Profitability of Insider Trading

A Cross-Country Analysis on European Markets

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Abstract

This thesis takes on an international business perspective to analyze the returns earned by corporate insiders in eight European countries between 2012–2018. By employing a performance evaluation methodology based on insiders' reported transactions, we establish that insiders in only a few countries earn statistically significant abnormal returns. To shed further light on insiders' profits, we investigate the effects of trade- and firm-specific factors. The results are mixed, suggesting that different factors matter in different countries. Finally, we examine what impact the introduction of the EU Market Abuse Regulation (MAR) has had on insiders' returns. Our results suggest that MAR has had little impact on returns, which could either indicate that the regulation is ineffective or that it is still too early to observe its full effect. The implications of our findings should be of interest to scholars within the international business discipline and policymakers in their efforts to regulate insider trading on the capital markets.

Keywords: Abnormal returns, Europe, Insider trading, International business, Market Abuse Regulation.

JEL Classifications: G11, G14, G18

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1. Introduction

> "*There's nothing that they do, you can't name me one thing, not one single thing that the SEC [Security and Exchange Commission] has done in terms of insider trading that has enhanced capital formation, made people more confident in the market or made it easier for people to understand the laws. Not one single thing.*"
> – Mark Cuban (2016)

Insider trading has been a subject of considerable debate in the past decades and has involved people from all sorts of backgrounds, ranging from academics and investors to financial authorities and various lawmakers. The debate stems from the assumption that corporate insiders – directors, executives and other high-ranking officers – have access to valuable and non-public information about their firms that outside investors do not, which gives them an unfair advantage on the capital markets. If insiders were to capitalize on this advantage, by using private information when trading shares in their own firms, they could essentially earn profits at the expense of other market participants. Thus, to level the playing field and to build trust in the markets, countries today have laws regulating how insiders are allowed to trade. These commonly require insiders to disclose all transactions they execute in their firms as well as specify closed periods where no trade is allowed at all. But despite these steps to limit insiders' advantage, the matter is not free of controversies.

There are numerous examples of corporate insiders getting caught breaching trading regulations and a variety of scandals have attracted substantial media coverage around the world. Since the millennium shift, insiders in multiple industries, within various roles and level of fame have been caught violating insider trading rules. In 2003, Martha Stewart, a popular American television celebrity was indicted due to trades she made in her own

company two years earlier (Hays, 2003). In 2006, Yoshiaki Murakami, an investment manager for a large Japanese investment fund was arrested and charged for acting on private information (Koh, 2010), and recently Gene Levoff, a former Apple executive, was accused of illegal insider trading after dumping stock just days prior to a negative iPhone sales report (Bradshaw, 2019).

However, there is a thin line between what is legal and illegal, and the definition is in broad terms based on access and exploitation of private information. In the recently introduced EU Market Abuse Regulation (MAR), the latter is best described as a situation in which a person is knowingly trading on private information, that if it were public, would have a significant impact on the related security's price (MAR, Regulation (EU) 596/2014). In other words, insiders are allowed to trade their own firm's stock, but only on information readily available to the public. In this, distinguishing between what is private information and who holds it is easier said than done, and the border between legal and illegal trading is at times diffuse.

The implication of the difficulties in distinguishing illegal insider trading creates a grey area where all insider trades are regarded as legal until otherwise proven by court. However, prosecuting is a cumbersome activity and evidence from the US market suggests that regulators only have enough resources to investigate a minority of all transactions. Thus, despite a recent stronger emphasis on prosecutions by legal authorities, insider trading based on private information seems to continue being a recurring phenomenon (Sorkin, 2014). While the US for long has been a predecessor in terms of insider trading legislation, the EU has in recent decades caught up through a series of initiatives with the aim to create fairer and more transparent markets in Europe. The latest initiative, MAR, was implemented in 2016 and stipulates unified and formal reporting requirements for all corporate insiders in the member countries. In addition to this, it gives financial authorities increased power to

investigate and sanction illegal activities related to capital markets (MAR, Regulation (EU) 596/2014). While lawmakers around the world appear determined to restrict insiders and their potential advantage, it is a debated topic amongst others.

Regulations on security markets is a sensitive topic in general, and this is certainly true for questions regarding insider trading. A dividing line concerns the question whether it should be regulated or not. While the pro-regulation side usually point to the aspect of unfairness that comes from insider trading, the opposite side claims that even if it were to be true that insiders make profitable trades based on their superior access to information, it is still not enough to restrict them from trading on it. Instead, they suggest that the welfare benefit in terms of more efficient markets, and executives' right to use the information advantage as a compensation scheme, are valid arguments to allow it (Brudney, 1979; Carlton & Fischer, 1983; Thompson, 1999).

However, for the debate to be legitimate, a first criteria is to determine whether insiders in fact benefit on capital markets from their superior access to information. Studies, predominantly based on the US market, suggest that insiders do earn abnormal returns, i.e. returns greater than the market when adjusting for a stock's specific risk characteristics, when trading their own company's stock. While this also seems to be the main conception both by market participants and regulators, studies conducted on European markets are less conclusive in the matter.

In light of this, the purpose of this thesis is to investigate insiders' abnormal returns on European markets. Examining multiple countries within Europe is interesting from an international business perspective since it allows us to relate and contrast our findings across countries. This could potentially help clarifying potential implications of insider trading on an aggregate level, which by extension can be useful for policy makers, corporations and the

investment community in general. The exploration of this will be conducted by answering the following research questions:

i. Do corporate insiders in European countries earn abnormal returns when trading shares in their own firms?

ii. Are there any groups of insiders that perform better than others?
   - More specifically, do insiders' position within the firm, transaction size, firm size and industry type affect insiders' abnormal returns.

iii. Has the implementation of MAR had any impact on insiders' abnormal returns?

To answer the research questions we adopt quantitative methods based on data from corporate insider transactions in the time period 2012–2018, covering eight European countries: Denmark, France, Germany, Greece, Italy, Poland, Romania and Sweden. The composition of sample countries and the differences between them in terms of domestic market size, wealth and development, makes a comparison particularly interesting from an international perspective. Moreover, all countries are members of the European Union, which enables us to test how the implementation of MAR has impacted corporate insiders' profitability.

While earlier studies primarily have focused on the US or single markets in Europe, this thesis contributes to the existing literature by employing comprehensive cross-country data on European countries. Our thesis also covers a more recent time period than previous studies and is the first, to our knowledge, to analyze the effects of MAR. Thus, this study could serve as a starting point for academics within the international business discipline who aim to further investigate how country differences could explain insider trading variations in different markets. Due to the scope of the thesis, we do not assess potential

trading strategies for outside investors. Nor do we claim our findings to be directly applicable on the other countries in Europe. Instead, we take on an international business perspective with the objective to look at insiders' abnormal returns in eight different European markets and relate the findings between these countries.

Our overall results suggest that insiders in only a few of the investigated countries in aggregate earn abnormal returns when trading stocks in their own firms. This is true for both purchase and sale transactions. When analyzing determinants of abnormal returns, the results are dispersed, both across insider groups and countries. Our findings suggest that insider trading practices differ vastly between countries and that there are no principles that can be applied to all markets. Finally, we test how the implementation of MAR has affected insiders' abnormal returns. We find a significant effect in only one country in the sample, but argue that this effect likely can be ascribed country-specific factors associated with the time period, rather than a direct impact of the new regulation. While MAR has had little impact on insiders' returns, our overall results imply that profitable insider trading in Europe is not as widespread as one might think, which could indicate that previous legislations have been sufficient.

The rest of this thesis is outlined as follows. In section two we provide a general background to asymmetric information, the efficient market hypothesis and the regulatory development on insider trading in Europe. Section three gives a detailed description of the previous literature on the subject, focused on policy, profits and determinants of abnormal returns. Section four presents our research design followed by a description of the dataset used for our analysis. The section continues by outlining the methodology applied in order to answer our research questions. Section five presents our results as well as an analysis of our findings. In section six, we discuss the implications of our results and potential directions for future research. Finally, in section seven we conclude the main findings of our research.

2. Background

This section will give an introduction to theories related to insider trading as well as the regulatory development in the EU. It will start by discussing asymmetric information and how this phenomenon can give rise to unfair markets with winners and losers. It continues by outlining the efficient market hypothesis and how insiders' abnormal returns is a way to test the validity of the theory. The section concludes with comments on the development of insider trading regulations and how these aim to reduce asymmetric information and create more efficient markets.

2.1 Asymmetric Information

Asymmetric information is a well-established concept within economic theory and has been used to explain a number of relationships in different settings. The concept is related to transactions where one party has an informational advantage over the other and it is commonly argued that this is the case between corporate insiders and outside investors (Frankel & Li, 2004). Since insiders are closely involved in the strategic decisions as well as the operational activities of their companies, they should reasonably have better information about events affecting the firm's future prospects, thus giving them an advantage when assessing the true value of the firm. Further, even if outsiders could potentially acquire this information, the costs of accessing it would likely be higher than what an insider must pay for it (Fishman & Hagerty, 1992).

The relationship between insiders and outsiders can be related to Akerlof's (1970) seminal paper on adverse selection in which he theoretically linked asymmetric information and market value. Although Akerlof based his analysis on used cars, the principles laid out in the paper can be generalized to any market that is characterized by information asymmetries (Clark, 2014). We can think of a situation with two types of firms, high-quality and low-

quality firms. In the presence of asymmetric information, for example when corporate insiders have specific knowledge about the firm that outsiders do not, then the market price of the firm's stock may not represent the true value of the firm. If outside investors are unable to separate high-quality firms from low-quality firms, they will only be willing to pay the average of the stock prices for the two firms. Due to this, high-quality firms will be undervalued in the market while low-quality firms will be overvalued. This asymmetric relationship will create inefficient allocations of capital among the firms. High-quality firms will be unwilling to issue equity as the share price is too low whereas overvalued low-quality firms will want to issue too much equity. As a result, only low-quality firms will be left in the market, as no capital will be allocated to high-quality firms, which in turn could cause inefficient markets or even market failure (Clark, 2014).

Although the example above is a very simplified illustration of capital markets, it highlights some of the potential consequences asymmetric information could lead to. However, the implications of the asymmetric relationship between insiders and outsiders do not only concern inefficient allocations of capital, but also how the exploitation of insiders' informational advantage can cause monetary losses for outsiders. If insiders use private information when purchasing shares in their firms and earn abnormal returns on the trade, other investors are at the other end of the transactions and will have to pay for it (Jeng et al., 2003). Thus, asymmetric information is closely related to insiders' abnormal returns and unfair markets and it is suggested that larger information asymmetries creates greater opportunities for insiders to generate profits (Frankel & Li, 2004).

2.2 Efficient Markets

Are capital markets efficient? The discussion has been alive for a long time and is related to the information content in security prices. In 1970, Eugene Fama (1970) took an award winning dive into the concept when he proposed the *efficient market hypothesis*. In short, a

market is efficient when firms can make production decisions and investors investment decisions based on the assumption that security prices fully reflect all available information. According to the hypothesis, and as a result of the criteria 'fully reflects all available information', securities are always priced correctly and investors cannot consistently beat the market.

Fama (1970) distinguished between three different forms of efficiency, *weak*, *semi-strong*, and *strong* form. The weak form suggests that current security prices only reflects historical prices and that future short-term movements follow a random walk. Thus, it is impossible to make superior profits by studying past returns. This would in turn entail that the growing field of technical analysis, where previous patterns are studied to predict future price movements, is useless. The semi-strong form assumes that in addition to historical prices, security prices adjust rapidly and efficiently to publicly available information. Based on this, investors cannot make superior profits from trading on public information as it is immediately incorporated in security prices. Trading on private information could however generate abnormal returns. In the strong form, security prices adjust to all private and public information, i.e. there are no groups that could exploit their superior information to gain from investments in capital markets. Basically, any market participant should always trust current prices.

Fama (1970) suggested that a market can be efficient even though investors may disagree about available information, as long as there are no investors that consistently outperform the market. This is of relevance to this thesis since if the efficient market hypothesis is true, it implies that there are no investors that in the long-run can earn economically significant abnormal returns. In other words, it would suggest that insiders either do not have superior access to information or that they are unable to leverage it due to regulations, inability, or some other factor. Since the purpose of this thesis is to investigate whether insiders earn

abnormal returns when trading shares in their own firms, we implicitly test the strong form hypothesis. With that said, we make no effort in testing the semi-strong form of market efficiency, but our results could serve as a starting point for future research testing its validity on European markets.

2.3 Insider Trading Regulations

Regulators across the world seem to agree on the idea of an unfair playing field between insiders and outsiders and the harmful consequences unrestricted insider trading could have on capital markets. As an effect of this, and to curb the consequences of the asymmetric relationship between insiders and outsiders, a large proportion of markets across the world have imposed regulations on insiders and their trading (Bhattacharya & Daouk, 2002). The regulations are primarily a mean to restrict destructive activities on financial markets and to establish investor confidence in order to improve liquidity and market efficiency. In other words, regulations aim to establish fair, liquid and transparent markets for all investors (Colombatto & Tavormina, 2018).

The US has been a predecessor in terms of market regulations for insider trading. The earliest legislation trace back to 1934, when the Security and Exchange Act was introduced, and was designed to reduce information asymmetries in the capital markets (Frankel & Li, 2004). Since, the regulation has been amended multiple times and in relation to several financial scandals during the 1990s, an even stricter control-mechanism was implemented via the Sarbanes-Oxley Act (Stephens, 2005).

While regulations have been in place for almost a century in the US, it was for long neglected and unharmonized within Europe, with large differences in reporting and enforcement standards across the markets. However, over the past 30 years, efforts have been made to create more homogenous regulations within the Union. In 1989, as a consequence of

several financial scandals, the Council of the European Communities (1989) took a first step towards a uniform platform to combat illegal insider trading. The directive required member countries to implement rules on illegal insider trading and brought a common definition of the term 'inside information' as information that would have a significant impact on a security's price if it was publicized. The definition has been applied in the EU since and can be broken down into four conditions that information must meet in order to be classified as inside information. First, the effect on the security prices, if the information were to be made public, would be significant. Second, the information needs to be non-public. Third, the information must be related to a market participant or a financial instrument and fourth, the information has to be precise (Siems, 2008).

In 2003, the European Parliament and Council (2003) followed the US and proposed a stricter directive for financial markets. The directive went under the name the Market Abuse Directive (MAD), and was mainly a framework to prohibit people with inside information from trading on it. A directive separates itself from a regulation in that it articulates a binding overarching goal for each member state, but that each member state can interpret and implement the directive so that it fits their legal system (Insider Dealing and Criminal Law, 2012). MAD forced managers from EU countries to disclose transactions made in their own firms, which enabled regulatory authorities to create lists over insiders' transactions and more effectively take action against illegal activities. The directive aimed to build more confidence in the markets while ensuring the integrity of the financial system. It also facilitated regulators to better cooperate and integrate concepts across borders (European Parliament and Council, 2003). While this was considered a step in the right direction towards a synchronization of insider trading laws, critics still believed it lacked teeth (Woolfe, 2012).

The European Parliament and Council (2011) acknowledged that there were certain parts in MAD that were unsatisfactory, which created an unleveled playing field. Since a directive gives member states the right to interpret and implement it in its own way, a divergence in implementation caused heterogenous regulations in the member countries. This gave rise to some concerns in relation to the disclosure of inside information by issuers, and directors' obligation to report their trading. The implications of this was explicitly pointed out by the parliament, who raised concerns that insiders could exploit regulatory differences across borders. Due to this, and as a consequence of fast-growing technology, which gave rise to new platforms and new types of over-the-counter trading, the EU took action on the criticism and proposed an updated version of MAD. The updated directive harmonized security markets in the EU further by introducing common definitions of crimes related to insider dealings and market manipulation. It also increased the sanctions imposed on the most severe market abuse offenses (The European Parliament and Council, 2011).

Coupled with the update, and as a binding act rather than just an overarching goal, a new Market Abuse Regulation (MAR) was proposed by the European Parliament and Council (2011) to cover the vast commodity and derivative markets. The regulation was fully implemented in all member countries on the 3rd of July 2016, and has since empowered regulatory forces to investigate and sanction illegal activities related to financial markets. Moreover, it has advocated uniform supervisory approaches across countries. For example, notifications of insider transactions shall be made no later than three business days after the date of the transaction and must include name of the person, reason for notification, name of issuer, description of security, nature of transaction, date and place of transaction as well as price and volume. Furthermore, all subsequent transactions within a calendar year exceeding EUR 5,000 must be disclosed and a closed period of 30 days prior to a financial report, where no trading is allowed, applies to all member countries (MAR,

Regulation (EU) 596/2014). MAR is also suggested to be a framework for enforcement throughout the EU (ESMA, 2019).

Table 1. Insiders' Reporting Requirements Prior to and After MAR

	Reporting Deadline	Exclusions	Closed Periods
Denmark	2 business days	Trades with aggregate value of less than EUR 5,000 in a calendar year	Insiders are allowed to trade for a maximum of 6 weeks after each published interim report or preliminary announcement of annual results. Each issuer determine internal rules and the time period can thus be shorter
France	5 business days	Trades with aggregate value of less than EUR 5,000 in a calendar year	15 days prior to the publication of an interim financial report or year-end report
Germany	5 business days	Trades with aggregate value of less than EUR 5,000 in a calendar year	None
Greece	4 business days	Trades with aggregate value of less than EUR 5,000 in a calendar year	None
Italy	5 business days	Trades with aggregate value of less than EUR 5,000 in a calendar year	No formal. Specific rules have been adopted by firms on their own discretion
Sweden	5 business days	Companies listed on First North Exchange	30 days before an financial report is released
MAR	3 business days	Trades with aggregate value of less than EUR 5,000 in a calendar year	30 calendar days before an interim financial report or year-end report

The table summarizes regulations and reporting requirements for corporate insiders in different countries prior to the implementation of MAR. The regulations were in place at the beginning of the sample period in 2012. MAR describes the new regulatory framework introduced in EU countries July 2016. Due to insufficient data, Romania and Poland have been excluded from the table. Table source: Gebka et al. (2017) and MAR, Regulation (EU) 596/2014.

Table 1 summarizes reporting requirements for corporate insiders prior to and after the implementation of MAR. Worth highlighting are previous inconsistencies in formal requirements between our sample countries, and in particular differences in regulations on closed periods prior to a financial report. While Sweden and Denmark have had similar, or even

stricter regulations in place than those imposed by MAR[1], the requirements in the rest of the countries have previously been more lax. In Germany and Greece, insiders were previously unrestricted in terms of when they could make a transaction within their firm. Following the purpose of imposing closed periods, to restrict insiders from trading during times when their informational advantage is superior (Gebka et al., 2017), anomalies between countries suggest that stricter reporting requirements should have a larger effect on countries with previously more flexible regulations.

3. Literature Review

There is an extensive literature on insider trading and its implications on security markets. Considering the vast amount of research conducted within the field, dividing it into different subsections is appropriate to clarify different motives and approaches. Therefore, and in line with the purpose of this thesis, this section will primarily cover findings related to our three research questions. It will start by giving an introduction to the debate concerning insider trading regulations as well as present empirical evidence on how regulations affect markets. It continues by looking into the topic of whether insiders earn profits when trading shares in their firms and if outsiders can benefit from tracking insiders' trades. Finally, the last section summarizes previous literature related to determinants of insiders' returns.

3.1 Should Insider Trading be Regulated?

Insider trading regulation has been a widely debated topic amongst scholars for many decades and two opposing camps have emerged in the discussion. On one side, there are researchers arguing that insider trading increases the informational efficiency of markets

[1] MAR impose minimum requirements in all member countries. However, issuers themselves can impose stricter requirements.

and thus should be permitted. On the other side, there are those suggesting that insider trading harms investor confidence and thereby affects market efficiency negatively.

Manne (1966), a pioneer within the academic literature on insider trading, belongs to the first camp. He argued that insider trading does not harm investors. Instead, it can be an efficient tool for compensating entrepreneurs for their innovation. If insiders were allowed to trade on non-public information, it would give them greater incentives to create additional value for the company, which in turn would be beneficial to both the company and the society. Further, stock prices would be more accurate as insider trading allows for information to be quickly reflected in security prices, which would make capital markets more efficient. Additional arguments by Manne (1966) pointed to the lack of evidence against insider trading actually being harmful, and that common compensation schemes were not sufficient to incentivize innovation.

Carlton and Fischer (1983) built on Manne's (1966) arguments and pointed out that insider trading conveys information that is subsequently captured in the price of securities. This increases price efficiency and reduces investor uncertainty since insiders can generate this information at a lower cost than outside investors. Bris (2005) provided another case against regulation by suggesting that regulations fail in its purpose. Rather than mitigating insiders' returns, regulations increase the profitability for insiders.

Amongst those opposing the idea that insider trading has a positive effect on market efficiency are Fishman and Hagerty (1992). In their paper, they analyzed the effect of insider trading on the informational efficiency of stock prices and argued that insider trading can lead to less efficient stock prices. Insider trading might discourage market professionals from acquiring information and trading, thus reducing the number of informed traders in the market. While insiders have free access to valuable information, outsiders need to spend resources to obtain it and may abstain from doing so if insiders' information is superior

and used in trading. As a result, the total amount of information captured in the stock price is reduced, rendering less efficient prices. This was supported by Leland (1992) who evaluated the validity of arguments used in the insider trading debate. The study suggested that although several arguments from both sides were indeed true, insider trading results in less liquid markets and higher volatility. Further, it reduces the expected returns for outsiders and increases the expected returns for insiders.

Thompson (1999) criticized Manne's (1966) proposition that insider trading is an appropriate compensation tool for entrepreneurs. His concern was related to the changing landscape for executives and their compensation schemes. By arguing that executive compensation had changed dramatically since Manne's paper, much due to a better alignment between the interest of shareholders and executives, he contended that insider trading as a compensation tool should not be practiced. Instead, other types of entrepreneurial compensation schemes, such as options, are less likely to reward the wrong people and incentivize wrong behavior. Kronman (1978) also challenged Manne's view, and argued that employees creating additional value for the company seldom are the ones that later capitalize on the private information. Inside trading as compensation tool is thus not appropriate as it compensates the wrong insiders.

Other scholars have argued against insider trading from a fairness perspective. Brudney (1979) suggested that insiders have access to corporate information that outside investors cannot lawfully obtain and allowing this informational advantage renders unfair markets. This unfairness is not simply a question of insiders possessing more information, outsiders may have information advantages over other outside investors, but due to the fact that this information cannot be competed away as an outsider cannot lawfully acquire access. He argued that regulation can foster fairness and stability in the market and lead to greater liquidity as more investors are willing to participate.

Although scholars are yet to reach a consensus on whether insider trading is desirable from an outsider perspective or not, research shows that a vast majority of markets indeed have insider trading laws and regulations in place. In fact, Bhattacharya and Daouk (2002) revealed that out of 103 countries with a stock market in 1998, 87 had insider trading laws in place. But while countries in general have laws restricting insider trading, enforcement of these laws is less documented. Bhattarachya and Daouk (2002) found that enforcement, as evident by insider prosecutions had taken place in only 38 of the countries investigated at the time the study was conducted. They also proposed that regulation is a phenomenon of the 1990s. Before 1990, 34 countries had insider trading regulations and enforcement had only taken place in 9 of these.

As more and more countries have adopted insider trading regulations as well as enforcement of these, an array of research has set out to investigate its implications. Cumming, Johan and Li (2011) analyzed 42 different markets worldwide between 2006–2008 to examine whether different rules and regulations matter for market liquidity. Their results showed that a more detailed set of trading rules is positively associated with liquidity while countries with poor regulations have higher market volatility and bid-ask spreads. These findings were supported by Beny (2005) but at odds with an earlier study by Estrada and Peña (2002), who investigated how new insider trading regulations impacted the risk and return in ten European countries between 1988 and 1994. Despite introducing greater restrictions, they found that these regulations had no, or very little impact, on the security markets' volatility.

Another paper by Garfinkel (1997) focused on how regulations affect insiders' behavior. He studied the effects of ITSFEA, a 1988 law in the US that significantly increased penalties associated with insider trading. The results showed that while the volume per transaction did not change considerably, the frequency of informed insider transactions significantly

decreased after the introduction of the act. The effect was apparent both prior to and after earnings announcements, albeit significantly larger for trades pre-announcement.

Several authors have pointed out that the mere existence of insider trading regulations is not enough to affect markets. Instead, enforcement of these laws are required in order to observe any impact. Bhattacharya and Daouk (2002) found consistent evidence that insider trading enforcement is associated with a decrease in the cost of equity, but found no such relationship in countries where insiders had not been prosecuted. Similarly, Durnev and Nain (2007) showed that the volume of trading based on private information is significantly reduced after the first enforcement of insider trading laws. Wielhouwer (2012) also advocated the importance of enforcement, but pointed out that this is not sufficient if the expected penalties are too low. Rather, both enforcement and severe penalties are necessary to reduce trading on non-public information. Aussenegg et al. (2018) investigated seven European countries and concluded that public enforcement of insider trading regulation is a significant determinant for insiders' returns. Moreover, they argued that differences in enforcement can be explained by a country's legal origin. Countries with German legal origin have weaker enforcement than countries with French legal origin and this is associated with a larger price effect.

Some scholars have proposed a market-based approach to regulation, where it is up to each company to decide how restrictions should be imposed. Painter (1999) argued that the effect insider trading has on the cost of equity is individual to all firms and therefore should companies themselves be able to determine whether or not to restrict it. Haddock and Macey (1987) took a similar approach by suggesting that insider trading could be settled through private contracts between insiders and shareholders. If investors know that managers trade on private information, they will lower their bid on the stock so that the implied cost of equity increases.

Bettis et al. (2000) tested whether self-regulation based on firms' own initiatives to curb insider trading is efficient. By 1996, 92 percent of the sample firms in the US had incorporated insider trading policies and close to 80 percent had explicit blackout periods where no trading were allowed. The results suggested that insider trading is concentrated in time periods where trading is permitted. However, trading still exists in blackout periods, indicating that self-regulation is not perfectly efficient. Moreover, the liquidity is greater, as indicated by narrower bid-ask spreads, when corporate policies restricts insiders from trading.

Insider trading regulation has been, and continues to be, a widely debated topic amongst academics and there is still no consensus whether trading on private information should be allowed. As evident by Bhattacharya and Daouk (2002), however, authorities appear to be less equivocal in the question and most countries do in fact have insider trading laws in place.

3.2 Insider Trading and Abnormal Returns

A plethora of research and empirical studies have been carried out to determine whether insider trading is profitable or not. One of the first papers on the subject was published by Smith (1940). He compared insiders' trades to monthly indices but did not find any evidence that insiders consistently sold shares at high prices and bought them at lower prices. Since Smith's early paper, numerous scholars have been interested in the topic and tested it with increasingly sophisticated methods.

Lorie and Niederhoffer's (1968) paper has its origin in the SEC's interest of investigating insiders' exploitation of private information to gain personal profits, and the general belief by the investment community that outsiders can use data on insiders trading to predict future stock movements. To test the validity of these claims, they investigated the stock

performance of 105 companies listed on New York Stock Exchange by applying an "intensive trading" criterion, defined as months in which there were at least two or more buyers than sellers and vice versa. The study reached the conclusion that intensively bought shares are likely to outperform the market in the six months subsequent insider trades, while intensively sold stocks are likely to underperform.

Jaffe (1974) used a similar approach in his study on insider trading returns, but unlike Lorie and Niederhoffer (1968), he explicitly took market risk into account. By applying an equilibrium pricing model he concluded that insiders indeed possess and exploit private information when trading shares in their own firms. However, after adjusting for transaction costs, only samples with intensive insider trading[2] and longer holding periods of the stock had earnings that were statistically significant relative to the market. Finnerty (1976) supported these findings in his study on insider trading and market efficiency. Rather than looking at intensive trading months, he constructed purchase and sale portfolios comprising all securities which were bought or sold by insiders in each respective month. The results indicated that insiders are able to generate abnormal returns up to eleven months following trades. The highest returns were observed in the first month, which he proposed could imply that insider information is incorporated in stock prices relatively quickly. Based on his findings he rejected the strong-form of the efficient market hypothesis.

In contrast to Finnerty (1976), Seyhun (1986) provided results consistent with the efficient market hypothesis. Based on a sample of listed American firms between 1975–1981, he found that insiders do generate abnormal returns. They tend to buy shares prior to a significant rise in the stock price and sell shares before the stock price declines. However, these returns disappear once transaction costs are accounted for, thus implying that the

[2] In contrast to Lorie and Niederhoffer (1968), Jaffe (1974) defined intensive insider trading as months where there were at least three or more buyers than sellers, or vice versa.

efficient market hypothesis still holds. He argued that previous studies had found contradicting results because they had failed to take into account the bid-ask spread as an additional cost of trading.

Rozeff and Zaman (1988) investigated whether abnormal returns found in previous insider trading research could be a mismeasurement that arises from the presence of firm size and earnings/price ratio effects. By applying an event study methodology, they found that corporate insiders gain abnormal returns of approximately eight percent annually. When accounting for transaction costs as well as size factor and earnings/price ratio effects, only the longest holding period of 12 months displayed statistically significant returns. However, the magnitude of the returns was significantly reduced and the authors suggested that it could even be considered nil, if abnormal returns were measured net of transaction costs. Based on their results, they argued that excess returns found in other insider trading research are largely attributable to effects known to be found in firms with small market capitalizations and high earnings/price ratios. In a more recent study, Lakonishok and Lee (2001) also documented abnormal returns for insiders in US firms. But in contrast to Rozeff and Zaman (1988), the returns persisted even after controlling for the size effect and book-to-market ratio.

Cohen et al. (2012) took a different approach to insider trading by investigating whether it is possible to distinguish between informative and uninformative insiders. To do this, they categorized insiders as either *routine* or *opportunistic* traders based on their trading patterns. The results indicated that abnormal returns associated with routine traders are close to zero whereas a strategy focusing on opportunistic traders generate abnormal returns of 0.82–1.80 percent per month. Moreover, trades by opportunistic traders can predict the outcome of future events such as earnings announcements as well as managerial forecasts. Interestingly,

these trades increase the likelihood of SEC enforcement action, implying that authorities follow trading patterns to identify unlawful trading.

Early studies have primarily focused on American firms, much due to the developed regulatory framework in the US and availability of data. In recent decades however, several papers have been published investigating insider trading in Europe. While findings in the US have provided a largely unified picture, the results in Europe are mixed. Eckbo and Smith (1998) analyzed insider trading in Norway over the time period 1985–1992, when insider regulation and enforcement were relatively lax in the country. They argued that the classical event study methodology commonly applied in insider trading studies not necessarily reflects insiders' actual holding period of stocks. To account for this they formed portfolios of monthly aggregate insider holdings on the Oslo Stock Exchange and then measured the performance using several different evaluation methods, but did not find any evidence of abnormal returns to insiders. By comparing the results to the event study methodology, they concluded the estimated performance of insiders is conditional on the evaluation approach. Further, the insider portfolios did not outperform the average mutual fund manager in the sample, which could either imply that insiders only rarely possess inside information or that the value of maintaining corporate control benefits outweigh trading on such information.

Dymke and Walter (2008) studied insider trading in Germany and found that insiders exploit private information when trading shares in their own firm, as evident by a mean abnormal return of more than 4 percent in the 20 days following a transaction. Aussenegg and Ranzi (2008) obtained similar results on the German market. Interestingly, they found a strong market reaction to insider sales, but only a moderate reaction to purchases, which contradicted much of the previous literature. They suggested that their results could be

related to a lack of class-action lawsuits associated with insider trading in Germany, which could reduce the perceived risk of trading on information.

In addition to the supply of single-country studies, a few authors have conducted analyses on larger sets of countries. Dardas and Güttler (2011) studied eight European countries and provided mixed evidence of insiders generating abnormal returns, with significant announcement effects in only half of the countries in the sample. They argued that country-specific governance factors, including legal origin and legal protection of minority shareholders, could be one explanation for their results. Moreover, the reporting standards differed between countries as well as the accessibility to insider transactions reports, suggesting investors have different conditions to track insiders' trades. Fidrmuc et al. (2013) and Gebka et al. (2017) presented similar findings in their cross-country studies in Europe. In line with Dardas and Güttler (2011), abnormal returns to insiders appeared to differ largely between countries and both papers cite differences in shareholder protection as an important determinant of insider profitability. Aussenegg et al. (2018) added to these findings by testing whether legal origin could explain any differences in returns. They found that insiders on aggregate tend to purchase stocks after periods of negative abnormal returns and sell stocks after periods of positive abnormal returns, with the strongest effects in countries where public enforcement is weak.

The convincing evidence, at least in the US, that insiders trade profitably when purchasing or selling shares in their own firms, have led several scholars to ask the question whether outside investors can benefit from this by adopting strategies mimicking these trades. Lorie and Niederhoffer (1968) and Jaffe (1974) contended that this is the case. Since insiders tend to be better than the market at forecasting large changes in their own company's stock price, outside investors can benefit from analyzing data on insider trading. These findings were contradicted by Seyhun (1986) who found that outsiders generate negative

abnormal returns once transaction costs are taken into account. Even when applying more selective trading rules based on transaction size, proportion of the firm traded and firm size, he could not find any significant profits to outsiders from these strategies net of transaction costs. Rozeff and Zaman (1988) presented similar results, showing that outsiders' profits are zero or negative once adjusted for trading costs as well as size factor and price/earnings ratio effects.

In a more recent study, Bettis et al. (1997) reached a different conclusion. By focusing on large-volume trades conducted by top executives, they proposed that outsiders can earn significant excessive returns. One explanation for their result was the shorter reporting delay between the insider transaction and the day the information is publicly available, compared to earlier studies.

To conclude this section, a wealth of research has been carried out to investigate whether corporate insiders trade profitably in their own companies' shares. While many scholars have recognized that this is the case in the US, more recent studies on European countries have provided less consistent results. Whether outsiders can benefit from mimicking insiders' trades is another debated question yet to be agreed upon. While some scholars argue that it is possible to generate abnormal returns by observing insiders, others find no such evidence once transaction costs are taken into account.

3.3 What are the Determinants of Insiders' Abnormal Returns?

As more and more researchers have proclaimed that corporate insiders indeed earn abnormal returns, it has become increasingly popular to assess determinants of these returns. One factor that has received a lot of attention in the literature is insiders' position within the firm, which Seyhun (1986) was one of the first to examine. His findings later came to be known as the *information hierarchy hypothesis.* The hypothesis states that the informational

value of insiders are dependent on the position within the firm, with insiders closer to the firm's overall operations trading on more valuable information. Lin and Howe (1990) and Degryse et al. (2013) found support for the hypothesis, but it was dismissed by Jeng et al. (2003) who found no statistical evidence that top executives, deemed to be highest up in the hierarchy, generate higher abnormal returns than officers and directors. They argued that insiders higher up in the hierarchy indeed are expected to have access to better information, but since they are likely to be more carefully scrutinized by both shareholders and regulators, they are more reluctant to take advantage of this informational advantage. Dardas and Güttler (2011) tested the information hypothesis on European countries with mixed results. In a majority of the countries there were no indications that top executives outperformed other insiders and only two countries investigated showed signs of an information hierarchy. In relation to these studies, Cicero and Wintoki (2015) pointed out that all insiders are likely to possess relevant information in the short-term. However, only senior executives possess information that will take a longer time-window to be revealed. Thus, the information hierarchy may only be relevant when observing insiders' returns over longer holding periods.

Wang et al. (2012) investigated whether trades by chief financial officers (CFOs) reveal more information about future returns than trades by chief executive officers (CEOs). They found that CFOs outperform CEOs with approximately 5 percent annually and argued that this could be explained by two reasons. First, since the CFO is more intimately related with the firm's financial details it is possible that CFOs possess superior information, in particular regarding financial reports and earnings. Second, since the CEO is the highest ranked person in the corporation, he or she is more likely to be scrutinized by shareholders and regulators, and may therefore refrain from trading on the private information available.

Cohen et al. (2012) took another approach to the insider hierarchy and found that the most informative traders are local non-senior opportunistic insiders. These are likely to work within companies characterized by poor governance and a high geographical concentration. The results would imply that the level of management is irrelevant when measuring the performance of insiders' trades.

Another determinant of insiders' returns that has been heavily discussed amongst scholars is the size of the transaction. Lin and Howe (1990) tested this relationship in their study on OTC markets[3]. They predicted transaction size to be positively related to future returns, but instead found a significant negative relationship, which they could not find any explanation for. In contrast, Seyhun (2000) found that there is an inverse U-shaped relationship between transaction size and profitability. For smaller transactions, the profitability increases monotonically as the trades grow larger. However, when the transaction reaches a certain point the profitability begins to drop and for the largest trades the abnormal returns are essentially economically insignificant. When the trade volume is relatively small, profit motives appear to dominate the risk of regulatory action. For larger transactions, which are more visible and likely to be scrutinized, the risk of regulatory sanctions increases and insiders subsequently avoid trading on private information.

Rather than investigating the absolute trade volume, Jeng et al. (2003) tested how transaction size, measured as a percentage of market capitalization, affects abnormal returns. They found that larger transactions are associated with greater returns and that these profits are mostly due to superior information. Gregory et al. (1997) supported the findings that the volume of a trade has informational value, but in their empirical analysis they only found evidence of this for sale transactions. Jaffe (1974) and Eckbo and Smith

[3] Refers to securities traded over-the-counter via broker-dealer networks as opposed to on a centralized exchange

(1998) also analyzed the effect of transaction size but found no indications that larger transactions contain more information than smaller trades.

Kyle (1985) proposed that informed investors will tend to strategically split their investments into medium-sized transactions to go under the authority's radar. Barclay and Warner (1993) built on this, and found empirical evidence in line with Kyle's (1985) hypothesis that medium-sized transactions are superior in terms of informativeness. They suggested that large transactions could reveal too much information whereas small transactions were expensive due to high transaction costs. The findings have later been confirmed by Chakravarty (2001), who added that institutions predominate medium-sized transactions. Similarly, Friederich et al. (2002) reported that medium-sized insider trades are more informative in the short-term.

As evident by preceding paragraphs, scholars are yet to agree on how transaction size and profitability are related. Both theories and empirical evidence point in different directions, and authors have suggested the results likely depend on how transaction size is defined as well as the methodology applied in analysis (Jeng et al., 2003; Eckbo & Smith, 1998).

While the impact of trade volume on abnormal returns is somewhat ambiguous, scholars are less divided when it comes to the effect of firm size, where many have pointed out that insiders in small firms tend to outperform their counterparts in larger firms (Seyhun, 1986; Finnerty, 1976; Gregory et al., 1997; Jeng et al., 2003). Several explanations have been offered why this may be the case. Jeng et al. (2003) suggested that insiders in small firms are likely to know a larger portion of relevant information, and thus have a greater information advantage than insiders in larger firms. Similarly, larger firms tend to have more non-executive directors which are more distanced from the firm's operations, giving them less information to trade on (Gregory et al., 1997).

Lakonishok and Lee (2001) also found that firm size is an important predictor of abnormal returns to insiders and argued that large firms are priced more efficiently than smaller firms. They proposed that larger firms put more efforts into discouraging their insiders from trading on relevant information by employing stricter corporate policies. Seyhun (1986) suggested that the profitability of insiders' trades in smaller firms may be overstated if the cost of trading is not taken into account. Although smaller firms outperform larger firms, the bid-ask spread of trading in these firms is typically much larger compared to larger firms, thus reducing the income from these trades.

Jeng et al. (2003) pointed out that large firms are more scrutinized by analysts and the public, which could have two effects on insider trading. First, insiders become more careful when trading on information due to the increased risk of regulatory sanctions. Second, due to the high coverage by analysts, larger firms are more efficiently priced. As a result, insiders have less advantage of their private information, explaining the significantly lower returns observed. Frankel and Li (2004) support the latter argument and added that analyst coverage in fact is a better predictor of returns than the actual size of the company. They argued that analyst coverage decrease information asymmetries between inside and outside investors, and that there is a positive relationship between profitability and asymmetric information. Hence, small firms' outperformance can primarily be explained by its lower degree of analyst coverage.

Other authors have argued that insiders' abnormal returns in small firms is the result of the well-documented small firm effect, where it has been shown that small firms generate consistently higher risk-adjusted returns than their larger counterparts (Fama & French, 1992). As insiders to a larger extent trade in smaller firms, this effect could potentially be the reason why research has found a strong relationship between firm size and insider returns (Seyhun, 1986). Rozeff and Zaman (1988) controlled for this effect in their study

and found that the size effect explained a significant proportion of the abnormal returns to insiders. Thus, insiders earn abnormal returns not necessarily because their trades are more informative, but because they invest a larger portion of their funds in smaller firms.

The final determinant we will look into in this section concerns industry characteristics related to insider trading. While the area is not as explored as the determinants in previous paragraphs, a few scholars have tested whether insiders in specific industries outperform others. Aboody and Lev (2000) studied this relationship and found that insiders in R&D intensive firms generate higher abnormal returns. They argued that higher R&D investments are associated with greater information asymmetries. Since R&D investments are unique in its character with oftentimes long-term impact on firm performance, inside knowledge about these is a substantial advantage in comparison to financial and more tangible investments. They also found evidence that insiders in these firms are more likely to benefit from their advantage, as they trade both more frequently and in larger quantities.

Dardas and Güttler (2011) also investigated the profitability of insiders in light of R&D spending in their study on European countries. Their results indicated that healthcare, energy and IT are the sectors where insiders perform best. While energy is not perhaps associated with large R&D investments, the authors proposed that the high returns observed could be explained by an overall high demand for products in the energy sector during observation period, where stocks in general performed very well. Gebka et al. (2017) tested the industry effect as well, by dividing firms into high-tech and traditional industries. Surprisingly, they found that traditional industries generated higher abnormal returns than high-tech industries.

4. Methodology

This section will start by outlining the research design for this thesis. It will continue by describing our sources of data, how it has been handled as well as descriptive statistics of the dataset used for our analysis. It will then go into detail of the methodology employed for our empirical analysis and the rationale behind why it was chosen. We thereafter describe our estimation models used to analyze abnormal returns. The section continues with a description of the motives behind each of the determinants tested, how insiders have been grouped to test for differences in returns and the methodology applied to estimate abnormal returns for each group. The section ends with a description of the approach used to test the impact of MAR.

4.1 Research Design

There are primarily two approaches to consider before conducting academic research, qualitative and quantitative. In order to establish which one is more appropriate for a particular study, the starting point should be the purpose of the study and the research questions at hand (Darmer & Freytag, 1995). In our case, we are looking to answer questions related to whether insiders in European countries earn abnormal returns when trading shares in their own firms. Thus, it is against this background we will evaluate our research design.

A qualitative study is typically inductive in its approach as theories are applied from few, but detailed observations, commonly derived from various interviews with people related to the topic. While interviews could have the advantage of providing in-depth knowledge about the subject in matter, they also faces certain limitations. For instance, interviewees may not objectively answer questions but could instead let personal beliefs influence their response. In addition, interviewees may not, for one reason or another, answer in an honest manner to certain questions. Another drawback is that researchers might interpret answers

in different ways depending on their own subjective opinions, thus violating the reliability of the study, i.e a replication of the study could yield different results (Lewis et al., 2009). A quantitive study is typically conducted using a larger set of observations with the purpose of making inferences to a broader population (Bryman, 2004). In contrast to qualitative methods, it is usually deductive in its nature in that it aims to reject or verify existing theories. Due to large quantities of data, analyses are commonly carried out through statistical sampling and procedures (Darmer & Freytag, 1995).

Insider trading is a sensitive topic in general which could complicate interviews. Insiders may be reluctant to participate and even if they do, they may not be completely honest in their answers. Personal emotions may steer the conversation in a certain directions and interviewees may be hesitant to admit to unlawful behavior if they have traded on private information. Considering the purpose of this thesis, coupled with the perceived complications with interviews, a quantitive approach is deemed more appropriate for this study. Since our ambition is to make inferences about a greater population than the ones covered by our observations, namely all insiders in the countries of interest, statistical models to estimate insiders' returns are regarded better suited for this purpose.

4.2 Data Description

Since the implementation of MAD in the early 2000s, corporate insiders in EU member countries are required to disclose all transactions they conduct in their own firms. While reporting standards have differed to some extent, as evident in table 1, all disclosures have been required to include basic information such as which type of security the transaction involved, the price of it as well as the day the transaction was carried out. Transactions are reported to either the stock exchange where the firm is listed or the financial supervisory authority in the country, before being made public (European Parliament and Council, 2003).

The data used for the quantitative analysis in this thesis is built on these disclosed transactions. The dataset was retrieved from Smart Insider (2019), a global provider of insider transaction data, which timely and consistently tracks insider transactions across world markets. Smart Insider itself collects its information directly from published transactions by financial authorities and stock exchanges, thus ensuring its reliability. However, there could still be potential sources of errors in the data, such as reporting errors by the issuer or the data provider. It should also be noted that the dataset only includes disclosed transactions. Thus, unreported insider trades are not accounted for. Relatives and other closely related persons to corporate insiders are also required to disclose their transactions, otherwise insiders could trade in their names to bypass authorities' reporting requirements. Therefore, the dataset includes transaction both by insiders and their closest dependents. Since it is likely that insiders are involved in these transactions as well, albeit not officially carrying out the trade, we have counted all these transactions as being carried out by the insider himself.

The original dataset included all insider transactions taking place in the eight countries of interest for the time period January 1st 2012 to December 31st 2018. These transactions covered stock awards, stock transfers, purchases and sales of stocks, option exercises, dividend reinvestments and subscriptions. Each transaction included detailed information about ISIN[4] number, industry classification, security description, in which country the transaction took place, insider's job title, transaction date, currency of transaction, daily exchange rates for each local currency to euros, price of the security and number of shares bought or sold. Additionally, each transaction carried a unique transaction ID to ensure that there are no duplicates in the dataset.

[4] International Securities Identification Number

Daily stock price data for all securities traded by insiders during the observation period were obtained from Datastream. Each security's unique ISIN was used to link the retrieved stock data from Datastream with the corresponding transaction. Moreover, we used Datastream to source daily data on the three month interbank rate for each country as well as daily closing prices on each country's MSCI Index. For member countries of the Eurozone (Germany, Italy, France and Greece) we used the Euro LIBOR three month interbank rate and for non-members (Denmark, Poland, Romania and Sweden) we used the local interbank rate for each country. Risk factors used in the Carhart four-factor model, which will be described in section 4.3.1, were obtained from the data library of AQR (2019), a global investment management firm. Daily data were available for six out of eight countries in the sample. As AQR had no data on risk factors for Poland and Romania, we sourced European factors from Kenneth R. French's (2019) database for these countries. Finally, annual market capitalization data for all firms in our sample were collected from Datastream.

The original dataset provided by Smart Insider included 102,171 insider transactions from the time period 2012–2018. After inspecting the data, we discovered that certain transactions were missing information on relevant variables, such as number of stocks traded or which type of transaction that was carried out. These data entries were removed from the dataset. Similar to previous studies, we limited our research to open-market purchase and sale transactions of shares and thus excluded option exercises, dividend reinvestments, subscriptions, stock awards and transfers. The rationale behind this was to only focus on transactions initiated by the insiders themselves, as these transactions are likely to convey more informational value. For instance, option exercises are a common part of executives' compensation schemes, and as these trades are not initiated by insiders themselves, we would not expect them to be based on private information.

Datastream did not have stock price data available on all firms in our sample. Since these were necessary to perform our analysis, we excluded all transactions where data were missing. After all exclusions, we were left with a dataset containing 70,799 transactions, which was used for our analysis. When testing for the impact of firm size, we used annual market capitalization data from Datastream. In the case data were not available in the database, we excluded those transactions from the analysis. As a result, there is a small discrepancy between the number of transactions in the full dataset and the number of transactions in that specific analysis. Furthermore, when testing for the impact of MAR, Poland and Romania have been excluded due to insufficient data on regulations prior to MAR. Thus, all transactions for these countries have been excluded for that analysis. A more detailed overview of our dataset and cleaning process is found in table 2.

Table 2. Data Cleaning Process

Type of Transaction	**Number of Transactions**
Insider transactions reported in Smart Insider dataset	102,171
Transactions with incomplete entries	–93
Type of transaction	
Option exercises	–11,789
Dividend reinvestments	–787
Transfers	–3,680
Stock awards	–2,242
Subscriptions	–12,155
Transactions with no stock price data	–626
Insider transactions in the final sample	**70,799**
Transactions missing market capitalisation data for firm size analysis	–857
Insider transactions in firm size analysis	**69,942**
Transactions in Romania and Poland excluded from MAR analysis	–12,516
Insider transactions in MAR analysis	**58,253**

Table 3 gives an overview of the number of transactions per country for the final sample. In total, 70,799 transactions were included in the final set, divided on 59.3% purchases and

40.7% sales. A majority of countries have more purchases than sales, with France and Denmark the only exceptions. Overall, there is a great dispersion between each country's total number of transactions, as well as differences between purchase and sale transactions. For example, Sweden, with the most transactions have more than six times as many transactions as Romania. Sweden has also registered more purchases than any other country, both in total and for each of the years 2013 to 2018. France has the most registered sales over the time period. The aggregated total number of transactions per year lies in the range 9,481 to 10,873 and is fairly stable for each consecutive year.

Table 3. Number of Transactions for Each Country

	Transaction Type	2012	2013	2014	2015	2016	2017	2018	**Total**
Denmark	Purchase	196	276	271	239	214	192	223	**1,611**
	Sale	54	261	642	608	676	432	315	**2,988**
France	Purchase	1,019	951	866	936	1,044	753	1,070	**6,639**
	Sale	775	855	976	1,120	1,050	1,351	759	**6,886**
Germany	Purchase	600	530	666	693	812	749	1,117	**5,167**
	Sale	338	373	305	287	198	316	202	**2,019**
Greece	Purchase	1,514	748	778	452	520	497	417	**4,926**
	Sale	481	736	423	169	241	226	220	**2,496**
Italy	Purchase	642	421	514	547	1,082	646	928	**4,780**
	Sale	336	616	531	524	376	665	303	**3,351**
Poland	Purchase	911	1,035	1,040	837	667	606	691	**5,787**
	Sale	532	930	655	528	496	466	237	**3,844**
Romania	Purchase	251	201	263	220	166	202	186	**1,489**
	Sale	164	199	258	210	216	231	118	**1,396**
Sweden	Purchase	1,072	1,030	1,268	1,335	1,724	2,379	2,789	**11,697**
	Sale	596	641	754	839	917	1,162	914	**5,823**
Total		**9,481**	**9,803**	**10,210**	**9,544**	**10,399**	**10,873**	**10,489**	**70,799**

Table 4 adds a more detailed view of the dataset with descriptive statistics of firms, insiders and transaction sizes across all countries. The number of firms and insiders in the sample is as expected correlated with the number of transactions in each country. France have the largest sale and purchase volumes, which accounts for close to half of the total transaction volume for all countries. In contrast, Romania's transaction volume accounts for as little as 0.1% of the total trade value for all countries. Furthermore, as indicated by mean and

median values, the dataset is heavily skewed. For all countries, the average transaction value is significantly larger than its corresponding median, which indicates that the set is characterized by large outliers.

Table 4. Descriptive Statistics of Data

	Number of firms	Number of insiders	Number of transactions	Total volume of purchases *(mEUR)*	Total volume of sales *(mEUR)*	Avg. volume per purchase transaction *(mEUR)*	Avg. volume per sale transaction *(mEUR)*	Median volume purchase transactions *(mEUR)*	Median volume sale transactions *(mEUR)*
Denmark	169	949	4,599	546.5	5,788.7	0.34	1.94	0.033	0.119
France	622	2,643	13,525	17,740.9	31,640.0	2.67	4.59	0.040	0.101
Germany	637	2,264	7,186	4,285.1	8,721.1	0.83	4.32	0.050	0.162
Greece	160	773	7,422	1,056.5	1,458.0	0.21	0.58	0.009	0.027
Italy	330	1,489	8,131	5,277.6	4,490.5	1.10	1.34	0.028	0.065
Poland	775	1,625	9,631	2,009.2	2,813.8	0.35	0.73	0.012	0.043
Romania	248	933	2,885	40.5	81.0	0.03	0.06	0.005	0.006
Sweden	809	5,939	17,420	7,103.9	5,762.5	0.61	0.99	0.016	0.046
Total	**3,724**	**16,527**	**70,799**	**38,060.1**	**60,755.6**	**0.91**	**2.11**	**0.020**	**0.065**

All transactions have been converted to euros using daily exchange rates provided by Smart Insider

4.3 Performance Evaluation

To answer the first research question, whether insiders earn abnormal returns when trading shares in their own firms, we followed the performance evaluation method proposed by Jeng et al. (2003). Several previous papers studying insider trading have applied the event study methodology outlined by MacKinley (1997), which calculates the cumulative average abnormal returns in the days following insider transactions. Despite its popularity, Jeng et al. (2003) point out that the approach has certain difficulties. First, it faces concerns of cross-sectional correlation across trades that could impede statistical inference when measuring abnormal returns. Second, event studies could be biased when they are used to test abnormal returns over longer time periods. Finally, while the approach is suitable when investigating the informativeness of insider trades for future firm performance, it is less useful when answering the question of abnormal returns earned by insiders. To overcome these problems, and to estimate the actual returns earned by insiders, Jeng et al. (2003)

proposed a performance-evaluation method. The approach is built on value-weighted portfolios mimicking insiders' trades. Since this approach accounts for the trading volume it better reflects insiders' returns as opposed to equally-weighted returns in event studies. Considering the purpose of our study, to investigate insiders' abnormal returns, coupled with the statistical difficulties related to event studies, Jeng et al's. (2003) approach betters serves the aim of this analysis.

The methodology is laid out as follows. All insider purchases on a given day are placed in a portfolio starting on the day the transaction takes place and are then held for a specified period of time. As more insiders purchase stocks, those stocks are added to the mimicking portfolio. For each day, the returns of all stocks in the portfolio are calculated and weighted based on their values. When a stock has been held for the specified holding period, it is dropped from the portfolio and no longer affects the return. For example, if the holding period is 20 trading days, the purchase portfolio will include all stocks purchased by insiders in a country over the previous 20 days. Thus, each day the return of the stock is weighted relative to all other stocks currently in the portfolio. If a portfolio does not contain any stocks on a given day, the return of the portfolio is set to zero. This happens occasionally for countries with fewer transactions. In a similar way, a sale portfolio is created containing all stocks sold by insiders. The sale portfolios can be interpreted as a portfolio that is short all insider trades. In other words, the performance evaluation approach can be resembled to a mutual fund that is managed by all insiders combined.

Due to data limitations it is impossible to know exactly how long insiders hold their stocks. This is because disclosing requirements only apply once a person becomes an insider. Thus, we do not have any information about trades taking place before an insider reaches this position, or about transactions taking place once a person ceases to be an insider. To overcome this concern, Jeng et al. (2003) use a holding period of 6 months as a proxy for the

actual period of time insiders hold their shares. This is motivated by the fact that insiders in the US are not allowed to keep any profits from their trades if the transaction is reversed within 6 months. Those restrictions do not apply in the EU countries in our sample (Gebka et al., 2017). Thus, we have extended our analysis to investigate the abnormal returns gained from holding periods of 20, 60 and 120 trading days, which approximately corresponds to 1, 3 and 6 months, respectively.

To exemplify our methodology, let us assume we want to measure the performance of the purchase portfolio in a country for a holding period of 20 trading days. On the first day, an insider in Company A purchases 100 shares at a price[5] of EUR 100 and another insider in Company B purchases 100 shares at a price of EUR 50. No other purchases are registered on that day. On the second day, the price of Company A's stock has increased to EUR 110 whereas Company B's stock price is unchanged. The portfolio return for day two is then calculated as:

Company A				**Company B**			
Weight:	100 shares x €100	=	€10,000	*Weight:*	100 shares x €50	=	€5,000
	€10,000 / €15,000	=	66.7%		€5,000 / €15,000	=	33.3%
Return:	(110 – 100) / 100	=	10%	*Return:*	(50 – 50) / 50	=	0%

Return portfolio day 2*:* 66.7% x 10% + 33.3% x 0% = 6.67%

On day number three, the price of Company A's stock increases to EUR 115 and Company B's stock increases to EUR 55. No other stocks are purchased by insiders that day. The portfolio return for day three is then calculated as:

[5] All prices are based on the stock's closing price for a given day

Company A				**Company B**			
Weight:	100 shares x €110	=	€11,000	*Weight:*	100 shares x €50	=	€5,000
	€11,000 / €16,000	=	68.75%		€5,000 / €16,000	=	31.25%
Return:	(115 – 110) / 110	=	4.5%	*Return:*	(55 – 50) / 50	=	10%

Return portfolio day 3*:* 68.75% x 4.5% + 31.25% x 10% = 6.22%

The weight is based on the day the transaction takes place and is then multiplied with the return the subsequent day. When a stock has been held for 20 trading days, it will be dropped from the portfolio. That means Stock A and Stock B will leave the portfolio after day 21. In other words, we have a rolling portfolio that for each day will contain all the stocks traded in the previous 20 trading days.

For the portfolios using other holding periods, the approach is the same with the exception that the shares are held for 60 and 120 trading days.

4.3.1 Estimation Models for Abnormal Returns

To benchmark the daily returns obtained from our mimicking portfolios against the market portfolio and thereby evaluate insiders' abnormal returns, we performed OLS regressions using two risk-adjusting models. Following Jeng et al. (2003) we employed the Capital Asset Pricing Model (CAPM) and the Carhart four-factor model for this purpose. The former is considered the creation of asset pricing theory and was developed by Sharpe (1964) and Lintner (1965). It displays the relationship between asset prices and risk and is an extension and simplification from Markowitz's (1952) work on portfolio selection. It has since its inception been a common feature in academic literature due to its relatively easy interpretation. In short, the model base expected returns for a given asset on its covariance with the market portfolio and the risk-free return. Thus, abnormal return is the difference

between the expected and the realized return for a given portfolio. Formally, the CAPM model looks as follows:

$$R_{pt,i} - R_{ft,i} = \alpha_i + \beta_{1,i} RMRF_{t,i} + \varepsilon_{t,i} \quad (1)$$

where $R_{pt,i}$ is the return on insider portfolio i for day t and $R_{ft,i}$ is the risk-free return[6] for country i on day t. The daily three-month interbank interest rate has been used for each country as a proxy for the risk-free return. For countries within the Eurozone – France, Germany, Greece and Italy – the Euro LIBOR three-month interbank rate has been used and for countries not part of the Eurozone – Denmark, Poland, Romania and Sweden – we have used each country's local three-month interbank rate. Three-month interbank rates are commonly used as risk-free returns when pricing financial derivatives and thus serves as a suitable proxy in our analysis (Linderstrøm, 2013).

The main variable of interest for this study is α_i which indicates risk-adjusted abnormal returns earned on insider portfolio i, expressed on a daily basis. In other words, this is what insiders earn in addition to the expected return of the portfolio, based on the portfolio's covariance with the market. $RMRF_{t,i}$ is the market portfolio return minus the risk-free return for portfolio i on day t. The value-weighted MSCI Index for each country have been used as a proxy for the market portfolio in each country. MSCI (2019) constructs indices in a similar way for all markets, which makes them comparable across different regions. Thus, $\beta_{1,i}$ is the systematic risk for portfolio i, indicating the portfolios volatility in relation to the market portfolios' excess return (market portfolio return minus the risk-free return). The $\varepsilon_{i,t}$ is the error term for the OLS regression.

[6] Daily interest rates from Datastream are expressed on an annual basis. We have therefore converted these to daily rates based on the assumption that a year has 252 trading days.

Several scholars have pointed out the flaws with CAPM. The original concerns were related to its unrealistic assumptions, such as eliminated taxes and transaction costs and no restrictions on borrowing and short selling (Mullins, 1982). In addition, Fama and French (1996) argued that CAPM fails to capture certain risk-factors that could explain some of the variance in returns. Nevertheless, the model is still vividly used both by academics and practitioners in financial analyses, and is therefore motivated to include as an estimation model in this thesis. Additionally, applying CAPM allows for better comparisons with previous studies, as it is commonly used when studying insider returns.

To test the robustness of our results and to complement CAPM, we have included Carhart's (1997) four-factor model as an additional risk-adjusting estimation model. The model is an extension from Fama-French's (1993) three-factor model, which besides the size of companies and their book-to-market ratio, also includes a momentum factor. The rationale for Fama and French to include two additional risk factors in the original CAPM model was the finding that small firms tend to outperform large firms while value stocks tend to outperform growth stocks. In addition, Carhart found that some of the variation in returns could also be explained by the lagged performance of stocks. Formally, the Carhart four-factor model looks as follows:

$$R_{pt,i} - R_{ft,i} = \alpha_i + \beta_{1,i} RMRF_{t,i} + \beta_{2,i} SMB_{t,i} + \beta_{3,i} HML_{t,i} + \beta_{4,i} MOM_{t,i} + \varepsilon_{t,i} \qquad (2)$$

$R_{pt,i}$, $R_{ft,i}$, α_i, $RMRF_{t,i}$ and $\varepsilon_{i,t}$ are defined as in equation 1.

$SMB_{i,t}$ is an abbreviation for small minus big and is incorporated in the model to take into account the expected additional return investors can retain from holding stocks in small-sized companies. Size is based on market capitalization and a positive (negative) $SMB_{t,i}$

indicates that small firms outperformed (underperformed) larger firms in a given market i on day t.[7]

$HML_{t,i}$ stands for high minus low and is included in the model to take into account differences in expected return for value stocks and growth stocks. It has been shown that firms with a high book-to-market ratio, i.e value stocks, tend to outperform firms with a low book-to-market ratio, also called growth stocks. A positive (negative) $HML_{t,i}$ shows that high book-to-value companies outperformed (underperformed) low book-to-value companies in a given market i on day t.

$MOM_{i,t}$ is a shortening for momentum and is included to capture the tendency for well-performing stocks to continue doing well and vice versa. It takes into account the differences in returns between the best and worst performing stocks in a given market i on day t. A positive (negative) value of the factor indicates that previously high-performing stocks generated larger (smaller) returns compared to previously low-performing stocks for a given day.

As previously mentioned, for six of the countries in the sample, country-specific risk factors were retrieved from AQR (2019). As no data were available for Poland and Romania, we collected European factors on aggregated data from Kenneth R. French's (2019) database to analyze returns in these countries. As a result, these factors do not fully track the market movements in Poland and Romania, but instead use Europe as a whole as a proxy.

4.4 Determinants of Insiders' Abnormal Returns

To answer our second research question, namely whether certain insider groups perform better than others, we followed the performance evaluation methodology laid out by Jeng et al. (2003). In addition to analyzing insiders' position within the firm, firm size and

[7] For a detailed overview of how the portfolios are constructed, see French (2019) and AQR (2019).

transaction size as done by Jeng et al. (2003), we also investigated industry type and the effect of MAR. For all of the analyses in this section we limited the holding period to a long-term portfolio of 120 trading days.

4.4.1 Insiders' Position Within the Firm

Our first analysis is related to insiders' position within the firm and how this is linked to abnormal returns. Previous studies on the topic have discussed the implications of insiders' position within the firm, ranging from geographic location to how close they are to the firm's operations. Several scholars have proposed an information hierarchy among insiders and there seems to be a general notion about insiders at the top of organizations being the ones that possess the most valuable private information (Seyhun, 1986; Lin & Howe, 1990). If this were to be true, we would expect insiders higher up in the hierarchy to outperform both the market and their peers when trading their own company's stock.

Based on the original dataset provided by Smart Insider, we created three different insider groups: *Directors, Officers and Top Executives,* for both purchase and sale transactions. This categorization follows Jeng et al. (2003), who suggest that top executives are highest up in the hierarchy, followed by officers and then directors.

We categorized employees in managing roles, including chief executive officers, chief financial officers and presidents, as top executives. All corporate officers who are not top executives were classified as officers and members of the supervisory board, advisory board and former board members were grouped as directors.

Insiders serving on multiple positions were categorized in a hierarchical order with top executives being the highest level and directors the lowest. For instance, if an insider is both CEO and chairman of the board, he was categorized as top executive rather than

director. By using this categorization no insider groups overlapped and we covered the whole sample.

DIRECTORS	**OFFICERS**	**TOP EXECUTIVES**
Members of the board, supervisory board and former board members	Corporate officers who are not top executives	Top management including CEOs, CFOs, and Presidents
Transactions: 31,086	*Transactions:* 18,724	*Transactions:* 20,989

To calculate daily returns, we started by constructing purchase and sale portfolios for each insider group and country and continued by employing the performance evaluation method described in section 4.3. Abnormal returns were estimated in CAPM (equation 1) and the Carhart four-factor model (equation 2), using daily returns from each portfolio as well as from the corresponding market portfolio. In line with Jeng et al. (2003), we estimated each model using seemingly unrelated regressions (SUR). The model was proposed by Zellner (1962) and is used to estimate dependent variables across multiple equations. It is suggested to be a more efficient method of estimating multiple regressions than performing each equation separately. Since we are performing three regressions, one for each group, SUR is a preferable approach. SUR also provides covariance estimates necessary to test for differences in the coefficients, in our case alpha. To this end, we performed Wald[8] tests to evaluate significant differences in the magnitude of abnormal returns between different groups of insiders. When testing for differences in the coefficients, we needed to perform three tests as each group must be tested against the other two groups, separately. If no adjustment is made to the p-values, the probability of committing an error increases for each test. To correct for this, we used Bonferroni[9] correction to adjust for inflated p-values. The method divides the significance level by the number of test hypotheses and thereby

[8] See for example Gudicha et al. (2017) for a description of the Wald test

[9] See for example Shaffer (1995) for a description of the Bonferroni correction

reduces the probability of committing a type 1 error. That is, supporting the alternative hypothesis that abnormal returns differ between the groups, when they in fact do not (Hae-Young, 2015).

4.4.2 Transaction Size

Academics have proposed that the size of transactions is an important determinant of insiders' abnormal returns. Some scholars have argued that large transactions should perform better since insiders would not make sizable trades unless they were confident in their investments (Jeng et al., 2003). Others have suggested that insiders trading on private information divide their trades into smaller transactions to avoid attention from regulatory authorities (Kyle, 1985; Barclay & Warner, 1993). All in all, since it is commonly agreed that size matters, it is of interest to test this factor on our sample countries.

To test whether size has an impact on insiders' abnormal return, we separately divided our purchase and sale transactions into three groups based on the absolute value of the transactions. This was calculated as the price of the stock multiplied with the number of shares purchased or sold. To form groups for insider purchases, we ranked all purchase transactions in order based on transaction size and then divided the set into thirds. The smallest third were categorized as *Small,* the next third as *Medium* and the largest third were categorized as *Large*. In a similar way, we constructed three groups for the sale transactions. This gave us a total of six groups, three for purchases and three for sales.

Different studies have employed various measures of transaction size when estimating its impact on returns. Common examples include the absolute value of the trade, number of shares and transaction value relative to firm size. Since stock prices differ significantly in our sample, it would not make sense to categorize simply by the number of shares traded.

Two transactions with the same value could essentially be grouped differently if one insider bought large quantities of cheap shares and the other bought few but expensive stocks in his firm. Using this categorization would imply that the number of shares traded is more important for investors than the actual transaction value, which seems rather unlikely. Jeng et al. (2003) used transaction size relative to firm size in their study, which arguably would have been a reasonable measurement. However, in our sample there is only very small differences in these proportions for a majority of the transactions. Thus, we would end up with two groups with practically the same relative transaction size, which could be problematic for our analysis. The distribution for the absolute transaction value is much wider, which provides more distinct differences between the groups. Based on this, we suggest that the absolute transaction value is a more appropriate measure for this dataset.

Similar to previous sections, we constructed portfolios following the performance evaluation method to calculate daily returns. We then estimated abnormal returns in CAPM (equation 1) and the Carhart four-factor model (equation 2), using daily returns from each portfolio as well as from the corresponding market portfolio. Furthermore, we used SUR to estimate parameters for each model and then performed Wald tests with Bonferroni corrections on the coefficients to determine any significant differences in abnormal returns between the groups.

4.4.3 Firm Size

The size of firms, in which insider trading take place, is argued to have an impact on insiders' abnormal returns. In general, larger companies are closer scrutinized by media and analysts and thus the flow of information to outsiders is better than for small firms with less coverage. It has therefore been argued that smaller firms are characterized by greater information asymmetries between inside and outside investors (Seyhun, 1986; Jeng

et al., 2003). Based on this argument, we would assume that insiders in smaller firms outperform insiders in larger firms when trading shares in their own firms.

To test this, we divided purchase and sale transactions separately into three groups for each country depending on firm size: *Small, Medium* and *Large,* each containing a third of the total number of transactions. To create the groups, we used annual data on firms' market capitalization from Datastream, collected the 1st of January each year. We then paired all purchase and sale transactions for the full sample period with the corresponding market value for each firm, depending on the year the transaction took place. For example, if a transaction took place on the 15th of June 2015, the firm's market value was based on data from January 1st 2015. This way all transactions were given a firm size based on the market capitalization for the corresponding year. Next, we ranked all purchase transactions for the whole sample period based on firm size and categorized the largest third as large, the next third as medium and the smallest third as small. The procedure was then replicated for all sale transactions. This gave us a total of six groups, three for purchases and three for sales, which combined made up all transactions in a given country. As a result of this categorization, the same firm could be included in more than one size group if its market value changed substantially over the sample period.

When categorizing the size groups, daily data on market capitalization would have been a more precise measure. However, based on the size of the dataset and the number of countries analyzed, we chose to simplify the grouping. While this could potentially affect the categorization of firms with market values close to the cutoff points, we do not expect that this will have any major impact on our overall results. It would seem unlikely that the volatility of firms' market capitalization from year to year would be large enough to impact the categorization in any substantial way.

For each group, we constructed portfolios following the performance evaluation method to calculate daily returns. Abnormal returns were estimated in CAPM (equation 1) and the Carhart four-factor model (equation 2), using daily returns from each portfolio as well as from the corresponding market portfolio. The models were estimated using SUR and we then performed Wald tests with Bonferroni corrections on the p-values, as described in section 4.4.1, to determine whether we could find any significant differences in abnormal returns between the groups.

4.4.4 Industry Type

Previous research studying industry effects on insider trading have primarily done so based on the argument that certain industries have greater information asymmetries than others. When the information asymmetry is large, insiders have more advantage of their information and should thus, according to theory, be able to generate greater profits when trading shares in their own firms. Aboody and Lev (2000) argued that R&D investment is a good proxy for information asymmetries and that R&D spending typically is concentrated in healthcare and technology firms.

While Aboody and Lev (2000) built their study based on reported R&D spending, we were not been able to access similar data on our sample countries. Instead, we simplified the approach by dividing the sample into two categories, *R&D Intensive* and *Others*, based on firms' industry classification. The dataset provided by Smart Insider contain Industry Classification Benchmark (ICB)[10] for all insider transactions, which classifies firms into industry categories. Based on Aboody and Lev's (2000) argument, we grouped all firms classified within healthcare and technology as R&D intensive and the remaining firms as others. This gave us four groups, two for purchase transactions and two for sale transactions.

[10] ICB is an industry classification taxonomy provided by FTSE International

In line with previous sections, we constructed portfolios following the performance evaluation method to calculate daily returns. We then estimated abnormal returns in CAPM (equation 1) and the Carhart four-factor model (equation 2), using daily returns from each portfolio as well as from the corresponding market portfolio. Furthermore, we used SUR to estimate parameters for each model and then performed Wald tests on the coefficients to determine any significant differences in abnormal returns between the groups. In contrast to previous sections, no Bonferroni correction was necessary in this case, since only two groups were tested against each other. Thus, we did not have to adjust for inflated p-values.

4.4.5 Effect of the Market Abuse Regulation

In the EU there are multiple countries with different legal systems and origin. Considering MAD could be implemented according to each country's interpretation of the directive, laws on insider trading shifted depending on where in the EU one looked. With MAR, which came into force the 3rd of July 2016, stricter and more unified regulations across the EU were introduced. As evident by table 1 in section 2.3, formal requirements imposed by the regulation affected countries differently. If these changes have had any effect on insiders' returns, and under the assumption that stricter regulations could hamper insiders' profitability, we would expect MAR to have the largest impact on countries with softer requirements prior to MAR, such as Germany and Greece. However, MAR has not only imposed stricter formal requirements but also empowered financial authorities in their pursuit to fight illegal activities related to insider trading. Thus, we hypothesize that MAR also could have had an impact on abnormal returns in countries that already had strict formal requirements in place prior to MAR.

To test the claims above, and to answer our third research question, we separately constructed purchase and sale portfolios for each country. We then calculated daily returns using the performance evaluation method outlined in section 4.3. In line with Gebka et al.

(2017), who analyzed the effect of MAD, we added a dummy variable to the returns, which took a value of 1 for all portfolio returns obtained after the introduction of MAR, and 0 otherwise. To estimate abnormal returns and the effect of MAR, we used OLS regression on CAPM and the Carhart four-factor model. Formally, our regression model for CAPM looks as follows:

$$R_{pt,i} - R_{ft,i} = \alpha_i + \beta_{1,i} RMRF_{t,i} + \beta_{2,i} MAR_{t,i} + \varepsilon_{t,i} \tag{3}$$

$R_{pt,i}$, $R_{ft,i}$, α_i, $RMRF_{t,i}$ and $\varepsilon_{i,t}$ are defined as in equation 1. $MAR_{t,i}$ is the dummy variable added to the equation, where a negative (positive) value on $\beta_{2,i}$ would indicate that insider purchases (sales) in country i earn lower returns post-MAR. More specifically, a significant coefficient is interpreted as a parallel shift in abnormal returns.

Similarly, our regression model for the Carhart four-factor model is described below.

$$R_{pt,i} - R_{ft,i} = \alpha_i + \beta_{1,i} RMRF_{t,i} + \beta_{2,i} SMB_{t,i} + \beta_{3,i} HML_{t,i} + \beta_{4,i} MOM_{t,i} + \beta_{5,i} MAR_{t,i} + \varepsilon_{t,i} \tag{4}$$

$SMB_{t,i}$, $HML_{t,i}$ and $MOM_{t,i}$ are defined as in equation 2. The interpretation of $MAR_{t,i}$ is similar to equation 3.

Romania and Poland were excluded from this section, as we could not find sufficient information on regulations in these countries prior to MAR. Thus, interpreting the dummy variable and relating the results to differences in regulations prior to and after MAR would have been difficult.

5. Results

This section will present the results from our analyses and will thus serve as the foundation when answering our three research questions. In the first section, we look at whether insiders earn abnormal returns when trading shares in their own firms. Then, we will present the results for our chosen determinants to see if they have any affect on abnormal returns. The section will conclude by analyzing the impact of MAR.

Each section will start by giving an exploration of relevant descriptive statistics. The purpose for this is to outline the distribution of variables for the different portfolios, with the ambition of giving the reader insights into the data when interpreting the results.

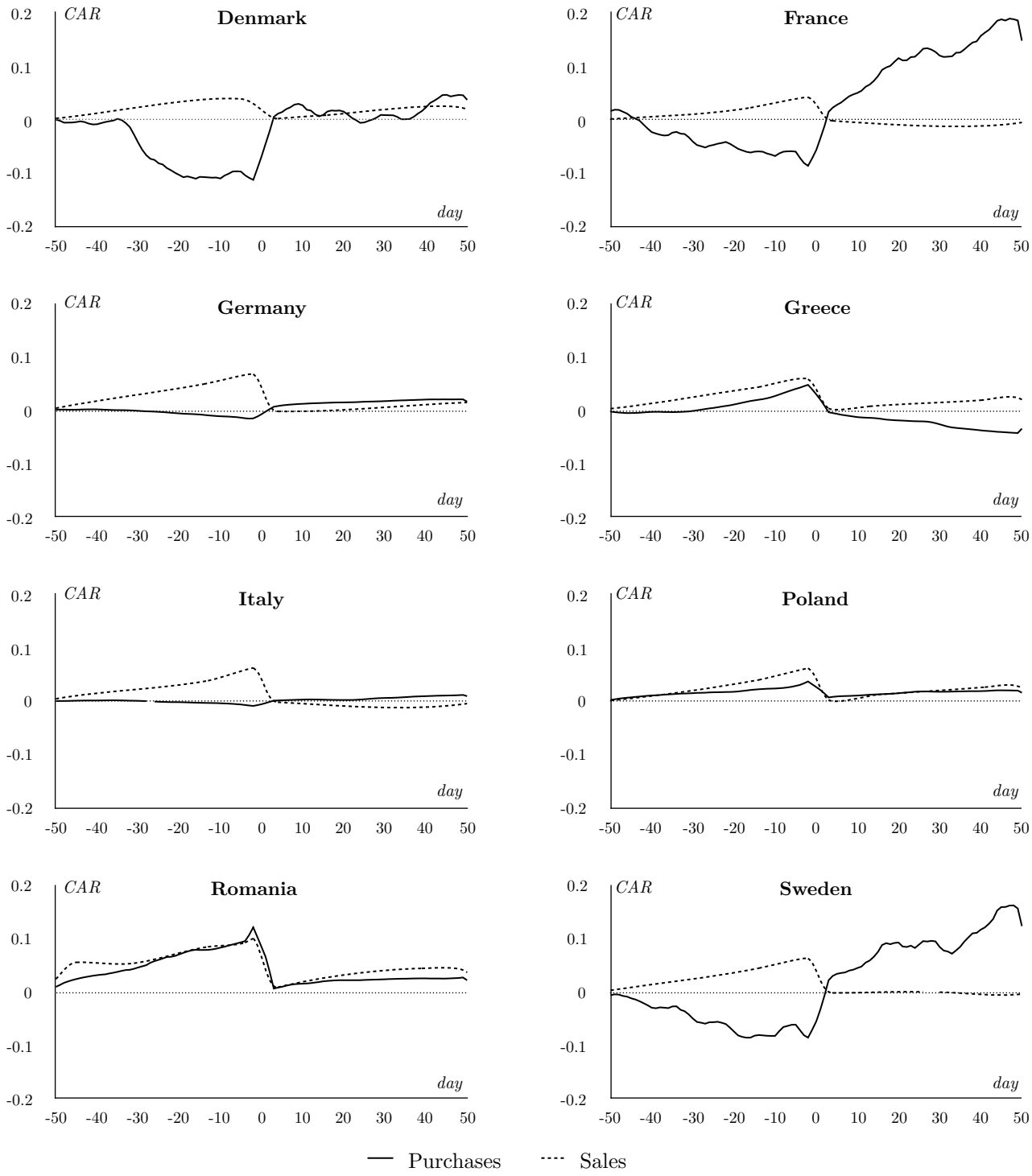
5.1 Abnormal Returns

Earlier studies have suggested that insiders are timing the market well, meaning that they purchase stocks when the price is low and sell stocks when the price is high (Seyhun, 1986). To analyze whether this is the case, we have calculated cumulative abnormal returns (CARs) around the transaction date for all purchases and sales in each country. For each transaction we have calculated the abnormal return, here defined as the stock-return minus the corresponding MSCI Index[11], for all days from 50 days before the transaction date to 50 days after. The CAR for day $-t$ is the sum of all abnormal returns from day –50 to $-t$ and the CAR for day t is the sum of all abnormal returns from the transaction date (day 0) to day t. These CARs are then averaged across all purchases and sales in a country and displayed in figure 2[12].

[11] Definition of abnormal return from Jeng et al. (2003).

[12] It should be noted that the graphs only provides a crude measure of abnormal returns and is included to give an indication of insiders' market timing.

Figure 1. Cumulative Abnormal Returns Before and After Insiders' Transactions



The diagrams show insiders' average cumulative abnormal return (CAR) around the date of the transaction (day 0). Daily abnormal returns are here defined as the stock-return minus the corresponding MSCI Index for each country. The CAR for day $-t$ is the sum of the daily abnormal returns from day –50 to day $-t$ and the CAR for day t is the sum of daily abnormal returns from day 0 to day t. CARs are then averaged across all purchases and sales to produce the graphs.

In all countries, we observe positive CARs in the 50 days leading up to a sale transaction, indicating that insiders sell their stocks after periods of upswings. In France, Germany, Italy and Sweden, CARs are close to zero or negative in the days following a transaction, implying that insiders indeed are market timers when they sell their shares. In the remaining countries, CARs continue to be positive, albeit at a lower level. Thus, insiders might have benefitted from holding on to the stocks for longer. The purchase transactions are more ambiguous. Insiders in France and Sweden appear to time their purchases. Transactions are preceded by negative CARs and followed by positive returns in the 50 days following a trade. However, in the remaining countries the pattern is less clear.

Table 5. Abnormal Returns – Purchase Portfolios

	CAPM			**Carhart four-factor**		
	20 days	60 days	120 days	20 days	60 days	120 days
Denmark	0.00050 (1.57)	0.00035 (1.34)	0.00043 (1.88)	0.00052 (1.73)	0.00032 (1.24)	0.00040 (1.75)
France	0.00062****** (2.02)	0.00071****** (2.84)	0.00057****** (2.62)	0.00059***** (1.98)	0.00071****** (2.88)	0.00054***** (2.56)
Germany	0.00067***** (2.15)	0.00027 (1.23)	0.00028 (1.43)	0.00063***** (2.03)	0.00021 (0.93)	0.00021 (1.08)
Greece	–0.00039 (–0.25)	–0.00073 (–0.65)	–0.00068 (–0.60)	–0.00031 (–0.28)	–0.00070 (–0.62)	–0.00065 (–0.57)
Italy	0.00021 (0.66)	0.00010 (0.30)	0.00008 (0.25)	0.00021 (0.64)	0.00016 (0.48)	0.00019 (0.57)
Poland	0.00063 (1.72)	–0.00022 (–0.64)	–0.00018 (–0.45)	0.00064 (1.74)	–0.00021 (–0.62)	–0.00016 (–0.41)
Romania	0.01244 (1.39)	0.00710 (1.64)	0.00580 (1.75)	0.01153 (1.28)	0.00670 (1.54)	0.00549 (1.65)
Sweden	0.00022 (0.51)	–0.00014 (–0.37)	0.00010 (0.22)	0.00023 (0.53)	–0.00013 (–0.34)	0.00009 (0.20)
Mean	0.00186	0.00093	0.00080	0.00176	0.00088	0.00076
Median	0.00056	0.00019	0.00019	0.00056	0.00019	0.00020

The table presents results from the performance evaluation method for the insider purchase portfolios, for the time period 2012–2018. The performance is measured as α from the CAPM model (Equation 1) and the Carhart four–factor model (Equation 2) for holding periods of 20, 60 and 120 trading days. The symbols * and ** indicate two–tail significance at the 5% and 1% levels, respectively. T–statistics are presented in the parentheses. Mean and median values are calculated based on the results for all countries' alphas. For a full representation of the regression output, see appendix.

Table 5 displays abnormal returns, measured by alpha, for the purchase portfolios for each holding period and country in the sample period 2012–2018. As presented in the table, we

find evidence of profitable insider trading in two countries, France and Germany. In France, alphas are statistically significant for all holding periods, with excessive daily returns ranging between 0.054%–0.071%, depending on holding period and model. This corresponds to annual abnormal returns of 14.63%–19.55%[13], indicating that the returns are of economic relevance. In Germany, alpha is significant only for the shortest holding period of 20 trading days, with point estimates of 0.067% and 0.063% for CAPM and the Carhart four-factor model, respectively. Translating this to an annual basis gives insiders in Germany an abnormal return of 17.11%–18.30%. We find no evidence of any abnormal returns in any of the six remaining countries in the sample.

The overall tendency in mean and median suggests that most of the abnormal returns are earned within the first 20 trading days. For holding periods longer than this, the abnormal returns still seem to be positive but smaller. The median indicates a threefold decline in abnormal returns between the shorter and the two longer holding periods. In other words, most of insiders' abnormal returns seem to be earned within the first month, which could indicate that insiders have a greater informational advantage in the short-term. While Germany seems to follow this trend, abnormal returns in France appear to be more persistent. For insiders in France, abnormal returns are only reduced by 0.5 basis points when the holding period is increased from 20 to 120 trading days.

The portfolios mimicking sale transactions give a somewhat similar picture as the purchase portfolios. Results are presented in table 6 and show statistically significant alphas in two countries, Germany and Poland. For Germany, we find significant alphas for one holding period, the longest, and the result is robust across both models. The alphas are negative with point estimates of –0.123% and –0.144%, which corresponds to –36.45% and –43.82% on an annual basis. The negative values represent what insiders would have lost, relative to

[13] The conversion is based on the assumption that a year has 252 trading days. The same formula for converting returns from daily to annual basis has been used throughout the result section.

the market, if they would have kept their stocks for an additional six months. In other words, German insiders on average sell their shares prior to stock declines and thus avoid subsequent losses. For Poland, we find statistically significant alphas across all holding periods and models, with abnormal returns ranging from 0.020% to 0.098% (5.12%–28.03% annualized). Unexpectedly, the alphas are positive rather than negative, indicating that insiders in Poland would be better off holding on to the stock for a longer period of time. We find no evidence of abnormal returns for the remaining countries.

While the purchase portfolios indicated that insiders perform better in the short-term, we do not find the same pattern for the sale portfolios. Instead both mean and median are dispersed across models and holding periods which makes it difficult to generalize any trends.

Table 6. Abnormal Returns – Sale Portfolios

	CAPM			**Carhart four–factor**		
	20 days	60 days	120 days	20 days	60 days	120 days
Denmark	0.00017 (0.50)	0.00020 (0.50)	0.00031 (1.14)	0.00019 (0.56)	0.00019 (0.66)	0.00031 (1.15)
France	0.00019 (0.87)	0.00016 (0.37)	0.00009 (0.59)	0.00007 (0.32)	0.00002 (0.12)	–0.00006 –0.38)
Germany	–0.00088 (–1.36)	0.00025 (0.36)	–0.00123***** (–2.23)	–0.00108 (–1.68)	–0.00004 (–0.06)	–0.00144****** (–2.62)
Greece	0.00020 (0.18)	–0.00045 (–0.40)	–0.00210 (–0.56)	0.00027 (0.81)	–0.00035 (–0.32)	–0.00220 (–0.59)
Italy	–0.00069 (–1.79)	–0.00031 (–0.73)	–0.00099 (–1.54)	–0.00074 (–1.92)	–0.00040 (–0.95)	–0.00103 (–1.60)
Poland	0.00020****** (2.63)	0.00083****** (2.65)	0.00097****** (2.09)	0.00012****** (2.63)	0.00085****** (2.73)	0.00098****** (2.11)
Romania	0.00069 (1.28)	0.00048 (0.90)	0.00002 (0.05)	0.00065 (1.20)	0.00049 (0.91)	–0.00000 (–0.01)
Sweden	–0.00047 (–1.21)	–0.00009 (–0.34)	–0.00019 (–0.96)	–0.00048 (–1.22)	–0.00016 (–0.59)	–0.00026 (–1.31)
Mean	–0.00007	0.00013	–0.00039	–0.00013	0.00008	–0.00046
Median	0.00018	0.00018	–0.00009	0.00010	–0.00001	–0.00016

The table presents results from the performance evaluation method for the insider sale portfolios, for the time period 2012–2018. The performance is measured as α from the CAPM model (Equation 1) and the Carhart four–factor model (Equation 2) for holding periods of 20, 60 and 120 trading days. The symbols * and ** indicate two–tail significance at the 5% and 1% levels, respectively. T–statistics are presented in the parentheses. Mean and median values are calculated based on the results for all countries' alphas. For a full representation of the regression output, see appendix.

Most of the studies on insider trading have been carried out on the US market and it is therefore a valid starting point to contrast our results to these findings. The majority of these studies have concluded that insiders do earn abnormal returns when trading shares in their own firm (see Jaffe, 1974; Finnerty, 1976; Seyhun, 1986; Lakonishok & Lee, 2001, amongst others). Since different studies have used different methodologies, our results are best put in relation to research using the same approach. As previously discussed, our rolling purchase and sale portfolios closely follow Jeng et al. (2003), who found that for a 6 month holding period, insiders in the US earn abnormal returns for purchases when estimating these using CAPM and the Carhart four-factor model. In contrast, only insiders in France earn abnormal returns for a comparable holding period in our analysis. Interestingly, while Jeng et al. (2003) found that returns decreased significantly after the first month, we do not see the same pattern in France. Our estimates suggest that insiders in France earn similar abnormal returns as in the US in the month following a transaction. However, when the holding period increases to six months, insiders in France earn between 4.5%–11.3% more on an annual basis. This could imply that insiders in France trade on information that is relevant not only in the short-term, but also have an impact for events in the long-term. These findings are in line with Jaffe (1974) and Rozeff and Zaman (1988) who proposed that insiders perform better on longer time horizons. Worth noticing is that while France stands out in the sample, the overall trend, as suggested by mean and median alpha values, is similar to Jeng et al.'s findings (2003).

The results for our sale portfolios are analogous to those of Jeng et al. (2003), with the exception of Germany, where we find that insiders earn economically significant returns for the longest holding period. The result is interesting, as it indicates that the value of their information only is relevant in the long-term, compared to the purchasing portfolios, where we only found abnormal returns in the short-term. Thus, it appears that insiders' trading pattern differ depending on what type of transaction they are carrying out.

Apart from Germany, the sale portfolios do not indicate any consistent abnormal returns earned by insiders. It has been argued that the low informational value from sales can be explained by the fact that the motives behind purchases and sales are not necessarily the same. When insiders purchase shares in their own firms, they primarily do so with the purpose of making money. For sales transactions, on the other hand, there may be other motives than the belief that the stock is overvalued, including liquidity needs and diversification purposes (Friederich et al. 2002; Jeng et al. 2003; Fidrmuc et al. 2013). Based on this, it could be argued that sale transactions to a lesser extent are based on private information, which could be one explanation for the results of the sale portfolios.

Turning to Europe, our findings are in line with earlier studies based on European data, where both Gebka et al. (2017) and Dardas and Güttler (2011) found that insiders in only a few countries earn abnormal returns. For the markets where we do find statistically significant alphas, Germany and France, our study is supported by previous research. Dymke and Walter (2008), Aussenegg and Ranzi (2008) and Dardas and Güttler (2011) all found that German insiders outperformed the market in the 20 days subsequent a purchase transaction. For France, Dardas and Güttler (2011) and Gebka et al. (2017) reported significant alphas for a 20 day holding period, but none of the studies found any abnormal returns for holding periods longer than this. Similarly, Fidrmuc et al. (2013) found no proof of insiders making excessive profits in France in their analysis. Thus, our findings add to the existing research on insider trading in France by suggesting that insiders gain abnormal returns following purchases, not only for short holding periods but also for periods covering 60 and 120 trading days.

Altogether, the overall low profitability of insider trading in our sample compared to previous studies, as well as large differences between the eight countries in the sample,

suggest that country-level factors can have a large effect on the trading performance of corporate insiders.

5.2 Position Within the Firm

Table 7 provides descriptive statistics for the purchase and sale portfolios divided into three groups depending on insiders' position within the firm. The categorization is described in more detail in section 4.4.1.

Table 7. Descriptive Statistics – Position Within the Firm

	Directors			**Officers**			**Top Executives**		
(All transactions in million euros)*	Number of transactions	Total transaction value	Avg. transaction value	Number of transactions	Total transaction value	Avg. transaction value	Number of transactions	Total transaction value	Avg. transaction value
Purchase Portfolios									
Denmark	1,035	471.9	0.46	241	25.6	0.11	333	48.8	0.15
France	3,712	13,642.6	3.68	535	203.3	0.38	2,392	3,895.0	1.63
Germany	2,339	3,319.2	1.42	931	322.0	0.35	1,895	643.6	0.40
Greece	931	456.4	0.49	930	116.8	0.13	3,065	483.2	0.16
Italy	2,286	2,129.6	0.93	653	267.5	0.41	1,794	2,085.6	1.16
Poland	3,333	1,593.1	0.48	311	28.6	0.09	2,142	387.4	0.18
Romania	243	7.9	0.03	1 064	28.6	0.03	182	4.0	0.02
Sweden	4,787	6,413.5	1.34	4 988	320.6	0.06	1,808	366.4	0.20
All countries	18,666	28,034.2	1.50	9 653	1,313	0.14	13,611	7,914	0.58
Sale Portfolios									
Denmark	1,845	4,882.6	2.65	397	654.9	1.65	746	251.2	0.34
France	3,137	26,333.5	8.39	1,522	1,551.2	1.02	2 227	3,755.3	1.69
Germany	956	5,711.0	5.97	489	696.5	1.42	574	2,313.6	4.03
Greece	670	703.0	1.05	1,131	226.4	0.20	695	528.7	0.76
Italy	1,395	2,191.0	1.57	953	228.8	0.24	996	2,069.9	2.08
Poland	2,237	2,145.6	0.96	293	58.0	0.20	1 314	610.2	0.46
Romania	213	14.4	0.07	1,046	51.3	0.05	137	15.3	0.11
Sweden	1,894	4,356.7	2.30	3,240	730.8	0.23	689	675.1	0.98
All countries	12,347	46,337.8	3.75	9,071	4,197.9	0.46	7 378	10,219.3	1.39

** All transactions have been converted to euros using daily exchange rates provided by Smart Insider*

As shown, directors are overrepresented in the sample, both in of number of transactions and total transaction value. More specifically, directors account for close to half of all transactions carried out and approximately three quarters of the total transaction value in the sample. The same pattern holds for both purchases and sales. Officers and top executives have rather similar trade frequency. However, the average transaction size for

top executives is significantly larger, approximately four times for purchases and three times for sales, than for officers.

Worth noticing are the large differences across countries. Romania stands out with the smallest transactions for all insider groups and in contrast to the overall trend, a vast majority of trades are conducted by officers. All insider groups in France trade in larger volumes than the average for all countries. This is particularly true for directors, where the average transaction size is significantly larger compared to the other countries, both for purchases and sales.

Table 8. Position Within the Firm – Purchase Portfolios

	Directors		**Officers**		**Top Executives**	
	CAPM	Carhart	CAPM	Carhart	CAPM	Carhart
Denmark	0.00010 (0.40)	0.00004 (0.14)	0.00040 (1.10)	0.00043 (1.00)	0.00052 (1.96)	0.00056***** (2.12)
France	0.00054***** (2.55)	0.00049***** (2.34)	0.00052 (1.82)	0.00042 (1.44)	0.00044 (1.58)	0.00047 (1.86)
Germany	0.00019 (0.79)	0.00016 (0.67)	0.00056 (1.41)	0.00059 (1.47)	0.00049 (1.85)	0.00049 (1.87)
Greece	–0.00014 (–0.24)	–0.00029 (–0.52)	–0.00026 (–0.22)	–0.00052 (–0.48)	0.00082 (1.32)	0.00076 (1.29)
Italy	0.00006 (0.15)	0.00005 (0.14)	–0.00004 (–0.08)	–0.00011 (–0.25)	0.00021 (0.63)	0.00014 (0.42)
Poland	0.00035 (0.47)	0.00038 (0.51)	–0.00125***** (–2.08)	–0.00119***** (–1.97)	–0.00065 (–1.72)	–0.00063 (–1.66)
Romania	0.00323 (1.22)	0.00296 (1.12)	0.00108***** (2.39)	0.00111***** (2.46)	0.00067 (0.91)	0.00071 (0.97)
Sweden	–0.00004 (–0.07)	–0.00018 (–0.36)	–0.00007 (–0.18)	–0.00016 (–0.42)	0.00030 (0.98)	0.00015 (0.50)
Mean	0.00058	0.00045	0.00012	0.00007	0.00035	0.00033
Median	0.00015	0.00011	0.00019	0.00015	0.00046	0.00048

The table presents results from the performance evaluation method for the insider purchase portfolios, based on insiders' position within the firm. The performance is measured as α from the CAPM model (Equation 1) and the Carhart four–factor model (Equation 2) for a holding period of 120 trading days. The symbols * and ** indicate two–tail significance at the 5% and 1% levels, respectively. T–statistics are presented in the parentheses. Mean and median values are calculated based on the results for all countries' alphas. For a full representation of the regression output. see appendix.

Table 8 shows alphas for the portfolios mimicking purchases for the three different insider groups. As evident, it does not appear to be a clear pattern for a particular type of insider being more profitable than others. For France, we find economically and statistically

significant alphas for trades executed by directors. The results are robust across both models with point estimates of 0.049% and 0.054% (13.14%–14.57% annualized), which is similar to the returns found for the 120 trading day portfolio when testing France on aggregated data. When testing whether directors indeed perform better[14] than officers and top executives we find no significant differences between the groups. In other words, while directors earn abnormal returns when purchasing shares in their firms, we cannot say whether these returns are of greater magnitude than those earned by officers and top executives. In sum, the results do not indicate that the suggested information hierarchy is related to returns in France.

For both Romania and Poland, we find statistically significant alphas for officers. For Romania, alphas are positive with point estimates of 0.108% and 0.111% (31.26%–32.26% annualized) for CAPM and the Carhart four-factor model, respectively. Interestingly, alphas are negative for Poland, implying that officers perform worse than the market subsequent purchases in their firms. Just as for directors in France, we find no evidence of officers performing differently than the other groups in either Romania or Poland. Thus, we cannot with statistical certainty conclude that insider's position within the firm has any impact on abnormal returns in these countries. Finally, we find significant alphas for top executives in Denmark. However, the result is not robust across both models.

In table 9, the results for the sale portfolios are presented. In contrast to the purchase portfolios, there are no significant results found in any of the countries. The mean and median alphas are small in magnitude across all insiders groups and no clear trend is evident.

[14] To test for differences we performed Wald tests on the coefficients. These are not reported in the table.

Table 9. Position Within the Firm – Sale Portfolios

	Directors		**Officers**		**Top Executives**	
	CAPM	Carhart	CAPM	Carhart	CAPM	Carhart
Denmark	0.00022 (0.72)	0.00048 (1.09)	0.00054 (1.96)	0.00048 (1.76)	0.00011 (0.26)	0.00007 (0.16)
France	0.00014 (0.81)	0.00005 (0.30)	0.00037 (1.76)	0.00028 (1.36)	–0.00012 (–0.59)	–0.00020 (–1.03)
Germany	–0.00023 (–0.85)	–0.00043 (–1.54)	0.00028 (0.69)	0.00010 (0.37)	–0.00111 (–1.37)	–0.00111 (–1.40)
Greece	0.00011 (0.13)	0.00000 0.00	–0.00043 (–0.38)	–0.00070 (–0.69)	–0.00134 (–1.35)	–0.00154 (–1.62)
Italy	–0.00011 (–0.33)	–0.00013 (–0.39)	–0.00079 (–0.97)	–0.00093 (–1.18)	–0.00013 (–0.35)	–0.00020 (–0.56)
Poland	0.00078 (1.58)	0.00078 (1.56)	0.00005 (0.094)	0.00003 (0.06)	0.00056 (1.26)	0.00055 (1.24)
Romania	0.00012 (0.16)	0.00008 (0.10)	0.00015 (0.48)	0.00014 (0.44)	0.00037 (0.59)	0.00043 (0.69)
Sweden	–0.00065 (–1.55)	–0.00075 (–1.79)	–0.00009 (–0.35)	–0.00018 (–0.74)	0.00021 (0.51)	0.00015 (0.37)
Mean	0.00005	0.00001	0.00001	–0.00010	–0.00018	–0.00023
Median	0.00011	0.00003	0.00010	0.00007	–0.00001	–0.00007

The table presents results from the performance evaluation method for the insider sale portfolios, based on insiders' position within the firm. The performance is measured as α from the CAPM model (Equation 1) and the Carhart four–factor model (Equation 2) for a holding period of 120 trading days. The symbols * and ** indicate two–tail significance at the 5% and 1% levels, respectively. T–statistics are presented in the parentheses. Mean and median values are calculated based on the results for all countries' alphas. For a full representation of the regression output, see appendix.

While several scholars have pointed out that there is an information hierarchy among insiders (Seyhun 1986; Lin & Howe, 1990; Degryse et al., 2013), we cannot relate this claim to our findings. Instead, our results are in line with Jeng et al. (2003) who found no differences in returns between groups in the US. They argued that insiders higher up in the hierarchy indeed are more likely to have access to better information, but since they presumably are more carefully inspected by both shareholders and regulators, they are more reluctant to exploit this information advantage. This could potentially be one explanation as to why we do not see signs of top executives outperforming other insiders across the sample.

Our results can, to some extent, be compared to Dardas and Güttler (2011), who found signs of a hierarchy in only two out of eight European countries. Interestingly, for France

they found that top executives outperformed directors when purchasing stocks in their firms while we found no such evidence in our study. Our results, as well as the findings by Dardas and Güttler (2011), suggest that there is no information hierarchy that can be generalized across European countries.

The results in this section makes an interesting comparison to our overall results for insiders' sales. The analysis in section 5.1 suggested that sale portfolios in Germany outperformed the market when using a holding period of 120 trading days. However, when looking at different insider groups in isolation, we no longer find any abnormal returns for any of the groups in the country. Thus, while German insiders in aggregate perform better than the market, there is no indication that certain groups of insiders are driving the results. The result is less surprising when looking at purchases. The previous section indicated that German insiders earned abnormal returns for the shortest holding period and in this section we only analyze a holding period of 120 trading days.

When comparing our results to previous research on information hierarchies, it should be noted that categorizations differ greatly between studies. For example, Degryse et al. (2013) grouped directors and top executives together while Lin and Howe (1990) only distinguished between large shareholders and other insiders. How one chooses to categorize insiders will likely have an impact on the results and could be one explanation for previous inconsistencies in the findings on the topic.

All in all, while the debate concerning insiders' position within the firm likely will continue, our results suggest that it has no significance in explaining abnormal returns in our sample countries.

5.3 Transaction Size

Table 10. Descriptive Statistics – Transaction Size

(All transactions in thousand euros)*	Small			Medium			Large		
	Smallest transaction	Largest transaction	Total transaction value	Smallest transaction	Largest transaction	Total transaction value	Smallest transaction	Largest transaction	Total transaction value
Purchases Portfolios									
Denmark	1.18	17.7	4,905	17.7	61.5	18,899	61.8	64,303	522,648
France	1.15	15.5	15,425	15.5	115.7	105,948	115.9	1,810,971	17,620,417
Germany	1.15	23.9	19,469	23.9	99.7	90,999	99.7	365,854	4,189,995
Greece	1.12	4.7	4,363	4.8	18.9	16,535	18.9	111,831	1,035,554
Italy	1.15	13.9	11,323	13.9	57.0	49,236	57.2	1,088,547	5,224,980
Poland	1.13	5.9	6,500	6.0	29.5	26,833	29.5	146,584	1,984,221
Romania	1.15	2.7	915	2.7	9.4	2,584	9.4	1,452	37,670
Sweden	1.06	9.1	18,323	9.1	33.4	69,801	33.4	343,597	7,070,412
Mean	1.10	11.7	10 153	11.7	53.1	47,604	53.2	491,642	4,710,737
Sale Portfolios									
Denmark	1.44	86.0	42,426	86.1	194.8	125,317	194.9	774,050	5,623,027
France	1.15	41.2	37,101	41.3	290.2	281,670	291.2	1,546,484	31,425,321
Germany	1.18	55.8	14,361	55.9	488.7	130,954	495.1	682,832	8,623,974
Greece	1.18	11.2	4,229	11.3	72.7	26,039	73.1	181,255	1,427,761
Italy	1.12	32.2	16,293	32.4	131.5	80,635	131.5	486,000	4,396,599
Poland	1.06	14.7	7,416	14.8	118.4	64,091	118.6	248,000	2,750,605
Romania	1.10	3.7	1,045	3.7	13.3	3,321	13.4	9,377	78,753
Sweden	1.13	20.0	17,445	20.0	116.8	103,222	117.0	236,138	5,641,856
Mean	1.14	26.1	15,327	26.2	125.0	91,929	125.0	367,000	5,009,813

** All transactions have been converted to euros using daily exchange rates provided by Smart Insider.*

Table 10 presents summary statistics for the purchase and sale portfolios, grouped according to absolute transaction size for each country. Consistent with the overall sample, sale transactions are in general of greater magnitude. Large transactions account on average for 98% of the total transaction value, for both purchases and sales, and the average range for the group is between 53,200 euros and 509 million euros. As previously discussed, the dataset is very skewed, which becomes even more apparent when looking at the wide distribution of large transactions.

For group small and medium, the transaction sizes range on average between 1,100–53,100 euros for purchases and 1,140–125,000 euros for sales. The total transaction value for these groups for both portfolios sums up to 1.4 billion euros, which can be related to the largest

single transaction in France worth 1.8 billions euros. In other words, there are great differences in transaction sizes between large transactions and medium and small.

There are also some noticeable differences between the countries. For both purchases and sales, Romania has by far the smallest transaction value across all groups and in total. The total transaction value accounts to only 0.2% of that of France, the country with the largest transaction value.

Table 11. Transaction Size – Purchase Portfolios

	Small		**Medium**		**Large**	
	CAPM	Carhart	CAPM	Carhart	CAPM	Carhart
Denmark	0.00016 (0.54)	0.00012 (0.41)	0.00035 (1.80)	0.00033 (1.67)	0.00011 (0.48)	0.00006 (0.25)
France	0.00036** (2.79)	0.00028* (2.27)	0.00048** (3.93)	0.00039** (3.52)	0.00054* (2.51)	0.00057** (2.64)
Germany	0.00047** (3.10)	0.00041** (2.84)	0.00047** (3.17)	0.00045** (3.17)	0.00027 (1.25)	0.00024 (1.16)
Greece	0.00062* (2.49)	0.00053* (2.22)	0.00070** (2.62)	0.00055* (2.29)	–0.00068 (–0.60)	–0.00088 (–0.85)
Italy	0.00043* (2.46)	0.00036* (2.23)	0.00036* (2.16)	0.00030* (1.99)	0.00008 (0.24)	0.00010 (0.30)
Poland	0.00178 (1.93)	0.00175 (1.90)	0.00064 (1.74)	0.00065 (1.76)	–0.00022 (–0.55)	–0.00020 (–0.50)
Romania	0.00028 (1.15)	0.00029 (1.27)	0.00066* (2.09)	0.00064* (2.02)	0.00138* (2.42)	0.00141* (2.46)
Sweden	0.00061** (3.34)	0.00053** (2.92)	0.00057** (3.08)	0.00047* (2.54)	0.00009 (0.20)	–0.00005 (-0.10)
Mean	0.00059	0.00053	0.00053	0.00047	0.00020	0.00016
Median	0.00045	0.00039	0.00053	0.00046	0.00010	0.00008

The table presents results from the performance evaluation method for the insider purchase portfolios, categorized based on transaction size. The performance is measured as α from the CAPM model (Equation 1) and the Carhart four-factor model (Equation 2) for a holding period of 120 trading days. The symbols * and ** indicate two-tail significance at the 5% and 1% levels, respectively. T-statistics are presented in the parentheses. Mean and median values are calculated based on the results for all countries' alphas. For a full representation of the regression output, see appendix.

Table 11 presents the results for the insider purchase portfolios. We find that small- and medium-sized transactions earn positive and significant returns across a majority of the countries. In fact, the only countries where we do not find any significance for medium-sized transactions are Denmark and Poland, and these countries generate insignificant

results across all groups and models. France and Romania are the only countries with abnormal returns for large transactions.

In France, alphas are positive and significant for all transaction sizes with point estimates ranging between 0.028%–0.057% (7.04%–15.44% annualized) depending on size and model. For Romania, the point estimates are 0.138%–0.141% (41.56%–42.27% annualized) for large transactions and between 0.064%–0.066% (17.50%–18.09% annualized) for medium-sized trades.

Germany, Greece, Italy and Sweden all present statistically significant alphas for both small and medium transactions, with similar magnitudes across the countries. For small transactions the largest alphas are found in Sweden and Greece with point estimates between 0.053%–0.062% (14.28%–16.91% annualized). For medium transactions the largest alphas are found in Greece and Romania, with estimates of 0.055%–0.070% (14.86%–19.28% annualized).

When looking at the mean and median values of alpha across all countries, it appears to be the case that insiders trade more profitable when the transaction size is smaller and that the effect is largely reduced when the trade value surpasses a certain level. While small- and medium-sized trades earn abnormal returns of similar magnitude, the returns are approximately three times smaller for large transactions. However, when testing for differences in the coefficients using Wald tests[15], we find no statistical evidence of any group performing better than the others. This is consistent across all countries. In other words, although we find significant alphas for small- and medium-sized transactions in a majority of the countries, we cannot conclude whether there are any actual differences in returns between groups.

[15] Not reported in table.

Turning to the sale portfolios, the results are overall insignificant with a few notable exceptions. In Germany, we find negative and statistically significant alphas for large transactions across both models. The point estimates are large and economically relevant, ranging between –0.126% and –0.137% (–37.43% and –41.20% annualized). The result holds when testing for differences in the coefficients, indicating that large sale transactions outperform both small and medium-sized transactions. Thus, insiders in Germany appear to sell large quantities of stocks prior to relative declines in the stock price. More specifically, in the 6 months following a transaction, the market outperforms the stock with approximately 18%.

Table 12. Transaction Size – Sale Portfolios

	Small		**Medium**		**Large**	
	CAPM	Carhart	CAPM	Carhart	CAPM	Carhart
Denmark	0.00076**	0.00065*	0.00089*	0.00076*	0.00018	0.00026
	(2.89)	(2.53)	(2.35)	(2.03)	(0.65)	(0.97)
France	0.00004	–0.00013	0.00003	–0.00009	0.00008	–0.00001
	(–0.22)	(–0.64)	(0.21)	(–0.62)	(0.47)	(–0.07)
Germany	0.00029	0.00019	0.00001	–0.00010	–0.00126*	–0.00137*
	(1.15)	(0.78)	(0.03)	(–0.60)	(–2.23)	(–2.45)
Greece	0.00052	0.00034	0.00004	–0.00009	–0.00033	–0.00058
	(1.26)	(0.86)	(0.11)	(–0.24)	(–0.30)	(–0.57)
Italy	–0.00003	–0.00010	0.00001	–0.00020	–0.00101	–0.00104
	(–0.14)	(–0.59)	(–0.52)	(–1.11)	(–1.55)	(–1.61)
Poland	0.00149	0.00159	0.00051	0.00051	0.00104*	0.00107*
	(1.31)	(1.39)	(1.32)	(1.31)	(2.08)	(2.13)
Romania	0.00033	0.00033	0.00076	0.00077	–0.00010	–0.00013
	(1.00)	(0.98)	(1.89)	(1.89)	(–0.25)	(–0.32)
Sweden	–0.00006	–0.00022	–0.00003	–0.00024*	–0.00016	–0.00027
	(–0.45)	(–1.70)	(–0.24)	(–2.08)	(–0.75)	(–1.31)
Mean	0.00042	0.00033	0.00019	0.00022	–0.00019	–0.00026
Median	0.00031	0.00026	0.00003	–0.00009	–0.00013	–0.00020

The table presents results from the performance evaluation method for the insider sale portfolios, categorized based on transaction size. The performance is measured as α from the CAPM model (Equation 1) and the Carhart four-factor model (Equation 2) for a holding period of 120 trading days. The symbols * and ** indicate two-tail significance at the 5% and 1% levels, respectively. T-statistics are presented in the parentheses. Mean and median values are calculated based on the results for all countries' alphas. For a full representation of the regression output, see appendix.

We also find abnormal returns for large transactions in Poland. However, the estimates are positive rather than negative. Similarly, alphas are positive and significant in Denmark for

small and medium trades. For neither Poland nor Denmark are there any statistical differences between the groups.

Our results in this section are in contrast to the findings of Jeng et al. (2003), who showed that larger purchase transactions outperformed smaller trades. They argued that this could primarily be explained by larger trades being driven by insiders' superior information. However, we found very little evidence of this being the case for the European countries in our sample. On the contrary, we find that a majority of countries earn abnormal returns for small and medium transactions. This is further displayed by mean and median values of alpha, where the point estimates for group large are approximately three times smaller in magnitude, compared to the other size groups. Based on this, it could be argued that our results are more in line with studies pointing out that insiders trade on less private information when the transaction size is large, due to the increased risk of regulatory sanctions (Kyle, 1985; Barclay & Warner, 1993).

The exception in our results is the sale portfolios in Germany, where large transactions significantly outperform smaller trades. The finding is interesting since it suggests that insiders with private information tend to exploit their informational advantage by trading in larger volumes when selling stocks in their own firm. Furthermore, table 10 shows that the smallest transaction size in group large is almost twice as big as for any other country. Thus, insiders in Germany do not seem to be as cautious as suggested by Kyle (1985) and Barclay and Warner (1993) when the trading is a mean to avoid losses. Rather than dividing their sales in smaller posts and over a longer time period, German insiders tend to sell large quantities prior to relatively poor stock performance. Economically, the avoided losses are considerable. For example, for the smallest trades within the size-group large,

insiders in Germany avoid losses that corresponds to more than 80,000 euros in the 6 months subsequent a trade[16].

The findings in this section make an interesting comparison to our overall analysis of insiders' abnormal returns. We observe significant alphas for the purchase portfolios in a majority of countries, primarily for small- and medium-sized transactions, while previous analysis only indicated abnormal returns in Germany and France. One explanation for this is the way we construct our portfolios. Since each return is weighted according to the size of the transaction, large transactions are given much greater weight in our overall sample. As we saw in table 10, there is a very skewed distribution between the three size groups, with large trades on average accounting for more than 98% of the total transaction value. Thus, even if a large part of transactions categorized as small and medium earn abnormal returns as we observe here, these are given very little weight when analyzing the sample as a whole.

Research on the relationship between returns and transaction size is not unanimous and neither is the definition of size. For instance, Jeng et al. (2003) measured transaction size relative to market capitalization whereas this study uses absolute trading value. Although both aim at measuring the same effect, it cannot be ruled out that different definitions could yield different results. It should also be noted that all transactions have been grouped based on transaction sizes within each country. Since the distribution differs between the countries, cut-off points vary depending on which country one is looking at. The most revealing example of this is Romania, where the cut-off point for large transactions is lower than the average cut-off point for medium transactions for all countries. Thus, a large transaction in Romania could be considered medium or even small if it was executed in another country.

[16] The smallest transaction has a value of 495,100 euros and the compounded daily returns on 120 trading days corresponds to approximately 17%.

5.4 Firm Size

Table 13. Descriptive Statistics – Firm Size

	Small		Medium		Large	
(All values in million euros)*	Average firm size	Average transaction size	Average firm size	Average transaction size	Average firm size	Average transaction size
Purchases Portfolios						
Denmark	21.8	0.178	200.1	0.302	9,372.9	0.541
France	54.4	0.225	484.2	0.786	13,682.4	7.022
Germany	41.5	0.168	493.4	0.705	19,106.0	1.640
Greece	16.3	0.069	106.1	0.153	1,105.6	0.422
Italy	35.2	0.086	207.8	0.240	6,241.5	3.022
Poland	4.3	0.059	22.2	0.104	1,308.2	0.880
Romania	4.2	0.029	56.6	0.031	1,039.4	0.022
Sweden	21.9	0.093	240.9	0.227	5,538.2	1.532
Mean	25.0	0.113	226.4	0.319	7,174.3	1.885
Sale Portfolios						
Denmark	236.4	0.409	1818.1	0.880	13,811.6	4.528
France	37.8	0.249	386.8	1.547	13,417.3	11.992
Germany	50.3	1.520	679.4	4.794	21,336.3	6.355
Greece	53.4	0.263	348.9	0.722	2,399.9	0.767
Italy	29.6	0.223	335.0	1.137	7,424.5	2.676
Poland	3.6	0.140	57.6	0.727	2,376.0	1.330
Romania	5.3	0.062	108.7	0.074	1,511.0	0.037
Sweden	31.5	0.478	322.0	1.106	8,369.9	1.339
Mean	56.0	0.418	507.1	1.373	8,830.8	3.628

** All values have been converted to euros using daily exchange rates provided by Smart Insider.*

Table 13 provides descriptive statistics of the insider portfolios, categorized based on firms' market capitalization. Previous sections have shown that sale transactions typically are larger than purchases and this also appears to be true when looking at firm size. The average market capitalization for firms in the sale portfolios is larger for all groups, with more than twice the size for the small and medium categories compared to purchases. The difference is particularly noticeable in Denmark where the average firm size for sales is approximately ten times larger for small and medium firms.

We can also observe some notable differences across the sample between both countries and size categories. For purchases, France and Germany stands out with the largest firms in each category while Romania and Poland are ranked in the bottom, with considerably

smaller firms. The sale portfolios show a similar pattern with the exception of Denmark, now among the countries with the largest firms. Overall, firms in established and more developed markets are typically larger with greater dispersion of market capitalization across the size categories.

Looking at the average transaction size for the three size categories, we can note that it appears to be a relationship between firm size and transaction value. As the firm size increases so does the transaction size. One explanation for this could be that insiders in larger firms on average are wealthier and thus are able to make larger purchases or sales. Additionally, stocks for larger firms typically have greater liquidity and there are normally counterparties available for sizable transactions. Interestingly, the relationship between transaction value and firm size appears to hold in all countries except Romania, where trades on average are smaller for large firms.

Table 14. Firm Size – Purchase Portfolios

	Small		**Medium**		**Large**	
	CAPM	Carhart	CAPM	Carhart	CAPM	Carhart
Denmark	0.00045 (1.26)	0.00043 (1.20)	–0.00008 (–0.28)	–0.00013 (–0.49)	0.00041 (1.66)	0.00039 (1.57)
France	0.00070****** (2.28)	0.00061****** (2.01)	0.00078****** (2.36)	0.00077****** (2.42)	0.00027 (1.41)	0.00028 (1.46)
Germany	0.00144****** (2.87)	0.00146****** (2.88)	0.00053 (1.68)	0.00046 (1.49)	0.00014 (0.79)	0.00011 (0.60)
Greece	0.00112****** (2.11)	0.00109****** (2.05)	0.00146 (1.84)	0.00129 (1.73)	–0.00088 (–0.78)	–0.00109 (–1.07)
Italy	0.00013 (0.27)	0.00007 (0.16)	0.00035 (1.33)	0.00030 (1.20)	–0.0009 (–0.29)	–0.00005 (–0.17)
Poland	0.00445 (1.08)	0.00443 (1.07)	–0.00018 (–0.40)	–0.00015 (–0.33)	–0.00038 (–1.42)	–0.00036 (–1.34)
Romania	0.00175****** (2.43)	0.00179****** (2.48)	0.00082 (1.71)	0.00085 (1.76)	–0.00022 (–0.66)	–0.00020 (–0.61)
Sweden	0.00013 (0.16)	0.00003 (0.03)	0.00027 (0.89)	0.00016 (0.53)	0.00014 (0.46)	–0.00000 (–0.01)
Mean	0.00127	0.00124	0.00049	0.00045	–0.00017	–0.00012
Median	0.00091	0.00085	0.00044	0.00038	–0.00004	–0.00003

The table presents results from the performance evaluation method for the purchase portfolios, categorized based on firm size. The performance is measured as α from the CAPM model (Equation 1) and the Carhart four-factor model (Equation 2) for a holding period of 120 trading days. The symbols * and ** indicate two-tail significance at the 5% and 1% levels, respectively. T-statistics are presented in the parentheses. Mean and median values are calculated based on the results for all countries' alphas. For a full representation of the regression output, see appendix.

Table 14 shows alphas for the purchase portfolios divided into small, medium and large firms. The results indicate that insiders in small firms earn abnormal returns in four out of eight countries in the sample. Meanwhile, we find significant alphas in only one country for medium-sized firms and no significance at all for large firms.

Germany, Greece and Romania all have statistically significant alphas for the small size category. For Germany, the point estimates range between 0.144%–0.146% (43.71%–44.43% annualized) while the alphas for Greece are 0.109%–0.112% (31.59%–32.59% annualized) and 0.175%–0.179% (55.37%–56.94% annualized) for Romania. Hence, the returns are of economical relevance in all three countries. Worth noticing is how little the point estimates vary between CAPM and the Carhart four-factor model, with a variation of less than 0.4 basis points for all three countries. For France, we find significant alphas for both the small and the medium category with point estimates of similar magnitude in the two groups. For small firms, alphas range between 0.061%–0.070% (16.61%–19.28% annualized) while the estimates for medium firms are 0.077%–0.078% (21.41%–21.71% annualized).

The average alpha across all countries in the sample is 0.124%–0.127% (36.65%–37.69% annualized) for the small size category. It goes down by more than half for the medium category and turns negative for large firms. The overall trend suggests that firm size matters for abnormal returns and that smaller firms in general perform better. When testing whether this is true for each individual country, by performing Wald tests on the coefficients[17], we find that small firms significantly outperform large firms in both Germany and Romania. However, in the remaining countries we find no evidence of such relationship. Thus, although insiders in France and Greece earn abnormal returns in small firms, we cannot with statistical certainty conclude that these insiders actually perform better than insiders in larger firms.

[17] Not reported in table.

The results for the sale portfolios in table 15 are in line with findings in previous sections, with very little significance across the sample. We find significant alphas for small firms in France and for medium firms in Italy and Germany, but none of these results are robust across both CAPM and the Carhart four-factor model. In other words, firm size seems to have little impact on abnormal returns for our sale portfolios.

Table 15. Firm Size – Sale Portfolios

	Small		**Medium**		**Large**	
	CAPM	Carhart	CAPM	Carhart	CAPM	Carhart
Denmark	0.00043 (1.35)	0.00037 (1.16)	0.00048 (1.58)	0.00043 (1.42)	0.00015 (0.50)	0.00032 (1.12)
France	0.00102***** (2.17)	0.00084 (1.82)	–0.00001 (–0.04)	–0.00016 (–0.65)	0.00013 (0.78)	0.00006 (0.35)
Germany	–0.00004 (–0.06)	–0.00018 (–0.24)	–0.00088 (–1.72)	–0.00039***** (–2.04)	–0.00026 (–1.05)	–0.00039 (–1.60)
Greece	0.00083 (1.39)	0.00079 (1.31)	0.00103 (0.99)	0.00075 (0.78)	–0.00101 (–1.15)	–0.00120 (–1.51)
Italy	–0.00158 (–1.91)	–0.00160 (–1.95)	0.00056***** (2.06)	0.00035 (1.37)	–0.00011 (–0.25)	–0.00013 (–0.29)
Poland	0.00061 (1.09)	0.00071 (1.27)	0.00017 (0.51)	0.00014 (0.42)	0.00153***** (1.99)	0.00150 (1.95)
Romania	0.00047 (0.79)	0.00043 (0.73)	–0.00032 (–1.08)	–0.00029 (–0.99)	–0.00028 (–1.29)	–0.00029 (–1.34)
Sweden	–0.00047 (–1.36)	–0.00058 (–1.68)	–0.00016 (–0.45)	–0.00027 (–0.78)	0.00021 (1.12)	0.00011 (0.58)
Mean	0.00016	0.00010	0.00004	0.00007	0.00005	0.00000
Median	0.00045	0.00040	–0.00001	–0.00001	0.00001	–0.00004

The table presents results from the performance evaluation method for the sale portfolios, categorized based on firm size. The performance is measured as α from the CAPM model (Equation 1) and the Carhart four-factor model (Equation 2) for a holding period of 120 trading days. The symbols * and ** indicate two-tail significance at the 5% and 1% levels, respectively. T-statistics are presented in the parentheses. Mean and median values are calculated based on the results for all countries' alphas. For a full representation of the regression output, see appendix.

Our results for the purchase portfolios in Germany and Romania are in line with Seyhun (1986), who found a negative relationship between firm size and abnormal returns. Other studies, including Lakonishok and Lee (2001) and Gregory et al. (1997), have come to similar conclusions. Several explanations have been offered as to why insiders in small firms tend to outperform their larger counterparts. Insiders in small firms are likely to have access to a larger portion of relevant information in their companies, and thus have an

informational advantage compared to insiders in larger firms (Jeng et al., 2003). Furthermore, Jeng et al. (2003) proposed that large firms are more scrutinized by analysts and the public, which makes the stock more efficiently priced with less inefficiencies for insiders to exploit. However, although they found positive alphas for small firms, these were never significantly different from medium or large firms, comparable to our results for Greece and France.

It has also been argued that insiders' abnormal returns in small firms are the result of the well-documented small firm effect, where it has been empirically shown that small firms generate consistently higher risk-adjusted returns than their larger counterparts (Fama & French, 1992). Based on this, it could be the case that insiders in small firms generate higher returns simply because they trade in small firms, rather than taking advantage of private information. While CAPM does not risk-adjust for the small firm effect, the Carhart four-factor model accounts for this in the SMB factor[18]. Hence, if the abnormal returns found in Germany and Romania were attributable to the small-firm anomaly in CAPM, we would expect alphas to drop under the four-factor model (Jeng et al., 2003). Interestingly, this is not the case as there are only minor differences in alphas across the two models, just 0.4 basis points for Romania and 0.2 basis points for Germany. From this, it appears that the abnormal returns found in small firms in Germany and Romania indeed are due to insiders' superior information rather than the documented small-firm effect in CAPM.

Overall, and similar to our previous analyses, the results differ largely between the countries in the sample, which could either imply that insider trading practices vary a lot in each market or that our categorizations influence the results. For example, as we saw in table 13 there is a great dispersion in average firm size for the size categories in each country, which

[18] See equation 2 for a description.

could potentially affect the results. However, this argument fails to explain why we found significant results in Germany and Romania, since these countries are at one end each in the spectra. Germany have among the largest companies in the sample while Romanian firms are among the smallest.

Germany and Romania also differ largely when it comes to transaction size, which has implications for the profits from insider trading. While returns in both countries are of similar magnitude, about 19% for Germany and 24%[19] for Romania over six months, the difference in absolute returns is considerable. Insiders in Romania, with an average transaction size of 29,000 euros, earn approximately 7,000 euros in the six months following a transaction. This could be contrasted to Germany, where insiders in small firms on average gain 32,000 euros in the same time period.

On a final note, a valid question is whether it is sufficient to divide the sample into only three size groups. In our case, the sample sizes would likely be too small in multiple countries if we were to divide the set further, which could result in portfolios with very few stocks. Jeng et al. (2003) tested firm size both with three and ten categories but found that the two approaches did not yield any different results.

5.5 Industry Type

In table 16, descriptive statistics for the insider portfolios based on industry type is displayed. Evidently, there are fewer transactions in R&D intensive industries. This is natural as this category is based on two industries, technology and healthcare, compared to others which consists of all other industry types.

[19] Daily abnormal returns compounded for 120 trading days

Table 16. Descriptive Statistics – Industry Type

(All transactions in million euros)*	**R&D Intensive**			**Others**		
	Number of transactions	Number of firms	Average transaction size	Number of transactions	Number of firms	Average transaction size
Purchase Portfolios						
Denmark	236	28	0.818	1,375	135	0.339
France	1,175	137	0.586	5,464	396	2.672
Germany	1,104	130	0.549	4,063	398	0.829
Greece	607	16	0.137	4,319	129	0.214
Italy	719	39	0.083	4,061	247	1.104
Poland	661	103	0.224	5,126	551	0.347
Romania	44	9	0.041	1,445	175	0.027
Sweden	2,723	238	0.151	8,874	497	0.613
Mean	909	88	0.324	4,341	316	0.768
Sale Portfolios						
Denmark	241	27	3.509	2,747	87	1.799
France	2,620	148	1.489	4,266	355	6.502
Germany	568	116	3.716	1,451	299	4.556
Greece	180	10	0.331	2,316	95	0.604
Italy	649	40	1.410	2,702	232	1.323
Poland	399	99	1.019	3,445	486	0.699
Romania	64	9	0.077	1,332	147	0.057
Sweden	1,288	192	0.729	4,535	421	1.064
Mean	751	80	1.535	2,849	265	2.076

** All transactions have been converted to euros using daily exchange rates provided by Smart Insider.*

Germany, France, Italy and Sweden have the largest proportions of transactions carried out in R&D intensive industries, both for purchases and sales. The average transaction size for the whole sample is smaller in R&D intensive firms than in others. Notable is the small number of transactions in R&D intensive firms in Romania.

In table 17, the alphas for the purchase portfolios for R&D intensive and other industries are shown. We find significant and robust results in France, Greece and Romania. Economically speaking, insiders in R&D intensive industries in France earn excessive returns of 0.122% and 0.135% on a daily basis (35.97%–41.20% annualized). For Greece, the point estimates are similar with daily abnormal returns of 0.121% and 0.127% (35.63%–37.69% annualized). In contrast, for Romania we find evidence that insiders in other industries earn abnormal returns, while the alpha for R&D intensive industries is

insignificant. The returns are economically large with point estimates of 0.128% and 0.130% (38.04%–38.73% annualized).

Table 17. Industry Type – Purchase Portfolios

	R&D Intensive		**Others**	
	CAPM	Carhart	CAPM	Carhart
Denmark	0.00041 (1.15)	0.00036 (0.99)	0.00010 (0.41)	0.00007 (0.28)
France	0.00135** (3.82)	0.00122** (3.58)	0.00033 (1.50)	0.00036 (1.69)
Germany	0.00043 (0.91)	0.00038 (0.79)	0.00030 (1.49)	0.00027 (1.35)
Greece	0.00127* (2.14)	0.00121* (2.04)	–0.00067 (–0.59)	–0.00087 (–0.84)
Italy	0.00044 (1.05)	0.00032 (0.77)	0.00008 (0.25)	0.00010 (0.31)
Poland	0.00019 (0.68)	0.00185 (0.67)	–0.00015 (–0.63)	–0.00014 (–0.58)
Romania	0.00190 (1.45)	0.00187 (1.42)	0.00128* (2.38)	0.00130* (2.41)
Sweden	–0.00012 (–0.16)	–0.00023 (–0.30)	0.00019 (0.69)	0.00007 (0.24)
Mean	0.00074	0.00087	0.00018	0.00015
Median	0.00044	0.00079	0.00015	0.00009

The table presents results from the performance evaluation method for the purchase portfolios, categorized based on industry type. The performance is measured as α from the CAPM model (Equation 1) and the Carhart four-factor model (Equation 2) for a holding period of 120 trading days. The symbols * and ** indicate two-tail significance at the 5% and 1% levels, respectively. T-statistics are presented in the parentheses. Mean and median values are calculated based on the results for all countries' alphas. For a full representation of the regression output, see appendix.

When testing for differences in the coefficients across the sample, the result do not suggest that they differ significantly[20]. Although the mean and median values of alpha for R&D intensive industries are four times as large as for others, and all countries follows the same pattern (besides Sweden), we cannot conclude that abnormal returns differ across industries.

For the sale portfolios shown in table 18, we find significant alphas for insiders in other industries in Germany. The results are economically relevant, with point estimates of –0.147% and –0.158% (–44.8% and –48.86% annualized), indicating that insiders avoid considerable losses subsequent their sales. Meanwhile, alphas are positive and insignificant for firms in R&D

[20] Not reported in table.

intensive industries. When testing for differences in returns, we find that insiders in other industries indeed outperform their counterparts in R&D intensive industries. While this is the case in Germany, we find no significant differences in the other countries.

Looking at the mean and median values of alpha across the sample, we see a similar trend as in Germany. Abnormal returns are on average negative in other industries but positive for R&D intensive industries. While the purchase portfolios suggested that insiders in R&D intensive firms on average performed better, the sale portfolios indicate the opposite. Here, it appears that insiders in other industries, on average, perform better than those in R&D intensive.

Table 18. Industry Type - Sale Portfolios

	R&D Intensive		**Others**	
	CAPM	Carhart	CAPM	Carhart
Denmark	0.00027 (0.80)	0.00017 (0.50)	0.00019 (0.65)	0.00027 (1.04)
France	0.00041 (1.75)	0.00025 (1.16)	0.00019 (0.69)	0.00005 (–0.32)
Germany	0.00045 (1.42)	0.00031 (0.98)	–0.00147****** (–2.40)	–0.00158****** (–2.61)
Greece	0.00092 (1.44)	0.00079 (1.25)	–0.00033 (–0.29)	–0.00057 (–0.57)
Italy	–0.00015 (–0.22)	–0.00029 (–0.44)	–0.00112 (–1.72)	–0.00111 (–1.72)
Poland	0.00021 (0.99)	0.00206 (0.96)	0.00044 (1.71)	0.00046 (1.78)
Romania	0.00058 (0.69)	0.00059 (0.68)	0.00010 (0.26)	0.00008 (0.20)
Sweden	–0.00028 (–1.06)	–0.00052***** (–2.02)	–0.00009 (–0.41)	–0.00019 (–0.86)
Mean	0.00030	0.00042	–0.00027	–0.00032
Median	0.00034	0.00028	0.00000	–0.00007

The table presents results from the performance evaluation method for the sale portfolios, categorized based on industry type. The performance is measured as α from the CAPM model (Equation 1) and the Carhart four-factor model (Equation 2) for a holding period of 120 trading days. The symbols * and ** indicate two-tail significance at the 5% and 1% levels, respectively. T-statistics are presented in the parentheses. Mean and median values are calculated based on the results for all countries' alphas. For a full representation of the regression output, see appendix.

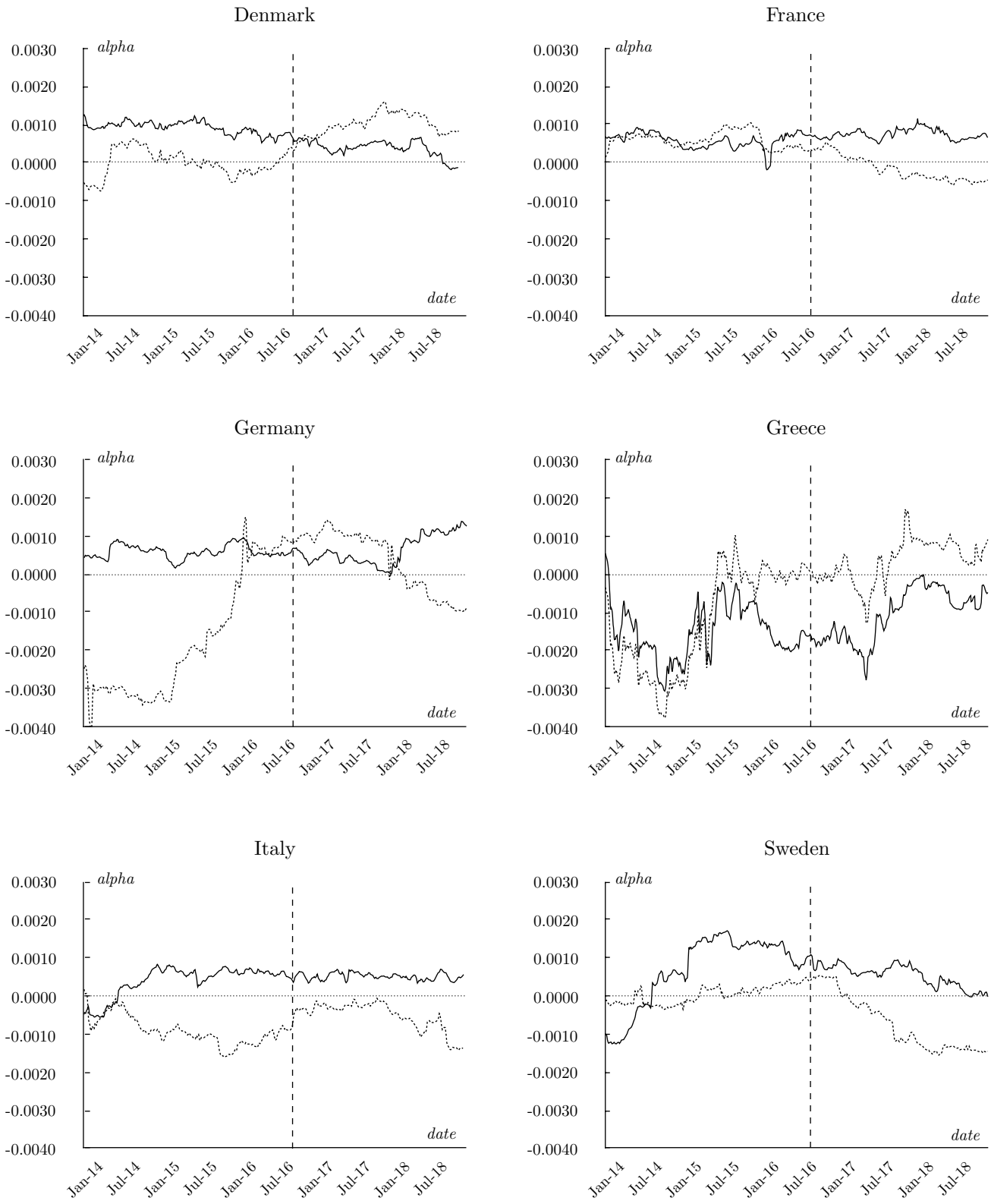
The findings in this section do not add any support to the arguments made by Aboody and Lev (2000). They proposed that R&D-intensive firms are characterized by greater information asymmetries, and as a consequence, insiders in these should be able to earn greater abnormal returns. While there are certain tendencies in the mean values for alphas for the purchase portfolios, we found no statistically significant evidence for any differences between industries in any of the countries.

For the German sale portfolios we do find anomalies in returns between industries. However, the results are opposite to what we expected based on Aboody and Lev's (2000) argument, and theory suggesting that greater asymmetric information leads to higher abnormal returns. In light of this, it could be questioned whether our proxy for asymmetric information is precise enough. Our categorization mainly relies on the premise that healthcare and technology firms spend more resources on R&D, an area which evidently is hard for outsiders to track the progression of. However, the categorization is not based on actual figures on R&D spending, but on a predefined industry classification. A better approach would likely be to collect firm-specific data on R&D spending and divide firms based on this. In our case, no source providing this kind of data for all countries was found. As a result, our categorization is not perfectly aligned with actual R&D spending, but instead serves as a proxy for it.

5.6 Effect of Market Abuse Regulation

Figure 2 shows alpha over time for the insider portfolios, estimated using the performance evaluation method with rolling windows of two years. Thus, each date on the horizontal axis represent the last date of the respective rolling window. The dashed vertical line indicate when MAR was implemented in the EU. Positive alphas for the purchase portfolios indicate that insiders performed better than the market after adjusting for risk, while abnormal returns for the sale portfolios are shown by negative alphas, indicating avoided losses.

Figure 2. Abnormal Returns Prior to and After the Implementation of MAR



The diagrams present alphas for the purchase and sale portfolios over time using the performance evaluation method, based on a 20 trading day holding period. Alphas are estimated using CAPM with rolling windows of 2 years. The date on the horizontal axis indicates the last date of the respective rolling window. The dashed vertical line shows the implementation of MAR.

Although alpha varies slightly over time, the figures do not suggest that MAR has had any dramatic impact on insiders' returns across the countries. The exception is Denmark, where it appears that abnormal returns for both purchases and sales have been gradually reduced after MAR. For the remaining countries, we do not observe the same trend. On the contrary, the graphs suggest that insiders' profits have gradually increased post MAR in several countries.

Table 19. Effect of Market Abuse Regulation – Purchase Portfolios

	CAPM		**Carhart four-factor**	
	alpha	MAR	alpha	MAR
Denmark	0.00108** (3.34)	–0.00125* (–2.33)	0.00111** (3.50)	–0.00126* (–2.39)
France	0.00063 (1.88)	0.00035 (0.63)	0.00089** (2.85)	0.00019 (0.36)
Germany	0.00060* (1.97)	–0.00048 (–0.95)	0.00067* (2.46)	–0.00053 (–1.12)
Greece	–0.00166 (–1.00)	0.00172 (0.62)	–0.00143 (–0.86)	0.00128 (0.47)
Italy	0.00018 (0.36)	0.00001 (0.01)	0.00058 (1.27)	–0.00038 (–0.50)
Sweden	0.00023 (0.40)	–0.00038 (–0.39)	0.00022 (0.38)	–0.00038 (–0.39)
Mean	0.00018	–0.00001	0.00034	–0.00018
Median	0.00042	–0.00019	0.00063	–0.00038

The table presents results from the performance evaluation method for the purchase portfolios. MAR is a dummy variable indicating the change in alpha after the implementation of MAR in 2016. The performance is measured as α from the CAPM model (Equation 1) and the Carhart four-factor model (Equation 2) for a holding period of 120 trading days. The symbols * and ** indicate two-tail significance at the 5% and 1% levels, respectively. T-statistics are presented in the parentheses. Mean and median values are calculated based on the results for all countries' alphas. For a full representation of the regression output, see appendix.

Table 19 presents alphas and the MAR-coefficients for the purchase portfolios. The latter indicates whether the Market Abuse Regulation has affected insiders' abnormal returns after its implementation July 3rd 2016. A significant coefficient suggests that the implementation indeed have had an effect on insiders' returns.

The only country where the regulation seems to have altered returns is Denmark. According to our results, the regulation has decreased insiders' profits by –0.125% on a daily basis (37% annualized) and the result is robust across both models. Meanwhile, alpha

is positive and significant, indicating that insiders in Denmark earned abnormal returns prior to MAR. Interestingly, the magnitude of the MAR-coefficient indicates that MAR has not only reduced insiders' abnormal returns, but completely eliminated them. More specifically, prior to MAR insiders in Denmark earned abnormal returns of 0.108%–0.111% (31.26%–32.26% annualized). However, since the implementation returns have turned negative with estimates of –0.015% and –0.017% (–3.85% and –4.37% annualized).

Mean and median follows the same pattern with positive alphas and negative MAR-coefficients. This is in line with the prediction that stricter regulation affects insiders' abnormal returns negatively. In contrast to our findings for Denmark, the mean for the MAR-coefficient is smaller than the alpha, which indicates that the regulation on average do not eliminate insiders' abnormal returns, but rather downwardly adjust them.

Table 20. Effect of Market Abuse Regulation – Sale Portfolios

	CAPM		**Carhart four-factor**	
	alpha	MAR	alpha	MAR
Denmark	0.00035 (1.01)	–0.00010 (–0.18)	0.00039 (1.16)	–0.00022 (–0.40)
France	0.00022 (1.11)	–0.00037 (–1.12)	0.00002 (0.10)	–0.00021 (–0.68)
Germany	–0.00156****** (–2.32)	0.00102 (0.88)	–0.00187****** (–2.73)	0.00121 (1.05)
Greece	–0.03342 (–0.71)	0.03403 (0.44)	–0.03343 (–0.71)	0.03137 (0.40)
Italy	–0.00151 (–1.89)	0.00146 (1.09)	–0.00158***** (–1.97)	0.00154 (1.15)
Sweden	–0.00011 (–0.43)	–0.00024 (–0.57)	–0.00020 (–0.78)	–0.00019 (–0.45)
Mean	–0.00601	0.00597	–0.00611	0.00558
Median	–0.00081	0.00046	–0.00089	0.00051

The table presents results from the performance evaluation method for the sale portfolios. MAR is a dummy variable indicating the change in alpha after the implementation of MAR in 2016. The performance is measured as α from the CAPM model (Equation 1) and the Carhart four-factor model (Equation 2) for a holding period of 120 trading days. The symbols * and ** indicate two-tail significance at the 5% and 1% levels, respectively. T-statistics are presented in the parentheses. Mean and median values are calculated based on the results for all countries' alphas. For a full representation of the regression output, see appendix.

For the sale portfolios displayed in table 20, the prediction would be a positive MAR-coefficient, indicating that abnormal returns have been reduced after the new regulation.

However, as evident by the table we find no significant results for the MAR variable in any of the countries.

It could be argued that a successful implementation of a regulation should at the very minimum curb the potential harmful effects of insider trading. Based on this, the expected outcome from our results would be decreased abnormal returns for insiders after the implementation of MAR. However, our overall results do not indicate any systematic differences in insiders' returns across the sample countries, and thus do not support above expectation. Instead the results mainly support previous literature arguing that regulations on insiders trading have little impact on insiders' returns. Our findings are thereby in line with Estrada and Peña (2002), who found that various regulations imposed on insider trading during the 1980s and 1990s on European markets had no consistent effect across countries. Similarly, Gebka et al. (2017) found no evidence of any systematic impact when they studied the effect of the initial MAD. They suggested that one reason for this could be that MAD would impact insiders' abnormal returns slowly over a transition phase, as it takes time for a directive to be implemented in each country.

Nevertheless, MAR is different from MAD in that it included formal requirements for each country to be implemented on the very day of July 3rd 2016. For example, closed periods ahead of financial reports, reporting deadlines and details about insiders' transactions were unified across all countries. As evident in table 1, these requirements meant stricter reporting rules in a majority of the countries in our analysis. Thus, if these formal requirements had any direct impact on insiders' profitability following the implementation of MAR, we would expect a sharper decline in returns in countries with more lax regulations pre-MAR. Interestingly, this is not the case. In the countries where MAR had the greatest impact on reporting standards – France, Germany, Greece and Italy – we find no significant effect on abnormal returns at all. The results are particularly interesting for

Germany and Greece, considering insiders in these countries previously could purchase and sell stocks unrestricted ahead of financial reports. On the contrary, we find a significant effect of MAR in Denmark, the country in the sample with the strictest formal requirements prior to MAR. Based on these results, it seems unlikely that stricter reporting requirements for insiders have had any effect on their abnormal returns.

However, while the formal rules of MAR came into effect 2016, it is likely that processes related to the regulation take time to implement and may differ across countries. For instance, it would be reasonable to assume that the extended mandate for financial authorities to prosecute insiders could not be enforced overnight. Several authors have pointed out that enforcement is a key variable to curb insider trading. In fact, Bhattacharya and Daouk (2002), claimed that the mere existence of insider trading regulations has no impact in the markets, but instead enforcement, as measured by prosecutions, is required to observe an effect. Similarly, Aussenegg et al. (2018) found that public enforcement is a key variable to hamper insiders' profits on European markets. In light of this, it would be reasonable to assume that the full implications of MAR on insider trading will be drawn-out. In addition to this, the time between an offense and a prosecution can be substantial (Sorkin, 2014), which could add further delays. Based on these claims, it may be more plausible to assume that MAR is followed by a transition phase in which the regulation slowly reduces insiders' returns. As our regression model measures significant shifts in alpha, it may be the case that the MAR-coefficient fails to capture such gradual effects. However, looking at abnormal returns over time in figure 2, we find little evidence of an actual impact over the years following the implementation. While we observe decreasing abnormal returns in Denmark, we see no such trend in the remaining countries.

All in all, insider trading regulations could possibly have both direct and gradual impacts on insiders' abnormal returns. While we find evidence of decreasing returns post MAR in Denmark, our overall results do not indicate any direct or gradual effects in the remaining countries. Due to this, the effects found in Denmark could likely be explained by other country-specific events associated with the time period, rather than the implementation of MAR. There could be various reasons for why we do not find a consistent pattern across the sample. First, the regulation may be ineffective and therefore has not changed how insiders execute their trading. Second, there may still not have been enough time for the implementation to change insiders' behavior. Finally, as we have seen in our previous analyses, insiders in our sample do not in general trade profitably when purchasing or selling shares in their own firms. This could indicate that previous regulations in place have already been effective and that MAR has not contributed further.

6. Discussion

In this section we will review our results from an international business context. We will start by examining our findings in the light of our three research questions and continue by discussing the general implications of our research. We will then comment on how our choice of methodology might have influenced the results and discuss general limitations with the thesis. The section concludes by suggesting directions for future research.

6.1 Answers to our Research Questions

While several scholars have analyzed insider trading with outside investors in mind and proposed investment strategies based on insiders' trading patterns, the central theme of this thesis is to determine the actual returns earned by insiders and whether they as a group perform better than the market. This has been done on the basis of three research questions which will be answered below.

i. Do corporate insiders in European countries earn abnormal returns when trading shares in their own firms?

The results from section 5.1 aim to answer our first research question. We find statistically significant results for purchase portfolios in France and Germany. The findings in France indicate that insiders earn abnormal returns for each of the tested holding periods, 20, 60 and 120 trading days. The returns are stable and economically significant over time. In Germany, insiders earn abnormal returns of similar magnitudes but only for the shortest holding period. In general, insiders' earnings seem to be larger for shorter holding periods and declines over time. For the sale portfolios, we find that German insiders avoid significant losses in the 6 months following the sale of stocks in their firms.

Thus, to answer our first research question. Yes, insiders in European countries do earn abnormal returns when trading shares in their own firms, but only in a few countries. This is true both for purchase and sale transactions. More specifically, while insiders in France and Germany earn excessive profits when executing purchases, only German insiders avoid losses subsequent sale transactions. Thus, the overall findings suggest that profitable insider trading is not a widespread phenomenon in the European countries analyzed in this thesis.

Our results are interesting from an international perspective. Since European security markets differ in terms of size and development, a reasonable assumption would be that smaller and less developed markets contain greater information asymmetries. Based on this, and theories about asymmetric information creating opportunities for insiders, we would rather expect to find abnormal returns in these markets. Instead, the two largest and seemingly most developed markets indicate inefficiencies with significant excessive profits earned by insiders. The findings are also interesting in comparison to studies conducted in the US, arguably the most developed market in the world, where extensive research suggests

that insiders in fact are profitable when trading stocks in their own firms. Surprisingly, there seems to be a relationship between large, developed markets and insiders' returns.

An explanation to why we do not find any abnormal returns in a majority of countries could be a lack of compliance with reporting requirements. For instance, Bajo (2009) suggested that only 30% of all insider transactions in Italy was reported during 2003. While this was a long time ago, and regulation on reporting have been harmonized across countries in Europe since, it could not be ruled out that not all insiders comply with the rules. Looking at reported transactions in our sample countries gives an indication that there still may be differences in reporting standards. For example, Sweden has by far the most transactions in the sample even though its capital market is relatively small compared to countries such as France and Germany. This could either indicate that insider trading simply is more common in Sweden or that there are trades that go unreported in other countries. Considering our dataset only includes disclosed transactions, we could potentially miss the effect of unreported transactions. While we are unable to determine if this is the case, it highlights some of the difficulties in testing for anomalies in insider returns.

ii. Are there any groups of insiders that perform better than others?

To answer our second research question we analyzed how insiders' position within the firm, transaction size, firm size and industry type affect abnormal returns. While previous studies have indicated that all these factors are important determinants in explaining insiders' returns, we find little evidence of any insider groups consistently performing better in our analysis. In fact, in only two countries do we find groups of insiders that statistically and economically outperform their counterparts. More specifically, insider purchases in small firms outperform larger firms in both Romania and Germany. In Germany we also find that large sale transactions perform better than smaller trades and

that sale transactions in R&D intensive industries underperform other industries. Insiders' position within the firm do not appear to have any significant impact on returns in any of the countries.

Thus, to answer our second research question, there are groups that perform better than others. However, this is only true for two countries and we can therefore not generalize the findings across all countries in the sample.

In Germany we can pinpoint several groups within the country that outperform their counterparts. Industry type, firm size and transaction size all seem to have an impact on insiders' profits. This makes an interesting comparison to France, where purchase transactions in aggregate earn abnormal returns for all holding periods, but no insider groups perform better than others. Since none of the trade- or firm-specific determinants analyzed contribute to explaining abnormal returns in France, it could be the case that individual insider characteristics are better explanatory factors. For example, other studies have suggested that risk attitude, year of birth and gender, all could have an impact on profits earned by insiders (Kallunki et al., 2018; Hillier et al., 2015). Studying individual factors could potentially shed more light on insider trading behavior in other countries as well.

Considering previous literature being relatively unanimous in that the trade- and firm-specific factors we have tested in some way affect abnormal returns, our findings, or rather lack of them, are quite surprising. For instance, scholars have argued that both small and large transactions should yield greater returns. But in our case, we only find evidence for this in one out of eight countries. Even though we perhaps would not expect the result to go in the same direction in all countries, the lack of significant results between groups is striking.

Although our results provide little answer to the question of whether certain insider groups perform better than others across all countries, it sheds, to some extent, light on which insider groups that trade profitably in their firms. For instance, insiders in small- and medium-sized firms earn abnormal returns in a majority of countries. Similarly, while insiders in small firms earn profits in four out of eight countries, we find no significant results for large firms in any of the countries.

iii. Has the implementation of MAR had any impact on insiders' abnormal returns?

Our final research question is analyzed in section 5.6. For the purchase portfolios we only find evidence for MAR having an effect on insiders' profits in one country, Denmark. The finding is economically large and indicates that following the implementation of the regulation, insiders' abnormal returns have been completely phased out and even turned negative. For the sale portfolios we find no such evidence for any of the countries.

While we do find statistical evidence for a shift in abnormal returns in Denmark in the period after the implementation of MAR, it could be questioned whether this could be attributed to MAR and not other country-specific events. Since the regulation should have had an effect across all countries in our sample, we would have expected to observe an impact not only in Denmark. As previously mentioned, Denmark is also the country in the sample where MAR had the least impact in terms of reporting requirements, which further strengthens the view that other factors could be in play.

To answer our question, we cannot find evidence that the implementation of MAR has had any significant impact on insiders' abnormal returns across countries, at least not at this stage. However, as previously discussed, it may take time for a regulation to have an effect and it may therefore be too early to evaluate its effectiveness.

MAR has been implemented by the EU partly to make security markets fairer between insiders and outsiders. One factor in this is to reduce, or even eliminate insiders' profits. Therefore, from a policy perspective, our findings suggest that MAR lack what is necessary to curb some of the damaging impacts insider trading could have on security markets. However, from our overall findings, it can be discussed whether it was necessary in the first place to impose stricter regulations on the countries investigated. According to our results, insiders in Europe in general do not seem to trade on valuable information. With that said, our sample only covers 8 out of 28 countries within the EU and it is possible that MAR have had a greater impact in the remaining 20 countries.

6.2 General Implications of our Research

Overall, the analyses in this thesis are characterized by ambiguous results. Considering our study is conducted on multiple countries, with different findings in each one of them, it is difficult to summarize the results and draw general conclusions. A majority of earlier studies separates themselves from ours in two ways. First, they are conducted on a single country, and second, they analyze insider trading in the US market. The implication of this is that much of what has been said about, and taken as given within the topic of insider trading, is a generalization of the findings made in one country. Our thesis displays the complexity in analyzing cross-country data and highlights that findings in the US not necessarily can be applied to other countries.

However, one general trend we can point to is that our significant results are of a magnitude that make them important from an economical perspective. For the groups that seem to trade on valuable information, the abnormal returns are surprisingly large, in general between 15%–40% on an annual basis. While it is questionable whether these returns can be sustained over time, even smaller returns would have been enough to claim that the strong form of market efficiency is debatable. Thus, our results follow the general

conception about the strong-form being an extreme form of efficiency rather than a realistic description of markets. In line with this, as indicated by the economical impact of our results, deviations from the strong form evidently appear in all of the sample countries.

Much of the debate concerning insider trading is centered around regulations and how they should be designed. From our analysis on this topic, we concluded that MAR has not had any significant impact on insiders' returns in the countries in our study, which raises the question whether the means actually justifies the end. New regulations do not come without costs, for all parties involved. Time and money has been spent on EU-level to negotiate and develop new frameworks, which have been passed on to each country's financial supervisory authority, responsible for administration and regulation on a local level. Moreover, a substantial share of the burden has been placed on the individual companies, who in order to comply with regulations must spend time and resources on additional administrative tasks. This burden is even higher in relative terms for small firms who need to apply the same rules as their much larger counterparts. In the end, these costs will likely be placed on the citizens in the form of taxes and higher prices.

One of the prime arguments for insider trading regulation is that it creates fairer markets and thus reduce costs for the society, but does the benefits with MAR really outweigh the additional costs? Our analysis suggests that previous regulations have worked sufficiently in a majority of markets, without the need for further restrictions on insider trading. While a general conception is that insiders have an advantage in the markets that must be limited, which may well be true, we find little evidence of insiders actually exploiting this advantage in European countries, at least in the countries analyzed in this thesis. Legislation must be balanced so that it maintains trust in the markets without being too restrictive and administratively expensive. Furthermore, too restrictive laws could make insiders more hesitant trading shares in their own firms, which is not an optimal outcome

either. Oftentimes it is desired that executives and officers own stakes in the firm in order to align their interests with that of the shareholders. Even if we are yet to see the full effect of MAR, the discussion is relevant when assessing the overall implications of imposing stricter regulations. While insider trading may have negative effects on outside investors, it is equally important to consider the costs of regulations and how these affect stakeholders and the society as a whole.

To conclude this section, insider trading differs between countries and there are no principles that can be applied to all markets. While we do find that certain insiders trade profitably, and that specific determinants have explanatory power in some countries, the results cannot be generalized across the whole sample. As a consequence of this, it could be questioned whether it is reasonable to impose unified regulations across the EU when there are evident differences in insiders' profits between the member countries. In particular when considering that a majority of countries in our sample do not show any signs of profitable insider trading in aggregate.

6.3 Limitations with the Thesis

It should be noted that our choice of methodology is likely to influence the outcome of the study, as pointed out by Eckbo and Smith (1998). They tested both the event study and a performance evaluation method similar to ours in their paper and found that the two approaches yielded different results. While the event study methodology indicated abnormal returns, the performance evaluation approach did not. Thus, comparing our results to other papers may not necessarily provide the whole picture and there is a possibility that our findings would be more in line with other authors if we had applied comparable methodologies. Although our findings could be replicated by others using the same methodology, a different approach could potentially generate different results.

It should also be acknowledged that our approach in this thesis has certain limitations. The methodology is well-suited to answer our research questions, namely whether insiders earn abnormal returns when trading shares in their own firms. However, when we fail to find any systematic evidence across countries in our regressions, it does not provide any further answers as to why we observe what we observe. In other words, we can determine whether insiders of a particular group earns abnormal returns or not, but when theory fails to explain the results, we are left to speculate about the implications. Thus, a model where we could incorporate country-specific differences and other relevant factors could potentially shed more light on our observations and help us better explain our results.

Due to our chosen methodology, with rolling portfolios mimicking insiders' trades, we occasionally end up with portfolios without any stocks. This primarily happens when we test the 20 trading days holding period in smaller markets and in certain cases when we divide the sample in smaller groups to analyze determinants. Rather than excluding these from the analysis we set the portfolio return to zero, which could potentially distort our results. To exemplify, if the market performed well while our purchase portfolios were empty, the abnormal returns would be downwardly biased, and vice versa. Under the assumption that the market have a long-term positive trend, our estimated abnormal returns for the purchase portfolios could then be depressed whereas the returns for the sale portfolios could be inflated. Although empty portfolios is a relatively rare occurrence in our study, it should be noted that it could influence the results.

Our categorizations could have further implications for our results. As discussed earlier, R&D intensive firms were categorized based on their industry classification, rather than actual R&D spending. Thus, a categorization based on actual spending, or a better proxy, could have produced more accurate results. Similarly, firm size was categorized based on annual market capitalization whereas daily data would have been a more precise measure.

Due to this, firms could have ended up in the wrong size category if the market value decreased or increased significantly over a year. Another limitation could stem from our definition of transaction size. As we saw in table 13, it appears to be a relationship between firm size and transaction size, which could make it difficult to distinguish which effect is in play. Abnormal returns in small firms could partly be driven by smaller transactions and vice versa.

A relevant difference between our study and previous research on insider trading is the sample period. While our results are based on a period covering 7 years of transactions, Jeng et al. (2003) for instance, analyzes transactions over 21 years. Our short sample period could reduce the statistical power of our results and thereby increase the risk of type 2 errors, that is, wrongfully accept the null hypothesis (Hae-Young, 2015). In other words, we may forgo meaningful relationships that actually exists. Additionally, our holding periods are merely a proxy for the period of time insiders hold their stocks, as it is impossible to know how long they are actually held. Thus, if our proxies differ significantly from the actual holding periods, our findings may not reflect reality.

On a final note, all our tests have been conducted with CAPM and the Carhart four-factor model as estimation models. The limitations with CAPM were discussed in section 4.3.1, but there could also be difficulties with the Carhart four-factor model when analyzing Romania and Poland. As we could not find country specific data for these countries, we used European factors, which do not necessarily mirror the actual risk-factors for the two countries.

6.4 Directions for Future Research

This thesis has several implications for future research. Firstly, our results give a mixed picture of abnormal returns across the investigated countries. It is likely that the

differences in our findings stem from country-specific factors. Due to the scope of this work, some of these have only been touched upon in a qualitatively manner. For future cross-country studies, a deeper quantitative analysis of the impact of country characteristics could potentially shed some additional light on our findings.

Secondly, and in relation to the implementation of MAR, a welcomed contribution to the field would be a study conducted when sufficient time for MAR to be fully implemented has passed. While we make no effort in hypothesizing when this could be, we do not expect it to be fully implemented yet. Further studies could either help support our findings, or add additional insights that are yet in too close proximity to the implementation for us to reveal. Furthermore, including countries not part of this study could very well legitimize the implementation of MAR. No matter the outcome, a valid study would be to estimate the costs of the implementation for different stakeholders within society and relate this to the costs insider trading brings to outside investors.

Thirdly, to our knowledge, few earlier studies have investigated the relationship between R&D intensive industries and insiders' abnormal returns. Our thesis therefore contributes to the field and to scholars that aim to test for abnormal returns based on industry type. While our results do not find any conclusive evidence for R&D intensive industries being a solid proxy for asymmetric information across Europe, a different categorization could potentially generate a different outcome.

Finally, although our results indicate that insiders in aggregate outperform the market for purchases in France, we cannot find any insider groups that outperforms others. Based on this, we hypothesize that other individual traits might be better determinants in explaining abnormal returns. As much of the current research is concentrated on trade- and firm-specific factors, it would be valuable for future studies to look further into individual characteristics and how they relate to insiders' returns.

7. Conclusion

In this thesis we have analyzed the returns earned by corporate insiders in eight European countries when they trade shares in their own firms. More specifically, we have analyzed whether portfolios that separately mimic insiders' purchase and sale transactions perform better than the market in each country between 2012–2018. While previous research on the US market is rather unanimous in that insiders earn profits from their trades, our overall results suggest that this is not the case in the countries in our sample. For purchase transactions we find evidence of abnormal returns in two countries while only one country indicate abnormal returns for sale transactions.

We continue our analysis by investigating if certain insider groups perform better than others by testing how insiders' position within the firm, transaction size, firm size and industry type affect returns. The results are dispersed and there are no uniform patterns across the countries. Instead, it appears that different characteristics matter in different markets.

We end the study by examining if the latest EU regulation on insider trading, MAR, has had any impact on insiders' profits. We find that the regulation has had a significant effect in only one country, but conclude that this likely can be explained by other country-specific events associated with the time period, rather than a direct impact from the regulation. Based on this, we argue that the regulation either is ineffective or that it is still too early to observe the full effect. Meanwhile, profitable insider trading does not appear to be a widespread concern which could indicate that previous legislation has been sufficient.

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Appendix

Abnormal returns – Purchase portfolios

Denmark		Coef.	Std. Err.	t-stat	P-value	R-sq
20 days	RMRF	0.4480	0.0325	13.77	0.000	0.12
	SMB	0.0188	0.0878	0.21	0.830	
	HML	0.1221	0.0867	1.41	0.159	
	MOM	-0.1560	0.0631	-2.47	0.014	
	alpha	0.0005	0.0003	1.73	0.083	
60 days	RMRF	0.4917	0.0266	18.50	0.000	0.18
	SMB	0.1532	0.0717	2.14	0.033	
	HML	0.1401	0.0709	1.98	0.048	
	MOM	0.0046	0.0516	0.09	0.929	
	alpha	0.0003	0.0003	1.24	0.216	
120 days	RMRF	0.4893	0.0233	21.04	0.000	0.23
	SMB	0.1249	0.0628	1.99	0.047	
	HML	0.1230	0.0620	1.98	0.047	
	MOM	0.0163	0.0451	0.36	0.718	
	alpha	0.0004	0.0002	1.75	0.080	

France		Coef.	Std. Err.	t-stat	P-value	R-sq
20 days	RMRF	0.7005	0.0435	16.11	0.000	0.19
	SMB	0.5014	0.1109	4.52	0.000	
	HML	-0.2289	0.0829	-2.76	0.006	
	MOM	-0.1844	0.0604	-3.05	0.002	
	alpha	0.0006	0.0003	1.98	0.049	
60 days	RMRF	0.7911	0.0351	22.54	0.000	0.32
	SMB	0.5737	0.0896	6.41	0.000	
	HML	-0.2854	0.0669	-4.26	0.000	
	MOM	-0.2933	0.0488	-6.01	0.000	
	alpha	0.0007	0.0002	2.88	0.004	
120 days	RMRF	0.8053	0.0303	26.55	0.000	0.39
	SMB	0.5900	0.0774	7.63	0.000	
	HML	-0.2010	0.0578	-3.48	0.001	
	MOM	-0.2373	0.0421	-5.63	0.000	
	alpha	0.0005	0.0002	2.56	0.011	

Germany		Coef.	Std. Err.	t-stat	P-value	R-sq
20 days	RMRF	0.6846	0.0406	16.88	0.000	0.18
	SMB	0.4460	0.1063	4.20	0.000	
	HML	-0.2649	0.0836	-3.17	0.002	
	MOM	-0.1159	0.0614	-1.89	0.059	
	alpha	0.0006	0.0003	2.03	0.042	
60 days	RMRF	0.6610	0.0291	22.74	0.000	0.31
	SMB	0.2813	0.0762	3.69	0.000	
	HML	-0.2148	0.0599	-3.59	0.000	
	MOM	0.0251	0.0440	0.57	0.569	
	alpha	0.0002	0.0002	0.94	0.349	
120 days	RMRF	0.6550	0.0256	25.55	0.000	0.37
	SMB	0.2449	0.0672	3.64	0.000	
	HML	-0.1980	0.0528	-3.75	0.000	
	MOM	0.0581	0.0388	1.50	0.135	
	alpha	0.0002	0.0002	1.08	0.281	

Greece		Coef.	Std. Err.	t-stat	P-value	R-sq
20 days	RMRF	0.9411	0.0397	23.73	0.000	0.27
	SMB	0.1399	0.2708	0.52	0.605	
	HML	0.4568	0.2960	1.54	0.123	
	MOM	-0.3726	0.2143	-1.74	0.082	
	alpha	-0.0003	0.0011	-0.28	0.778	
60 days	RMRF	0.9940	0.0412	24.10	0.000	0.28
	SMB	0.5044	0.2816	1.79	0.073	
	HML	0.4568	0.3079	1.48	0.138	
	MOM	-0.3008	0.2229	-1.35	0.177	
	alpha	-0.0007	0.0011	-0.62	0.533	
120 days	RMRF	1.0201	0.0415	24.58	0.000	0.28
	SMB	0.5878	0.2834	2.07	0.038	
	HML	0.3923	0.3098	1.27	0.206	
	MOM	-0.3075	0.2243	-1.37	0.171	
	alpha	-0.0006	0.0011	-0.57	0.568	

Italy		Coef.	Std. Err.	t-stat	P-value	R-sq
20 days	RMRF	0.5911	0.0331	17.85	0.000	0.27
	SMB	0.1628	0.1040	1.57	0.118	
	HML	-0.1017	0.0958	-1.06	0.289	
	MOM	-0.0454	0.0636	-0.71	0.476	
	alpha	0.0002	0.0003	0.64	0.521	
60 days	RMRF	0.6933	0.0339	20.47	0.000	0.32
	SMB	0.2345	0.1064	2.20	0.028	
	HML	-0.2861	0.0979	-2.92	0.004	
	MOM	-0.2398	0.0651	-3.68	0.000	
	alpha	0.0002	0.0003	0.48	0.634	
120 days	RMRF	0.7046	0.0342	20.59	0.000	0.35
	SMB	0.1117	0.1075	1.04	0.299	
	HML	-0.2405	0.0990	-2.43	0.015	
	MOM	-0.3196	0.0658	-4.86	0.000	
	alpha	0.0002	0.0003	0.57	0.572	

Poland		Coef.	Std. Err.	t-stat	P-value	R-sq
20 days	RMRF	0.3722	0.0361	10.31	0.000	0.06
	SMB	0.1284	0.0940	1.37	0.172	
	HML	0.0706	0.0993	0.71	0.477	
	MOM	-0.0589	0.0727	-0.81	0.418	
	alpha	0.0006	0.0004	1.74	0.082	
60 days	RMRF	0.3154	0.0334	9.45	0.000	0.06
	SMB	0.0525	0.0870	0.60	0.546	
	HML	0.0498	0.0919	0.54	0.588	
	MOM	-0.0413	0.0673	-0.61	0.540	
	alpha	-0.0002	0.0003	-0.62	0.537	
120 days	RMRF	0.3175	0.0391	8.11	0.000	0.04
	SMB	0.1301	0.1020	1.28	0.202	
	HML	0.0790	0.1077	0.73	0.463	
	MOM	-0.0738	0.0789	-0.94	0.350	
	alpha	-0.0002	0.0004	-0.41	0.681	

Romania		Coef.	Std. Err.	t-stat	P-value	R-sq
20 days	RMRF	-0.0164	0.8476	-0.02	0.985	0.00
	SMB	-0.7917	2.2442	-0.35	0.724	
	HML	-0.6842	2.4410	-0.28	0.779	
	MOM	2.4525	1.7948	1.37	0.172	
	alpha	0.0115	0.0090	1.28	0.199	
60 days	RMRF	0.1407	0.4105	0.34	0.732	0.00
	SMB	-0.4556	1.0867	-0.42	0.675	
	HML	-0.1377	1.1820	-0.12	0.907	
	MOM	1.1352	0.8691	1.31	0.192	
	alpha	0.0067	0.0043	1.54	0.124	
120 days	RMRF	0.2103	0.3132	0.67	0.502	0.00
	SMB	-0.3761	0.8291	-0.45	0.650	
	HML	-0.1613	0.9018	-0.18	0.858	
	MOM	0.8823	0.6631	1.33	0.183	
	alpha	0.0055	0.0033	1.65	0.098	

Sweden		Coef.	Std. Err.	t-stat	P-value	R-sq
20 days	RMRF	-0.0390	0.0524	-0.75	0.456	0.01
	SMB	0.3090	0.1329	2.33	0.020	
	HML	0.0859	0.1187	0.72	0.469	
	MOM	-0.1476	0.0876	-1.69	0.092	
	alpha	0.0002	0.0004	0.53	0.593	
60 days	RMRF	0.0134	0.0441	0.30	0.762	0.01
	SMB	0.2516	0.1118	2.25	0.025	
	HML	0.0419	0.0998	0.42	0.675	
	MOM	-0.1234	0.0737	-1.67	0.094	
	alpha	-0.0001	0.0004	-0.34	0.730	
120 days	RMRF	0.0343	0.0557	0.62	0.538	0.00
	SMB	0.3020	0.1415	2.13	0.033	
	HML	0.0238	0.1263	0.19	0.851	
	MOM	-0.1011	0.0933	-1.08	0.279	
	alpha	0.0001	0.0005	0.20	0.844	

Abnormal returns – Sale portfolios

Denmark		Coef.	Std. Err.	t-stat	P-value	R-sq
20 days	RMRF	0.6507	0.0344	18.94	0.000	0.21
	SMB	0.0028	0.0928	0.03	0.976	
	HML	0.4690	0.0914	5.13	0.000	
	MOM	-0.0558	0.0666	-0.84	0.402	
	alpha	0.0002	0.0003	0.56	0.578	
60 days	RMRF	0.6722	0.0299	22.48	0.000	0.27
	SMB	0.0202	0.0808	0.25	0.803	
	HML	0.4676	0.0796	5.88	0.000	
	MOM	0.0020	0.0580	0.03	0.972	
	alpha	0.0002	0.0003	0.66	0.508	
120 days	RMRF	0.7174	0.0274	26.19	0.000	0.33
	SMB	0.0510	0.0740	0.69	0.491	
	HML	0.4925	0.0729	6.76	0.000	
	MOM	-0.0289	0.0531	-0.54	0.586	
	alpha	0.0003	0.0003	1.15	0.249	

France		Coef.	Std. Err.	t-stat	P-value	R-sq
20 days	RMRF	0.7164	0.0314	22.84	0.000	0.32
	SMB	0.4027	0.0800	5.03	0.000	
	HML	-0.2922	0.0598	-4.89	0.000	
	MOM	0.0909	0.0436	2.09	0.037	
	alpha	0.0001	0.0002	0.32	0.751	
60 days	RMRF	0.8296	0.0244	34.05	0.000	0.51
	SMB	0.4454	0.0621	7.17	0.000	
	HML	-0.2950	0.0465	-6.35	0.000	
	MOM	0.1071	0.0339	3.16	0.002	
	alpha	0.0000	0.0002	0.12	0.905	
120 days	RMRF	0.8426	0.0217	38.78	0.000	0.58
	SMB	0.4389	0.0554	7.92	0.000	
	HML	-0.2495	0.0414	-6.02	0.000	
	MOM	0.1279	0.0302	4.24	0.000	
	alpha	-0.0001	0.0002	-0.38	0.701	

Germany		Coef.	Std. Err.	t-stat	P-value	R-sq
20 days	RMRF	0.7267	0.0848	8.57	0.000	0.06
	SMB	0.4975	0.2222	2.24	0.025	
	HML	0.2691	0.1747	1.54	0.124	
	MOM	0.3094	0.1284	2.41	0.016	
	alpha	-0.0011	0.0006	-1.68	0.094	
60 days	RMRF	0.9191	0.0904	10.17	0.000	0.07
	SMB	0.9504	0.2369	4.01	0.000	
	HML	0.1539	0.1862	0.83	0.408	
	MOM	0.3325	0.1369	2.43	0.015	
	alpha	0.0000	0.0007	-0.07	0.948	
120 days	RMRF	0.7897	0.0724	10.91	0.000	0.07
	SMB	0.8122	0.1898	4.28	0.000	
	HML	-0.0276	0.1492	-0.19	0.853	
	MOM	0.1697	0.1097	1.55	0.122	
	alpha	-0.0014	0.0006	-2.62	0.009	

Greece		Coef.	Std. Err.	t-stat	P-value	R-sq
20 days	RMRF	1.1092	0.0405	27.37	0.000	0.33
	SMB	-0.1579	0.2765	-0.57	0.568	
	HML	0.2609	0.3017	0.86	0.387	
	MOM	-0.2476	0.2186	-1.13	0.258	
	alpha	0.0003	0.0011	0.81	0.412	
60 days	RMRF	1.2095	0.0407	29.73	0.000	0.37
	SMB	0.1720	0.2776	0.62	0.536	
	HML	0.3703	0.3030	1.22	0.222	
	MOM	-0.4084	0.2195	-1.86	0.063	
	alpha	-0.0004	0.0011	-0.32	0.749	
120 days	RMRF	5.1564	1.3805	3.74	0.000	0.01
	SMB	6.1603	9.4208	0.65	0.513	
	HML	17.0702	10.2808	1.66	0.097	
	MOM	-1.5978	7.4490	-0.21	0.830	
	alpha	-0.0220	0.0376	-0.59	0.558	

Italy		Coef.	Std. Err.	t-stat	P-value	R-sq
20 days	RMRF	0.7799	0.0397	19.66	0.000	0.27
	SMB	0.5435	0.1246	4.36	0.000	
	HML	-0.1930	0.1147	-1.68	0.093	
	MOM	-0.0562	0.0762	-0.74	0.461	
	alpha	-0.0007	0.0004	-1.93	0.054	
60 days	RMRF	0.7582	0.0431	17.60	0.000	0.22
	SMB	0.4836	0.1353	3.57	0.000	
	HML	-0.2766	0.1246	-2.22	0.026	
	MOM	0.0597	0.0828	0.72	0.471	
	alpha	-0.0004	0.0004	-0.95	0.341	
120 days	RMRF	0.8212	0.0665	12.34	0.000	0.12
	SMB	0.6159	0.2090	2.95	0.003	
	HML	-0.2783	0.1924	-1.45	0.148	
	MOM	-0.1268	0.1279	-0.99	0.322	
	alpha	-0.0010	0.0006	-1.60	0.110	

Poland		Coef.	Std. Err.	t-stat	P-value	R-sq
20 days	RMRF	0.4459	0.0452	9.86	0.000	0.06
	SMB	-0.1260	0.1178	-1.07	0.285	
	HML	-0.0213	0.1244	-0.17	0.864	
	MOM	0.0115	0.0912	0.13	0.900	
	alpha	0.0012	0.0005	2.63	0.009	
60 days	RMRF	0.3954	0.0309	12.78	0.000	0.10
	SMB	0.0258	0.0806	0.32	0.748	
	HML	0.0270	0.0851	0.32	0.751	
	MOM	-0.0794	0.0624	-1.27	0.203	
	alpha	0.0009	0.0003	2.73	0.006	
120 days	RMRF	0.4495	0.0458	9.81	0.000	0.06
	SMB	0.0159	0.1193	0.13	0.894	
	HML	0.0309	0.1261	0.25	0.806	
	MOM	-0.0399	0.0924	-0.43	0.666	
	alpha	0.0010	0.0005	2.12	0.035	

Romania		Coef.	Std. Err.	t-stat	P-value	R-sq
20 days	RMRF	0.5196	0.0508	10.22	0.000	0.06
	SMB	0.1685	0.1346	1.25	0.211	
	HML	-0.1638	0.1464	-1.12	0.263	
	MOM	0.0470	0.1076	0.44	0.663	
	alpha	0.0006	0.0005	1.20	0.228	
60 days	RMRF	0.4354	0.0507	8.60	0.000	0.04
	SMB	-0.0241	0.1341	-0.18	0.857	
	HML	-0.2546	0.1459	-1.75	0.081	
	MOM	-0.0382	0.1072	-0.36	0.722	
	alpha	0.0005	0.0005	0.91	0.361	
120 days	RMRF	0.4074	0.0353	11.55	0.000	0.07
	SMB	0.0203	0.0934	0.22	0.828	
	HML	-0.0774	0.1016	-0.76	0.446	
	MOM	0.0418	0.0747	0.56	0.576	
	alpha	0.0000	0.0004	0.00	0.999	

Sweden		Coef.	Std. Err.	t-stat	P-value	R-sq
20 days	RMRF	0.7075	0.0465	15.20	0.000	0.15
	SMB	0.2751	0.1182	2.33	0.020	
	HML	-0.0556	0.1055	-0.53	0.598	
	MOM	-0.1106	0.0779	-1.42	0.156	
	alpha	-0.0005	0.0004	-1.22	0.224	
60 days	RMRF	0.7209	0.0329	21.93	0.000	0.25
	SMB	0.3538	0.0835	4.24	0.000	
	HML	0.0053	0.0745	0.07	0.943	
	MOM	0.0334	0.0550	0.61	0.543	
	alpha	-0.0002	0.0003	-0.59	0.554	
120 days	RMRF	0.6684	0.0240	27.89	0.000	0.36
	SMB	0.2720	0.0609	4.47	0.000	
	HML	-0.0070	0.0543	-0.13	0.897	
	MOM	0.0640	0.0401	1.59	0.111	
	alpha	-0.0003	0.0002	-1.31	0.190	

Position within the firm – Purchase Portfolios

Denmark		Coef.	Std. Err.	t-stat	P-value	R-sq
Directors	RMRF	0.5946	0.0303	19.65	0.00	0.21
	SMB	0.2572	0.0402	6.40	0.00	
	HML	0.1263	0.0307	4.11	0.00	
	MOM	0.0463	0.0315	1.47	0.14	
	alpha	0.0000	0.0003	0.14	0.89	
Officers	RMRF	0.7193	0.0436	16.50	0.00	0.19
	SMB	0.0198	0.0579	0.34	0.73	
	HML	0.3018	0.0443	6.82	0.00	
	MOM	0.0752	0.0453	1.66	0.10	
	alpha	0.0004	0.0004	1.18	0.24	
Top Executives	RMRF	0.4534	0.0320	14.19	0.00	0.15
	SMB	0.0201	0.0424	0.47	0.64	
	HML	0.1899	0.0324	5.85	0.00	
	MOM	-0.0143	0.0332	-0.43	0.67	
	alpha	0.0006	0.0003	2.12	0.03	

France		Coef.	Std. Err.	t-stat	P-value	R-sq
Directors	RMRF	0.7724	0.0350	22.04	0.00	0.35
	SMB	0.3433	0.0544	6.31	0.00	
	HML	-0.1128	0.0485	-2.32	0.02	
	MOM	-0.0437	0.0391	-1.12	0.26	
	alpha	0.0005	0.0002	2.34	0.02	
Officers	RMRF	0.6276	0.0478	13.14	0.00	0.16
	SMB	0.2605	0.0741	3.52	0.00	
	HML	-0.0078	0.0661	-0.12	0.91	
	MOM	0.1231	0.0533	2.31	0.02	
	alpha	0.0004	0.0003	1.44	0.15	
Top Executives	RMRF	0.8417	0.0454	18.53	0.00	0.30
	SMB	0.4095	0.0705	5.81	0.00	
	HML	0.1519	0.0629	2.41	0.02	
	MOM	-0.3206	0.0507	-6.33	0.00	
	alpha	0.0005	0.0003	1.86	0.06	

Germany		Coef.	Std. Err.	t-stat	P-value	R-sq
Directors	RMRF	0.6607	0.0357	18.50	0.00	0.24
	SMB	0.3153	0.0635	4.97	0.00	
	HML	-0.0127	0.0546	-0.23	0.82	
	MOM	0.0342	0.0441	0.77	0.44	
	alpha	0.0002	0.0002	0.67	0.51	
Officers	RMRF	0.7943	0.0582	13.65	0.00	0.19
	SMB	0.1051	0.1034	1.02	0.31	
	HML	-0.0857	0.0889	-0.96	0.34	
	MOM	-0.0331	0.0719	-0.46	0.65	
	alpha	0.0006	0.0004	1.47	0.14	
Top Executives	RMRF	0.8367	0.0377	22.18	0.00	0.28
	SMB	0.5467	0.0670	8.16	0.00	
	HML	-0.0556	0.0576	-0.97	0.33	
	MOM	-0.0190	0.0466	-0.41	0.68	
	alpha	0.0005	0.0003	1.87	0.06	

Greece		Coef.	Std. Err.	t-stat	P-value	R-sq
Directors	RMRF	0.6012	0.0307	19.58	0.00	0.40
	SMB	0.0865	0.0524	1.65	0.10	
	HML	0.4071	0.0520	7.83	0.00	
	MOM	-0.1144	0.0306	-3.73	0.00	
	alpha	-0.0003	0.0006	-0.52	0.61	
Officers	RMRF	0.9629	0.0595	16.19	0.00	0.48
	SMB	0.2303	0.1015	2.27	0.02	
	HML	0.9170	0.1007	9.10	0.00	
	MOM	-0.9022	0.0594	-15.19	0.00	
	alpha	-0.0005	0.0011	-0.48	0.63	
Top Executives	RMRF	0.2753	0.0320	8.60	0.00	0.32
	SMB	-0.0889	0.0546	-1.63	0.10	
	HML	0.2512	0.0542	4.63	0.00	
	MOM	-0.3896	0.0320	-12.19	0.00	
	alpha	0.0008	0.0006	1.29	0.20	

Italy		Coef.	Std. Err.	t-stat	P-value	R-sq
Directors	RMRF	0.9242	0.0368	25.12	0.00	0.38
	SMB	0.5189	0.0701	7.40	0.00	
	HML	0.1061	0.0609	1.74	0.08	
	MOM	-0.1285	0.0441	-2.91	0.00	
	alpha	0.0001	0.0004	0.14	0.89	
Officers	RMRF	0.7244	0.0445	16.26	0.00	0.17
	SMB	0.4493	0.0849	5.29	0.00	
	HML	-0.0563	0.0738	-0.76	0.45	
	MOM	0.0255	0.0534	0.48	0.63	
	alpha	-0.0001	0.0005	-0.25	0.80	
Top Executives	RMRF	0.6651	0.0313	21.24	0.00	0.31
	SMB	-0.0456	0.0597	-0.76	0.45	
	HML	-0.5036	0.0519	-9.71	0.00	
	MOM	0.0753	0.0376	2.01	0.05	
	alpha	0.0001	0.0003	0.42	0.67	

Poland		Coef.	Std. Err.	t-stat	P-value	R-sq
Directors	RMRF	0.2995	0.0731	4.10	0.00	0.01
	SMB	0.3348	0.1888	1.77	0.08	
	HML	0.2324	0.2021	1.15	0.25	
	MOM	-0.1436	0.1474	-0.97	0.33	
	alpha	0.0004	0.0007	0.51	0.61	
Officers	RMRF	0.3246	0.0595	5.45	0.00	0.02
	SMB	0.2810	0.1539	1.83	0.07	
	HML	-0.0472	0.1647	-0.29	0.78	
	MOM	-0.2270	0.1201	-1.89	0.06	
	alpha	-0.0012	0.0006	-1.97	0.05	
Top Executives	RMRF	0.2749	0.0372	7.38	0.00	0.03
	SMB	-0.0468	0.0963	-0.49	0.63	
	HML	-0.1029	0.1030	-1.00	0.32	
	MOM	-0.0457	0.0752	-0.61	0.54	
	alpha	-0.0006	0.0004	-1.66	0.10	

Romania		Coef.	Std. Err.	t-stat	P-value	R-sq
Directors	RMRF	0.2453	0.2552	0.96	0.34	0.00
	SMB	-0.2520	0.6627	-0.38	0.70	
	HML	-0.3256	0.7273	-0.45	0.65	
	MOM	0.7299	0.5344	1.37	0.17	
	alpha	0.0030	0.0027	1.12	0.26	
Officers	RMRF	0.3289	0.0435	7.56	0.00	0.03
	SMB	0.0161	0.1130	0.14	0.89	
	HML	0.1155	0.1240	0.93	0.35	
	MOM	-0.0856	0.0911	-0.94	0.35	
	alpha	0.0011	0.0005	2.46	0.01	
Top Executives	RMRF	0.2446	0.0708	3.46	0.00	0.01
	SMB	-0.1301	0.1838	-0.71	0.48	
	HML	0.3890	0.2017	1.93	0.05	
	MOM	-0.0460	0.1482	-0.31	0.76	
	alpha	0.0007	0.0007	0.97	0.33	

Sweden		Coef.	Std. Err.	t-stat	P-value	R-sq
Directors	RMRF	0.1147	0.0637	1.80	0.07	0.01
	SMB	0.3248	0.1007	3.23	0.00	
	HML	-0.1003	0.1005	-1.00	0.32	
	MOM	0.0962	0.0858	1.12	0.26	
	alpha	-0.0002	0.0005	-0.36	0.72	
Officers	RMRF	0.0690	0.0498	1.38	0.17	0.01
	SMB	0.2370	0.0788	3.01	0.00	
	HML	0.0018	0.0786	0.02	0.98	
	MOM	0.0436	0.0671	0.65	0.52	
	alpha	-0.0002	0.0004	-0.42	0.67	
Top Executives	RMRF	0.0778	0.0396	1.97	0.05	0.01
	SMB	0.2314	0.0626	3.70	0.00	
	HML	-0.0565	0.0625	-0.90	0.37	
	MOM	0.1405	0.0533	2.63	0.01	
	alpha	0.0002	0.0003	0.50	0.62	

Position within the firm – Sale portfolios

Denmark		Coef.	Std. Err.	t-stat	P-value	R-sq
Directors	RMRF	0.7205	0.0350	20.60	0.00	0.32
	SMB	-0.1434	0.0464	-3.09	0.00	
	HML	0.3573	0.0355	10.06	0.00	
	MOM	0.0259	0.0364	0.71	0.48	
	alpha	0.0003	0.0003	1.09	0.27	
Officers	RMRF	0.7361	0.0329	22.36	0.00	0.27
	SMB	0.1984	0.0437	4.54	0.00	
	HML	0.2170	0.0334	6.49	0.00	
	MOM	0.1098	0.0342	3.21	0.00	
	alpha	0.0005	0.0003	1.76	0.08	
Top Executives	RMRF	0.6660	0.0496	13.43	0.00	0.11
	SMB	0.2205	0.0658	3.35	0.00	
	HML	0.2250	0.0503	4.47	0.00	
	MOM	0.0578	0.0516	1.12	0.26	
	alpha	0.0001	0.0004	0.16	0.87	

France		Coef.	Std. Err.	t-stat	P-value	R-sq
Directors	RMRF	0.8074	0.0288	28.05	0.00	0.51
	SMB	0.2107	0.0446	4.72	0.00	
	HML	-0.1324	0.0398	-3.32	0.00	
	MOM	0.0977	0.0321	3.04	0.00	
	alpha	0.0001	0.0002	0.30	0.76	
Officers	RMRF	0.8942	0.0344	26.03	0.00	0.44
	SMB	0.3483	0.0533	6.54	0.00	
	HML	-0.2809	0.0476	-5.90	0.00	
	MOM	0.0357	0.0383	0.93	0.35	
	alpha	0.0003	0.0002	1.36	0.17	
Top Executives	RMRF	0.8597	0.0326	26.37	0.00	0.39
	SMB	0.5296	0.0506	10.48	0.00	
	HML	-0.2566	0.0451	-5.69	0.00	
	MOM	-0.0626	0.0363	-1.72	0.09	
	alpha	-0.0002	0.0002	-1.03	0.30	

Germany		Coef.	Std. Err.	t-stat	P-value	R-sq
Directors	RMRF	0.8519	0.0404	21.09	0.00	0.26
	SMB	0.6063	0.0718	8.44	0.00	
	HML	0.1232	0.0617	2.00	0.05	
	MOM	0.2412	0.0499	4.83	0.00	
	alpha	-0.0004	0.0003	-1.54	0.13	
Officers	RMRF	0.8499	0.0411	20.65	0.00	0.32
	SMB	0.2289	0.0731	3.13	0.00	
	HML	-0.0558	0.0629	-0.89	0.38	
	MOM	0.1385	0.0509	2.72	0.01	
	alpha	0.0001	0.0003	0.37	0.71	
Top Executives	RMRF	0.8757	0.1184	7.40	0.00	0.03
	SMB	0.9512	0.2104	4.52	0.00	
	HML	0.2877	0.1809	1.59	0.11	
	MOM	-0.0390	0.1463	-0.27	0.79	
	alpha	-0.0011	0.0008	-1.40	0.16	

Greece		Coef.	Std. Err.	t-stat	P-value	R-sq
Directors	RMRF	0.6691	0.0420	15.94	0.00	0.40
	SMB	-0.0397	0.0716	-0.56	0.58	
	HML	0.3565	0.0711	5.02	0.00	
	MOM	-0.3752	0.0419	-8.96	0.00	
	alpha	0.0000	0.0008	0.00	1.00	
Officers	RMRF	0.9441	0.0554	17.05	0.00	0.51
	SMB	0.1415	0.0944	1.50	0.13	
	HML	0.8944	0.0937	9.54	0.00	
	MOM	-0.8496	0.0553	-15.37	0.00	
	alpha	-0.0007	0.0010	-0.69	0.49	
Top Executives	RMRF	0.3985	0.0517	7.70	0.00	0.28
	SMB	-0.3623	0.0882	-4.11	0.00	
	HML	0.4789	0.0876	5.47	0.00	
	MOM	-0.4019	0.0517	-7.78	0.00	
	alpha	-0.0015	0.0009	-1.62	0.11	

Italy		Coef.	Std. Err.	t-stat	P-value	R-sq
Directors	RMRF	0.7672	0.0334	22.96	0.00	0.33
	SMB	0.3189	0.0637	5.01	0.00	
	HML	-0.1129	0.0554	-2.04	0.04	
	MOM	-0.0745	0.0401	-1.86	0.06	
	alpha	-0.0001	0.0003	-0.39	0.70	
Officers	RMRF	0.9877	0.0778	12.70	0.00	0.10
	SMB	0.6374	0.1483	4.30	0.00	
	HML	-0.2334	0.1289	-1.81	0.07	
	MOM	0.1204	0.0933	1.29	0.20	
	alpha	-0.0009	0.0008	-1.18	0.24	
Top Executives	RMRF	0.7574	0.0352	21.49	0.00	0.25
	SMB	0.5916	0.0672	8.80	0.00	
	HML	-0.2282	0.0584	-3.91	0.00	
	MOM	-0.0614	0.0423	-1.45	0.15	
	alpha	-0.0002	0.0004	-0.56	0.57	

Poland		Coef.	Std. Err.	t-stat	P-value	R-sq
Directors	RMRF	0.4292	0.0488	8.79	0.00	0.05
	SMB	-0.0429	0.1262	-0.34	0.73	
	HML	0.0239	0.1351	0.18	0.86	
	MOM	0.0235	0.0986	0.24	0.81	
	alpha	0.0008	0.0005	1.57	0.12	
Officers	RMRF	0.4718	0.0478	9.87	0.00	0.05
	SMB	0.1814	0.1235	1.47	0.14	
	HML	-0.1543	0.1322	-1.17	0.24	
	MOM	0.0026	0.0965	0.03	0.98	
	alpha	0.0000	0.0005	0.06	0.95	
Top Executives	RMRF	0.3924	0.0439	8.95	0.00	0.05
	SMB	0.0985	0.1133	0.87	0.39	
	HML	0.0979	0.1213	0.81	0.42	
	MOM	-0.0001	0.0885	0.00	1.00	
	alpha	0.0006	0.0004	1.25	0.21	

Romania		Coef.	Std. Err.	t-stat	P-value	R-sq
Directors	RMRF	0.3443	0.0694	4.97	0.00	0.01
	SMB	0.1937	0.1822	1.06	0.29	
	HML	-0.1719	0.2008	-0.86	0.39	
	MOM	0.0426	0.1469	0.29	0.77	
	alpha	0.0001	0.0007	0.10	0.92	
Officers	RMRF	0.4579	0.0302	15.18	0.00	0.12
	SMB	0.0538	0.0792	0.68	0.50	
	HML	-0.0858	0.0873	-0.98	0.33	
	MOM	0.0142	0.0639	0.22	0.82	
	alpha	0.0001	0.0003	0.44	0.66	
Top Executives	RMRF	0.2467	0.0586	4.21	0.00	0.01
	SMB	-0.2074	0.1539	-1.35	0.18	
	HML	-0.2116	0.1696	-1.25	0.21	
	MOM	-0.1287	0.1241	-1.04	0.30	
	alpha	0.0004	0.0006	0.69	0.49	

Sweden		Coef.	Std. Err.	t-stat	P-value	R-sq
Directors	RMRF	0.8271	0.0545	15.18	0.00	0.13
	SMB	0.5262	0.0862	6.11	0.00	
	HML	-0.1291	0.0860	-1.50	0.13	
	MOM	-0.0576	0.0734	-0.78	0.43	
	alpha	-0.0008	0.0004	-1.79	0.07	
Officers	RMRF	0.7394	0.0313	23.64	0.00	0.29
	SMB	0.3648	0.0495	7.38	0.00	
	HML	-0.1276	0.0494	-2.59	0.01	
	MOM	0.2253	0.0421	5.35	0.00	
	alpha	-0.0003	0.0002	-1.31	0.19	
Top Executives	RMRF	0.6142	0.0533	11.52	0.00	0.09
	SMB	0.2852	0.0843	3.38	0.00	
	HML	-0.0525	0.0842	-0.62	0.53	
	MOM	-0.0271	0.0719	-0.38	0.71	
	alpha	0.0002	0.0004	0.37	0.71	

Transaction size – Purchase portfolios

Denmark		Coef.	Std. Err.	t-stat	P-value	R-sq
Small	RMRF	0.5419	0.0347	15.60	0.00	0.13
	SMB	0.2608	0.0461	5.65	0.00	
	HML	0.1959	0.0353	5.56	0.00	
	MOM	0.0111	0.0361	0.31	0.76	
	alpha	0.0001	0.0003	0.41	0.68	
Medium	RMRF	0.5959	0.0228	26.14	0.00	0.30
	SMB	0.2746	0.0303	9.07	0.00	
	HML	0.2298	0.0231	9.93	0.00	
	MOM	0.0435	0.0237	1.83	0.07	
	alpha	0.0003	0.0002	1.61	0.11	
Large	RMRF	0.5847	0.0268	21.82	0.00	0.25
	SMB	0.1903	0.0356	5.35	0.00	
	HML	0.1347	0.0272	4.95	0.00	
	MOM	0.0593	0.0279	2.13	0.03	
	alpha	0.0001	0.0002	0.25	0.81	

France		Coef.	Std. Err.	t-stat	P-value	R-sq
Small	RMRF	0.7004	0.0202	34.65	0.00	0.49
	SMB	0.5235	0.0313	16.70	0.00	
	HML	0.1050	0.0280	3.75	0.00	
	MOM	-0.0341	0.0225	-1.52	0.13	
	alpha	0.0003	0.0001	2.27	0.02	
Medium	RMRF	0.7355	0.0185	39.67	0.00	0.55
	SMB	0.5663	0.0288	19.70	0.00	
	HML	0.0918	0.0257	3.58	0.00	
	MOM	-0.0477	0.0207	-2.31	0.02	
	alpha	0.0004	0.0001	3.52	0.00	
Large	RMRF	0.7894	0.0356	22.19	0.00	0.38
	SMB	0.3270	0.0552	5.93	0.00	
	HML	0.0483	0.0493	0.98	0.33	
	MOM	-0.1870	0.0397	-4.71	0.00	
	alpha	0.0006	0.0002	2.64	0.01	

Germany		Coef.	Std. Err.	t-stat	P-value	R-sq
Small	RMRF	0.7045	0.0209	33.69	0.00	0.45
	SMB	0.5462	0.0372	14.70	0.00	
	HML	0.1238	0.0320	3.88	0.00	
	MOM	0.0489	0.0258	1.89	0.06	
	alpha	0.0004	0.0001	2.84	0.00	
Medium	RMRF	0.7909	0.0205	38.62	0.00	0.55
	SMB	0.4981	0.0364	13.68	0.00	
	HML	0.0733	0.0313	2.34	0.02	
	MOM	-0.0058	0.0253	-0.23	0.82	
	alpha	0.0004	0.0001	3.17	0.00	
Large	RMRF	0.6986	0.0294	23.75	0.00	0.35
	SMB	0.2882	0.0523	5.51	0.00	
	HML	-0.0666	0.0449	-1.48	0.14	
	MOM	0.0570	0.0364	1.57	0.12	
	alpha	0.0002	0.0002	1.16	0.24	

Greece		Coef.	Std. Err.	t-stat	P-value	R-sq
Small	RMRF	0.1085	0.0131	8.26	0.00	0.21
	SMB	-0.0583	0.0224	-2.60	0.01	
	HML	0.1942	0.0222	8.74	0.00	
	MOM	-0.0212	0.0131	-1.61	0.11	
	alpha	0.0005	0.0002	2.22	0.03	
Medium	RMRF	0.1873	0.0131	14.28	0.00	0.46
	SMB	-0.1049	0.0224	-4.69	0.00	
	HML	0.3279	0.0222	14.77	0.00	
	MOM	-0.0450	0.0131	-3.43	0.00	
	alpha	0.0006	0.0002	2.29	0.02	
Large	RMRF	0.5670	0.0562	10.09	0.00	0.40
	SMB	-0.1232	0.0958	-1.29	0.20	
	HML	0.6742	0.0951	7.09	0.00	
	MOM	-0.8375	0.0561	-14.93	0.00	
	alpha	-0.0009	0.0010	-0.85	0.40	

Italy		Coef.	Std. Err.	t-stat	P-value	R-sq
Small	RMRF	0.5885	0.0160	36.81	0.00	0.52
	SMB	0.4834	0.0305	15.86	0.00	
	HML	0.0723	0.0265	2.73	0.01	
	MOM	0.0104	0.0192	0.54	0.59	
	alpha	0.0004	0.0002	2.23	0.03	
Medium	RMRF	0.7450	0.0150	49.81	0.00	0.67
	SMB	0.5479	0.0285	19.21	0.00	
	HML	0.0189	0.0248	0.76	0.45	
	MOM	-0.0292	0.0179	-1.63	0.10	
	alpha	0.0003	0.0002	1.99	0.05	
Large	RMRF	0.7378	0.0331	22.29	0.00	0.35
	SMB	0.1639	0.0631	2.60	0.01	
	HML	-0.1412	0.0548	-2.58	0.01	
	MOM	-0.1180	0.0397	-2.97	0.00	
	alpha	0.0001	0.0003	0.30	0.76	

Poland		Coef.	Std. Err.	t-stat	P-value	R-sq
Small	RMRF	0.3369	0.0911	3.70	0.00	0.01
	SMB	-0.2882	0.2354	-1.22	0.22	
	HML	-0.2098	0.2519	-0.83	0.41	
	MOM	0.1262	0.1838	0.69	0.49	
	alpha	0.0018	0.0009	1.90	0.06	
Medium	RMRF	0.3041	0.0364	8.35	0.00	0.04
	SMB	-0.0930	0.0941	-0.99	0.32	
	HML	-0.0982	0.1007	-0.97	0.33	
	MOM	-0.0031	0.0735	-0.04	0.97	
	alpha	0.0006	0.0004	1.76	0.08	
Large	RMRF	0.3140	0.0402	7.81	0.00	0.04
	SMB	0.1339	0.1039	1.29	0.20	
	HML	0.0891	0.1112	0.80	0.42	
	MOM	-0.0776	0.0812	-0.96	0.34	
	alpha	-0.0002	0.0004	-0.50	0.62	

Romania		Coef.	Std. Err.	t-stat	P-value	R-sq
Small	RMRF	0.3196	0.0230	13.91	0.00	0.11
	SMB	-0.0980	0.0604	-1.62	0.10	
	HML	0.0824	0.0665	1.24	0.22	
	MOM	0.0129	0.0487	0.26	0.79	
	alpha	0.0003	0.0002	1.17	0.24	
Medium	RMRF	0.3066	0.0298	10.27	0.00	0.06
	SMB	-0.0184	0.0784	-0.23	0.82	
	HML	0.0923	0.0864	1.07	0.29	
	MOM	0.0584	0.0632	0.92	0.36	
	alpha	0.0006	0.0003	2.03	0.04	
Large	RMRF	0.3242	0.0540	6.01	0.00	0.02
	SMB	-0.0777	0.1418	-0.55	0.58	
	HML	0.0863	0.1563	0.55	0.58	
	MOM	-0.0412	0.1143	-0.36	0.72	
	alpha	0.0014	0.0006	2.46	0.01	

Sweden		Coef.	Std. Err.	t-stat	P-value	R-sq
Small	RMRF	0.0850	0.0240	3.55	0.00	0.03
	SMB	0.2631	0.0379	6.94	0.00	
	HML	-0.0159	0.0378	-0.42	0.67	
	MOM	0.0161	0.0323	0.50	0.62	
	alpha	0.0005	0.0002	2.92	0.00	
Medium	RMRF	0.0824	0.0241	3.43	0.00	0.04
	SMB	0.2994	0.0380	7.87	0.00	
	HML	-0.0384	0.0380	-1.01	0.31	
	MOM	0.0450	0.0324	1.39	0.16	
	alpha	0.0005	0.0002	2.54	0.01	
Large	RMRF	0.1034	0.0614	1.68	0.09	0.01
	SMB	0.2949	0.0971	3.04	0.00	
	HML	-0.0875	0.0969	-0.90	0.37	
	MOM	0.1033	0.0827	1.25	0.21	
	alpha	0.0000	0.0005	-0.10	0.92	

Transaction size – Sale portfolios

Denmark		Coef.	Std. Err.	t-stat	P-value	R-sq
Small	RMRF	0.7146	0.0308	23.23	0.00	0.28
	SMB	0.2579	0.0408	6.32	0.00	
	HML	0.2662	0.0312	8.53	0.00	
	MOM	0.2173	0.0320	6.79	0.00	
	alpha	0.0006	0.0003	2.53	0.01	
Medium	RMRF	0.7959	0.0447	17.80	0.00	0.21
	SMB	0.1697	0.0594	2.86	0.00	
	HML	0.3067	0.0454	6.76	0.00	
	MOM	0.3482	0.0465	7.49	0.00	
	alpha	0.0008	0.0004	2.03	0.04	
Large	RMRF	0.7437	0.0325	22.89	0.00	0.35
	SMB	-0.1177	0.0431	-2.73	0.01	
	HML	0.3497	0.0330	10.60	0.00	
	MOM	0.0553	0.0338	1.64	0.10	
	alpha	0.0003	0.0003	0.97	0.33	

France		Coef.	Std. Err.	t-stat	P-value	R-sq
Small	RMRF	0.7838	0.0329	23.82	0.00	0.28
	SMB	0.7046	0.0510	13.81	0.00	
	HML	0.0722	0.0455	1.58	0.11	
	MOM	-0.0374	0.0367	-1.02	0.31	
	alpha	-0.0001	0.0002	-0.64	0.52	
Medium	RMRF	0.9478	0.0229	41.35	0.00	0.57
	SMB	0.7298	0.0356	20.53	0.00	
	HML	-0.0565	0.0317	-1.78	0.08	
	MOM	-0.0617	0.0256	-2.41	0.02	
	alpha	-0.0001	0.0001	-0.62	0.54	
Large	RMRF	0.8077	0.0258	31.29	0.00	0.56
	SMB	0.2224	0.0400	5.55	0.00	
	HML	-0.1652	0.0357	-4.62	0.00	
	MOM	0.0843	0.0288	2.93	0.00	
	alpha	0.0000	0.0002	-0.07	0.94	

Germany		Coef.	Std. Err.	t-stat	P-value	R-sq
Small	RMRF	0.7431	0.0356	20.86	0.00	0.24
	SMB	0.5682	0.0633	8.97	0.00	
	HML	0.0992	0.0544	1.82	0.07	
	MOM	0.1048	0.0440	2.38	0.02	
	alpha	0.0002	0.0002	0.78	0.43	
Medium	RMRF	0.8011	0.0231	34.68	0.00	0.50
	SMB	0.5013	0.0411	12.21	0.00	
	HML	0.1292	0.0353	3.66	0.00	
	MOM	0.1114	0.0286	3.90	0.00	
	alpha	-0.0001	0.0002	-0.60	0.55	
Large	RMRF	0.9214	0.0816	11.29	0.00	0.08
	SMB	0.8581	0.1450	5.92	0.00	
	HML	0.1970	0.1247	1.58	0.11	
	MOM	0.1093	0.1009	1.08	0.28	
	alpha	-0.0014	0.0006	-2.45	0.01	

Greece		Coef.	Std. Err.	t-stat	P-value	R-sq
Small	RMRF	0.2700	0.0213	12.71	0.00	0.35
	SMB	-0.1803	0.0362	-4.97	0.00	
	HML	0.3829	0.0360	10.64	0.00	
	MOM	0.0008	0.0212	0.04	0.97	
	alpha	0.0003	0.0004	0.86	0.39	
Medium	RMRF	0.5579	0.0208	26.84	0.00	0.58
	SMB	0.0796	0.0354	2.25	0.03	
	HML	0.3801	0.0352	10.80	0.00	
	MOM	-0.1575	0.0207	-7.59	0.00	
	alpha	-0.0001	0.0004	-0.24	0.81	
Large	RMRF	0.8835	0.0550	16.06	0.00	0.49
	SMB	0.1084	0.0938	1.16	0.25	
	HML	0.8381	0.0931	9.00	0.00	
	MOM	-0.8405	0.0549	-15.31	0.00	
	alpha	-0.0006	0.0010	-0.57	0.57	

Italy		Coef.	Std. Err.	t-stat	P-value	R-sq
Small	RMRF	0.7718	0.0176	43.93	0.00	0.60
	SMB	0.5638	0.0335	16.83	0.00	
	HML	-0.0853	0.0291	-2.93	0.00	
	MOM	-0.0152	0.0211	-0.72	0.47	
	alpha	-0.0001	0.0002	-0.59	0.56	
Medium	RMRF	0.8910	0.0179	49.71	0.00	0.66
	SMB	0.5377	0.0342	15.73	0.00	
	HML	-0.0603	0.0297	-2.03	0.04	
	MOM	0.0512	0.0215	2.38	0.02	
	alpha	-0.0002	0.0002	-1.11	0.27	
Large	RMRF	0.8567	0.0640	13.39	0.00	0.13
	SMB	0.6132	0.1219	5.03	0.00	
	HML	-0.0654	0.1059	-0.62	0.54	
	MOM	-0.1260	0.0767	-1.64	0.10	
	alpha	-0.0010	0.0006	-1.61	0.11	

Poland		Coef.	Std. Err.	t-stat	P-value	R-sq
Small	RMRF	0.3134	0.1132	2.77	0.01	0.01
	SMB	-0.1894	0.2925	-0.65	0.52	
	HML	-0.4390	0.3131	-1.40	0.16	
	MOM	-0.2315	0.2285	-1.01	0.31	
	alpha	0.0016	0.0011	1.39	0.17	
Medium	RMRF	0.3049	0.0382	7.99	0.00	0.04
	SMB	0.0137	0.0986	0.14	0.89	
	HML	0.0927	0.1055	0.88	0.38	
	MOM	0.0023	0.0770	0.03	0.98	
	alpha	0.0005	0.0004	1.31	0.19	
Large	RMRF	0.4620	0.0493	9.36	0.00	0.05
	SMB	0.0189	0.1275	0.15	0.88	
	HML	0.0146	0.1364	0.11	0.92	
	MOM	-0.0762	0.0996	-0.77	0.44	
	alpha	0.0011	0.0005	2.13	0.03	

Romania		Coef.	Std. Err.	t-stat	P-value	R-sq
Small	RMRF	0.4490	0.0312	14.40	0.00	0.11
	SMB	0.0195	0.0819	0.24	0.81	
	HML	-0.0170	0.0903	-0.19	0.85	
	MOM	0.0021	0.0660	0.03	0.97	
	alpha	0.0003	0.0003	0.99	0.32	
Medium	RMRF	0.4073	0.0381	10.69	0.00	0.06
	SMB	0.1157	0.1001	1.16	0.25	
	HML	0.0890	0.1104	0.81	0.42	
	MOM	-0.0268	0.0807	-0.33	0.74	
	alpha	0.0008	0.0004	1.90	0.06	
Large	RMRF	0.4071	0.0383	10.63	0.00	0.06
	SMB	0.0100	0.1006	0.10	0.92	
	HML	-0.1118	0.1109	-1.01	0.31	
	MOM	0.0586	0.0811	0.72	0.47	
	alpha	-0.0001	0.0004	-0.32	0.75	

Sweden		Coef.	Std. Err.	t-stat	P-value	R-sq
Small	RMRF	0.7504	0.0165	45.60	0.00	0.59
	SMB	0.3614	0.0260	13.89	0.00	
	HML	-0.0007	0.0260	-0.03	0.98	
	MOM	0.0908	0.0222	4.10	0.00	
	alpha	-0.0002	0.0001	-1.70	0.09	
Medium	RMRF	0.7599	0.0148	51.42	0.00	0.64
	SMB	0.4050	0.0234	17.33	0.00	
	HML	-0.0114	0.0233	-0.49	0.62	
	MOM	0.1562	0.0199	7.85	0.00	
	alpha	-0.0002	0.0001	-2.08	0.04	
Large	RMRF	0.7128	0.0268	26.61	0.00	0.35
	SMB	0.2565	0.0424	6.05	0.00	
	HML	-0.0911	0.0423	-2.15	0.03	
	MOM	0.0831	0.0361	2.30	0.02	
	alpha	-0.0003	0.0002	-1.31	0.19	

Firm size – Purchase portfolios

Denmark		Coef.	Std. Err.	t-stat	P-value	R-sq
Small	RMRF	0.2864	0.0428	6.70	0.00	0.04
	SMB	0.0332	0.0568	0.58	0.56	
	HML	0.1234	0.0434	2.84	0.00	
	MOM	0.0876	0.0445	1.97	0.05	
	alpha	0.0004	0.0004	1.20	0.23	
Medium	RMRF	0.5283	0.0316	16.70	0.00	0.15
	SMB	0.2928	0.0420	6.97	0.00	
	HML	0.1275	0.0321	3.97	0.00	
	MOM	-0.0086	0.0329	-0.26	0.79	
	alpha	-0.0001	0.0003	-0.49	0.63	
Large	RMRF	0.7683	0.0296	26.00	0.00	0.33
	SMB	0.1883	0.0392	4.80	0.00	
	HML	0.2156	0.0300	7.19	0.00	
	MOM	0.0426	0.0307	1.39	0.17	
	alpha	0.0004	0.0002	1.57	0.12	

France		Coef.	Std. Err.	t-stat	P-value	R-sq
Small	RMRF	0.5848	0.0502	11.65	0.00	0.08
	SMB	0.6274	0.0778	8.06	0.00	
	HML	-0.0075	0.0695	-0.11	0.92	
	MOM	-0.0742	0.0560	-1.33	0.19	
	alpha	0.0006	0.0003	2.01	0.05	
Medium	RMRF	0.8170	0.0529	15.43	0.00	0.18
	SMB	0.7247	0.0821	8.83	0.00	
	HML	0.2716	0.0733	3.71	0.00	
	MOM	-0.2970	0.0590	-5.03	0.00	
	alpha	0.0008	0.0003	2.42	0.02	
Large	RMRF	0.8052	0.0313	25.75	0.00	0.50
	SMB	0.1354	0.0485	2.79	0.01	
	HML	-0.1147	0.0433	-2.65	0.01	
	MOM	-0.0828	0.0349	-2.37	0.02	
	alpha	0.0003	0.0002	1.46	0.14	

Germany		Coef.	Std. Err.	t-stat	P-value	R-sq
Small	RMRF	0.4188	0.0737	5.68	0.00	0.02
	SMB	0.2893	0.1311	2.21	0.03	
	HML	0.0517	0.1127	0.46	0.65	
	MOM	-0.0411	0.0911	-0.45	0.65	
	alpha	0.0015	0.0005	2.88	0.00	
Medium	RMRF	0.6767	0.0455	14.89	0.00	0.12
	SMB	0.7139	0.0808	8.84	0.00	
	HML	0.1310	0.0695	1.89	0.06	
	MOM	0.0508	0.0562	0.90	0.37	
	alpha	0.0005	0.0003	1.49	0.14	
Large	RMRF	0.8204	0.0261	31.46	0.00	0.55
	SMB	0.1055	0.0463	2.28	0.02	
	HML	-0.1849	0.0398	-4.64	0.00	
	MOM	0.0778	0.0322	2.41	0.02	
	alpha	0.0001	0.0002	0.60	0.55	

Greece		Coef.	Std. Err.	t-stat	P-value	R-sq
Small	RMRF	0.1320	0.0290	4.55	0.00	0.03
	SMB	0.0502	0.0494	1.02	0.31	
	HML	0.0935	0.0491	1.90	0.06	
	MOM	-0.0215	0.0289	-0.74	0.46	
	alpha	0.0011	0.0005	2.05	0.04	
Medium	RMRF	0.0021	0.0406	0.05	0.96	0.17
	SMB	-0.2209	0.0693	-3.19	0.00	
	HML	0.4583	0.0688	6.66	0.00	
	MOM	-0.4061	0.0406	-10.01	0.00	
	alpha	0.0013	0.0007	1.73	0.08	
Large	RMRF	0.7327	0.0556	13.17	0.00	0.45
	SMB	-0.0269	0.0949	-0.28	0.78	
	HML	0.7260	0.0942	7.71	0.00	
	MOM	-0.8253	0.0555	-14.86	0.00	
	alpha	-0.0011	0.0010	-1.07	0.28	

Italy		Coef.	Std. Err.	t-stat	P-value	R-sq
Small	RMRF	0.4267	0.0453	9.42	0.00	0.06
	SMB	0.3920	0.0863	4.54	0.00	
	HML	0.0380	0.0750	0.51	0.61	
	MOM	0.0035	0.0543	0.06	0.95	
	alpha	0.0001	0.0005	0.16	0.87	
Medium	RMRF	0.4418	0.0251	17.62	0.00	0.18
	SMB	0.4402	0.0478	9.21	0.00	
	HML	-0.0878	0.0415	-2.11	0.03	
	MOM	-0.0535	0.0301	-1.78	0.08	
	alpha	0.0003	0.0003	1.20	0.23	
Large	RMRF	0.8332	0.0283	29.48	0.00	0.48
	SMB	0.1960	0.0539	3.64	0.00	
	HML	-0.2497	0.0468	-5.33	0.00	
	MOM	-0.1891	0.0339	-5.58	0.00	
	alpha	0.0000	0.0003	-0.17	0.87	

Poland		Coef.	Std. Err.	t-stat	P-value	R-sq
Small	RMRF	-0.5609	0.4070	-1.38	0.17	0.00
	SMB	2.1128	1.0520	2.01	0.05	
	HML	1.1391	1.1259	1.01	0.31	
	MOM	-0.3957	0.8215	-0.48	0.63	
	alpha	0.0044	0.0041	1.07	0.28	
Medium	RMRF	0.3087	0.0443	6.97	0.00	0.03
	SMB	0.0515	0.1145	0.45	0.65	
	HML	0.0366	0.1225	0.30	0.77	
	MOM	-0.1033	0.0894	-1.16	0.25	
	alpha	-0.0001	0.0004	-0.33	0.74	
Large	RMRF	0.4089	0.0267	15.33	0.00	0.13
	SMB	-0.0261	0.0689	-0.38	0.71	
	HML	-0.0537	0.0738	-0.73	0.47	
	MOM	-0.0542	0.0538	-1.01	0.31	
	alpha	-0.0004	0.0003	-1.34	0.18	

Romania		Coef.	Std. Err.	t-stat	P-value	R-sq
Small	RMRF	0.1866	0.0679	2.75	0.01	0.01
	SMB	0.0731	0.1784	0.41	0.68	
	HML	0.0574	0.1967	0.29	0.77	
	MOM	-0.1156	0.1439	-0.80	0.42	
	alpha	0.0018	0.0007	2.49	0.01	
Medium	RMRF	0.4381	0.0456	9.62	0.00	0.06
	SMB	-0.0421	0.1197	-0.35	0.73	
	HML	0.2013	0.1319	1.53	0.13	
	MOM	-0.0447	0.0965	-0.46	0.64	
	alpha	0.0009	0.0005	1.77	0.08	
Large	RMRF	0.6397	0.0309	20.73	0.00	0.21
	SMB	-0.1842	0.0811	-2.27	0.02	
	HML	0.1210	0.0894	1.35	0.18	
	MOM	0.0115	0.0654	0.18	0.86	
	alpha	-0.0002	0.0003	-0.61	0.54	

Sweden		Coef.	Std. Err.	t-stat	P-value	R-sq
Small	RMRF	0.1401	0.1052	1.33	0.18	0.00
	SMB	0.1461	0.1663	0.88	0.38	
	HML	-0.0670	0.1660	-0.40	0.69	
	MOM	0.1143	0.1417	0.81	0.42	
	alpha	0.0000	0.0008	0.03	0.98	
Medium	RMRF	0.1038	0.0402	2.58	0.01	0.02
	SMB	0.3257	0.0636	5.12	0.00	
	HML	-0.0189	0.0634	-0.30	0.77	
	MOM	0.0360	0.0541	0.66	0.51	
	alpha	0.0002	0.0003	0.53	0.60	
Large	RMRF	0.0581	0.0380	1.53	0.13	0.02
	SMB	0.3290	0.0601	5.48	0.00	
	HML	-0.0789	0.0600	-1.32	0.19	
	MOM	0.0900	0.0512	1.76	0.08	
	alpha	0.0000	0.0003	-0.01	0.99	

Firm size – Sale Portfolios

Denmark		Coef.	Std. Err.	t-stat	P-value	R-sq
Small	RMRF	0.4514	0.0384	11.77	0.00	0.08
	SMB	0.2261	0.0509	4.44	0.00	
	HML	0.1458	0.0389	3.74	0.00	
	MOM	0.0717	0.0399	1.80	0.07	
	alpha	0.0004	0.0003	1.16	0.25	
Medium	RMRF	0.6671	0.0368	18.11	0.00	0.22
	SMB	0.0767	0.0489	1.57	0.12	
	HML	0.3409	0.0374	9.12	0.00	
	MOM	0.2550	0.0383	6.66	0.00	
	alpha	0.0004	0.0003	1.42	0.16	
Large	RMRF	0.8640	0.0347	24.93	0.00	0.41
	SMB	-0.2034	0.0460	-4.42	0.00	
	HML	0.4234	0.0352	12.03	0.00	
	MOM	-0.0613	0.0360	-1.70	0.09	
	alpha	0.0003	0.0003	1.12	0.26	

France		Coef.	Std. Err.	t-stat	P-value	R-sq
Small	RMRF	0.8805	0.0762	11.55	0.00	0.07
	SMB	1.0539	0.1182	8.91	0.00	
	HML	-0.0905	0.1055	-0.86	0.39	
	MOM	-0.0764	0.0850	-0.90	0.37	
	alpha	0.0008	0.0005	1.82	0.07	
Medium	RMRF	0.8887	0.0410	21.68	0.00	0.26
	SMB	0.7879	0.0636	12.39	0.00	
	HML	-0.2829	0.0567	-4.98	0.00	
	MOM	-0.0266	0.0457	-0.58	0.56	
	alpha	-0.0002	0.0002	-0.65	0.51	
Large	RMRF	0.8061	0.0278	29.02	0.00	0.55
	SMB	0.1407	0.0431	3.27	0.00	
	HML	-0.1416	0.0384	-3.68	0.00	
	MOM	0.0924	0.0310	2.99	0.00	
	alpha	0.0001	0.0002	0.35	0.73	

Germany		Coef.	Std. Err.	t-stat	P-value	R-sq
Small	RMRF	0.6983	0.1045	6.68	0.00	0.03
	SMB	0.8761	0.1858	4.71	0.00	
	HML	0.5032	0.1598	3.15	0.00	
	MOM	0.0907	0.1292	0.70	0.48	
	alpha	-0.0002	0.0007	-0.24	0.81	
Medium	RMRF	0.7514	0.0742	10.12	0.00	0.06
	SMB	0.7579	0.1319	5.75	0.00	
	HML	0.1985	0.1134	1.75	0.08	
	MOM	0.1824	0.0917	1.99	0.05	
	alpha	-0.0010	0.0005	-2.04	0.04	
Large	RMRF	0.9919	0.0356	27.87	0.00	0.44
	SMB	0.3661	0.0633	5.79	0.00	
	HML	-0.0699	0.0544	-1.28	0.20	
	MOM	0.1975	0.0440	4.49	0.00	
	alpha	-0.0004	0.0002	-1.60	0.11	

Greece		Coef.	Std. Err.	t-stat	P-value	R-sq
Small	RMRF	0.1202	0.0327	3.68	0.00	0.04
	SMB	-0.0781	0.0557	-1.40	0.16	
	HML	0.0983	0.0553	1.78	0.08	
	MOM	-0.0097	0.0326	-0.30	0.77	
	alpha	0.0008	0.0006	1.31	0.19	
Medium	RMRF	0.1624	0.0524	3.10	0.00	0.27
	SMB	-0.4523	0.0894	-5.06	0.00	
	HML	0.6732	0.0888	7.58	0.00	
	MOM	-0.5198	0.0523	-9.93	0.00	
	alpha	0.0008	0.0010	0.78	0.43	
Large	RMRF	0.9743	0.0437	22.32	0.00	0.57
	SMB	0.1481	0.0744	1.99	0.05	
	HML	0.6675	0.0739	9.03	0.00	
	MOM	-0.6278	0.0436	-14.41	0.00	
	alpha	-0.0012	0.0008	-1.51	0.13	

Italy		Coef.	Std. Err.	t-stat	P-value	R-sq
Small	RMRF	0.4991	0.0816	6.12	0.00	0.03
	SMB	0.5096	0.1556	3.28	0.00	
	HML	0.1163	0.1352	0.86	0.39	
	MOM	-0.0754	0.0979	-0.77	0.44	
	alpha	-0.0016	0.0008	-1.95	0.05	
Medium	RMRF	0.6405	0.0253	25.35	0.00	0.28
	SMB	0.5938	0.0482	12.33	0.00	
	HML	-0.0593	0.0419	-1.42	0.16	
	MOM	0.2610	0.0303	8.61	0.00	
	alpha	0.0004	0.0003	1.37	0.17	
Large	RMRF	1.0352	0.0424	24.43	0.00	0.35
	SMB	0.5237	0.0808	6.48	0.00	
	HML	-0.2005	0.0702	-2.86	0.00	
	MOM	-0.1589	0.0508	-3.13	0.00	
	alpha	-0.0001	0.0004	-0.29	0.77	

Poland		Coef.	Std. Err.	t-stat	P-value	R-sq
Small	RMRF	0.2061	0.0555	3.72	0.00	0.02
	SMB	-0.1716	0.1433	-1.20	0.23	
	HML	-0.1644	0.1534	-1.07	0.28	
	MOM	-0.2548	0.1119	-2.28	0.02	
	alpha	0.0007	0.0006	1.27	0.20	
Medium	RMRF	0.3369	0.0333	10.12	0.00	0.06
	SMB	0.0202	0.0860	0.24	0.81	
	HML	0.1288	0.0920	1.40	0.16	
	MOM	0.0745	0.0672	1.11	0.27	
	alpha	0.0001	0.0003	0.42	0.67	
Large	RMRF	0.5290	0.0760	6.96	0.00	0.03
	SMB	0.0618	0.1963	0.31	0.75	
	HML	0.1341	0.2101	0.64	0.52	
	MOM	0.0476	0.1533	0.31	0.76	
	alpha	0.0015	0.0008	1.95	0.05	

Romania		Coef.	Std. Err.	t-stat	P-value	R-sq
Small	RMRF	0.1883	0.0557	3.38	0.00	0.01
	SMB	0.1550	0.1462	1.06	0.29	
	HML	-0.0433	0.1612	-0.27	0.79	
	MOM	0.0476	0.1179	0.40	0.69	
	alpha	0.0004	0.0006	0.73	0.47	
Medium	RMRF	0.4264	0.0275	15.51	0.00	0.13
	SMB	-0.1140	0.0722	-1.58	0.12	
	HML	0.0858	0.0796	1.08	0.28	
	MOM	-0.0339	0.0582	-0.58	0.56	
	alpha	-0.0003	0.0003	-0.99	0.32	
Large	RMRF	1.0902	0.0203	53.59	0.00	0.62
	SMB	0.0743	0.0534	1.39	0.16	
	HML	-0.1064	0.0589	-1.81	0.07	
	MOM	-0.0015	0.0431	-0.03	0.97	
	alpha	-0.0003	0.0002	-1.34	0.18	

Sweden		Coef.	Std. Err.	t-stat	P-value	R-sq
Small	RMRF	0.3912	0.0452	8.65	0.00	0.04
	SMB	0.2666	0.0715	3.73	0.00	
	HML	0.0728	0.0714	1.02	0.31	
	MOM	0.0561	0.0609	0.92	0.36	
	alpha	-0.0006	0.0003	-1.68	0.09	
Medium	RMRF	0.7373	0.0456	16.18	0.00	0.15
	SMB	0.5365	0.0721	7.44	0.00	
	HML	-0.1952	0.0719	-2.71	0.01	
	MOM	-0.0331	0.0614	-0.54	0.59	
	alpha	-0.0003	0.0004	-0.78	0.44	
Large	RMRF	0.8935	0.0244	36.62	0.00	0.57
	SMB	0.0625	0.0386	1.62	0.11	
	HML	-0.1165	0.0385	-3.02	0.00	
	MOM	0.1508	0.0329	4.59	0.00	
	alpha	0.0001	0.0002	0.58	0.56	

Industry type – Purchase portfolios

Denmark		Coef.	Std. Err.	t-stat	P-value	R-sq
R&D Intensive	RMRF	0.8640	0.0347	24.93	0.00	0.00
	SMB	-0.2034	0.0460	-4.42	0.00	
	HML	0.4234	0.0352	12.03	0.00	
	MOM	-0.0613	0.0360	-1.70	0.09	
	alpha	0.0003	0.0003	1.12	0.26	
Others	RMRF	0.0264	0.0400	0.66	0.51	0.00
	SMB	0.0250	0.0706	0.35	0.72	
	HML	-0.0642	0.0609	-1.05	0.29	
	MOM	-0.0832	0.0494	-1.68	0.09	
	alpha	0.0003	0.0003	1.30	0.19	

France		Coef.	Std. Err.	t-stat	P-value	R-sq
R&D Intensive	RMRF	0.8061	0.0278	29.02	0.00	0.17
	SMB	0.1407	0.0431	3.27	0.00	
	HML	-0.1416	0.0384	-3.68	0.00	
	MOM	0.0924	0.0310	2.99	0.00	
	alpha	0.0001	0.0002	0.35	0.73	
Others	RMRF	0.7938	0.0355	22.34	0.00	0.40
	SMB	0.2937	0.0551	5.33	0.00	
	HML	0.0915	0.0492	1.86	0.06	
	MOM	-0.2041	0.0396	-5.15	0.00	
	alpha	0.0004	0.0002	1.69	0.09	

Germany		Coef.	Std. Err.	t-stat	P-value	R-sq
R&D Intensive	RMRF	0.9919	0.0356	27.87	0.00	0.12
	SMB	0.3661	0.0633	5.79	0.00	
	HML	-0.0699	0.0544	-1.28	0.20	
	MOM	0.1975	0.0440	4.49	0.00	
	alpha	-0.0004	0.0002	-1.60	0.11	
Others	RMRF	0.7084	0.0294	24.08	0.00	0.35
	SMB	0.3450	0.0523	6.60	0.00	
	HML	-0.0082	0.0450	-0.18	0.86	
	MOM	0.0316	0.0364	0.87	0.38	
	alpha	0.0003	0.0002	1.35	0.18	

Greece		Coef.	Std. Err.	t-stat	P-value	R-sq
R&D Intensive	RMRF	0.9743	0.0437	22.32	0.00	0.03
	SMB	0.1481	0.0744	1.99	0.05	
	HML	0.6675	0.0739	9.03	0.00	
	MOM	-0.6278	0.0436	-14.41	0.00	
	alpha	-0.0012	0.0008	-1.51	0.13	
Others	RMRF	0.5858	0.0564	10.39	0.00	0.41
	SMB	-0.1240	0.0962	-1.29	0.20	
	HML	0.6696	0.0955	7.01	0.00	
	MOM	-0.8538	0.0563	-15.16	0.00	
	alpha	-0.0009	0.0010	-0.84	0.40	

Greece		Coef.	Std. Err.	t-stat	P-value	R-sq
R&D Intensive	RMRF	0.9743	0.0437	22.32	0.00	0.03
	SMB	0.1481	0.0744	1.99	0.05	
	HML	0.6675	0.0739	9.03	0.00	
	MOM	-0.6278	0.0436	-14.41	0.00	
	alpha	-0.0012	0.0008	-1.51	0.13	
Others	RMRF	0.5858	0.0564	10.39	0.00	0.41
	SMB	-0.1240	0.0962	-1.29	0.20	
	HML	0.6696	0.0955	7.01	0.00	
	MOM	-0.8538	0.0563	-15.16	0.00	
	alpha	-0.0009	0.0010	-0.84	0.40	

Italy		Coef.	Std. Err.	t-stat	P-value	R-sq
R&D Intensive	RMRF	1.0352	0.0424	24.43	0.00	0.00
	SMB	0.5237	0.0808	6.48	0.00	
	HML	-0.2005	0.0702	-2.86	0.00	
	MOM	-0.1589	0.0508	-3.13	0.00	
	alpha	-0.0001	0.0004	-0.29	0.77	
Others	RMRF	0.1468	0.0611	2.40	0.02	0.02
	SMB	0.0414	0.1079	0.38	0.70	
	HML	0.1504	0.0922	1.63	0.10	
	MOM	-0.2425	0.0750	-3.23	0.00	
	alpha	0.0003	0.0004	0.69	0.49	

Poland		Coef.	Std. Err.	t-stat	P-value	R-sq
R&D Intensive	RMRF	0.5290	0.0760	6.96	0.00	0.00
	SMB	0.0618	0.1963	0.31	0.75	
	HML	0.1341	0.2101	0.64	0.52	
	MOM	0.0476	0.1533	0.31	0.76	
	alpha	0.0015	0.0008	1.95	0.05	
Others	RMRF	-0.0068	0.0392	-0.17	0.86	0.00
	SMB	-0.0613	0.0692	-0.89	0.38	
	HML	0.1246	0.0595	2.10	0.04	
	MOM	0.0130	0.0482	0.27	0.79	
	alpha	-0.0002	0.0003	-0.66	0.51	

Romania		Coef.	Std. Err.	t-stat	P-value	R-sq
R&D Intensive	RMRF	1.0902	0.0203	53.59	0.00	0.00
	SMB	0.0743	0.0534	1.39	0.16	
	HML	-0.1064	0.0589	-1.81	0.07	
	MOM	-0.0015	0.0431	-0.03	0.97	
	alpha	-0.0003	0.0002	-1.34	0.18	
Others	RMRF	0.3035	0.0509	5.97	0.00	0.02
	SMB	-0.0735	0.1336	-0.55	0.58	
	HML	0.0615	0.1473	0.42	0.68	
	MOM	-0.0281	0.1077	-0.26	0.79	
	alpha	0.0013	0.0005	2.41	0.02	

Sweden		Coef.	Std. Err.	t-stat	P-value	R-sq
R&D Intensive	RMRF	0.8935	0.0244	36.62	0.00	0.00
	SMB	0.0625	0.0386	1.62	0.11	
	HML	-0.1165	0.0385	-3.02	0.00	
	MOM	0.1508	0.0329	4.59	0.00	
	alpha	0.0001	0.0002	0.58	0.56	
Others	RMRF	0.0670	0.0413	1.62	0.10	0.00
	SMB	0.0456	0.0734	0.62	0.54	
	HML	0.0217	0.0631	0.34	0.73	
	MOM	-0.0960	0.0510	-1.88	0.06	
	alpha	0.0003	0.0003	1.06	0.29	

Industry type – Sale portfolios

Denmark		Coef.	Std. Err.	t-stat	P-value	R-sq
R&D Intensive	RMRF	0.8640	0.0347	24.93	0.00	0.00
	SMB	-0.2034	0.0460	-4.42	0.00	
	HML	0.4234	0.0352	12.03	0.00	
	MOM	-0.0613	0.0360	-1.70	0.09	
	alpha	0.0003	0.0003	1.12	0.26	
Others	RMRF	0.0242	0.0495	0.49	0.63	0.00
	SMB	0.0797	0.0873	0.91	0.36	
	HML	-0.0678	0.0754	-0.90	0.37	
	MOM	-0.0747	0.0611	-1.22	0.22	
	alpha	0.0005	0.0003	1.58	0.12	

France		Coef.	Std. Err.	t-stat	P-value	R-sq
R&D Intensive	RMRF	0.8061	0.0278	29.02	0.00	0.39
	SMB	0.1407	0.0431	3.27	0.00	
	HML	-0.1416	0.0384	-3.68	0.00	
	MOM	0.0924	0.0310	2.99	0.00	
	alpha	0.0001	0.0002	0.35	0.73	
Others	RMRF	0.7890	0.0282	27.96	0.00	0.53
	SMB	0.1493	0.0438	3.41	0.00	
	HML	-0.1239	0.0391	-3.17	0.00	
	MOM	0.0696	0.0315	2.21	0.03	
	alpha	0.0001	0.0002	0.32	0.75	

Germany		Coef.	Std. Err.	t-stat	P-value	R-sq
R&D Intensive	RMRF	0.0000	0.0000	0.00	0.00	0.14
	SMB	0.3661	0.0633	5.79	0.00	
	HML	-0.0699	0.0544	-1.28	0.20	
	MOM	0.1975	0.0440	4.49	0.00	
	alpha	-0.0004	0.0002	-1.60	0.11	
Others	RMRF	1.0967	0.0884	12.40	0.00	0.09
	SMB	1.0003	0.1571	6.37	0.00	
	HML	0.2931	0.1351	2.17	0.03	
	MOM	0.0864	0.1093	0.79	0.43	
	alpha	-0.0016	0.0006	-2.61	0.01	

Greece		Coef.	Std. Err.	t-stat	P-value	R-sq
R&D Intensive	RMRF	0.0000	0.0000	0.00	0.00	0.04
	SMB	0.1481	0.0744	1.99	0.05	
	HML	0.6675	0.0739	9.03	0.00	
	MOM	-0.6278	0.0436	-14.41	0.00	
	alpha	-0.0012	0.0008	-1.51	0.13	
Others	RMRF	0.8901	0.0547	16.27	0.00	0.50
	SMB	0.1027	0.0933	1.10	0.27	
	HML	0.8392	0.0926	9.06	0.00	
	MOM	-0.8503	0.0546	-15.57	0.00	
	alpha	-0.0006	0.0010	-0.57	0.57	

Italy		Coef.	Std. Err.	t-stat	P-value	R-sq
R&D Intensive	RMRF	1.0352	0.0424	24.43	0.00	0.00
	SMB	0.5237	0.0808	6.48	0.00	
	HML	-0.2005	0.0702	-2.86	0.00	
	MOM	-0.1589	0.0508	-3.13	0.00	
	alpha	-0.0001	0.0004	-0.29	0.77	
Others	RMRF	0.1072	0.1047	1.02	0.31	0.01
	SMB	-0.0214	0.1856	-0.12	0.91	
	HML	-0.1989	0.1593	-1.25	0.21	
	MOM	-0.3470	0.1287	-2.70	0.01	
	alpha	-0.0008	0.0007	-1.11	0.27	

Poland		Coef.	Std. Err.	t-stat	P-value	R-sq
R&D Intensive	RMRF	0.5290	0.0760	6.96	0.00	0.00
	SMB	0.0618	0.1963	0.31	0.75	
	HML	0.1341	0.2101	0.64	0.52	
	MOM	0.0476	0.1533	0.31	0.76	
	alpha	0.0015	0.0008	1.95	0.05	
Others	RMRF	0.0145	0.0425	0.34	0.73	0.00
	SMB	-0.0396	0.0750	-0.53	0.60	
	HML	-0.0736	0.0641	-1.15	0.25	
	MOM	-0.0403	0.0522	-0.77	0.44	
	alpha	0.0005	0.0003	1.64	0.10	

Romania		Coef.	Std. Err.	t-stat	P-value	R-sq
R&D Intensive	RMRF	1.0902	0.0203	53.59	0.00	0.00
	SMB	0.0743	0.0534	1.39	0.16	
	HML	-0.1064	0.0589	-1.81	0.07	
	MOM	-0.0015	0.0431	-0.03	0.97	
	alpha	-0.0003	0.0002	-1.34	0.18	
Others	RMRF	0.4378	0.0363	12.05	0.00	0.08
	SMB	0.0286	0.0954	0.30	0.76	
	HML	-0.0728	0.1052	-0.69	0.49	
	MOM	0.0402	0.0769	0.52	0.60	
	alpha	0.0001	0.0004	0.20	0.84	

Sweden		Coef.	Std. Err.	t-stat	P-value	R-sq
R&D Intensive	RMRF	0.8935	0.0244	36.62	0.00	0.00
	SMB	0.0625	0.0386	1.62	0.11	
	HML	-0.1165	0.0385	-3.02	0.00	
	MOM	0.1508	0.0329	4.59	0.00	
	alpha	0.0001	0.0002	0.58	0.56	
Others	RMRF	-0.0110	0.0398	-0.28	0.78	0.01
	SMB	0.1026	0.0706	1.45	0.15	
	HML	0.0788	0.0606	1.30	0.19	
	MOM	-0.0493	0.0491	-1.00	0.32	
	alpha	0.0001	0.0003	0.39	0.70	

Effect of MAR – Purchase Portfolios

		Coef.	Std. Err.	t-stat	P-value	R-sq
Denmark	RMRF	0.4876	0.0233	20.95	0.000	0.23
	SMB	0.1230	0.0627	1.96	0.050	
	HML	0.1248	0.0620	2.01	0.044	
	MOM	0.0156	0.0451	0.35	0.730	
	MAR	-0.0008	0.0005	-1.69	0.091	
	alpha	0.0007	0.0003	2.42	0.016	
France	RMRF	0.8061	0.0303	26.57	0.000	0.39
	SMB	0.5916	0.0774	7.65	0.000	
	HML	-0.2026	0.0578	-3.50	0.000	
	MOM	-0.2367	0.0421	-5.62	0.000	
	MAR	0.0005	0.0004	1.11	0.268	
	alpha	0.0004	0.0003	1.39	0.165	
Germany	RMRF	0.6546	0.0257	25.51	0.000	0.37
	SMB	0.2441	0.0672	3.63	0.000	
	HML	-0.1974	0.0529	-3.73	0.000	
	MOM	0.0579	0.0389	1.49	0.137	
	MAR	-0.0002	0.0004	-0.52	0.604	
	alpha	0.0003	0.0002	1.17	0.241	
Greece	RMRF	1.0201	0.0415	24.57	0.000	0.28
	SMB	0.5883	0.2835	2.08	0.038	
	HML	0.3906	0.3099	1.26	0.208	
	MOM	-0.3065	0.2244	-1.37	0.172	
	MAR	0.0010	0.0023	0.44	0.659	
	alpha	-0.0010	0.0014	-0.72	0.470	
Italy	RMRF	0.7046	0.0342	20.58	0.000	0.35
	SMB	0.1116	0.1076	1.04	0.299	
	HML	-0.2403	0.0990	-2.43	0.015	
	MOM	-0.3196	0.0658	-4.86	0.000	
	MAR	0.0000	0.0007	-0.06	0.952	
	alpha	0.0002	0.0004	0.49	0.625	
Poland	RMRF	0.3183	0.0392	8.13	0.000	0.04
	SMB	0.1303	0.1020	1.28	0.202	
	HML	0.0806	0.1077	0.75	0.454	
	MOM	-0.0746	0.0789	-0.94	0.345	
	MAR	-0.0008	0.0008	-0.93	0.354	
	alpha	0.0001	0.0005	0.22	0.824	
Romania	RMRF	0.2074	0.3132	0.66	0.508	0.00
	SMB	-0.3811	0.8292	-0.46	0.646	
	HML	-0.1518	0.9020	-0.17	0.866	
	MOM	0.8740	0.6632	1.32	0.188	
	MAR	-0.0053	0.0069	-0.77	0.442	
	alpha	0.0074	0.0041	1.79	0.074	
Sweden	RMRF	-0.0063	0.0448	-0.14	0.888	0.00
	SMB	0.2520	0.1160	2.17	0.030	
	HML	0.0259	0.1260	0.21	0.837	
	MOM	-0.1046	0.0929	-1.13	0.260	
	MAR	-0.0004	0.0010	-0.39	0.699	
	alpha	0.0002	0.0006	0.42	0.676	

Effect of MAR – Sale Portfolios

		Coef.	Std. Err.	t-stat	P-value	R-sq
Denmark	RMRF	0.7169	0.0274	26.14	0.000	0.33
	SMB	0.0505	0.0740	0.68	0.496	
	HML	0.4930	0.0729	6.76	0.000	
	MOM	-0.0291	0.0531	-0.55	0.584	
	MAR	-0.0002	0.0006	-0.40	0.690	
	alpha	0.0004	0.0003	1.16	0.246	
France	RMRF	0.8422	0.0217	38.75	0.000	0.58
	SMB	0.4382	0.0554	7.90	0.000	
	HML	-0.2488	0.0414	-6.00	0.000	
	MOM	0.1277	0.0302	4.23	0.000	
	MAR	-0.0002	0.0003	-0.68	0.497	
	alpha	0.0000	0.0002	0.10	0.922	
Germany	RMRF	0.7921	0.0724	10.94	0.000	0.07
	SMB	0.8167	0.1898	4.30	0.000	
	HML	-0.0313	0.1492	-0.21	0.834	
	MOM	0.1710	0.1097	1.56	0.119	
	MAR	0.0012	0.0011	1.05	0.293	
	alpha	-0.0019	0.0007	-2.73	0.006	
Greece	RMRF	5.1540	1.3809	3.73	0.000	0.01
	SMB	6.1744	9.4232	0.66	0.512	
	HML	17.0194	10.2841	1.65	0.098	
	MOM	-1.5691	7.4511	-0.21	0.833	
	MAR	0.0314	0.0779	0.40	0.687	
	alpha	-0.0334	0.0471	-0.71	0.478	
Italy	RMRF	0.8230	0.0665	12.37	0.000	0.13
	SMB	0.6199	0.2090	2.97	0.003	
	HML	-0.2848	0.1925	-1.48	0.139	
	MOM	-0.1251	0.1279	-0.98	0.328	
	MAR	0.0015	0.0013	1.15	0.249	
	alpha	-0.0016	0.0008	-1.97	0.049	
Poland	RMRF	0.4515	0.0458	9.86	0.000	0.06
	SMB	0.0160	0.1192	0.13	0.893	
	HML	0.0349	0.1260	0.28	0.782	
	MOM	-0.0418	0.0923	-0.45	0.651	
	MAR	-0.0019	0.0010	-2.00	0.046	
	alpha	0.0017	0.0006	2.89	0.004	
Romania	RMRF	0.4074	0.0353	11.54	0.000	0.07
	SMB	0.0203	0.0934	0.22	0.828	
	HML	-0.0773	0.1016	-0.76	0.447	
	MOM	0.0417	0.0747	0.56	0.577	
	MAR	-0.0001	0.0008	-0.07	0.945	
	alpha	0.0000	0.0005	0.04	0.968	
Sweden	RMRF	0.6683	0.0240	27.88	0.000	0.36
	SMB	0.2717	0.0609	4.46	0.000	
	HML	-0.0066	0.0543	-0.12	0.904	
	MOM	0.0637	0.0401	1.59	0.113	
	MAR	-0.0002	0.0004	-0.45	0.650	
	alpha	-0.0002	0.0003	-0.78	0.435	