

Directors' Dealings in Germany and their con- sequences for the firm value

DIPLOMARBEIT

zur Erlangung des akademischen Grades

Diplom-Ingenieur/in

im Rahmen des Studiums

Business Informatics

eingereicht von

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an der
Fakultät für Informatik der Technischen Universität Wien

Betreuung
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Wien, 24.04.2014

(Unterschrift Verfasser/in)

(Unterschrift Betreuer/in)

Abstract

This thesis examines directors' dealings transactions in Germany. The sample includes over 3,612 events which were reported to the German financial authority BaFin from January 2002 until August 2013. Since the release of the European Market Abuse Directive there is a regulatory framework for doing such transactions. When managers are buying and selling their own companies' stocks they reveal information about their companies' values to the public. In fact, they often take the contrarian role to investors. This position is often based on the fact of information asymmetry and often managers or investors may earn excess returns. This abnormality is clearly a violation of the strong form efficient market hypothesis.

Through this study an important hypothesis will be tested, for purchase and sale transactions. The results for the first category show that directors act as contrarian investors and usually trade against the general market wisdom. Indeed, other studies suggest similar results.

Declaration

„I certify that this work contains no material which has been accepted for the award of any other degree or diploma in my name, in any university or other tertiary institution and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text.“

Location, Date, Signature

Acknowledgements

First of all I would like to thank my parents for supporting me financially throughout my studies. I am grateful to my girlfriend Teresa Böcskör for being there and for understanding that writing a thesis can sometimes take long hours and be stressful from time to time. Finally I want to thank my supervising professor Wolfgang Aussenegg for giving me the opportunity to write about such an interesting topic.

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1. Introduction

In the age of information, financial markets have become faster and more complex.¹ New technologies such as algorithmic trading and new statistical modeling techniques, such as machine learning, have made the markets much more dynamic and much more unstable.² For many companies this means it is harder to satisfy investor's expectations and many investors are very careful where they spend their money. This concept holds not only for external investors but also for inside investors which use their trading right to invest in the company they are working for.

To ensure their return in such volatile times some investors try criminal practices. Often these strategies are based on unfair exploitations of market conditions. In fact, a common practice among companies' managers is to exploit private information, in terms of buying and selling stocks of their company they are working for. A famous Austrian example is the case of the former Voest-Alpine CEO Franz Struzl.³ Former Voest Alpine CEO Struzl did illegal speculations in stocks of the Voest subsidiaries VAE. Through his insider trading activity he yielded large returns for himself. This case shows that directors' dealing is no minor offense. Through his activities Struzl has hurt the reputation of Austria as a financial marketplace, as well as the company Voest-Alpine.⁴

When managers are buying and selling their own company's stocks they reveal information about the company's value to the public.⁵ Clever investors try to use this information in their investment strategies. From an investor's perspective, if the management buys stocks, they do that because they think the price of their company is too cheap and the management sells them, when they think the price of their stocks is too high. However, if this information is not publicly available there is an *information asymmetry* between investors and managers.⁶ Hence, this *information*

¹ Kevin Slavin, How Algorithms shape our world -

http://www.ted.com/talks/kevin_slavin_how_algorithms_shape_our_world.html.

² Martha Poon HFT traders under fire after algo glitch - <http://www.ft.com/cms/s/0/7319a262-dbf5-11e1-86f8-00144feab49a.html#axzz2uR0xKjmw>.

³ Voest Case of Franz Struzl - <http://www.profil.at/articles/0333/560/62694/boerse-voest-insider-party>.

⁴ Voest Case of Franz Struzl - <http://www.profil.at/articles/0333/560/62694/boerse-voest-insider-party>.

⁵ See Aussenegg and Ranzi (2008).

⁶ See Gregoriou (2009).

asymmetry can be used by managers. This practice is called insider trading or directors' dealings and is only allowed to a certain extent.

The terms *insider trading* and *directors' dealings* often cause confusion because of their direct relationship to each other.^{7,8} Both terms were developed independently through historical language terminology.⁹ The first term can refer to the illegality and also the legality of the transaction and is mostly used under US law. The second term is mostly used in Europe and refers to a *legal* buying and selling transaction by managers of their own companies' stocks. Therefore, we can say that *directors' dealings* are a subset of insider trading and do not describe the action of "*acting against the law by exploiting market information*".¹⁰ Throughout this thesis the legal action of using corporate insider information will be referred to by the terms directors' dealings and insider trading. If one of these terms is used differently, it will be marked properly.

The lack of information exchange between managers and the general public might lead to the misuse of knowledge by corporate insiders. By law this information has to be reported to the corresponding supervisors and to the public to improve market transparency.¹¹ In Austria the responsible entity is the *Finanz Markt Aufsicht* (FMA) which makes the data publicly available. In contrast, the financial regulation authority "*Bundesanstalt für Finanzdienstleistungsaufsicht*" (BaFin) makes German directors' dealings data publicly available on their website. According to the interests of investors, academic studies have taken up the topic and analyzed it under various aspects.¹² Many of these studies focus on the measurement of abnormal returns and cumulative abnormal returns and show statistical significance of their underlying hypotheses as well as measurable consequences to financial stakeholders.¹³

⁷ Director dealings and insider trading - <http://www.boerse-frankfurt.de/en/glossary/d/directors+dealings+661>.

⁸ See Alexander (2001), p. 3.

⁹ See Pope et al. (1990), p. 371.

¹⁰ See Pope et al. (1990), p. 371.

¹¹ Market Abuse Directive 2003/6/EC - http://www.esma.europa.eu/system/files/Dir_03_6.pdf.

¹² See chapter 3.3 Related Event Studies.

¹³ See chapter 3.3 for further event studies.

By outlining the relevancy of director's dealings to regulators, investors and the academic community, the aim of this thesis is to present the following:

The primary objective is to analyze a long history of German stock market data and to show the significance of a quantifiable hypothesis by a certain methodology named event study.¹⁴ Therefore, I will focus in the second chapter on the legislative framework and its evolutionary aspect. The third chapter will conclude with the most important literary aspects. This will include the influence of the efficient market hypothesis and its consequences for directors' dealings. Furthermore, its empirical challenges will be shown. Later in the chapter a comparison of different academic event studies will be given. To round out this chapter, the earlier mentioned hypothesis will be explained in detail. The fourth chapter will focus on the methodology and the used data. The event study model will be introduced and other possible models will be shown. Finally the data will be presented via descriptive statistics. The fifth chapter will focus on the empirical results. All results will be tested upon their significance. Finally I will conclude my thesis by summarizing my results.



Figure 1 - Insider Trading

¹⁴ The used methodology is modeled after MacKinlay (1997), pp. 13-19.

2. Legislative Framework and Foundation of Directors' Dealings

2.1 Introduction

The inherent information asymmetry of directors' dealings has led to lots of regulations which were introduced by public authorities. These regulations were redefined over the financial history. However, a public debate has broken out whether these regulations are justified.^{15,16} On the one hand there are people, which are mainly managers, arguing that these control mechanisms negatively influence the participation on a free market. Besides the participation argument, it is often said, that the myth of a fully transparent market cannot be achieved, because there is always secret information, which gets, for example, fully revealed at a product release.¹⁷ On the other hand there are people who argue that a market should be fully transparent, even though full transparency cannot be achieved.¹⁸ The reason for this argument is that, even though all information is included in the market price, the information about corporate processes is not yet public and therefore unknown to the general public. Hence, insider trading clearly hurts investors who are trading on publicly available information only. Therefore, allowing it would lead to a two-class society, where you either have the private information or not. These wild-west style markets are explicitly rejected by public authorities and the general public. Therefore, around the world public authorities have enforced market regulations for directors' dealings.

2.2 Definition of Directors' Dealings

Throughout history, many cases have been made public, dealing with insider trading in Europe and the US. In both confederations legal frameworks have been implemented to address the problem of illegal activities among insiders. The Security and Exchange Commission (SEC) and several courts in the United States struggle since

¹⁵ Why insider trading should be legal - <http://www.cnbc.com/id/100917279>.

¹⁶ Discussion at cnbc about insider trading - <http://www.cnbc.com/id/100903736>.

¹⁷ The folly of trying to level the investment playing field - <http://blogs.reuters.com/bethany-mclean/2013/07/25/the-folly-of-trying-to-level-the-investment-playing-field/>.

¹⁸ Discussion about insider trading - <http://www.cnbc.com/id/100903736>.

1961 to define what insider trading means in terms of illegal trading, using non-public information.¹⁹ In contrast, the European Union implemented the Market Abuse Directive (2003/6/EC) long after the US.²⁰

The SEC defines directors' dealings under their rules *10b5-1* and *10b5-2*. The basis of the definition of directors' dealings is grounded in the rule 10b-1 and defines the use of non-public information to get a market advantage in its general form,

*"...the purchase or sale of a security of any issuer, on the basis of material nonpublic information about that security or issuer, in breach of a duty of trust or confidence that is owed directly, indirectly, or derivatively, to the issuer of that security or the shareholders of that issuer, or to any other person who is the source of the material nonpublic information."*²¹

This general definition allows a lot of room for interpretation to bypass the authority and manipulate the financial market. In fact, courts had problems in the past to implement the specified rules.²² This problem is grounded due to the "broad" definition of insider information.

By comparing this rather old definition of directors' dealings by the SEC, to the definition of the European Parliament market abuse directive 2003/6/EC, which is quite young, we can see a lot of differences in the frameworks.²³ In fact, the European member states have implemented the market abuse directive since October, 12th 2004.²⁴ One of the first member states was Germany, which already implemented the

¹⁹ The case Lehman Brothers and the first attempt against insider trading - http://www.sechistorical.org/museum/galleries/it/takeCommand_b.php.

²⁰ Directive 2003/6/EC of the European Parliament and of the council of January 2003 on insider trading and market manipulation.

²¹ SEC § 240.10b5-1 Trading "on the basis of" material nonpublic information in insider trading cases, <http://www.ecfr.gov/cgi-bin/retrieveECFR?gp=1&SID=c75c742a28622edba388e93111cc24ad&ty=HTML&h=L&r=SECTION&n=17y3.0.1.1.1.1.65.95>.

²² For more specific cases see Hazen (1992), pp. 231-239.

²³ Market Abuse Directive 2003/6/EC - http://www.esma.europa.eu/system/files/Dir_03_6.pdf.

²⁴ Article 18 of the Directive 2003/6/EC requires the European member states to implement the directive till October, 12th 2004.

directive on July, 1st 2002.²⁵ Within the European Union insider trading directive, market abuse is defined as:

*“Market abuse consists of insider dealing and market manipulation. The objective of legislation against insider dealing is the same as that of legislation against market manipulation: to ensure the integrity of Community financial markets and to enhance investor confidence in those markets.”*²⁶

This definition also provides a lot of arguments why directors’ dealings are not allowed. Hence, directors’ dealings information means under the directive that, *“...information of a precise nature which has not been made public, relating, directly or indirectly, to one or more issuers of financial instruments or to one or more financial instruments and which, if it were made public, would be likely to have a significant effect on the prices of those financial instruments or on the price of related derivative financial instruments”*.²⁷

By market manipulation the European parliament and the council define, *“transactions or orders to trade.”*, *“transactions or orders to trade, which employ fictitious devices or any other form of deception or contrivance”* and *“dissemination of information through the media (...) which gives or is likely to give, false or misleading as to financial instruments”*.²⁸

One of the market abuse directives’ biggest strengths is the further definition of insider information. Precisely insider information is defined as any information of (1) *“...a precise nature which has not been made public”*, (2) *“related to one or more issuer of financial instruments”* and (3) *“...information which could have a significant effect on the evolution of the forming of the process of a regulated market...”*²⁹.

Consequently, the European Union divides the persons who could possess insider information into two categories: On the one hand there are *“Primary”* insiders, who

²⁵ See Dickgießer (2000).

²⁶ See Directive 2003/6/EC (12).

²⁷ See Directive 2003/6/EC Article 1.

²⁸ See Directive 2003/6/EC Article 2.a, 2.b, 2.c.

²⁹ See Directive 2003/6/EC Article 1, Paragraph (16).

are persons which get the insider information through their activity in business and on the other hand there are “*Secondary*” insiders, which are persons who have the information from a primary source.³⁰

By comparing the rules of the Security and Exchange Commission (SEC) with the directive of the European parliament, we can see several distinctions. By classifying insiders into two categories, the directive makes the line between legal and illegal insider trading much clearer than the SEC rules. The advantage of this definition can be seen in countless trials by the SEC, against prospective insider traders.³¹ For example, one interesting trial where the classification of insiders matters is Security and Exchange Commission (SEC) versus Barry Switzer, where the defendant heard about insider information and used it for his advantage.³² Even though he possessed insider trading information he was not found guilty during this trial.

One of the most important classifications in the European definition about “*market abuse*” is the classification of information.³³ This allows the authorities to clearly distinct between directors’ dealings investors and non-directors’ dealings investors. Hence, the fine degree between legal and illegal directors’ dealings becomes more apparent.

2.3 Directors’ dealings controversy

As we can see from the previous chapter, the distinction between a legal and an illegal transaction is extremely blurry and is often based on several factors. To give financial authorities a regulatory framework, legislations based on legal decisions were created, to make the distinction between the fine lines of legal or illegal clearer. How-

³⁰ Directive 2003/6/EC Article 1.

³¹ Notable trials are: United States v Chestman or Dirks v SEC, See Bhattacharya (2013).

³² *SEC v. Switzer*, In this trial the defendant heard about insider information and used this not yet public information for trading, Steinberg (2002).

³³ Eur-lex definition of market abuse - <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32003L0006:EN:NOT>.

ever, ongoing cases, for example by the SEC, made the discussion, why directors' dealings should be illegal or legal, flame up again.³⁴

In Henry Manne's (1966) book "*Insider trading and the stock market*", the author expresses his views about arguments against a directors' dealings law. Manne (1966) made important economic and law contributions in company law and securities regulations between 1980 and 1990. Manne (1966) identifies two main principles in which directors' benefit from trading on the reliance of non-public information:³⁵

1. *Market efficiency*: Manne (1966) argues that the market price of an affected security would move against the real price of the security that the security would make if the information would be publicly available. Therefore, society and the firm would benefit through increasing price accuracy.
2. *Manager's compensation*: Manne (1966) proposed directors' dealings as an efficient way to compensate managers for creating information. This circumstance could be used instead of the widespread "Bonus" system, where managers earn huge amounts of money often based on companies' principals. Manne (1966) does completely reject this contractual form of benefit.

In contrast, the reasons for illegalizing directors' dealings usually fall into three categories:³⁶

1. *Harm of investor's confidence*: Directors' dealings harm the confidence of investors into certain stocks. This can be, because the investor does not trust the management of the company anymore or he feels a disadvantage against the management. Often this trust relationship is destroyed by ambiguous management decisions.³⁷
2. *Harm of the investor's security*: Disclosed information could lead to a certain elite, which shares their information with whom they want. Another way, in

³⁴ Examples of the SEC's recent insider trading actions - <https://www.sec.gov/spotlight/insidertrading/cases.shtml>.

³⁵ See Manne (1966), p.117.

³⁶ See Manne (1966).

³⁷ See Manne (1966).

which a deregulation of the nonpublic information is harmful to investors, is that this could lead to a high volatility in price movements and could harm the “not informed” investor.³⁸

3. *Theft of company property*: Directors’ dealings can be seen as a form of information theft. That is because this information belongs to a company and not to a certain manager. By making the information available to the public, investors can be protected against non-explainable price fluctuations.³⁹

However, under certain circumstance and if the manager adheres to regulations insiders can trade their own stocks. In fact, §15a of the Security Trading Act of the United States requires insiders to report their trades within five days to the local authorities. This form of directors’ dealing is allowed, because the non-public information has to be made public and every investor can see the information, by visiting for example the local authority’s web site. Usually the information is reported for “Primary” insiders. By visiting the German Federal Financial Supervisory Authority (BaFin) web site, this information is freely available to investors. Nowadays, according to Section 403(a) of the Sarbanes Oxley Act of 2002, insiders in the United States have to report their trades within 2 trading days.

It is often argued that insider trading could be a potential method of compensating managers.⁴⁰ At its core it is about a mechanism to alter ineffective decisions made by persons in leading positions. The general public is not satisfied with the today’s compensation system which are based on bonus payments. Therefore, some people argue that insider information could be used as a mechanism to compensate managers.⁴¹ However, there are several factors which must be taken into account, when giving a CEO the right to trade disclosed information as their own bonus.

³⁸ See Manne (1966).

³⁹ See Manne (1966).

⁴⁰ See Manne (1966).

⁴¹ See Dent (2013), p. 257-259.

Let's consider an example, if a CEO has just received some good news and some bad news.⁴² Both “news” have the same value to investors in the market. If he makes the good and the bad news available to the market at the same time, it should not have an effect on the market, because these two events compensate for each other. However, if the CEO buys some shares of his company at the current market price and makes the good news available, then he clearly makes an arbitrage profit, because the market price will rise. If the CEO then shorts shares in the market and releases the bad news, the CEO bets on a falling stock price which is likely to occur. Consequently, the manager's gain is as much as the losses of outsiders which also traded in the market, which would have had no loss if both news items would have been released at the same time.⁴³

However, a negative behavior could be driven by one of the most basic human instincts: greed. To think further in this scenario, one might conclude that allowing information asymmetry would lead to misuse of information even at the highest company instances, such as the board of directors. Furthermore, the information would only be released after the manager's transactions. Therefore, at this point the whole market can be aware in some kind of the company's information. It can be said that in the long run this behavior would lead to inefficient decisions and would harm the company.⁴⁴

By owning the right of releasing company information, insiders could also communicate wrong information to the public.⁴⁵ However, this is clearly forbidden by the European law.⁴⁶ Despite that, it is hard to prove for the public authorities that the released information was really wrong, especially if it is vaguely formulated, with the only goal to affect the stock market to drive prices up or down. If an insider would also want disclosure he could sell his insider information to interested companies such as hedge funds, which could exploit this “zero-day” information (publicly unknown information) in one of their aggressively and sophisticated trading strategies. Rather than selling to a hedge fund, a public financial institution could manage a fund, which only

⁴² See Dent (2013), p. 257-259.

⁴³ See Dent (2013).

⁴⁴ See Dent (2013).

⁴⁵ See Dent (2013), p. 255.

⁴⁶ Market Abuse Directive 2003/6/EC - http://www.esma.europa.eu/system/files/Dir_03_6.pdf.

relies on insider information. The largest benefit for insiders in both models would be that they save a lot of time and trading costs compared to trading on their own account.⁴⁷ Such limitations would be seen doubtful though, because many funds rely on huge investments from outsiders, because only small wealthy elite would have access to the benefits of insider trading information.⁴⁸

The potential actions which could be taken by insider traders would definitely raise the bid and ask spread of a stock. Several studies show this and confirm the raised concerns from investors.⁴⁹ This would have tremendous effects on the liquidity of stock markets. Let's consider two publicly traded companies, A and B, which are identical in their day to day business. The only difference between these two companies is that company A allows insider trading and company B does not allow insider trading.⁵⁰ This fact is well known by outsiders. By considering a fair price for the two companies, outsiders have to consider a lower price for company A, because of its further risk factor "insider trading". Outsiders also lose trust in the integrity of company A. However, if outsiders cannot see vast differences in the two stock prices, which could be affected by insider trading, they will invest in both stocks as long as they can expect high enough returns. If insider trading is allowed for company stock A and B, than insiders will trade for their own gain, if they do not get the same return from other investments such as real estate.⁵¹ Outsiders will potentially stop to trade on the market.

This behavior will start, because imagine someone would buy a box which input is not known.⁵² The onliest information that is known by the bidders is that there is an opportunity for receiving money. However, some bidders know what is inside the box. They will raise the price to a level until they know that this is not the fair value of the box anymore. It is clear to everybody that no investor, who bases his decision on rational thoughts, would do such a deal.⁵³

⁴⁷ See Dent (2013), p. 255.

⁴⁸ See Dent (2013), p. 257.

⁴⁹ See Dolgoplov (2004).

⁵⁰ See Dent (2013), p. 261.

⁵¹ See Dent (2013), p. 261.

⁵² See Dent (2013), p. 261.

⁵³ See Dent (2013), p. 261.

As we can see there are a lot of pitfalls, when we consider insider trading as legal. By outlining some general principles what could happen to the market, if managers could trade on asymmetric information, we can clearly see the tremendous effects on the stock market. Neither would the markets be efficient, nor would investors trust in companies. The human greed for money and gain would rule the market, instead of the "*homo economicus*"⁵⁴, which bases his decisions on rational thoughts. This would potentially mean the end for the stock market as we know it today. Therefore, it is the author's opinion to ban every form of insider trading, because the benefits to the society seem much larger in the long run, than the benefits which insider trading could provide to the company and its managers.

Throughout the time insider trading was considered to be illegal. It seems that market transparency is deeply rooted in our society. The next chapter will shed some light on the origins of insider trading and its deep roots in the European Union.

⁵⁴ See Dent (2013).

2.4 Insider Trading Regulations in German law

The European market abuse directive builds the foundation of the legislative implementation for each European country. Therefore, Germany has also implemented the European directive into its legal system. However, as one of the world financial centers, Germany has a long history with illegal practices on the financial markets. The following chapter will give a brief historical view on the evolution of insider trading regulations. Then it will follow up with a specific definition of what Germany considers as an insider. Finally, I will show under which requirements it is possible for insiders to trade and what law enforcements they have to face if they violate the market abuse legislations.

2.4.1 Evolution of the Insider Trading Regulations

Compared to other European countries Germany was exceedingly late in the implementation cycle of insider trading regulations. This is quite surprising, because Germany, with Europe's financial center Frankfurt, has usually the leading role in implementing new regulations.⁵⁵ Historically they set up the basis for future implementations after the *EC Insider Trading Directive of the European Union* since November 13, 1989.⁵⁶ Germany implemented the laws in their *Wertpapierhandelsgesetz (WpHG)* and their *Finanzmarktförderungsgesetz (FFG)*⁵⁷ in the year 1994. In fact, the *Wertpapierhandelsgesetz* which specify German law for the stock market, also implements the illegal misuse of asymmetric information.

Comparing Germany to the United States of America, it was possible to exploit insider information prior to 1994, because it was not forbidden by law.⁵⁸ Furthermore, researchers compared the misuse of asymmetric information prior to 1994 to results

⁵⁵ See Bhattacharya and Daouk (2002), p. 81.

⁵⁶ Council Directive 89/592/EEC of November 13, 1989.

⁵⁷ See BGBl I of July 30, 1994, p. 1749.

⁵⁸ See Arneeth (2001), p. 2.

after 1994 to see a clear distinction between the two time periods.⁵⁹ These studies show that a *silent code of honor* existed between companies on the market since 1970, which regulated the market without outer authorities.⁶⁰ After the implementation of the legislation in Germany, several financial authorities started to investigate insider trading activities of German companies.

After the Deutsche Börse implemented the concept of *Neuer Markt*⁶¹ in 2002, which can be compared to the famous NASDAQ in the US, several insider trading scandals happened.⁶² *Neuer Markt* was a place where extremely young technology savvy companies were listed. This newly created market was seen by many insiders as an opportunity to abuse their insider trading potential. The *Bundesaufsichtamt für den Wertpapierhandel* reported several violations against the recently implemented legislation. One of the most famous is the investigation of Thomas Haffa and his company *EM.TV*, where shareholders were left with penny stocks after a spectacular market scandal.⁶³

After several cases of disgrace against the German insider trading legislation, the German government implemented the fourth Finanzmarktförderungsgesetz on July 1, 2002. This legislation gave the *Bundesanstalt für Finanzdienstleistungsaufsicht (BaFin)* the authority to control the reporting of insider trading data. The BaFin was initially created in 2002 and merged with the „*Bundesaufsichtsamt für das Kreditwesen*“, the „*Bundesaufsichtsamt für das Versicherungswesen*“ and the „*Bundesaufsichtsamt für den Wertpapierhandel*“.⁶⁴ In particular, since this date companies have to report their directors' dealings transaction to the German authority, which makes them publicly available and also monitors which transactions were based on the illegal use of non-public information.⁶⁵ The legislation got improvements in the *Anlegerschutz-*

⁵⁹ See Bhattacharya and Daouk (2002).

⁶⁰ See Arneth (2001), p. 2.

⁶¹ Germany may relaunch “Neuer Markt” for tech shares - <http://www.reuters.com/article/2013/08/19/us-germany-market-tech-idUSBRE9710CW20130819>.

⁶² Germany's Neuer Markt May Be the Exchange to Beat in Europe - <http://www.businessweek.com/bwdaily/dnflash/oct1999/nf91029f.htm>.

⁶³ Bloomberg Businessweek July 29, 2001.

⁶⁴ Function & History - http://www.bafin.de/EN/BaFin/FunctionsHistory/functionshistory_node.html.

⁶⁵ See Dymke and Walter (2006).

verbesserungsgesetz (AnSVG) on October 30, 2004.⁶⁶ The extension served as improvement for the reporting time of insider trading activities.

Since 2005, the BaFin reported many violations against the German insider trading law. Prominent cases were managers of *DaimlerChrysler*TM and the *European Aeronautic Defense and Space Company*TM (EADS).^{67,68} EADS company's managers exploited insider trading information to yield high returns, after they made a deal about the airplane A380.

On January 22nd, 2007 the *Transparenzrichtlinien-Umsetzungsgesetz* came into force for the benefit of investors.⁶⁹ The new law promised stronger adherence, higher transparency and stricter controls from authorities. The law got slightly changed in 2007 with the *Finanzmarktrichtlinie-Umsetzungsgesetz*, the Financial Markets Directive Implementation Law.⁷⁰ Basically the law change makes it clearer, that only relevant insider transactions have to be reported.

One of the most recent discussions about directors' dealings was done in 2010. The *Bundesgerichtshof* (BGH) has stated in its decision on January the 27th, 2010, that there should be clear rules, which make the reporting of insider transactions dispensable.⁷¹ However, the criteria have not been made clear yet, because no threshold could be derived from the previous cases. Furthermore, this is an extremely difficult undertaking, because many insider transactions rely on many factors in the market and each insider transaction case is completely different from the other.

As we can see management transactions were widely discussed in Germany and are now well implemented through a stable legislation and authority, which monitors the

⁶⁶ Draft law of the Federal Government - <http://dip21.bundestag.de/dip21/btd/15/031/1503174.pdf>.

⁶⁷ See Handelsblatt Juni 28, 2012, <http://www.handelsblatt.com/unternehmen/industrie/insider-informationen-daimler-droht-hoher-schadenersatz/6809276.html>.

⁶⁸ See Handelsblatt, August 29, 2005.

⁶⁹ See Bundesverband der Bilanzbuchhalter und Controller (2007) - <http://www.bvbc.de/bvbc-info/archiv/nachricht/meldung/transparenzrichtlinien-umsetzungsgesetz-anlegerschutz-durch-transparentes-rechnungswesen.html>.

⁷⁰ Financial Instruments Directive (MiFID) 2004/39/EC - <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32004L0039:EN:HTML>.

⁷¹ Decision of the Bundesgerichtshof of 27th 2007 - <http://juris.bundesgerichtshof.de/cgi-bin/rechtsprechung/document.py?Gericht=bgh&Art=en&sid=595974b5fe45e0b0c035f6bc33683d4b&nr=50997&pos=0&anz=1>.

compliance with the laws. The next chapter shows the definition of insider trading based on the legislation of the German country.

2.4.2 Definition of Insider Trading in Germany

As we know from previous chapters insider trading is well defined in the European Union and the US. Germany has made a lot of changes to the original implementation based on their own laws. Therefore, this chapter shows the most significant changes of the core of regulations, the German definition of an insider and the clear definition of insider information.

Insider trading is prohibited by the WpHG. In section 14, subsection 1 the WpHG states that:⁷²

1. It is prohibited to acquire or dispose insider securities for his or her own account or for another account, by relying on insider information.
2. It is prohibited to make insider information accessible to another person.
3. It is prohibited to recommend a buying or selling transaction to another person, which is based on insider information.

The WpHG also defines in section 12 insider securities, which are allowed to be traded. These securities are:⁷³

- i. Securities which are admitted to trading on a German stock exchange or traded on the regulated market or in the open market.
- ii. Securities which are authorized in another member state of the European Union or another signatory to the agreement on the European economic area to trading on a regulated market.
- iii. Securities whose price depends directly or indirectly on financial instruments referred to in point (i) or (ii) above.

⁷² See Wertpapierhandelsgesetz §12 - <http://www.buzer.de/gesetz/1262/a17888.htm>.

⁷³ See Wertpapierhandelsgesetz §12 (i-iii) - <http://www.buzer.de/gesetz/1262/a17888.htm>.

It can be seen, that the regulations also clearly address derivatives. However, if the price of the financial instrument is directly or indirectly related to insider trading, the regulations from section 14 WpHG also apply.

When we consider the authority regulations, one might ask about the definition of an insider and insider information. Section 14 only outlines the use of insider trading information. Furthermore, section 13 defines an *insider* in the *Wertpapierhandelsgesetz*. As we know from the European Directive there are *primary* and *secondary* insiders. This clear distinction is also done in section 13 of the WpHG. The subsection 1 of section 13 defines *insider information*:⁷⁴

*“Insider information is any specific information, that is not publicly known and that relates to one or more issuers of insider securities, or the insider securities themselves, and which are likely in the event of their becoming public knowledge to influence the exchange or market price of insider securities.”*⁷⁵

This definition implies the thread of insider trading. By using publicly unknown information the insider influences the market price. By taking the definition out of the context of directors’ dealings, subsection 1 also addresses the problem of front running.⁷⁶ That means that a stock broker exploits insider information, which he gains from the orders of his customers. Furthermore, subsection 2 addresses the valuation of financial instruments which has to rely on the publicly available information.

2.4.3 Reporting requirements of directors’ dealings data

Since the enactment of 2002, German companies have to report their insider transactions to the local authority, BaFin. In the WpHG the items that have to be reported are listed in section 14.⁷⁷ Besides shares, holding in other financial instruments such

⁷⁴ Wertpapierhandelsgesetz §13 - <http://www.buzer.de/gesetz/1262/a17889.htm>.

⁷⁵ Wertpapierhandelsgesetz §13 - <http://www.buzer.de/gesetz/1262/a17889.htm>.

⁷⁶ See Dickgießer (2000).

⁷⁷ §14 Disallowance of Insider Trading - <http://www.buzer.de/gesetz/1262/a17890.htm>.

as bonds, warrants, loans, different types of options, futures, bonus shares, convertible bonds and also almost all derivative instruments have to be reported. Therefore, if a person with a leading role, such as a director or manager, trades his company's financial instruments he can expect that his transactions are made publicly available. If a transaction gets reported to the BaFin, there have to be several elements which the company has to name for an insider transaction. This properties are listed in the German *Wertpapierhandelsanzeige und Insiderverzeichnisordnung (WpAIV)*⁷⁸. Content of the reporting are the full name of the person, who did the transaction, position within the company, name of the exchange, type of transaction, International Securities Identification Number (ISIN), date and exact time, order limit of the transaction, the security code of the financial instrument, price, currency, volume and special properties for derivatives such as date of maturity or the price of its underlying.⁷⁹

“Secondary” investors also have to report their transactions to the financial authority. This definitely also includes children or spouses of directors.⁸⁰ For “Primary” or “Secondary” insiders it is only possible to be left out of the reporting requirements, if “... *the total sum of transactions by a person discharging managerial responsibilities and parties closely associated with them is less than 5,000 euros by the end of the calendar year.*”⁸¹

The subsection §15a of the WpHG also defines certain groups which have to report their trading such as the members of executive, administrative or supervisory board.⁸² This also includes persons with managerial functions, which have a clear knowledge of insider trading information. Therefore, regular employees are apart from the regulatory framework, if they do not fit in one of the groups mentioned by the WpHG. By having a brief look at the data, we can clearly see that mostly directors or board members make insider transactions, rather than their close relatives. Section 15a of the German Security Trading act (WpHG) insiders have to report their insider

⁷⁸ See law draft of German Bundestag - <http://dipbt.bundestag.de/extrakt/ba/WP16/106/10662.html>.

⁷⁹ See WpAIV (2004) §2 (1).

⁸⁰ Section 15a, subsection § 1(2) of the WpHG.

⁸¹ See Bafin Security Trading Act 15a -

http://www.bafin.de/SharedDocs/Aufsichtsrecht/EN/Gesetz/wphg_101119_en.html?nn=2821360#doc2684270bodyText22.

⁸² See Wertpapierhandelsgesetz -

http://www.bafin.de/SharedDocs/Aufsichtsrecht/EN/Gesetz/wphg_101119_en.html.

transactions “*not later than the next working day (excluding Sundays) after conclusion of the transaction*”.^{83,84}

In practice, the reporting happens as follows: Firstly, the company has to verify that its reporting is subject to the legislation requirement and that in the company`s report all required data is available. This can lead to a time delay of up to two business days. Hence, this can take even longer when the reporting happens on Friday.⁸⁵ After the reporting, several media services get notified about the transactions. This includes a news agency, a print agency, a financial related website and the electronic dissemination system of the financial authority.⁸⁶ To ensure the compliance of the European directive, at least one of the media has to be closely related with the European Union. When the company announces the transactions of their managers, the reporting requirements for the financial authority BaFin have to be fulfilled. When the BaFin gets the announcement of the company, they store it into their accessible database. From that moment on, it is possible for interested investors to visit the website of the BaFin where everyone can publicly access the database, which also contains historical transactions. In addition, the transaction also has to be reported to the German business register, where the information is also stored. Consequently, the reporting of a management transaction requires a lot of effort for a company manager. Through this business need several services have emerged, which help a company to deal with the reporting. The most famous companies which provide the service of reporting in Germany are: DGAP⁸⁷, Euro Adhoc⁸⁸, and Hugin⁸⁹.

⁸³ See WpHG §9(1) - http://www.bafin.de/SharedDocs/Aufsichtsrecht/EN/Gesetz/wphg_101119_en.html.

⁸⁴ See WpHG 15a, subsection 4, clause 1.

⁸⁵ See Rau (2004).

⁸⁶ Bundesanstalt für Finanzdienstleistungsaufsicht (2008), p. 186 – 187.

⁸⁷ See <https://dgap.org/de>.

⁸⁸ See <http://www.euroadhoc.com/>.

⁸⁹ See www.hugin.com.

2.4.4 Enforcements of Regulations in Germany

Even though this legislation framework has been implemented, there are still management transactions which are illegal. These transactions are often revealed by the Security Supervision division of the German BaFin. In particular, the division uses data mining, data warehousing techniques and machine learning techniques to reveal insider trading patterns.⁹⁰ This can be extremely hard for the division, because as reported in the Annual Report 2011, 2,002 “*ad-hoc disclosures*” were announced to the authority.⁹¹ BaFin also requests insider trading information from different firms. In 2011, 4 court proceedings were fined with 12,000 Euro and several others were set off for policy reasons.⁹² However, the division also relies on tips from the general public. If any suspicious activity is found, the related transactions get analyzed and if there is an indication for an insider transaction, further investigation follows. In Germany, illegal insider trading can be sued with a prison sentence of up to five years, or a monetary fine, according to section 14 of the WpHG.⁹³ The degree of the penalty depends on whether the insider is a *primary* or *secondary* insider. In subsection 3 it is also stated, that an attempt of insider trading is punishable. Hence, this could be unauthorized communication of insider information to, for example, an outsider. If this has been done carelessly, then according to the WpHG section 38 the penalty could be put down to one year in prison or a monetary fine.⁹⁴

Furthermore, it is illegal for a company, if they do not report insider transactions to the financial authority. In many cases reporting has to be done immediately. According to section 39, subsection 4 of the WpHG the competent entity of the company can be fined with up to 100,000 Euro. Besides the fine, the owners of the insider transaction do not lose the ownership of their financial instruments.⁹⁵ When we com-

⁹⁰ See

http://www.bafin.de/EN/BaFin/FunctionsHistory/SecuritiesSupervisionAssetManagement/securitysupervisionassetmanagement_node.html.

⁹¹ See Jahresbericht der Bundesanstalt für Finanzaufsicht (2011), p210.

⁹² See Jahresbericht der Bundesanstalt für Finanzaufsicht (2011), p212.

⁹³ See WpHG §14 -

http://www.bafin.de/SharedDocs/Aufsichtsrecht/EN/Gesetz/wphg_101119_en.html.

⁹⁴ See WpHG §38 -

http://www.bafin.de/SharedDocs/Aufsichtsrecht/EN/Gesetz/wphg_101119_en.html.

⁹⁵ See section 28 of the WpHG.

pare this to the US, where traders can be fined up to several millions for insider trading, Germany is rather harmless with its fines.

3. Literature

The efficient market hypothesis was first proposed by the 2013 Nobel Prize winner Eugene Fama (1970). It is one of the central theorems of finance and has become a large building block of modern portfolio selection theory and derivative pricing.⁹⁶ The following chapter will introduce the efficient market hypothesis in connection to directors' dealings. There are two main important aspects, which have to be recognized when considering management transactions with the efficient market hypothesis.⁹⁷

First, transactions, which are published to financial authorities, may contain unknown information and may, therefore, add to the publicly available information set.⁹⁸ Directors who use this information to rely their trading decisions on should not (in relation to the market efficiency hypothesis) earn abnormal returns. Therefore, the later analyzed results also provide an important prove of the efficient market hypothesis.

Secondly, the regulatory framework prevents managers from hiding insider information. Market transparency should improve the fundamental pricing of company's securities and should also increase market efficiency. However, the detection of price anomalies can be interpreted that the market is not fully efficient.

⁹⁶ See Fama (1970), p. 383.

⁹⁷ See Dickgießer (2000).

⁹⁸ See Dickgießer (2000).

3.1 Efficient Market Hypothesis

The term “Efficient Market Hypothesis” was first introduced by Eugen F. Fama in his famous paper *“Efficient Capital Markets: A Review of Theory and Empirical Work”* in the year 1970. Until today, the hypothesis has been discussed controversially in a lot of academic papers and it is one of the foundational blocks of modern portfolio selection and option pricing theory. Fama states that an efficient market is,

“...a market in which firms can make productive-investment decisions, and investors can choose among the securities that represent ownership of firms’ activities under the assumption that security prices at any time “fully reflect” all available information.”⁹⁹

In fact, the most important part for directors’ dealings is that all available information of a certain company is *“fully reflected”* in the market price. The associations which are drawn from the definition refer to a wide range of financial applications. In particular, this means that there are no inefficiencies in the market, which investors could use to generate abnormal returns and exploit market opportunities. In a strong version of the effective market it would be impossible to take advantage of a *“market edge”* like hedge funds do today. Therefore, it should not be possible to forecast prices. This assumption is strongly supported by the *random walk theory*.¹⁰⁰ Huge price changes should only be occurring after large news announcements, which even insiders cannot predict, because all available information is in the market price.¹⁰¹ When referring continuing this argumentation, it should not be possible for investors to attain abnormal returns above the market. Logically, financial instruments, which track the market activity, seem to be the proper choice for an investor. Such instruments are index funds, which can be unweight, market weighted, price weighted or capitalization weighted.¹⁰² The overall assumption in an efficient market states that investors can only make a return which is equal to the market return. Therefore, they

⁹⁹ See Fama (1970).

¹⁰⁰ See Cootner (1964).

¹⁰¹ See Dickgießer (2000).

¹⁰² See CFA Level 1 - <http://www.investopedia.com/exam-guide/cfa-level-1/securities-markets/efficient-market-implications.asp>.

should minimize their cost per trade, such as transaction costs or slippage.¹⁰³ Hence, the safest ways to invest in the market with the minimal amount of costs are index funds, which track for example the S&P500 or the Austrian Traded Index (ATX). As we can see the definition is quite broad of the efficient market, therefore it has been divided into three subsections.

The following sections will describe the three basic forms of the efficient market hypothesis.

3.1.1 The strong form efficient market hypothesis

The strong form efficient market hypothesis is the direct reflection of Fama's initial definition of an efficient market. Therefore, in the strong form efficient market hypothesis, the price includes "*all available information*".¹⁰⁴ Information can here be understood, as past pricing data, company news, analyst's ratings, balance sheet numbers, the quality of the company's management decisions, the public view of the company, the companies account practices and traders' analysis of the company.

Hence, the strong form of the efficient market hypothesis encompasses not only fundamental information, but also technical information, like such as is derived from quantitative models. "*All available information*" also includes the asymmetric informational advantage on which insiders are trading, to derive abnormal returns from the market. If the strong form would hold for the real world, then there would be no need for restrictions on directors' dealings, because no market edge would be possible. In fact, Fama itself proclaimed that the strongest form of the efficient market hypothesis cannot be true for the real world.¹⁰⁵ A proof of this claim would be, that for the strongest form of the efficient market hypothesis there would be transaction and trading costs of zero.¹⁰⁶ However, this is not the case as in modern trading model devel-

¹⁰³ See CFA Level 1 - <http://www.investopedia.com/exam-guide/cfa-level-1/securities-markets/efficient-market-implications.asp>.

¹⁰⁴ See Fama (1970).

¹⁰⁵ See Fama (1991) p. 1575.

¹⁰⁶ See Shleifer (2000).

opment factors like the transaction costs and slippage play an extremely important role.¹⁰⁷

3.1.2 The semi-strong form efficient market hypothesis

As we have pointed out, the strongest form of the efficient market hypothesis cannot hold in the real world. The semi strong form of the hypothesis breaks up the restriction on information, so that it can be applied better to the real world. The assumption, under which the semi strong form of the efficient market hypothesis holds, is that it requires that all “*publicly-available information*” is included in the price of the company’s stock at any point in time.¹⁰⁸ That means, that prices reflect information to the point, where the marginal costs for a transaction are lower than the yield of the action taken on the information.¹⁰⁹ Furthermore, in the semi strong form of the efficient market hypothesis, “*publicly-available information*” does not restrict directors’ dealings. However, the semi strong form of the efficient market hypothesis is usually meant by a reference to the efficient market hypothesis in the academic literature.¹¹⁰

3.1.3 The weak form efficient market hypothesis

The weak form of the efficient market hypothesis focuses on all available information that can be derived from stock prices. As Jensen (1978) states in his paper,

“The Weak Form of the Efficient Market Hypothesis, in which the information set θ_t is taken to be solely the information contained in the past price history of the market as of time t .”¹¹¹

¹⁰⁷ See Narang (2013).

¹⁰⁸ See Dickgießer (2000).

¹⁰⁹ See Dickgießer (2000).

¹¹⁰ See Jensen (1978) p. 95-101.

¹¹¹ See Jensen (1978) p. 95-101.

That means that all historical price movements are contained in the today's stock price. Therefore, traders who use technical analysis or charting methods cannot yield excessive returns, because the price includes past information. Furthermore, it is possible for traders, who rely heavily on the fundamentals of a company, to attain abnormal returns. Consequently, it is possible for insiders, who rely on their information, to accumulate profits.¹¹²

3.2 Empirical Challenges to the efficient market hypothesis

As we have seen the theoretical foundation on which the efficient market hypothesis is built on, we will now focus on the empirical challenges of the hypothesis. By recalling efficiency, we can see that in efficient markets investors cannot reach abnormal returns, without having a certain amount of risk.¹¹³ This idea can be best illustrated by a well-known story:

*A student and a finance professor walk down a street. Suddenly the student sees a 100\$ bill lying on the ground. Intuitively the student wants to pick up the bill. However, the professor says, "Do not bother – if it were really a 100\$ bill it would not be there."*¹¹⁴

By talking about efficiency we can suppose that there are no *"100\$ bills around, to get picked up by any investor"*¹¹⁵. Since Fama wrote his paper, researchers found a lot of contradictions against the different forms of efficient markets.¹¹⁶ In most studies researchers found inefficiencies in the market, which are known as market abnormalities.¹¹⁷ This unusual market behavior allows experienced investors to take advantage of certain market conditions.¹¹⁸ According to the efficient market hypothesis such opportunities should not exist in the market. However, several abnormalities

¹¹² See Saad (1998).

¹¹³ See Malkiel (2003).

¹¹⁴ See Malkiel (2003).

¹¹⁵ See Malkiel (2003).

¹¹⁶ See Dickgießer (2000).

¹¹⁷ See Malkiel (2003).

¹¹⁸ For example Shiller (1981) or Merton (1987).

have been identified by researchers, such as size effect and the value effect. These abnormalities will be explained in the next subsections further.

3.2.1 Size effect

One of the most recognized market abnormalities is the size effect. Banz (1981)¹¹⁹ and Reinganum (1981)¹²⁰ present evidence that small firms have historically gained much higher returns than forecasted by the CAPM. In their study, they presented evidence that over a forty year period, larger NYSE¹²¹ listed firms had a smaller risk adjusted return than smaller NYSE listed firms. They point out that an investment into a smaller firm yields into an abnormal return. Chang and Cheng (1991) present in their study that the reasons for this behavior is that small firms suffer from financial hard times and therefore compensate this with higher returns.¹²² Contrary to this argument, Fama and French (1992)¹²³ argue that between the research period of 1963 and 1990 the dependency of the CAPM¹²⁴ beta and the return stayed the same. Fama and French (1992) come to the conclusion, that size could be a much more accurate risk factor than market beta.¹²⁵ Another factor which could lead to the conclusion of the size effect is the dependability of the size phenomenon. As Malkiel (2003) suggest in his research, from the mid-1980s until 1990 there has been no significant abnormal returns for investing in small caps.¹²⁶ In fact, in most of the markets, stocks with a high market capitalization, usually over \$2 billion, performed much better. In his research Malkiel (2003) interpreted his results by the growing institutionalization of the market. Therefore, portfolio managers prefer larger companies because they have much more liquidity in contrast to small companies.¹²⁷ Another factor which could lead to potential false results of some research studies is, that

¹¹⁹ See Banz (1981).

¹²⁰ See Reinganum (1981).

¹²¹ New York Stock Exchange.

¹²² See Chang and Chen (1991).

¹²³ See Fama and French (1992).

¹²⁴ Capital Assets Pricing Model – describes the relationship between risk and return.

¹²⁵ See Dickgießer (2000).

¹²⁶ See Malkiel (2003).

¹²⁷ See Malkiel (2003).

companies went bankrupt during the investigated time span. Not including all insolvent companies in the data set can lead to a survivorship bias.¹²⁸

3.2.2 Value effect

For many years investment professionals have argued that a value portfolio can outperform the market.¹²⁹ Investing in *value* stocks seems more profitable than investing in *growth* stocks.¹³⁰ Value stocks typically have a lower price compared to its fundamentals, like earnings, sales or the market value/book value.¹³¹ Therefore, such stocks tend to be undervalued by the market. This evidence was provided by Nicholson (1968)¹³² and Basu (1977, 1983)¹³³ with similar research results. Basu (1977) for example explained in his paper that firms with high earnings relative to the price yield abnormal returns relative to the CAPM.¹³⁴ Malkiel (2003) mentioned in his paper that since the DFA¹³⁵ began with Eugen Fama as its director of research many members of the financial community picked up the value effect.¹³⁶

Furthermore, Fama and French (1992, 1993)¹³⁷ argue in their papers that size and value, measured by the book to market ratio, are two additional priced risk factors not included in the CAPM. Although their paper from 1993 points out that the value effect has disappeared since their publication. The argument that the value effect has disappeared got also confirmed by Lakonishok et al. (1994)¹³⁸ in a research paper, which had a closer look on the effects of investing in value stocks.

¹²⁸ See Data snooping.

¹²⁹ Basu (1977), Basu (1978), Basu (1983).

¹³⁰ See Nickolson 1968.

¹³¹ Definition of value stocks - <http://www.investopedia.com/terms/v/valuestock.asp>.

¹³² See Nickolson 1968.

¹³³ See Basu (1977) and Basu (1983).

¹³⁴ See Basu (1977) and Basu (1983).

¹³⁵ Firm of Dimensional fund advisors.

¹³⁶ See Malkiel (2003).

¹³⁷ See Fama and French (1993).

¹³⁸ See Lakonishok et al. (1994).

3.3 Related Event Studies

A considerable amount of literature has been published about directors' dealings. These studies have a clear emphasis on the event study methodology as research method. This chapter will give a brief explanation of related event studies about insider trading. Further studies can be found in the table below, which represents a brief overview on the large growing body of literature, which focuses on the analysis of directors' dealings.

Previous studies on insider trading focus on the analysis of insider trading transaction disclosures. Early studies such as Seyhung (1986) show that insiders obtain abnormal returns by predicting future stock price changes, Jaffe (1974), Finnerty (1976) and Pratt and DeVere (1970) showed that insiders can earn significant returns by trading their own companies' stocks. Lakonishok and Lee (2001) showed that there is high demand for insider trading information.

After MacKinlay's (1997) introduced the event study methodology, researchers concentrated extensively with their studies on directors' dealings. Further studies such as Aktas et al. (2007) focus on the question whether insiders contribute to market efficiency. Their research focuses on NYSE/AMEX data, over the period January 1995 until the end of September 1999. To measure the market reaction, they used the event study approach. Their results suggest that insiders tend to contribute to market efficiency. Furthermore, insiders also help to improve price discovery after the regulator announced the transaction. Hence, this helps to improve market efficiency.

Researchers, who focus on the analysis of directors' dealings in Germany, mainly concentrate on the period after the implementation of the Market Abuse Directive in July 2002. Aussenegg and Ranzi (2008) focus their research on the period July 2002 until December 2007 and analyze over 11,420 insider purchase transactions and 8,664 insider sale transactions. Hence, they put an emphasis on purchase transactions on over 421 companies and sale transactions on 391 companies. Their methodology follows Campell et al. (1997) and they use several test statistics to verify their results. Their research shows that German investors tend to act as contrarian

investors. In their results Aussenegg and Ranzi (2008) find a strong market reaction for insider sale transactions. In comparison, there is only modest market reaction to purchase transactions.

Recent studies focus on the informational value of insider transactions. Fidrmuc et al. (2013) use a huge sample of over 15 countries to examine the connection between the protection of shareholders and abnormal returns. Their sample includes countries like, Austria, Belgium, Czech Republic, France, Germany, Greece, Ireland, Italy, Netherlands, Poland, Slovenia, Spain, Sweden, Switzerland, UK and USA. They propose in their study that insider purchase transactions convey more informational value to investors, if the laws of a country are well developed. In contrast, the information value of sale transactions is lower because the reasons for selling stocks are often liquidity or diversification necessities. Furthermore, their results suggest that the better the laws of a country against insider trading are developed, the smaller the informational value for insiders.

Bauwhede et al. (2014) focus with their recent study on the question if forward looking communication, such as investor relationship programs, reduces the profitability and information asymmetry among cooperate insiders. Their research is focused on the country Belgium, with a total sample of 407 transactions, which occurred in the timeframe from January 2006 until August 2010. Bauwhede et al. (2014) find evidence for high quality communications and the reduction of insider earnings and information asymmetry. Furthermore, they point out that for regulators backward looking financial statements are not the most effective information source. In contrast, they suggest focusing on investor relation activities as the most effective information source, because they provide forward looking information.

Author(s)	Points of Investigation	Sample size	Country(ies)	Results
Aktas et al. (2007)	The aim of the study is to answer the question if insiders contribute to market efficiency.	2,110 companies with 59,244 aggregated insider transactions disclosures between January 1995 and the end of September 1999	Netherlands, USA	Financial markets do not tend to respond strongly in terms of abnormal returns to directors' dealings activities. Their main finding is that even though investors do not strongly respond to insider trading, when looking at their abnormal returns, price discovery happens much faster on insider days compared to non-insider days.
Aussenegg and Ranzi (2008)	The aim of the study is to find the informational value of management transactions disclosures.	490 companies with 7,762 legal insider transactions from July 2002 to December 2007	Germany	Contrarian investment strategies among directors' dealings. They find a strong market reaction for insider sale transactions. In contrast, there are only modest market reactions to purchase transactions.
Kolasinski and Li (2009)	The aim of the study is to find out how public information about price and earnings influences the strategies of managers, who use insider trading information.	Sample is collected from the NYSE, AMEX and NASDAQ and consists of 346,120 insider transactions for 6,925 firms in the sample period of 1980 to 1997.	USA	Insiders tend to adjust their trading strategy within the earning announcement. For example, when they believe the market will underreact to their announcement. Furthermore, the study finds that insiders tend to sell less when the news are good. In contrast, insiders tend to sell more when the earnings announcement is bad.

Author(s)	Points of Investigation	Sample size	Country(ies)	Results
Agrawal and Nasser (2012)	Examination of directors' dealings in takeover targets.	5,792 transactions over 1 million from 1988–2006 from NYSE, AMEX, or NASDAQ	USA	They use difference-in-differences regressions of several insider trading measures and find no evidence that directors' increase their purchases before takeover announcements. They instead find in their data that directors' decrease them.
Fidrmuc et al. (2013)	Examination of the link of 15 European countries with their shareholder protection and abnormal returns from insider trades.	240,000 reported insider transactions, 100,000 insider purchase and more than 140,000 insider sale transactions from August 2002 until May 2007.	Austria, Belgium, Czech Republic, France, Germany, Greece, Ireland, Italy, Netherlands, Poland, Slovenia, Spain, Sweden, Switzerland, UK, USA	They find that there is a tendency that insider sale transactions in countries with better shareholder protection have less informational value. Furthermore, if shareholders are much more protected, insiders tend to communicate more information to the market.
Bauwhede et al. (2014)	Examination if high-quality communication reduces the profitability and information asymmetry among insiders.	The initial sample consists of over 4889 transactions from January 2006 and August 2010. After filtering the final sample consists of 407 transactions.	Belgium	There is evidence that high quality communication contributes to a reduction in information asymmetry and insider returns. Furthermore, Bauwhede et al. (2014) suggest the most effective communication channels are press releases and investor relation programs.

Table 1 – Directors' Dealings studies

3.4 Hypothesis

This chapter will focus on the description and the evaluation of the tested hypothesis related to my event study on German insider transaction data. The hypothesis focuses on the abnormal performance of purchase and sales transactions.

The hypothesis focuses on the question whether there is a clear effect on the performance of insiders purchase or sales transactions. Therefore, hypothesis 1 is formulated:

Hypothesis 1a:

Insider sale transactions lead to a negative abnormal performance after a sale is disclosed.

Hypothesis 1b:

Insider purchase transactions lead to a positive abnormal performance after the purchase is disclosed.

Betzer and Theissen (2008) study the effects which disclosure of insider trading has on the German Market. Their sample consists of 977 purchase and 1,005 sales events from July 2002 until June 2004, collected from the German financial authority BaFin.¹³⁹ During their research process, they use the event study methodology with an underlying market model.¹⁴⁰ To calculate expected returns the CDax is used. The estimation window is 180 days and ends 20 days prior the reporting day. Betzner and Theissen (2008) find that “...*abnormal returns are independent of the reporting delay.*”¹⁴¹ In detail they find that “...*prices are distorted in the period between the trading and the reporting date.*”¹⁴²

¹³⁹ See Betzer and Theissen (2008) p. 5-7.

¹⁴⁰ See Betzer and Theissen (2008) p. 15.

¹⁴¹ See Betzer and Theissen (2008) p. 17.

¹⁴² See Betzer and Theissen (2008) p. 17.

4. Data and Methodology

In 1969 Fama published, *“The adjustment of stock prices to new information”*. This paper was a milestone for the academic world, because it introduced the basic event study methodology to the general public. A long tail of academic research followed. Since then, the event study method became one of the leading methodologies in the statistical analysis of certain events concerning the firm value. These events can be macroeconomic events, such as the fluctuation of employees, interest rate changes or the influence of inflation on the company, or corporate events such as merger and acquisition announcements, patents and innovative product announcements, competitor bankruptcy announcements or directors’ dealings announcement.¹⁴³

The following sub-chapters will explain the used processes and techniques which are the prerequisites for the study in Chapter 5. Furthermore, I will give a short introduction into the used market model approach. I will also show how the significance of the derived results is tested. Finally, I will introduce the used data and which process was used to derive this subsample.

¹⁴³ See Fama(1969).

4.1 Process and Technologies

This chapter will give an introduction into the toolset and technologies which were used to calculate the research results.¹⁴⁴ Furthermore, this part gives also slight recommendations to the creation of an event study, with an emphasis on performance and technology related issues.

For the analysis several different technologies were chosen. Figure 2 shows the 4 layer model, which consists of the following steps:

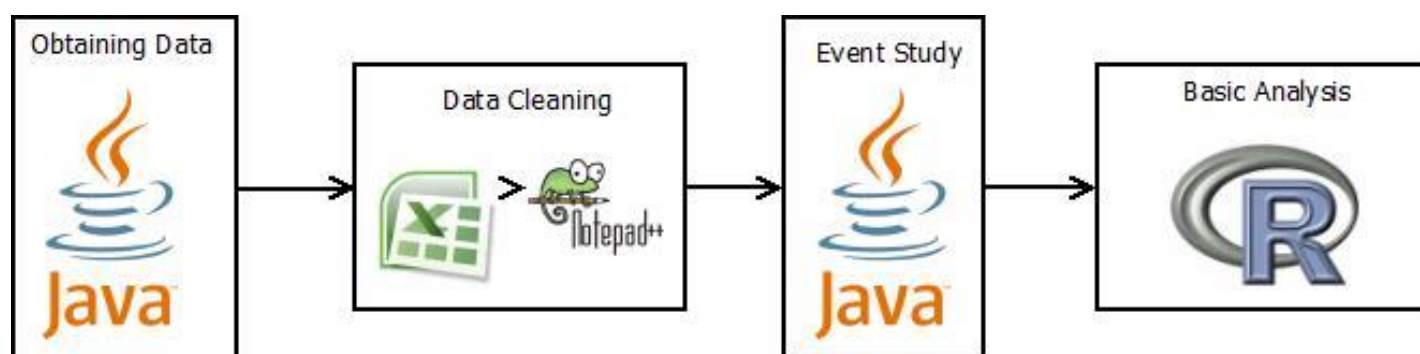


Figure 2- Used tools and steps¹⁴⁵

In the first step the data was obtained from the BaFin webpage by consistently downloading the directors' dealings events. The downloading process was done by a self-written java program which used a HTML parsing library to extract the specified da-

¹⁴⁴ See Chapter 5.

¹⁴⁵ Logos were taken from <http://www.oracle.com/index.html>, <http://www.microsoft.com/de-at/default.aspx>, <http://cran.r-project.org/>, <http://notepad-plus-plus.org/>.

ta.¹⁴⁶ After downloading all insider trading events, the data was written into a single comma separated file to obtain a consistent sample.

Secondly, the data was cleaned for further analysis. From a technological standpoint the cleaning process was done with Excel manipulation functions, like VLOOKUP or COUNTIF and self-programmed macros, for example to filter false ISIN numbers. On the one hand, one of the main advantages of cleaning data in Excel is that the effect of the actual cleaning operations can be instantly seen. On the other hand manipulating such an enormous amount of data can lead to slow performance of Excel. For more information on the final sample and the omitted data see chapter 4.4.1.

Furthermore, during the second step the data was also changed into the right format. During the prototyping phase of the program, the Excel format "*Excel Binary File Format*" (.xls) proved to be extremely inconsistent with its data types. This can be illustrated briefly by the date format Excel is using, which is extensively dependent from the local date settings. Therefore, for the implementation of the event study I choose the "*Comma Separated Values*" (.csv) - Format which is used to represent a sequence of tuples separated by a specific character.¹⁴⁷ Consequently, the file can be also transformed by a text editor and easily read by a Java program or R script. Hence, by preparing the data it became much easier during the later steps to get the values properly converted into the analysis scripts.

Third, I used the programming language Java for the implementation of the event study. To compute the prepared csv sheet, the opencsv¹⁴⁸ library, which can read and write csv files and the widely applicable Apache commons math library¹⁴⁹ was used. The second library was mainly used for computations of the market model.

When designing the program several performance oriented decisions were taken. These measures include: cutting down the amount of read and write operations, by loading the data explicitly in the local RAM. Furthermore, to minimize the computa-

¹⁴⁶ See JSoup is an open source Java HTML Parsing library which provides several methods to extract and manipulate data - <http://jsoup.org/>.

¹⁴⁷ Separators can be for example, semicolon, comma, tab or point

¹⁴⁸ See <http://opencsv.sourceforge.net/>.

¹⁴⁹ See <http://commons.apache.org/proper/commons-math/>.

tional time, loops and previously created objects were reused if possible. Therefore, before implementing the program, a brief class diagram was created to lay out the application architecture:

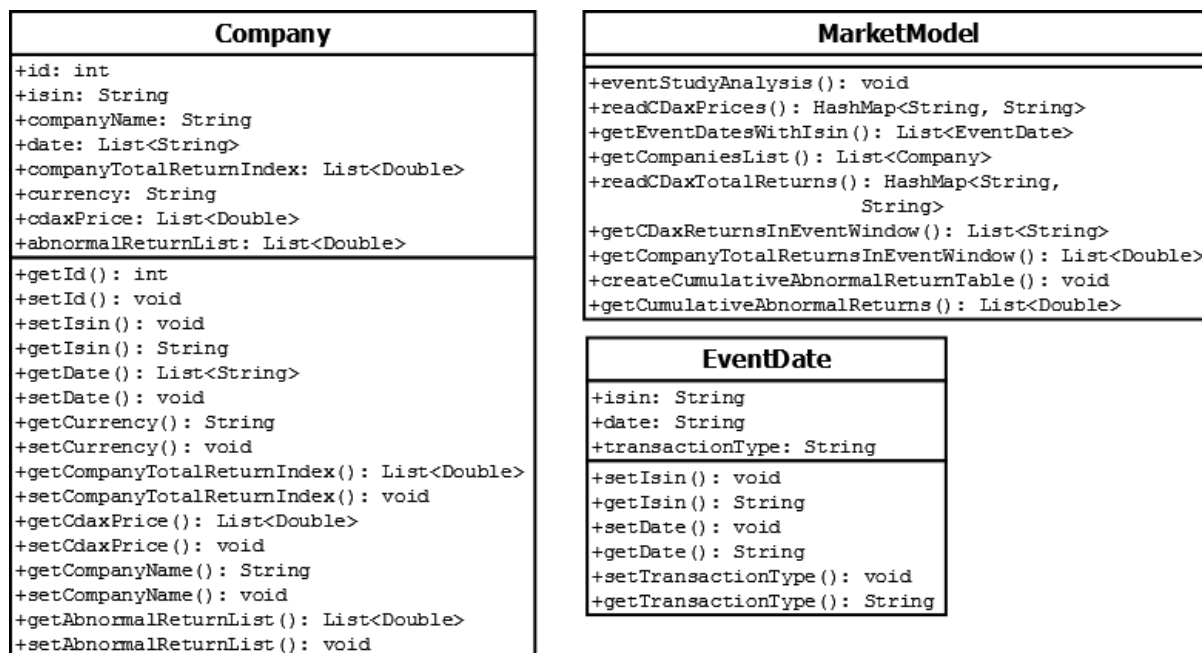


Figure 3 - Basic class diagram of the implementation of the event study analysis

As we can see we have the Java-classes Company, EventDate and MarketModel. Company has the properties id, isin, companyName, date, total return index of the company, currency, cdaxPrice and the final calculated abnormal returns. Furthermore, several getter and setter methods exist to access the fields properly. For each company there exists an event date, which has the properties isin, date and transactionType. As methods there were also several getter and setters implemented in the class. By using this approach the full object oriented potential of Java was used.

The MarketModel class has the whole logic of obtaining the data from the pre-generated csv files, computing the event windows, calculating the market model and writing every company with date in a result sheet. Basically MarketModel has the two subclasses EventDate and Company which are used in this class to represent a company and an event.

Finally, the basic analysis of the abnormal returns was done. During this step the statistical programming language R was used.¹⁵⁰ R is a programming language which focuses on the statistical analysis of data. The language itself is “Open Source”,¹⁵¹ which means, that it is freely available to the scientific community and can be used and modified to derive statistical aspects for underlying data. Basically R uses vectorized functions, which implies that large computations can be done by using less code. A well-known example is that control structures can be completely ignored, because R can process a dataset by just applying a function to the whole data set.¹⁵² This feature makes R an extremely effective language when handling data.

Compared to this fact, R has also some large disadvantages. Unlike imperative languages like Java,¹⁵³ R as a functional programming language¹⁵⁴ is rather slow with big data sets. Mostly this lack of performing code comes from the fact that many R packages¹⁵⁵ are mainly programmed in C++. Therefore, R is just a high level wrapper, which basically at its core, executes C++ code.¹⁵⁶ However, even though executing plain C++ performs extremely well, R is rather slow when performing large vectorized functions on big data sets.¹⁵⁷

Another disadvantage of R is that through its highly functional nature, loading and writing tasks become extremely slow. For example, the process of writing a csv file takes one third of total execution.¹⁵⁸ Furthermore, to manipulate data, for example to cut out a specific timeframe, R cannot use its vectorized functions and one has to use a slower implementation of a “for” or “while” loop to get the desired results.

Therefore, I decided to use R only for basic analysis like descriptive statistics of the initial data set, deeper analysis of the results and plotting of important graphs. For this task I used R 3.0.1 and several statistical libraries, such as the MASS package

¹⁵⁰ See <http://cran.r-project.org/>.

¹⁵¹ See Braun and Murdoch (2007).

¹⁵² Example for such functions are `lapply`, `mapply`.

¹⁵³ http://research.sun.com/pls/apex/f?p=labs:40150:0::::P40000_PUBLICATION_ID:2821.

¹⁵⁴ <http://cran.r-project.org/doc/manuals/r-release/R-lang.html>.

¹⁵⁵ <https://r-forge.r-project.org/>.

¹⁵⁶ See R core packages - <http://cran.r-project.org>.

¹⁵⁷ R can be speed up with several packages, for example: RCpp package or multicore package.

¹⁵⁸ The times were measures with the `proc.time()` function.

or the ggplot package. For more information on the used test statistics see chapter 4.3.

4.2 Model for calculating normal returns

4.2.1 Event Definition and Structure

This chapter will describe how an event can be defined and how the usual structure of such a study is. The method which is used was initially created by MacKinlay (1997). There are several different steps for the process of an event study:¹⁵⁹

1. The first, initial, task is to define an event of interest and describe the event window. The time span could be seconds, hours, days or months.¹⁶⁰ To illustrate this by an example, one can look at insider trading behavior of a certain company. The defined event will be the announcement of directors' dealings event and the event window could be defined as 5, 10 and 20 days before and after the management transaction. In particular, this process captures the market activity around the event of interest and allows one to interpret and to test hypotheses about insider trading in the market.
2. After the definition of the event and its associated event window, the next step is to identify several criteria for the selection of the companies.¹⁶¹ During this phase the analyst decides which firms are selected and which criteria every company has to fulfill. The principles of selecting companies are often highly interlinked with the event selection. For example, when selecting cooperation's for an analysis of insider trading activity, firms have to fulfill certain criteria, such as to belong to the same country and to report their data to a financial authority. Hence, the selection of companies defines the sample size of the analyzed set and should be picked extremely carefully.
3. After the definition of the event window, one has to define an estimation window to calculate estimators for the parameters used in the event window.¹⁶² The size of the estimation window and the estimated parameters clearly de-

¹⁵⁹ See Campell et al. (2010) and MacKinlay (1997). Furthermore, for the different steps of an event study, see <http://home.business.utah.edu/finml/fin787/slides/eventstudiesclm.pdf>.

¹⁶⁰ See MacKinlay (1997).

¹⁶¹ See MacKinlay (1997).

¹⁶² See MacKinlay (1997).

depends on the used methodology, such as constant mean return model, the market adjusted return model or the market model. It is typical for the estimation window that it should not overlap with the event window, because of the influence character of the event window's results.¹⁶³ That means that the estimation could bias the normal return measure.¹⁶⁴

4. The next step is to measure the normal and abnormal returns from the securities in the selected sample set. Under abnormal returns it can be understood "*the actual ex post return of the security over the event window minus the normal return of the firm over the event window*".¹⁶⁵ Under normal return it can be understood the expected profit without adapting the return on the underlying event. For company i and date τ the abnormal return is described as:¹⁶⁶

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

Where $AR_{i\tau}$ describes the abnormal return, $R_{i\tau}$ describes the realized return and $E(R_{i\tau}|X_{\tau})$ describes the normal return, respectively to the event date τ . Under X_{τ} we understand the adaptive information for the normal return model. There are three frequent methods for choosing X_{τ} to model normal returns. On the one hand the researcher can pick the *constant mean return model*.¹⁶⁷ The constant mean model assumes that the average return of a certain stock is constant over time. A clear connection can be drawn to the *mean reversion model*, which assumes that the market price will return to the mean over time.¹⁶⁸ On the other hand there is the *market model*, which assumes that there is a stable connection between the market return and the share price.¹⁶⁹ This process will be described more deeply in chapter 4.2.2.

¹⁶³ See MacKinlay (1997), p. 20.

¹⁶⁴ See MacKinlay (1997), p. 20.

¹⁶⁵ See MacKinlay (1997), p. 20.

¹⁶⁶ See MacKinlay (1997), p. 20.

¹⁶⁷ See MacKinlay (1997).

¹⁶⁸ See MacKinlay (1997).

¹⁶⁹ See MacKinlay (1997).

5. For testing purposes the analyst has to define the null and alternative hypotheses and test them for significance. This step goes further into econometric design. This can be illustrated briefly by different test statistics like the Wilcoxon Signed Rank Tests, which is further described in chapter 4.3.
6. Finally the results should be investigated and conclusions should be drawn. This can also mean that the researcher has to decide between two competing hypotheses. The researcher should also provide explanations and clarifications of the outcome. Optimally the results will provide new insights into the underlying subject, and the potential reader can use the results for further investigations.¹⁷⁰

4.2.2 Measuring and Analyzing Abnormal Returns

Before proceeding to examine the market model, it will be necessary to define some important notations, which are inspired by MacKinlay (1997). Returns are indexed by the event time, τ . The event date is set with $\tau = 0$ and the event window is set from $\tau = T_1 + 1$ to $\tau = T_2$. The estimation window is from $\tau = T_0 + 1$ to $\tau = T_1$. From that we can conclude that the length of the estimation window is $L_1 = T_1 - T_0$ and the length of the event window is given by $L_2 = T_2 - T_1$.¹⁷¹ After the event there is the post-event window, which is defined from $\tau = T_2 + 1$ to $\tau = T_3$ and the length is given by $L_3 = T_3 - T_2$. Figure 4 explains the relationship between the estimation window, the event window and the post-event window:

¹⁷⁰ See MacKinlay (1997).

¹⁷¹ See MacKinlay (1997), p. 20.

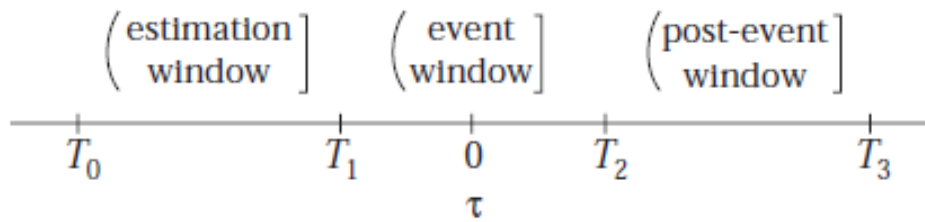


Figure 4 - Events of an event study¹⁷²

The graphic shows that an estimation window, the event window, and the post-event window do not overlap. MacKinlay (1997) describes in his paper the distinction between several different “event” categories and provides researchers estimators for the normal return model, which are not biased by the returns of other events.¹⁷³ Therefore, if the events would overlap, the returns would not be estimated precisely for each event category. Hence, the underlying assumption of the event study methodology, that the event impact is captured by the returns of the event would be lost. Basically, the estimators are kind of testing parameters, which are then taken and proven by the event window.

4.2.3 Market model

The market model has its ancestry in Sharps diagonal model, which was later named single index model and is now known under the name market model.¹⁷⁴ It is a statistical model, which assumes a linear relationship between the return of a security and the return of a market portfolio.¹⁷⁵ MacKinlay (1997) points out that the market models linearity follows from the combined normality of asset returns.¹⁷⁶ The market model can be calculated by a simple ordinary least squares regression. Therefore, for the firm i during the event time the market model parameters are:¹⁷⁷

¹⁷² See MacKinlay (1997), p. 20.

¹⁷³ See MacKinlay (1997), p. 20.

¹⁷⁴ See Sharpe (1964).

¹⁷⁵ See MacKinlay (1997), p. 18.

¹⁷⁶ See MacKinlay (1997), p. 18.

¹⁷⁷ See MacKinlay (1997), p. 21.

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

$$\hat{\alpha}_i = \hat{\mu}_i - \hat{\beta}_i \hat{\mu}_m \quad (3)$$

$$\hat{\sigma}_{\varepsilon_i}^2 = \frac{1}{L_1 - 2} \sum_{\tau=T_0+1}^{T_1} (R_{i\tau} - \hat{\alpha}_i - \hat{\beta}_i \widehat{R}_{m\tau})^2 \quad (4)$$

Where

$$\hat{\mu}_i = \frac{1}{L_1} \sum_{\tau=T_0+1}^{T_1} R_{i\tau} \quad (5)$$

$$\hat{\mu}_m = \frac{1}{L_1} \sum_{\tau=T_0+1}^{T_1} R_{m\tau} \quad (6)$$

$R_{i\tau}$ are the returns on security i and $R_{m\tau}$ are the returns of the market portfolio. $\hat{\mu}_m$ and $\hat{\mu}_i$ are estimates describe the average of $R_{i\tau}$ and $R_{m\tau}$ over the estimation window L_1 . $\hat{\sigma}_{\varepsilon_i}^2$ is the variance of the market model for the disturbance term ε for security i . ε_{it} is the period t zero mean disturbance term for security i . $\hat{\alpha}_i$ is the estimated constant component in the market model for security i and $\hat{\beta}_i$ the estimated sensitivity parameter in the market model, measuring the systematic risk of security i .

By the given market model the abnormal returns can be measured and analyzed. Let $\widehat{AR}_{i\tau}$ be the abnormal returns for period τ of security i .¹⁷⁸ Then by using the market model the abnormal returns are given by:¹⁷⁹

¹⁷⁸ See MacKinlay (1997), p. 20.

¹⁷⁹ See MacKinlay (1997), p. 18.

$$\epsilon_i = R_{it} - \widehat{\alpha}_i - \widehat{\beta}_i R_{mt} \quad (7)$$

with

$$E(\epsilon_{it}) = 0 \quad (8)$$

$$\text{var}(\epsilon_{it}) = \sigma_{\epsilon_i}^2 \quad (9)$$

MacKinlay (1997) states in his paper, that the abnormal return can be seen as the “*disturbance term*” of the market model. By restricting the null hypothesis so that abnormal returns are jointly normally distributed:¹⁸⁰

$$\widehat{AR}_{it} \sim N(0, \sigma^2(\widehat{AR}_{it})) \quad (10)$$

Then the variance is defined by:¹⁸¹

$$\sigma^2(\widehat{AR}_{it}) = \sigma_{\epsilon_i}^2 + \frac{1}{L_1} \left[1 + \frac{(R_{mt} - \widehat{\mu}_m)^2}{\widehat{\sigma}_m^2} \right] \quad (11)$$

By having a closer look at the variance, it can be seen that the variance has two components, namely the disturbance variance $\sigma_{\epsilon_i}^2$ and the additional variance, which results from the errors of α_i and β_i .¹⁸²

4.2.4 Accumulation of abnormal returns

Abnormal returns must be aggregated in order to draw conclusions of the event, which is analyzed in the event study methodology. Therefore, this step basically prepares the obtained results for the later significance tests. To aggregate the abnormal returns multiple event windows have to be defined. Let $\widehat{CAR}_i(\tau_1, \tau_2)$ be the estimated

¹⁸⁰ See MacKinlay (1997), p. 21.

¹⁸¹ See MacKinlay (1997), p. 21.

¹⁸² See MacKinlay (1997), p. 21.

cumulative abnormal return for security i . Then $\widehat{CAR}_i(\tau_1, \tau_2)$ is the sum from τ_1 to τ_2 where $T_1 < \tau_1 \leq \tau_2 \leq T_2$. This can be written by:¹⁸³

$$\widehat{CAR}_i(\tau_1, \tau_2) = \sum_{t=\tau_1}^{\tau_2} \widehat{AR}_{it} \quad (12)$$

with

$$\overline{AR}_t = \frac{1}{N} \sum_{i=1}^N \epsilon_{it} \quad (13)$$

\overline{AR}_t is the average abnormal returns over the number N sample companies on day t . The variance of $\widehat{CAR}_i(\tau_1, \tau_2)$ is defined by

$$\sigma_i^2(\tau_1, \tau_2) = (\tau_2 - \tau_1 + 1) \sigma_{\epsilon_i}^2 \quad (14)$$

This estimator of the variance for time τ_1 and τ_2 is appropriately used for large L_1 . In contrast, for small values of L_1 the variance should be adjusted for errors.¹⁸⁴

The distribution of the cumulative abnormal returns is:¹⁸⁵

$$\widehat{CAR}_i(\tau_1, \tau_2) \sim N(\mathbf{0}, \sigma_i^2(\tau_1, \tau_2)). \quad (15)$$

4.3 Analyzing Abnormal Returns

In order to identify the significance of the obtained cumulative abnormal returns several statistical tests are performed to show the significance of the results. This chap-

¹⁸³ See Aussenegg and Ranzi (2008).

¹⁸⁴ See MacKinlay (1997), p. 21.

¹⁸⁵ See MacKinlay (1997), p. 21.

ter will give a theoretic description of two tests, which are later used to analyze the empirical results.¹⁸⁶

MacKinlay (1997) proposes in his paper a parametric test-statistics, which is used to test the null hypothesis that the abnormal returns are 0. The test is defined as follows:¹⁸⁷

$$\theta = \frac{\overline{CAR}(\tau_1, \tau_2)}{\sqrt{\text{var}(\overline{CAR}(\tau_1, \tau_2))}} \quad (17)$$

Where

$$\overline{CAR}(\tau_1, \tau_2) = \sum_{\tau=\tau_1}^{\tau_2} \overline{AR}_{\tau} \quad (10)$$

$$\text{var}(\overline{AR}_{\tau}) = \frac{1}{N^2} \sum_{i=1}^N \sigma_{\epsilon_i}^2 \quad (19)$$

$$\text{var}(\overline{CAR}(\tau_1, \tau_2)) = \sum_{\tau=\tau_1}^{\tau_2} \text{var}(\overline{AR}_{\tau}) \quad (20)$$

The cumulative abnormal returns between the dates τ_1 and τ_2 are calculated by taking the sum of the abnormal returns. Taking the sum of the residual variances for each security i divided by the squared number of variances, the $\text{var}(\overline{AR}_{\tau})$ is calculated. To obtain the $\text{var}(\overline{CAR}(\tau_1, \tau_2))$ the sum of the abnormal return variances between the dates τ_1 and τ_2 are calculated. Furthermore, the test statistic θ can be assumed to be asymptotic standard normal distributed $N(0, 1)$ for large sample sizes.¹⁸⁸

The above test is a parametric test, which basically assumes a probability distribution and makes assumptions about parameters of the distribution.¹⁸⁹ A large grown body of literature documents that the abnormal returns of an event study are often fat

¹⁸⁶ See Chapter 5.

¹⁸⁷ See MacKinlay (1997), p. 24.

¹⁸⁸ See MacKinlay (1997) p.12.

¹⁸⁹ See Aussenegg and Ranzi (2008), p. 44.

tailed and heavily skewed.¹⁹⁰ Hence, the next test is a non-parametric test. Compared to parametric tests, non-parametric tests can be called distribution free, because they are based on fewer assumptions.¹⁹¹ Especially they do not depend on the data having a certain distribution.¹⁹² For this reason the Wilcoxon Signed Rank Tests is chosen. This test considers that both, the sign and also the magnitude of the measured abnormal returns are relevant.¹⁹³ The test statistic is defined by:¹⁹⁴

$$W_+ = \sum_{i=1}^N r_i^+ \quad (11)$$

r_i^+ is the positive rank of the absolute value of the cumulative abnormal returns.¹⁹⁵ Hence, the null hypothesis is that the median between the pairs of observation is zero. The test works as follows:¹⁹⁶

1. Take the absolute difference for each pair of the total sample.
2. Omit the pairs which difference is zero.
3. The remaining pairs should be ranked from smallest to largest, tied ranks are used if they are appropriate.
4. If the difference of the pair is positive the sign of the rank is "+", if the difference is negative the sign of the rank is "-".
5. Calculate the test statistics by summing up all signed ranks.

¹⁹⁰ See MacKinlay (1997) p.12.

¹⁹¹ Description of non-parametric tests - http://sphweb.bumc.bu.edu/otlt/MPH-Modules/BS/BS704_Nonparametric/BS704_Nonparametric2.html.

¹⁹² Description of non-parametric tests - http://sphweb.bumc.bu.edu/otlt/MPH-Modules/BS/BS704_Nonparametric/BS704_Nonparametric2.html.

¹⁹³ See Serra (2002), p. 7.

¹⁹⁴ See Wilcoxon (1945), p. 44.

¹⁹⁵ See Wilcoxon (1945).

¹⁹⁶ See <http://vassarstats.net/wilcoxon.html>.

The Wilcoxon Signed Rank Test assumes that none of the calculated absolute values are equal.¹⁹⁷ Aussenegg and Ranzi (2008) state that for large samples W_+ will be roughly normal distributed.¹⁹⁸

4.4 Data

The directors' dealings data which is used in this study was obtained from the public website of the German financial authority BaFin¹⁹⁹, which is basically the equivalent to the Austrian FMA. The original data set consists of 36,799 rows, without the header, and 23 columns. Each column represents a certain field type and each row represents a company transaction. The columns include important information about the issuer name, the company location, the professional role in the company, the private role of the person related to the company, the ISIN²⁰⁰ code, a BaFin identification string, the type of transaction, the day when the security is traded, the amount of the traded security, the currency, the price of the traded security on the trading day, the filling date and the publishing date. In the original dataset there are over 1,756 companies, which are represented by their ISIN numbers. Generally the sample selection process is tightly connected to the data cleaning process which consists of two steps, which can be seen in Table 2.²⁰¹

The table below shows only 32,432 transactions, compared to the obtained sample from the BaFin. The reason for the difference of 4,367 transactions is that these transactions were omitted, because they were not clearly marked as buying or selling transactions of stocks. Hence, to show the reader a logic overview of the sample creation process, only 19,814 purchase and 12,618 sale transactions were used as a starting point.

¹⁹⁷ See Serra (2002), p. 8.

¹⁹⁸ See Aussenegg and Ranzi (2008), p. 44.

¹⁹⁹ See www.bafin.de.

²⁰⁰ International Security Identification Number.

²⁰¹ More on the two step data cleaning process can be read in the following chapter.

	Insider Purchase Transactions	Insider Sale Transactions
Downloaded sample	19,814	12,618
Some data are not clearly signed, with DE or have a broken ISIN numbers.	-7,112	-7,289
Remaining Data	12,702	5,329
The sample also consists of transactions which have a broken currency, trading holiday or price field.	-224	-153
Remaining Data	12,478	5,176
In the second sample selection step the unique transactions and also the transaction occurrence within a ± 20 day windows were omitted.	-9,770	-3,655
Remaining Data	2,708	1,521
For some companies there exists no matching ISIN number in the Thomson One Database for an event date. Therefore, these data is omitted.	-316	-162
Remaining Data	2,392	1,359
If the estimation window has a period where no data exists, "NaN"-values are computed within the program. These data is not used in the final computations.	-95	-44
Final Sample	2,297	1,315

Table 2 - Sample Selection Process: This table outlines the sample selection process. The data cleaning process²⁰² was an extremely important step to obtain a consistent data sample.

Table 2 describes the sample selection process. The downloaded sample for purchase and sale transactions consists of 36,799 events. In the first step, the broken or unsigned ISIN numbers and all transactions, which do not describe purchase and sale transactions, are filtered out of the sample. In the next step the currency symbols, which do not have euro as currency and broken stock prices are filtered out. Furthermore, the total sample is cleaned for unique transactions. That means that

²⁰² See Chapter 4.4.1 for further information about the data cleaning process.

transactions which have the same ISIN, transaction type and event date are combined into one transaction. This step also includes that there cannot be the same transaction within ± 20 trading days. After this step, the sample of 2,708 purchase and 1,521 sale transactions is used in the Java program. However, 478 transactions are omitted, because no matching ISIN number exists in the Thomson One Banker sample, which consists of the total returns for each company. After the results are obtained from the program, 139 transactions are omitted, because they contain “NaN” values, which are not used for the final analysis of the data set. Hence, the final sample consists of 2,297 purchase transactions and 1,315 sale transactions.

4.4.1 Data Cleaning

As we can see from the description of the sampling process a lot of data was cut out to obtain the final sample, which is used in the results section. The following data sources were used: insider transaction disclosures from the BaFin, company’s total return index obtained from Thomson One Banker and the CDax obtained from yahoo finance. This chapter will describe shortly the most important processes to derive the final sample.

The data cleaning process was done in three major steps. First, the broken or unclear records were cleaned. Then the uniqueness of a transaction was determined and the transactions were cleaned by similar transactions within ± 20 trading days. Finally data inconsistencies among several different data sources were cleaned automatically by the program.

During the first two steps of the cleaning process there were several important cleaning aspects, such as inconsistency of the data compared to the other data sources (for example.: trading holidays, inconsistent dates or “NaN”²⁰³ values) and broken and incorrect data. To document the cleaning process, the excluded types of data were marked in the dataset in an extra column with “1” for a correct value and “0” for

²⁰³ NaN means “Not a number”, and describes a value, which cannot be represented by a numerical expression.

an incorrect value. This process has the huge advantage that no data is lost and can be recreated during the cleaning process.

One of main problems in creating a proper subsample of the data, were its inconsistencies among different sources. By data inconsistencies, it is meant that out of the three data sources a summarized data set is created. This can be best illustrated by an example, some data sources had certain dates which other data sources had not, like trading holidays. Therefore, the information has to be cleaned in all three data sets. The dates which were considered in the cleaning process can be seen in the table below:

Trading Holidays²⁰⁴
Weekends from 2002 until 2013
New Year
Good Friday
Easter Monday
Labor Day
Christmas Eve
1.Christmas Day
2.Christmas Day

Table 3 - Trading Holidays

Furthermore, in the first two steps the sample had to be cleaned for incorrect values, such as broken ISIN numbers. At first all proper ISIN numbers were marked with a self-written excel macro. In the next step, an attempt was made to recreate incorrect ISIN numbers to ensure the maximum possible sample size for the later evaluation.

Another problem was that the transaction type in the BaFin data was not consistent within the sample. For example, some transactions were marked as “Verkauf”, “Kauf”, “Exercise of options” or “Acquisition of shares by exercise of options”. Many more of these markings can be found in the BaFin database. Therefore, for further

²⁰⁴ International Trading Holidays – Germany http://www.boerse-frankfurt.de/de/termine/internationaler_handelskalender.

analysis it was important to mark all unambiguous "sale" and "purchase" transactions consistently and ignore all derivatives and equity funds. In the final data sample the used transaction types were marked with a "K" and "V".

4.4.2 Descriptive Statistics

The downloaded sample consists of 36,799 transactions. There are 19,814 insider purchase transactions and 12,618 sale transactions in the sample. In the downloaded sample there are 1,756 companies in total, for purchase 1,226 and 1,441 for sale transactions.

The final sample consists of 3,612 transactions, which can be split into 1,315 sale and 2,297 purchase transactions. Figure 5 below shows all buy and sell transactions from June 2003 until August 2013. From the graphic it can be seen that the transaction high is from 2006 until 2008 and decreases after this period. When having a look at the used subsample there are 733 companies which are analyzed for purchase transactions and 550 for sale transactions. Overall there are 833 companies in the sample. From the total of 3,612, there are 2,297 events which are purchase transactions and 1,315 events which are sale transactions.

The value per transaction is an average 2,373,800.23 Euro. For purchase and sale transactions the average is 2,625,794.86 Euro and 1,920,209.90 Euro. The total volume of buying and selling transactions is 9,903.4 million Euros. Furthermore, when comparing purchase with sale transactions, the volume of purchase transactions exceeds the volume of sale transactions, which is consistent with findings in other academic research.²⁰⁵ According to Aussenegg and Ranzi (2008) this provides "*...evidence of performance-related managerial remuneration like stocks and stock options*".²⁰⁶

²⁰⁵ See Aussenegg and Ranzi (2008).

²⁰⁶ See Aussenegg and Ranzi (2008).

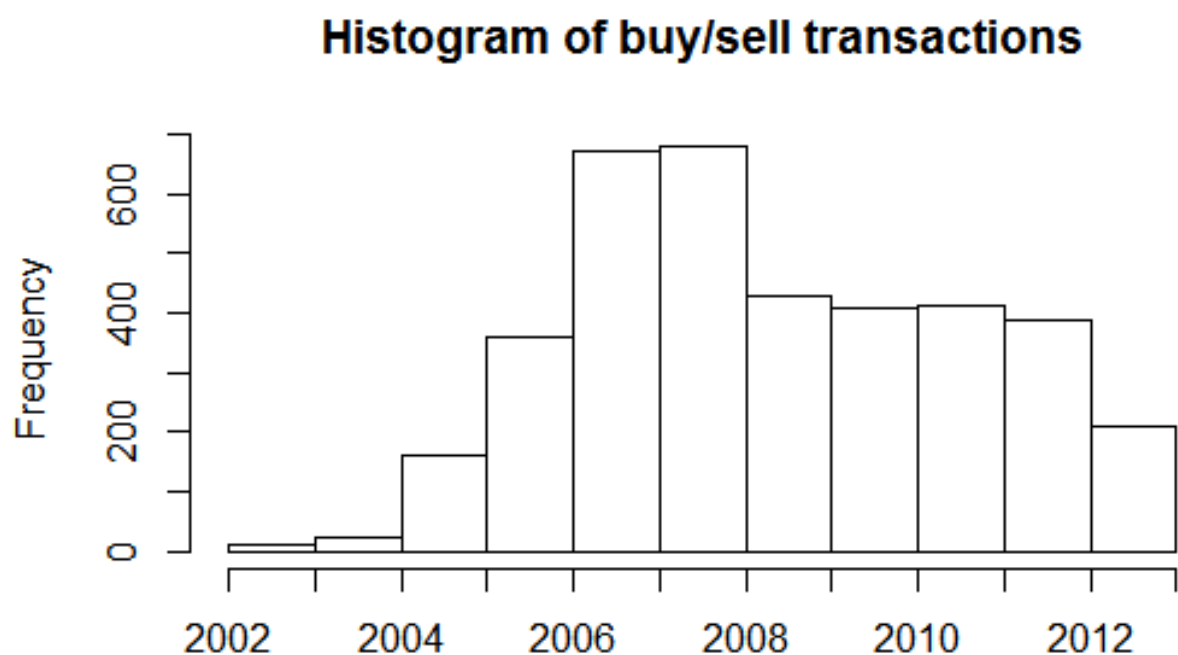


Figure 5 - Histogram of buy and sell transactions: The final number of 3,612 director dealings transactions, including 2,297 insider purchase and 1,315 sale transactions in the time period June 2003 until August 2013.

Descriptive Statistics of the total sample					
	Number of companies	Number of disclosures	Value per transaction		Total Volume in Million €
			Average in €	Median in €	
Purchase transactions	733	2,297	2,625,794.86	133,637.15	7,042.3
Sale transactions	550	1,315	1,920,209.90	32,500.00	2,861.1
All transactions	833	3,612	2,373,800.23	49,584.50	9,903.4

Table 4 - Descriptive statistics: This table presents a descriptive statistics for the total director dealings sample of Germany over the timeframe June 2003 until August 2013.

5. Results

The following chapter will provide the empirical results, which were obtained using the explained methodology from chapter 4. The focus of the analysis will be on sale and purchase transactions. Furthermore, I will check my results by testing them for robustness.

5.1 Sale and Purchase Transactions

The used sample of insider transaction data proposes that managers act as contrarian investors. The Figure below combines the results for the cumulative abnormal returns (CAR) for insider sale and purchase transactions from June 2003 until August 2013. On one hand the plot shows the cumulative abnormal returns (CAR) of sale transactions, which are indicated by a red line with circle points. On the other hand Figure 6 shows the cumulative abnormal returns (CAR) of purchase transactions, indicated by the black line with square points. Both transaction types are plotted in a 20 day interval around the disclosure date. When observing the plot, the highest point tends to be around the announcement date. After the event date the CAR of sale transactions decline nearly linearly. Another observation is that there tends to be a much higher market reaction for insider purchase transactions compared to sale transactions.

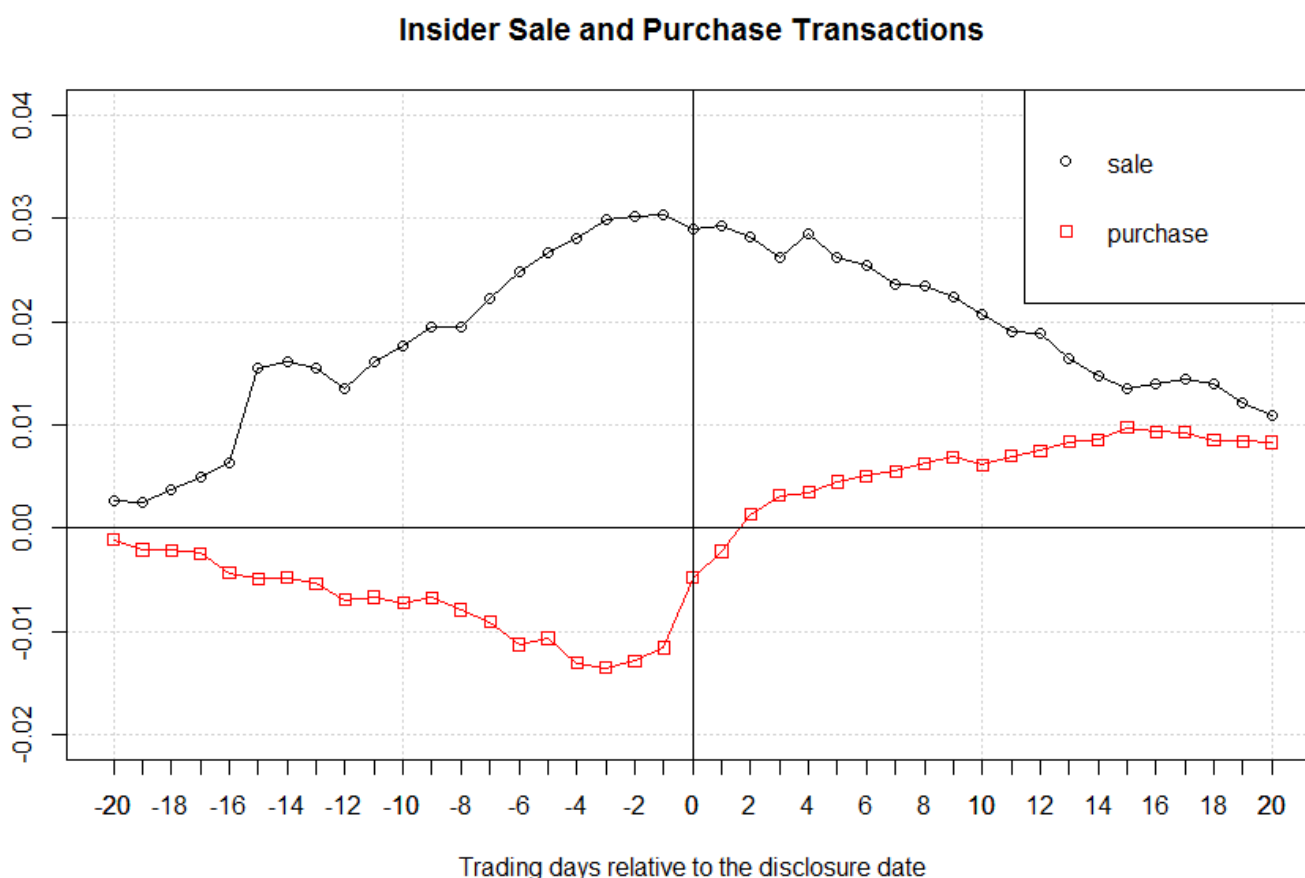


Figure 6 - Insider Sale and Purchase Transactions – This figure presents the cumulative abnormal returns (CARs) for the total sample of 2,297 purchase and 1,315 sale transactions, within the total sample period from June 2003 until August 2013. The cumulative abnormal returns are presented in the time interval 20 days before and 20 days after the event date (T_0).

For the total sample of 1,315 sale transactions in the period from June 2003 until August 2013 the average CAR in the interval $T_{-20} - T_{-1}$ is 3.04%.²⁰⁷ In contrast to findings in the US²⁰⁸, prices tend to decline quite slowly after the announcement date in Germany.²⁰⁹ Furthermore, before the disclosure date the mean in the interval $T_{-10} - T_{-1}$ is 1.43% and $T_{-5} - T_{-1}$ is 0.56%. After the event date insider transaction decline nearly linearly, this agrees with studies from the US.²¹⁰ The cumulative abnormal returns for $T_0 - T_5$ is -0.42% for the interval $T_0 - T_{10}$ it is -0.97% and for the interval $T_0 - T_{20}$ it is -1.96%.

²⁰⁷ See Table 4.

²⁰⁸ See Chapter 3.3 Related Event Studies.

²⁰⁹ See Aussenegg and Ranzi (2008) p. 45 or Aktas et al. (2007).

²¹⁰ See Chapter 3.3 Related Event Studies.

Aussenegg and Ranzi (2008) interpret the observed behavior, that insider transactions decline after a sale, in a way that managers of German cooperation do not fear “...the legal hazard inherent in insider trading based on private information about unfavorable development of the company”.²¹¹ One reason for these activities, which is proposed by Aussenegg and Ranzi (2008), could be that there are only a small number of trials against insiders in Germany, compared with historical development in the US.²¹² Therefore, German managers do not fear the consequences of insider trading, because they probably believe that insider trading in Germany is still handled without any further consequences than fines.²¹³ Hence, an explanation of this behavior might be that the payoff of doing insider trading is much more profitable, than the actual possible unpleasant consequences.

According to chapter 3.4 the hypothesis, which is relevant for insider sale transactions is:

Hypothesis 1a:

Insider sale transactions lead to a negative abnormal performance after a sale is disclosed.

When comparing the results of table 5 with the hypothesis 1a, we can see that in the interval $T_{-20} - T_{-1}$ before the announcement date the significant parameter for the test statistics is significant at the 1% level. The value of the test statistics for the interval $T_{-20} - T_{-1}$ is 7.4283. After the announcement date the test statistic is not significant at the 1% level. In detail, in the interval $T_0 - T_{20}$ the value of the test statistics is -4.6665 when rounded to 4 digits.

Therefore, hypothesis 1a is significant for the claim that insider sale transactions lead to a negative abnormal performance after the sale is disclosed.

²¹¹ See Aussenegg and Ranzi (2008) p.45.

²¹² See Chapter 2.4.4 for further information and examples of law enforcements of Germany and the US.

²¹³ See Annual Reports of BaFin -

http://www.bafin.de/EN/DataDocuments/Dokumentlisten/ListeJahresberichte/liste_jahresberichte_nod e.html.

Directors' Dealings Sale Transactions						
	Mean			Median		
$T_{-20} - T_{-1}$	0.0304	(7.4283)	(0.0000)	0.0037	(482495)	[0,0003]
$T_{-10} - T_{-1}$	0.0143	(4.9231)	(0.0000)	0.0029	(479069)	[0,0007]
$T_{-5} - T_{-1}$	0.0056	(2.7322)	(0.0031)	0.0001	(456194)	[0,0872]
$T_0 - T_5$	-0.0042	(-1.8843)	(0.0297)	-0.0072	(351425)	[0,0000]
$T_0 - T_{10}$	-0.0097	(-3.1829)	(0.0007)	-0.0112	(339045)	[0,0000]
$T_0 - T_{20}$	-0.0196	(-4.6665)	(0.0000)	-0.0213	(316155)	[0,0000]

Table 5 - Directors' Dealings Sale Transactions – Mean and Median cumulative abnormal returns (CARs) for the total sample of 1,315 sale transactions within the total sample period from June 2002 until August 2013. Test statistics are given in () and p-values are presented in [].

When looking at the purchase transactions we can almost see an ambivalent picture. For the total sample of 2,297 purchase transactions in the period from June 2003 until August 2013 the average CAR in the interval $T_{-20} - T_{-1}$ before the disclosure date is -1.16%.²¹⁴ Furthermore, in the interval $T_{-10} - T_{-1}$ and $T_{-5} - T_{-1}$ cumulative abnormal returns of -0.49% and -0.03% can be found. After the announcement date of the insider purchase transaction all average cumulative abnormal returns are positive. Hence, in the interval $T_0 - T_5$ and $T_0 - T_{10}$ the CARs are 1.61% and 1.77%. For the whole timeframe ($T_0 - T_{20}$) after the disclosure date an average of 1.99% can be observed.

For insider purchase transactions hypothesis 1b is relevant.

Hypothesis 1b:

Insider purchase transactions lead to a positive abnormal performance after the purchase is disclosed.

²¹⁴ See Table 6.

According to hypothesis 1b the interval before the announcement date is highly significant when having a closer look at the intervals $T_{-20} - T_{-1}$ and $T_{-10} - T_{-1}$. From the view of the used test, after the disclosure date purchase transactions are significantly different from 0 at the 1% level. Therefore these transactions lead to a positive abnormal performance.

The table below summarizes the findings for director dealing's purchases transactions:

Directors' Dealings Purchase Transactions						
	Mean			Median		
$T_{-20} - T_{-1}$	-0.0116	(-3.6354)	[0.0001]	-0.0108	(1100747)	[0.0000]
$T_{-10} - T_{-1}$	-0.0049	(-2.1653)	[0.0151]	-0.0058	(1144153)	[0.0000]
$T_{-5} - T_{-1}$	-0.0003	(-0.1835)	[0.4272]	-0.0011	(1229979)	[0.0059]
$T_0 - T_5$	0.0161	(9.1992)	[0.0000]	0.0048	(1591574)	[0.0000]
$T_0 - T_{10}$	0.0177	(7.4828)	[0.0000]	0.0034	(1552036)	[0.0000]
$T_0 - T_{20}$	0.0199	(6.0897)	[0.0000]	0.0039	(1506282)	[0.0000]

Table 6 – Directors' Dealings Purchase Transactions – Mean and Median cumulative abnormal returns (CARs) for the total sample of 2,297 purchase transactions within the total sample period from June 2003 until August 2013. Test statistics are given in () and p-values are presented in [].

This chapter shows all results which were obtained by the event study methodology of McKinely (1998). One of the most interesting findings is that German insider investors tend to have another opinion than present on the market. However, the effect tends to be much larger for sale than for purchase transactions. The next chapter will focus on the validity of the obtained results by proofing its robustness.

5.2 Robustness Check

To check whether the used tested sample gives relevant results a robustness check is conducted. One of the main problems, when doing an empirical study is the validity of the derived results. Therefore, the aim of the robustness test is to show the correctness of the results from chapter 5.1 by comparing the results of a smaller time frame with the “result”-sample. Furthermore, the robustness test also uses the same time period as the study from Aussenegg and Ranzi (2008), which also focuses on Germany, to compare the results of their study. If differences in the robustness test occur, they can be attributed to the chosen sub periods. Consequently, in the worst case the robustness test shows that the derived results are not meaningful.

Another problem which can occur in the final sample could be event clustering.²¹⁵ Event clustering is, when the cumulative abnormal returns for one event influence the CARs of a later event that was announced in the 20 day post event window.²¹⁶ Furthermore, event clustering can lead to autocorrelation among the cumulative abnormal returns. Hence, the results of the test statistics are not meaningful. Therefore, the final sample and the robustness test sample are cleaned for event clustering.

The timeframe of the used sub-sample of the robustness test is from June 2003 until December 2007. In the sample there are 520 sale transactions and 612 purchase transactions. Figure 7 shows the cumulative abnormal returns for sale and purchase transactions in the interval of $T_{-20} - T_{+20}$ for the robustness test subsample. Concurrently with Figure 6, the subsample in Figure 7 has close similarities to the total sample.

²¹⁵ See Aussenegg and Ranzi (2008) p.45.

²¹⁶ See Aussenegg and Ranzi (2008).

Robustness Test - Insider Sale and Purchase Transactions

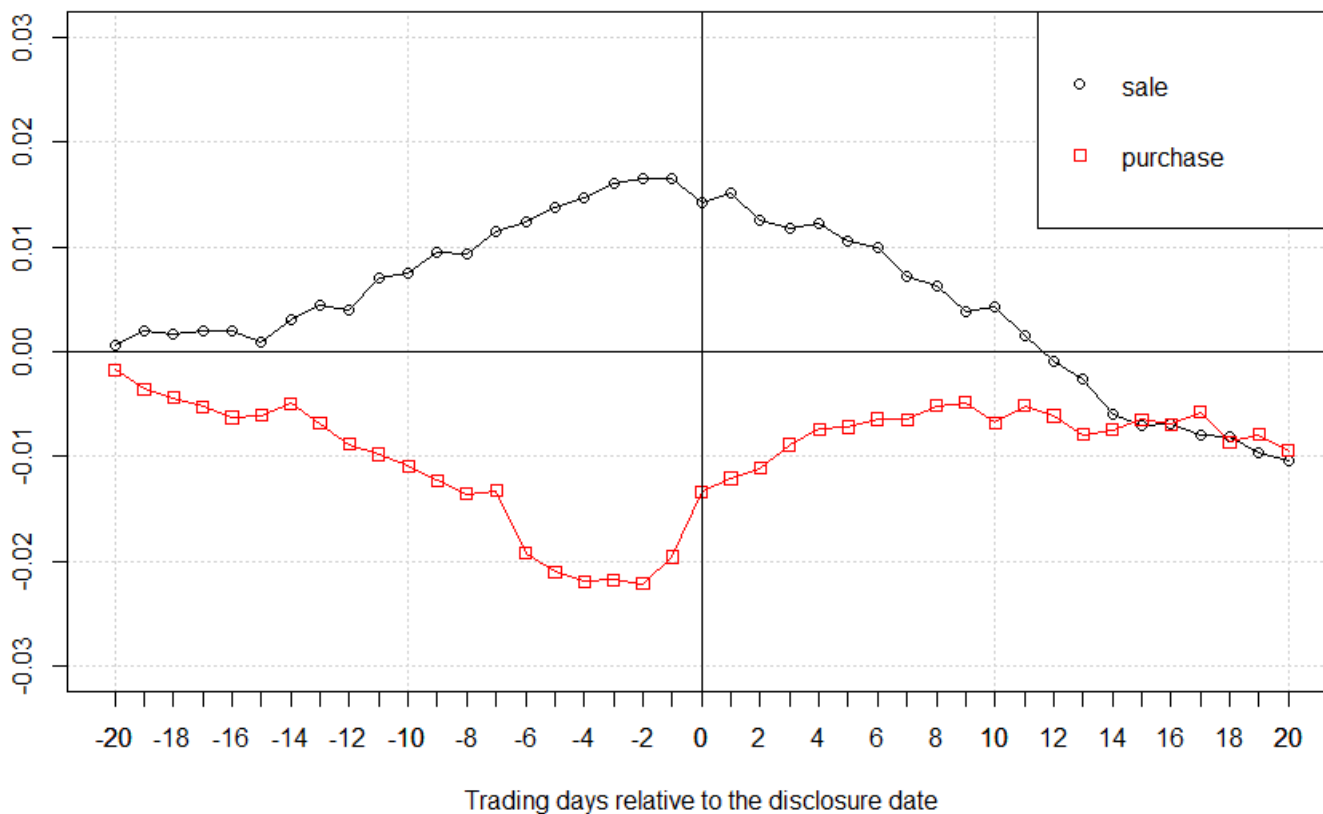


Figure 7 - Robustness Test Insider Sale and Purchase Transactions – This figure presents the cumulative abnormal returns (CARs) for the total sample of 612 purchase and 520 sale transactions, within the total sample period from June 2003 until December 2007. The cumulative abnormal returns are presented in the time interval 20 days before and 20 days after the event date (T_0).

For the subsample of 520 sale transactions in the period from June 2003 until December 2007 the average CAR 20 days before the disclosure date is 1.65%. Furthermore, in the interval $T_{-10} - T_{-1}$ and $T_{-5} - T_{-1}$ the average CAR's are 0.94% and 0.4%. After the event date, as in the total sample, the CAR's decline nearly linearly. For the interval $T_0 - T_{20}$ the cumulative abnormal returns are -2.69%. For the intervals $T_0 - T_5$ and $T_0 - T_{10}$ the mean is -0.59% and -1.22%.

Table 7 summarizes the findings:

Robustness Test - Directors' Dealings Sale Purchase Transactions						
	Mean			Median		
$T_{-20} - T_{-1}$	0.0165	(2.8913)	[0.0019]	0.0025	(210)	[0.0019]
$T_{-10} - T_{-1}$	0.0094	(2.3265)	[0.0099]	0.0000	(66)	[0.0009]
$T_{-5} - T_{-1}$	0.0040	(1.4172)	[0.0782]	0.0000	(21)	[0.0312]
$T_0 - T_5$	-0.0059	(-1.8803)	[0.0300]	-0.0053	(21)	[0.0312]
$T_0 - T_{10}$	-0.0122	(-2.8798)	[0.0019]	-0.0087	(66)	[0.0009]
$T_0 - T_{20}$	-0.0269	(-4.6189)	[0.0000]	-0.0190	(153)	[0.2029]

Table 7 - Robustness Test Directors' Dealings Sale Transactions – Mean and Median cumulative abnormal returns (CARs) for the total sample of 520 sale transactions within the total sample period from June 2003 until December 2007. Test statistics are given in () and p-values are presented in [].

By having a closer look at the robustness subsample of 520 purchase transactions in the interval June 2003 until December 2007 the average cumulative abnormal returns in the 20 day timeframe before the disclosure date is -1.96%. All interval values before the announcement date are negative. Hence, in the interval $T_{-10} - T_{-1}$ the average CARs are -0.98% and in the interval $T_{-5} - T_{-1}$ the average CARs are -0.03%. For the interval $T_{-20} - T_{-1}$ the median is significantly different from zero, which means that abnormal returns might occur. After the announcement date the cumulative abnormal returns are positive. For example, for the total subsample in the interval $T_0 - T_{20}$ the cumulative abnormal returns are 1.02%. Furthermore, in the interval $T_0 - T_{10}$ and $T_0 - T_{20}$ the CARs are 1.28% and 1.24% (both significant from zero at the 1% level).

Table 8 summarizes the findings:

Robustness Test - Directors' Dealings Purchase Transactions						
	Mean			Median		
$T_{-20} - T_{-1}$	-0.0196	(-3.8989)	[0.0000]	-0.0060	(0.0000)	[0.0019]
$T_{-10} - T_{-1}$	-0.0098	(-2.7517)	[0.0029]	-0.0005	(0.0000)	[0.0009]
$T_{-5} - T_{-1}$	-0.0003	(-0.1314)	[0.4477]	0.0000	(0.0000)	[0.0312]
$T_0 - T_5$	0.0124	(4.4984)	[0.0000]	0.0007	(0.0000)	[0.0312]
$T_0 - T_{10}$	0.0128	(3.4385)	[0.0002]	0.0000	(0.0000)	[0.0009]
$T_0 - T_{20}$	0.0102	(1.9746)	[0.0241]	0.0000	(0.0000)	[0.0009]

Table 8 - Robustness Test Directors' Dealings Purchase Transactions – Mean and Median cumulative abnormal returns (CARs) for the total sample of 612 purchase transactions within the total sample period from June 2003 until December 2007. Test statistics are given in () and p-values are presented in [].

The robustness sample shows high similarities with the final sample as either seen from the graphical representation and also from table 7 and table 8. Therefore, it can be assumed that the results from chapter 5.1 are meaningful.

6. Conclusion

This thesis examines the reporting policy of directors' dealings transactions of German companies by looking at market reactions of their disclosures of 1,315 sale and 2,297 purchase transactions. The focus of the research is on announcement dates from June 2003 until August 2013. An event study methodology by MacKinlay (1997) was used on each event date and several statistical testing methods were used to derive the significance of the results.

Compared with other academic research like Aussenegg and Ranzi (2008) German insiders tend to follow a contrarian investment strategy, when placing their directors' dealings transactions. When focusing on the derived results, the market reacts much stronger to insider sale transactions, when compared to insider purchase transactions, which concurs with Aussenegg and Ranzi (2008) and Fidrmuc et al. (2013). These papers suggest that insiders tend to be much more cautious about sale transactions than purchase transactions. This behavior might result from the *"...increasing litigation risk associated with insider sales by the absence of class action laws."*²¹⁷ Another reason for this might be that by Aier (2013), who suggests that insiders perceive asymmetric litigation risk in time before a bad news announcement.

Secondly, the results could be also explained by the theory that some market participants get the information before the regulator officially announces it. However, Fidrmuc et al. (2013) suggest that *"...the information of insider sales is in general significantly less than for purchase"*.²¹⁸ A reason for selling might be that it may include insider's diversification and liquidity needs.²¹⁹ Fidrmuc et al. (2013) point out that especially these necessities are not related to information.²²⁰ Furthermore, Fidrmuc et al. (2013) argue that if a country is much better protected by insider trading laws, insider sales have much less information content.

²¹⁷ Aussenegg and Ranzi (2008), p. 52.

²¹⁸ Fidrmuc et al. (2013), p. 1934.

²¹⁹ Fidrmuc et al. (2013), p. 1934.

²²⁰ Fidrmuc et al. (2013), p. 1934.

A solution to solve the problem of illegal insider transaction is suggested by Bauwhede et al. (2014). In their study of 407 transactions for Belgium, they focus on the question if forward looking communication could help a cooperation to reduce insider trading.²²¹ They find that companies, which focus much more on voluntary communication channels have much lower insider trading activity than other companies.²²² Therefore, they suggest that companies should focus much more on forward looking communication channels, such as press releases or voluntary investor relation activities.²²³

²²¹ See Bauwhede et al. (2014).

²²² See Bauwhede et al. (2014).

²²³ See Bauwhede et al. (2014).

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List of Abbreviations

AnSVG	Anlegerschutzverbesserungsgesetz
BaFin	Bundesanstalt für Finanzdienstleistungsaufsicht
BGBI	Das Bundesgesetzblatt
BGH	Bundesgerichtshof
DFA	Firm of dimensional fund advisors
EADS	European Aeronautic Defense and Space Company
FMDA	Financial Markets Dealers Association
ISIN	International Securities Identification Number
MiFID	Markets in Financial Instruments Directive
SEC	Security Exchange and Commission
WpAIV	Wertpapierhandelsanzeige und Insiderverzeichnisordnung
WpHG	Wertpapierhandelsgesetz

References

- Agrawalm, A., and T. Nasser (2011), Insider trading in takeover targets, 5th Annual Conference on Empirical Legal Studies paper, University of Alabama and Kansas State University.
- Aier J. K. (2013) Insider trading in loss firms, *Advances in Accounting*, Vol. 29, Issue 1, pp. 12-26.
- Aktas et al. (2007), Legal insider trading and market efficiency, *Journal of Banking & Finance*, Vol. 32, pp 1379-1392.
- Ali, P. and G. N. Gregoriou (2009), *Insider Trading: Global Developments and Analysis*, CRC Press.
- Anderson et al. (2013), The efficacy of regulatory intervention: Evidence from the distribution of informed option trading, *Journal of Banking & Finance*, Vol. 37, p. 4337-4352.
- Arneth, S. (2001), *Die Marktwirkung von Insiderhandel an Wertpapierbörsen*, Ph. D. thesis.
- Aussenegg, W., and R. Ranzi (2008), *Corporate Insider Trading and the Short-Run Price Impact of Private Information in Continental Europe*, Vienna University of Technology.
- Aussenegg, W., and R. Ranzi (2008), Legal Corporate Insider Trading and the Price Impact of Private Information: Evidence for Germany, *The Open Business Journal*, 2008, No. 1, pp. 40-52.
- Bachelier L. (1900), *The Theory of Speculation*, PhD thesis.
- Bainbridge, S. M. (2000), *Insider Trading: An Overview*, UCLA School of Law, Working Paper.
- Banz, R. W. (1981), The relationship between return and market value of common stocks, *Journal of Financial Economics*, Vol. 9, No. 1, pp. 3-18.
- Barclay, M., Litzenberger, R. (1988), Announcement effects of new equity issues and the use of intraday price data, *Journal of Financial Economics*, Vol. 21, pp. 71–99.
- Barnes, P. (2011), *Insider dealing and market abuse: The UK's record on enforcement*, Nottingham Business School, Working Paper.
- Basu, S. (1977), Investment performance of common stocks in relation to their price-earnings ratios: a test of the efficient market hypothesis, *Journal of Finance*, Vol. 32, pp. 663–682.

Basu, S. (1983), The relationship between earnings' yield, market value and return for NYSE common stocks: further evidence, Journal of Financial Economics, Vol. 12, pp. 129–156.

Bauwhede H.V., P. V. Cauwenberge and Geyt D. V. (2014), Does high-quality corporate communication reduce insider trading profitability?, International Review of Law and Economics, Vol. 37, pp. 1-14.

Betzer, A. and E. Theissen (2008), Sooner or later-Delays in trade reporting by corporate insiders, Working Paper.

Bhattacharya, U. and D. H. (2002), The World Price of Insider Trading, The Journal of Finance, Vol. 57, No. 1, pp. 75-108.

Bhattacharya, U., and C. Marshall, (2012), Do they do it for the money?, Journal of Corporate Finance, Elsevier, Vol. 18, Issue 1, pp. 92-104.

Bhattacharya, U. (2013), Insider Trading Controversies: A Literature Review, Indiana University Bloomington-Department of Finance, Working Paper.

Bonaimé, A. A. and M. D. Ryngaert (2013), Insider trading and share repurchases: Do insiders and firms trade in the same direction?, Journal of Corporate Finance, Vol. 22, pp. 35-53.

Booth et al. (2013), Robust Methods in Event Studies: Empirical Evidence and Theoretical Implications, Journal of Data Science, Vol. 11, pp. 575-606.

Braun, W.J., and M. Duncan (2007), A First Course in Statistical Programming with R, Cambridge University Press, 2nd edition.

Bris A., (2005), Do insider trading laws work?, European Financial Management, 2005, Vol. 11, No. 3, pp. 267–312.

Brown, S. J. and J. B. Warner (1985), Measuring Security Price Performance, Journal of Finance and Economics, Vol. 8, No. 3, pp. 205–58.

Bundesanstalt für Finanzdienstleistungsaufsicht (2012), Annual Report 2011.

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

Campbell C. J., A. Cowan and S. Valentina (2010), Multi-Country Event Study Methods, Iowa State University.

Carhart, M. M. (1997), On Persistence in Mutual Fund Performance, The Journal of Finance, Vol. 52, pp. 57–82.

Chakrabarty B., and A. Shkilko (2013), Information transfers and learning in financial markets: Evidence from short selling around insider sales, Journal of Banking and Finance, Vol. 37, pp. 1560-1572.

Chan, K. C., and Chen, Nai-fu (1991), Structural and return characteristics of small and large firms, Journal of Finance, Vol. 46, pp. 1467–84.

Chan et al. (2009), Share repurchase as a potential tool to mislead investors, Journal of Corporate Finance, Vol. 16, pp. 137-158.

Chang C. (2013), The market response of insider transferring trades and firm characteristics in Taiwan, Emerging Markets Review, Vol. 16, pp. 131-144.

Chen, Y. et al. (2007), "Betting on permutations". Proceedings of the 8th ACM conference on Electronic commerce, Vol. 8, pp. 326–335.

Cheng, Q. and K. Lo (2006), Insider trading and voluntary disclosures, Journal of Accounting Research, Vol. 44, No. 5, pp. 815-848.

Cicero, D., and M. B. Wintoki (2012), Insider Trading Patterns, College of Business Administration University of Tennessee and School of Business University of Kansas, Working Paper.

Cootner, P. H. (1964), The random character of stock market prices, MIT Press.

Cross, F. (1973), The Behavior of Stock Prices on Fridays and Mondays, Financial Analysts Journal, Vol. 29, pp 67-69.

Dardas K., and A. Guettler (2011), Are Directors' Dealings Informative? Evidence from European Stock Markets, Financial Markets and Portfolio Management, Vol. 25, No. 2, pp. 111-148.

Dardas K. (2011), Identifying Profitable Insider Transactions, The Journal of Investing, Vol. 21, No. 2, pp. 61-75.

Dardas K. (2012), Intraday Effects Around Directors' Dealings: Disclosures in Germany and the United Kingdom, The Journal of Trading, Vol. 7, No. 2, pp. 83-105.

Dent G. W. (2013), Why legalized insider trading would be a disaster, Western Reserve University School of Law, Delaware Journal of Corporate Law, Vol. 38, p. 247.

Dickgießer, C. P. S. (2010), Directors' Dealings, Market Efficiency, and Strategic Insider Trading in the German Stock Market, Ph. D. thesis.

Dolgoplov S. (2004), Insider Trading and the Bid-Ask Spread: A Critical Evaluation of Adverse Selection in Market Making, Capital University Law Review, Vol. 33, pp. 83-180.

Dymke B.M., and A. Walter (2008), Insider Trading in Germany – Do Corporate Insiders Exploit Insider Information?, BuR Business Research, Vol. 1, No. 2, pp. 188-205.(2),

Engle, E. (2008), Insider Trading in US and EU Law: A Comparison, Harvard Law School, Working Paper.

Fama, E. F. (1970), Efficient Capital Markets: A review of theory and empirical work, Journal of Finance, Vol. 25, No. 2, pp. 383-417.

Fama, E. F. (1991), Efficient capital markets: II, Journal of Finance, Vol. 46, No. 5, pp. 1575-1617.

Fama, E. F. and K.R. French (1992), The Cross Section of Expected Stock Returns, Journal of Finance, Vol. 47, pp. 427-465.

Fama, E. F. (1996), Multifactor Explanations of Asset Pricing Anomalies, Journal of Finance, Vol. 51, Issue 1, pp. 55-84.

Fama, E. F. (2004), The capital asset pricing model: Theory and Evidence, Journal of Economic, Vol. 18, No. 3, pp. 25-46.

Fidrmuc, J.P, A. Korczak and P. Korczak (2010), Why are abnormal returns after insider transactions larger in better investor protection countries?, Warwick Business School and School of Economics, Finance and Management, Working Paper.

Fidrmuc J. P., Korczak A. and P. Korczak (2013), Why does shareholder protection matter for abnormal returns after reported insider purchases and sales?, Journal of Banking & Finance, Vol. 37, Issue 6, pp 1915-1935.

Fischel, D. R. and D. C. (1982), The Regulation of Insider Trading, University of Chicago Law School.

Friedman, M. (1953), The case for exible exchange rates. In Essays in Positive Economics, University of Chicago Press.

Giamouridis, D., M. Liodakis and A. Moniz (2008), Some Insiders are Indeed Smart Investors, Athens University of Economics and Business, European Quantitative Equity Research and Citigroup Investment Research.

Hazen, L.T. (1992), Defining illegal insider trading lessons from the European Community directive on insider trading, Law and Contemporary Problems, Vol. 55, No. 4, pp. 232-239

Inci A. C. (2012), Insider trading activity, tenure length, and managerial compensation, Global Finance Journal, Vol. 23, Issue 3, pp. 151-166.

Jegadeesh N. (2004), Long-Run Performance Evaluation: Correlation and Heteroskedasticity-Consistent Tests, Warrington College of Business.

Jensen, M. C. (1978), Some anomalous evidence regarding market efficiency, Journal of Financial Economics, Vol. 6, pp. 95-101.

Jensen, M. C. and R. S. Ruback (1983), The market for corporate control: The scientific evidence, Journal of Financial Economics, Vol. 11, 5-50.

Jensen, M. C. (1994), Arbitrage, information theft, and insider trading. New Palgrave Dictionary of Money and Finance, pp. 50-52.

Ke, B., Huddart S., Petroni, K. (2003), What insiders know about future earnings and how they use it: Evidence from insider trades, Journal of Accounting and Economics, Vol. 35, pp. 315 – 346.

Keim B. D. and Stambaugh R. F. (1984), A further investigation of the weekend effect in stock returns, The Journal of Finance, Vol. 39, No. 3, pp. 819-835.

Kern, A. (2001), Insider dealing and market abuse: The Financial Services and Markets Act 2000, ESRC Centre for Business Research, University of Cambridge.

Kimball R., M. R., (2002), The Data Warehouse Toolkit: The Complete Guide to Dimensional Modeling, John Wiley & Sons, 2nd edition.

Khotari, S. P. and Warner J. B. (2006), Econometrics of Event Studies, Handbook of Corporate Finance: Empirical Corporate Finance, Vol. A.

Kolasinski A., Li X. (2010), Are corporate managers savvy about their stock price? Evidence from insider trading after earnings announcements, Journal of Accounting and Public Policy, Vol. 29, Issue 1, pp. 27-44.

Lakonishok, J., A. Shleifer, and R.W. Vishny (1994), Contrarian investment, extrapolation, and risk. Journal of Finance, Vol. 5, pp. 1541-1578.

Lakonishok, J., and I. Lee (2001), Are insider trades informative?, Review of Financial Studies, Vol. 14, pp. 79-11.

Laoniramai, W. (2012), Insider Trading Behavior and News Announcement: Evidence from the Stock Exchange of Thailand, Mahidol University and Institute of Management, Working Paper.

Lewellen J. (2002), Momentum and Autocorrelation in Stock Returns, The Review of Financial Studies Special, Vol. 15, No. 2, pp. 533–563.

Lo, A. W. and MacKinlay, A.C. (1992), Maximizing predictability in the stock and bond market, Working Paper.

MacKinlay, A.C. (1997), Event Studies in Economics and Finance, Journal of Economic Literature, Vol. 35, No. 1, pp. 13-19.

Malkiel, B. G. (2003), The efficient market hypothesis and its critics, Journal of Economic Perspectives, Vol.17, No. 1, pp. 59-82.

Mandelbrot, B. (1966), Forecasts of future prices, unbiased markets, and "martingale" models, Journal of Business, Vol. 39, No. 1, pp. 242-255.

McNeill, J. R., and McNeill W. H.(2003),The Human Web: A Bird's-Eye View of World History, W. W. Norton & Company.

Merton, R. C. (1987), On the current state of the stock market rationality hypothesis. In R. Dornbusch, S. Fischer, and J. Bossons *Macroeconomics and Finance: Essays in Honor of Franco Modigliani*, MIT Press, Cambridge, pp. 93-124.

Narang K. Rishi (2013), Inside the Black Box: A Simple Guide to Quantitative and High Frequency Trading, Wiley Finance.

Narasimhan J. and Sheridan T. (1993), Returns to Buying Winners and Selling Losers: Implications for Stock Market Efficiency, The Journal of Finance, Vol. 48, No. 1, pp. 65-91

Nicholson, S. F. (1968), Price Ratios in Relation to Investment Results, Financial Analysts Journal, Vol. 24, pp. 105-109.

Olmo et al. (2011), Detecting the presence of insider trading via structural break tests, Journal of Banking & Finance, Vol. 35, pp. 2820-2828.

Penman, S. H. (1982), Insider trading and the dissemination of firm's forecast information, Journal of Business, Vol. 55, No. 4, 479 -503.

Pope, P.F., R.C. Morris, and D.A. Peel (1990), Insider trading: Some evidence on market efficiency and directors' dealings in Great Britain, Journal of Business Finance & Accounting, Vol. 17, No. 3, pp. 359-380.

Rau, M. (2004), Directors' Dealings am deutschen Aktienmarkt. Empirische Analyse meldepflichtiger Wertpapiergeschäfte. Ph. D. thesis, Universität Zürich.

Ravina, E., and P. Sapienza (2010), What Do Independent Directors Know? Evidence from Their Trading, Review of Financial Studies, Vol. 23, pp. 962-1003.

Raymond, D. K., and Terrence B. O. (1986), *The Accounting Review*, Vol. 61, No. 1, pp. 76-90.

Reinganum, M. (1981), Misspecification of capital asset pricing: Empirical anomalies based on earnings yields and market values, Journal of Financial Economics, Vol. 9, No. 1, pp. 19-46.

Saad, E.W. and D.V. Prokhorov (1998), Wunsch, D.C. , "Comparative study of stock trend prediction using time delay, recurrent and probabilistic neural networks," *Neural Networks, IEEE Transactions*, Vol.9, No.6, pp.1456-1470.

Samuelson, P. A. (1965), Proof that properly anticipated prices fluctuate randomly, Industrial Management Review, Vol. 6, No. 2, pp. 41-49.

Schwert, G. W. (2003), Anomalies and market efficiency, In Handbook of the Economics of Finance, Chapter 15, pp. 937-972.

Serra, A. P. (2004), Event Study Tests: A Brief Survey, Universidade do Porto-Faculdade de Economia, Working Paper.

Seyhun, H.N. (1986), Insiders' profits, costs of trading, and market efficiency, Journal of Financial Economics, Vol. 16, pp. 189 – 212.

Seyhun, H. N. (1988), The information content of aggregate insider trading, Journal of Business, Vol. 61, No. 1, pp. 1-24.

Sharpe, William F. (1964), Capital Asset Prices: A Theory of Market Equilibrium under Conditions of Risk, Journal of Finance, Vol. 19, No. 3, pp. 425–429.

Sharpe, W., and Alexander, G. (1990), Investments, 4 Edition, Englewood, NJ: Prentice Hall.

Sheskin, D. (2004), Handbook of Parametric and Nonparametric Statistical Procedures, CRC Press, pp. 54.

Shiller, R. J. (1981), Do stock prices move too much to be justified by subsequent changes in dividends?, American Economic Review, Vol. 71, No. 3, pp. 421-436.

Shleifer, A. (2000), Inefficient Markets-An Introduction to Behavioral Finance, Oxford University Press.

Steinberg, M. I. (2002), Insider Trading – A Comparative Perspective, IMF, Working Paper.

Szakmary, A.C., Shen, Q., Sharma, S.C., (2010), Trend-following trading strategies in commodity futures: A re-examination, Journal of Banking & Finance, Vol. 34, pp. 409– 426.

Tong, et al. (2013), Trading on inside information: Evidence from the share-structure reform in China, Journal of Banking & Finance, Vol. 37, Issue 5, pp. 1422-1436

Wielhouwer J. L. (2013), When is public enforcement of insider trading regulations effective?, International Review of Law and Economics, Vol. 34, pp. 52-60.

Wilcoxon Frank (1945), Individual Comparisons by Ranking Methods, Biometrics Bulletin, Vol. 1, No. 6., pp. 80-83.

Wong, E. (2002), Investigation of market efficiency: An event study of insider trading in the stock exchange of Hong Kong, Stanford University.