" published in 2006 by IPCP – *Instituto Português de Corporate Governance*, regarding this directive, highlights as a new disposition the one allowing to "apprehend the patrimonial advantages that have their origins in the crime of insider dealing and market manipulation, and use those patrimonial advantages in favour of those who have suffered damages, and have judicially complained". The Government, on the other hand, emphasizes the firms' duty of creating a list of all persons who have access to privileged information, as well as the financial intermediaries' responsibility to inform the authorities about any suspicious transactions regarding information abuse.

3.2. Evidences of Illegal Inside Trading

In spite of the legal framework, CMVM has detected various illegal insiders trading activities as reported on its annual reports. The activities reported by the regulator are only related to illegal inside trading, which means the acquisition or disposal of financial instruments by a person who knows, or should know, that the information possessed is inside information. The article 3 of the "CMVM Regulation N°.7/2001" came into force on 1 February 2002. Thus, for the financial year commencing on January 2001, all companies we have included in our sample have already started disclosing their annual reports with information in appendixes regarding inside trading actions.

Table 1 shows that in 2001, before the article 3 of the "Regulation N°.7/2001" came into force, inside trading activity (16 enquiries) represented 35% of the enquiries carried out by the Enforcement Department of CMVM (46 enquiries). It was the biggest percentage of the enquiries investigated by the CMVM. Ten inquiries of inside trading were brought forward and six new ones were received, totalling 16 inquiries.

Table 1: Enquiries Carried Out by CMVM's Enforcement Department

	Passed on	Received	Total	Completed	Pending	Jud. Auth. *
Enquiries (2001)						
Abuse of Information	**10**	**6**	**16**	**13**	**3**	**4**
Market manipulation	3	6	9	6	3	3
Unauthorised intermediation	4	0	4	4	0	0
Other misdemeanours	0	12	12	7	5	1
Cooperation with judiciary authorities	0	3	3	3	0	0
Request for international assistance	0	2	2	2	0	0
Total	17	29	46	35	11	8
Enquiries (2002)						
Inside trading	**3**	**4**	7	**5**	**2**	**3**
Market manipulation	3	4	7	6	1	1
Unauthorised performance of intermediation	0	15	15	5	10	0
Other criminal offences	0	1	1	1	0	2
Other breaches of regulations	5	7	12	10	2	0
Cooperation with judiciary authorities	0	1	1	1	0	0
Request for international assistance	0	2	2	2	0	0
Total	11	34	45	30	15	6
Enquiries (2003)						
Inside trading	**2**	7	**9**	**5**	**4**	**2**
Market manipulation	1	8	9	6	3	0
Unauthorised financial intermediation	10	5	15	7	8	0
Other criminal offences	0	1	1	1	0	1
Other breaches of regulations	2	2	4	4	0	0
Cooperation with judiciary authorities	0	4	4	3	1	0
Request for international assistance	0	1	1	0	1	0
Total	15	28	43	26	17	3
Enquiries (2004)						
Inside trading	**4**	7	**11**	**6**	**5**	
Market manipulation	3	4	7	4	3	
Unauthorised financial intermediation	8	8	16	14	2	
Other criminal offences	0	1	1	1	0	
Other breaches of regulations	0	3	3	2	1	
Cooperation with judiciary authorities	1	1	2	2	0	
Request for international assistance	1	3	4	4	0	
Total	17	27	44	33	11	
Enquiries (2005)						
Abuse of Information	**5**	**6**	**11**	**6**	**5**	
Market manipulation	3	4	7	4	3	
Unauthorised financial intermediation	2	4	6	3	3	
Other criminal offences	0	0	0	0	0	
Other breaches of regulations	1	7	8	4	4	
Cooperation with judiciary authorities	0	4	4	3	1	
Request for international assistance	0	4	4	4	0	
Total	11	29	40	24	16	

Source: The table compiles data from CMVM annual reports in 2001, 2002, 2003, 2004 and 2005.
* Cases reported by CMVM' Enforcement Department to the judicial authorities.

Out of these, four cases were reported by the Enforcement Department to the judicial authorities. As a result, without the regulation into force, 2001 was the year with the most intense illegal inside trading activities in the period analysed in our investigation. In 2002, with the regulation already into force, the illegal inside trading cases dropped to less than a half, representing just 16% of the total inquiries carried out by the Enforcement Department. Only three proceedings with evidence of inside trading were passed on to the Director of Public Prosecutions. In 2003, 2004 and 2005 the weight of inside trading activity on the total enquiries carried out by the Enforcement Department increased again to 21%, 25% and 28%, respectively.

In the meantime, Portugal witnessed the first condemnatory sentence for the crime of inside trading, pronounced by the Criminal Court in Lisbon on 25 July 2003. The Court convicted a non-executive member of the Board of Directors and shareholder in the company "Vidago, Melgaço & Pedras Salgadas, SA", as the mastermind of the crime of inside trading. In short, the material facts proved that in July 1996, the accused had been aware of his father's intentions to sell "Vidago" to "Jerónimo Martins". It was also proved that the accused monitored the negotiations between the two companies. Simultaneously, he bought several blocks of shares in "Vidago" between July and October of 1996, which he then sold in the special stock market section with the intention of determining the outcome of the public sale offering, carried out in January 1997, which allowed him to obtain capital gains of around 4 millions euros.

According to the CMVM 2004 annual report, investigations into potential insider trading show "that many suspicious situations arise in the days immediately preceding the disclosure of information likely to have a significant effect on share prices in the securities market, especially with regard to the verification of annual or quarterly results (favourable or unfavourable to the issuer), mergers, cessations or transformation and, more frequently, announcements of public acquisition offerings". This is the reason why the "White Book about Corporate Governance in Portugal" recommends that "members of the board and the partners of a company should refrain themselves from trading the

company' securities in an interval of time defined around the dates of the publication of price sensitive events"[4].

3.3. The Study Hypothesis

In our investigation, we analyse the abnormal return for each company to identify these (illegal) and other potential insider trading activities. Therefore, our sample includes not only those illegal inside trading activity reported by the regulator in its annual reports, but other transactions (cases in which the regulator considered that an investigation was not justified) dropped by the CMVM's Enforcement Department as well. We have based our investigation on one main hypothesis: that an insider earns abnormal returns if after purchases (sales) stock prices rise (decline) abnormally. We try to answer the questions using the traditional event study methodology, where the null hypothesis to be tested is whether abnormal returns in the event day and for the surrounding period are significantly different from zero.

Abnormal returns are also analysed for industry classification, as well as for samples grouped by firm size, relative trading volume, price to book ratio (P/B) and price earnings ratio (P/E).

Wong (2002) found that when cumulative daily excess returns are separated by firm size according to each firm's market capitalization, only the smallest capitalization shows significant returns within the post event period. Small firms are found to generate the largest and most persistent abnormal profits.

Trading volume is found to be positively associated with the quality of information. Relative trading volume is therefore used as an indicator of the quality of information associated with each insider transaction.

[4] CMVM does not impose any restrictions forbidding insiders from trading around the publication of price sensitive events. Some companies, however, have internal rules forbidding trading before and after the publication of annual or quarterly results.

The sample is also grouped and ranked by P/B and P/E to examine if insiders take into account their company valuation while trading shares of their own firms. It is hypothesized that high P/B may predict bad performance, while low P/B value predicts good performance. [5] The literature also documented (see Cheuk *et al.* (2006)) a negative relationship between P/E and future stock returns. With this valuation hypothesis, we are expecting to see purchases with high (low) P/B and P/E to perform worse (better). On the other hand, we do expect to see sales with high (low) P/B and P/E to perform well (poorly).

[5] Cheuk *et al.* (2006) assume this hypothesis, using the book to market ratio. We assume the same hypothesis using the inverse ratio: the price to book ratio.

4. DATA CONSTRUCTION

Our original sample included the 55 shares listed in the Eurolist from Euronext Lisbon at the end of 2005. We excluded three foreign companies from the sample, since those were cross-listed shares. The sample was therefore reduced to 52 issues. Four other companies had listed two different classes of shares. For each one of those companies, we decided to select only the most liquid class, which reduced the sample to 48 issues, matching 48 companies. We then collected the inside trading information (the date and the amount of shares bought and sold by insiders). The sample was afterwards reduced to 31 securities, since 17 companies had no record of inside trading activity or their trades did not fulfil some of the criteria that will be described later.

The sample period of this study is January 2001 to December 2005, covering two years of market slump (Portuguese benchmark PSI-20 dropped 24.73% in 2001 and 25.62% in 2002), and three years of market rally (PSI-20 gained 15.84% in 2003; 12.64% in 2004 and 13.40 % in 2005).

Each company's data was manually collected from their annual reports available at the Portuguese watchdog Internet website. Data on daily cash-dividend-adjusted stock returns were obtained from the Bloomberg terminal database. For each company, as well as for the benchmark index, we have extracted daily closing prices to calculate their daily returns. Our analysis only considered insider transactions dealing with shares, which led us to drop all transactions with bonds and other company's related securities, such as derivatives. The transactions upon treasury's stocks were also dropped.

Within the sample period, we initially collected 2.426 insider transactions. Then, following Del Brio *et al.* (2002), we excluded a number of transactions that are not likely to be driven by privileged information. To assure that our sample consisted only of insider transactions motivated by the possession of private information, we dropped all transactions made for non-informational reasons. As a result, we eliminated all trades related to inheritances, gifts, bonuses, acquisitions or disposals by conversion or

exchange, exercise of options and rights. Consequently, 1.142 observations were withdrawn from the sample. We separated the excluded data into eight categories as reported in Table 2, which we suggest should be explored later in further investigation.

Table 2. Transactions Excluded from the Sample

	Increase	Decrease	Total
(1) Conversions	16	-	16
(2) Capital increase & IPO	134	2	136
(3) Remunerations plans	398	74	472
(4) Transferences	17	12	29
(5) Takeover	1	1	2
(6) Capital change	16	-	16
(7) No date	47	46	93
(8) Corporate insiders	307	71	378
Total	936	206	1.142

These categories are:

(1) Insider transactions that resulted from conversions (convertible bonds or exchange offers);

(2) Shares acquired in a capital increase or subscribed at IPO operations;

(3) Shares received and sold by insiders as a consequence of the exercise of stock options and other incentives or remuneration plans;

(4) Shares transferred between insiders (such as heritages);

(5) Shares sold or bought by insiders on takeover operations;

(6) Shares received as a consequence of a change of a company's capital (change in the nominal value or stock split);

(7) Transactions made by insiders that did not specify the precise day when the trade occurred.

Following the literature, we also left out several trades made by corporate insiders (8) since we presume that their transactions are most likely to be driven by shareholder ownership reasons, rather than exploitation of privileged information. As a result, we have established to rule out all transactions made by corporate insiders with a qualifying holding. In accordance with article 16 (communication duties) of the Portuguese Securities Code, 2% is the first qualifying holding limit where it is compulsory to inform

CMVM. This criterion leads us to remove 378 transactions, most of them (81%) representing an increase in corporate ownership. We ignored hundreds of buy and sell orders made by investment banking and brokers[6]. We assume those transactions not to be related neither to the exploitation of privileged information nor ownership reasons. We presume they are part of banks' core business as they act as financial intermediary, trader or market maker.

All the above-described screening resulted in 1.284 eligible transactions, which means an average of 41 trades per company. We have identified an average of 55 different insiders trading in each year, representing an average of 4,7 transactions per insiders during the sample period. The breakdown by type of insider is 51 individual insiders per year and 4 corporate insiders (companies with less than a 2% ownership) per year.

In cases where an insider has carried out more than one transaction in a particular day, we include only one transaction, adding up the shares purchased or sold. This screening reduced the sample to 1.080 observations, with 686 purchases and 394 sales. There were transactions where either the same or different directors from the same firm were trading in different directions (e.g., a purchase of 25.000 shares and a sale of 201.793 on the same day). In this case, net transactions were reported (i.e., 176.793 as sale). The sample was then reduced to 1.059 trades. Finally, we have also applied the Brown and Warner (1985) procedure: for a security to be included in the sample, it must have at least 30 daily returns in the entire period (estimation window plus the event window), and no missing return data in the last 20 days. This allows us to reduce the influence of asynchronous trading.

4.1. Final Sample

With this last screening our sample was reduced to 1.052 transactions, and the number of firms dropped from 31 to 28. Nevertheless, the remaining companies cover all the nine

[6] Banks and brokers compelled to comply with the "CMVM Regulation N°. 7/2001" described early, acting on their own or on behalf of clients.

industry sectors quoted at Eurolist (as reported in Table 3) and 95% of the Portuguese market capitalization at the end of 2005.

Table 3: Frequency Distribution of Insider Trading by Industry Classification

	Purchases	Sales	All Transactions	Ratio of purchases to sales	Number of companies *
Financial	247	144	391	1.72	5
Basic Materials	58	31	89	1.87	5
Communications	142	114	256	1.25	5
Consumer. Cyclical	154	25	179	6.16	4
Consumer. Non-cyclical	8	10	18	0.80	3
Diversified	1	0	1	-	1
Industrial	47	55	102	0.85	3
Technology	3	1	4	3.00	1
Utilities	7	5	12	1.40	1
Total	667	385	1.052	1.73	28

Note: * The figures in the column refer to the number of companies in that industry classification at the end of December 2005. Industry classification is assigned by the Stock Exchange according to the nature of the business of the company.

Overall, insiders from financial and communication industries are the most active in trading the stocks of their own firms. From those 28 securities preserved, 17 belonged to PSI-20 index at the end of the sample period, representing 98% of the benchmark value. Purchases outnumber sales, split into 667 (63%) purchases and 385 (37%) sales. The ratio of insider purchases to insider sales is 1.73:1, such that almost two out of three insider transactions are purchases. This can lead us to conjecture, beforehand, that insiders may seek benefits of corporate control instead of short term trading profits.

Although there are far more purchases than sales in each year of the sample period, the average number of shares per transaction is larger for sales (64.945) than for purchases (26.152). The ratio between the average number of shares sold by transaction and the number of shares purchased by transaction is 2.48, which suggest that shares are usually sold in larger blocks. Seyhun (1998) also found that insiders in the U.S. are likely to break up purchases into smaller transactions for fear of insider trading sanctions. He suggested that an insider purchase provides a stronger signal to both the authority and the general public than does an insider sale. However, insiders are not as concerned with insider trading regulations in sales transactions. It might be taken by the authority that the

motivations for profiting from the private information behind insider sales are less obvious.

Table 4 summarizes inside trading activities cut off by firm size, P/B, P/E and relative trading volume, following Cheuk *et al.* (2006) procedure. We use three cutoffs to classify all transactions in each group.

Table 4: Cut off of insider trading events by firm size, relative trading volume, P/B and P/E

A - Firm size

	Purchases			Sales		
	Smallest 1/3	Medium 1/3	Largest 1/3	Smallest 1/3	Medium 1/3	Largest 1/3
From	12	245	2.822	13	245	2.822
to	222	2.809	12.597	222	2.809	12.597
N	222	222	223	128	128	129

B - Relative trading volume

	Purchases			Sales		
	Lowest 1/3	Medium 1/3	Highest 1/3	Lowest 1/3	Medium 1/3	Highest 1/3
From	0,0000%	0,0008%	0,0037%	0,0000%	0,0016%	0,0093%
to	0,0008%	0,0037%	1,4308%	0,0015%	0,0091%	1,4767%
N	222	222	223	128	128	129

C - Price to book value

	Purchases			Sales		
	Lowest 1/3	Medium 1/3	Highest 1/3	Lowest 1/3	Medium 1/3	Highest 1/3
From	0,32	1,61	2,46	0,34	1,75	2,49
to	1,60	2,45	25,69	1,75	2,49	15,48
N	210	210	209	127	127	127

D - Price earnings ratio

	Purchases			Sales		
	Lowest 1/3	Medium 1/3	Highest 1/3	Lowest 1/3	Medium 1/3	Highest 1/3
From	1,55	11,11	15,46	3,10	12,90	17,98
to	11,01	15,46	94,86	12,90	17,96	100,86
N	141	141	141	99	99	99

Firm size is measured in millions of euros. Data regarding the market capitalization, the total number of shares outstanding, the P/B and P/E ratios were obtained from the Bloomberg terminal database.

In order to test for the differences by firm size, companies in the sample are segregated into three groups according to their market capitalization at the time of the insider transactions (small, medium and large size firms). The size of an inside trading firm is calculated for every transaction based on the month-end figures of the month prior to when the insider trading occurred.

As in Cheuk *et al.* (2006) and other studies, relative trading volume is given as the ratio between total number of shares traded in the insider transaction and the total number of outstanding shares of the stock at that moment. Total number of outstanding shares is based on the month-end figure of the month prior to the month when the insider trade occurred. Each transaction is then ranked by the relative trading volume (low, medium and high) and is assigned to one of three groups: low relative trading volume, medium relative trading volume, and high trading volume.

The P/B is equal to a stock's price divided by its book value (i.e., total stockholders' equity) per share. The book value of the insider-trading firm, for every transaction, is based on the data from the most recent reporting period before trading (quarterly, semi-annual or annual). In our sample, each transaction is ranked by the P/B of the stock concerned and is assigned to one of the three groups: low P/B, medium P/B, and high P/B. In this particular analysis we have dropped 42 transactions from our sample, since book value information was not available[7].

The P/E is the ratio of the current share price to earnings per share (EPS) of the past year. The EPS of the inside trading firm for every transaction is based on the fiscal year-end figure of the year prior to that year when insider trading occurred. Similar to the analysis with the previous ratio, each transaction is ranked by the P/E of the stock concerned and is assigned to one of three groups: low P/E, medium P/E, and high P/E. In this examination, the sample of 1.052 transactions was reduced to 720, since there were 332 transactions where the respective EPS was negative and therefore P/E was not computed.

4.2. Sample Adjustments

Throughout this research, we have done some sample modifications and adjustments related to complications arising from violations of the statistical assumptions, being able to accommodate more specific hypotheses.

[7] This is the reason why in Table 4 the number of purchases and sales (N) drops when section C is compared with N in sections A and B.

The first one was brought forward by MacKinlay (1997) who states that while aggregating the abnormal returns across firms it is assumed that there is no clustering, meaning that the event windows of the included securities do not overlap in terms of calendar time. This assumption allows us to calculate the variance of the aggregated sample cumulative abnormal returns without concerning about the covariances across securities because they are assumed to be null. If this assumption is incorrect, then the parametric tests may be biased. Therefore, distributional results presented at the section 5 for the aggregated abnormal returns will no longer be valid. Brown and Warner (1985) point out that, in general, the use of daily or weekly data makes clustering of events on a single day much less severe than the use of monthly data. But diversification across industries mitigates the problem, as stated by Bernard (1987). Since our sample is highly diversified (all industry sectors are present in our data) we hope to overcome the referred problem. Following the portfolio approach suggested by MacKinlay (1997), the abnormal returns for those securities that share the same event day were aggregated into a single portfolio. We have build up 171 different portfolios, with an average of 2.15 securities per portfolio. As a result our sample was thereafter reduced to 855 (522 purchases and 333 sales), from the previous 1.052 transactions.

Following Calvo *et al.* (2002), we also built a non-overlapping sample in order to guarantee that the abnormal return calculation of an inside transaction is not influenced by the abnormal return of an early event. We assume that when insiders purchase or sell on consecutive days, they are trading with the same privileged bit of information. In order to prepare our sample, we follow Duque and Pinto's (2004) procedure to remove overlapping of event windows. Therefore, when transactions occurred on consecutive days, or within less than a five-day time interval, it was assumed as a single inside transaction, and the "event day" was assumed to include the entire time interval between the day of the first event and the day of the last event. The use of such a procedure reduced our sample even further. From 855 we came out with 450 transactions (255 purchases and 195 sales).

5. METHODOLOGY

The methodology and notation for the modelling of abnormal returns ($AR_{i\tau}$) follow largely MacKinlay (1997) and Campbell *et al.* (1997). We have done few additional adjustments in line with the insider trading literature.

The $AR_{i\tau}$ is computed by subtracting expected returns $E[R_{i\tau} | X_\tau]$ from the actual returns $R_{i\tau}$ (the log return of company i at time τ).

$$AR_{i\tau} = R_{i\tau} - E(R_{i\tau} | X_\tau). \qquad (1)$$

$X\tau$ stands for the conditioning set of information for the expected return. Event time (a counter) is denoted by τ, with the event date corresponding to $\tau = 0$. Different authors use different models to estimate expected returns. However, Brown and Warner (1980) after comparing different methodologies used in event studies showed that beyond a simple, one factor market model, there is no evidence that more sophisticated methodologies convey any benefit.

5.1. Market Model

The market model is a statistical model, which relates the return of any given security to the return of the market portfolio. This method takes into account both market-wide factors and the systematic risk of each sample security. We used the PSI-20 index as a proxy to the market portfolio. For any security *i* the market model is

$$R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it}, \qquad (2)$$

$$E(\varepsilon_{it} = 0) \qquad \text{var}(\varepsilon_{it}) = \sigma^2_{\varepsilon_i}.$$

ε_{it} is the zero mean disturbance term and α_i, β_i, and $\sigma^2_{\varepsilon_i}$ are the parameters of the market model.

The OLS[8] estimators of the market model parameters for an estimation window of observations are

$$\hat{\beta}_i = \frac{\sum_{\tau=T_0+1}^{T_1}(R_{i\tau} - \hat{\mu}_i)(R_{m\tau} - \hat{\mu}_m)}{\sum_{\tau=T_0+1}^{T_1}(R_{m\tau} - \hat{\mu}_m)^2}, \tag{3}$$

$$\hat{\alpha}_i = \hat{\mu}_i - \hat{\beta}_i \hat{u}_m, \tag{4}$$

$$\hat{\sigma}^2_{\varepsilon_i} = \frac{1}{L_1 - 2}\sum_{\tau=T_0+1}^{T_1}(R_{i\tau} - \hat{\alpha}_i - \hat{\beta}_i R_{m\tau})^2, \tag{5}$$

where

$$\hat{\mu}_i = \frac{1}{L_1}\sum_{\tau=T_0+1}^{T_1} R_{i\tau},$$

and

$$\hat{\mu}_m = \frac{1}{L_1}\sum_{\tau=T_0+1}^{T_1} R_{m\tau}.$$

$R_{i\tau}$ and $R_{m\tau}$ are the log returns in event period τ for security i and for the market portfolio, respectively.

Following the Brown and Warner's (1985) procedure to compute the $AR_{i\tau}$ we have firstly considered an event window of eleven days [-5, +5], which includes five days before the

[8] Under general conditions OLS is a consistent estimation procedure for the market model parameters.

event, the event day, and five days after insiders' transactions. Afterwards, and following inside trading literature, we analysed other event windows as well: [-5, -1], [+1, +5]: [+1, +10]; [+1, +20] and [+1, +80]. The event day ($\tau = 0$) is taken as the day the insider transaction actually takes place.

[estimation window]	[event window]	
T_0= -245	T_1= -6 $^{\tau=0}$	T_2= -1, +5, +10, +20 or +80

For each security we use a maximum of 325 daily returns observations for the period around its respective event, starting at day T_0 = -245 and ending at day T_2 = -1, + 5, +10, +20 or +80 relative to the event, depending on which event window we chose to examine.

The first 239 days period (from $\tau = T_0 + 1$ to $\tau = T_1$) is called the estimation window. For those event periods that include days before the event day, namely [-5, +5] and [-5, -1], the length of the event window is $L_2 = T_2 - T_1$ (11 or 5 days). For other event windows starting at day +1, the length of the event window is $L_2 = T_2$.[9]

5.2. Abnormal Return and its Statistical Properties

Given the market model parameter estimates, one can measure and analyse the $AR_{i\tau}$, measured as

$$\hat{A}R_{i\tau} = R_{i\tau} - \hat{\alpha}_i - \hat{\beta}_i R_{m\tau}. \qquad (6)$$

The abnormal return is the disturbance term (ε_{it} from equation 2) of the market model calculated on a sample basis. Under the null hypothesis, conditional on the event window market returns, the abnormal returns will be jointly normally distributed with a zero conditional mean and conditional variance $\sigma^2(\hat{A}R_{i\tau})$ where

[9] It is typical for the estimation window and the event window not to overlap. This design provides estimators for the parameters of the normal return model, which are not influenced by the return around the event.

$$\sigma^2(\hat{AR}_{it}) = \sigma^2_{\varepsilon_i} + \frac{1}{L_1}\left[1 + \frac{(R_{mt} - \hat{\mu}_m)^2}{\hat{\sigma}^2_m}\right] \quad (7)$$

The conditional variance has two components. One component is the disturbance variance $\sigma^2_{\varepsilon_i}$ (see equation 2) and a second component is the additional variance due to the sampling error in α_i and β_i.[10] Under the null hypothesis, H_0, that the event has no impact on the behaviour of returns (mean or variance) the distributional properties of the abnormal returns can be used to draw inferences over any period within the event window. Under H_0 the distribution of the sample abnormal return of a given observation in the event window is

$$\hat{AR}_{it} \sim N(0, \sigma^2(\hat{AR}_{it})). \quad (8)$$

If abnormal returns are independent, identically distributed and normal, the test statistic is distributed as Student's t under the null hypothesis. Brown and Warner (1985) show that as the degrees of freedom increase the distribution converges to a normal distribution. Since the degrees of freedom in our research exceed 200, the test statistic is assumed to be unit normal.

5.3. Aggregation Through Time and Across Securities

It is usual to aggregate the individual securities abnormal returns through time and across securities in order to draw overall inferences for the event under scope. We cumulate these abnormal over time to analyse the pre- and post-event period returns. Define $\hat{CAR}(\tau_1,\tau_2)$ as the sample cumulative abnormal return (CAR), where τ_1 and τ_2 are the cumulating periods. Following Calvo *et al.* (2002) and Cheuk *et al.* (2006) we analyse

[10] As the length of the estimation window L_1 becomes large, the second term approaches zero. This is to be expected, since in this case the sampling error of the parameters vanishes. The variance of the abnormal return will be $\sigma^2_{\varepsilon i}$ and the abnormal return observations will be independent. In practice, in agreement with MacKinlay (1997), the estimation window can usually be chosen to be large enough to make it reasonable to assume that the contribution of the second component to the variance of the abnormal return is zero.

CAR for the [-5, -1] event window to assess significance of the CAR immediately before the event took place, and also CAR for the [+1, +5]; [+1, +10]; [+1, +20] and [+1, +80] periods to evaluate the significance of the excess returns after the transactions and for how long it lingers.

The CAR from τ_1 to τ_2 is the sum of the included abnormal returns.

$$\hat{CAR}_i(\tau_1,\tau_2) = \sum_{\tau=\tau_1}^{\tau_2} \hat{AR}_{i\tau}. \tag{9}$$

Asymptotically (for large L_1) the variance of $\hat{CAR}_i$ is

$$\sigma_i^2(\tau_1,\tau_2) = (\tau_2 - \tau_1 + 1)\sigma_{\varepsilon_i}^2. \tag{10}$$

The distribution of the cumulative abnormal return under H_0 is

$$\hat{CAR}_i(\tau_1,\tau_2) \sim N(0,\sigma_i^2(\tau_1,\tau_2)). \tag{11}$$

Given the null distributions of the abnormal return and the cumulative abnormal return, tests of the null hypothesis can be performed.

The abnormal return observations must be aggregated for the event window and across observations of the event.[11] The individual securities' abnormal returns can be aggregated using $\hat{AR}_{i\tau}$ from equation (6) for each event period $\tau = T_1 + 1,\ldots, T_2$. Given N events, the sample aggregated abnormal returns for period τ is

[11] We normally look at the average effect of the announcement rather than examine each firm separately, because other events are occurring and averaging across all the firms should minimized the effect of these other events, thereby allowing a better examination of the event under study, according to Elton and Gruber (1995). For this aggregation, it is assumed that there is not any clustering. That is, there is not any overlap in the event windows of the included securities.

$$\overline{AR}_\tau = \frac{1}{N}\sum_{i=1}^{N} \hat{A}R_{i\tau}, \tag{12}$$

and for large L_1, its variance is

$$\text{var}(\overline{AR}_\tau) = \frac{1}{N^2}\sum_{i=1}^{N} \sigma_{\varepsilon_i}^2 . \tag{13}$$

The average abnormal returns can afterwards be aggregated over the event window using the same approach as that used to calculate the cumulative abnormal return for each security *i*. For any interval in the event window[12]

$$\overline{CAR}(\tau_1, \tau_2) = \sum_{\tau=\tau_1}^{\tau_2} \overline{AR}_\tau, \tag{14}$$

$$\text{var}(\overline{CAR}(\tau_1, \tau_2)) = \sum_{\tau=\tau_1}^{\tau_2} \text{var}(\overline{AR}_\tau), \tag{15}$$

Inferences about the cumulative abnormal returns can be drawn using

$$\overline{CAR}(\tau_1, \tau_2) \sim N\left[0, \text{var}(\overline{CAR}(\tau_1, \tau_2))\right] \tag{16}$$

to test the null hypothesis that the abnormal returns are zero. In practice, because $\sigma_{\varepsilon_i}^2$ is unknown, an estimator must be used to compute the variance of the abnormal returns as in (13). The usual sample variance measure of $\sigma_{\varepsilon_i}^2$ from the market model regression in the estimation window is an appropriate choice, according to MacKinlay (1997).

Using this to calculate $\text{var}(\overline{AR}_\tau)$ in (13), H_0 can be tested using the following statistics[13]

[12] For the variance estimators the assumption that the event windows of the N securities do not overlap is used to set the covariance terms to zero.

[13] This distributional result is asymptotic with respect to the number of securities N and the length of estimation window L_1.

$$\theta_1 = \frac{\overline{AR}_\tau}{\text{var}(\overline{AR}_\tau)^{1/2}} \sim N(0,1). \quad (17)$$

$$\theta_2 = \frac{\overline{CAR}(\tau_1,\tau_2)}{\text{var}(\overline{CAR}(\tau_1,\tau_2))^{1/2}} \sim N(0,1). \quad (18)$$

In order to test if our conclusions could be biased as a consequence of an inadequate model for testing abnormal returns, we also used the mean adjusted return and the market adjusted return models in the return-generating process. For the mean adjusted return, abnormal return is taken as

$$AR_{i\tau} = R_{i\tau} - \overline{R}_i. \quad (19)$$

Mean adjusted returns are computed by subtracting the average return for stock i during the estimation period from the stock's return during the event period. This method does not explicitly takes into account the risk of the stock and the return of the market portfolio.

For the market adjusted return, abnormal return is taken as,

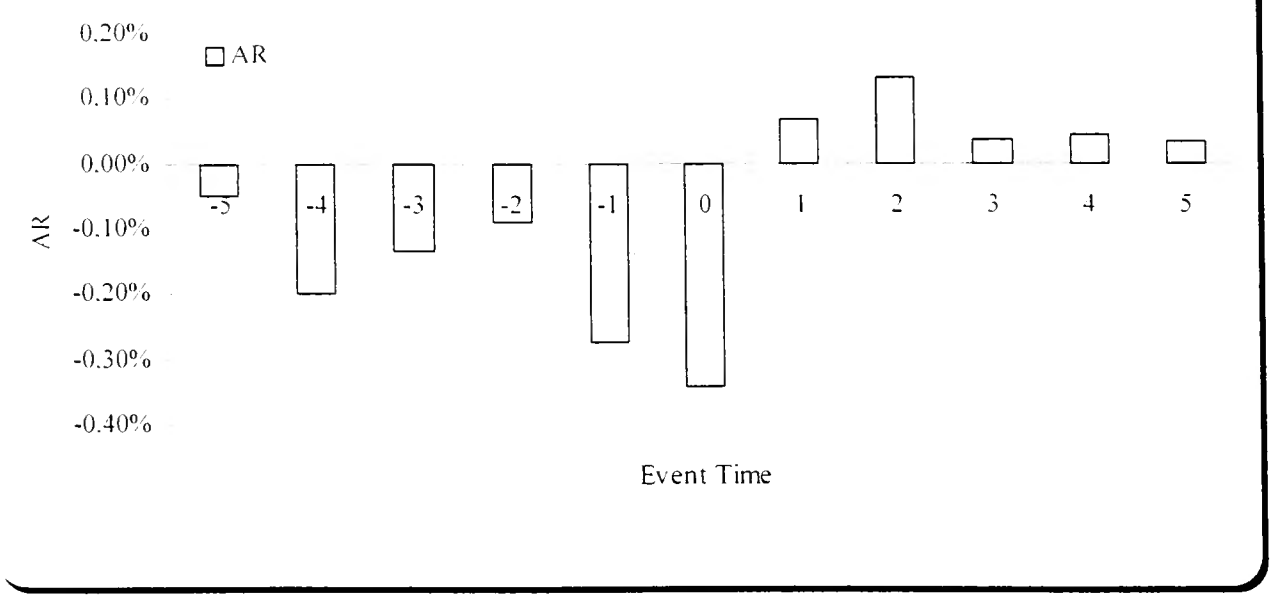
$$AR_{i\tau} = R_{i\tau} - R_{m\tau}. \quad (20)$$

Market adjusted returns are computed by subtracting the return on the market portfolio from the stock's return during the event window.

6. EMPIRICAL FINDINGS

We have initially applied the event study methodology described earlier to all the 1.052 transactions reported previously. Following Brown and Warner's (1985) methodology we started by considering an event window of eleven days [-5, +5]. After computing the abnormal returns (AR) we can draw conclusions regarding the prices' performance at the event day and on each day surrounding the insiders' transactions as well. We apply the methodology for the purchases and sales samples, but also for the aggregated transactions. As stated by Del Brio *et al.* (2002), if we believe that both purchase and sale returns should be measured as positive abnormal returns in the overall sample, excess returns for insiders' sales should be multiplied by -1 for the purpose of aggregation. The aggregated results we have obtained analysing 1.052 transactions are largely consistent with the literature providing evidences that a security return around insiders' trades follows a pattern, as shown in Figure 1.

Figure 1: Average Abnormal Return



This finding can be confirmed by analysing the statistical test described earlier, with the results being presented in Table 5.

Table 5: Results of Tests to Abnormal Return Overall sample			
Day	AR	Test θ_1	
-5	-0,05%	-1,061	
-4	-0,20%	-4,204	***
-3	-0,13%	-2,832	***
-2	-0,09%	-1,878	*
-1	-0,27%	-5,782	***
0	-0,34%	-7,214	***
1	0,07%	1,409	
2	0,13%	2,802	***
3	0,04%	0,798	
4	0,04%	0,890	
5	0,03%	0,683	

The symbols ***, **, and * indicate two-tail significance at the 1%, 5% and 10% levels, respectively.

The first striking result is that insiders' transactions are preceded by negative abnormal returns during the five days before the event and for the event day as well, which means that insiders wait for a short-run persistent decline (increase) in the stock price to buy (sell) shares. The individual day's abnormal returns were thereafter added to compute the cumulative abnormal return (CAR) for the events windows described earlier, with the results presented in Table 6.

Table 6: Cumulative Daily Abnormal Returns for Insider Trading Events								
Event window	Overall sample			Insider purchase			Insider sales		
	CAR	Test θ_2		CAR	Test θ_2		CAR	Test θ_2	
Pre-event window [-5, -1]	-0,75%	-7,046	***	-0,18%	-1,340		1,74%	9,646	***
Transaction day [0]	-0,34%	-7,214	***	-0,15%	-2,570	**	0,67%	8,366	***
Post-event window [+1, +5]	0,31%	2,943	***	0,35%	2,678	***	-0,25%	-1,361	
Post-event window [+1, +10]	0,40%	2,647	***	0,54%	2,922	***	-0,15%	-0,575	
Post-event window [+1, +20]	0,76%	3,604	***	0,92%	3,501	***	-0,50%	-1,387	
Post-event window [+1, +80]	3,11%	7,329	***	4,25%	8,105	***	-1,14%	-1,579	

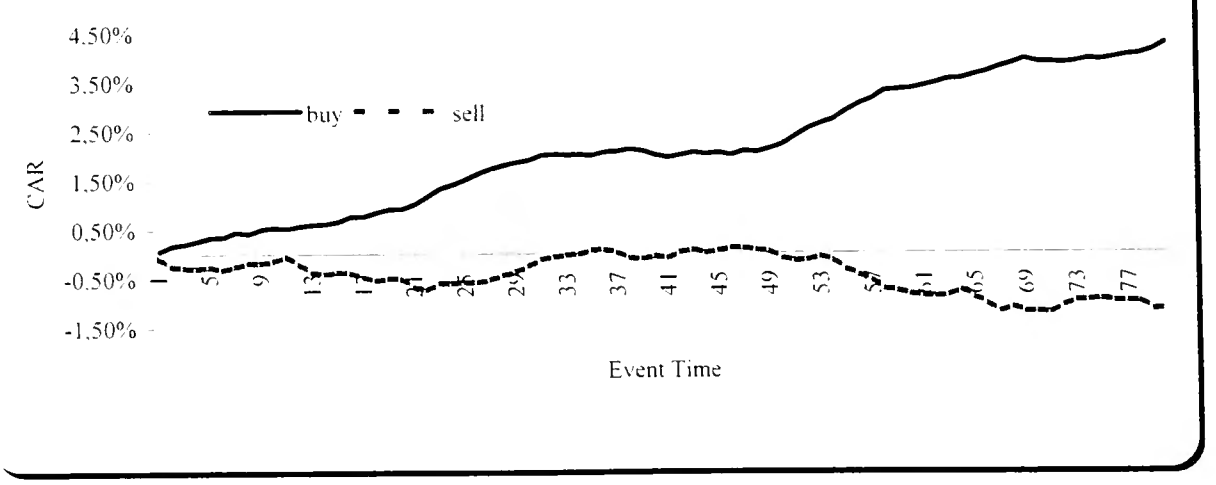
The symbols ***, **, and * show two-tail significance at the 1%, 5% and 10% levels, respectively.

CAR for pre-event window [-5, -1] confirms that an insider purchases (sales) occur after a period of low (high) stock price. After the event took place, the overall sample results (N=1.052) show that prices tend to increase after insider purchases and decrease after insider sales, for all the four post-event windows analysed. For the aggregated sample, the 5-day, 10-day, 20-day, and 80-day CAR are 0,31%, 0,40%, 0,76% and 3,11%,

respectively, and all are statistically significant. The null hypothesis is therefore rejected with a 99% confidence level.

Breaking up the overall sample between purchases and sales, we found that for the shares bought (N=667), the patterns and results remain identical to those from the aggregated sample. Insiders are able to make profits from their purchases, since CAR is significantly positive within all the event windows analysed. Since the abnormal return lingers for a period of at least 80 days (as illustrated in Figure 2), outsiders are capable of making abnormal profit by following insider purchases. Nevertheless, and according to Portuguese laws, information regarding insider transactions is only available to the public at the time a company releases its annual reports. Therefore, although our findings suggest the possibility of making abnormal profits by mimicking insider purchases, this strategy is not practicable due to the lack of information immediately after the transactions take place.

Figure 2: Cumulative Abnormal Return



From the sales sample (N=385), CAR is positive and significant before the insider transactions happen, which means that insiders wait for a short-run increase in the stock price to sell shares. After the event day and for all post-event window, although being always negative, CAR points towards the absence of significant excess return, because the hypothesis that the variable is null is always accepted. Previous researches suggest

insider buying is a stronger indicator than selling. Insiders may sell shares to invest the money elsewhere, to pay off loans, pay off mortgages, etc. Insiders would have little other incentive to buy unless the thought the stock price would increase in the future.

6.1. Firm and Transaction-Specific Factors

In order to study any industry specific effect, we split the sample into industries. Table 7 presents CAR according to industry classifications for the entire sample.

Table 7: Cumulative Daily Abnormal Returns for Insider Trading by Industry Classification

	Financial				Basic Materials			
	Insider purchase		Insider sales		Insider purchase		Insider sales	
Event window	CAR	Test θ_2	CAR	Test θ_2	CAR	Test θ_2	CAR	Test θ_2
[-5, -1]	-0,74%	-5,015 ***	0,65%	3,004 ***	0,00%	-0,008	3,56%	6,810 ***
[0]	-0,21%	-3,215 ***	0,23%	2,355 **	0,23%	1,315	0,36%	1,528
[+1, +5]	0,14%	0,951	0,02%	0,101	0,42%	1,089	-0,36%	-0,695
[+1, +10]	-0,02%	-0,090	0,06%	0,204	0,54%	0,989	-0,25%	-0,336
[+1, +20]	0,11%	0,358	-0,08%	-0,175	0,31%	0,403	0,89%	0,853
[+1, +80]	-1,92%	-3,265 ***	-0,03%	-0,033	1,75%	1,127	4,48%	2,143 **
	Communications				Consumer, Cyclical			
	Insider purchase		Insider sales		Insider purchase		Insider sales	
Event window	CAR	Test θ_2	CAR	Test θ_2	CAR	Test θ_2	CAR	Test θ_2
[-5, -1]	1,11%	3,004 ***	1,60%	4,332 ***	-0,04%	-0,143	6,91%	6,254 ***
[0]	-0,13%	-0,817	0,88%	5,342 ***	-0,13%	-0,920	3,88%	7,856 ***
[+1, +5]	0,97%	2,627 ***	-0,61%	-1,648 *	-0,12%	-0,377	1,41%	1,275
[+1, +10]	1,96%	3,755 ***	0,39%	0,744	0,25%	0,566	-1,90%	-1,218
[+1, +20]	3,08%	4,179 ***	0,92%	1,246	1,11%	1,777 *	-10,67%	-4,827 ***
[+1, +80]	13,61%	9,221 ***	0,81%	0,547	5,51%	4,410 ***	-6,12%	-1,384
	Consumer, Non-cyclical				Industrial			
	Insider purchase		Insider sales		Insider purchase		Insider sales	
Event window	CAR	Test θ_2	CAR	Test θ_2	CAR	Test θ_2	CAR	Test θ_2
[-5, -1]	-2,13%	-1,407	4,65%	4,404 ***	-1,16%	-2,839 ***	0,99%	1,919 *
[0]	-0,66%	-0,979	0,49%	1,027	-0,11%	-0,607	0,29%	1,260
[+1, +5]	0,02%	0,010	0,15%	0,140	0,44%	1,084	-0,90%	-1,728 *
[+1, +10]	-0,62%	-0,289	1,31%	0,879	-0,58%	-0,999	-0,71%	-0,965
[+1, +20]	-2,06%	-0,679	9,11%	4,314 ***	-0,50%	-0,605	-1,62%	-1,558
[+1, +80]	-0,65%	-0,108	-8,41%	-1,991 **	5,50%	3,356 ***	-6,32%	-3,049 ***

The symbols ***, ** and * indicate two-tail significance at the 1%, 5% and 10% levels, respectively.

We refrain from analysing diversified, technology and utility industries, since each one had only one company (as shown in Table 3). The analysis of the six remaining sectors shows that only insiders from communications industry are able to make significant

profits through insider purchases at all the post-event windows. The CAR of insider purchases over the 5-days, 10-days, 20-days, and 80-days after the transaction day are all significantly positive at 0,97%, 1,96%, 3,08% and 13,61%, respectively. The purchases made by insiders from the financial sector have the worst performance among the industries analysed. This contrasts with the conclusion of Baesel and Stein (1979) who found that bank directors earn larger premiums than ordinary insiders. In terms of sale transactions, insiders of the consumer (cyclical) and industrial sectors tend to perform much better.

As observed before, Wong (2002) and Seyhun (1998) noticed that insiders' benefit might well be a result of some size effect. Having this in mind we started by testing the inside trades split up by firm size. Table 8 shows the CAR grouped by the firm size.

Table 8: Cumulative Daily Abnormal returns for Insider Trading Events by Firm Size

	Small 1/3					
	Insider purchase			Insider sales		
Event window	CAR	Test θ_2		CAR	Test θ_2	
[-5, -1]	0,10%	0,390		3,36%	8,989	***
[0]	0,03%	0,236		1,53%	9,160	***
[+1, +5]	0,49%	1,845	*	0,66%	1,770	*
[+1, +10]	0,98%	2,640	***	0,38%	0,718	
[+1, +20]	1,48%	2,809	***	-0,68%	-0,903	
[+1, +80]	6,61%	6,269	***	1,17%	0,784	
	Medium 1/3					
	Insider purchase			Insider sales		
	CAR	Test θ_2		CAR	Test θ_2	
[-5, -1]	0,20%	0,808		1,57%	4,901	***
[0]	-0,21%	-1,888	*	0,39%	2,737	***
[+1, +5]	0,49%	1,980	**	-0,95%	-2,962	***
[+1, +10]	0,72%	2,047	**	-0,07%	-0,155	
[+1, +20]	1,56%	3,127	***	0,60%	0,936	
[+1, +80]	8,92%	8,961	***	-1,67%	-1,303	
	Large 1/3					
	Insider purchase			Insider sales		
	CAR	Test θ_2		CAR	Test θ_2	
[-5, -1]	-0,83%	-5,495	***	0,26%	1,192	
[0]	-0,27%	-3,994	***	0,09%	0,904	
[+1, +5]	0,07%	0,481		-0,45%	-2,068	**
[+1, +10]	-0,08%	-0,385		-0,75%	-2,428	**
[+1, +20]	-0,29%	-0,952		-1,42%	-3,239	***
[+1, +80]	-2,80%	-4,626	***	-2,93%	-3,339	***

The symbols ***, **, and * indicate two-tail significance at the 1%, 5% and 10% levels, respectively.

For insider purchases, only the small and medium capitalisations show significantly positive post-event CAR. Cheuk *et al.* (2006) argue that in many cases, especially in small firms, the separation of management and ownership is rare. Since manager–owners are, in general, more informed about the business prospects of their own firms, insider trading which involves the directors of small corporations is likely to be the most profitable. Relating firm size to insider sales, the results show that only large firms insiders are taking any abnormal benefit from selling their stocks. The CAR for all the four post-event windows is negative and statistically significant.

Following the conclusions of Jeng *et al.* (1999) we wonder whether insider trades are anyhow related to trade volume. Table 9 shows the CAR grouped by the relative trading volume of the transactions.

Table 9: Cumulative Daily Abnormal Returns for Insider Trading Events by Relative Trading Volume

	Low 1/3					
	Insider purchase			Insider sales		
Event window	CAR	Test θ_2		CAR	Test θ_2	
[-5, -1]	-0,17%	-0,774		1,18%	4,038	***
[0]	-0,04%	-0,430		0,35%	2,702	***
[+1, +5]	0,17%	0,767		-0,75%	-2,549	**
[+1, +10]	0,22%	0,684		-0,73%	-1,756	*
[+1, +20]	0,76%	1,689	*	-1,53%	-2,608	***
[+1, +80]	4,04%	4,510	***	-3,58%	-3,060	***
	Medium 1/3					
	Insider purchase			Insider sales		
	CAR	Test θ_2		CAR	Test θ_2	
[-5, -1]	-0,26%	-1,212		2,07%	6,991	***
[0]	-0,14%	-1,462		0,83%	6,243	***
[+1, +5]	0,10%	0,457		-0,05%	-0,177	
[+1, +10]	1,01%	2,401	**	0,25%	0,594	
[+1, +20]	1,01%	2,401	**	0,34%	0,581	
[+1, +80]	2,56%	3,032	***	0,43%	0,364	
	High 1/3					
	Insider purchase			Insider sales		
	CAR	Test θ_2		CAR	Test θ_2	
[-5, -1]	-0,10%	-0,397		1,96%	5,696	***
[0]	-0,27%	-2,481	**	0,84%	5,470	***
[+1, +5]	0,78%	3,214	***	0,07%	0,193	
[+1, +10]	1,00%	2,907	***	0,04%	0,086	
[+1, +20]	0,98%	2,008	**	-0,31%	-0,450	
[+1, +80]	6,13%	6,283	***	-0,25%	-0,179	

The symbols ***, **, and * indicate two-tail significance at the 1%, 5% and 10% levels, respectively.

Purchases in the high relative trading volume group predict better performance for all the event windows. For sales transactions, post-event CAR is statistically significant only for small relative trading volume. This means that larger abnormal profits are achieved when insiders purchase in larger blocks or when they sell shares in smaller lots. Previously we showed that insiders in Portuguese market usually sell shares in larger blocks, and now we found that only shares sold in small lots bring the greatest profits. This result is in line with findings that insiders may sell shares not to avoid losses through the exploitation of private information, but to invest the money elsewhere or to supply any consumptions need. Jeng *et al* (1999) also argue that insiders with sizeable corporate holding may undertake high volume sales to diversification or liquidity purposes.

The relationship between the two valuation ratios and abnormal return is examined next.

Table 10: Cumulative Daily Abnormal Returns for Insider Trading Events by Price to Book Ratio

	Low 1/3					
	Insider purchase			Insider sales		
Event windo	CAR	Test θ_2		CAR	Test θ_2	
[-5, -1]	0,39%	1,545		3,24%	9,166	***
[0]	-0,06%	-0,556		1,42%	8,967	***
[+1, +5]	0,93%	3,696	***	0,54%	1,539	
[+1, +10]	1,73%	4,877	***	0,24%	0,476	
[+1, +20]	2,46%	4,897	***	-0,54%	-0,759	
[+1, +80]	6,61%	6,577	***	4,60%	3,253	***
	Medium 1/3					
	Insider purchase			Insider sales		
	CAR	Test θ_2		CAR	Test θ_2	
[-5, -1]	-0,30%	-1,282		0,51%	1,811	*
[0]	-0,07%	-0,697		0,15%	1,223	
[+1, +5]	-0,05%	-0,214		-0,47%	-1,684	*
[+1, +10]	-0,35%	-1,051		-0,19%	-0,465	
[+1, +20]	0,19%	0,411		-0,40%	-0,717	
[+1, +80]	4,81%	5,144	***	-1,89%	-1,679	*
	High 1/3					
	Insider purchase			Insider sales		
	CAR	Test θ_2		CAR	Test θ_2	
[-5, -1]	-0,84%	-3,730	***	1,50%	4,998	***
[0]	-0,33%	-3,281	***	0,44%	3,253	***
[+1, +5]	0,09%	0,405		-0,84%	-2,780	***
[+1, +10]	0,09%	0,280		-0,54%	-1,272	
[+1, +20]	-0,07%	-0,166		-0,59%	-0,973	
[+1, +80]	0,15%	0,169		-6,14%	-5,104	***

The symbols ***, **, and * indicate two-tail significance at the 1%, 5% and 10% levels, respectively.

As noticed before, inside trading benefits may well be related to P/B and P/E ratios (see see Cheuk *et al.* (2006)). It is hypothesized that insiders tend to buy at periods of low P/B and low P/E and sell at periods of high P/B and high P/E. Table 10 shows that stocks bought by insiders with the lowest P/B perform better than the stocks bought with medium and high ratio. Contrarily, for stocks sold by insiders, the CAR is significantly negative only for those shares with the highest P/B. This is consistent with the hypothesis that a high P/B predicts bad future performance.

A low P/E ratio is also associated with a high future stock return, while high P/E is associated with a low future stock return. Table 11 illustrates this relationship.

Table 11: Cumulative Daily Abnormal Returns for Insider Trading Events by Price Earnings Ratio

	Low 1/3					
	Insider purchase			Insider sales		
Event window	CAR	Test θ_2		CAR	Test θ_2	
[-5, -1]	-0,27%	-1,333		1,70%	5,548	***
[0]	0,07%	0,809		0,39%	2,830	***
[+1, +5]	0,39%	1,941	*	-0,28%	-0,920	
[+1, +10]	0,37%	1,286		-0,19%	-0,449	
[+1, +20]	1,25%	3,098	***	-0,42%	-0,690	
[+1, +80]	1,41%	1,741	*	-1,13%	-0,928	
	Medium 1/3					
	Insider purchase			Insider sales		
	CAR	Test θ_2		CAR	Test θ_2	
[-5, -1]	-0,58%	-2,515	**	0,21%	0,819	
[0]	-0,30%	-2,914	***	0,31%	2,701	***
[+1, +5]	0,06%	0,242		-0,23%	-0,922	
[+1, +10]	-0,15%	-0,472		-0,41%	-1,149	
[+1, +20]	-0,19%	-0,414		-0,71%	-1,394	
[+1, +80]	-0,30%	-0,326		-0,76%	-0,751	
	High 1/3					
	Insider purchase			Insider sales		
	CAR	Test θ_2		CAR	Test θ_2	
[-5, -1]	-1,13%	-4,558	***	1,54%	4,448	***
[0]	-0,23%	-2,049	**	0,40%	1,058	
[+1, +5]	0,59%	2,387	**	-0,43%	-1,242	
[+1, +10]	0,36%	1,017		-0,62%	-1,274	
[+1, +20]	-0,51%	-1,032		-1,38%	-1,990	**
[+1, +80]	-1,06%	-1,072		-4,11%	-2,968	***

The symbols ***, **, and * indicate two-tail significance at the 1%, 5% and 10% levels, respectively.

Therefore, as stated by Cheuk *et al.* (2006), it is likely that insiders, who are more able to assess the value of their firms, buy when the P/E of the stock is low, and sell when the P/E is high. Table 11 shows that for the purchase sample, positive post-event CAR is only found in the low P/E group. Contrarily, for the sales transactions, post-event CAR is significantly negative only for the high P/E group. Both results are significant only for [+1, +20] and [+1, +80] event windows.

Overall, our results confirm that insiders take into account their company valuation before buying or selling stocks of their own firms.

6.2. Methodology Adjustments

As explained before, we also used two alternative strategies in order to control the results. Abnormal returns were also computed using the mean adjusted return (equation 19) and the market adjusted return (equation 20). For the mean adjusted return, the patterns remain identical, as shown in Table 12 (which compares with the results from Table 6).

Table 12: CAR for Insider Trading Events Using the Mean Adjusted Return Model

Event Window	Overall sample			Insider purchase			Insider sales		
	CAR	Test θ_2		CAR	Test θ_2		CAR	Test θ_2	
Pre-event window [-5, -1]	-1,08%	-8,862	***	-0,54%	-3,595	***	2,01%	9,756	***
Transaction day [0]	-0,46%	-8,441	***	-0,26%	-3,928	***	0,80%	8,654	***
Post-event window [+1, +5]	0,29%	2,401	**	0,42%	2,754	***	-0,08%	-0,384	
Post-event window [+1, +10]	0,37%	2,161	**	0,72%	3,358	***	0,22%	0,770	
Post-event window [+1, +20]	0,92%	3,771	***	1,43%	4,751	***	-0,03%	-0,063	
Post-event window [+1, +80]	4,41%	9,060	***	7,10%	11,767	***	0,24%	0,296	

The symbols ***, **, and * indicate two-tail significance at the 1%, 5% and 10% levels, respectively.

Previously, we have done some sample modifications and adjustments related to complications arising from violations of the statistical assumptions. These complications arise when event windows of the included securities overlap in terms of calendar time or when abnormal return calculation is influenced by the abnormal return of an early event. These adjustments, however, did not modify our main conclusions and findings.

Table 13 reports the results, already taking into account the clustering issue. We have go back to the market model.

Table 13: Cumulative Daily Abnormal Returns Taking into Account the Clustering Issue

Event Window	Overall sample			Insider purchase			Insider sales		
	CAR	Test θ_2		CAR	Test θ_2		CAR	Test θ_2	
Pre-event window [-5, -1]	-0,75%	-6,593	***	-0,11%	-0,798		1,74%	9,150	***
Transaction day [0]	-0,35%	-7,011	***	-0,16%	-2,557	**	0,66%	7,757	***
Post-event window [+1, +5]	0,35%	3,103	***	0,46%	3,271	***	-0,18%	-0,963	
Post-event window [+1, +10]	0,46%	2,870	***	0,64%	3,211	***	-0,18%	-0,677	
Post-event window [+1, +20]	0,86%	3,803	***	1,05%	3,758	***	-0,56%	-1,470	
Post-event window [+1, +80]	3,36%	7,438	***	4,85%	8,657	***	-1,04%	-1,366	

The symbols ***, **, and * indicate two-tail significance at the 1%, 5% and 10% levels, respectively.

Although we have reduced the sample size and chosen a new approach for those transactions where the clustering was noticeable in the event dates, the results remain mostly identical, and for the three samples, the statistical significant regions remain unchanged. Friederich *et al.* (2000) argue that although event clustering can affect the results through cross-sectional correlation of the excess returns, this is not necessarily a strong limitation when different industries and daily data are used because the probability of events being clustered decreases under those circumstances. As the events in our research are relatively evenly distributed across the sample period, we are not expecting any bias relating to clustering.

This portfolio approach allows us also to achieve a better fitting for the market model parameters. Using the initial sample (N=1.052), the average value for the coefficient of determination R^2 is 0,20, higher than the estimation found by Duque and Pinto (2004)[14]. The authors have used the PSI Geral index to compute the market return parameters, rather than the PSI-20 index that we use in our research. After the portfolio approach, R^2 coefficient average was slightly improved to 0,22. The average β_i (0,70 for the 1.052 sample or 0,72 for the 855 sample) differ substantially from 1, but the average beta was computed as a non-weight average of 28 securities (only 17 belonged to PSI-20 index at the end of the sample period, although they count for 98% of the benchmark value).

[14] The higher the R-squared the larger the variance reduction of abnormal return.

Table 14 reports the results taking into account the clustering issue and the non-overlapping approach simultaneously.

Table 14: CAR Taking into Account the Clustering Issue and a Non-Overlapping Approach

Event Window	Overall sample			Insider purchase			Insider sales		
	CAR	Test θ_2		CAR	Test θ_2		CAR	Test θ_2	
Pre-event window [-5, -1]	-0,71%	-4,702	***	-0,21%	-1,087		1,37%	5,633	***
Transaction day [0]	-0,74%	-10,888	***	-0,46%	-5,370	***	1,10%	10,111	***
Post-event window [+1, +5]	0,47%	3,143	***	0,50%	2,601	***	-0,45%	-1,838	*
Post-event window [+1, +10]	0,49%	2,286	**	0,67%	2,484	**	-0,25%	-0,730	
Post-event window [+1, +20]	0,51%	1,681	*	0,74%	1,942	*	-0,20%	-0,417	
Post-event window [+1, +80]	0,49%	0,807		0,70%	0,921		-0,21%	-0,212	

The symbols ***, **, and * indicate two-tail significance at the 1%, 5% and 10% levels, respectively.

The CAR for the significant test for the first three shorter post-event windows and the AR for the event day remain robust and practically identical. CAR for both [-5, -1] and [+1, +5] windows, where we have completely eliminated the overlapping, are -0,71% (θ_2 = -4,702) and 0,47% (θ_2 = 3,143). In the previous sample, CAR for [-5, -1] and [+1, +5] event windows were -0,75% (θ_2 = -6,593) and 0,35% (θ_2 = 3,103). For longer periods, namely for the [+1, +80] event window, the test θ_2 cease from being significant. Larger event windows could reflect other factors that lead shares to rally or slump that is external and outside the firm control, and news or events that are unknown by insider at the time the transaction is executed.

One potential problem that can arise from using both the mean adjusted return and market model is that the results can be sensitive to the inclusion (or exclusion) of other event periods into the estimation period. Brown and Warner (1980) argue that if high levels of abnormal performance are present, then including observations from around the time of the event gives more weight to apparent "outliers", tending to increase the variance of the security-specific performance measures, and lowering the power of the tests. To cope with this potential problem, we have redone the analysis using the market adjusted return model. This method allows for abnormal return not to be contaminated by other events taking place during the estimation period.

The results are presented in Table 15.

Table 15: Cumulative Daily Abnormal Returns Using the Market Adjusted Return

Event Window	Overall sample			Insider purchase			Insider sales		
	CAR	Test θ_2		CAR	Test θ_2		CAR	Test θ_2	
Pre-event window [-5, -1]	-0.58%	-3.548	***	0.02%	0.097		1.36%	5.246	***
Transaction day [0]	-0.82%	-11.226	***	-0.66%	-7.087	***	1.02%	8.836	***
Post-event window [+1, +5]	0.37%	2.255	**	0.42%	2.010	**	-0.30%	-1.159	
Post-event window [+1, +10]	0.25%	1.101		0.49%	1.684	*	0.06%	0.171	
Post-event window [+1, +20]	0.28%	0.860		0.73%	1.761	*	0.31%	0.602	
Post-event window [+1, +80]	-0.51%	-0.789		0.72%	0.872		2.13%	2.060	**

The symbols ***, **, and * indicate two-tail significance at the 1%, 5% and 10% levels, respectively.

For the aggregate sample, the pattern and significance of the abnormal returns persist until the [+1, +5] event window, but we loose the effect for the remaining post-event windows.

7. CONCLUSIONS

This study focused on insider trading in the Euronext Lisbon stock market between January 2001 and December 2005.

Although there exist other studies on the subject using similar methodologies and data treatment, this type of research is particularly sensitive to differences in jurisdiction. As noticed by Bhattacharya and Daouk's (2002) and Beny (2005), inside trading legislation varies widely around the world with different impact on trading activity and information release. Even within the European Union, that issued the "Directive 2003/6/EC", the rules and regulations do not provide a completely uniform set of practices, resulting on a country dependent effect. This is why the results for the Portuguese market become relevant.

Our overall results show that, although there exists legislation to regulate insiders' transactions in Portugal, they still seem to be able to make abnormal profits when trading shares of their own firms. We find patterns in abnormal returns that are consistent with directors engaging in short-term market timing: they sell (buy) after an increase (decline) in prices, and their trades are followed by a partial price reversal.

We find that insiders time their trades and they convey information when they buy or sell securities in their own firms, but our results suggest that insider buying is a stronger indicator than insider selling. After the purchases take place, prices increase in all the post-event windows analysed and the test θ_2 is always significant. After selling, prices decline, but the results point towards the absence of significant negative excess return. In Portugal, insiders seem to do far more buying than selling in the sample period. Therefore, when analysing the aggregated sample, the positive excess returns from purchases are more than enough to compensate the absence of significant negative return (multiplied by –1 for the purpose of aggregation) from insider sales.

Since the abnormal return lingers for a period of at least 80 days, outsiders are capable of making abnormal profit by mimicking insider trading. This is particularly true for insider purchases. Therefore, the results offer evidence inconsistent with the strong and semi-strong form of efficient market hypothesis. The first one asserts that insiders should not be able to earn excess returns from privileged asymmetric information, and the second one allows for the existence of abnormal returns immediately after the inside transactions, but not on other days.

A possible explanation for this lies in the fact that companies operating in Portugal do not immediately disseminate their insider transactions information to the public. According to Baesel and Stein (1979), if the market was efficient in the semi-strong sense, insiders could use their information profitably, but once the information or information on the insider trading activity is released to the public it will have no further trading value. In Portugal, the public only gets access to the insider trading information at the moment a company releases its annual report. This means that outsiders do not have access to information allowing them to mimic an insider transaction immediately after it took place. When the information finally arrives at the public, it is already worthless in terms of trading value. Therefore, we conjecture that the inefficiency in the Portuguese stock market arises from the lack of information at the right time, rather than from the inability of security prices to adjust quickly to fully reflect new information. The "Directive 2003/6/EC" of the European Parliament, regarding the release of insider trading information recommends that member States shall ensure that issuers inform the public as soon as possible of inside information[15]. In Portugal, this recommendation has not up till now being followed.

In Spain, for instance, Comision Nacional del Mercado de Valores (CNMV), which is the Spanish version of the Portuguese CMVM, requires insiders to report their trading within fifteen days following the trade, but unlike Portugal, the files remitted by the insiders are, from that moment on, available to the public. Even though for the Spanish stock markets, Del Brio *et al.* (2002) results suggest a semi-strong efficient market, where insiders are

[15] Article n. ° 6 from the "Directive 2003/6/EC"

able to beat the market by investing using their private information, while outsiders cannot earn abnormal profits by using the publicly available information concerning insider trades compiled by the CNMV.

Even if outsiders in Portugal had access to insider information without delay, our results suggest that some insiders' transactions may comprise more information than others.

For the shares bought, we find that the largest and persistent abnormal returns are found in purchases that have some common denominators: the firm belongs preferentially to the communication industry; the firm is small or medium in terms of market capitalization; the relative trading volume of the purchase is high and the price to book ratio and the price earnings ratio of the security is small.

For the shares sold, although the results from analysing the entire sample point towards the absence of significant negative excess returns, there are some firm and transaction-specific factors that lead abnormal returns to fall within the statistical significant regions. These sales have some common features: the firm is usually a consumer (cyclical) or an industrial company; the firm is large in terms of market value; the relative trading volume of the sales is low and the price to book ratio and the price earnings ratio of the shares sold are typically high.

We have previously showed that insiders in the Portuguese market usually sell shares in larger blocks, and now we found that only shares sold in small lots (measured by relative trading volume) bring the greatest abnormal profits. We presume that insiders are compelled to sell shares in larger blocks to invest the money elsewhere, without concern to beat the market by timing their sales. On the other hand, when insiders sell small amounts of shares, they care about the best moment to trade.

8. REFERENCES

Baesel, J. B. and Stein, G. R. (1979), The Value of Information: Inferences from the Profitability of Insider Trading, *Journal of Financial and Quantitative Analysis*, 14, pp. 553-571.

Ball, R. and Brown, P. (1968), An Empirical Evaluation of Accounting Income Numbers, *Journal of Accounting Research*, 6(2), pp. 159-178.

Beny, L. N. (2005), Do Insider Trading Laws Matter? Some Preliminary Comparative Evidence, *Working Paper*, The University of Michigan Business School.

Bernard, V. L. (1987), Cross-Sectional Dependence and Problems in Inference in Market-Based Accounting Research, *Journal of Accounting Research*, 25, pp. 1-48.

Bhattacharya, U., and Daouk, H. (2002), The World Price of Insider Trading, *Journal of Finance*, 57, pp. 75-108.

Brown, S. and Warner J. (1980), Measuring Security Price Performance, *Journal of Financial Economics*, 8, pp. 205-258.

Brown, S. and Warner, J. (1985), Using Daily Stock Returns: The Case of Event Studies, *Journal of Financial Economics*, 14, pp. 3-31.

Calvo, E. and Lasfer, M. (2002), Why do Corporate Insiders Trade? The UK Evidence, *Working Paper*, Cass Business School.

Campbell, J. Y., Lo, A. and MacKinlay A. C. (1997), *The Econometrics of Financial Markets*, Princeton: Princeton University Press.

Cheuk, M.-Y., Dennis, K. F. and Raymond, W. (2006), Insider trading in Hong Kong: Some Stylized Facts, *Pacific-Basin Finance Journal*, 14, pp. 73-90.

Chiang, M.-H., Hwang, L.-J., Wu, Y.-C. (2004), Insider Trading Performance in the Taiwan Stock Market, *International Journal of Business and Economics*, 3, pp. 239-256.

CMVM, "Regulation N° 7/2001 (with the amendments introduced and re-published by CMVM Regulation No. 11/2003, CMVM Regulation No. 10/2005 and CMVM Regulation No. 3/2006)" 20 October 2006 <http://www.cmvm.pt/NR/exeres/D6BBE355-D610-42ED-9858-5DDD37E222DA.htm>.

CMVM, "Decree-Law No. 52/2006, of 15 March" 20 October 2006 <http://www.cmvm.pt/NR/exeres/E736007D-EFBF-4F7B-91E8-49F3BA9FA050.htm>. (Contents in Portuguese)

CMVM, "Portuguese Securities Code, Section II, Qualifying holdings, article 16 (Communication duties)" 20 October 2006 <http://www.cmvm.pt/NR/rdonlyres/7F744DB2-D365-4552-8AF6-8EB931B99C69/3529/cvm_tituloI.pdf >.

CMVM, "Portuguese Securities Code, article 378 (Insider trading)" 20 October 2006 <http://www.cmvm.pt/NR/exeres/7195446F-FE74-4595-9F7B-F05C31687777.htm>.

CMVM, "Annual report on the situation of the Portuguese securities markets - 2001" 20 October 2006 <http://www.cmvm.pt/NR/rdonlyres/99958CD2-349C-4BBB-AC91-B2D2FC275CAD/3410/RA2001Ing.pdf>.

CMVM, "Report on the General Situation of the Securities Markets - 2002" 20 October 2006 <http://www.cmvm.pt/NR/exeres/5068D076-9D25-4533-819D-CC87770F51D3.htm>.

CMVM, "Report on the General Situation of the Securities Markets - 2003"
20 October 2006
<http://www.cmvm.pt/NR/exeres/C2F9EE9E-0011-4767-9921-9C298A9432BB.htm>.

CMVM, "Report on the General Situation of the Securities Markets - 2004"
20 October 2006
<http://www.cmvm.pt/NR/exeres/7D6475B3-8C4B-4BE6-A650-A132687722D7.htm>.

CMVM, "Report on the General Situation of the Securities Markets - 2005"
20 October 2006 <http://www.cmvm.pt/NR/exeres/99958CD2-349C-4BBB-AC91-B2D2FC275CAD.frameless.htm>.

Código das Sociedades Comerciais, "Chapter VII – Publicity of Ownerships and Market Abuse: article 447. ° and article 448.°" 20 October 2006
<http://www.apdt.org/guia/L/CSC/csca.htm>. (Contents in Portuguese)

Del Brio, E. B., Miguel, A., Perote, J. (2002), An Investigation of Insider Trading Profits in the Spanish Stock Market, *The Quarterly Review of Economics and Finance*, 42, pp. 73-94.

"Directive 2003/6/EC of the European Parliament And Of The Council of 28 January 2003 on insider dealing and market manipulation (market abuse)", *Official Journal of the European Union, L 096, 12/04/2003 P. 0016 – 0025*, 20 October 2006 <http://www.europarl.eu.int/comparl/econ/lamfalussy_process/market_abuse_directive/market_abuse.pdf>.

Dolley, J. C. (1933), Characteristics and Procedure of Common Stock Split-Ups, *Harvard Business Review*, 11, pp. 316-326.

Duque, J. and Pinto, I. (2004), How Sensitive are Price Sensitive Events, *Working Paper*, Departamento de Gestão do ISEG.

Eckbo, B. E. and Smith, D. C. (1998), The Conditional Performance of Insider Trades, *Journal of Finance*, 53, pp. 467-498.

Elton, E. J. and Gruber, M. J. (1995), *Modern Portfolio Theory and Investment Analysis*, New York: John Wiley & Sons.

Fama, E. F., Fisher, L., Jensen, M. and Roll, R. (1969), The Adjustment of Stock Prices to New Information, *International Economic Review*, 10, pp. 1-21.

Friederich, S., Gregory, A., Matatko, J. and Tonks, I. (2000), Stock Price Patterns around Directors' Trades on the London Stock Exchange, *Working Paper*, London School of Economics.

Heinkel, R. and Kraus, A. (1987), The Effect of Insider Trading on Average Rates of Return, *The Canadian Journal of Economics*, 20, pp. 588-611.

Instituto Português de Corporate Governance (2006), "White Book about Corporate Governance in Portugal", 20 October 2006 <http://www.cgov.pt/cgov/images/pdf/LivroBrancoCGov.pdf>. (Contents in Portuguese)

Jaffe, J. (1974), Special Information and Insider Trading, *Journal of Business*, 47, pp. 163-193.

Jeng, L. A., Metrick, A., and Zeckhauser, R. (1999), The Profits to Insider Trading: A Performance-Evaluation Perspective, *NBER Working Paper*, No. 6913.

Kabir, R. and Veanaelen, T. (1996), Insider Trading Restrictions and the Stock Market: Evidence from the Amsterdam Stock Exchange, *European Economic Review*, 41, pp. 1591-1603.

MacKinlay, A. C. (1997), Event Studies in Economics and Finance, *Journal of Economic Literature*, 35, pp. 13-39.

Moss, J. D. and Kohers, T. (1990), Abnormal Gains for Insiders Trading Prior to Unexpected Corporate Earnings and Dividend Announcements, *Akron Business and Economic Review*, 21, pp. 63-74.

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

Seyhun, N. (1988), The Information Content of Aggregate Insider Trading, *Journal of Business*, 61, pp. 1-23.

Seyhun, N. (1998), *Investment Intelligence from Insider Trading*, Cambridge, Mass: MIT Press.

Wong, M., Cheung, Y., Wu, L. (2000), Insider Trading in the Hong Kong Stock Market, *Asia–Pacific Financial Markets*, 7, pp. 275-288.

Wong, E. (2002), Investigation of Market Efficiency: An Event Study of Insider Trading in the Stock Exchange of Hong Kong, *Stanford University Department of economics, unpublished.*