

TECHNISCHE UNIVERSITÄT MÜNCHEN

Lehrstuhl für Finanzmanagement und Kapitalmärkte

Directors' Dealings, Market Efficiency, and Strategic Insider Trading in the German Stock Market

Carl Philipp Sebastian Dickgießer, M.Sc.

Vollständiger Abdruck der von der Fakultät für Wirtschaftswissenschaften der Technischen Universität
München zur Erlangung des akademischen Grades eines

Doktors der Wirtschaftswissenschaften (Dr. rer. pol.)

genehmigten Dissertation.

Vorsitzender: Univ.-Prof. Dr. Isabell M. Welpé

Prüfer der Dissertation:

1. Univ.-Prof. Dr. Christoph Kaserer
2. Univ.-Prof. Dr. Gunther Friedl

Dissertation wurde am 03.05.2010 bei der Technischen Universität München eingereicht und durch die Fakultät für Wirtschaftswissenschaften am 07.07.2010 angenommen.

Abstract

This dissertation studies two distinct aspects of directors' dealings in the German stock market. First, it is empirically examined if insiders trade strategically around news announcements. The results show that while insiders do trade prior to ad-hoc announcements, trading activity increases in particular after news events. This suggests that insiders delay their transactions to periods of time that are associated with low reputational and litigation risks. The second empirical study is concerned with the slow adjustment of stock prices and the excess returns that follow reported insider trades. The presented results show that price efficiency is impeded by arbitrage risk and it is concluded that the market's underreaction to director's dealings can mainly be explained by the cost of risky arbitrage. Furthermore, it is shown that outside investors can not easily earn abnormal returns by imitating directors' dealings.

Contents

Abstract	1
Table of Contents	1
List of Figures	7
List of Tables	8
List of Abbreviations	10
1 Introduction	13
1.1 Insider Trading and Directors' Dealings	13
1.2 Aims of the Study	15
1.3 Structure of Analysis	16
2 Legislative Framework and Enforcement of Insider Trading Regulations	18
2.1 Insider Trading Regulations in the United States	19
2.1.1 Evolution of Regulations	19
2.1.2 Definition of Illegal Insider Trading	20
2.1.2.1 Core of Regulations	20
2.1.2.2 Insider Definition	21
2.1.2.3 Inside Information	22
2.1.3 Directors' Dealings Reporting Requirements	22
2.1.3.1 Reporting Framework	22
2.1.3.2 Groups Required to Report	23
2.1.3.3 Publication of Directors' Dealings	23
2.1.4 Enforcement of Regulations	24
2.1.4.1 Enforcement Framework	24
2.1.4.2 Penalties and Sanctions	24
2.1.4.3 Effectiveness of Enforcement	25
2.2 Insider Trading Regulations in the United Kingdom	25
2.2.1 Evolution of Regulations	25
2.2.2 Definition of Illegal Insider Trading	27
2.2.2.1 Core of Regulations	27
2.2.2.2 Insider Definition	28
2.2.2.3 Inside Information	29

2.2.3	Directors' Dealings Reporting Requirements	29
2.2.3.1	Reporting Framework	29
2.2.3.2	Groups Required to Report	30
2.2.3.3	Publication of Directors' Dealings	30
2.2.4	Enforcement of Regulations	31
2.2.4.1	Enforcement Framework	31
2.2.4.2	Penalties and Sanctions	31
2.2.4.3	Effectiveness of Enforcement	32
2.3	Insider Trading Regulations in Germany	33
2.3.1	Evolution of Regulations	33
2.3.2	Definition of Illegal Insider Trading	34
2.3.2.1	Core of Regulations	34
2.3.2.2	Insider Definition	35
2.3.2.3	Inside Information	35
2.3.3	Directors' Dealings Reporting Requirements	36
2.3.3.1	Reporting Framework	36
2.3.3.2	Groups Required to Report	36
2.3.3.3	Publication of Directors' Dealings	37
2.3.4	Enforcement of Regulations	38
2.3.4.1	Enforcement Framework	38
2.3.4.2	Penalties and Sanctions	38
2.3.4.3	Effectiveness of Enforcement	39
2.4	Comparative Analysis of U.S., U.K., and German Insider Trading Legislation	40
2.4.1	Definition of Illegal Insider Trading	40
2.4.2	Directors' Dealings Reporting Requirements	44
2.4.3	Enforcement of Regulations	47
2.5	Ad-hoc Disclosure Requirements in the German Stock Market	50
2.5.1	Aims of Ad-hoc Disclosure	50
2.5.2	Ad-hoc Disclosure Regulation	50
2.5.3	Publication of Ad-hoc Disclosures	52
3	Strategic Insider Trading	53
3.1	Insiders Trading Incentives and Trading Strategies	54
3.2	Trading around Different Types of News Announcements	55
3.3	Trading around Earnings-related Announcements	59
3.4	Trading around Profit Warnings and other Financial Distress Announcements	71
3.5	Trading around New Security Issue Announcements	72
3.6	Trading around M&A-Related Announcements	76
3.7	Trading around Other News Announcement	81
3.8	Trading around News Announcements in the German Stock Market	81
4	Directors' Dealings and Stock Market Efficiency	83
4.1	The Efficient Market Paradigm	84
4.1.1	The Three Versions of the Efficient Market Hypothesis	84
4.1.1.1	The Strong-Form	84

4.1.1.2	The Semistrong-Form	84
4.1.1.3	The Weak-Form	85
4.1.2	Theoretical Foundations of the Efficient Market Hypothesis	85
4.1.2.1	Investor Rationality	85
4.1.2.2	Randomness of Irrational Trades	85
4.1.2.3	Arbitrage	86
4.1.3	Empirical Tests of the Efficient Market Hypothesis	86
4.2	Challenges to the Efficient Markets Hypothesis	87
4.2.1	Theoretical Challenges to the Efficient Markets Hypothesis	88
4.2.1.1	Investor Rationality	88
4.2.1.2	Randomness of Irrational Trades	88
4.2.1.3	Arbitrage	88
4.2.2	Empirical Challenges to the Efficient Markets Hypothesis	89
4.2.2.1	Firm Size Effect	89
4.2.2.2	Value Effect	90
4.2.2.3	Momentum Effect	90
4.2.2.4	Long-term Return Reversal	90
4.2.2.5	Post-earnings Announcement Drift	91
4.2.2.6	Accrual Anomaly	91
4.2.2.7	Closed-end Fund Anomaly	91
4.2.2.8	Index Inclusion Effect	92
4.2.3	Implications for the Efficient Markets Hypothesis	92
4.3	Limits to Arbitrage	93
4.3.1	Transaction Costs	93
4.3.2	Holdings Costs	94
4.3.2.1	Idiosyncratic Risk	94
4.3.2.2	Noise Trader Risk	96
4.3.2.3	Short-selling Constraints	96
4.3.2.4	Dividends	97
4.3.3	Empirical Evidence on Limits to Arbitrage	97
4.4	Event Study Methodology	100
4.4.1	Structure and Design of Event Studies	100
4.4.2	Asset Pricing Models	101
4.4.2.1	Economic Models	101
4.4.2.2	Statistical Models	103
4.4.3	Cross-sectional Regression Analysis	107
4.5	Tests of Stock Market Efficiency Based on Returns to Directors' Dealings	107
4.5.1	Empirical Evidence from the U.S. Stock Market	107
4.5.1.1	Jaffe (1974)	108
4.5.1.2	Seyhun (1986)	108
4.5.1.3	Bettis, Vickrey, and Vickrey (1997)	110
4.5.1.4	Lakonishok and Lee 2001	111
4.5.1.5	Other Studies	112
4.5.1.6	Implications for the Efficiency of the U.S. Stock Market	112
4.5.2	Empirical Evidence from the U.K. Stock Market	114

4.5.2.1	Gregory, Matatko, and Tonks (1997)	114
4.5.2.2	Friederich, Gregory, Matatko, and Tonks (2002)	115
4.5.2.3	Fidrmuc, Goergen, and Renneboog (2006)	116
4.5.2.4	Implications for the Efficiency of the U.K. Stock Market	116
4.5.3	Empirical Evidence from the German Stock Market	119
4.5.3.1	Rau (2004)	119
4.5.3.2	Heidorn, Meyer, and Pietrowiak (2004)	120
4.5.3.3	Tebroke and Wollin (2005)	121
4.5.3.4	Klinge, Seifert, and Stehle (2005)	121
4.5.3.5	Stotz (2006)	122
4.5.3.6	Betzer and Theissen (2009)	123
4.5.3.7	Betzer and Theissen (2008)	124
4.5.3.8	Implications for the Efficiency of the German Stock Market	124
5	Empirical Analysis of Strategic Insider Trading around News Announcements	126
5.1	Hypotheses	127
5.1.1	Pre-announcement Trading Activity	128
5.1.2	Post-Announcement Trading Activity	129
5.1.3	Influence of Stock Price Impact of News Announcements on Trading Patterns	130
5.1.4	Overview of Hypotheses	130
5.2	Study Design	131
5.3	Data Set	132
5.3.1	Sample Selection	132
5.3.2	Data Sources and Adjustments	133
5.3.2.1	Directors' Dealings Data	133
5.3.2.2	Ad-hoc Announcement Data	135
5.3.2.3	Other Data	138
5.4	Descriptive Statistics	139
5.5	Methodology	141
5.5.1	Purchases and Sales	142
5.5.2	Definition of Insider Trading Variables	142
5.5.2.1	Value of Shares Traded	142
5.5.2.2	Number of Shares Traded	143
5.5.2.3	Number of Insiders Trading	143
5.5.2.4	Percentage of Market Capitalization Traded	143
5.5.3	Test Statistics	144
5.5.4	Positive and Negative News Announcements	145
5.5.4.1	Abnormal Return Estimation	145
5.5.4.2	Classification of News Announcements into Positive and Negative Events	146
5.6	Results	147
5.6.1	Trading around News Announcements – Full Sample	147
5.6.1.1	Trading Prior to Positive News Announcements	148
5.6.1.2	Trading Prior to Negative News Announcements	148
5.6.1.3	Trading After Positive News Announcements	152
5.6.1.4	Trading After Negative News Announcements	152

5.6.2	Trading around News Announcements – “Significant” Sample	156
5.6.2.1	Trading Prior to Positive News Announcements	156
5.6.2.2	Trading Prior to Negative News Announcements	156
5.6.2.3	Trading After Positive News Announcements	160
5.6.2.4	Trading After Negative News Announcements	160
5.6.3	Discussion of Results	163
5.7	Conclusion and Implications	164
6	Empirical Analysis of Directors’ Dealings and Stock Market Efficiency	166
6.1	Hypotheses	167
6.1.1	The Market’s Reaction to Directors’ Dealings	167
6.1.2	Holding Costs and Directors’ Dealings	168
6.1.3	Transaction Costs and Directors’ Dealings	169
6.1.4	Overview of Hypotheses	170
6.2	Study Design	170
6.3	Data Set	172
6.3.1	Sample Selection	172
6.3.2	Data Sources and Adjustments	173
6.3.2.1	Directors’ Dealings Data	173
6.3.2.2	Other Data	175
6.4	Definition of Variables	177
6.4.1	Holding Cost Variables	177
6.4.1.1	Idiosyncratic Risk	177
6.4.1.2	Systematic Risk	178
6.4.1.3	Risk-free Rate	178
6.4.2	Transaction Cost Variables	178
6.4.2.1	Direct Transaction Costs	178
6.4.2.2	Indirect Transaction Costs	178
6.4.3	Control Variables	179
6.4.3.1	Trade-specific Variables	179
6.4.3.2	Insider-specific Variables	180
6.4.3.3	Company-specific Variables	180
6.5	Descriptive Statistics	181
6.6	Methodology	185
6.6.1	Return Calculation	185
6.6.2	Abnormal Returns Measure	185
6.6.3	Robustness Checks	187
6.6.3.1	Event Clustering	187
6.6.3.2	Non-normality	188
6.6.3.3	Event Induced Changes in Variance	188
6.6.3.4	Autocorrelation	188
6.6.3.5	Thin and Non-synchronous Trading	189
6.7	Results	189
6.7.1	Event Study Analysis	189
6.7.2	CAARs for Arbitrage Risk Portfolios	193

6.7.3	Cross-sectional Regression Analysis	195
6.7.4	Application of Arbitrage Trading Strategy	197
6.8	Conclusion and Implications	204
7	Conclusion and Implications	206
7.1	Conclusion	206
7.2	Implications	207
7.2.1	Directors' Dealings around News Announcements	207
7.2.1.1	Implications for Research and Theory	207
7.2.1.2	Implications For Practice	208
7.2.2	Directors' Dealings and Market Efficiency	209
7.2.2.1	Implications For Research and Theory	209
7.2.2.2	Implications for Practice	209
	Appendices	211
A	Additional Results Related to Chapter 5	212
B	Additional Results Related to Chapter 6	217
C	SEC Form 4	222
D	BaFin Directors' Dealings Notification Form	224
E	Sample Directors' Dealings Notice	227
F	Sample Ad-hoc Announcement	228

List of Figures

1.1	Structure of Analysis	16
4.1	Exemplary Event Study Time Line	101
6.1	Event Study Time Line	186
6.2	CAARs for Purchase Transactions	190
6.3	CAARs for Sale Transactions	190

List of Tables

2.1	Definition of Illegal Insider Trading in the U.S., U.K., and Germany	41
2.1	Definition of Illegal Insider Trading in the U.S., U.K., and Germany	42
2.1	Definition of Illegal Insider Trading in the U.S., U.K., and Germany	43
2.2	Directors' Dealings Reporting Requirements in the U.S., U.K., and Germany	45
2.2	Directors' Dealings Reporting Requirements in the U.S., U.K., and Germany	46
2.3	Enforcement of Regulations in the U.S., U.K., and Germany	48
2.3	Enforcement of Regulations in the U.S., U.K., and Germany	49
3.1	Empirical Studies on Insider Trading around Different Types of News Announcements . .	58
3.2	Directors' Dealings around Earnings Announcements	67
3.2	Directors' Dealings around Earnings Announcements	68
3.2	Directors' Dealings around Earnings Announcements	69
3.2	Directors' Dealings around Earnings Announcements	70
3.3	Directors' Dealings around New Security Issue Announcements	75
3.4	Directors' Dealings around other M&A Announcements	80
4.1	Empirical Studies on Market Efficiency and Insider Trading in the U.S. Stock Market . .	113
4.2	Empirical Studies on Market Efficiency and Insider Trading in the U.K. Stock Market . .	118
4.3	Empirical Studies on Market Efficiency and Insider Trading in the German Stock Market	125
5.1	Overview of Hypotheses	131
5.2	Directors' Dealings Data Set	135
5.3	Ad-hoc News Data Set	138
5.4	Pre-announcement Ad-hoc News Sample - Descriptive Statistics	140
5.5	Post-announcement Ad-hoc News Sample - Descriptive Statistics	140
5.6	Pre-announcement Trading – Positive Announcements ($CAR(0;1) > 0\%$)	150
5.7	Pre-announcement Trading – Negative Announcements ($CAR(0;1) < 0\%$)	151
5.8	Post-announcement Trading – Positive Announcements ($CAR(0;1) > 0\%$)	154
5.9	Post-announcement Trading – Negative Announcements ($CAR(0;1) < 0\%$)	155
5.10	Pre-announcement Trading – Positive Announcements ($CAR(0;1) > 10\%$)	158
5.11	Pre-announcement Trading – Negative Announcements ($CAR(0;1) < 10\%$)	159
5.12	Post-announcement Trading – Positive Announcements ($CAR(0;1) > 10\%$)	161
5.13	Post-announcement Trading – Negative Announcements ($CAR(0;1) < 10\%$)	162
6.1	Overview of Hypotheses	171
6.2	Directors' Dealings Data Set	176

6.3	Definition of Variables	182
6.4	Descriptive Statistics	183
6.5	Correlation Table	184
6.6	Event Study Results	192
6.7	CAARs for Arbitrage Risk Portfolios	194
6.8	Cross-sectional Regression Analysis Results	198
6.9	Average Returns to Arbitrage Trading Strategies: Sample Period 01-Jul-2002 – 31-Oct-2007	200
6.10	Average Returns to Arbitrage Trading Strategies: Sample Period 01-Jul-2002 – 09-Dec-2005	201
6.11	Average Returns to Arbitrage Trading Strategies: Sample Period 10-Dec-2005 – 31-Oct-2007	202
6.12	Average Market Weighted Returns to Arbitrage Trading Strategies: Sample Period 01-Jul-2002 – 31-Oct-2007	203
A.1	Pre-announcement Trading – Positive Announcements ($CAR(0;1) > 0\%$) – Adjusted for Event Clustering	213
A.2	Pre-announcement Trading – Negative Announcements ($CAR(0;1) < 0\%$) – Adjusted for Event Clustering	214
A.3	Post-announcement Trading – Positive Announcements ($CAR(0;1) > 0\%$) – Adjusted for Event Clustering	215
A.4	Post-announcement Trading – Negative Announcements ($CAR(0;1) < 0\%$) – Adjusted for Event Clustering	216
B.1	Event Study Results including Events with a Reporting Delay Greater than 30 Days . . .	218
B.2	Cross-sectional Regression Analysis Results	219
B.3	Cross-sectional Regression Analysis Results for CARs Calculated under SUR	220
B.4	CAARs Calculated under JGLS for Arbitrage Risk Portfolios	221

List of Abbreviations

AIM	Alternative Investment Market of the London Stock Exchange
AMEX	American Stock Exchange
AnSVG	Anlegerschutzverbesserungsgesetz (Investor Protection Improvement Act)
API	Abnormal Performance Index
APT	Arbitrage Pricing Theory
BaFin	Bundesanstalt für Finanzaufsicht (formerly: BAWe) (Federal Financial Supervisory Authority)
BAWe	Bundesaufsichtamt für den Wertpapierhandel (now: BaFin) (Federal Financial Supervisory Authority)
BGB	Bürgerliches Gesetzbuch (German Civil Code)
BGBI	Bundesgesetzblatt (Federal Law Gazette)
BörsG	Börsengesetz (German Stock Exchange Act)
CA 1985	Companies Act 1985
CA 2006	Companies Act 2006
CAAR	Cumulative Average Abnormal Return
CAPM	Capital Asset Pricing Model
CAR	Cumulative Abnormal Return
CEO	Chief Executive Officer
cf.	confer
CJA 1993	Criminal Justice Act 1993
CRSP	Center for Research in Security Prices at the Graduate School of Business, University of Chicago
DAFOX	Deutscher Aktien-Forschungsindex (German Stock Market Research Index)
DEPP	Decision Procedure and Penalties Manual
DGAP	Deutsche Gesellschaft für Ad-hoc-Publizität mbH
DTR	Disclosure Rules and Transparency Rules
e.g.	exempli gratia (for example)
EBIT	Earnings Before Interest and Taxes
EBITDA	Earnings Before Interest, Taxes, Depreciation, and Amortization
EC	European Community
EEA	European Economic Area
EMH	Efficient Market Hypothesis
EPS	Earnings per share
ESO	Employee Stock Option
et al.	et alii (and the following)

EU	European Union
FMDA	Financial Market Development Act (Finanzmarktförderungsgesetz)
FSA	Financial Services Authority
FSMA 2000	Financial Services and Markets Act 2000
FSMA 2005	Financial Services and Markets Act (Market Abuse) Regulations 2005
FTASI	Financial Times All Share Index
FWB	Frankfurter Wertpapierbörse (Frankfurt Stock Exchange)
GAAP	Generally Accepted Accounting Principles
DCGK	Deutscher Corporate Governance Kodex (German Corporate Governance Code)
HGB	Handelsgesetzbuch (German Commercial Code)
i.e.	id est (that is)
I/B/E/S	Institutional Brokers' Estimate System
IFRS	International Financial Reporting Standards
IPO	Initial Public Offering
ISIN	International Securities Identification Number
ITSA	Insider Trading Sanctions Act of 1984
ITSFEA	Insider Trading and Securities Fraud Enforcements Act of 1988
LBO	Leveraged Buy-out
LR	Listing Rules of the United Kingdom Listing Authority
LSE	London Stock Exchange
M&A	Mergers & Acquisitions
MAD	Market Abuse Directive
MAR	Code of Market Conduct
MBO	Management Buy-out
MiFID	Markets in Financial Instruments Directive
n/a	Not applicable
NYSE	New York Stock Exchange
OLS	Ordinary Least-Squares
OTC	Over-the-Counter
p. / pp.	page / pages
RIS	Regulatory Information Service
RNS	Regulatory News Service of the London Stock Exchange
S&P	Standard & Poor's
S&P 500	Standard & Poor's 500 Stock Index
SAR	Stock Appreciation Right
SOX	Sarbanes-Oxley Act of 2002
SEA	Securities Exchange Act of 1934
SEC	Securities and Exchange Commission
SEO	Seasoned Equity Offering
SIC	Standard Industrial Classification
TUG	Transparenzrichtlinien-Umsetzungsgesetz (German Transparency Directive Ratification Act)
U.K.	United Kingdom
UKLA	United Kingdom Listing Authority
U.S.	United States of America

VIF	Variance Inflation Factor
WSJ	Wall Street Journal
WpAIV	Wertpapierhandelsanzeige- und Insiderverzeichnisverordnung (German Securities Trading Notification and Insider Register Decree)
WpHG	Wertpapierhandelsgesetz (German Securities Trading Law)
WpÜG	Wertpapiererwerbs- und Übernahmegesetz (Germany Acquisition & Takeover Law)

Chapter 1

Introduction

1.1 Insider Trading and Directors' Dealings

This study aims at analyzing two distinct aspects of share dealings by corporate insiders in the German stock market, where laws regulating the disclosure of insider trades have been in effect only since July 2002.¹ First, it is investigated whether and how insiders engage in *strategic trading* around corporate news announcements. The second aspect of this dissertation concerns the stock price reaction to reported insider transactions, the availability of abnormal profits to outsiders, and the implications for *market efficiency*. The findings of this study should, thus, be relevant not only to researchers but also to the regulator charged with preventing illegal insider trading, and for investors trying to profit from reported directors' dealings.

Insider trading and *directors' dealings* are ambivalent terms that can cause confusion. While the former term is often associated with *illegal* conduct, it actually refers to *illegal* as well as *legal* transactions of insiders in stock of their own companies under U.S. law. In Europe, on the other hand, insider trading generally exclusively refers to *illegal* trading behavior. Instead, the term *directors' dealings* has been coined by European law to refer to *legal* share dealings of corporate insiders.² While illegal insider transactions are based on non-public, material, and price-sensitive information, directors' dealings are supposedly not and have to be disclosed to the general public.³

Recently, illegal insider trading has received much public attention. Several instances of dubious and abusive transactions by corporate insiders have been brought to light, causing public outcry and disarray at the respective companies. At the European Aeronautic Defence and Space Company (EADS), the former CEO, Noël Forgeard, and 17 other executives were investigated for three years for selling stock prior to the announcement of delays in the production of the Airbus A380, before being cleared of any wrongdoing.⁴ On the initial news, the value of EADS' stock plummeted c. 26%.⁵ At Daimler, several employees were suspected of having exploited private information concerning the resignation of Jürgen

¹Prior to July 1, 2002, only the Neuer Markt segment of the Deutsche Börse required stock issuers to report trades of corporate insiders.

²The origins of the term *directors' dealings* can be traced back to the U.K. Criminal Justice Act of 1993, which uses the term *insider dealings*. Alternative terms are also *directors' trading* and *managers' transactions*. Throughout this dissertation, *insider trading* as well as *directors' dealings* will generally refer to legal conduct. References to illegal conduct will be stated explicitly.

³See chapter 2 for legal definitions of insider trading and directors' dealings.

⁴See Peggy Hollinger, "Ex-EADS chief under formal investigation," *Financial Times*, May 29, 2008, and Scheherazade Daneshkhu and Ben Hall, "Regulator's credibility at stake over EADS probe," *Financial Times*, December 19, 2009.

⁵See "EADS im Visier der Ermittler," *Handelsblatt*, December 07, 2006.

Schremp, the CEO at the time, which resulted in a stock price rally of c. 10%.⁶ In the U.S., the prominent television figure Martha Stewart was sentenced to five months in jail and five months of home confinement for selling ImClone Systems shares based on privileged information.⁷ Most recently, the Galleon scandal, which has been deemed as one of the largest insider trading cases history, has shuttered markets.⁸

For stock market regulators, such as the U.S. Securities and Exchange Commission (SEC) and the German Bundesanstalt für Finanzsufsicht (BaFin), combating illegal insider trading is one of the main objectives. Already in 1934, the U.S. Congress deemed insider trading based on private information to be undesirable. Laws outlawing insider trading are mostly motivated by fairness, equity, and efficiency considerations.⁹ Letting insiders exploit their informational advantage at the expense of outside investors generally contradicts the notion of justice and fairness. In addition, illegal insider trading can have adverse effects on stock market efficiency as such abuse undermines investor confidence and increases the cost of equity, because bid-ask spreads widen. As a result, all developed countries and the majority of emerging countries have implemented laws prohibiting insider trading based on non-public and material information.¹⁰

Illegal or apparently illegal insider transactions are, however, not only of interest to regulators, but also to academia. For example, the responsiveness of insiders trading to changes in regulations has been researched since the 1970s.¹¹ Moreover, the trading behavior of insiders in the proximity of corporate news announcements, such as seasoned equity offerings, earnings releases, and tender offers, has increasingly received attention from researchers. In this regard, the German stock market provides an open field for research as legislation outlawing transactions based on private information has been in effect only since 1994.¹²

In addition to illegal transactions by insiders, *directors' dealings* are an equally relevant and interesting feature of capital markets. Directors' dealings are transactions by company management that are—supposedly—not based on private, specific and price-sensitive information. In many parts of the world, local legislation requires such trades to be made public to increase market transparency. For the regulator, they constitute an important tool to combat illegal insider transactions. Regulators employ large databases to identify trades that may be based on private information. The above-cited EADS insider trading scandal, for example, was based upon reported trades by the management of EADS. Thus, directors' dealings may deter insider trading in the first place by facilitating the identification of illegal transactions and increasing the risk of litigation for rogue insiders. The second important objective of directors' dealings legislation is to improve nothing less than overall stock market efficiency. Disregarding liquidity needs and deliberate signaling, rational insiders will only buy (sell) securities of their own company if they believe it to be undervalued (overvalued). Thus, conveying the investment decisions of insiders to other market participants should lead to more efficient prices, which more accurately reflect the true and fundamental value of the underlying company.

For market participants, reported share dealings by insiders may be an important investment tool. Widespread belief and evidence suggest that insiders are better informed about the prospects of their firms and convey this informational advantage through their reported transactions. The relevance of

⁶See C. Herz and M. Maisch, "Schremp geht, die Börsenpolizei kommt," *Handelsblatt*, August 29, 2005.

⁷See Richard Beales and Holly Yeager, "Martha Stewart gets five month jail term," *Financial Times*, July 16, 2004.

⁸See Joanna Chung, "Galleon founder faces more US charges," *Financial Times*, January 6, 2010.

⁹Bainbridge (2000) summarizes the arguments for and against insider trading based on private information.

¹⁰See Bhattacharya and Daouk (2002), pp. 81–84, Table I.

¹¹The study by Jaffe (1974a) was one of the first to examine the effect of increased regulation on insider trading.

¹²European member countries had been obliged to install insider trading regulations by the European Community Insider Trading Directive (89/592/EEC of November 13, 1989).

directors' dealings to the investment community is clearly shown by the numerous data providers and newsletters concerned with reported insider dealings.¹³ In addition, several investment trust certificates have been issued, which follow investment strategies based on reported directors' dealings.¹⁴

The profitability of trading strategies based on directors' dealings has become an extensively researched topic in corporate finance.¹⁵ Most studies in this field are motivated by the *efficient markets paradigm*. Examining the profits to insiders themselves allows for a test of the strong-form of market efficiency and estimating the profits to outsiders allows for a test of the semistrong-form of market efficiency. Empirical evidence on the profitability of trades for insiders themselves overwhelmingly speaks against the strong-form of market efficiency. Regarding profits for outsiders mimicking insiders, research generally supports the semistrong-form of market efficiency. Interestingly, however, the few existing studies on insider trading in Germany suggest that outsiders are able to earn abnormal returns by imitating insiders, which contradicts the semistrong-form of market efficiency.

1.2 Aims of the Study

Having outlined the relevance of insider trading to the regulator, the investment community, and academic researchers, the aims of this dissertation are presented in the following.

The primary objective of this study is to empirically analyze directors' dealings in the German stock market. First of all, the *strategic trading behavior* of insiders around corporate news events is examined. If insiders are assumed to possess private information about impending news announcements, they may profit from their knowledge by either *actively* trading prior to the news disclosure, or by *passively* delaying their transaction until after the news release. While the former strategy is associated with regulatory and reputational risk, the latter one is relatively risk-free. Empirical evidence is especially scarce on passive trading strategies pursued by corporate insiders—not only in Germany, but also in other jurisdictions such as the U.S. and the U.K.. The empirical analysis presented in the due course of this dissertation adds to the existing body of literature by examining a large set of news announcements in a jurisdiction where insider trading and directors' dealings regulations are relatively new. In addition, the empirical analysis benefits from the fact that the studied news releases are ad-hoc announcements and thus, by definition, convey *private information* to market participants. The results show that insiders do time their transactions strategically around ad-hoc disclosures in order to exploit their informational advantage but at the same time avoid the risk of litigation.

The second aim of this dissertation is to examine whether outside investors can profit from reported directors' dealings. Existing empirical studies for Germany have emphasized a slow price adjustment to reported insider trades, which, on the face of it, should allow for profitable arbitrage trading strategies. Whether this is indeed the case is investigated using a sample of 5,128 directors' dealings observations reported in the German stock market between July 1, 2002, and October 31, 2007. It is hypothesized that arbitrage risk, as measured by the level of idiosyncratic risk, makes arbitrage costly and thereby prevents investors from exploiting seemingly profitable post-event abnormal returns. Sorting trades into quintiles according to the level of idiosyncratic risk of the underlying stock, abnormal returns for different levels of arbitrage risk are analyzed. Excess returns after directors' dealings prove to be highly sensitive to the level of arbitrage risk. The return difference between the quintiles with highest and

¹³In Germany, the Handelsblatt and FTD newspapers regularly publish insider trading indices, which are based on the selling and buying activity of corporate insiders.

¹⁴In Germany, Commerzbank, Credit Suisse, Deutsche Bank, and Deutsche Börse have issued such insider investment trust certificates.

¹⁵Classical papers such as Lorie and Niederhoffer (1968), Jaffe (1974b), and Finnerty (1976) date back almost 40 years.

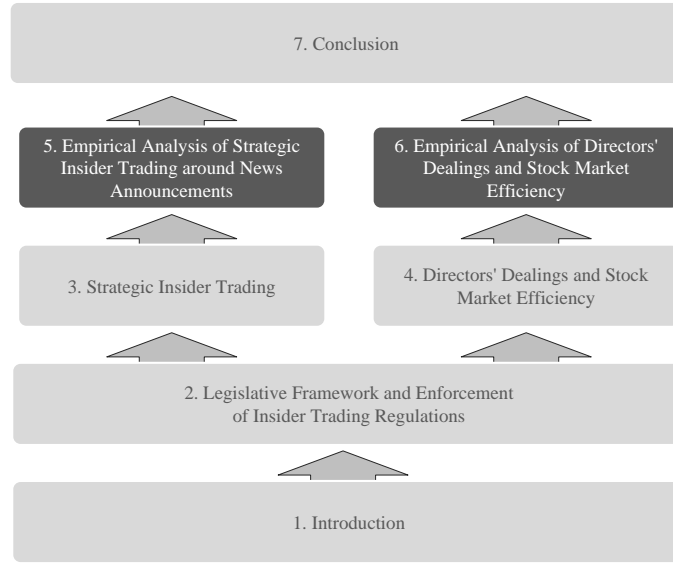


Figure 1.1: Structure of Analysis

lowest idiosyncratic risk is in the range of 2.99% (for a 5-day period post directors' dealings) to 4.90% (for a 20-day period) highly significant. In addition, it is demonstrated that arbitrage risk is negatively related to the speed of price adjustment after reported corporate dealings. Thus, an explanation based on barriers to arbitrage can accommodate the documented predictability of subsequent abnormal stock returns to directors' dealings.

In addition to the two main objectives mentioned above, a theoretical backdrop of insider trading regulations in the U.S., U.K., and Germany is provided. Definitions of illegal insider trading and directors' dealings are given, and cross-border differences are highlighted. For the German stock market, the laws regarding the ad-hoc disclosure of inside information are also synthesized. Furthermore, existing literature on strategic insider trading behavior, the profitability of directors' dealings, and the efficient markets paradigm and its limitations are discussed.

1.3 Structure of Analysis

To achieve the above-stated objectives, this dissertation is organized into theoretical as well as empirical chapters. Figure 1.1 shows the structure of the analysis.

Chapter 2 is concerned with the legislative framework regulating insider trading and provides the necessary prerequisites for interpreting the theoretical and empirical chapters that follow. For U.S., the U.K., and Germany, the laws regarding illegal as well as legal insider trading are outlined (sections 2.1 to 2.3). Moreover, the main legislative differences between the three countries are highlighted (section 2.4). In addition, section 2.5 details the ad-hoc news disclosure legislation in Germany.

Building upon the outline of insider trading legislation, *chapter 3* analyzes the existing literature on insider trading around corporate news events, such as earnings announcements, share repurchases, and tender offers. It is reviewed how the behavior of corporate insiders is influenced by impending news announcements. In addition, profits to insider trading depending on the timing of transactions are

examined.

Chapter 4 examines directors' dealings in the context of market efficiency. First, section 4.1 outlines the efficient market hypothesis (EMH), and section 4.2 discusses its main challenges. The role of costly arbitrage and its relevance in the string of argument for market efficiency are presented in section 4.3. An important tool in assessing market efficiency, event study methodology, is discussed in section 4.4. The chapter concludes by reviewing empirical tests of market efficiency that examine the returns to outsiders mimicking reported directors' dealings (section 4.5).

Based upon the synthesis of insider trading around corporate news announcements provided in chapter 3, *chapter 5* empirically analyzes the behavior of corporate insiders in the German stock market. Section 5.1 formulates hypotheses derived from the findings of chapter 3, and sections 5.2 to 5.5 outline the empirical analysis. The study's results and implications are discussed in sections 5.6 6.7 and 5.7, respectively.

Chapter 6 empirically analyzes the returns to outsiders mimicking directors' dealings in the German stock market. Section 6.1 hypothesizes that real-world arbitrage is risky, which prohibits rational traders from exploiting the abnormal returns observable after the publication of insider trades. Section 6.2 outlines the study design, and section 6.3 describes the data set. Descriptive statistics are presented in section 6.5 and the study's methodology is presented in section 6.6. The study's results and implications are discussed in sections 6.7 and 6.8, respectively.

Last, *chapter 7* concludes this study. Section 7.1 summarizes the main findings of chapters 5 and 6, and the implications for academia, the regulator, and investors are outlined in section 7.2.

Chapter 2

Legislative Framework and Enforcement of Insider Trading Regulations

Knowledge of the laws regulating the legal as well as illegal dealings of insiders is essential to understand and interpret insider trading patterns. The effects of the regulatory framework on insider trading behavior are complex. On the one hand, insider trading laws may discourage the exploitation of private and material information, consequently reducing profits for insiders and the information conveyed by their trades. On the other hand, legislation may prevent manipulation and deliberate signalling by insiders, thus increasing the informational content and usefulness of reported transactions.¹ In addition, insiders may exploit loopholes in the legislative and enforcement framework, thereby making some trades more informative than others. Thus, in order to understand the effects of regulations on the trading of insiders, this chapter describes and analyzes the environment in which insiders operate. While this dissertation focuses on the German stock market, the U.S. and U.K. security markets are discussed as well given that they present long-standing yardsticks.

Today, the benefits of insider trading laws, such as improved investor confidence, lower cost of equity, more accurate stock prices, and more liquid stock markets, are well-known.² For much of the twentieth century, however, the exploitation of private information by company insiders was regarded in many countries as a peccadillo, or even seen as a legitimate part of manager compensation.³ As a result, many countries have adopted and enforced insider trading regulations only relatively recently. Bhattacharya and Daouk (2002) find that insider trading legislation has mostly been a phenomenon of the 1990s. While prior to 1990, only 34 countries had implemented insider trading laws, the number had increased to 87 countries ten years later.⁴

The U.S. and the U.K. bucked the trend and were two of the first countries to implement insider trading laws. The U.S. banned insider trading based on material non-public information under the Securities Exchange Act of 1934 (SEA) because of the widespread market abuse during the 1929 stock market crash, and the U.K. outlawed insider trading in the Companies Act of 1980. Given their long existence, the U.S. and U.K. regulations stood as a model for many other lawmakers, including Germany, which

¹See Seyhun (1998), p. 24.

²See Bhattacharya and Daouk (2002) and Beny (2005).

³See Cramburg and Hannich (2002), p. 11.

⁴See Bhattacharya and Daouk (2002), p. 75.

banned insider trading only in 1994.⁵

Following the chronological inception of insider trading laws, this chapter starts out with an outline of U.S. (section 2.1) and U.K. (section 2.2) regulations, before German law is addressed (section 2.3). This facilitates the assessment of German legislation in section 2.4 relative to two other well-established capital markets. In addition, knowledge of U.S. and U.K. insider trading regulations is an important prerequisite for evaluating the empirical studies on the exploitation of private information in chapter 3 and the profitability of directors' dealings in chapter 4. For each country, the evolution of regulations, the definition of illegal insider trading, the rule set concerning directors' dealings, and the enforcement of regulations are addressed.

Section 2.5 is devoted to the statutory ad-hoc disclosure requirements in the German stock market, which are especially relevant to the empirical analysis in chapter 5. Similar to directors' dealings regulations, these disclosure requirements aim to improve market efficiency and prevent illegal insider trading by requiring inside information to be made public without delay.

2.1 Insider Trading Regulations in the United States

2.1.1 Evolution of Regulations

The U.S. was the first country to implement laws and regulations restricting insider trading. Prior to Black Tuesday in 1929, insider trading was largely considered as a legitimate part of manager compensation.⁶ After the stock market crash, however, sentiment changed, and the U.S. Congress acted to curb abuse believed to have contributed to the stock market slump and, ultimately, to the Great Depression.⁷ As part of the *New Deal* legislation of President Roosevelt, the Securities Act was implemented in 1933, which contains prohibitions of fraud in the offering and sale of securities.⁸ In 1934, Congress enacted the SEA, which contains under section 10(b) and rule 10b-5 a broad anti-fraud provision in connection with the purchase and sale of securities.⁹ The U.S. justice system was left with the task of developing common law based on the provisions and consequently created the *disclose or abstain rule* and the *misappropriation theory*.¹⁰

Section 4(a) of the SEA also constitutes the legal foundation for the Securities and Exchange Commission (SEC), which can issue specific *rules* in order to shape regulations in accordance with the SEA. The SEC did so under the 1968 Williams Act and enacted *rule 14e-3*, which specifically bans trading on inside information concerning tender offers.

To strengthen the enforcement framework of security trading laws, the U.S. Congress substantially increased penalties for illegal insider trading by implementing the Insider Trading Sanctions Act (ITSA). Both civil and criminal penalties were increased, and the rule set was extended to include derivative instruments. Shortly after, the Insider Trading and Securities Fraud Enforcement Act of 1988 (ITSFEA) again increased the monetary fines and maximum jail terms. It also required companies to take action in order to prevent insider trading by employees. The Securities Enforcement Remedies and Penny Stock

⁵See the draft bill of the Federal Government printing matter 14/8017 regarding the Fourth Financial Market Development Act (Finanzmarktförderungsgesetz), p. 88; Fleischer (2002), p. 1218; Osterloh (2007), p. 78.

⁶Nevertheless, the Supreme Court ruled in 1909 that a corporate director had committed fraud when buying company stock knowing its stock price was about to increase (*Strong v. Repide*, 213 U.S. 419, 430 (1909)).

⁷See Newkirk and Robertson (1998).

⁸The full text of the Securities Act of 1933 is available at <http://www.sec.gov/about/laws/sea34.pdf>, as of February 15, 2008.

⁹See Cramburg and Hannich (2002), pp. 11–12, and Bettis and Chang (1996). The full text of the SEA is available at <http://www.sec.gov/about/laws/sa33.pdf>, as of February 15, 2008.

¹⁰Bainbridge (2000), p. 773.

Reform Act of 1990 further increased sanctions against insider trading, and the Sarbanes-Oxley Act of 2002 (SOX) introduced “blackout periods” related to pension plans, such as 401(k) plans, during which no trading at all by insiders is allowed.¹¹

The SEA also includes laws regulating the publication of insider trades in section 16(a), which remained virtually unchanged for more than half a century. In 1991 and 1996, however, the rules issued by the SEC were revised to simplify the notification and publication requirements. One of the latest modifications of section 16(a) of the SEA is owed to section 403(a) of the SOX, which drastically shortened the notification periods for insiders.

2.1.2 Definition of Illegal Insider Trading

2.1.2.1 Core of Regulations

Regulations of insider trading in the U.S. have evolved into a complex amalgamation, consisting of official laws, such as the SEA, rules issued by the SEC, and court rulings interpreting the law as well as the rules. Nevertheless, the illegality of insider trading can be derived from three main theories: the *disclose or abstain rule*, the *misappropriation theory*, and *rule 14e-3* on insider trading related to tender offers.

First, the *disclose or abstain rule*, based on section 10(b) of the SEA and rule 10b-5, prescribes that insiders must either disclose material inside information or refrain from trading. Generally, the courts have interpreted section 10(b), which bans any “manipulative or deceptive device” used “in connection with the purchase or sale of any security,” as a broad prohibition of insider trading based on private information.¹² It was established in *SEC v. Texas Gulf Sulphur Co.* that this rule applied to virtually anyone in possession of privileged information.¹³ If the insider’s fiduciary responsibilities prohibited the disclosure of the information then, abstaining from trading is the only option.

In *Chiarella v. United States* and *Dirks vs. SEC*, however, the U.S. Supreme Court overturned the broad interpretation of rule 10b-5.¹⁴ Trading on material non-public information was now considered illegal only if it included a breach of the fiduciary duty owed to either the issuer of the securities or to the counterparty of the trade. While this ruling narrowed the scope of the disclose or abstain rule, it did not change the fact that trading by “traditional” or “true” insiders, i.e., directors and officers, was unlawful. In addition, the exploitation or transmission of inside information also remained unlawful for outsiders in a position of trust and confidence with the issuer (e.g., lawyers, auditors, and investment bankers). Such insiders have come to be known as “constructive insiders,” or outsiders who legitimately receive confidential information by providing services to a company. These constructive insiders inherit the fiduciary duties of the traditional insider, if the outsider is expected to treat the obtained information as confidential.¹⁵

Moreover, tippees can be held liable if they breach their fiduciary duty by disclosing the private information and the tippee is aware of this.¹⁶ Nevertheless, *Chiarella vs. United States* opened several gaps in the insider trading rule set. It was, for example, not illegal for an outsider to trade on private information that was acquired without the breach of any fiduciary duty owed to the issuer of the respective securities.

As a result, the SEC instated *rule 14e-3*, which prohibits anyone from trading on privileged information

¹¹The full text of the Sarbanes-Oxley Act of 2002 is available at <http://www.sec.gov/about/laws/soa2002.pdf>, as of February 15, 2008.

¹²See Hu and Noe (1997), p. 35.

¹³See Bainbridge (2000), pp. 773–774.

¹⁴See *Chiarella v. United States*, 445 U.S. 222 (1980), and *Dirks v. SEC*, 463 U.S. 646 (1983).

¹⁵See Newkirk and Robertson (1998), and Wang (1984), p. 569, ff.

¹⁶See *re Cady, Roberts & Co.*, 40 SEC 907 (1961).

related to any foreseeable tender offer or one that has already commenced.¹⁷ In contrast to rule 10b-5 of the SEA, rule 14e-3 does not require any breach of a fiduciary duty or an intent to deceive.¹⁸

The *misappropriation theory* has become the third cornerstone of U.S. insider trading regulations (rule 10b5-2 of the SEA). It prohibits outsiders from profiting from inside information concerning *any* company with tradable shares obtained during the due course of employment.¹⁹ Any trading based on such information breaches the fiduciary duty owed by the employee to the company from which the information was obtained.²⁰ The inside information does not, however, have to concern the employer; it can relate to any issuer of publicly-traded shares.

In addition to the three main theories on insider trading outlined above, corporate insiders, as defined under section 16(a) of the SEA, are subject to several additional trading regulations. This affects directors, officers, and large shareholders with a stake of 10% or more.²¹

First, section 16(b) of the SEA prohibits insiders from realizing short-swing profits from trading stock of their own corporation. Short-swing profits are derived from round-trip transactions that entail a purchase and a sale (or a sale and a purchase) of company stock within six months.²² This trading restriction is designed to prevent insiders from exploiting short-term stock price movements and prevent the deliberate manipulation of share prices by insider trading signals or delayed disclosure of positive or negative news events.

Second, section 16(c) of the SEA prohibits insiders from short-selling. Any insider engaged in short-selling would be betting on a declining stock price and could potentially take steps to increase the probability of such, resulting in principal agent conflicts between the managers or directors and the company's shareholders. Since this is, in almost all circumstances, to the disadvantage of shareholders, the SEA prohibits any short-selling. This includes the replication of equity short positions by selling call options or buying put options.

Third, the SOX has introduced *trading bans* during certain pension fund blackout periods.²³ Previously, traditional insiders had been allowed to trade all year round, as long as their transactions were not based on private information and the provisions of section 16 of the SEA were followed.

In contrast to the insider trading restriction outlined above, the *mosaic theory* asserts that trading based on analyst recommendations derived from nonmaterial non-public as well as material public information does not amount to fraud. Such conclusions reflect good analytical skill, and individuals and corporations are free to act on it.²⁴

2.1.2.2 Insider Definition

The definition of "insiders" U.S. law can be derived from the above-outlined three main pillars of insider trading regulation. *Traditional, corporate, or true insiders* are corporate insiders and include company officers, directors, and beneficial owners of more than ten percent of any class of equity (section 16(a) of the SEA).²⁵ Any trading based on material non-public information by these insiders constitutes fraud, as prescribed by the disclose or abstain rule.

¹⁷See Schuster (1996), p. 191.

¹⁸See Persons (1997), p. 188.

¹⁹See Doffou (2003), p. 2.

²⁰See *U.S. v. O'Hagan*, 92 F.3d 612 (8th Cir. 1996).

²¹See section 2.1.3.2 for a discussion of corporate insiders as defined under section 16(a) of the SEA.

²²See Newkirk and Robertson (1998).

²³The full text of the Sarbanes-Oxley Act of 2002 is available at <http://www.sec.gov/about/laws/soa2002.pdf>, as of February 15, 2008.

²⁴See Doffou (2003), p. 2.

²⁵See Ausubel (1990), p. 1023.

The disclose or abstain rule also employs the term *constructive insiders*, who are outsiders who legitimately receive confidential information by providing services to a company and are required to treat the obtained information as confidential.

2.1.2.3 Inside Information

Section 10(b) of the SEA, in conjunction with rule 10b-5, outlaws the purchase or sale of securities on the basis of material non-public information concerning securities themselves or the issuer of the respective securities. Thus, information can be considered *inside information* if it is *material* as well as *non-public*. The U.S. Congress and the SEC, however, have refrained from offering clear definitions of the two terms, since the SEC finds some ambiguity desirable.²⁶ As a result, only courts can decide on a case-by-case basis whether dealings by insiders amounted to fraud.

Some earlier court rulings, however, offer guidance in defining *material* information, which has been defined as *material* if (i) there is a “substantial likelihood” that a “reasonable investor” would consider the information important in making an investment decision, (ii) the disclosure of the information would be “viewed by the reasonable investor as having significantly altered the total mix of information made available,” or (iii) the disclosure of the information is “reasonably certain to have a substantial effect on the market price of the security.”²⁷

Case law has defined *non-public* information as information that has not been disseminated to investors in general.²⁸ Insiders are obliged to wait a “reasonable time” after disclosure before trading. What constitutes a reasonable time depends on the circumstances of the dissemination.²⁹

2.1.3 Directors’ Dealings Reporting Requirements

2.1.3.1 Reporting Framework

Since 1934, section 16(a) of the SEA has prescribed notification and publication requirements related to legal insider dealings. While traditional insiders are permitted to trade as long as they do not take advantage of confidential information, all transactions in stocks and related securities have to be reported to the SEC before the end of the second business day following the day on which the subject transaction was executed (section 16(a)(2)(C) of the SEA).

Prior to the implementation of the SOX, insiders had to report their trades within the first ten days of the month following the month in which the transaction was executed. In some instances, this provision resulted in a legal reporting delay of up to 40 days. Nevertheless, more than half of all directors’ dealings were filed late during the second half of the 1980s, according to the SEC.³⁰ Seyhun (1986) also shows that between 1975 and 1981, the actual reporting delay exceeded 60 business days in 84% of all cases.³¹

Section 16(a) of the SEA applies to equity securities that are registered according to section 12. In addition to transactions in common stocks, the SEC has to be notified of trades in preferred stock or convertible bonds. Equity derivatives are also subject to the reporting requirements, as are the awarding, exercising, and expiration of employee stock options.³² Thus, only trades in straight debt are exempt

²⁶See Seyhun (1998), p. xxix.

²⁷See *Basic Inc. v. Levinson*, 485 U.S. 224, 231-32 (1988), quoting *TSC Industries, Inc. v. Northway, Inc.*, 426 U.S. 438, 448-49 (1976); *Elkind v. Liggett & Myers, Inc.*, 635 F.2d 156, 166 (1980).

²⁸See Selective Disclosure and Insider Trading, 65 Fed. Reg. 51716, 51721, Release Nos. 33-7881, 34-43154, IC-24599 (August 24, 2000), which is accessible at <http://www.sec.gov/rules/final/33-7881.htm>, as of April 10, 2008.

²⁹*Faberge, Inc.*, 45 S.E.C. 249, 255 (1973), citing *Texas Gulf Sulphur*, 401 F.2d at 854.

³⁰See Breetwor (1991), p. 48.

³¹See Seyhun (1986), p. 208.

³²Rule 16a-4 of the SEA set out the regulations for trades in equity derivatives.

from the notification requirements.³³

The SEC provides several forms for reporting purposes. Once an individual becomes an insider, Form 3 must be filed within ten calendar days in order to report any holding of the respective security.³⁴ Form 4 is to be used for all non-exempt transactions with attached liability.³⁵ Form 5 has to be filed on an annual basis. It documents exempt trades such as stock splits, deferred transactions, and small trades with a transaction volume of \$10,000 or less.³⁶ Forms 4 and 5 also require insiders to report their total share holdings, instead of only the conducted transaction.

Section 16(a)(4) of the SEA prescribes that the filings have to be submitted electronically to the SEC.³⁷ The regulator is bound to publish the reported transactions in its online *EDGAR* system by no later than the following business day after receipt.³⁸ Chang and Suk (1998) find that most transactions are published in the SEC's database on the same day as the submission of the notification. Shortly after the SEC's publication, the trades are also published in the *Wall Street Journal* (*WSJ*) and other newspapers.

2.1.3.2 Groups Required to Report

Only insiders, as defined in section 16(a) of the SEA, have to file insider trading statements with the SEC. This includes the directors, officers, and beneficial owners of more than ten percent of any class of equity. Thus, all members of the board of directors are considered insiders. Similarly, large shareholders with ten percent or more of any class of equity are insiders. Large shareholders may be individuals, corporations, or trusts, and the holding may be direct or indirect.³⁹

The definition of the term *officers* was not clearly defined until 1991, when the SEC stated that only persons in charge of a principal business unit, division, or function are considered insiders.⁴⁰ Individuals also qualify if they are empowered to set company policy.⁴¹ As a result, the *function* of an employee instead of his or her *title* determines whether the employee is legally considered an insider or not.

In addition to the above-mentioned insiders, connected persons are also required to report their trades, since section 16(a) of the SEA, in connection with rule 16a-1(a)(2), requires that insiders report their trades in the issuer's securities of which they are "beneficial owners." Common law has established that it is sufficient for insiders to have a direct (*pecuniary interest*) or indirect interest (*indirect pecuniary interest*) in the issuer's securities.⁴² Thus, transactions executed by family members and related trusts also have to be reported by the respective "primary" insider.⁴³

2.1.3.3 Publication of Directors' Dealings

Traditional insiders must notify the SEC of their transactions before the end of the second business day following the day on which the subject transaction was executed (section 16(a)(2)(C) of the SEA). According to section 16(a)(4)(B) of the SEA, the SEC is then obliged to publish the filed directors' dealings on a publicly-accessible Internet site not later than the end of the business day following the notification. In addition, issuers have to publish any Forms 4 on their corporate website, also not later

³³See Seyhun (1998), p. xxviii.

³⁴Section 16(a)(2)(B) of the SEA.

³⁵Form 4 is named "Statement of changes in beneficial ownership of securities." An exemplary Form 4 can be found in appendix C.

³⁶See rule 16a-3 of the SEA for the reporting transactions and holdings and rule 16a-6 for small transactions.

³⁷The electronic filing requirement was implemented under the SOX in 2002.

³⁸The SEC's online database is accessible at <http://sec.gov/edgar.shtml>, as of as of February 15, 2008.

³⁹Rule 16a-8 of the SEA outlines specific regulations for trusts.

⁴⁰See Bettis and Chang (1996), p. 2.

⁴¹See Breetwor (1991), p. 46.

⁴²Osterloh (2007), p. 94, ff.

⁴³Rule 16a-1(a)(2)(ii)(A) of the SEA.

than the end of the business day following that filing, assuming that the company maintains an Internet presence.⁴⁴ Shortly after the publication by the SEC, the filings are disseminated by other outlets, such as the *WSJ's* Insider Spotlight. As a result, the time it takes for directors' dealings to be disseminated should be no longer than four business days.

2.1.4 Enforcement of Regulations

2.1.4.1 Enforcement Framework

In the U.S., the SEC is charged with the enforcement of insider trading regulations. Enforcement leads are obtained from various sources, including the SEC's bounty program, stock exchanges, banks and other financial institutions, the National Association of Securities Dealers, and the SEC's own data mining system, which scans for clues regarding illegal insider trading.⁴⁵ The SEC's bounty program for informants was established by the ITSFEA. Section 21A(e) of the SEA authorizes the SEC to award a bounty of up to ten percent of the illegal insider trading profits to individuals providing information leading to the recovery of civil penalties.⁴⁶

Suspicious trades may trigger an informal investigation by the SEC, which is conducted on a voluntary basis. Suspects may be asked to provide data and documents concerning the case under investigation. If the SEC believes that illegal transactions have occurred, a formal investigation is launched with the agreement of an SEC commissioner. Otherwise, the case is dropped. Ordinarily, the SEC seeks repayment of the illegally-obtained profits or avoided losses in civil law suits. The SEC may also refer cases to the U.S. Justice Department for criminal charges.⁴⁷

2.1.4.2 Penalties and Sanctions

2.1.4.2.1 Violations of Insider Trading Laws Two regulations in particular levy sanctions against illegal insider trading in the U.S. First, the ITSA punishes illegal insider trading with up to three times the profits gained (or losses avoided) in civil penalties, and up to ten times the unlawful profits in criminal penalties (from \$10,000 to \$100,000).

Second, the ITSFEA increases the maximum jail sentence from five to ten years and the maximum criminal penalty to \$1 million.⁴⁸ Investors are also given the right to recover losses from insiders. In addition, the ITSFEA increases the liability of officers and directors by holding top management legally responsible for any reckless failure to prohibit insider trading within their company. Seyhun (1998) points out that, today, insider trading laws provide harsh penalties and jail sentences that are comparable to those applied to violent crimes leading to death or physical injury.⁴⁹

2.1.4.2.2 Violations of Reporting Requirements The SEC was relatively lax in enforcing the timely reporting of directors' dealings as prescribed by section 16(a) of the SEA. As outlined in section 2.1.3.1, late filings were the norm rather than the exception. Since the Enforcement Remedies and Penny Stock Reform Act of 1990, however, the SEC has sought monetary penalties from delinquent filers. In practice, violations of section 16(a) of the SEA are commonly sanctioned with cease-and-desist orders,

⁴⁴See section 16(a)(4)(C) of the SEA.

⁴⁵See U.S. SEC, Final Report to the Senate Committee on Banking, Housing, and Urban Affairs and the House Committee on Energy and Commerce regarding the Market Oversight and Surveillance System at 2-3, 14-15 (Jan. 15, 1985).

⁴⁶Information concerning the SEC's insider trading bounty program is accessible at <http://www.sec.gov/divisions/enforce/insider.htm>, as of May 10, 2008.

⁴⁷See Persons (1997), p. 188.

⁴⁸See Seyhun (1992), p. 150.

⁴⁹See Seyhun (1998), p. 26.

which are easier to obtain than civil monetary penalties.⁵⁰ Willful violations of section 16(a) of the SEA, however, are punishable, according to section 32(a) of the SEA, by a maximum monetary fine of \$5 million and a jail sentence of up to twenty years. The SEC has stated that the civil monetary penalty is dependent on the number of transactions filed late and the associated trading volume.⁵¹

Although insiders are personally responsible for the timely reporting of directors' dealings, companies are required to publish any delinquent filers during the past two years on the first page of the proxy statement (10-K Form).⁵² This prominent position in one of the most important disclosure venues for publicly-listed companies should act as a great deterrent. Noncompliance by companies with this rule can also lead to fines and penalties. In addition, penalties also exist for companies that miss the 48-hour deadline for publishing received directors' dealings on their website.

2.1.4.3 Effectiveness of Enforcement

Although the level of enforcement of insider trading laws in the U.S. is generally considered to be high, virtually no convictions related to insider trading led to jail sentences before 1980.⁵³ Courts imposed mild sanctions for illegal insider trading, and white-collar crime was not taken seriously.⁵⁴ During the 1980s, however, the SEC increased its efforts to combat insider trading by more than sixfold.⁵⁵ In particular, the ITSA and ITSFEA gave the SEC more leeway and credibility in prosecuting illegal insider trading. In recent years, however, illegal insider trading has been on the rise again, and the SEC has reinstated the detection and persecution of illegal trading as a priority.⁵⁶ Nevertheless, the SEC has more targets for a formal investigation than it can possibly pursue. Between 2001 and 2006, on average, only 51 cases per year could be investigated in detail.⁵⁷ Thus, the Commission focuses on cases with both high visibility and a high probability of success, such as the case of Martha Stewart.⁵⁸ In 2007, the SEC's enforcement cases resulted in penalties and disgorgements of approximately \$1.6 billion. This figure, however, also includes all payments related to market abuse enforcement cases, not just insider trading.⁵⁹

2.2 Insider Trading Regulations in the United Kingdom

2.2.1 Evolution of Regulations

The U.K. terminology typically makes a distinction between (legal) directors' dealings and (illegal) insider trading. Although the U.K. outlawed insider trading much earlier than most of continental Europe, only a few general restrictions on insider dealings existed, before 1980.⁶⁰ In 1977, the London Stock Exchange (LSE) enacted the Model Code, which imposes blackout periods during which directors of listed companies are not allowed to trade.⁶¹ In addition, the City Panel on Takeovers and Mergers adopted rules

⁵⁰Osterloh (2007), p. 104.

⁵¹See Breetwor (1991), p. 47.

⁵²See Bettis and Chang (1996), p. 2

⁵³See Stuart Taylor Jr., "Sentences getting stiffer," *The New York Times*, May 9, 1985.

⁵⁴See Xu (2006) pp. 8–9.

⁵⁵See Seyhun (1992), p. 150.

⁵⁶See "Hints, tips and handcuffs," *The Economist*, March 8, 2007.

⁵⁷See Appendix A of Chatman Thomsen (2006).

⁵⁸Martha Stewart, once a prominent figure on U.S. television, was sentenced to five months in jail and another five months of home confinement, in addition to a \$30,000 fine, for lying to investigators about an unlawful share sale in 2001. The case drew intense media interest and sparked a debate about the prosecution of insider trading. See *The Financial Times*, July 16, 2004.

⁵⁹See Securities and Exchange Commission (2007), p. 25.

⁶⁰See Alexander (2001), p. 3.

⁶¹The 1977 Model Code of the LSE became active in 1979. See Pope et al. (1990), p. 371.

that prohibit trading on private information concerning company acquisitions.⁶² In practice, however, these rules were never thoroughly enforced.⁶³ Furthermore, no statutory prohibition of the practice existed, and common law did not consider insider trading as actionable.

In 1980, Parliament amended the 1948 Companies Act and declared insider dealing a criminal offence.⁶⁴ Subsequently, the insider trading provisions were consolidated in the Companies Act of 1985 (CA 1985) and became known as the Companies Securities (Insider Dealing) Act of 1985.⁶⁵ The CA 1985 outlawed the exploitation of material non-public information by individuals having access to such information due to their position within a firm.⁶⁶ “Tipping,” i.e., the selective disclosure of non-public information to third parties, was also prohibited. Regarding legal transactions by directors, the CA 1985 demanded the timely disclosure of all trades by directors of publicly-quoted companies. In particular, sections 324 to 329 of the CA 1985 required directors to report their trades within five business days following the date of the transaction. In 1986, the regulations were supplemented by the Financial Services Act, which strengthened the enforcement of regulations.⁶⁷

In 1993, the CA 1985 was replaced by the Criminal Justice Act 1993 (CJA 1993), which contains a broader definition of illegal insider trading.⁶⁸ The CJA 1993 implemented the 1989 European Community Insider Dealing Directive, yet failed to tackle insider trading by corporations.⁶⁹

The U.K. rules governing insider trading underwent substantial revision with the enactment of the Financial Services and Markets Act 2000 (FSMA 2000) in December 2001. The FSMA 2000 equipped the Financial Services Authority (FSA) with the statutory powers that are still largely in place today.⁷⁰ Similar to the U.S. SEC, the FSA is a quasi-judicial body that supervises the financial services industry, including insurance, investment business, and banking. In particular, the FSMA 2000 imposed four statutory objectives upon the FSA: market confidence, public awareness, consumer protection, and reduction of financial crime. These objectives also include the responsibility for preventing market abuse, which includes misuse of information, misleading practices, and market manipulation, relating to investments traded on prescribed UK markets.⁷¹ Section 188 of the FSMA 2000 outlines market abuse and the powers given to the FSA to sanction such conduct. In addition, the FSMA 2000 requested that the regulator establishes guidelines on the new market abuse provisions.⁷² The FSA complied with this request by publishing the Code of Market Conduct as part of the FSA Handbook. Generally, the FSA Handbook presents the standards to which the FSA expects market participants to adhere and is a mixture of hard laws (official statutes) and soft laws (guidelines).⁷³

While the FSMA 2000 expanded the existing market abuse regime, the FSMA 2000 left the directors’

⁶²See Rule 4.1 of the Takeover Code. The Takeover Code is accessible at <http://www.thetakeoverpanel.org.uk/new/codesars/DATA/code.pdf>, as of April 4, 2008.

⁶³See Alexander (2001), p. 5.

⁶⁴See sections 68-73 of the Companies Act 1980. The Companies Act 1980 came into force on December 22, 1980, and is accessible at http://www.companieshouse.gov.uk/about/tableA/comm22Dec80CoAct1980_P1.pdf, as of April 4, 2008.

⁶⁵Companies Securities (Insider Dealings) Act 1985 is accessible at http://www.opsi.gov.uk/acts/acts1985/pdf/ukpga_19850008_en.pdf, as of April 4, 2008.

⁶⁶See Alexander (2001), p. 6.

⁶⁷See sections 173-178 of the Financial Services Act of 1986, which is accessible at http://www.opsi.gov.uk/RevisedStatutes/Acts/ukpga/1986/cukpga_19860060_en_1, as of April 4, 2008.

⁶⁸See Part V of the Criminal Justice Act 1993, which is accessible at http://www.opsi.gov.uk/acts/acts1993/Ukpga_19930036_en_1, as of April 4, 2008.

⁶⁹See Alexander (2001), p. 8.

⁷⁰The FSA was first created in October 1997 from its predecessor, the Securities and Investments Board. Responsibility for banking supervision was transferred to the FSA from the Bank of England in June 1998, and in May 2000, the FSA took over the role of UK Listing Authority from the LSE. In 2001, the FSMA 2000 transferred the responsibilities of six other organizations to the FSA. The FSMA 2000 is accessible at http://www.opsi.gov.uk/ACTS/acts2000/ukpga_20000008_en_1, as of April 4, 2008.

⁷¹See Alexander (2001), p. 3.

⁷²Section 119 of the FSMA 2000.

⁷³The FSA Handbook is accessible at <http://fsahandbook.info/FSA/html/handbook/>, as of April 8, 2008.

dealings provisions unchanged.⁷⁴ However, the implementation of the European Union Market Abuse Directive (MAD) by means of the Financial Services and Markets Act (Market Abuse) Regulations 2005 (FSMA 2005) adjusted the regulations concerning legal directors' dealings in several aspects, such as the definition of the individuals and entities who are required to report their transactions.⁷⁵ To implement the MAD, section 118 of the FSMA was edited to be consistent with the European Directive. However, elements of the existing U.K. market abuse regime, which are "superequivalent" to the Directive, have been retained.

While the Companies Act 2006 (CA 2006) repealed the directors' dealings legislation set out by the CA 1985, the core of the regulation is still intact and is embedded in the Disclosure Rules and Transparency Rules of the FSA Handbook.⁷⁶ The regulations are supplemented by the Model Code, which is set out in section 9, annex 1 of the UK Listing Authority (UKLA) Listing Rules (LR).⁷⁷

2.2.2 Definition of Illegal Insider Trading

2.2.2.1 Core of Regulations

The original provisions on insider trading are the 1977 London Stock Exchange Model Code and the Companies Act 1985. Today, the Model Code is part of the UKLA LR.⁷⁸ Every listed company is required to ensure that persons discharging managerial responsibility, including directors, comply with the Model Code.⁷⁹

As a peculiarity of U.K. insider trading regulations, the Model Code specifies close periods during which no dealings by directors are permitted. The close periods include the 60 days preceding preliminary annual results or annual financial reports, and the 30 days prior to quarterly earnings announcements.⁸⁰ In addition, any trade by restricted persons, i.e., persons discharging managerial responsibilities, including directors, requires clearing in advance by the company chairman or a director designated by the board for this purpose.⁸¹ The Model Code also affects connected persons, i.e., spouses and children, of the restricted person. While these individuals may execute transactions without prior clearance from the company chairman, they are advised to notify the listed company immediately afterwards.⁸² Connected persons also may not trade during close periods.⁸³ The trading ban periods may only be transcended in exceptional circumstances. Restricted persons may be allowed to sell (not to buy), if it is the only reasonable course of action.⁸⁴

The provisions of the CA 1985 supplemented those of the Model Code and are today contained—in edited and extended form—in the Market Abuse section of the FSMA 2005. In addition to the official statutes, the Code of Market Conduct (MAR), which the FSA is required to publish under section 119 of

⁷⁴See Balmforth et al. (2007), p. 383.

⁷⁵The European Parliament and Council Directive 2003/6/EC of January 28, 2003, on insider dealing and market manipulation is accessible at <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32003L0006:EN:NOT>, as of April 4, 2008. The Financial Services and Markets Act 2000 (Market Abuse) Regulations 2005 came into force on July 1, 2005, and are accessible at http://www.opsi.gov.uk/si/si2005/uksi_20050381_en.pdf, as of April 08, 2008

⁷⁶The repealed sections include sections 324 to 326, 328 to 329, and schedule 13 of the CA 1985. The CA 2006 is accessible at http://www.opsi.gov.uk/acts/acts2006/pdf/ukpga_20060046_en.pdf, as of April 8, 2008. The Disclosure Rules and Transparency Rules of the FSA Handbook are based on section 96A of the FSMA.

⁷⁷The FSA is referred to as the UKLA when it is acting as the competent authority for listing of shares on a stock exchange.

⁷⁸See section 9, annex 1 of the LR.

⁷⁹Section 9.2.8(R) of the LR.

⁸⁰Section 1 (a) of the Model Code.

⁸¹Section 4 (a) of the Model Code.

⁸²Section 22 of the Model Code.

⁸³Section 21 of the Model Code.

⁸⁴See Fidrmuc et al. (2006), p. 2934.

the FSMA 2000, provides detailed guidance on the behavior that constitutes to market abuse.⁸⁵ Section 118(2) of the FSMA 2005 rules that a dealing, or an attempted dealing, by an insider in securities on the basis of inside information constitutes behavior that amounts to market abuse (“*insider dealing*”). Trading has to occur in the U.K. and has to take place in “qualifying investment” or “related investment” on a “prescribed market.”⁸⁶ Prescribed markets are markets established under the rules of a U.K. recognized investment exchange.⁸⁷

It is also illegal for an insider to disclose inside information to a third party (“*improper disclosure*”). The release of inside information, however, does not constitute abusive behavior if the insider is acting within the “proper course” of his “employment, profession or duties.”⁸⁸

In addition to the above-mentioned cases of market abuse, which have been mandated by the MAD, the U.K. legislator has retained “*superequivalent*” provisions originally contained in the FSMA 2000. Section 118(4) of the FSMA 2005 rules that the *misuse of relevant information* also amounts to market abuse.⁸⁹ The misuse of relevant information includes conduct that “a regular user of the market in question would consider to be a failure to observe reasonable standards of behavior.”⁹⁰ As part of the retained superequivalent legislation, behavior in connection with the market abuse regime includes both action and inaction.

One of the most important innovations of the FSMA 2000 is that the market abuse regime applies to all market participants, not just to authorized persons.⁹¹ In general, the rules contained in the CA 1985 and the CJA 1993 defined insider trading more narrowly and relied on the fiduciary relationship between company directors’ and shareholders as a prerequisite for unlawful behavior.

In addition to the regulations set out by the FSMA 2005 and the Model Code, listed companies are expected to implement their own insider trading guidelines, which have to be at least as restrictive as those laid out in the official provisions.⁹²

2.2.2.2 Insider Definition

Section 118B of the FSMA 2005 defines an insider as anyone in possession of inside information arising out of a specific set of circumstances. First, an individual may have acquired inside information because of “his membership of an administrative, management or supervisory body of an issuer of qualifying investments,” or “through the exercise of his employment, profession or duties.” Furthermore, the person qualifying as an insider may possess private information due to his “holding in the capital of an issuer of qualifying investments,” or as a result of criminal activities. In addition, persons obtaining information that could reasonably be qualified as inside information, by other means than those laid out before are also considered insiders.

⁸⁵See section 1.3 Market abuse (insider dealing) of the Code of Market Conduct.

⁸⁶Section 118A(1) of the FSMA 2005.

⁸⁷As of July 2005, prescribed markets in the U.K. included the EDX London, London Stock Exchange (including AIM), virt-x, International Petroleum Exchange, LIFFE, London Metal Exchange, and OFEX. See the Prescribed Markets and Qualifying Investments Order by the UK Treasury.

⁸⁸Section 118 (2) of the FSMA 2005 and section 1.5 of the MAR.

⁸⁹The FSMA 2005 prescribes a total of seven types of market abuse. In addition to the three already mentioned, *manipulating transactions*, *manipulating devices*, *misleading dissemination*, and other forms of *misleading behavior* or *market distortion* are also considered market abuse under section 118 of the FSMA 2005.

⁹⁰Linklaters (2005), p. 12.

⁹¹See Alexander (2001), p. 40.

⁹²See Hillier and Marshall (2002), p. 396.

2.2.2.3 Inside Information

The definition of inside information is contained in section 118C of the FSMA 2005. Information constituting inside information is (i) of a “precise nature,” (ii) “not generally available,” (iii) “relates, directly or indirectly, to one or more issuers of qualifying investments,” and (iv) “would, if generally available, be likely to have a significant effect on the price of the qualifying investments.”

Information is considered precise if it concerns circumstances or events that are already in existence or that are reasonably to be expected to come into existence, and are specific enough to enable a conclusion regarding the effects on the price of the qualifying investment.⁹³ Furthermore, section 118C (6) of the FSMA 2005 states that a significant effect on price can be expected if “a reasonable investor would be likely to use [the information] as part of the basis of his investment decisions.”

Information that can be obtained through financial research or analysis, however, is not considered inside information but information that is generally available.⁹⁴

Prior to the implementation Market Abuse Directive of 2005, inside information was defined as information that is “not generally available to those using the market but which, if available to a regular user of the market, would or would be likely to be regarded by him as relevant when deciding the terms on which transactions in investments of the kind in question should be effected.”⁹⁵

2.2.3 Directors’ Dealings Reporting Requirements

2.2.3.1 Reporting Framework

Regulations concerning the reporting of legal insider transactions are set out in chapter 3 of the Disclosure Rules and Transparency Rules (DTR) of the UKLA (“*Transactions by persons discharging managerial responsibilities and their connected persons*”).⁹⁶ The DTR apply only to publicly-listed companies and have been amended to cohere with the MAD.⁹⁷ Previously, the CA 1985 imposed additional disclosure rules regarding directors’ dealings in public companies, whether they were being listed or not.⁹⁸ Several provisions of the CA 2006, however, came into force on April 6, 2007, and effectively repealed the relevant directors’ dealings legislation of the CA 1985. As a result of this deregulation, the information concerning trades by directors of unlisted public companies has been reduced.⁹⁹ It is noteworthy to point out that the FSMA 2000 did not change any of the U.K. disclosure requirements concerning directors’ dealings.¹⁰⁰

The DTR requires persons discharging managerial responsibilities and connected persons to disclose their transactions in company shares and related instruments.¹⁰¹ This obligation applies to all issuers incorporated in the U.K. either with financial instruments that are trading on a regulated market or securities for which a request for admission to trade on a regulated U.K. market has been made.¹⁰²

The issuer has to be notified within four business days beginning on the day following the transaction.¹⁰³ Directors’ dealings notifications have to include the name of insider discharging managerial responsibilities

⁹³Section 118C (5) of the FSMA 2005.

⁹⁴Section 118C (8) of the FSMA 2005.

⁹⁵Section 118 (2) (a) of the FSMA 2000.

⁹⁶The Disclosure Rules and Transparency Rules are part of the FSA Handbook.

⁹⁷The DTR are based on section 96A of the FSMA 2005 (previously on section 96 of the FSMA 2000) and were maintained by the LSE until May 2000.

⁹⁸The Companies Act 1985 only governed public companies and, thus, was not concerned with sole traders, partnerships, limited liability partnerships, etc.

⁹⁹See Linklaters, UK Corporate Update, April 5, 2007.

¹⁰⁰See Balmforth et al. (2007), p. 383.

¹⁰¹Section 3.1.2 of the DTR.

¹⁰²Section 1.1.1 (2) of the DTR.

¹⁰³Section 3.1.2 of the DTR.

or the connected person, the reason for the notification, the name of the issuer, a description of the traded instrument, the nature of the transaction, the date and place of the trade, as well as the price and volume.¹⁰⁴ The issuer is required to notify a Regulatory Information Service (RIS) as soon as possible, and no later than the end of the business day following the receipt of the directors' dealings notice.¹⁰⁵ As a result, it should take no longer than six business days for directors' trades to be disseminated to the public.

Prior to the implementation of the MAD through the FSMA 2005, section 324 of the CA 1985 required directors to notify their company of any transactions in their firm's shares. Reports had to be filled within five working days, beginning on the date following the date of the transaction.¹⁰⁶ Section 329 of the CA 1985 required listed companies to forward information regarding directors' dealings to the exchange by the end of the following business day.¹⁰⁷ Thus, information regarding directors' dealings could be disseminated to the market no later than seven business days following the transaction, or one day later than under the new regime.

2.2.3.2 Groups Required to Report

The implementation of the MAD widened the scope of individuals who are required to disclose their dealings in their companies' stock and related securities. Section 3.1.2 of the DTR requires *persons discharging managerial responsibilities* and *connected persons* to report their trades.

Persons discharging managerial responsibilities include (i) company directors and (ii) senior executives who are not directors but who have both regular access to inside information concerning the issuer and the power to make managerial decisions affecting the company's future development and business prospects.¹⁰⁸

For connected persons, the same definition as under section 346 of the CA 1985 applies. This definition includes spouses and children together with entities controlled by those exercising managerial responsibilities as well as trusts of which they, their families, or controlled entities are beneficiaries.¹⁰⁹ In addition, relatives who have shared the same household for at least twelve months, and any other legal entity of which the person discharging managerial responsibilities or a close associate is a director or senior manager, are defined as connected persons.¹¹⁰

Prior to the enactment of the FSMA 2005 on July 1, 2005, only executive as well as non-executive directors were obliged to report their trades.¹¹¹ In contrast to U.S. legislation, large shareholders have never been required to disclose their transactions in the U.K.

2.2.3.3 Publication of Directors' Dealings

Directors are obliged to notify the issuer of any dealings within four business days beginning the day following the transaction. The issuer has to forward the notifications to a Regulatory Information Service (RIS) as soon as possible, and no later than the end of the business day following the receipt of the directors' dealings notice.¹¹² The RIS ensures the dissemination of information. Currently, there are seven approved services that act as RIS providers, including the LSE's Regulatory News Service (RNS),

¹⁰⁴Section 3.1.3 of the DTR.

¹⁰⁵Section 3.1.4 of the DTR.

¹⁰⁶See Balmforth et al. (2007), p. 383.

¹⁰⁷See Pope et al. (1990), pp. 361–362.

¹⁰⁸See section 96B(1) of the FSMA 2005.

¹⁰⁹See section 96B(2)(a) of the FSMA 2005.

¹¹⁰See section 96B (2) (b) and (c) of the FSMA 2005.

¹¹¹See section 324 of the CA 1985.

¹¹²Section 3.1.4 of the DTR.

from which U.K. companies can choose. The selected RIS provider is responsible for disseminating the directors' dealings notification to all subscribers, including major data vendors, at the same time.

As a result, it should take the notification no longer than six business days following the transaction to be disseminated to the public. Fidrmuc et al. (2006) point out that the actual reporting delay is much shorter. For their sample, which encompasses 58,363 trades from 1991 to 1998, 85% of directors' dealings are disclosed within the same day as the trade or the following day to the market.¹¹³ Prior to the CA 2006, companies also had to maintain a *register of director's interest*, which documented directors' dealings in chronological order within three days of the notification by the insider.¹¹⁴

2.2.4 Enforcement of Regulations

2.2.4.1 Enforcement Framework

In the U.K., the FSA is charged with the supervision of financial markets and the enforcement of the market abuse regime. While the FSA is comparable to the U.S. SEC, the latter discharges wider powers, including administrative, civil, and criminal proceedings and plea bargaining. The FSA itself can only bring civil enforcement proceedings against offenders of market abuse. These may result in substantial fines and/or public censure of the individuals and companies involved. In addition, the FSA can discipline individuals and institutions by private warnings or public censure.

In order to identify and prevent illegal insider trading, the FSA relies on several instruments. First of all, companies trading on regulated markets are required to maintain insiders' lists.¹¹⁵ These directories contain information regarding the identity of persons having, regularly or occasionally, access to inside information, and they have to be updated on an ongoing basis.¹¹⁶ The insiders' lists must contain not only the names of employees but also of external consultants, such as bankers, lawyers, and insurance brokers. The issuers are required to release the insider list as soon as possible to the FSA upon request.¹¹⁷ The FSA relies on these directories to deter illegal insider trading in the first place, and uses the provided information in case of suspected market abuse.

Second, the FSA relies on "whistleblowing" by financial intermediaries executing transactions. Section 15.10.2 of the Supervision Manual of the FSA Handbook requires intermediaries to report any transactions that might constitute market abuse to the FSA without delay. In such instances, the whistleblower may disregard client confidentiality considerations and may also not inform the client concerned about the notification made to the FSA.

Third, provisions in the UKLA LR enable the FSA to investigate breaches of the Listing Rules. Listed companies are generally obliged to be open and to cooperate with the FSA. With relatively few exceptions, requested documents and information have to be supplied to the FSA. Based on the supplied information, the FSA may decide to go forward with a formal investigation, which can potentially lead to civil charges against individuals and companies.

Moreover, the FSA employs a transaction monitoring system, called *Sabre 2*, to identify suspicious transactions prior to the publication of significant corporate events.¹¹⁸

2.2.4.2 Penalties and Sanctions

¹¹³Fidrmuc et al. (2006), p. 2935.

¹¹⁴Section 324 and 328 of the CA 1985.

¹¹⁵Insiders' lists are a provision of the MAD and have been implemented in U.K. law through the DTR.

¹¹⁶Section 2.8.1 and 2.8.4 of the DTR.

¹¹⁷Section 2.8.2 of the DTR.

¹¹⁸See Financial Services Authority (2007), p. 18.

2.2.4.2.1 Violations of Insider Trading Laws In the U.K., insider trading violations can be prosecuted via a dual track of civil and criminal law procedures. Prior to the enactment of the FSMA 2000, the exploitation of private information could only be prosecuted under criminal law, as outlined in Part V of the CJA 1993.¹¹⁹ The FSMA 2000 expanded the existing regime and allows for far-reaching civil law procedures against market abuse, which includes illegal insider trading.¹²⁰

Section 61 of the CJA 1993 provides for an imprisonment of individuals guilty of insider trading on summary conviction for a maximum term of six months, or a fine. Individuals convicted on indictment face prison terms of up to seven years and/or a fine.¹²¹ It is not, however, sufficient for individuals to engage in market abuse, as defined by the FSMA 2000 and the Code of Market Conduct, to be prosecuted under the CJA 1993. Fraud has to be established by a court under the provisions of the CJA 1993.

Market abuse offenders are subject to civil proceedings by the FSA, as outlined in the Decision Procedure and Penalties Manual (DEPP) of the FSA Handbook.¹²² The U.K. regulator can impose appropriate yet theoretically unlimited fines on companies and individuals.¹²³ Other sanctions include public reprimand, court injunctions to prevent any future market abuse, and a redemption of the profits unlawfully obtained.¹²⁴ In addition, corporations may sue employees for insider trading on the grounds of a breach of fiduciary duty by employees owed to the company.¹²⁵

2.2.4.2.2 Violations of Reporting Requirements Until the partial enactment of the CA 2006 on April 6, 2007, failure by *directors* to disclose dealings to the issuer according to section 324 of the CA 1985 were punishable with up to two years of imprisonment or a monetary fine.¹²⁶ If a company failed to forward directors' dealings notifications according to section 329 of the CA 1985 in a timely manner, the responsible officers and the corporation itself were punishable by up to a fifth of the statutory maximum penalty.¹²⁷ As opposed to violations of section 324 CA 1985, section 329 CA 1985 could be prosecuted only with the consent of the Secretary of State or the Director of Public Prosecution.

Under the new regime, violations of directors' dealings reporting requirements arising out of the LR and DR may be penalized by the FSA. Similar penalties apply to those outlined in section 2.2.4.2.1, and the FSA's procedures are outlined in the DEPP of the FSA Handbook. Companies that violate the LR can be penalized with a monetary fine, which is in theory unlimited, or public reprimand. For companies that violate the DR, the same sanctions used for directors apply.

2.2.4.3 Effectiveness of Enforcement

The FSA has been criticized for its supposedly weak enforcement program. Between 2001 and 2007, for example, only eight fines were imposed for insider trading.¹²⁸ Likewise, there has been only one

¹¹⁹See Alexander (2001), p. 3. The Criminal Justice Act 1993 is accessible at http://www.opsi.gov.uk/acts/acts1993/Ukpga_19930036_en_1, as of April 08, 2008.

¹²⁰See section 2.2.2.1.

¹²¹In the U.K., a summary conviction occurs when the defendant is tried by a judge alone; this punishment typically applies to non-serious offences. A conviction on indictment entails a full jury and applies to more serious offences.

¹²²The Decision Procedure and Penalties Manual came into effect on August 27, 2007, and replaced the Enforcement chapter.

¹²³Section 123 of the FSMA 2000.

¹²⁴Victims of insider trading, however, have no right of direct action against offenders of the market abuse regime.

¹²⁵See Gower and Davies (2003), p. 755.

¹²⁶Farrar et al. (1998), p. 511.

¹²⁷Section 329(3) of the CA 1985.

¹²⁸See Alexis Xydias and James Lumley, "FSA Struggles With Insider Trading That Doesn't Happen in U.K.," *Bloomberg*, June 11, 2007, http://www.bloomberg.com/apps/news?pid=20601170&refer=special_report&sid=a0Le7f.KNDos, (accessed May 10, 2008).

conviction in civil court proceedings on insider dealings.¹²⁹ Recently, the FSA has vowed to step up its enforcement.¹³⁰ In February 2007, the FSA obtained its first asset freezing injunction against two individuals due to suspected insider trading related to a tender offer.¹³¹ Moreover, the FSA fined the hedge fund GLG Partners LP and its former managing director, Philippe Jabre, £750,000 each for insider trading based on confidential information. This has been the largest fine ever imposed by the FSA on an individual, which is in line with the FSA's aim to focus on high-profile market abuse cases.¹³²

The FSA, however, admits that more than 30% of significant news announcements are preceded by abnormal price movements.¹³³ One problem has been that until the implementation of the FSMA 2000, insider trading cases were notoriously hard to prove in court.¹³⁴ Yet informed trading has increased rather than decreased in spite of the strengthened regulatory environment introduced by the FSMA 2000.¹³⁵ Insider trading ban periods for company directors, on the other hand, are apparently well enforced. Hillier and Marshall (1998) state that such infringements are extremely scarce, and according to FSA officials, only few violations of the blackout periods have occurred.¹³⁶

2.3 Insider Trading Regulations in Germany

2.3.1 Evolution of Regulations

Germany, similar to the rest of continental Europe, was relatively late in adopting laws regulating insider trading.¹³⁷ Germany was even slower in instating directors' dealings legislation. Laws regulating insider trading were finally instituted in Germany because European Community member countries were obliged to implement the EC Insider Trading Directive (Council Directive 89/592/EEC of November 13, 1989).¹³⁸ In 1994, Germany implemented the measures outlined in the directive through the Second Financial Market Development Act (FMDA, Finanzmarktförderungsgesetz) and the Wertpapierhandelsgesetz (WpHG), Germany's Securities Trading Law.¹³⁹ The WpHG, which can be considered the cornerstone of German capital market regulation, also addresses insider trading and outlaws the exploitation of private information.¹⁴⁰

Prior to 1994, the exploitation of inside information at the expense of other market participants was not prohibited by law. Only a non-binding code of honor existed since 1970.¹⁴¹ Trade associations were charged with ensuring that self-monitoring would prevent insider trading.¹⁴² The guidelines were generally accepted in 1972. In spite of the 1994 legislation outlawing the exploitation of insider information, market abuse was rampant during the height of the Neuer Markt, Deutsche Börse's now defunct

¹²⁹The case involved trading of Middlesmiss' Company Secretary prior to an earnings announcement. See Fidrmuc et al. (2006), p. 2936.

¹³⁰See Paul Murphy, "Market insight: Despite FSA rhetoric market abuse is rampant," *Financial Times*, July 9, 2007; Edward Fennell, "Insiders beware of criminal acts," *The Times*, July 10, 2007.

¹³¹See Financial Services Authority (2007), p. 18.

¹³²See Financial Services Authority (2007), p. 17.

¹³³See Dubow and Monteiro (2006), p. 22.

¹³⁴See Farrar et al. (1998), p. 422.

¹³⁵See Monteiro et al. (2007), pp. 7–8.

¹³⁶See Fidrmuc et al. (2006), p. 2936.

¹³⁷With the exception of France, which had already enacted insider trading laws in 1967. See Bhattacharya and Daouk (2002), p. 81, Table I.

¹³⁸The European Community Council Directive 89/592/EEC of November 13, 1989, coordinating regulations on insider dealing, is accessible at <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31989L0592:EN:HTML>, as of April 4, 2008.

¹³⁹See BGBI I of July 30, 1994, p. 1749.

¹⁴⁰Hopt (1995), for example, refers to the WpHG as the Basic Law of German capital markets regulation.

¹⁴¹See Arneth (2001), p. 2., and Pfister (1981), p. 319.

¹⁴²See Schlüter (2002), p. 154.

market segment for tech shares. Several insiders of companies listed on the Neuer Markt were under investigation by Germany's former supervision agency, the *Bundesaufsichtamt für den Wertpapierhandel* (BAWe), regarding informed selling prior to significant decreases in stock prices.¹⁴³

To restore market integrity, transparency, and investor confidence, the Fourth FMDA and directors' dealings legislation were implemented on July 1, 2002. Since then, section 15a of the WpHG has required company insiders to report their share dealings to Germany's financial services authority and the company itself. Previously, only members of the executive and supervisory board of Neuer Markt companies were obliged to disclose their trades to the Deutsche Börse. The set of rules on directors' dealings was strengthened by the *Anlegerschutzverbesserungsgesetz* (AnSVG), which became effective on October 30, 2004.¹⁴⁴ The AnSVG serves the implementation of the insider dealing and market manipulation (market abuse) directive of January 28, 2003, which aims at harmonizing insider trading and directors' dealings legislation in Europe. The AnSVG shortened the time insiders may take to report their trades, required companies to maintain registers of persons having access to inside information, and overhauled the rules provisioning illegal insider trading in section 14 of the WpHG.¹⁴⁵

The *Transparenzrichtlinien-Umsetzungsgesetz* (TUG), Transparency Directive Ratification Act, of January 20, 2007, changed section 15a, subsection 4 of the WpHG and separated the notification obligation from the publication requirement of directors' dealings.¹⁴⁶ In addition, the TUG requires directors' dealings to be submitted to the German business register. One of the latest, albeit small, addition to directors' dealings legislation has been the *Finanzmarktrichtlinie-Umsetzungsgesetz*, the Financial Markets Directive Implementation Law, of July 16, 2007, which merely clarifies that only relevant domestic insider dealings have to be reported.¹⁴⁷

In Germany, the *Bundesanstalt für Finanzdienstleistungsaufsicht* (BaFin) is charged with enforcing insider trading as well as directors' dealings regulations. The BaFin is the federal authority charged with the surveillance of securities trading in general. It was created in 2002 by merging the *Bundesaufsichtsamt für das Kreditwesen* (banking surveillance), the *Bundesaufsichtsamt für das Versicherungswesen* (surveillance of the insurance industry), and the *Bundesaufsichtsamt für den Wertpapierhandel* (surveillance of securities trading).

2.3.2 Definition of Illegal Insider Trading

2.3.2.1 Core of Regulations

Insider trading in Germany is outlawed by section 14 of the WpHG, which prohibits anyone from trading on the basis of inside information. Owing to the MAD, this definition of insider trading is almost identical to that of the U.K. In particular, section 14, subsection 1 of the WpHG states that it is prohibited to

1. *acquire or dispose of insider securities for his or her own account or for the account of another person, or for another person, by utilizing knowledge of inside information,*

¹⁴³A prominent and often cited example is the investigation of EM.TV and its former CEO, Thomas Haffa. See (*Handelsblatt*, January 14, 2002).

¹⁴⁴See BGBl I No. 56, of October 29, 2004.

¹⁴⁵The European Parliament and Council Directive 2003/6/EC of January 28, 2003, on insider dealing and market manipulation (market abuse) is accessible at <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32003L0006:EN:NOT>, as of April 4, 2008.

¹⁴⁶The TUG serves the implementation of the EU Transparency Directive 2004/109/EC of December 15, 2004, which is accessible at <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32004L0109:EN:HTML>, as of April 5, 2008.

¹⁴⁷The *Finanzmarktrichtlinie-Umsetzungsgesetz* serves the implementation of the EU Markets in Financial Instruments Directive (MiFID) 2004/39/EC, which is accessible at <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32004L0039:EN:HTML>, as of April 5, 2008.

2. *disclose or make accessible insider information to another person without authorization,*
3. *recommend the purchase or sale of insider securities to another person based on the knowledge of insider information or to induce another person to this end.*¹⁴⁸

Insider securities are defined in section 12 of the WpHG and include financial instruments that are (i) approved for trading on a *domestic exchange*, on the *regulated market*, or on the *regulated unofficial market* (Freiverkehr), (ii) approved for trading on an organized market in an European Union or European Economic Area member country, or (iii) other instruments of which the price is directly or indirectly dependent on the securities listed under (i) and (ii). While the latter primarily addresses financial derivatives, it also implies that assets not trading on a stock market are subject to the insider trading laws of section 14 of the WpHG, if their price is related to traded financial securities.

2.3.2.2 Insider Definition

The provisions of section 14 of the WpHG generally outlaw the exploitation and unauthorized disclosure of inside information by anyone, regardless of how the information is obtained. Prior to the implementation of the AnSVG in October 2004, however, section 13 of the WpHG differentiated between primary and secondary insiders.

Primary insiders were defined as members of the management, members of the executive and supervisory bodies, and personally-liable partners of the issuer or of an undertaking associated with the issuer, who possess private and price-sensitive information. This definition also includes individuals who possess inside information by virtue of any holding in the capital of the issuer or of an undertaking associated with the issuer, or by virtue of the individual's profession, employment, or duties.¹⁴⁹ *Secondary insiders*, on the other hand, were defined as all other persons in the possession of insider information.

While primary insiders were prohibited from exploiting and disclosing insider information or recommending insider securities to third parties, secondary insiders were only prohibited from exploiting obtained private information (section 13, subsection 1 of the WpHG (old version)).¹⁵⁰ Thus, the implementation of the AnSVG considerably extended the provisions outlawing insider trading. As detailed in section 2.3.4.2.1, the differentiation between primary and secondary insiders is still relevant in the context of penalties and sanctions levied on illegal insider trading.

2.3.2.3 Inside Information

The new inception of section 13 of the WpHG defines inside information. Subsection 1 declares that

*inside information is specific information regarding non-public circumstances, which refers to one or several issuers of insider securities or refers to insider securities themselves, and which, if the information became public, would likely have a significant effect on the stock or market price of the insider securities.*¹⁵¹

It is sufficient if a competent investor would have utilized the information in her investment decision. In addition, the law does not require the non-public circumstances to materialize with absolute certainty—sufficient certainty is satisfactory. Section 13, subsection 1 of the WpHG also specifically addresses front-running, i.e., trading on the basis of received customer orders by security traders.

¹⁴⁸Own translation.

¹⁴⁹See section 13, subsection 1 of the WpHG (old version).

¹⁵⁰See Assmann and Schneider (2006), p. 389.

¹⁵¹Own translation.

Section 13, subsection 2 of the WpHG specifies that valuations, which have been compiled solely on the basis of publicly-available information, do not constitute inside information, even if they are suited to significantly affect the price of insider securities.

2.3.3 Directors' Dealings Reporting Requirements

2.3.3.1 Reporting Framework

Only since July 1, 2002, have corporate insiders been required to report their share dealings. According to section 15a, subsection 1 of the WpHG, insiders have to report their trades in financial securities and related instruments, derivatives in particular, to the BaFin and the company itself within five business days. Prior to the effective date of the AnSVG on October 30, 2004, trades had to be reported without delay. This vague definition caused extreme reporting delays in some instances and was therefore replaced.¹⁵²

The scope of regulations of section 15a, subsection 1 of the WpHG is generally more narrow than the insider trading provision of section 14 of the WpHG. It is limited by the definition of securities and markets.¹⁵³ First, the provision applies only to financial securities that satisfy section 2, subsection 2b of the WpHG. In addition to shares, this includes convertible bonds and loans, warrants, call and put options, bonds with a warrant attached, phantom stock, stock appreciation right (SARs), reverse convertible notes, bonus shares, futures, and derivatives in general. Second, the financial securities have to be traded either on a domestic stock exchange, or on a foreign organized market, if the issuer's place of business is Germany or Germany is the originating country, according to the Securities Prospectus Act (Wertpapierprospektgesetz), for the disclosure requirements to apply.¹⁵⁴

Items that are required to be reported are listed in section 10 of the Wertpapierhandelsanzeige- und Insiderverzeichnisverordnung (WpAIV), Germany's Securities Trading Notification and Insider Register Decree. Items include, amongst others, the name of the insider, the number of traded shares, the stock price, the ISIN and name of the security, the date and nature of the transaction, the name of the issuer of stock, and the position of the insider within the company. If derivatives are traded, supplement information, such as the exercise price of stock options, has to be reported. Appendix D contains the BaFin template for directors' dealings notifications.

The reporting obligation also encompasses related persons, such as dependent children and spouses.¹⁵⁵ Insiders may refrain from disclosing their transactions only if the cumulative trading volume, including that of persons closely related to the insider, does not exceed 5,000 euros in one calendar year.¹⁵⁶ This threshold was sharply reduced by the AnSVG and initially amounted to 25,000 euros in 30 days.

Issuers that have been notified of an insider transaction must forward the information to the German business register (Unternehmensregister) and must notify the BaFin of the nature of the publication.¹⁵⁷

2.3.3.2 Groups Required to Report

Section 15a, subsection 1 of the WpHG prescribes that individuals with managerial functions at issuers of stock are required to report their trades. Subsection 2 further defines persons with managerial functions

¹⁵²Betzer and Theissen (2008), for example, find an average reporting delay of 13.1 days in directors' dealings between July 1, 2002, and June 30, 2004.

¹⁵³See Osterloh (2007), p. 213.

¹⁵⁴See section 15a subsection 1 clause 3 of the WpHG.

¹⁵⁵See section 15a, subsection 1 clause 2 of the WpHG.

¹⁵⁶See section 15a, subsection 1 clause 5 of the WpHG.

¹⁵⁷Issuers are required to forward directors' dealings notifications to the business register by the TUG, which became effective on January 20, 2007.

as personally-liable partners or members of an executive, administrative, or supervisory board. Other persons who regularly have access to inside information and are authorized to decide on material corporate issues are also considered to be persons with a managerial function. Thus, regular employees without managerial function or substantial decision-making authority are exempt from the reporting obligation. In addition, large shareholders and former directors are unaffected by the obligation to report their trades, as long as they do not fit in any of the above-outlined categories.

However, to avoid any bypassing of disclosure rules, persons with a close relationship to insiders are not exempt from reporting their transactions.¹⁵⁸ Section 15a, subsection 3 specifies that closely related persons include spouses, registered partners, dependent children, and other relatives living in the insider's household for at least one year. Since the implementation of the AnSVG, transactions by other legal entities, in which insiders hold managerial functions, are subject to directors' dealings regulation. It is sufficient for disclosure rules to apply if insiders directly or indirectly control other legal entities, founded a legal entity, or if the economic or commercial interests of a legal entity correspond to those of the insider. In practice, however, most insiders are members of the executive and supervisory boards, and subsequently, the largest proportion of directors' dealings are reported by these groups.

2.3.3.3 Publication of Directors' Dealings

In Germany, several venues exist for the publication and dissemination of trades by corporate insiders. Insiders also have to notify their corporation as well as the BaFin of their dealings within five business days following the transaction. Domestic issuers, as defined according to section 2, subsection 7 of the WpHG, must publish directors' dealings *without delay*.¹⁵⁹ First, however, the issuer has to verify that the insider is indeed subject to the disclosure requirements of section 15a of the WpHG and that the report is correct and not manipulated.¹⁶⁰ In practice, this leads to a delay of one or two business days.¹⁶¹ After this verification, the announcement has to be forwarded to several media services, including at least one electronic dissemination system, one news agency, one news provider, one print medium, and one finance-related website.¹⁶² At least one of these media outlets has to be suited to disseminate the information throughout the EU and the EEA.¹⁶³ In practice, many issuers also publish directors' dealings on their website, in line with the transparency recommendations set out by the German Corporate Governance Code (DCGK).¹⁶⁴ As a result, it can take up to seven working days for directors' dealings to be disclosed to the general public. It should, however, be regarded as critical that the time companies may take to verify the notification is not limited in a more precise manner.

At the same time as the disclosure of the announcement to the general public, issuers must inform the BaFin of the publication.¹⁶⁵ After processing the transaction, which commonly takes one to two business days, the BaFin publishes the directors' dealings in its online database.¹⁶⁶ The BaFin's database contains all trades that have been published within the last year.¹⁶⁷

¹⁵⁸See section 15a, subsections 1 and 3 of the WpHG.

¹⁵⁹See section 15a, subsection 4, clause 1 of the WpHG in connection with section 3a, section 3b, and section 13 of the WpAIV.

¹⁶⁰See Bundesanstalt für Finanzdienstleistungsaufsicht (2002).

¹⁶¹Rau (2004), p. 111.

¹⁶²Bundesanstalt für Finanzdienstleistungsaufsicht (2008), pp. 186–187.

¹⁶³See section 3a of the WpAIV.

¹⁶⁴See section 6 of the DCGK.

¹⁶⁵See Section 15a, subsection 4 of the WpHG, in connection with sections 13a and 3c of the WpAIV.

¹⁶⁶See Bundesanstalt für Finanzdienstleistungsaufsicht, "Meldungen nach § 15a WpHG (Mitteilungen über Geschäfte von Führungspersonen)," http://www.bafin.de/cIn_109/nn_722764/SharedDocs/Artikel/DE/Verbraucher/Recherche/db_WpHG.html (accessed June 6, 2008).

¹⁶⁷The BaFin is authorized to publish trades on its website by section 15a subsection 5 clause 1 of the WpHG in connection with section 13 of the WpAIV. The directors' dealings database is accessible at <http://ww2.bafin.de/database/>

In addition, companies have to forward the notification to the business register, where it is stored according to section 8b of the German Commercial Code (Handelsgesetzbuch, HGB). In practice, corporations commonly employ special directors' dealings service providers to handle the statutory notification and publication requirements.¹⁶⁸

2.3.4 Enforcement of Regulations

2.3.4.1 Enforcement Framework

The enforcement of insider trading and directors' dealings legislation in Germany falls to the BaFin, and its Securities Supervision division in particular. According to the BaFin, the division's staff utilizes a specialized data mining system to constantly analyze transactions on the basis of trading data obtained from financial institutions.¹⁶⁹ In 2007, on average, 2.6 million transactions per day were transmitted to the BaFin.¹⁷⁰ Price movements and changes in turnover are related to news announcements in order to identify suspicious trades. In addition, the BaFin relies on tip-offs by investors, members of the press, domestic as well as foreign financial institutions, and foreign regulators. The majority of complaints, about 50%, are transmitted by domestic credit and securities trading institutions.¹⁷¹ If suspicious transactions are found, a formal investigation is initiated. This allows the BaFin to request the insider lists of the affected company as well as other information (section 4, subsections 1 to 4 of the WpHG).¹⁷² If a lead can be substantiated, the case has to be forwarded to the public prosecutor's office (section 4, subsection 5 of the WpHG).¹⁷³ If the offense can be traced back to a secondary insider, i.e., a company outsider, the BaFin itself is empowered to prosecute the illegal transmission of any inside information or investment advice.

To prevent insider trading from occurring in the first place, the German market generally requires that insider information be made public immediately according to the ad-hoc news disclosure regulation of section 15, subsection 1 of the WpHG. The statutory ad-hoc disclosure is discussed in more detail in section 2.5. Naturally, insider information that has entered the public domain cannot be exploited anymore. The reporting requirement of directors' dealings serves the same purpose and also potentially simplifies the detecting of insider trading. In addition, insider lists, as required by section 15b of the WpHG, support the prosecution of illegal insider trading, as companies are required to document all persons with access to private and price-sensitive information.¹⁷⁴ Issuers of stock are also required to inform persons registered on the insider list about the consequences of insider trading.

2.3.4.2 Penalties and Sanctions

2.3.4.2.1 Violations of Insider Trading Laws Illegal insider trading, according to section 14, subsection 1 of the WpHG, is punishable according to section 38 of the WpHG, which prescribes prison sentences of up to five years or a monetary fine, regardless of whether the offender is a primary or sec-

DealingsInfo/, as of June 6, 2008.

¹⁶⁸In Germany, three major directors' dealings service providers for the German market exist: DGAP, euro adhoc, and hugin.

¹⁶⁹See BaFin, "The key functions of BaFin's securities supervision," http://www.bafin.de/nm_721298/EN/BaFin/Functions/SecuritiesSupervisionAssetManagement/SecuritiesSupervisionAssetManagement__node.html?__nnn=true (accessed April 8, 2005).

¹⁷⁰See Bundesanstalt für Finanzdienstleistungsaufsicht (2008), p. 172.

¹⁷¹See Bundesanstalt für Finanzdienstleistungsaufsicht (2008), p. 172, Figure 27.

¹⁷²See Hienzsch (2006b), p. 67.

¹⁷³See Hienzsch (2006a), p. 67.

¹⁷⁴Insider lists have been implemented by the AnSVG.

ondary insider.¹⁷⁵ Furthermore, subsection 3 specifies that also attempted insider trading is punishable. If the accused is found to have acted carelessly, the maximum term of imprisonment is reduced to one year (section 38, subsection 4 of the WpHG).

Any unauthorized communication of inside information is punishable according to section 39, subsection 2 of the WpHG. If the individual committing fraud is a secondary insider, the conduct amounts to a regulatory offense, and the individual can be fined with up to 20,000 euros. If, however, the communication or recommendation of an insider security is performed by a primary insider, the same penalties as for insider trading under section 38 of the WpHG apply.¹⁷⁶

2.3.4.2.2 Violations of Reporting Requirements An intentional or negligent violation of the notification requirements of section 15a, subsection 1 of the WpHG represents a regulatory offense, according to section 39, subsection 2 of the WpHG. The same applies to violations of the publication requirements by issuers of stock according to section 15a, subsection 4 of the WpHG, or a delayed submission of directors' dealings notifications to the BaFin. Section 39, subsection 4 of the WpHG details that such offenses can be fined up to 100,000 euros. Insiders, however, do not stand the risk of losing ownership of the traded securities, according to section 28 of the WpHG. However, claims for damages under civil law cannot be asserted under section 823 of the BGB, since such charges are not specifically addressed by the WpHG. Compared to U.S. sanctions, which can amount to several million dollars, penalties in Germany for wrongful reporting seem relatively harmless.¹⁷⁷

2.3.4.3 Effectiveness of Enforcement

The annual reports published by the BaFin details past and ongoing legal procedures against insider trading. In 2007, a total of 750 (2006: 1,250) cases of alleged market abuse or insider trading were analyzed by the BaFin.¹⁷⁸ Of these 750 cases, 42 (2006: 51) were associated with illegal insider trading, and formal investigations were initiated.¹⁷⁹ Similar to previous years, the majority (45%) of the illegal dealings were based on insider information related to mergers and acquisitions (M&A) transactions, followed by earnings announcements (20%), and insolvencies (11%).¹⁸⁰ Of these new cases, twenty were forwarded to the public prosecutor's office, involving a total of 64 persons. At the same time, however, the BaFin also closed 29 investigations. At the end of 2007, a total of 99 formal investigations were ongoing, including cases from previous years.

Similarly to the BaFin, the public prosecutor's office discontinued the majority of its proceedings in 2007. In 65 instances, the investigation was dropped without any charges or fines against the alleged insider trader.¹⁸¹ Only three cases led to penalty orders, and in fourteen instances, proceedings were dropped after payment of a monetary fine. In 2007, no investigation led to an actual trial.¹⁸²

The figures published by the BaFin suggest that illegal insider trading in Germany is either relatively rare or the enforcement of provisions is inadequate. In 2007, for instance, the BaFin initiated only 42 formal investigations, out of a total of 712 million security transactions, and only half of those were forwarded to the public prosecutor's office. Furthermore, public prosecution does not fare much better. In 2007, almost 80% of all cases were dropped without any charges against the defendants. This poor

¹⁷⁵Osterloh (2007), p. 214.

¹⁷⁶See Hienzsch (2006a), p. 36.

¹⁷⁷See Przewlocka (2007), p. 42.

¹⁷⁸See Bundesanstalt für Finanzdienstleistungsaufsicht (2008), p. 172.

¹⁷⁹See Bundesanstalt für Finanzdienstleistungsaufsicht (2008), p. 176, Table 20.

¹⁸⁰See Bundesanstalt für Finanzdienstleistungsaufsicht (2008), p. 173, Figure 28.

¹⁸¹See Bundesanstalt für Finanzdienstleistungsaufsicht (2008), p. 176, Table 21.

¹⁸²In 2005 and 2006, five cases lead to trials.

performance is mirrored in Germany's low score in the enforcement index of La Porta et al. (2006), which ranks at a relatively low 0.22.¹⁸³

2.4 Comparative Analysis of U.S., U.K., and German Insider Trading Legislation

Since the insider trading and directors' dealings legislation in the U.S., U.K., and Germany have been summarized, this section highlights the most prevalent differences between the three countries. Generally, the differences are outlined in relation to the regulatory environment in Germany. The comparative analysis follows the structure of sections 2.1 to 2.3, while the evolution of regulations is neglected. Thus, the definitions of illegal insider trading are contrasted first (section 2.4.1), followed by the directors' dealings reporting requirements (section 2.4.2), and the enforcement of regulations (section 2.4.3). In addition, the different aspects of legislation are summarized in tables 2.1, 2.2, and 2.3, respectively.

2.4.1 Definition of Illegal Insider Trading

Owing to the market abuse directive (MAD) of the European Union, the definitions of illegal insider trading in Germany and the U.K. are very similar, particularly with respect to the definitions of insiders and inside information. U.K. legislation is, however, more restrictive in several regards. First, the U.K. prescribes certain trading bans prior to earnings announcements, during which no director is allowed to trade.¹⁸⁴ Betzer and Theissen (2009) make the case for the implementation of blackout periods in Germany, as the authors find greater abnormal return associated with directors' dealings prior to earnings announcements. Dymke and Walter (2008) also find larger profits for trades preceding ad-hoc news announcements. In addition, directors are required to obtain clearance from the company chairman or a designated director. In Germany, such a requirement may only be prescribed through private company policy.

In contrasting Germany with the U.S., several discrepancies emerge. First, regulations are structured very differently. While Germany primarily relies on the main provision of section 14 of the WpHG, U.S. regulations have their origin in common law and have evolved into a complex mesh, consisting of the disclose or abstain rule, the misappropriation theory, and rule 14e-3 of the SEA. Second, U.S. regulations can be considered stricter than those in Germany. Insiders in Germany are not barred from short-selling, no stock short-swing trading restrictions apply, and no trading bans related to pension fund blackout periods exist. The definitions of insiders and inside information are, however, comparable.

Table 2.1 summarizes the main aspects of insider trading legislation in the three countries.

¹⁸³The U.S. and the U.K. achieved scores of 0.90 and 0.68, respectively. See La Porta et al. (2006), pp. 15–6, Table II.

¹⁸⁴See Hillier and Marshall (2002).

Table 2.1: Definition of Illegal Insider Trading in the U.S., U.K., and Germany

	U.S.	U.K.	Germany
Legislation on Illegal Insider Trading	<p>The Securities Act of 1933; The Securities and Exchange Act of 1934: section 16(b) (“short-swing” profits), section 10(b)5 (trading on material non-public information), rule 10b-5 (implements section 10(b)5), rule 10b5-1 (“disclose or abstain rule”), rule 10b5-2 (misappropriation theory), rule 14e-3 (“constructive insider issue”); The Insider Trading Sanctions Act of 1984; Insider Trading and Securities Fraud Enforcement Act of 1988; Enforcement Remedies and Penny Stock Reform Act of 1990; Sarbanes-Oxley Act 2002: section 306 (pension fund blackout periods).</p>	<p>The Model Code of the London Stock Exchange of 1977; The Companies Act of 1985; The Companies Securities (Insider Dealings) Act of 1985; The Criminal Justice Act of 1993; The Financial Services and Markets Act 2000; Financial Services and Markets Act (Market Abuse) Regulations 2005; The Model Code; The Code of Market Conduct.</p>	<p>Wertpapierhandelsgesetz: section 14 (main provision), section 12 (insider securities), section 13 (insider information); Anlegerschutzverbesserungsgesetz.</p>

Table 2.1: Definition of Illegal Insider Trading in the U.S., U.K., and Germany

	U.S.	U.K.	Germany
Core of Regulations	<p><i>The disclose or abstain rule:</i> Traders either have to disclose material non-public information or refrain from trading (section 10(b) of the SEA, rule 10b-5, and rule 14e-3).</p> <p><i>Misappropriation theory:</i> Individuals obtaining inside information of a company to which a fiduciary duty is owed are prohibited from trading on this information. The inside information may concern any issuer of shares, not necessarily the company to which the fiduciary duty is owed (rule 10b5-2 of the SEA).</p> <p><i>Rule 14e-3:</i> Trading on inside information related to an ongoing or foreseeable tender offer is prohibited.</p> <p><i>Short-swing profits:</i> Corporate insiders may not engage in round-trip transactions that entail a purchase and a sale (or a sale and a purchase) of securities within six months (section 16(b) of the SEA).</p> <p><i>Short-selling ban:</i> Corporate insiders may not engage in shorting the issuer's shares (section 16(c) of the SEA). <i>Trading ban periods:</i> Corporate insiders may not trade during certain pension fund blackout periods (section 306 of the SOX).</p>	<p><i>Insider trading:</i> Trading or attempted trading by insiders on the basis of inside information is prohibited (section 118(2) of the FSMA 2005). The unauthorized disclosure of inside information to another person is prohibited (section 118(3) of the FSMA 2005).</p> <p><i>Misuse of information:</i> Trading or disclosing relevant information, which is not generally available, and does not constitute market abuse (insider dealing) (section 118(4) of the FSMA 2005). <i>Trading ban periods:</i> No trading by corporate insiders during the 60 days preceding preliminary, interim, or final earnings announcements, and during the 30 days prior to quarterly earnings announcements (section 1 (a) of the Model Code).</p> <p><i>Clearing by the company's chairman:</i> Corporate insiders are required to obtain clearance from the company's chairman or a director designated by the board for this purpose (section 4 (a) of the Model Code).</p>	<p><i>Insider trading:</i> Trading or attempted trading in insider securities on the basis of inside information is prohibited. The unauthorized disclosure of inside information to another person is prohibited (section 14, subsection 1 of the WpHG).</p>
Definition of Insider	<p><i>Traditional insiders:</i> officers, directors, or beneficial owners of more than ten percent of any class of equity (section 16(a) of the SEA).</p> <p><i>Constructive insiders:</i> outsiders who legitimately receive confidential information by providing services to a company and are required to treat the obtained information as confidential (rule 14e-3 of the SEA).</p>	<p>Anyone in possession of inside information arising out of a specific set of circumstances (section 118B of the FSMA 2005).</p>	<p>Anyone in possession of inside information (section 14 of the WpHG).</p>

Table 2.1: Definition of Illegal Insider Trading in the U.S., U.K., and Germany

	U.S.	U.K.	Germany
Definition of Inside Information	<p>Material and non-public information. Information is <i>material</i> if (i) there is a “substantial likelihood” that a “reasonable investor” would consider the information important in making an investment decision, (ii) the disclosure of the information would be “viewed by the reasonable investor as having significantly altered the total mix of information made available,” or (iii) the disclosure of the information is “reasonably certain to have a substantial effect on the market price of the security.”</p> <p><i>Non-public</i> information is information that has not been disseminated to investors in general.</p>	<p>Information of a “precise nature” that is “not generally available,” “relates, directly or indirectly, to one or more issuers of qualifying investments” and “would, if generally available, be likely to have a significant effect on the price of the qualifying investments” (section 118C of the FSMA 2005).</p>	<p>Specific information regarding non-public circumstances, which refers to one or several issuers of insider securities or refers to insider securities themselves, and which, if the information became publicly known, would likely have a significant effect on the stock or market price of the insider securities (section 13 of the WpHG).</p>

2.4.2 Directors' Dealings Reporting Requirements

Generally, all examined markets demand the publication of trades by insiders. Nevertheless, the specific notification requirements, the definition of insiders, and the publication of reported trades differ in several aspects.

The most obvious difference between the three studied countries concerns the definition of the groups required to report their trades. In the U.S., directors' dealings legislation applies to directors, officers, and beneficial owners of more than ten percent of any class of equity. The corresponding legislation in Germany reads that employees have to exercise managerial functions at the issuer, and the same wording applies in the U.K. Members of the supervisory board are required to report their trades in all three legal systems, as are connected persons and entities. In Germany and the U.K., however, large shareholders are exempt from the notification requirements. Additionally, former board members do not have to report their trades in Germany.

The notification framework also differs across the legal systems. In Germany, insiders are required to report their trades to the issuer as well as the regulator. In the U.K., only the company has to be notified, and in the U.S., only the SEC has to be informed, leaving internal company regulations aside. American insiders are required to report their trades within two business days to the SEC, which has to publish the transaction on the following business day. Thus, transactions should not take more than four trades to be disseminated to the public. Prior to the implementation of the SOX, however, insiders had substantially more leeway and, in extreme cases, were allowed to delay their trade notification for up to 40 days. In the U.K., directors can take four business days to report their dealings to their company, which is required to forward the notification on the following business day. The resulting maximum reporting delay is six business days. Germany insiders must report their trades within five days to the regulator as well as the issuer.¹⁸⁵ The latter is then required to publish the transaction without delay. "Without delay" is a legal term and is, according to section 121, subsection 1, clause 1 of the BGB, to be interpreted as "without undue delay." According to the BaFin, issuers take about one to two business days to forward directors' dealings to disseminating media services.¹⁸⁶ Thus, the resulting reporting day should generally not exceed seven business days. Thus, Germany features the longest legally admissible reporting delay, but is on par with several other European countries that have also implemented a reporting delay for insiders of five days.¹⁸⁷

Differences also exist in the publication venue of directors' dealings. In the U.S., trades are published on the SEC's EDGAR online platform, and since the implementation of the SOX, on company websites. In the U.K., trades are disseminated by RIS providers, such as the RNS of the LSE. In Germany as well as the U.K., trades do not have to be published on the issuer's website, but they commonly are. German issuers are required to ensure a Europe-wide dissemination of directors' dealings through the news media. Moreover, trades are published with a short additional delay on the BaFin website. This service is comparable to the SEC's EDGAR system.

Table 2.2 summarizes the main aspects of directors' dealings legislation in the three countries.

¹⁸⁵Prior to the implementation of the AnSVG, the law required insiders to report their trades to the BaFin as well as the issuer "without delay."

¹⁸⁶See Rau (2004), p. 111.

¹⁸⁷See also Betzer and Theissen (2008), p. 1.

Table 2.2: Directors' Dealings Reporting Requirements in the U.S., U.K., and Germany

	U.S.	U.K.	Germany
Legislation on Directors' Dealings	The Securities and Exchange Act of 1934: section 16(a) (main provision); Sarbanes-Oxley Act 2002: section 403 (amendment of section 16 of the SEA).	The Companies Act 1985; The Financial Services and Markets Act 2000; Act 2000 (Market Abuse) Regulations 2005: section 96A (basis for DTR); Disclosure and Transparency Rules of the United Kingdom Listing Authority: section 3.1 (main provision).	Wertpapierhandelsgesetz: section 15a (main provision); Wertpapierhandelsanzeiger- und Insiderverzeichnisverordnung: section 3a (European wide dissemination), section 10 (required information); Anlegerschutzverbesserungsgesetz; Transparenzrichtlinien-Umsetzungsgesetz.
Reporting Framework	Trades have to be reported to the SEC as well as the company (section 16(a) of the SEA). <i>Max. reporting delay for insider:</i> two business days. Prior to SOX: within the first ten days of the month following the month of the transaction. <i>Max. reporting delay for issuer:</i> next business day. <i>Max. reporting delay for SEC:</i> next business day. <i>Resulting delay to dissemination:</i> four business days.	Trades have to be reported to the company, which forwards the notification to a regulatory information service (chapter 3.1 of the DTR). <i>Max. reporting delay for insider:</i> four business days. <i>Max. reporting delay for issuer:</i> next business day. <i>Resulting delay to dissemination:</i> six business days.	Trades have to be reported to the BaFin as well as the issuer. The latter forwards the notification to news media (section 15a of the WpHG). <i>Max. reporting delay for insider:</i> five business days. <i>Max. reporting delay for issuer:</i> "without delay" (commonly one to two business days). <i>Resulting delay to dissemination:</i> seven business days.
Transaction Requiring Disclosure	Trades in equity securities registered according to section 12 of the SEA, and transactions in related financial instruments (section 16(a) of the SEA). Transactions such as stock splits, deferred transactions, and small trades with a transaction volume of \$10,000 or less are exempt, but have to be reported on an annual basis.	Trades in shares of the issuer, or derivatives or any other financial instruments relating to those shares (section 3.1.4 of the DTR). The issuer has to be incorporated in the U.K., and the financial instruments must be admitted to trading on a regulated market (section 1.1.1 of the DTR).	Trades in shares of the issuer, or derivatives or any other financial instruments relating to those shares (section 15a and section 2, subsection 2b of the WpHG). The issuer's shares have to be admitted to trading on a domestic stock exchange, or on a foreign organized market, if the issuers' place of business is Germany or Germany is the originating country, according to the Securities Prospectus Act (Wertpapierprospektgesetz) for the disclosure requirements to apply (section 15a, subsection 1 of the WpHG). Transactions with an aggregated trading volume of 5,000 or less are exempt (section 15a, subsection 1 of the WpHG).

Table 2.2: Directors' Dealings Reporting Requirements in the U.S., U.K., and Germany

	U.S.	U.K.	Germany
Groups to Report	<i>Directors, officers, and beneficial owners</i> of more than ten percent of any class of equity (section 16(a) of the SEA). Officers are required to be in charge of a principal business unit, division, or function, or to have the authority to set empowered to set company policy.	<i>Persons discharging managerial responsibilities:</i> directors, senior executives who have regular access to inside information and the power to make managerial decisions (section 96B (1) of the FSMA 2005). <i>Connected persons:</i> spouses, children, controlled entities, related entities, trusts, relatives who have shared the same household for at least 12 months (section 346 of the Companies Act 1985 and section 96B (2) (a) of the FSMA 2005).	<i>Persons discharging managerial responsibilities:</i> members of the executive board, members of the supervisory board, members of an administrative body, personally liable partners, and other employees who regularly have access to inside information and are authorized to decide on material corporate issues (section 15a, subsections 1 and 2 of the WpHG). <i>Connected persons:</i> spouses, registered partners, dependent children, and other relatives living in the insiders' household for at least one year, legal entities, in which the insider holds a managerial function, legal entities that are directly or indirectly controlled or have been founded by an insider, and legal entities with economic or commercial interests corresponding to those of the insider (section 15a, subsection 3 of the WpHG).
Publication Venue	SEC EDGAR online platform and company website.	RIS providers.	Media outlet with an electronic dissemination system, news agency, news provider, print media, finance-related website, and BaFin database. At least one of the media outlets has to be suited to disseminate the information throughout the EU and the EEA. ¹⁸⁸

¹⁸⁸Section 3a of the WpAIV.

2.4.3 Enforcement of Regulations

The enforcement frameworks of the examined countries are relatively similar and are characterized by a central regulator. The SEC, FSA, and BaFin each rely on a complex IT system and tippees to identify suspicious transactions, and insider lists to facilitate investigations of illegal dealings. Arguably, however, the SEC has the widest powers of security enforcement. These include administrative, civil, and criminal proceedings and plea bargaining. The FSA itself can pursue only civil proceedings. The BaFin itself can pursue administrative offenses only. All other proceedings have to be referred to the public prosecutor's office. Beny (2005) constructs a public enforcement index based on the characteristics of the regulator, including its investigative powers.¹⁸⁹ The relatively low score of Germany suggests a superior level of securities trading law enforcement in the U.S. and the U.K.¹⁹⁰

One important factor influencing the quality of enforcement is certainly the budget available to the supervisory institutions. While the SEC has the largest absolute budget to enforce security regulations if falls behind when relative figures in terms of the supervised value of equity markets are examined. Jackson (2005) shows that the enforcement spending per billion dollars of stock market capitalization of the SEC (\$83,943) is lower than that of the FSA (\$138,159), yet substantially higher than that of the BaFin (\$8,896).¹⁹¹ In addition, while the number of the SEC's enforced cases is higher than that of the FSA or the BaFin, the figures are again less impressive once the relative size of the equity markets is taken into account.¹⁹² However, all regulators face a common challenge in that it is notoriously difficult to build an insider trading case, because such cases are, by nature, hard to prove and time-consuming.¹⁹³ To use their limited resources efficiently, regulators mainly concentrate on high-profile cases.

If an insider-trading case is built, the charges that can be brought upon offenders in the U.S. can lead to civil penalties of up to three times the profits gained (or losses avoided). Additionally, insiders can be prosecuted under criminal law, which prescribes a maximum jail sentence of ten years and a maximum penalty of \$1 million. The maximum criminal charges in the U.K. amount to seven years of imprisonment and a fine. Civil charges can be brought against offenders by the FSA and are unlimited in theory. In Germany, the maximum prison sentence is, at five years, even shorter than in the U.K. Yet, monetary fines are also unlimited in nature.

Concerning violations of the directors' dealings reporting requirements, U.S. laws allow for civil and even criminal penalties. The civil monetary fine is dependent on the number of violations and the unreported trading volume and is capped at \$5 million. In addition, the law prescribes jail sentences of up to twenty years. In addition, delinquent filers are exposed on the company's annual 10-K Form. Corporations are also liable if they fail to publish directors' dealings in a timely manner on their website. Interestingly, violations of directors' dealings reporting requirements can be punished more seriously than insider trading in the U.S.; this is not so in the U.K. and Germany. In the U.K., individuals as well as firms can only be sanctioned by the FSA with a monetary fine and public reprehension. German law is even more lenient and only codifies a maximum fine of 100,000 euros for directors' dealings-related offenses. In 2007, for example, the BaFin decreed only ten monetary fines of up to 27,500 euros upon delinquent filers.¹⁹⁴ Such fines are much lower than in the U.S. and appear to be relatively unimpressive, as they may not provide the strongest incentives for corporate insiders to adhere to regulations.

¹⁸⁹Beny (2005), pp. 150–154, Table I.

¹⁹⁰See Table 2.4.3.

¹⁹¹See Jackson (2005), pp. 19–20.

¹⁹²See Table 2.3 for absolute figures on insider trading enforcement cases.

¹⁹³Financial Services Authority. "Insider Dealing in the City," Speech by Margaret Cole, Director of Enforcement, FSA, London School of Economics, March 17, 2007, http://www.fsa.gov.uk/pages/Library/Communication/Speeches/2007/0317_mc.shtml (accessed June 10, 2008).

¹⁹⁴Bundesanstalt für Finanzdienstleistungsaufsicht (2008), p. 187.

Table 2.3: Enforcement of Regulations in the U.S., U.K., and Germany

	U.S.	U.K.	Germany
Enforcement Framework ¹⁹⁵	<i>Supervisory authority:</i> Securities & Exchange Commission. <i>Available tools:</i> Bounty program, data mining system, insider lists, obligation to give information for companies and individuals. <i>Enforcement powers:</i> Administrative, civil and criminal proceedings, and plea bargaining. <i>Supervisor characteristics index:</i> 1.00.	<i>Supervisory Authority:</i> Financial Services Authority. <i>Available tools:</i> Data mining system, insider lists, obligation to give information for companies and individuals. <i>Enforcement powers:</i> Civil proceedings, public reprehension. <i>Supervisor characteristics index:</i> 0.00.	<i>Supervisory Authority:</i> Bundesanstalt für Finanzdienstleistungsaufsicht. <i>Available tools:</i> Data mining system, insider lists, obligation to give information for companies and individuals. <i>Enforcement powers:</i> Administrative proceedings. <i>Supervisor characteristics index:</i> 0.33.
Quality of Insider Trading Laws ¹⁹⁶	<i>Beny (2005) Insider Trading Law Index:</i> 4 out of 4.	<i>Beny (2005) Insider Trading Law Index:</i> 3 out of 4.	<i>Beny (2005) Insider Trading Law Index:</i> 3 out of 4.
Penalties for Violations of Insider Trading Laws	<i>Civil penalties:</i> Three times of the profits gained (or losses avoided) (ITSA), and counter-party investors can sue to recover losses (ITSFEA). <i>Criminal penalties:</i> Imprisonment of up to ten years and monetary fine of up to \$1 million (ITSFEA). Officers and directors are liable for reckless insider trading in their company.	<i>Civil penalties:</i> Redemption of profits gained (or losses avoided) and monetary fine, which is not limited by the law (FSMA 2000). <i>Criminal penalties:</i> Imprisonment up to seven years or monetary fine (CJA 1993).	<i>Civil & criminal penalties:</i> Imprisonment up to five years or monetary fine (section 38 of the WpHG).
Penalties for Violations of Reporting Requirements	Civil monetary fine of maximum \$5 million and jail sentence of up to twenty years (section 32(a) of the SEA). Delinquent filers are displayed on the front page of the issuer's annual 10-K proxy statement (item 405 of Regulation S-K).	Monetary fine, which is not limited by the law, and public reprehension (DEPP).	Monetary fine of up to 100,000 euros (section 39, subsection 2 of the WpHG).

¹⁹⁵The supervisor characteristics index of La Porta et al. (2006) takes into account the appointment and tenure of supervisory officials, and also the focus of the regulator. See La Porta et al. (2006), p. 7, Table I.

¹⁹⁶See Beny (2005), pp. 160–161, Table II.

Table 2.3: Enforcement of Regulations in the U.S., U.K., and Germany

	U.S.	U.K.	Germany
Procedures against Illegal Trading	Insider trading cases initiated by SEC: ¹⁹⁷ 2000: 40 (116) 2001: 57 (115) 2002: 59 (144) 2003: 50 (104) 2004: 42 (95)	Market abuse and insider trading initiated by the FSA: ¹⁹⁸ 2003/04: 15 2004/05: 17	Insider trading cases forwarded by the BaFin to the public prosecutor's office: ¹⁹⁹ 2001: 25 (n/a) 2002: 33 (n/a) 2003: 26 (137) 2004: 23 (71) 2005: 23 (95) 2006: 24 (106) 2007: 20 (64)
Effectiveness of Enforcement ²⁰⁰	<i>Public enforcement power index:</i> 1.00 <i>Private enforcement power index:</i> 10.00	<i>Public enforcement power index:</i> 0.63 <i>Private enforcement power index:</i> 0.00	<i>Public enforcement power index:</i> 0.25 <i>Private enforcement power index:</i> 0.00

¹⁹⁷Source: SEC annual reports.

¹⁹⁸Source: FSA annual reports.

¹⁹⁹Source: BaFin annual reports.

²⁰⁰The public enforcement power index of Beny (2005) takes the securities market supervisor's characteristics and its investigative powers into account. The private enforcement power index takes the rights of private parties and the efficiency of the judiciary into account. See Beny (2005), pp. 160–161, Table II.

2.5 Ad-hoc Disclosure Requirements in the German Stock Market

Ad-hoc news disclosure regulations (*Ad-hoc Publizität*) are a fundamental part of German capital markets law and requires issuers of stock to disclose insider information to the market without delay. The laws regulating ad-hoc disclosure have been in place since 1995 and are manifested in section 15 of the WpHG. The legislation applies to all issuers of stock of the Regulated Market (*Regulierter Markt*).²⁰¹ A peculiarity of Germany's ad-hoc disclosure is that it is directly linked to insider trading regulations by relying on the same definition of insider information, which is outlined in section 13 of the WpHG.

2.5.1 Aims of Ad-hoc Disclosure

The main intention of ad-hoc disclosure requirements is to ensure a fair and orderly functioning of capital markets. The main preconditions for this is transparency, which in turn requires the prevention of large information asymmetries as well as information deficiencies between market participants.²⁰² Ad-hoc disclosure is part of the capital markets reporting requirements and is, thus, part of the information system of German capital markets.²⁰³ Hence, ad-hoc disclosure complements periodic reporting (*Regelpublizität*).²⁰⁴ In contrast to periodic reporting, however, the primary addressees of ad-hoc disclosure include not only shareholders and creditors, but also other market participants. The information conveyed by ad-hoc announcements assists market participants in making sound purchases or sale decisions and saves investors time and money. As a result, ad-hoc disclosure improves market efficiency by reducing information costs and mispricings. Assmann and Schneider (2006) point out that ad-hoc disclosure is not concerned with guarding individual investors' interests, but aims at protecting the interest of investors as a collective.

The second yet equally-important objective of the ad-hoc news disclosure legislation is to prevent insider trading. If inside information is promptly made public, insiders have little or no opportunity to exploit their informational advantage. The release of private and price-sensitive information automatically render its legal attribute as insider information obsolete. Therefore, the concept of ad-hoc news disclosure favors and improves the equal treatment of market participants and investors—akin to directors' dealings.²⁰⁵ That directors' dealings as well as ad-hoc disclosure legislation rely on the same definition of insider information further underlines that both sets of regulations have similar objectives and serve as the two pillars of German law that are designed to prevent illegal insider trading, as outlined in section 14 of the WpHG.

2.5.2 Ad-hoc Disclosure Regulation

The main provisions concerning ad-hoc disclosure are outlined in section 15 of the WpHG. Section 15, subsection 1 of the WpHG rules that issuers of stock listed on a domestic organized market are required to disclose inside information without delay. The disclosure requirement is also effective if an issuer has

²⁰¹Prior to November 1, 2007, an Official Market (*Amtlicher Markt*) as well as a Regulated Market segment existed. Both segments have been merged under the name of the Regulated Market. The admission and follow-up requirements for the Regulated Market are, however, those previously valid for the Official Market.

²⁰²See Assmann and Schneider (2006), p. 501.

²⁰³See Assmann and Schneider (2006), p. 500.

²⁰⁴Issuers of stock in the Regulated Market are obliged to fulfil the information and disclosure requirements laid out in sections 39-42 of the Börsengesetz (BörsG, Germany's Stock Exchange Act), including periodic reporting requirements, such as annual reports.

²⁰⁵See Assmann and Schneider (2006), p. 503.

merely applied to list its shares on an organized market. After the merging of the Official and Regulated Market segments, only the Regulated Market segments qualifies as an organized market.²⁰⁶ The open-market segment (*Freiverkehr*) does not qualify as an organized market and is, thus, exempt from the ad-hoc disclosure requirements. The ad-hoc disclosure rules apply regardless of whether the issuer is a domestic or foreign company; however, the shares have to be listed on a domestic exchange.²⁰⁷

The inside information that must be disclosed has to directly concern the issuer of stock. It is irrelevant whether the inside information is related to the company itself or the securities issued by the firm.²⁰⁸ This is the case in particular if the insider information is related to circumstances that fall under the issuer's area of operations. The definition of inside information stems directly from section 13 of the WpHG and is the same as that which is utilized by the set of rules governing illegal insider trading.²⁰⁹ Prior to the implementation of the AnSVG on October 30, 2004, the definition of circumstances that warranted disclosure was more narrow. The former version of section 15, subsection 1 of the WpHG declared that only circumstances that materially impact the company's financial condition, its assets, or the general course of business, had to be disclosed to the public. Thus, the revised provisions are broader and comprise a larger spectrum of business developments that have to be disclosed.

The BaFin has published guidelines for issuers of stock ("Emittentenleitfaden") containing several exemplary circumstances and events that fall into the issuer's area of operations and have to be released by ad-hoc announcements if they have a potentially significant effect on security prices. The exemplary list includes, amongst others, tender offers, changes in dividends, corporate restructuring, profit warnings, large orders, significant product innovations and patents, and stock repurchases.²¹⁰ Section 15, subsection 1 of the WpHG also demands that any operating figures or key data published in ad-hoc announcements have to be customary. In addition, a comparison with previously published data should be facilitated.

However, a general provision that requires an immediate disclosure of all insider information affecting issuers of stock would, in many cases, disregard legitimate interests of the issuer. Therefore, section 15, subsection 3 of the WpHG contains exceptions to the general provision of section 15, subsection 1 of the WpHG and allows for delaying ad-hoc announcements under three prerequisites. First, the postponement is required to guard the legitimate interests of the issuer of the stock. Second, it has to be unlikely that the postponement misleads the public. Third, the issuer of stock must guarantee the confidentiality of the insider information. Prior to the modification of section 15 of the WpHG by the AnSVG, issuers had to file an application with the BaFin to receive authorization to postpone the release of insider information.²¹¹ Today, this decision lies not with the BaFin, but with the issuer itself. The executive board decides whether it believes that the requirements for an exemption are met and merely has to notify the BaFin.²¹²

In contrast to the above exemption option for issuers, section 15 (2) of the WpHG contains legislation forbidding the disclosure of information that does not fit the requirements outlined in subsection (1). The provisions in subsection (2) were tightened after widespread abuse of ad-hoc disclosure. Güttler (2005) reports that, in particular, companies of the Neuer Markt misused ad-hoc announcements for investor

²⁰⁶Section 2, subsection 5 of the WpHG specifies that an organized market has to be regulated and supervised by an EU member state or a country of the EEA, has to take place regularly, and has to be directly and indirectly accessible to the public.

²⁰⁷See Assmann and Schneider (2006), p. 521.

²⁰⁸See Ziemons (2004), and Simon (2005).

²⁰⁹See section 2.3.2.3.

²¹⁰See Bundesanstalt für Finanzdienstleistungsaufsicht (2005), pp. 43–44.

²¹¹See Assmann and Schneider (2006), pp. 553–554.

²¹²See Bundesanstalt für Finanzdienstleistungsaufsicht (2005), p. 53.

relation purposes and did not contain relevant insider information, as demanded by regulations.

In case any disclosed ad-hoc announcement contains false or misleading information, it has to be revised and replaced immediately by a correct ad-hoc news release.

2.5.3 Publication of Ad-hoc Disclosures

The process and requirements concerning the dissemination of ad-hoc announcements are outlined in sections 3 to 9 of the WpAIV. Companies regularly rely on special service providers to fulfill the obligations and to transmit ad-hoc news releases to the market. Märzheuser and Gutzy (2004) find that this market is dominated by three service providers: Deutsche Gesellschaft für Ad-hoc-Publizität (DGAP), news aktuell GmbH (“euro adhoc”), and Hugin IR Services. The service providers commonly guarantee an Europe-wide dispersion of the news release and forward the ad-hoc announcement to the stock exchanges, the BaFin, the business register, and an information system commonly used by financial institutions.²¹³ Section 5 of the WpAIV further demands that if the issuer maintains an Internet website, all ad-hoc announcements have to be published on the website and be accessible for at least one month. Section 3b of the WpAIV dictates that the language of ad-hoc announcements must be in German, with the exception of certain foreign companies. In practice, most ad-hoc announcements are published in German, while large and DAX companies in particular publish German as well as English versions of their ad-hoc announcements.

²¹³See section 3a, subsection 1; section 3c; section 5; and section 5a of the WpAIV.

Chapter 3

Strategic Insider Trading

Although corporate insiders are subject to the extensive regulations outlined in chapter 2, insiders trade stock in their own company relatively frequently. Seyhun (1998), for example, finds that about 60% to 80% of all firms listed on the NYSE, AMEX, and NASDAQ featured at least one insider transaction per year between 1975 and 1995.¹ Insiders may choose to trade their company's securities for many reasons. Some transactions may be motivated by liquidity needs, portfolio rebalancing considerations, or a change in preferences. Arguably, however, a large proportion of insider transaction will be driven by profit motives, especially if insiders are believed to be rational investors. Researchers, such as Jaffe (1974b), Finnerty (1976), Seyhun (1986), Rozeff and Zaman (1988), Lin and Howe (1990) and Lakonishok and Lee (2001) for the U.S. stock market, Fidrmuc et al. (2006) for the U.K. stock market, and Stotz (2006) and Betzer and Theissen (2009) for the German stock market, find that insiders earn excess returns when trading their companies' shares. Most commonly, this result is interpreted as insiders exploiting their informational advantage at the expense of outside investors.

A more controversial theme in insider trading literature is which *kind of informational advantage* insiders use to earn excess returns. Generally, four competing sources of insider gains have emerged in the literature. First, insiders may have superior knowledge about their firms' *long-term* prospects. Thus, the expectations and knowledge of insiders regarding their firm's strategy, operating environment, and ultimately, future cash flow realizations, may be more accurate. Second, insiders may possess superior market timing abilities, as they seem to be able to identify the long-term as well as short-term highs and lows of their companies' stocks. Put differently, insiders may follow a contrarian investment strategy that involves buying (selling) stock after a period of abnormal negative (positive) returns.² Third, insiders may earn abnormally large returns because of the disclosure of their trading decisions. Givoly and Palmon (1985), for example, argue that outside investors accept that insiders have superior knowledge and mimic their trading decisions, thus moving stock prices in a beneficial direction for insiders.³

The potential sources of insider trading profits outlined so far do not necessarily involve illegal trading behavior. Insiders could, however, also *unfairly* earn profits by exploiting specific private information regarding forthcoming significant corporate news events, such as earnings, M&A, and dividend announcements. This source of trading profits is also most commonly in the public's mind in connection with illegal insider trading. This chapter is primarily concerned with the latter source of insider profits and the trade-off insiders face. On the one hand, insiders will be tempted to exploit non-public information

¹See Seyhun (1998), p. 5, Figure 1.1.

²Lakonishok and Lee (2001) and Cheng et al. (2005), amongst others, find that insiders buy (sell) when abnormal returns are negative (positive) over the previous three to six months.

³See Givoly and Palmon (1985), pp. 86–87.

to reap excess returns. On the other hand, they face substantial disincentives stemming from potential litigation and reputational risk. This trade-off may lead insiders to adapt their trading behavior in order to evade regulations, for example by delaying transactions until after the publication of news events.

The aim of this chapter is not to establish which of the aforementioned potential sources for insider trading profits is the most convincing one. Instead, it provides a summary of the literature on insider trading around the time of corporate news disclosures and aims to synthesize the academic evidence. Since different corporate news announcements are associated with different trading incentives and peculiarities, the chapter is structured around the information content of news announcements. First, studies examining insider trading around several news announcements are analyzed in section 3.2. Research on trading around earnings announcements is summarized in section 3.3, followed by studies on profit warnings and other financial distress (section 3.4), new security issuances (section 3.5), M&A transactions (section 3.6), and other news events (section 3.7). Section 3.8 is dedicated to research concerning this issue in the German market. The studies of Betzer and Theissen (2009) and Dymke and Walter (2008) are summarized, and potential areas for further research are outlined.

3.1 Insiders Trading Incentives and Trading Strategies

Several authors, such as Hirshleifer (1971), Fama and Laffer (1971), and Penman (1982), recognize the possible link between insider trading and the release of non-public information into the market. Individuals or institutions possessing private information have incentives to trade upon the information before releasing it to outside investors. Since such activity puts regular market participants at a disadvantage, the prevailing view is that insiders should be discouraged from such practices. This has led policy-makers to design and enforce the extensive insider trading regulations outlined in chapter 2. Given the legislative framework, insiders not only face incentives, but also considerable disincentives from trading on non-public information, which has been generally outlawed.⁴ These disincentives include potential litigation from the regulator or the company itself, reputational risk, a reduction in human capital, and job loss.⁵

As a result, insiders in possession of private information regarding upcoming news events may face a difficult decision. In essence, they may pursue three different trading strategies. The most obvious and morally *right* choice would be not to trade on the non-public information at all. If, however, insiders desire to profit from their informational advantage, they may engage in *active* or *passive* trading strategies. The definitions of active and passive trading follow those outlined by Seyhun (1998).⁶ *Active trading* typically refers to informed insider trading prior to news announcements. In the case of positive news, insiders may choose to exploit their knowledge by purchasing stock prior to the dissemination of private information. Insiders will, with relative certainty, profit from the stock price movement caused by the favorable news event. In case of private information concerning negative news releases, insiders may choose to sell stock of their own company. Such active trading is, however, also associated with the potential negative consequences outlined above. Arguably, these costs are correlated with the potential gains from active trading strategies. If a news event causes large stock price movements, regulatory and public scrutiny will be higher. If the disincentives stemming from the regulatory framework as well as its enforcement are sufficiently large, insiders will not engage in active trading.

⁴Bhattacharya and Daouk (2002) find that 22 developed countries and four out of five of 81 emerging stock markets had insider trading laws in place by the end of 1998. See Bhattacharya and Daouk (2002), p. 104.

⁵See, for example, Karpoff and Lee (1991), p. 19.

⁶See Seyhun (1998), p. 50.

Alternatively, insiders may benefit from their private information by utilizing *passive trading* strategies. Anticipating a rise in stock price because of an impending positive news disclosure, insiders may delay selling until after the release of the announcement, thus receiving a passive return from postponing their trade.⁷ In the case of impending negative news releases, insiders may choose to delay their purchase transactions. While both active and passive trading strategies allow insiders to profit from private information, only the former strategy is associated with substantial costs. Although the public and other market participants may disapprove of passive trading by insiders, it is generally not prosecuted by regulators.⁸ Thus, passive trading could be considered “smart” trading. It is, however, frowned upon by the public. A recent example may be the conduct of Klaus Zumwinkel, CEO of Deutsche Post AG, who, in December 2007, sold stock options days after the announcement of minimum wages for the mail sector, which boosted his company’s share price by about 5%.⁹ While the studies summarized in sections 3.2 to 3.8 often only focus on active trading, some also examine passive trading.

3.2 Trading around Different Types of News Announcements

This section summarizes the existing research on insider trading around different types of news announcements, i.e. studies that analyze not one particular kind of news events but several types of news disclosures. Table 3.1 summarizes the presented papers.

Elliott et al. (1984) provide some initial evidence of insider dealings around corporate news announcements. Instead of focussing on a specific set of news events, the authors’ data set comprises disclosures regarding annual earnings, large dividend changes, bond rating changes, mergers, and bankruptcies, in the U.S. stock market during 1975 to 1979.¹⁰ Two main measures for the intensity of trading activity by corporate insiders are developed. The first variable is a count of the different individuals buying stock during a given month minus the individuals who sell stock, and is referred to as *net buyer/seller* variable. The second measure equals the market value of shares bought minus the market value of shares sold, divided by the market value of shares of the firm’s common stock, and is referred to as the *percentage of shares purchased or sold*. In contrast to the former variable, the percentage of shares purchased or sold allocates more weight to larger transactions.

Instead of relying on an event study to classify information releases into good and bad news, the classification is performed on a qualitative basis. As a result, large earnings increases, large dividend increases, bond rating increases, and merger announcements are treated as good news. Large earnings decreases, large dividend decreases, bond rating decreases, and bankruptcy announcements, on the other hand, are treated as negative news events.¹¹ Regarding positive news events, all types of information releases are found to be associated with informed active trading. However, the authors also find reduced selling prior to negative earnings and bankruptcy releases, which is inconsistent with the assumption that insiders

⁷Cf. Huddart et al. (2007), p. 12.

⁸The literature appears to be consistent in the view that passive trading is not illegal under U.S. law (cf. Penman (1982) and Bettis et al. (1998)). Under European law, however, passive trading may be viewed as illegal, since a loss has been avoided or a profit realized because insiders made a decision based on non-public information. Passive trading is, however, difficult to prove, since the intention of buying or selling stock, conditional on the insider not having had access to the private information, would have to be established.

⁹Although Klaus Zumwinkel may not have had inside information regarding the outcome of the negotiations concerning minimum wages for the mail sector, and thus may not have deliberately delayed his trading decision on the basis of such information, the case nevertheless shows that the public disapproves of such trading activity. See, for example, a press article published by the Spiegel magazine, available at <http://www.spiegel.de/politik/deutschland/0,1518,521549,00.html>, as of June 23, 2009.

¹⁰See Elliott et al. (1984), pp. 524–525.

¹¹See Elliott et al. (1984), pp. 529.

trade on private information.¹² Using a logit model, the authors fail to find a statistically significant relationship between earnings forecast errors and the probability of insider purchases.¹³ Furthermore, delayed trading until after the release of news is only observed in some instances. The authors conclude that while they are able to find some evidence of informed trading, their results do not support the hypothesis in all cases.

Givoly and Palmon (1985) examine whether the excess returns insiders are able to achieve are the consequence of the use of superior information concerning subsequent news releases or result from the disclosure of the trade itself. The authors argue that the mere occurrence of insider trading may trigger abnormal returns, as outside investors imitate insiders and trade in the same direction. In this case, insiders do not need to engage in unlawful activity to to earn abnormal returns.

The studied data sample consists of 68 randomly-selected companies listed on the AMEX throughout the three-year period from 1973 to 1975. The selected companies feature 1,118 purchase and 413 sales transactions for which return data is available from the CRSP data tape. News events are collected from the *WSJ* and classified into “good,” “bad,” and “neutral” information releases. The classification is not performed on a subjective basis, but is instead contingent upon the cumulative abnormal return in the proximity of the news releases. In particular, daily abnormal returns are calculated under the market model, where the market return is proxied by the equally-weighted index of all securities listed in the AMEX and NYSE. Since AMEX companies are relatively small in size, the authors apply the “aggregated coefficients” methodology, as proposed by Dimson (1979) to avoid any downward bias in the estimated beta coefficients. The classification is performed depending on a standardized $CAR(-1;5)$ measure. While the authors use different thresholds for the standardized abnormal return, the reported results are based on a threshold of 1.3%. Events are further classified into eleven classes, depending on the informational content. These classes range from earnings announcements to contracts awards and litigation announcements.¹⁴ To identify insider trading prior to news releases, several search intervals are used, ranging from 5 to 180 days after the transaction. The authors argue that purchases (sales) in advance of good (bad) news would constitute informed trading and the exploitation of inside information.

The results show that insiders generally trade very profitably. Givoly and Palmon (1985) report estimated abnormal trading profits of 8.60% for purchases and 11.53% for sales after a 240-day holding period.¹⁵ The long persistence of abnormal returns in itself indicates that insiders do not base their trading on private information. The association between insider transactions and classified news events is presented in Table 4 of Givoly and Palmon (1985). No relationship between the direction of insider transactions and the first subsequent news release can be found that would confirm the hypothesis that insiders exploit specific private information concerning upcoming news announcements. News releases are further broken down into “discretionary” news, such as management forecasts and the disclosure of future plans, as opposed to mandatory news, such as earnings and dividend announcements, since it can be argued that the former case is more prone to exploitation by insiders.¹⁶ The results are, however, similar to those reported in Table 4. The authors also find no evidence for a relationship between the

¹²See Elliott et al. (1984), pp. 531, Table 4.

¹³See Elliott et al. (1984), p. 534.

¹⁴The complete list of news events studied by Givoly and Palmon (1985) is as follows: earnings announcements, dividends announcements and news, management forecast concerning earning or sales, expansions and acquisitions, new products, discoveries, and patents, award of a contract, cancelation of previously announced plans or contracts, labor disputes and their settlement, stock dividends, stock splits, stock repurchase, litigation, and other news: layoffs, unionization, recalls, legislation, etc. See Givoly and Palmon (1985), Appendix B.

¹⁵Givoly and Palmon (1985) acknowledge that their relatively large abnormal return estimates, i.e. when compared to the findings of Jaffe (1974a) or Finnerty (1976), may be due to the relatively small size of the of the studied AMEX firms.

¹⁶See Givoly and Palmon (1985), p. 80, Table 5.

size of transactions and the use of inside information.¹⁷

The authors conclude that abnormal returns earned by insiders are not generally related to or generated by foreknowledge of firm-specific news. Instead, excess returns may be caused in a large part by outsiders who copy insiders and trade in the same direction, thus moving stock prices in a beneficial direction for insiders.

¹⁷See Givoly and Palmon (1985), p. 81, Table 7.

Table 3.1: Empirical Studies on Insider Trading around Different Types of News Announcements

Author(s) (Year) <i>Journal</i>	Sample	Source(s) of News Event Data	Studied News Event(s)	Time Horizon	News Classification	Informed Trading Active	Informed Trading Passive	Study Focus and Conclusions
Elliott et al. (1984) <i>The Rand Journal of Economics</i>	United States (1975–1979) 3,042 annual earnings, 97 div- idend changes, 85 bond rating changes, 125 mergers, 29 bankruptcies	SEC (directors' dealings), Compustat (earnings, div- idend changes), Moody's (bond rating changes), CRSP (mergers, bankruptcies)	Annual earnings, dividend changes, bond rating changes, mergers, and bankrupt- cies	12 months	Qualitative	Prior to positive earn- ings, divi- dend in- creases, and bond rating de- creases	After large divi- dend in- creases	Active trad- ing is more prevalent than passive trading. In some in- stances, insiders reduce in trad- ing activity in an uninformed manner.
Givoly and Palmon (1985) <i>Journal of Business</i>	United States (1973–1975) 68 AMEX com- panies, 1,531 purchases, 413 sales, 1,437 news events	SEC (directors' deal- ings), <i>WSJ</i> (news events)	Several	5 days to 180 days	CAR(- 1;5)	No	n/a	Little evidence of exploita- tion of inside information regarding up- coming news events.

3.3 Trading around Earnings-related Announcements

Earnings releases may be considered one of the most important components of corporate disclosure. They not only recur on a regular basis, but they also convey material information to outside market participants. Ball and Brown (1968), Ball and Kothari (1991), and Beaver (1968), for example, report that earnings releases move stock prices in a statistically significant way. Therefore, earnings releases potentially lend themselves to insiders for trading on private and material information. The large number of trading opportunities is mirrored in the large number of studies examining insider transactions around earnings releases. The key findings of the papers presented in this section are summarized in Table 3.2.

The directions in which stock prices are moved by earnings disclosures do not merely depend on whether the company reports a profit or loss. Instead, stock price movements depend on whether the market's expectations of earnings are missed or beaten.¹⁸ If reported net income figures are larger (smaller) than market estimates, the company's share price should increase (decrease). These so-called *earnings surprises*, therefore, represent an additional methodology to classify earnings-related news events into *positive* and *negative* news events.

One of the first studies ever conducted on strategic trading behavior by insiders around information releases is that of Penman (1982). While the events of primary interest are not earnings releases per se but earnings forecasts published by company management, these types of news announcements are closely related. One of the most important differences between earnings releases and management forecasts is that publicly-listed companies are generally required to publish the former, while management earnings estimates are published on a voluntary basis.

The studied data set consists of 1,188 annual earnings forecasts by company management that were published in the *WSJ* during the time period between 1968–73. The earnings forecast announcements are classified into good and bad news according to the stock price's abnormal performance index (API) over the days t_{-1} to t_{+1} relative to the publication date in the *WSJ*.¹⁹

Consequently, the news events are sorted into twenty portfolios according to the associated abnormal returns.²⁰ For each portfolio, the monthly mean net purchases, i.e. the number of shares purchased minus number of shares sold, as well as the number of net purchase transactions, i.e. the number of purchases minus the number of sales, are calculated. Instead of relying on a model of a *normal* level of directors' dealings, Penman (1982) argues that informed trading should lead to increased (reduced) net purchasing measures prior to good (bad) news rather than compared to net purchasing after the release of management earnings forecasts. Examining directors' dealings during the month of the information release, this trend is apparent in 15 out of the 20 portfolios as measured by net share purchases. The hypothesis is also confirmed in 17 out of 20 portfolios for the number of net purchase transactions.²¹ The results also indicate that strategic trading is especially prevalent in portfolios with large absolute abnormal returns.²² Moreover, the results are further substantiated by a contingency table test, which benefits from only examining the direction of trades and not their size.²³ The author also shows that trades that occur closer to the release of management earnings forecasts are more profitable.²⁴ Penman (1982) concludes that the risk of litigation leveled by the SEC seems to be insufficient to deter trading on the basis of private information. The author recognizes, however, that many of the identified trading

¹⁸Market profit estimates are often proxied by the Institutional Brokers' Estimate System (I/B/E/S) estimates.

¹⁹The API method was first developed and employed by Ball and Brown (1968).

²⁰See Penman (1982), pp. 486–487, Table 2.

²¹See Penman (1982), p. 488.

²²See Penman (1982), p. 489, Table 3.

²³See Penman (1982), p. 493, Table 5.

²⁴See Penman (1982), p. 497, Table 6.

patterns are “on average” results and are associated with a large degree of noise, i.e., trading in the “wrong” direction.

Closely related to Penman (1982) is the study by Noe (1999), who also examines the relationship between voluntary earnings forecasts and insider transactions. The results suggest that managers avoid trading prior to announcements but do so in a frequent way after earnings forecasts. Since insider trading is not found to be correlated with management earnings forecasts errors, Noe (1999) suggests that insiders cluster their trades when informational asymmetries are low and derive their excess returns from superior knowledge of their firms’ long-term performance.

The sample is based on the data set of Pownall et al. (1993), which consists of 93 companies that were listed for the entire period from July 1979 to December 1987. The earnings forecasts were originally collected from the *WSJ* and the Dow Jones News Service, and they amount to 949 announcements in the final sample. Open-market insider transactions are obtained from the SEC’s Official Summary for the same time period, resulting in 5,247 sales and 1,622 purchases.

The research methodology used by Noe (1999) examines first the incidence of insider trading around earnings forecasts, then the excess returns in the proximity of earning forecasts, and finally the post-announcement “information environment” of firms where insider trading occurs after earnings forecasts. The first analysis is performed by an ordinary least-squares (OLS) regression, which tests whether the traded dollar volume of insider sales or purchases is related to the incidence of an earning forecast announcement in the 20 days prior to and after the transaction. Four dummy variables are included in the regression model to indicate whether trades occur prior to or after earnings releases that are associated with positive or negative abnormal returns. Similar dummy variables are defined for the presence of quarterly earnings announcements. The cumulative abnormal return estimates, employed to classify forecasts and earnings releases, are based on market adjusted returns over a three-day period centered on the respective announcement, where the market return is proxied by the CRSP AMEX/NYSE index.

The results show that the incidence of insider sales transaction is relatively low prior to earnings forecasts, and especially so if the announcement is associated with negative abnormal returns. Findings are similar for actual earnings announcements. Insider selling activity is, however, relatively frequent after positive earnings forecasts and less so for negative releases. With regard to purchases, insiders increase their buying activity prior to positive earnings forecast disclosure, but also prior to negative announcements, thus not clearly indicating opportunistic behavior based on foreknowledge of earnings forecasts. Again, the results suggest that insiders rely on passive trading, i.e. transactions during the post-disclosure period.

The second analysis by Noe (1999) examines the abnormal returns associated with the existence of pre- or post-disclosure insider sales or purchases.²⁵ While average excess returns are not statistically different from zero for forecast announcements preceded by insider transactions, news releases followed by insider trading are. The findings show that earnings forecasts followed by purchases feature an average abnormal return of -2.10% . This, however, does not translate into increased abnormal returns of post-event purchases, as opposed to purchases made during other time periods.²⁶

The third analysis regresses the post-forecast dollar value of insider purchases against the 3-5 year annualized change actual EPS figures, the forecast error, and the abnormal return associated with the forecast announcement.²⁷ The findings of the OLS regression indicate that insider purchases are positively

²⁵See Noe (1999), p. 318, Table 4.

²⁶See Noe (1999), p. 320, Table 5.

²⁷See Noe (1999), pp. 321–323.

related to long-term EPS growth rather than to the forecast error, which proxies for post-disclosure information asymmetry. The earlier finding that insiders purchase more after negative earnings forecasts is, however, confirmed.

In summary, Noe (1999) uncovers evidence that trading volumes prior to earnings forecasts are relatively low. At the same time, however, insiders sell more shares after good news releases than after bad news and buy more after negative news than after good news releases. This passive, informed trading does not necessarily translate into increased abnormal returns compared to other time intervals. Nevertheless, the author argues that post-event insider transactions are mostly driven by superior knowledge concerning the long-term prospects of firms and that the timing of transactions after forecasts may be due to a decreased level of information asymmetry, thus, protecting insiders against accusations of improper trading activity.

The study by Cheng and Lo (2006) is primarily concerned with insider trading around earnings forecast announcements by company management and, thus, is related to the papers by Penman (1982) and Noe (1999). Cheng and Lo (2006), however, extend the two mentioned studies by taking into account the fact that management may not only strategically time their directors' dealings, but also the release of earnings forecasts, i.e. treating the management's disclosure policies as an endogenous instead of exogenous variable. The authors argue that given insiders want to trade, the disclosure might be adjusted so that the planned trade occurs at a more advantageous share price. Such activity, however, is always constrained by litigation risk, stemming primarily from the SEC in the U.S.

The data set consists of 27,292 earnings forecasts published by 4,995 firms between 1995 and 2002, which are collected from the First Call database.²⁸ Earnings forecasts are classified according to size-adjusted, three-day cumulative abnormal returns centered on the release date of the announcement. This methodology yields 15,850 negative and 11,942 positive news events. Directors' dealings are collected from the SEC Official Summary, and the final sample consists of 199,941 insider sales and 91,094 insider purchases.

Cheng and Lo (2006) identify that the incentives provided by insider trading cause management to release earnings forecasts that increase the profitability of transactions. For example, in periods during which insiders buy shares, more negative news is disclosed in order to reduce stock prices. This result is especially prevalent for CEOs, as opposed to other members of management, which is consistent with the argument that CEOs have the largest amount of discretion regarding the disclosure of earnings forecasts. A similar relationship is, however, not found for insider sales. Cheng and Lo (2006) attribute this finding to the increased litigation risk attached to tampering with news releases when trying to profit from insider sales, as management would have to either accelerate the release of good news or delay the disclosure of bad news.²⁹

The aim of the study of Park et al. (1995) is to establish whether the average insider engages in "ethical" conduct and does not exploit non-public information concerning forthcoming earnings announcements, or if insiders do take advantage of their superior information to reap profits at the expense of outsiders. Park et al. (1995) concentrate on directors' dealings around annual earnings announcements published between 1986 and 1987.

The authors argue that reported directors' dealings should decrease as the day of the earnings announcement approaches. Unethical insiders are assumed to maximize their expected utility, which results from the benefits of exploiting private information reduced by the costs of potential litigation. As benefits from trading on privileged information decrease with time and the costs of detection by the regulator increase,

²⁸See Cheng and Lo (2006), p. 824, Table I.

²⁹See Cheng and Lo (2006), p. 821.

this group of insiders should, on average, cease trading as the release date approaches.³⁰ While ethical insiders as well as insiders with no private information would not exploit non-public information, they anticipate the regulatory attention and scrutiny that any trading prior to earnings announcements would cause and, thus, would also reduce their trading activity. It is hypothesized that this trading pattern is more prevalent for sales transactions and also for corporate officers and directors, who face increased supervision by the SEC because of their privileged position and access to price-relevant information.³¹

The studied sample covers NYSE and AMEX firms reporting earnings during the two-year period from 1986 to 1987. Companies with no insider trading filing at all in the proximity of the earnings release are removed from the sample.³² Of the 1,328 studied annual earnings releases, 538 news events are classified as *good* news events and 706 as *bad* news events. The classification is based on whether reported earnings per share (EPS) are greater or smaller than expected EPS, as supplied by the Institutional Brokers' Estimate System (I/B/E/S) consensus.

Examining reported transaction volumes, Park et al. (1995) identify an increase in trading activity from day t_{-41} to t_{-21} , and reduced trading especially from day t_{-10} to t_{-2} .³³ After the earnings announcement, directors' dealings pick up again. Thus, the authors find evidence of little active trading immediately prior to the event and increased passive trading when the regulatory risk is low. This finding, however, is primarily driven by the volume of shares sold.

Limited if not contrary evidence is presented on *informed* active trading prior to news releases. The reduction in sales transactions, for example, is more pronounced prior to good news rather than bad news; this behavior is consistent with insiders fearing SEC prosecution.³⁴ This notion is also supported by the estimated trading profits, which are relatively large for buying transactions during the period from day t_{-50} to t_{-26} , yet insignificant for other more recent transactions prior to earnings announcements.

Insiders seem, however, to strategically delay sales transactions, as selling volume increases more strongly after good news rather than after bad news. While the insider's position within a company appears to be unrelated to the observed trading patterns, it seems to be more important in larger firms.³⁵ The authors argue that this may be because insiders in small firms hold a larger percentage of ownership than insiders in large firms and, thus, exploit private information less often. This interpretation is opposed to the argument that small firms are less in the public spotlight and are consequently less monitored by the regulator.

As opposed to the majority of other research presented here, Sivakumar and Waymire (1994) focus exclusively on directors' dealings after the release of news announcements, i.e., passive trading. In particular, the authors study the frequency and profitability of directors' dealings after quarterly earnings releases. Citing increased SEC insider trading enforcement and private company restrictions on directors' dealings prior to material news releases, Sivakumar and Waymire (1994) argue that (i) the disclosed trading activity after announcements should increase, (ii) post-event purchases (sales) will be associated with positive (negative) abnormal returns, and (iii) post-announcement transactions by insiders do not systematically earn excess profits.

The studied sample contains quarterly earnings reports and insider transactions disclosed in the U.S. between 1984 and 1989. A notable sample selection criteria is that only earnings announcements with at least one insider trade during the 51 days before to 50 days after the news event are included in the data

³⁰See Park et al. (1995), pp. 589–590.

³¹See Park et al. (1995), p. 592.

³²In particular, earnings announcements with no reported insider transactions between day t_{-150} and day t_{+20} relative to the announcement day t_0 are removed from the sample. See Park et al. (1995), p. 593.

³³See Park et al. (1995), p. 598, Table 2.

³⁴See Park et al. (1995), pp. 604–605, Table 5.

³⁵See Park et al. (1995), p. 608.

set.³⁶ While this data adjustment may remove some *noise*, in the sense that some companies feature no or only very few directors' dealings, it may also bias results by increasing the observed insider trading after quarterly earnings releases.

Similar to other studies, such as Penman (1982) and Elliott et al. (1984), the authors compute the *net insider trading position* as the number of shares purchased minus the number of shares sold during the ten days following the release of the earnings figures. Additionally, the earnings forecast error is calculated for the quarterly earnings reports as the actual disclosed EPS minus the forecasted EPS, divided by the pre-announcement stock price.

Sivakumar and Waymire (1994) find that the incidence of directors' dealings prior to earnings announcements monotonically declines and significantly increases directly after the news event day.³⁷ This suggests that insiders fear the regulatory risk stemming from front-running news events and choose to delay their trades. These delayed trades are, however, not associated with foregone trading profits. Announcements with negative (positive) abnormal returns are followed by insider purchases (sales), suggesting that insiders deliberately delay their transactions and engage in strategic trading.³⁸ The results also provide evidence of a positive relationship between delayed trading and absolute forecasts errors, as these pose more profitable trading opportunities. In trying to explain the profitability of post-announcements trades, Sivakumar and Waymire (1994) evaluate several explanations, including the post-announcement earnings drift, foreknowledge of the next quarter's earnings, and other general sources of directors' dealings profitability.³⁹ In aggregate, the results suggest that the profitability stems from knowledge of the firm's longer-term prospects and the exploitation of short-term mispricings.⁴⁰ The authors conclude that while SEC enforcement and private company policies may alter the timing of trading, those measures do not lead to reduced trading profits.

Cheng et al. (2005) offer evidence of active trading by corporate insiders around simultaneous earnings and dividend announcements in the Hong Kong stock market. The authors suggest that the relatively low corporate transparency of the Hong Kong market results in high information asymmetries and potentially large trading profits for insiders exploiting their informational advantage.⁴¹ The presented descriptive statistics, however, show that trading intensity declines prior to the news announcements and increases drastically afterwards.⁴² This pattern is especially strong for purchase transactions and less so for insider selling. The intensity of directors' dealings is captured using three different measures: the number of shares, the traded market value, and the number of transactions. Using two logit as well as an OLS model, Cheng et al. (2005) continue to present evidence which suggests that trading intensity is positively related to changes in dividends and earnings, and especially to special dividends. The authors also present evidence that indicates that the probability of an informed trade is positively related to changes in dividends.⁴³

Lustgarten and Mande (1995) examine directors' dealings prior to as well as after earnings announcements and show that insiders exploit their informational advantage. The authors are also concerned with the revision of financial analysts' forecasts after the release of earnings. Using an OLS regression analysis, they find a positive relationship between insider purchases (sales) and positive (negative) earnings

³⁶See Sivakumar and Waymire (1994), p. 24.

³⁷See Sivakumar and Waymire (1994), p. 26, Exhibit 1.

³⁸See Sivakumar and Waymire (1994), p. 27, Exhibit 2.

³⁹See Bernard (1987) and section 4.2.2.5 for a discussion of the post-earnings announcement drift.

⁴⁰See Sivakumar and Waymire (1994), p. 31, Exhibit 7.

⁴¹See Cheng et al. (2005), p. 280.

⁴²See Cheng et al. (2005), p. 293, Table 1.

⁴³See Cheng et al. (2005), p. 295–296, Table 2.

forecast revisions by analysts.⁴⁴

The authors show that the trading volume in the 30 days prior to earnings announcements is generally lower than immediately after the accounting release.⁴⁵ For active as well as passive trading, insiders seem to exploit their foreknowledge about upcoming earnings announcements. For example, insider purchasing volume in undervalued stocks, as measured by the analysts' forecast error, is 144% greater during the 30 days preceding the announcement than during the 30-day post-announcement period.⁴⁶ These patterns are, however, not found for insider sale transactions. Nonetheless, the authors do find that pre-announcement insider selling, as measured by the dollar amount as well as the number of shares traded, is greater for overvalued than for undervalued stocks.⁴⁷ This patterns is also found for post-announcement transactions. The results of the descriptive tables are also confirmed by the regression analysis.

Similar to Lustgarten and Mande (1995), Sivakumar and Vijayakumar (2001) are concerned with the relationship between directors' dealings, earnings changes, and analysts' forecasts revisions. They find that insider trades contain value-relevant information, which is picked up and used by analysts who revise their EPS forecasts accordingly. The authors conclude that insiders exploit their informational advantage about future earnings but also derive profits from acting on mispricings in their the company's stock.

Instead of studying directors' dealings around earnings announcements, Ke et al. (2003) study trading patterns of insiders prior to breaks in strings of consecutive increases in quarterly earnings. It is argued that such strings of consecutive quarterly earnings increases constitute a significant corporate event that is associated with large and negative stock price reactions.⁴⁸ Ke et al. (2003) find that insider selling increases during the three to nine quarters prior to the string breaks, thus avoiding negative abnormal returns caused by the announcement.⁴⁹ At the same time, insiders seem to avoid regulatory risk by reducing their selling activity in the two quarters preceding breaks in strings of earnings increases.

The relatively recent study of Huddart et al. (2007) examines directors' dealings around two related information announcements—summary earnings announcements and the more detailed 10-K or 10-Q Forms. Arguing that jeopardy, or in other words, the downside risk stemming from adverse publicity, civil liability and criminal prosecution, is greater prior to initial earnings announcements than prior to the subsequent 10-K and 10-Q disclosure, Huddart et al. (2007) find little evidence of informed trading prior to summary earnings releases.⁵⁰ In addition, if such informed active trades are observed, they are typically associated earnings release with relatively small absolute abnormal returns, which is consistent with regulatory risk being negatively related to excess returns caused by the news event.

However, trading intensity, as measured by the net number of transactions as well as the net purchasing volume, is positively and statistically significantly related to the filing return. During the time window between the summary earnings release and the subsequent Form 10-K or Form 10-Q filing, the occurrence of directors' dealings are also negatively related to the returns caused by the dissemination of the earnings figures. This result suggests that insiders delay their trades until periods when the litigation risk is low, i.e., engage in informed passive trading. In summary, Huddart et al. (2007) provide evidence that insiders respond to the regulatory framework and condition their informed trades regarding near-term forthcoming information releases to periods of low jeopardy.

⁴⁴See Lustgarten and Mande (1995), p. 246, Table 1, and p. 248, Table 2.

⁴⁵See Lustgarten and Mande (1995), p. 249, Table 3.

⁴⁶See Lustgarten and Mande (1995), p. 251, Table 4.

⁴⁷See Lustgarten and Mande (1995), p. 253, Table 5.

⁴⁸Barth et al. (1999) and DeAngelo et al. (1996) the impact of breaks in consecutive earnings increases on stock prices.

⁴⁹See Ke et al. (2003), p. 328, Figure 1

⁵⁰See Huddart et al. (2007), p. 17, Table 3.

The paper of Hillier and Marshall (2002) contributes U.K. evidence to the literature, which is mostly dominated by U.S. research. The authors study the effect of trading bans, which are a distinct property of U.K. insider trading regulations. The U.K. Model Code prescribes that insiders are not allowed to trade during the two months preceding annual and interim earnings announcements, and also during the one month preceding quarterly earnings releases.⁵¹ Hillier and Marshall (2002) generally find that while the timing of trades is affected by the trading bans, the profitability of trades is not.

Another important insight of Hillier and Marshall (2002) is that insiders trade more during the 20-day period surrounding announcements than during any other period.⁵² In addition, these trades exhibit a greater purchase-to-sales ratio than during other periods. The latter finding is especially pronounced for interim earnings announcements. Regardless of whether trades take place in the proximity of earnings releases or not, transactions are generally profitable, and the hypothesis that returns between the two sets of trades are equal cannot be rejected.⁵³ Further analysis shows that trading surrounding earnings releases is mostly passive trading and concentrated in the first ten days following the earnings release.⁵⁴ The number of passive transactions is about four times greater than that of active transactions.⁵⁵ Again, the authors fail to find any statistically significant difference between the excess profits derived from active and passive trades, suggesting that the close periods do not impose opportunity costs on corporate insiders.

In order to examine the occurrence and profitability of *informed* and *uninformed* trading, earnings releases are classified into *good*, *bad*, and *no surprise* information releases by utilizing the method outlined by Beaver et al. (1979) as well as a ranking procedure of standardized returns of the day of the announcement.⁵⁶ While active trading does not seem to be driven by informed trading, passive trading exhibits a strong tendency to be based on privileged information.⁵⁷ In particular, insiders seem to engage in buying after unexpectedly bad earnings announcements. However, the results do not suggest that a clear-cut relationship between abnormal profits and informed or uninformed trading strategies exists.

Udpa (1996) examines whether directors' dealings as a form of pre-disclosure lower the informational content of earnings releases. The informational content of earnings is measured by the earnings response coefficient, as proposed by Holthausen and Verrecchia (1988), and the variance of excess returns associated with the earnings release. The results show that active insider trading reduces both the earnings response coefficient as well as the variance of abnormal returns.⁵⁸ As such, these findings suggest that directors' dealings pre-disclose information to investors, implying that active trading is, on average, informed trading. The author argues that his findings may support the reasoning of Manne (1966), Carlton and Fischel (1983), and Leland (1992).

On a related topic, Allen and Ramanan (1990) and Allen and Ramanan (1995) study the relationship between directors' dealings and surprises in annual earnings announcements. While Allen and Ramanan (1990) finds that active insider trading and earnings surprises are jointly informative, Allen and Ramanan (1995) observe that the stock price reaction to unexpected earnings is most pronounced if insider trading occurs in the same direction as the earnings surprise, i.e., insider purchasing prior to positive earnings surprises and insider selling prior to negative earnings surprises. The market's reaction is strongest

⁵¹The Model Code is set out in section 9, annex 1 of the Listing Rules of the UK Listing Authority. See section 2.2 for a more detailed discussion of insider and directors' dealings regulations in the U.K..

⁵²This 20-day period does not include the two-months close period. See Hillier and Marshall (2002), p. 401, Table 1.

⁵³See Hillier and Marshall (2002), p. 402, Table 2.

⁵⁴The related study of Hillier and Marshall (1998) also finds a marked increase in trading activity after earnings releases.

⁵⁵See Hillier and Marshall (2002), p. 403, Table 3.

⁵⁶See Hillier and Marshall (2002), p. 405.

⁵⁷See Hillier and Marshall (2002), p. 406, Table 5.

⁵⁸See Udpa (1996), pp. 1086–1087.

in the former case. Although not explicitly tested, the results of Allen and Ramanan (1995) suggest that insiders trading in the right direction earn larger abnormal returns. Furthermore, while Allen and Ramanan (1995) do not address the incidence of informed trading prior to earnings announcements, they provide insights regarding the general level of directors' dealings during the quarter preceding annual earnings releases. The presented descriptive statistics show that 43% of all earnings announcements are preceded by directors' dealings.⁵⁹

In summary, studies on insider trading around earnings releases do provide evidence of strategic trading behavior. Generally, insiders do not appear to engage in informed active trading, which is associated with litigation and reputational risk. Sivakumar and Waymire (1994) and Lustgarten and Mande (1995) report that insider trading volumes decline as earnings announcements approach. Huddart et al. (2007) also find no link between returns to insider transactions taking place during the 20 days before quarterly or annual earnings releases. The same applies to the studies of Allen and Ramanan (1990) and Sivakumar and Waymire (1994). Lustgarten and Mande (1995) do, however, report contradictory results and find that the direction of insider trading is correlated with the earnings disclosures. In addition, the majority of papers also provide evidence of informed passive trading.

⁵⁹See Allen and Ramanan (1995), p. 659, Table 1.

Table 3.2: Directors' Dealings around Earnings Announcements

Author(s) (Year) <i>Journal</i>	Sample	Source(s) of News Event Data	Studied News Event(s)	Time Horizon	News Classification	Informed Trading Active	Informed Trading Passive	Study Focus and Conclusions
Allen and Ramanan (1995) <i>Management Science</i>	United States (1978–1987) 6,484 news events	SEC Official Summary (directors' dealings), Compustat (news events)	Annual earnings	1 quarter	Earnings surprise	n/a	n/a	Stronger stock price reaction to unexpected earnings if news release is preceded by informed directors' dealings.
Cheng (2006) <i>Journal of Accounting Research</i>	United States (1995–2002) 27,792 news events, 291,836 directors' dealings	SEC Official Summary (directors' dealings), First Call (news events)	Quarterly and annual earnings forecasts	Day –30 to day +30	Size-adjusted $CAR(-1;1)$	No	Yes	Insider purchases influence disclosure activity.
Cheng, Szeto and Leung (2005) <i>Review of Pacific Basin Financial Markets & Policies</i>	Hong Kong (1993–1999) 3,177 news events	Inside Asia (directors' dealings), PACAP (news events)	Simultaneous earnings and dividend announcements	Month –3 to month +1	Changes in earnings and dividends	Prior to changes in dividends	n/a	Pre-event trading intensity decreases and increases after event. Active trading more likely if earnings and dividend news are favorable.
Hillier and Marshall (2002) <i>Journal of Corporate Finance</i>	United Kingdom (1992–1996) 3,871 (3,521) purchase (sale) transactions	Directorwatch (directors' dealings)	Interim and annual earnings announcements	Day –10 to day +10	Beaver et al. (1979) and ranked standardized returns	No	Yes	Passive trades are as profitable as active trades. Informed and uninformed trades are both profitable.

Table 3.2: Directors' Dealings around Earnings Announcements

Author(s) (Year) <i>Journal</i>	Sample	Source(s) of News Event Data	Studied News Event(s)	Time Horizon	News Classification	Informed Trading Active / Passive	Study Focus and Conclusions
Huddart, Ke and Shi (2007) <i>Journal of Ac- counting and Economics</i>	United States (1996- 2002) 100,305 Form 10-K and Form 10-Q filings	First Call/Thompson Financial (di- rectors' deal- ings), Edgar (news events)	Form 10-K and Form 10-Q filings	Day -20 to day +20	Market adjusted $CAR_{-1;1}$	Only prior to de- tailed Form 10-K and Form 10-Q filings	Insiders engage in informed active and passive trading during the period be- tween earnings and Form 10-K / Form 10-Q filings.
Ke et al. (2003) <i>Journal of Ac- counting and Economics</i>	United States (1989- 1997) 4,070 strings of length five or more quarters	First Call/Thompson Financial and Dow Jones News Service (directors' dealings), Compustat (news events)	Strings of consecutive earnings increases	16 quarters prior to break of strings of earnings increases	$CAR(-30;1)$ and $CAR(-2;1)$	Especially n/a during quar- ters nine to three prior to breaks of strings of earn- ings in- creases	Insiders trade on foreknowl- edge of breaks in strings of consecutive earnings in- creases but avoid selling during the two months preceding an- nouncements.
Lustgarten and Mande (1995) <i>Journal of Ac- counting and Public Policy</i>	United States (1984- 1990) 10,330 news events	Ownership Reporting System (direc- tors' dealings), Compustat (news events)	Annual earnings announce- ments	Day -120 to +120	Analyst forecast error	Yes Yes	Analysts' posi- tive (negative) forecast re- visions are positively related to in- sider buying (selling).

Table 3.2: Directors' Dealings around Earnings Announcements

Author(s) (Year) <i>Journal</i>	Sample	Source(s) of News Event Data	Studied News Event(s)	Time Horizon	News Classification	Informed Trading Active	Informed Trading Passive	Study Focus and Conclusions
Noe (1999) <i>Journal of Accounting and Economics</i>	United States (July 1979 - December 1987) 949 news events and 6,869 directors' dealings	SEC Official Summary (directors' dealings), <i>WSJ</i> and Dow Jones (news events)	Quarterly and annual earnings forecasts	Day -20 to day +20	Market adjusted $CAR(-1;1)$	No	Yes	Passive trading associated with increased abnormal returns in the case of sales. Post-event transactions primarily motivated by superior knowledge of long-term prospects.
Park, Jang and Loeb (1995) <i>Journal of Business Finance & Accounting</i>	United States (1986-1987) 1,328 news events	Invest/Net (directors' dealings), <i>WSJ</i> (news events)	Annual earnings announcements	Day -50 to day +20	Unexpected earnings	Not observed	For sale transactions	Trading activity prior to earnings releases increases during days -41 to -21, then declines and picks up again immediately after day 0.
Penman (1982) <i>Journal of Business</i>	United States (1968-1973) 550 news events	SEC Official Summary (directors' dealings), <i>WSJ</i> (news events)	Annual earnings forecasts	Up to four months	$API-1;1$	Yes	Yes	Informed active and passive trading are more pronounced if the stock price reaction to the information release is strong.

Table 3.2: Directors' Dealings around Earnings Announcements

Author(s) (Year) <i>Journal</i>	Sample	Source(s) of News Event Data	Studied News Event(s)	Time Horizon	News Classification	Informed Trading Active	Informed Trading Passive	Study Focus and Conclusions
Sivakumar and Waymire (1994) <i>Financial Management</i>	United States (1984– 1989) 24,658 news events	Invest/Net (directors' dealings), Compustat (news events)	Quarterly earnings announce- ments	30 days	CAR-1; 0	n/a	Yes	Trading ac- tivity prior to earnings releases de- clines and picks up again immediately afterwards. Post-event trades are profitable.

3.4 Trading around Profit Warnings and other Financial Distress Announcements

This section summarizes the existing literature on directors' dealings around profit warnings (Jackson and Madura 2003; Chang and Watson 2007) and financial distress announcements, such as bankruptcy announcements (Loderer and Sheehan 1989; Gosnell et al. 1992; Seyhun and Bradley 1997; Beneish et al. 2007).

Regarding profit warnings, Chang and Watson (2007) identify for the Australian stock market that profit warnings are preceded and followed by negative returns.⁶⁰ They conjecture that insiders strategically trade around profit warnings in that they increase their holdings, knowing that the depressed stock prices are only temporary, as earnings declines are found to be generally reversed in the following period.

Loderer and Sheehan (1989) provide some initial evidence of the relationship between directors' dealings and bankruptcy announcements. The authors contrast insider selling in bankrupt firms with selling in non-bankrupt firms in order to find any strategic reduction of insider share holdings. Although firms going bankrupt lose more than ninety percent of their value during the five years preceding insolvency, Loderer and Sheehan (1989) fail to find any evidence of a systematic reduction in share holdings. The authors conclude that the level of inside ownership of firms in financial distress does not provide outsiders with valuation relevant information.⁶¹ The only informed trading insiders show is that they are less likely to increase their holdings prior to bankruptcy announcements.

Extending the research of Loderer and Sheehan (1989), Gosnell et al. (1992) examine potential differences in insider selling prior to bankruptcy announcements in exchange-listed and OTC companies. The results show that insiders in exchange-listed companies engage in informed selling during the two years preceding bankruptcy announcements to a far lesser extent than insiders in OTC firms.⁶²

Reexamining the rather surprising results of Loderer and Sheehan (1989) in particular, Seyhun and Bradley (1997) provide circumstantial evidence that insider trading during the months preceding bankruptcy petitions is illegal. They report that systematic insider selling commences up to five years before the bankruptcy filing and continues up to the filing month. Furthermore, insiders' sales are timed so that they precede falls in stock prices. After stock price decreases, insiders again increase their buying activity. These patterns are especially prevalent for high-ranking executives and directors.⁶³

Beneish et al. (2007) extend the examination of directors' dealings prior to bankruptcy announcements by also studying earnings management. They find that if insiders engage in abnormal selling prior to company default, they inflate earnings in order to mask their transactions. If, however, insiders trade more in the proximity of bankruptcy filings, they refrain from managing earnings. The authors conclude that the observed trading and earnings management patterns are designed to avoid litigation risk.⁶⁴

The studies by Summers and Sweeney (1998) and Agrawal and Cooper (2008) focus on insider trading around intentionally misstated financial statements. Summers and Sweeney (1998) show that insiders offload their stock holdings by increasing their selling activity, as measured by the number of transactions, the number of shares traded, or the traded dollar amount, in the presence of fraud. Agrawal and Cooper (2008) study insider trading in 518 U.S. firms involved in accounting scandals between January 1997 and June 2002.⁶⁵ Given that accounting scandals, which are defined as disadvantageous restatements of

⁶⁰Jackson and Madura (2003) report a more condensed and accurate negative stock price reaction to profit warnings.

⁶¹See Loderer and Sheehan (1989), pp. 1073–1074.

⁶²See Gosnell et al. (1992), pp. 356–357, Table III.

⁶³See Seyhun and Bradley (1997), p. 204, Table 3.

⁶⁴See Beneish et al. (2007), p. 26.

⁶⁵See Agrawal and Cooper (2008), p. 40, Table I.

earnings, are associated with negative stock price impacts, insiders should have a propensity to sell prior to such restatements. The authors argue, however, that insiders should have less incentives to increase their selling compared to other financial distress events, such as bankruptcy filings, since insiders could be scrutinized not only for their trading activity, but also regarding misconduct in their financial reporting. The empirical results of Agrawal and Cooper (2008) weakly indicate that high-ranking insiders increase their selling during the misstated period when stock prices are inflated. In several sub-samples that feature larger incentives to sell, however, abnormal insider selling at a statistically significant level can be observed.

3.5 Trading around New Security Issue Announcements

Several researchers have focused on the relationship between insider trading and new issue announcements, such as seasoned equity offerings and debt issuances. The papers presented in this section include those of Karpoff and Lee (1991), Gombola et al. (1997), and Clarke et al. (2001).

Karpoff and Lee (1991) study insider trading prior to new issuances, including primary offerings of common stock, issuances of convertible debt, and issuances of straight debt. Smith (1986) shows that stock prices decrease on average as new common stock issuances or issuances of convertible debt are announced. For straight debt, however, the stock price reaction is not statistically different from zero. Karpoff and Lee (1991), thus, argue that insiders have an incentive to front-run announcements regarding news issuances of common stock and of convertible debt by increasing their selling activity. For issuances of straight debt, on the other hand, insiders should have little impetus to adjust their trading behavior. In all instances, however, disincentives stemming from the risk of litigation and reputational loss should reduce the exploitation of inside information.

The sample is based on the data set of Mikkelsen and Partch (1986) and includes 179 instances of the mentioned types of new security issuances of 83 different firms between 1975 and 1982.⁶⁶ Insider transactions are collected from the SEC's Official Summary. The insider trading data items are aggregated for each company in the sample into monthly "net sellers" measures, which are defined as the number of insiders who are net sellers minus the number of net buyers as measured by the number of shares traded. The net seller variable is beneficial in that it also captures reduced insider buying prior to negative news events. Based on the net seller measure, a firm-specific first-order autocorrelation model is designed in order to construct a measure for "normal" insider trading activity. Estimates of abnormal insider trading are calculated for up to eleven months preceding the new security issuance announcements.

The empirical results suggest that insiders exploit their foreknowledge of common stock and convertible debt issuances. In the former case, Karpoff and Lee (1991) find more net sellers than buyers during all the studied months preceding the announcement, and an especially large propensity to sell in the two months before and during the month of the news event. The not significant Wilcoxon test based on individual firms' cumulative abnormal number of net sellers, however, indicates that this result may be driven by a small number of large outliers. For convertible debt announcements, observations of the net seller measure per month are mostly positive, and also the Wilcoxon tests are statistically significant. In the case of straight debt, however, no clear pattern is observable. This finding is consistent with the hypothesis that such issuances provide too few incentives to risk prosecution by the SEC. Generally, the results of Karpoff and Lee (1991) support the notion that the disincentives provided by insider regulations and effective enforcement are insufficient to deter the exploitation of private information.

⁶⁶See Karpoff and Lee (1991), p. 20, Exhibit 1.

Gombola et al. (1997) extend the line of research of Karpoff and Lee (1991) and investigate insider trading after the announcement of seasoned equity offerings. The authors argue that issuances of common stock are followed by a prolonged period of negative returns, as shown by Loughran and Ritter (1995), who demonstrate that stock prices underperform for up to five years following issuances. On similar lines, McLaughlin et al. (1996) find evidence of a decreased profitability of companies issuing common stock during the three years after the announcement. Thus, insiders should have reason to continue selling stock after seasoned equity announcements. Furthermore, insiders may avoid the litigation risks associated with front-running common stock issuances by delaying their trades until after the news announcement.

The studied data set consists of 344 seasoned equity offerings during 1981–1989 from industrial firms listed on the AMEX or NYSE, or trading on the OTC market.⁶⁷ Data is collected from the *Investment Dealers' Digest* and verified with the *WSJ*. Insider transactions are collected from the SEC Official Summary. Insider trading is measured based on the number of shares traded, the number of trades, and the dollar value of trades. In addition, variables for abnormal trading activity are constructed based on a prior-period comparison and a control sample approach.

The empirical results show that offerings of common stock are followed by abnormal insider selling for several months. Furthermore, insider selling is especially prevalent in the month directly following the announcement. Gombola et al. (1997) also present some evidence that the Insider Trading Sanctions Act of 1984 intensified insider selling after seasoned equity offering announcements, which is consistent with the notion of increased costs from front-running such announcements. In addition, the authors' results support the hypothesis that abnormal net selling is more intense in growth stocks, as measured by Tobin's q , since growth stocks may generally feature larger mispricings.

Clarke et al. (2001) also study the interaction between insider trading and seasoned equity offerings. The existing research is extended in that the authors also examine canceled issuances of common stock. They find that insider selling increases before completed and canceled seasoned equity offerings. However, insider selling remains high only in the former case. These findings are consistent with the hypothesis of Loughran and Ritter (1995) that insiders take advantage of their stock's overvaluation by issuing common equity. If the overpricing is eliminated by the issuance, insiders decide to cancel the offering. In addition, Clarke et al. (2001) find that pre-filing insider selling is related to post-offering abnormal returns. For canceled issuances, pre-filing insider selling is related to the stock performance between filing and cancelation. The authors, thus, find evidence that insiders trade strategically around seasoned equity offerings and on overpricings of their stock. Once this overvaluation is eliminated, insiders adjust their trading activity accordingly.

Two related papers are those of Lee (1997) and Kahle (2000). Lee (1997) finds evidence that pre-announcement selling by CEOs is related to post-filing stock returns, if most of the equity being sold is held by existing shareholders. Kahle (2000) further validates the relationship between insider trading prior to the issuances of convertible debt and equity. Abnormal insider selling indicates negative post-announcement abnormal returns, and insiders seem to exploit their company's overvaluation not by only issuing stock, but also by trading on their own personal accounts.

In summary, the empirical studies on insider trading around issuances of seasoned equity and convertible debt offer convincing evidence of insiders exploiting their informational advantage to profit on their own account. First, managers seem to sell stock prior to the issuance of announcements that have a negative impact on stock prices. In addition, insiders continue their selling activity after such announcements if

⁶⁷See Gombola et al. (1997), p. 40, Table 1.

they believe that the market has not yet eliminated their company's overvaluation.

Table 3.3: Directors' Dealings around New Security Issue Announcements

Author(s) (Year) <i>Journal</i>	Sample	Source(s) of News Event Data	Studied News Event(s)	Time Horizon	News Classification	Informed Trading	Study Focus and Conclusions
						Active Passive	
Clarke et al. (2001) <i>Journal of Financial and Quantitative Analysis</i>	United States (1984–1996) 174 canceled offers, 3,092 completed offers	SEC Official Summary (directors' dealings), Security Data Company (news events)	Seasoned and canceled equity offerings	Month 1 to month 12	BAHR	Yes Yes	Abnormal selling before completed and canceled offerings; remains high only for completed issuances.
Gombola et al. (1997) <i>Financial Management</i>	United States (1981–1989) 344 news events	SEC Official Summary (directors' dealings), Investment Dealers' Digest (news events)	Seasoned equity offerings	Month 1 to month 12	Qualitative	n/a Yes	Abnormal net selling after seasoned equity announcements, especially in growth stocks.
Karpoff and Lee (1991) <i>Financial Management</i>	United States (1975–1982) 179 news events	SEC Official Summary (directors' dealings), Mikkelsen and Partch (1986) (news events)	Primary offerings of common stock, convertible debt, issuances of straight debt	-11 months to month 0	Qualitative	Yes n/a	Increased selling activity in the case of common stock and convertible debt issuances.

3.6 Trading around M&A-Related Announcements

Insiders can potentially make substantial profits from using information concerning merger and acquisition (M&A) announcements. Asquith et al. (1983), Asquith (1983), Dennis and McConnell (1986), Dodd (1980), and Keown and Pinkerton (1981) study the price performance and abnormal trading volume of M&A target firms. The cited studies report large share price run-ups prior to takeover announcements. Jensen and Ruback (1983), for example, report abnormal returns in excess of ten percent.⁶⁸ If the insiders of target firms are informed of a potential take-over announcement before the general public is, they possess private and price-sensitive information and may trade on it accordingly.

The main research question of Seyhun (1990) is whether bidder managers deliberately overpay in tender offers in order to entrench and protect their position within the firm. To infer the managers' motivations underlying takeovers, Seyhun (1990) investigates whether and how such insiders adjust their trading activity for their own personal accounts.

The author employs a sample of merger and tender offers published in the *WSJ* between January 1975 and March 1986. Open-market purchases and sales data by top management are collected from the SEC's Ownership Reporting System. The final data set consists of 216 tender offers and 177 merger announcements of a total of 393 companies. Since the stock price reaction to such events is mixed, Seyhun (1990) divides the news events into positive and negative releases according to the two-day announcement excess return, which is obtained from the CRSP database. To examine abnormal levels of insider trading, two measures of "normal" trading activity are defined. While the first measure is a control sample approach and uses non-bidder firms of a similar size to the bidder firms, the second measure uses the trading activity of the respective bidder company during the 12 months before and 6 months after the M&A announcement.

Seyhun (1990) finds some evidence that managers trade in anticipation of takeover announcements, despite the regulatory framework. For example, the net selling of insiders amounts to only 173.9, as opposed to the expected 1,391.3 shares per firm during the three months preceding announcements that cause a positive stock price reaction of more than 5%.⁶⁹ For the same period, top management sells a net number of shares of 5,091.9 if the takeover announcement is associated with a negative reaction of less than -5%. The trading activity after the announcements, however, follows no clear pattern.

Part of the analysis of Sanders and Zdanowicz (1992) investigates whether insiders of M&A target firms, as opposed to Seyhun (1990), who studies the trading behavior of insiders of the acquiring firm, do indeed exploit any informational advantage they might have.

Data on the initiation dates of takeover announcements is obtained from proxy statements and 14-D1 forms filed by NYSE and AMEX companies between 1978 and 1986. Public announcement dates are collected from the *WSJ*, and the final sample consists of 30 target firms.⁷⁰ Open-market purchases are obtained from the SEC's Ownership Reporting System.

A total of twelve firms featured insider purchases during the 150 days before the initiation date (uninformed period), and five companies did so between the initiation date and two trading days prior to the public takeover announcement (informed period).⁷¹ The average number of transactions per day and the mean trading value are compared for both periods and subjected to *t*-tests. Both *t*-tests, however, fail to reject the hypothesis that both measures of insider trading are, on average, equal for both periods. The

⁶⁸See, among others, Böhmer and Löffler (1999) and (Nowak 2001) for stock price effects related to M&A announcements in the German stock market.

⁶⁹See Seyhun (1990), p. 451, Table 5.

⁷⁰See Sanders and Zdanowicz (1992), p. 125, Appendix 1.

⁷¹See Sanders and Zdanowicz (1992), p. 122, Table 3.

authors acknowledge that this result is unsurprising, given the increased public and regulatory attention associated to takeover announcements.⁷² Thus, Sanders and Zdanowicz (1992) and Seyhun (1990) find conflicting evidence regarding reported insider trading prior to takeover announcements, although the two studies are not directly comparable. More general results from Sanders and Zdanowicz (1992) indicate that abnormal returns or trading volume occurs prior to the initiation dates. Excess returns materialize before the public announcement date, but after the initiation date. In addition, trading volumes only increase significantly after the public announcement of takeovers.

Bettis and Duncan (1996) try to reconcile the conflicting conclusions drawn by Seyhun (1990) and Sanders and Zdanowicz (1992), which could have potentially arisen, besides other influencing factors, out of the different research methodologies and different data sets employed. Bettis and Duncan (1996) argue that if insider trading sanctions are effective, fewer directors' dealings should be reported preceding takeover announcements, as the legal risks are higher during such periods.⁷³ To test this hypothesis, insider trading in target firms during the six months prior to public M&A announcements is examined.

Takeover announcements concerning NYSE and AMEX companies between 1985 and 1989 are collected from the *WSJ*, resulting in a final sample of 151 firms.⁷⁴ The Insider Trading Monitor database serves as source for reported insider transactions. For each company in the sample, the expected purchasing activity by corporate insiders is defined as the average monthly number of purchases or purchased volume over the 48 months ending six months prior to the public M&A announcement. Thus, abnormal purchasing activity results in the expected purchasing subtracted from the actual observed trades. Bettis and Duncan (1996) also calculate abnormal returns under the market model to establish whether any information about upcoming takeover announcements translates into excess profits for insiders of the target firm.

The empirical results do show a decrease in purchasing activity in anticipation of takeover announcements. In the month immediately before the first public announcement, which can be considered as the month associated with the highest probability of litigation risk and public scrutiny, the number of purchases and the volume of purchases are reduced and are statistically significant at the 1% level.⁷⁵ In addition, the last month also exhibits the lowest absolute level of both measures. For the other preceding months, however, no statistically significant decrease in insider purchasing can be observed. Regarding excess returns, Bettis and Duncan (1996) identify significant abnormal returns that begin to materialize in the three and two months before the public M&A announcements, which is consistent with the substantial profit opportunities presented by trading on foreknowledge of such news releases.⁷⁶ The authors conclude that while the regulatory and enforcement frameworks are sufficient to deter exploitative insider trading for the months immediately preceding public takeover announcements, this is not necessarily the case during earlier time periods.

A shortcoming of Sanders and Zdanowicz (1992) and Bettis and Duncan (1996) is that their measures of reported trading by insiders of target companies are solely based on purchases. Thus, they fail to take delayed trading into account, i.e. sales transactions that are postponed until after public takeover announcements. Madison et al. (2004) specifically argue that insider purchasing prior to takeover announcements is associated with large legal risks, while delaying planned sales is not. Either way, insiders may profit from private information regarding takeover announcements, and insiders should therefore,

⁷²Bettis and Duncan (1996) even argue that reported insider purchases should decrease prior to public takeover announcements.

⁷³Bettis (1995) also construct a test of takeover rumors based on this assumption, reasoning that if rumors are likely to be valid, no or reduced reported insider purchases should occur during the pre-announcement period.

⁷⁴See Bettis and Duncan (1996), Table I.

⁷⁵See Bettis and Duncan (1996), Table II.

⁷⁶See Bettis and Duncan (1996), Table III.

be more inclined to decrease sales prior to such announcements rather than to increase purchases.

The studied sample includes completed bank mergers announced between 1992 to 1997 in the *WSJ*. This time period should have provided additional incentives for insiders to avoid engaging in improper trading, as both the ITSA and also the ITSFEA were both in place, effectively enhancing the legal risk rouge insiders face.⁷⁷ Open-market insider purchases and sales of common stock are collected from SEC's Ownership Recording System for the 36-month period prior to the public M&A announcement. The final data set consists of 111 completed bank mergers and 1,168 (649) purchase (sale) insider transactions with 100 or more shares.⁷⁸ The level of insider trading activity is captured by six different measures, of which four are similar to those proposed by Agrawal and Jaffe (1995). The employed measures include the percentage of insiders who traded, the number of shares traded per insider, the percentage of total shares traded, the dollar value traded, the percentage of total share trading purchase volume, and the percentage of total dollar trading volume. The measures are calculated separately for purchase and sales transactions. The estimation period for "normal" insider trading ranges from month -36 to month -13 .

The empirical results of Madison et al. (2004) suggest that insiders of target banks exploit private information regarding upcoming M&A announcements without putting themselves in harm's way. Consistent with the findings of Seyhun (1990) and Agrawal and Jaffe (1995), insiders appear to significantly reduce their purchasing during the two months immediately preceding merger announcements.⁷⁹ During the same time period, insiders also seem to decrease their selling activity, which contrasts with the results of Agrawal and Jaffe (1995).⁸⁰ Thus, the findings of Madison et al. (2004) suggest that insiders trade strategically prior to bank merger announcements in order to exploit their informational advantage. They do so by the means of non-trading which allows insiders to avoid potential litigation.

Harlow and Howe (1993) reach a similar conclusion. They study directors' dealings prior to leveraged buy-outs (LBO) and management buy-outs (MBO). Arguing that incentives may cause insiders to rather reduce sales than increase purchases to profit from private information concerning upcoming LBO announcements, the authors find that insiders build their share positions not by increasing purchases, but by decreasing sales.

Additional evidence of reported insider trading prior to M&A announcements is provided by Agrawal and Jaffe (1995), Eyszell (1990), and Jabbour et al. (2000). Agrawal and Jaffe (1995) examine whether the short-swing rule of U.S. insider trading regulations (section 16b of the SEA) was able to deter directors' dealings before M&A announcements between 1941 and 1961. While they find that purchases decrease in the pre-merger period, no opportunistic behavior regarding sales is observable. Eyszell (1990) study so called "toehold acquisitions," which are defined as relatively small acquisitions, i.e. ten percent or less, of the shares of a potential target company. The sample consists of all "toehold acquisitions" of at least five percent conducted by the corporate raiders Irwin Jacobs, Carl Lindner, and Victor Posner, between 1975 and 1981. The empirical results appear to contradict those of the above-cited papers, as Eyszell (1990) identifies that high-level corporate insiders, especially company chairmen, do exploit inside information and increase their purchasing activity in the pre-disclosure period. Jabbour et al. (2000) provide international evidence on the subject by studying a sample of 128 Canadian acquisitions between 1985 and 1995. Canadian insider trading regulations can be considered as more lax, and Jabbour et al. (2000) argue that actual prosecutions and convictions related to illegal trading by corporate insiders are rare. Accordingly, the authors find that much of the pre-announcement price run-up is caused by the trading of corporate insiders. Furthermore, the purchasing volume of insiders is higher during the two

⁷⁷See section 2.1 for a discussion of U.S. insider trading laws, including the ITSA and ITSFEA.

⁷⁸See Madison et al. (2004), p. 211, Table 1.

⁷⁹See Madison et al. (2004), pp. 215–216, Table 3.

⁸⁰See Madison et al. (2004), pp. 217–218, Table 4.

months preceding takeover announcements than was suggested by the estimation period, which spans four months.

Table 3.4: Directors' Dealings around M&A Announcements

Author(s) (Year) <i>Journal</i>	Sample	Source(s) of News Event Data	Studied News Event(s)	Time Horizon	News Classification	Informed Trading Active	Informed Trading Passive	Study Focus and Conclusions
Bettis and Duncan (1996) <i>Journal of Accounting and Finance Research</i>	United States (1985– 1989), AMEX and NYSE firms 151 takeover announce- ments	Insider Trading Monitor (direc- tors' dealings), <i>WSJ</i> (news events)	Takeover announce- ments	Month -6 to month 0	n/a	Not in month 0	n/a	Reduced insider chasing in the month immedi- ately preceding public takeover announce- ments.
Madison et al. (2004) <i>The Financial Review</i>	United States (1992– 1997) 111 bank M&A announce- ments	SEC Owner- ship Reporting System (direc- tors' dealings), <i>WSJ</i> (news events)	Bank M&A announce- ments	Month -12 to month -1	n/a	No (but re- duced sales)	n/a	Reduced insider chasing and selling during the two months preceding bank merger an- nouncements.
Sanders and Zdanowicz (1992) <i>Journal of Financial and Quantitative Analysis</i>	United States (1978– 1986) 30 change in control announce- ments	SEC Owner- ship Reporting System (direc- tors' dealings), Proxy State- ments, and Form 14-D1 (news events)	Seasoned equity offerings	n/a	n/a	No	n/a	Insiders of target firms do not trade on foreknowledge of pending public takeover announce- ments.
Seyhun (1990) <i>The Journal of Business</i>	United States (January 1975–1986) 216 tender offers, 177 mergers	SEC Owner- ship Reporting System (direc- tors' dealings), <i>WSJ</i> (news events)	Tenders offers and merger announce- ments	Month -12 to month 6	CAR(0;1)	Yes	No	Top manage- ment takes stock price effect of M&A announce- ments into account for their personal transactions.

3.7 Trading around Other News Announcement

Lee et al. (1992) analyze reported insider trading around different types of tender offers. Dann et al. (1991) and Lakonishok and Vermaelen (1990), for example, show that tender offers are usually associated with a stock price increase, which lasts until after the offer's expiry date. Thus, share repurchases may offer profit opportunities for managers trading on their personal accounts. For a sample of 146 firms conducting tender offers between January 1977 and June 1988, Lee et al. (1992) identify that corporate insiders increase their buying and decrease their selling activity during the pre-announcement period. This increased activity is especially prevalent during the six months immediately preceding the announcement. These results, however, only apply to tender offers with a fixed price and not to Dutch auction offers. In addition, no abnormal trading activity can be observed during the post-announcement period.

Other papers touching on insider trading around corporate news events are those of John and Mishra (1990), who develop and test a signaling model of insider transactions in the proximity of corporate expenditures, and John and Lang (1991). The latter study examines the information content of dividend announcements as well as insider transactions around such corporate news events. John and Lang (1991) conclude that dividend increases cannot always be interpreted as good news and argue that the interpretation of the dividend signals has to take into account accompanying insider transactions. Their empirical analysis shows that insiders trade in advance of dividend signals and act on pricing relevant information that is private at the time of the transaction.

Corporate sell-off decisions and adjacent insider trading are studied by Hirschey and Zaima (1989). The data set consists of 170 voluntary corporate sell-offs by U.S. companies between 1975 and 1982. The authors find that the sale of substantial assets is, on average, viewed positively by the market if firms have large shareholders and insiders are net-buyers during the six months prior to sell-off announcements.

The study by Hartigan and Rogers (2003) is concerned with insider trading around filings of anti-dumping petitions. The studied panel consists of 66 U.S. firms requesting anti-dumping investigations against competitors between 1985 and 1987. Since anti-dumping petitions are generally associated with positive stock price reactions, high-level insiders with knowledge of the process could personally benefit by acting on their information. The results of Hartigan and Rogers (2003) show that such public policy events are preceded by abnormal purchasing by corporate insiders, suggesting that the SEC's enforcement effort in this respect is lacking.

3.8 Trading around News Announcements in the German Stock Market

For the German stock market, two studies exist that touch on the topic of directors' dealings around corporate news disclosures. The study of Betzer and Theissen (2009), which is also discussed in more detail in section 4.5.3.6, examines the determinants of insider trading profits. Transactions falling into U.K. blackout periods, which are defined as the two months prior to annual and interim earnings announcements and the four weeks prior to quarterly announcements, are identified. The authors point out that the U.K. regulations are based on the assumption that informational asymmetries during these periods are especially high and thus pose profitable trading opportunities for insiders. A total of 757 transactions fall within the blackout period while 1,147 trading events do not.

Comparing the abnormal returns earned by both samples, it becomes apparent that transactions pre-

ceding earnings releases are more profitable than trades which do not fall within the blackout period.⁸¹ Excess returns during the 20 days following the trading date amount to 5.26% (−4.85%) for purchases (sales) for the blackout period sample. For transactions not preceding earnings announcements, excess returns amount to only 1.96% (−2.75%) for purchases (sales). While the reported abnormal returns are statistically significantly different from zero at the 1% level for both samples, Betzer and Theissen (2009) interpret these results as evidence for increased informational asymmetries prior to earnings announcements, which warrants trading bans in Germany similar to those in the U.K.. Although the authors do not statistically test the two samples for differences in means to verify their argument, the results of the cross-sectional regression confirms the results. A dummy variable indicating whether transactions precede earnings disclosures or not is included in the regression analysis.⁸² For the trading day sample, the regression coefficient is positive and statistically significant at the 1% and 5% level.

The methodology employed by Dymke and Walter (2008) is similar to that of Betzer and Theissen (2009). Dymke and Walter (2008), however, do not only examine insider transactions prior to earnings releases, but also generally before ad-hoc announcements. Transactions of interest are followed by ad-hoc announcements within twenty days of the date of trading. The results show that about one-fifth of all transactions are followed by ad-hoc news disclosures.⁸³ In addition, excess returns to directors' dealings followed by news events are generally higher than for other transaction. A two-sample t-test reveals, however, that the means of news and no-news samples are only statistically different for purchases and not for sales.⁸⁴ Within the purchases sample, members of the supervisory board and other non-executive insiders are particularly able to reap large excess returns when trading prior to news releases. A cross-sectional regression that also controls for other factors, such as firm size and shareholder structure, generally confirms the results.⁸⁵ Dymke and Walter (2008) interpret these results as evidence for the exploitation of private information by insiders in the German stock market.

While Betzer and Theissen (2009) and Dymke and Walter (2008) study directors' dealings prior to news events, i.e. active trading, they do not examine any forms of passive trading. In addition, both studies fail to examine trading volumes prior to news announcements. If, for example, trading volumes are relatively low during pre-announcement periods, this would partially exculpate insiders. Chapter 5 of this dissertation aims to extend the research on directors' dealings around corporate news announcements by examining these and other aspects.

⁸¹See Betzer and Theissen (2009), p. 419, Table 5.

⁸²See Betzer and Theissen (2009), p. 423–424, Table 6.

⁸³See Dymke and Walter (2008), p. 197, Table 4.

⁸⁴See Dymke and Walter (2008), p. 199, Table 5.

⁸⁵See Dymke and Walter (2008), p. 202, Table 6.

Chapter 4

Directors' Dealings and Stock Market Efficiency

This chapter discusses directors' dealings in the context of market efficiency. Two aspects of directors' dealings in particular are related to market efficiency. First, as outlined in chapter 2, regulators prescribe the disclosure of transactions by corporate insiders in order to prevent illegal dealings and to improve market transparency. Company insiders are supposedly better informed about the prospect of their companies, and conveying this informational advantage to the public reduces information asymmetries. As a result, markets should be able to price securities more accurately at their fundamental value, which increases market efficiency.

Second, as soon as directors' dealings are published, they become part of the information set available to investors, very much like any news announcement or other valuation-relevant information. While investors may trade on this information, the efficient market hypothesis (EMH) prescribes that they should not be able to achieve abnormal profits by doing so. If this proposition does not hold, it presents a challenge to the EMH. Either a market anomaly, or other biases and costs exist that impede market efficiency. Thus, analyzing the returns to disclosed insider trades allows for a test of the efficiency of stock markets.

This chapter is concerned with the second aspect of directors' dealings in particular, and thus, constitutes the theoretical foundation for the empirical analysis in chapter 6. Section 4.1 of this chapter outlines the three forms of the EMH, presents its theoretical foundations, and discusses methods to test the EMH. Theoretical as well as empirical challenges to market efficiency and the implications for the validity of the EMH are presented in section 4.2. Section 4.3 discusses a relatively new field in the area of behavioral finance—limits to arbitrage. Transaction as well as holding costs make arbitrage costly and have been identified as a large obstacle to market efficiency. Finally, empirical tests of market efficiency based on returns to directors' dealings are analyzed in section 4.5. While the U.S. and U.K. stock markets appear to incorporate disclosed insider trades relatively efficiently into equity prices, the story for Germany appears to be different.

4.1 The Efficient Market Paradigm

First populated in the classic paper of Fama (1970), the EMH has been the central theorem of finance and has become a building block for theories such as portfolio selection and option pricing.¹ In addition, the EMH has been one of the most controversial and well-studied theorems in economics and finance. The EMH makes a powerful statement in that any given market is efficient if

*“security prices at any time fully reflect all available information.”*²

Equally powerful are the implications of this statement. It follows that no one, from the average investor to the sophisticated hedge fund manager, can hope to achieve excess returns other than by chance. Even company insiders cannot expect to reap any excess profits, as all inside information is already reflected in security prices. This implies that prices are not predictable; i.e. they follow a *random walk*. Price changes occur only because of unforeseen news events. If new developments occur, the adjustment process of prices is instantaneous, driven by stark competition between the market participants. Ultimately, active investing becomes a lottery, and larger returns can be achieved only by taking on greater risk. Surely, these implications and the theorem itself seem to be farfetched. Therefore, the EMH differentiates between three degrees of market efficiency: the strong-, the semistrong- and the weak-form.³

4.1.1 The Three Versions of the Efficient Market Hypothesis

4.1.1.1 The Strong-Form

The strong-form of the hypothesis is essentially described above and states that security prices fully reflect *all available information*. Such information includes past prices, analysts’ earnings forecasts, the quality of company management, patents held, accounting practices, balance sheet data, etc. Thus, the strong-form not only renders technical analysis, fundamental analysis, and active portfolio management obsolete, but also states that corporate insiders, who typically have access to privileged information, cannot exploit their informational advantage in order to earn excess returns because this information is already reflected in security prices. In fact, if the above outlined strong form of market efficiency were to be true in the real world, supervisory authorities such as the U.S. *Securities and Exchange Commission* or the British *Financial Services Authority* would have little reason to pursue insider trading at all. Shleifer (2000) wittily refers to the insiders serving terms in minimum security prisons because of illegal trading as evidence against the strong-form of the EMH.⁴ Even Eugene Fama does not believe that the EMH holds in its extreme form.⁵

4.1.1.2 The Semistrong-Form

The semistrong-form of the EMH requires that security prices reflect all *publicly-available information* at any point in time. This includes all data items also incorporated under the strong-form, except private information. Although the term “publicly-available information” is subject to interpretation, the semistrong-form usually allows for profitable insider trading. Similar to the strong-form, the implications are that technical and fundamental analysis, as well as active portfolio management based solely on

¹The EMH can be traced back to Samuelson (1965) and the PhD dissertation of Eugene Fama at the University of Chicago Graduate School of Business. Fama (1965) first coined the term “*efficient markets*.”

²See Fama (1970), p. 383.

³See Fama (1970), p. 1.

⁴Shleifer (2000), p. 7.

⁵See Fama (1991), p. 1575.

publicly-available information, are fruitless. Jensen (1978) states that this more sensible definition of the EMH represents the accepted paradigm and that the term *market efficiency* typically refers to the semistrong-form of the EMH.

4.1.1.3 The Weak-Form

The weak-form of the EMH states that stock prices incorporate all information that can be inferred from market trading data. This includes past stock prices, trading volume data, or the short interest rate. This weak version of the EMH implies that only technical analysis based on past stock prices will not yield any abnormal returns. In addition, the weak-form allows for the possibility that market participants earn excess returns by trading on historic and publicly-available data, such as disclosed directors' dealings. Thus, outsiders trading on information derived from insider transactions may achieve abnormal returns. A prerequisite is, however, that insiders themselves earn abnormal profits when trading stock of their own companies.⁶

4.1.2 Theoretical Foundations of the Efficient Market Hypothesis

Shleifer (2000) summarizes the theoretical foundations of the EMH and points out its three underlying assumptions. First, it is assumed that investors are rational and accordingly value investments and securities rationally. Second, to the extent that some investors behave irrationally, their trades are random, such that they cancel each other out. Consequently, the transactions of irrational investors have no effect on security prices, and prices are equal to the fundamental value. Third, if the trades of irrational investors are not random, i.e., irrational investors act in concert, they are met by rational arbitrageurs who compensate for the impact of prices and ensure market efficiency.

4.1.2.1 Investor Rationality

Regarding the first assumption, Shleifer (2000) points out that market efficiency primarily results from competitive markets with *fully rational investors* in equilibrium. Rational markets value securities at their true and fundamental value, which equals the net present value of future cash flows. News concerning the fundamental value will impact future expected cash flows and their net present value. Rational investors will, thus, bid the price of the security either up or down to its new fundamental value. Samuelson (1965) and Mandelbrot (1966) show that competitive markets with risk-neutral investors cause prices to fluctuate randomly. If the assumption of risk-neutrality is dropped, prices are no longer predicted to follow a random walk, but investor rationality still renders it impossible to earn abnormal profits.⁷ Thus, investor rationality is the main building block of the EMH.

4.1.2.2 Randomness of Irrational Trades

Nevertheless, the two other key assumptions suggest that the EMH also holds if investors are not fully rational. If the trades of irrational investors are *random*, to the extent that they cancel each other out, prices and markets are still efficient, since the irrational behavior has no net effect on prices. Moreover, even with correlated trades, irrational investors do not necessarily undermine the validity of the EMH.

⁶Chapter 3 generally finds that corporate insiders do, on average, earn excess returns when trading stock of their own companies.

⁷See Shleifer (2000), p. 3.

4.1.2.3 Arbitrage

Even if trades of irrational agents are not random, Friedman (1953) and Fama (1965) argue that *arbitrage* will quickly eliminate any deviations in security prices from their fundamental value. Arbitrage is typically defined as “the practise of buying and selling equivalent goods or portfolios to take advantage of a price difference.”⁸ Arbitrage is a powerful concept in finance as well as economics. It implies that any mispricing will quickly vanish because of arbitrage forces. Suppose that the trades of irrational investors are not random and do not cancel out. As a result, mispricings in certain securities would materialize. Rational investors, or arbitrageurs, however, would see a profitable trading opportunity in such deviations from the fundamental value.⁹ If, for example, a stock is underpriced in relation to its fair value, arbitrageurs would buy the inexpensive stock. At the same time, arbitrageurs would also sell or sell short a close substitute in order to hedge their risks. If such similar securities exist, arbitrageurs profit once market prices return to their fundamental value, as they will have bought one security dearly and disposed of the associated fundamental risk by shorting a close substitute.

As a result of this arbitrage trading, the price of undervalued (overvalued) securities will rise (fall) and converge to their fundamental value. If many arbitrageurs compete with each other, the price adjustment process will be swift, and prices will never exhibit large deviations from their fair value. Moreover, arbitrageurs themselves will earn only a small or incremental profit. Yet, arbitrageurs do earn abnormal returns and profit at the expense of irrational investors, who constantly lose money. Friedman (1953), however, points out that irrational investors cannot lose money forever and will eventually cease to trade in the market. As a result, arbitrage itself purges the market of irrational traders and enforces market efficiency, at least in the long-run.

The argument of arbitrage is a powerful one and is essential to the theoretical as well as empirical foundation of the EMH. The assumption that all investors behave rationally is a stretch in the real world, as is the assumption that the trades of irrational traders cancel each other out. Therefore, arbitrage may be the single most important source of market efficiency and the primary element upholding the empirical validity of the EMH.

4.1.3 Empirical Tests of the Efficient Market Hypothesis

The main proposition of the EMH is that prices “fully reflect” all available information. This statement is so general, however, that it has no directly testable implications.¹⁰ Whether information is fully reflected in prices can only be established in the context of an asset pricing model that defines the meaning of “fully.”¹¹ Given an equilibrium model of prices, or respectively, a model of expected returns, all empirical tests are subject to the *joint-hypothesis problem*: if evidence of anomalous returns is found, it may be due to a falsely-specified return model (bad model problem), or because the market is indeed inefficient. Disregarding the joint-hypothesis problem, however, the EMH makes two kinds of predictions that can be tested empirically.

First, markets should react *quickly* and *correctly* to new information about the fundamental value of a security.¹² “Quickly” means that prices should adjust promptly to reflect the true value after the release of news. Ideally, prices should immediately “jump” to their new equilibrium level. “Correctly” means that

⁸See Berk and DeMarzo (2007), p. G-1.

⁹The terms *rational investors* and *arbitrageurs* are often used interchangeably throughout the economics and finance literature.

¹⁰See Fama (1970), p. 384.

¹¹See Fama (1991), p. 1576.

¹²See Shleifer (2000), p. 5.

prices react neither too much nor too little to new information, and they “hit” the new fundamental value right on the spot. Thus, prices should not exhibit any drift, e.g., a price reversal or a further appreciation, after the release of news. Second, since prices supposedly incorporate all available information regarding the securities’ fundamental value, prices should not move in the absence of any relevant news.

The first prediction, in particular, has been subject to extensive research. From the notion that prices adjust instantaneously follows the hypothesis that dated information is of no value to investors. Information is valuable only if it allows investors to earn superior and risk-adjusted returns. It is, thus, insufficient for investors to earn positive cash flows. Such cash flows might only be a fair compensation for the associated level of risk and may not contradict market efficiency. Only if investors can systematically achieve superior risk-adjusted returns, markets can be considered inefficient.

Referring to the above-mentioned joint-hypothesis problem, an accurate model defining the relationship between risk and return is required to empirically test the EMH. Without such a model, it is impossible to tell whether investors are compensated fairly for bearing the securities’ risk. The most commonly applied asset pricing model is the Capital Asset Pricing Model (CAPM).¹³ Building on the CAPM and other models, the common methodology to empirically test the predictions of the EMH are *event studies*.¹⁴

Event studies are also the methodology of choice to research whether insiders earn abnormal returns and whether outsiders can profit from disclosed directors’ dealings. If it can be established that outsiders cannot, on average, earn abnormal returns based on the reported share dealings by insiders, the results provide support for the semistrong-form of market efficiency. Section 4.5 provides a synthesis of the existing literature on the returns for outsiders from imitating insiders as well as an outline of the event study methodology commonly employed.

4.2 Challenges to the Efficient Markets Hypothesis

After the publication of the classic paper by Fama (1970), the initial empirical evidence was overwhelmingly in favor of the semistrong-form of the EMH. Event studies, pioneered by Fama et al. (1969), and other research, found that the predictions of the EMH hold in the real world. Markets adjust quickly to relevant news, and stale information could not be used to predict future stock returns or to achieve abnormal profits. In addition, Scholes (1972) found that markets did not—or at least only very limitedly—react to non-relevant information, which confirmed the prediction of the EMH that prices do not react to non-relevant information.¹⁵

Given the mutual consent in the academic world with regard to the EMH, Jensen (1978) declared that “there is no other proposition in economics which has more solid empirical evidence supporting it than the Efficient Markets Hypothesis.”¹⁶ Shortly after, however, new empirical evidence and corresponding theoretical considerations began to challenge the efficient markets paradigm. The following section details the most prominent obstacles the EMH has faced.

¹³The CAPM has been developed by Sharpe (1964) and Lintner (1965), and builds upon the work of Harry Markowitz on diversification and modern portfolio theory.

¹⁴Kothari and Warner (2007), pp. 6–9, find that 565 event studies have been published in five leading journals during the period from 1974 to 2000. See section 4.4.2 for a discussion of asset pricing models commonly employed in event studies.

¹⁵If good substitutes exist, the price of a given stock should not react to the announcement of block sales of (uninformed) sellers because its price is determined by its relative value to its substitutes, not its supply. In line with the EMH, Scholes (1972) finds only very small negative abnormal returns after the announcement of large block sales. See Scholes (1972), p. 179, ff.

¹⁶See Jensen (1978), p. 95.

4.2.1 Theoretical Challenges to the Efficient Markets Hypothesis

The theoretical foundation of the EMH has been outlined in section 4.1.2. The main underlying assumptions of the EMH are that (i) investors are fully rational, (ii) trades by irrational investors are random, and (iii) arbitrageurs quickly eliminate mispricings if trades of irrational investors do not cancel each other out. The theoretical challenges of the EMH have mainly emerged from the behavioral finance literature, which has been motivated by the fact that the above propositions do not always seem to hold in the real world.

4.2.1.1 Investor Rationality

In particular, the first assumption, that investors are fully rational and maximize expected utility, has been subject to much criticism. First of all, the EMH predicts that uninformed investors adopt a passive investment strategy.¹⁷ In reality, however, market participants trade actively, and in many cases, they do so too often.¹⁸ Furthermore, much of the trading by agents is based on *noise*, instead of relevant information.¹⁹ Moreover, the trading decisions of active investors seem to be systematically biased. Market participants are subject to phenomena such as overconfidence, optimism, and over-reaction to chance events.²⁰ Kyle (1985) and Black (1986) have coined the term *noise traders* for agents who do not adhere to the economic decision-making model.²¹

4.2.1.2 Randomness of Irrational Trades

The second assumption, that irrational trades cancel out, is challenged by the *prospect theory* of Kahneman and Tversky (1979).²² The prospect theory was developed as a psychologically realistic alternative to the expected utility hypothesis and aims at modeling the observed behavior of agents. Kahneman and Tversky (1979) find that people are loss-averse, not to be confused with risk-averse, which leads to an inconsistent assessment of risk.²³ In addition, the prospect theory argues that people miscalculate probability. Supposedly, people assume very likely outcomes to be less probable than they are in reality, and extremely unlikely events as virtually impossible.

The prospect theory implies that irrational behavior does not occur randomly, but is systematic and correlated.²⁴ Shiller et al. (1984) argue that such effects can be amplified if investing is a social activity and market participants copy the irrational trades of their peers.²⁵

4.2.1.3 Arbitrage

If the first two theoretical assumptions of the EMH do not hold up, the efficient markets argument relies on the workings of arbitrage to install price efficiency. Behavioral finance, however, argues that arbitrage is costly and may not be as effective as warranted by the price impact of irrational investors. Arbitrageurs face transaction as well as holding costs. The higher these costs, the less arbitrage resources

¹⁷See Shleifer (2000), p. 10.

¹⁸See Barber and Odean (2000), p. 773, ff. Barber and Odean (2001) find that men trade more often than women, costing them return.

¹⁹See Black (1986), p. 530, ff.

²⁰For example Odean (1998) finds that investors are reluctant to realize their losses but realize gains earlier than rational behavior would suggest. See Kahneman and Riepe (1998), p. 52, ff., for a summary of behavioral biases.

²¹See Black (1986), p. 530, and Kyle (1985), p. 1315.

²²See Kahneman and Tversky (1979), p. 263, ff.

²³See *The Economist*, December 16, 1999.

²⁴See Shleifer (2000), p. 12.

²⁵See Shiller et al. (1984), p. 457, ff.

will be committed to eliminate mispricings, and the less irrational traders will lose. Section 4.3 further elaborates on these limits to arbitrage.

There are, however, additional considerations that indicate why the classical argument that irrational investors are driven out of the market because they lose money on average does not hold up.²⁶ Figlewski (1978) points out that it may take an extremely long time for irrational agents to lose all of their wealth, yet still agrees that they will do so in the long run. De Long et al. (1991), on the other hand, show that investors with irrational expectations about return variance may end up dominating the market in the long run, despite their excessive risk taking and consumption. Kyle and Wang (1997) argue that risk-neutral and overconfident traders may outperform rational ones specifically because of their overconfidence, which acts as a pre-commitment and leads rational investors to reduce their trading activity. Hirshleifer et al. (2006) also find that if stock prices influence corporate investment decisions and underlying cash flows, irrational agents may earn larger profits than rational ones.

4.2.2 Empirical Challenges to the Efficient Markets Hypothesis

Initially, the empirical evidence was overwhelmingly in favor of the EMH. Since the late 1970s, however, more and more researchers have found evidence that contradicts the semistrong and even the weak-form of the EMH. In most instances, the evidence presents itself in the form of anomalies, i.e., return behavior that is at odds with market efficiency. Stock market anomalies indicate profit opportunities, which should not exist in efficient markets. On the other hand, anomalies may reflect inadequacies of the underlying asset pricing model (joint-hypothesis problem). Several anomalies have been identified, and the most pressing and prevailing ones are presented next. These include the firm size effect, the book-to-market value effect, the momentum effect, long-term return reversal, the post-earnings announcement drift, the accrual anomaly, the closed-end fund anomaly, and the index inclusion effect.²⁷

In addition to the evidence stemming from stock market anomalies, Shiller (1981) provides an early and important challenge to the EMH. The author computes the present values of stock by discounting expected dividends by a constant real discount rate.²⁸ Under the EMH, changes in stock prices, or stock price indexes, are attributed to changes in future dividends. Shiller found the market's volatility, however, to be far greater than could be explained by changes in expected dividends, and thus rejects the EMH.²⁹

4.2.2.1 Firm Size Effect

One of the most prominent stock market anomalies is the *firm size effect*. Banz (1981) and Reinganum (1981) document that small firms, as measured by their market value of equity, have historically earned larger returns than predicted by the CAPM.³⁰ This suggests that investing in small companies yields abnormal profits. Chan and Chen (1991), however, argue that a larger proportion of small firms suffer from financial distress, which has to be counterbalanced for by larger expected returns.³¹ Along similar lines, Schwert (2003) finds that the return premium associated with small firms has disappeared, or at least decreased, since the anomaly was first published. A different argument is pursued by Fama and

²⁶See Friedman (1953) and section 4.1.2.3.

²⁷Surveys of stock market efficiency and anomalies include Beechey et al. (2000), Lo (2000), Schwert (2003), Malkiel (2003), and Subrahmanyam (2007).

²⁸See Shiller (1981), p. 421, ff.

²⁹Merton (1987), p. 93, ff., argues that Shiller (1981) misspecifies the fundamental value of stocks.

³⁰See Banz (1981), p. 3, ff., and Reinganum (1981), p. 19, ff. Jegadeesh (1992) also finds that market betas do not explain the cross-sectional differences in expected returns.

³¹See Chan and Chen (1991), p. 1467, ff.

French (1992) and Fama and French (1993). The authors point out that the average relationship between the CAPM beta and the return was flat during the 1963-1990 period, i.e., that the relationship between return and beta is insignificant.³² Instead, they suggest that size may be a more appropriate risk factor than market beta. In their three-factor model, Fama and French (1993) add measures for firm size and the book-to-market value ratio to the market beta as risk factors.³³ As expected, Fama and French (1993) find no evidence of the firm size anomaly under their three-factor model. Other factors that could put the firm size effect into perspective could be the decreased liquidity of small companies, for which investors have to be compensated.³⁴ Moreover, some studies could suffer from a survivorship bias if they fail to include small firms that went bankrupt during the period of study.

4.2.2.2 Value Effect

Investments in *value* stocks appear to be more profitable than investments in *growth* or *glamor* stocks. Value stocks are characterized by large tangible assets, earnings, or cash flows relative to their share price, as opposed to growth stocks. Nicholson (1960) finds that value stocks outperformed growth stocks, and Ball (1978), Basu (1977), and Basu (1983) demonstrate similar results.³⁵ De Bondt and Thaler (1985) find that portfolios consisting of value stocks produce statistically significant larger returns relative to growth stocks over holding periods of one to five years.³⁶ In addition, Lakonishok et al. (1994) find that value investing strategies are not associated with larger degrees of risk, and, thus, constitute a stock market anomaly.³⁷ Similar to the size effect, however, Fama and French (1993) argue that the market-to-book value is a common risk factor of stock returns. Applying their three-factor model to portfolios of stocks sorted according to their market value of equity, book-to-market ratio, and earnings-to-price ratio, Fama and French (1993) do not find abnormal returns to be systematically different from zero. Fama and French (1996) apply the same analysis to the portfolio sorts employed by Lakonishok et al. (1994) and also find that the anomaly disappears.

4.2.2.3 Momentum Effect

Although value stocks seem to outperform other investments in the long-term, the opposite seems to be true for the short-horizon. Jegadeesh and Titman (1993) find that stocks that have recently produced superior returns continue to do so for the following three to twelve months. Chan et al. (1996) suggest that this *momentum effect* can be explained at least partially by the slow adjustment of stock prices to earnings surprises. Jegadeesh and Titman (2001) demonstrate that this inefficiency continued to persist during the 1990s and hypothesize that the inefficiency may persist due to behavioral biases. The momentum effect is also the only examined anomaly that Fama and French (1996) fail to explain utilizing their three-factor model.

4.2.2.4 Long-term Return Reversal

Considering the general predictability of long-term returns, De Bondt and Thaler (1985), De Bondt and Thaler (1987), and Chopra et al. (1992) provide evidence orthogonal to market efficiency. Past losers, stocks with low returns during the past two to five years, seem to outperform past winners, stocks with

³²See Fama and French (1992), p. 427, ff.

³³See section 4.4.2.2.4 for a discussion of the Fama-French three-factor model.

³⁴See Malkiel (2003), p. 68.

³⁵The *superiority* of value stocks as investment vehicles has also been put forward by Graham and Dodd (1934).

³⁶See De Bondt and Thaler (1985), p. 793, ff.

³⁷See Lakonishok et al. (1994), p. 1541, ff.

high past returns. Fama and French (1996), however, find no reliable evidence of the anomaly employing their three-factor model. They contribute this to the correlation between past losers and small distressed firms.

4.2.2.5 Post-earnings Announcement Drift

As noted above, stock prices adjust slowly to surprises in earnings announcements. This inefficiency has been studied for almost four decades, and Fama (1998) tellingly refers to the inefficiency as the “granddaddy of all under-reaction events.”³⁸ Ball and Brown (1968) find abnormal returns after the release of earnings figures, but reason that profits are within the bounds of transaction costs.³⁹ Jones and Litzenberger (1970), on the other hand, argue that the post-earnings announcement drift contrasts market efficiency. They believe that professional opinions of research analysts and the like concerning the impact of earnings surprises are only “gradually disseminated to the general investing public.”⁴⁰ Bernard and Thomas (1990) provide evidence that investors underestimate the implications of current earnings for future results, which also contradicts market efficiency. Mendenhall (2004) argues that the post-earnings announcement drift is related to arbitrage costs.⁴¹

4.2.2.6 Accrual Anomaly

Sloan (1996) finds that the market misinterprets or neglects the information contained in current cash flow and accrual figures for future earnings. A trading strategy based on a long (short) position of companies with the lowest (highest) accruals yields abnormal profits in the following year.⁴² Collins and Hribar (2000), Bradshaw et al. (2001), and Xie (2001) show that the accrual anomaly is robust across different U.S. samples and time periods, and Pincus et al. (2007) find that the inefficiency also exists in other countries, especially in those with a common law legal system. For the German stock market, Kaserer and Klingler (2008) find that the accrual anomaly is concentrated in companies that report their financial statements according to IFRS or U.S. GAAP.

4.2.2.7 Closed-end Fund Anomaly

Various authors, such as Pratt (1966), Boudreaux (1973), Malkiel (1977), and Thompson (1978), have documented that closed-end mutual funds trade at a discount to the net asset value of their investments.⁴³ As opposed to open-end mutual funds, shares of closed-end funds cannot be redeemed with the fund itself and have to be sold to other investors. This leads to several potential explanations of the closed-end fund puzzle, including agency costs, taxes, and insipidity of assets. In addition, Zweig (1973) suggests that closed-end fund discounts are premiums that are the result of investor sentiment, and Lee et al. (1991) attribute the mispricing to noise trader risk stemming from irrational investors. Other studies, such as Pontiff (1997), point to behavioral biases and limits to arbitrage.⁴⁴

³⁸See Fama (1998), p. 286.

³⁹See Ball and Brown (1968), p. 174.

⁴⁰See Jones and Litzenberger (1970), p. 144.

⁴¹See section 4.5 for a discussion of Mendenhall (2004).

⁴²See Sloan (1996), p. 307, Table 6.

⁴³Lee et al. (1990) state that closed-end fund discounts surpass 30% in some instances. See Lee et al. (1990), p. 154.

⁴⁴See section 4.5 for a discussion of Pontiff (1997).

4.2.2.8 Index Inclusion Effect

Every now and then, Standard & Poor's drops or adds new stocks to its S&P 500 index. Such adjustment to index membership may become necessary because of M&A activity or because S&P feels that the market is better represented by the new composition of the index. Although S&P is not overly specific regarding the criteria for deleting and adding new stocks to its flagship index, S&P states that "the investment appeal of the stocks does not enter into the selection process."⁴⁵ If the inclusion of a stock in the S&P 500 reveals little about a firm's future prospects, stock prices should not react to such events in efficient markets. Even if changes in demand occur because of an index inclusion, the availability of perfect substitutes should ensure that prices remain unchanged. The reasoning here is similar to that of Scholes (1972), who studies the effect of large block sales on stock prices.

Shleifer (1986), however, finds that companies' stock prices rise by up to 3.19% on news regarding their inclusion in the S&P 500 index.⁴⁶ The results indicate that heavy mechanical buying by index funds triggered by the inclusion is not balanced by investors shifting their holdings into substitutes. Shleifer (1986) interprets this finding as evidence for a downward sloping demand curve of stocks. Other potential explanations of the abnormal returns observed at a firm's index inclusion are liquidity (Edmister et al. 1996), information (Denis et al. 2003), and limits to arbitrage (Wurgler and Zhuravskaya 2002).

4.2.3 Implications for the Efficient Markets Hypothesis

Thirty years after the classic paper by Fama (1970), the discussion surrounding the validity of the EMH is still ongoing and unlikely to cease any time soon. Nevertheless, a common theme emerges in the literature: markets seem to be generally efficient, but periods of inefficiency and other exceptions are hard to curtail.

Proponents of the EMH argue that the anomalies brought forward suffer from the bad model problem, arising out of the inaccurate modeling of underlying the risk-return relationship.⁴⁷ While changing or modifying the asset pricing model or other methodology may render some of the anomalies more apparent than real, even two of the most prominent supporters of the EMH, Eugene Fama and Kenneth French, fail to refute all of the inefficiencies.⁴⁸

Others, such as Lo and MacKinlay (1990), point to the problem of data snooping in empirical tests of market efficiency. The argument goes that researchers are incentivized to focus on the finding of anomalies and unusual results because of the associated larger attention by the academic community. Moreover, Schwert (2003) argues that anomalies disappear if different samples or time periods are being studied, in part because practitioners implement investment strategies to exploit the inefficiencies.

Fama (1998) proposes another interesting argument in that the overreaction of stock prices is as common as the underreaction to information. Combined with the idea that anomalies are chance results, Fama implicitly argues that the anomalies themselves provide proof in favor of the EMH.

Nevertheless, many researchers question the validity of the above arguments and believe that the market is, at least temporarily and in some instances, "wrong." Their primary focus is the search for theoretical explanations of market inefficiencies, which can be hard to come by. This search has led to a whole new body of literature in economics—behavioral finance.

Behavioral finance argues that market inefficiencies are a result of investor irrationality and behavioral

⁴⁵See Jain (1987), p. 58.

⁴⁶See Shleifer (1986), p. 583, Table 2.

⁴⁷See Fama (1998), p. 283, ff.

⁴⁸See Fama and French (1996), p. 55, ff.

biases. The field mainly pursues two approaches: *limits to arbitrage* and *psychology*.⁴⁹ The limits to arbitrage literature argues that rational investors fail to correct the mispricings caused by irrational traders because arbitrage is costly.⁵⁰ Psychology, on the other hand, classifies the most likely deviations from rational behavior.

The limits to arbitrage literature offers some compelling—and in some sense, reconciliatory—arguments regarding the efficient markets hypothesis. Since the empirical analysis conducted in chapter 6 explores the effects of costly arbitrage in the context of directors' dealings, the line of argument and the underlying theory of the limits to arbitrage literature are presented in the following section.

4.3 Limits to Arbitrage

If it is the case that anomalies are manifestations of trading decisions of irrational investors, the question arises why rational traders fail to undo mispricings. This issue is addressed by the limits to arbitrage literature. Textbook arbitrage does not require any capital or equity and does not entail any risk. An arbitrageur buys (sells) an underpriced (overpriced) asset and sells (buys) a virtually identical security as a hedge. No net investment is required, and profits are earned instantaneously. The effect of such arbitrage trading is that the mispricing narrows, and stock prices move towards their fundamental value.

Obviously, real-world arbitrage is not as straightforward. In the real world, arbitrage is *risky* as well as *costly*, as agents are subject to *holding costs* and *transaction costs*.⁵¹ While transaction costs are only incurred when a position is opened or closed, holding costs are proportional to the investment period and are continuously incurred until the position is closed.

The main argument of the limits to arbitrage literature is that these costs prevent rational traders from fully eliminating the doings of irrational traders, i.e., mispricings. Moreover, the literature suggests that inefficiencies are more pronounced in assets with larger arbitrage costs, since they restrain arbitrageurs and thus reduce the number of rational trades.⁵²

4.3.1 Transaction Costs

Transaction costs deter arbitrage trading and thus impede price efficiency. Garman and Ohlson (1981) show that if market participants face transaction costs, the price of an asset equals its fair or frictionless price, plus/minus a so-called *fudge factor*, which can be interpreted as a price bound around the frictionless price of assets. Larger transaction costs imply a larger fudge factor and consequently widen the bounds around the fundamental value in which the equilibrium price with transaction costs may lie; this ultimately leads to greater security mispricings.⁵³

Arbitrageurs face a variety of transaction costs whenever a trade is executed. Generally, these costs can be classified into *direct* and *indirect* transaction costs. Direct transaction costs are easily observable and mainly include brokerage commissions and fees. Since typical arbitrage trading entails the buying and selling of two assets, the costs for investors amount to two round-trip transaction costs per arbitrage trade. Indirect transaction costs are not as easily observable and include costs such as market impact costs, bid-ask spreads, and illiquidity. Market impact costs equal unfavorable price movements caused by the

⁴⁹See Campbell (2000), Shleifer (2000), Barberis and Thaler (2003b), and Subrahmanyam (2007) for a survey of behavioral finance.

⁵⁰See Pontiff (2006) for a survey of the limits to arbitrage literature.

⁵¹Pontiff (1996) pioneered the classification of arbitrage costs into holding and transaction costs. See Pontiff (1996), p. 1138.

⁵²See Pontiff (2006), p. 38.

⁵³See Garman and Ohlson (1981), pp. 275–278.

transaction itself, i.e., an appreciation of stock prices in case of purchase transactions and a depreciation in the case of sale transactions. Market impact costs are predominantly relevant for institutional investors trading large volumes.⁵⁴

Another form of indirect transaction costs are bid-ask spreads, which act as a premium for buying/selling at the particular point in time. The quoted ask price includes a premium for immediate buying and the quoted bid price a discount for immediate selling.⁵⁵ As such, bid-ask spreads may also act as a proxy for the liquidity of a given security. Bid-ask spreads also compensate market makers for their incurred order processing costs, inventory holding costs, and adverse information costs.⁵⁶

Illiquidity in stocks can lead to delays in the processing of orders, which can cause adverse price effects. Bagehot (1971) recognizes that illiquidity in securities primarily stems from adverse selection, which arises from informed investors trading on private information.

If *total* transaction costs are larger than the gains that can be derived from exploiting the mispricing, arbitrageurs will have no incentive whatsoever to act on it. If, on the other hand, total transaction costs are smaller than the alpha of the mispriced security, arbitrageurs must decide how much wealth they commit to the position. In doing so, rational agents will also have to consider the holding costs associated with the trade.

4.3.2 Holdings Costs

Holding costs accumulate over time and are proportionate to the investment horizon.⁵⁷ They include noise trader risk, short-selling constraints, and idiosyncratic risk, which arises out of imperfect hedges. Dividends, on the other hand, are *negative* holding costs.

Shleifer and Vishny (1990) and Tuckman and Vila (1992) show that holding costs influence investor behavior in that they deter arbitrage activity.⁵⁸ As a result, mispricings are larger in securities that are associated with large holding costs. Since holding costs accumulate with time, longer-term securities generally exhibit larger holding costs than shorter-term assets.⁵⁹ Tuckman and Vila (1992) point out that even if the fundamental risk of a mispriced security can be perfectly hedged, costs stemming from short-selling could dwarf any gains if the mispricing persists for a long period of time. Barberis and Thaler (2003a) refer to this risk as *horizon risk*. Horizon risk differs from *mispricing risk*, which refers to the worsening of the overvaluation or undervaluation in the short-term.⁶⁰ Since mispricing risk may also lead to potential losses, it also deters arbitrage.

4.3.2.1 Idiosyncratic Risk

Pontiff (2006) argues that idiosyncratic risk is the most important cost arbitrageurs face.⁶¹ To appreciate the role of idiosyncratic risk for rational agents, the mechanics of arbitrage have to be revisited one more time. Textbook arbitrage involves buying (selling) shares of an overvalued (undervalued) security and selling (buying) a fair-priced security that is *perfectly correlated* with the fundamental value of the mispriced stock. The arbitrageur then holds this position until the price of the mispriced security reflects

⁵⁴For a survey on the impact of institutional trading on stock prices, see, for example, Keim and Madhavan (1998), p. 50, ff.

⁵⁵See Amihud and Mendelson (1986), p. 223.

⁵⁶See Stoll (1989), p. 115.

⁵⁷See Pontiff (1996), p. 1138.

⁵⁸See Shleifer and Vishny (1990), p. 148, ff., and Tuckman and Vila (1992), p. 1283, ff.

⁵⁹See Shleifer and Vishny (1990), p. 148.

⁶⁰See De Long et al. (1990), p. 703, ff.

⁶¹See Pontiff (2006), p. 45.

its fair and fundamental value. Changes in the fundamental value of the mispriced asset are irrelevant to the arbitrageur, since any change will be compensated by the substitute security, i.e., by the hedging position.

In reality, however, perfectly correlated substitutes may be hard to come by. For some assets, such as the stock market as a whole, good substitutes do not exist at all. On a stock level, acceptable or good substitutes may be available, but they will hardly be perfectly correlated with the mispriced security.⁶² If the fundamental value of the substitute is not perfectly correlated with that of the mispriced security, i.e., the hedge is imperfect, the arbitrageur will be exposed to fundamental risk, which is also often referred to as *arbitrage risk*.⁶³

As an example, Barberis and Thaler (2003a) propose buying Ford's stock and selling General Motors at the same time as a hedge.⁶⁴ Losses in Ford's shares stemming from bad news concerning the car industry as a whole will be offset by the gains from the hedging position in General Motors. The arbitrageur, however, will still be subject to company-specific risk, such as a product recall by Ford.⁶⁵ Thus, the quality and riskiness of an arbitrage trade ultimately depend on the quality of the hedge, which in turn is only as good as the available substitutes.

The availability of close substitutes is largely determined by the level of *idiosyncratic risk* associated with a stock. The systematic part of a stock's total risk, however, can be hedged relatively easily by taking an opposite position in, for example, the market index.⁶⁶ It is, however, substantially more difficult to find a hedging position if a stock is highly idiosyncratic. This argument also implies that the fundamental risk arbitrageurs will have to bear will consist mainly of idiosyncratic risk, since this part of the residual fundamental risk is much more difficult to hedge than systematic risk.⁶⁷

That idiosyncratic risk matters to arbitrageurs may seem counter-intuitive, since the CAPM and modern portfolio theory imply that idiosyncratic risk does not matter because of diversification. Nevertheless, idiosyncratic risk is relevant under several conditions.

First, Shleifer and Vishny (1997) point out that real-world arbitrage is conducted by a relatively small number of specialized investors, such as hedge funds and other institutional investors.⁶⁸ The term "specialized" implies that these arbitrageurs are active only in a limited number of large projects, so that the arbitrageurs are not fully diversified.⁶⁹ Thus, if arbitrageurs are risk-averse, idiosyncratic volatility is relevant. Moreover, Bennett and Sias (2007) argue that because arbitrageurs have to bear idiosyncratic risk from the mispriced security as well as their hedging position, diversification is much more difficult than for traditional investors, and even large portfolios of 200 securities or more contain non-negligible idiosyncratic volatility.⁷⁰

However, even if arbitrageurs are fully-diversified, idiosyncratic risk is still important. Treynor and Black (1973) and Stevens (1998) show that portfolio weights on individual *mispriced* securities depend on the extent of the over- or undervaluation as well as the security's idiosyncratic volatility. Pontiff

⁶²Wurgler and Zhuravskaya (2002) find that good substitutes can reduce the variance of returns by three-fifths for some stocks. For most stocks, however, the reduction in variance amounts only to one-fifth of total variance, indicating that good substitutes are not easy to find. See Wurgler and Zhuravskaya (2002), p. 594.

⁶³The terms *arbitrage risk* and *idiosyncratic risk* are used interchangeably throughout the discussion of limits to arbitrage. Another term also used in the literature is *risk arbitrage*. See Jensen (1994), p. 50.

⁶⁴See Barberis and Thaler (2003a), p. 1058.

⁶⁵If no perfect substitute security exists, the arbitrageur will also be subject to idiosyncratic risk stemming from the *hedging position* itself, in this case from General Motors. See Bennett and Sias (2007), p. 4.

⁶⁶See Pontiff and Schill (2003), p. 10.

⁶⁷Shleifer and Vishny (1997) point out that unhedgeable fundamental risk will nevertheless consist out of both idiosyncratic and systematic risk. See Shleifer and Vishny (1997), p. 49.

⁶⁸See Shleifer and Vishny (1997), p. 36.

⁶⁹See Shleifer and Vishny (1997), p. 51.

⁷⁰See Bennett and Sias (2007), p. 1, ff.

(2006) points out that the investor’s weight on a single mispriced security is independent of the total number of mispriced securities in the portfolio:

$$x_i = \left(\frac{\alpha_i}{\lambda \sigma_{e_i}^2} \right)$$

where α_i is the mispricing of security i expressed in returns, λ is the risk aversion parameter of the arbitrageur, and σ_{e_i} is the idiosyncratic variance of security i .⁷¹ Consequently, investors consider a mispriced security’s idiosyncratic volatility, regardless of the number of available projects.⁷²

4.3.2.2 Noise Trader Risk

Given that perfect substitutes are available, arbitrageurs will be able to completely hedge the fundamental risk of a mispriced security. In inefficient markets, however, security prices consist of the fundamental or fair value, plus/minus a mispricing. De Long et al. (1990) and Shleifer and Vishny (1997) demonstrate that fluctuations of the mispricing, which arbitrageurs strive to exploit and eliminate, pose a risk to arbitrageurs.

The authors argue that *noise traders* may further worsen the mispricing in the short-term before the mispricing disseminates in the long-run. Noise traders are irrational and hold beliefs about expected returns that are not warranted by fundamentals. This poses a threat for professional real-world arbitrageurs, who do not manage their own money but receive funds from outside investors. This agency relationship complicates arbitrage for professional asset managers. Shleifer and Vishny (1997) argue that if investors are unsophisticated and do not understand arbitrage trading strategies, such investors may resolve to rely on past returns to evaluate future prospects of asset managers.⁷³

If noise traders continue to be optimistic (pessimistic) about an already overvalued (undervalued) security, their actions could drive the stock price even further up (down) in the short-run. If such an adverse price move is not hedged, the arbitrageur’s position yields a negative return. As a result, outside investors may be inclined to withdraw their funds, and arbitrageurs could be forced to liquidate their positions prematurely, potentially leading to losses.⁷⁴ Anticipating this risk, arbitrageurs may be less inclined to take advantage of mispricings than if they invest only their own equity.

The implications of the principal-agent relationship are even more severe if the arbitrageur invests funds from creditors.⁷⁵ If assets are marked-to-market, poor short-term returns diminish the underlying collateral, triggering the calling of loans and the early unwinding of trades.⁷⁶ Barberis and Thaler (2003b) point out that if the arbitrageurs had a long-term investment horizon, they would not suffer from noise trader risk. Rational traders could hold their arbitrage positions until the mispricing disappears (neglecting other holding costs that could grow larger than the gains from the mispricing).

4.3.2.3 Short-selling Constraints

Since arbitrage involves selling at least one security short, any short-sale constraints reduce its attractiveness. First, short-sellers need to identify someone willing to lend them the relevant shares. D’Avolio (2002) finds for the U.S. stock market that approximately 84% of all stocks and 99% of the market

⁷¹See Pontiff (2006), p. 44, Equation 6.

⁷²See Pontiff (2006), pp. 43–45.

⁷³See Shleifer and Vishny (1997), p. 41.

⁷⁴See Shleifer and Vishny (1997), p. 48.

⁷⁵See Liu and Longstaff (2004), p. 612, ff.

⁷⁶The eroding of collateral due to short-term adverse price movements in arbitrage trades contributed, amongst other factors such as high leverage, to the collapse of Long Term Capital Management. See Lowenstein (2001).

capitalization can be borrowed.⁷⁷ Second, fees have to be paid for borrowing stocks. These are relatively small for most stocks and average seventeen basis points per annum. Nine percent of U.S. stocks, however, require shorting fees of 100 basis points per year and above.⁷⁸ Third, in addition to the fee, short-sellers are usually subject to margin requirements concerning the short-sale proceeds. If the interest received on the collateral is lower than invested otherwise, the margin requirements result in opportunity costs of capital, which are positively related to the risk-free rate.⁷⁹ Fourth, short-sellers stand the risk of their shares being recalled by the lender. If the borrower is unable to find another lender, the borrower may be forced to close the position. Yet, D'Avolio (2002) finds that recalls are very rare.⁸⁰ Furthermore, some asset managers, such as pension and mutual funds, are not permitted to engage in short-selling at all.⁸¹

4.3.2.4 Dividends

Dividends are a *negative* holding cost in the sense that they reduce the duration of the arbitrage position.⁸² Every time dividends are paid, the amount of devoted capital to an arbitrage position is reduced. This reduces future holding costs, as these are a function of the size of the position.

4.3.3 Empirical Evidence on Limits to Arbitrage

As noted above, mispricings are positively correlated to the costs and risks of arbitrage. If the limits to arbitrage are high, the potential profits for investors are lower, thus reducing arbitrage activity. If the mispricing is smaller than the costs of exploiting it, no arbitrage activity will take place. When arbitrage is hindered or not present at all, prices will deviate from their fundamental value, as the impact of irrational traders and their expectations are not countered by rational arbitrageurs.

Early papers on limits to arbitrage concentrated primarily on transaction costs. Several recent papers, however, focus on the relationship between mispricings and holding costs, idiosyncratic risk in particular. The basic theoretical implication of limits to arbitrage is that the greater the idiosyncratic volatility of an asset, the larger its mispricing or the associated inefficiency. Since this relationship is also the general theme of the empirical analysis in chapter 6, the most important and influential research of this growing body of literature is presented in—more or less—chronological order next.⁸³

Probably the first empirical paper studying the effects of arbitrage risk on mispricing is Pontiff (1996). The author studies the closed-end fund puzzle in order to determine whether the divergence between the funds' underlying asset value and their market value stems from mispricing or other factors.⁸⁴ The results show that the idiosyncratic risk of a fund's portfolio is statistically significantly related to the absolute value of price premiums.⁸⁵ In addition, transaction costs and interest rates, a proxy for the opportunity cost of capital, are also positively related to price differentials. Dividends, on the other hand, are negatively related to the funds' premiums, as predicted by theory. Pontiff (1996) concludes that his results imply that idiosyncratic volatility is the most important barrier to arbitrage and prevents mispricings from dissipating.

⁷⁷See D'Avolio (2002), p. 273.

⁷⁸See D'Avolio (2002), p. 273.

⁷⁹See Pontiff (1996), p. 1138–9.

⁸⁰See D'Avolio (2002), p. 273.

⁸¹See Barberis and Thaler (2003a), p. 1059.

⁸²See Pontiff (1996), p. 1139–40.

⁸³Pontiff (2006) provides a survey of the idiosyncratic risk in the context of limits in arbitrage literature.

⁸⁴See also section 4.2.2.7 for a general discussion of the closed-end fund puzzle.

⁸⁵See Pontiff (1996), p. 1143, Table 1.

Ackert and Tian (2000) examine the efficient pricing of Standard and Poor's Depository Receipts (SPDRs), which are securities that track the performance of a stock index, yet are tradable very much like stocks. Limits to arbitrage in SPDRs are low, since the dividend yield is high and transaction costs are low. In addition, virtually no idiosyncratic risk affects SPDRs, since the weights of the individual stocks are predetermined, and SPDRs can be redeemed for shares in individual stocks. Thus, perfect hedge portfolios for SPDRs can be constructed. As expected, Ackert and Tian (2000) find only extremely low mispricings that are never greater than 1%, as opposed to the premiums associated with closed-end funds. However, MidCap SPDRs, which track the S&P MidCap 400 index, exhibit economically significant mispricings. Ackert and Tian (2000) argue that MidCap SPDRs are subject to larger arbitrage costs because the S&P MidCap 400 index consists of relatively small companies. On average, the MidCap SPDR mispricing is about nine times higher than the SPDR mispricing.

Wurgler and Zhuravskaya (2002) relate the index inclusion effect to idiosyncratic risk.⁸⁶ They find that stocks with lower arbitrage risk have smaller price reactions to inclusion. The authors argue that their results show that arbitrage is weaker and mispricings stronger in stock without close substitutes. Arbitrage risk is proxied by two measures. The theoretically more vested measure is the residual variance of a regression of excess returns on three substitute securities. The three substitutes are stocks that match the respective stock on industry, size, and book-to-market value as closely as possible. The second measure is the residual variance of a market model regression, utilizing the S&P 500 Index as proxy for the market return. Both measures of arbitrage risk, however, are closely correlated and yield very similar results.⁸⁷ In addition, Wurgler and Zhuravskaya (2002) show that empirically, the proxies for arbitrage risk are of similar size than a stock's total variance, implying that few good substitutes exist for equity securities.

Baker and Savasoglu (2002) investigate a merger arbitrage trading strategy, which involves buying the shares of the target company and shorting the stock of the acquiring firm. While idiosyncratic risk is not specifically computed, it is proxied by ex-ante measures for completion risk and target size. Since the authors find both measures to be positively related to abnormal returns, they provide evidence that idiosyncratic risk impedes merger arbitrage resources.

Ali et al. (2003) study the idiosyncratic risk in the context of the book-to-market anomaly.⁸⁸ Idiosyncratic risk is proxied by the variance of market model residuals under the Center for Research in Security Prices (CRSP) value-weighted market index. The authors find a stronger relationship between the book-to-market ratio and predicted returns in highly idiosyncratic stocks. This relationship is also stronger if transaction costs are high. If both idiosyncratic volatility and firm size are included as independent variables in their regression analysis, arbitrage risk is not statistically significant, yet it has the expected sign.⁸⁹

Pontiff and Schill (2003) study long-run abnormal returns in the context of seasoned equity offerings (SEO) and arbitrage risk. Loughran and Ritter (1995), for example, find that companies in the three years following the issuing of shares significantly underperform their peers. Consistent with the limits to arbitrage framework, Pontiff and Schill (2003) find that firms conducting SEOs are overvalued and that the mispricing is primarily related to idiosyncratic volatility. The explanatory power of arbitrage risk also dwarfs that of the size effect in post-SEO returns found by other studies.⁹⁰

⁸⁶See also section 4.2.2.8 for a general discussion of the index inclusion effect.

⁸⁷See Wurgler and Zhuravskaya (2002), pp. 592–594.

⁸⁸See also section 4.2.2.2 for a general discussion of the value effect.

⁸⁹See Ali et al. (2003), p. 370, Table 4.

⁹⁰See, for example, Brav and Gompers (1997), Brav et al. (2000), and Mitchell and Stafford (2000).

Mendenhall (2004) relates the post-earnings announcement drift to idiosyncratic risk.⁹¹ The author argues that the anomaly is not exploited by rational investors because of limits to arbitrage and finds supporting evidence. Mendenhall (2004) shows that the effect is strongly related to the idiosyncratic risk, which is proxied by the same measure used by Wurgler and Zhuravskaya (2002). While the results concerning transaction costs are not conclusive, the anomaly is negatively related to a stock's trading volume. This is consistent with theory, since high trading volumes indicate low transaction costs.

Asquith et al. (2005) find that short-sale constrained stocks generally underperformed between 1988 and 2002 by about 2.15% per month on an equally-weighted basis.⁹² Stocks are short-sale constrained if the short interest ratio (shares sold short/shares outstanding) is high.

The role of idiosyncratic risk in the persistence of the accrual anomaly is examined by Mashruwala et al. (2006).⁹³ While transaction costs are also positively correlated to abnormal profits, idiosyncratic risk is generally the strongest explanatory variable of excess returns. The proxy for idiosyncratic risk is based on monthly returns relative to the equally-weighted CRSP index.

In contrast to the papers presented so far, Brav and Heaton (2006) argue that idiosyncratic risk is related neither to the firm size, value, or momentum effect, nor to the post-earnings announcement drift.⁹⁴ In fact, the anomalies are smallest when arbitrage risk is most pronounced. The proxy of idiosyncratic risk, however, is derived by a four-factor model, including the three-factors of Fama and French (1993) plus a momentum factor. As Fama and French (1996) show, incorporating these factors alone may eliminate the examined anomalies. In addition, the authors rely on calendar-time portfolios in which firm returns are value-weighted rather than equal weighted, which may influence results.

Duan et al. (2007) examine how idiosyncratic risk deters arbitrage among short-sellers. In stocks with high short-interest, arbitrage risk is positively related to returns. Not so, however, in low short interest stocks. The authors conclude that idiosyncratic risk is the greatest barrier to arbitrage over medium horizons and that idiosyncratic risk poses a greater obstacle to market efficiency than short-selling constraints outlined by Miller (1977).

Au et al. (2007) find for the U.K. market that stocks with low short interest outperform stocks with high short interest. In contrast to the U.S., however, portfolios consisting of high short-interest stock do not produce reliable negative abnormal returns. In addition, Au et al. (2007) find a negative relationship between short interest and idiosyncratic risk. This is consistent with the notion that arbitrageurs avoid shorting highly idiosyncratic stock because of the larger associated costs.

Cohen et al. (2007) examine abnormal returns in the proximity of periodic earnings announcements. The common explanation for this earnings announcement premium is that it compensates for "disclosure risk."⁹⁵ Cohen et al. (2007), however, find that the bid-ask spread and idiosyncratic risk are positively correlated with the premium.

Ben-David and Roulstone (2007) study the relationship between idiosyncratic risk and corporate transactions (insider trading, share repurchases, and SEOs). The authors find that firms as well as insiders follow a contrarian trading approach, which is especially pronounced in highly idiosyncratic companies where mispricings are large. Ben-David and Roulstone (2007) also reason that the slow response of the market to corporate transactions is a result of the large limits to arbitrage associated with idiosyncratic companies.

⁹¹See also section 4.2.2.5 for a general discussion of the post-earnings announcement drift.

⁹²For average value-weighted return, negative returns are not statistically significant.

⁹³See also section 4.2.2.6 for a general discussion of the accrual anomaly.

⁹⁴The firm size effect is discussed in section 4.2.2.1, the value effect in section 4.2.2.2, the momentum effect in section 4.2.2.3, and the post-earnings announcement drift in section 4.2.2.5.

⁹⁵See, for example, Penman (1984), Kalay and Loewenstein (1985), and Ball and Kothari (1991).

McLean (2008) relates the long-term reversal of stock returns to idiosyncratic risk and finds that the difference between high and low idiosyncratic volatility portfolios amounts to 1.5% per month.⁹⁶ Regarding the momentum effect, however, the author finds evidence that contradicts the costly arbitrage hypothesis—highly idiosyncratic stocks exhibit the least sensitivity to the momentum effect.

Although Brav and Heaton (2006) present orthogonal evidence, the majority of research suggests that idiosyncratic volatility is the most persuasive obstacle to arbitrage, dwarfing transaction costs and other holding costs such as noise-trader risk.⁹⁷ In many instances, idiosyncratic risk is related to mispricings and stock market anomalies. This positive relationship may explain why so many anomalies still exist decades after they have been first brought to light. As pointed out by Ben-David and Roulstone (2007), idiosyncratic risk may also play a role in the trading behavior of corporate insiders. Chapter 6 will also examine the relationship between arbitrage risk and insider trading, yet from a different perspective by examining the returns to outsiders. The next section studies whether a market inefficiency with regard to directors' dealings exists.

4.4 Event Study Methodology

Event study methodology has been pioneered by Fama et al. (1969) and since then has become the preferred method to measure the security price reaction to a large variety of events.⁹⁸ These events can be macroeconomic events, such as changes in interest rates, unemployment rates, and inflation, or corporate events such as M&A, earnings, and directors' dealings announcements. Generally, event studies can be classified into long-run and short-run event studies. While the former attempts to measure the valuation effects of events over several months or even years, the latter uses daily financial data. The following sections outline the event study methodology commonly employed in the analysis of the stock price effect caused by disclosed directors' dealings. First, the structure and design of event studies are presented (section 4.4.1), followed by a description and evaluation of asset pricing models (section 4.4.2), and a discussion of the regression framework commonly utilized to parameterize the effects of an event (section 4.4.3).

4.4.1 Structure and Design of Event Studies

Event studies generally follow a certain structure of analysis.⁹⁹ First, the event of interest needs to be defined. Second, the time period during which the reaction of stock prices to the event—the event window—is defined. In short-horizon event studies, the event window typically includes the day of the announcement and several post-event days. Third, sample selection criteria are determined. This includes the sample period, any restrictions due to data availability, and other filters to ensure the integrity of the data set. Fourth, abnormal returns for the event window are computed. Other common terms for abnormal profits are excess returns, prediction errors, or residuals. Abnormal returns are given by the actual ex-post return of a security minus the return that would have been expected if the event had not occurred. Thus, a security pricing model for expected returns has to be chosen. Popular choices are the market model and the constant mean return model. Depending on the normal performance model, the estimation window has to be specified. The estimation window is used to estimate the parameters of the

⁹⁶See also section 4.2.2.4 for a general discussion of the long-term return reversal anomaly.

⁹⁷Pontiff (2006) also makes this points. See Pontiff (2006), p. 45.

⁹⁸See Binder (1998), p. 112.

⁹⁹See Campbell et al. (1997), pp. 150–152, Bowman (1983), p. 563, and Peterson (1989), p. 36, ff., Henderson (1990), p. 284.

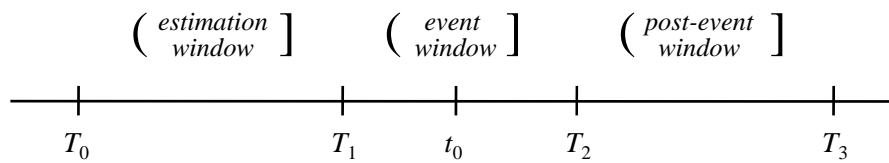


Figure 4.1: Exemplary Event Study Time Line¹⁰⁰

securities return model. Typically, the estimation period falls before the event date and does not include the event window in order to prevent the event from influencing the estimation of the asset return model. Figure 6.1 demonstrates the typical time sequence of event studies. Fifth, a testing framework for the estimated excess returns has to be developed. This involves the formulation of a null hypothesis, the aggregation of abnormal returns, and the specification of appropriate test statistics. Finally, the results are presented, analyzed, and interpreted.

4.4.2 Asset Pricing Models

As noted above, asset pricing models, or normal performance models, are essential to any event study, since they allow for the calculation of abnormal returns caused by the event of interest. Several asset pricing models have been developed. The different theories can generally be grouped into economic and statistical models.¹⁰¹ This section provides an overview of the available models and their most important properties.

4.4.2.1 Economic Models

Economic models are based on assumptions regarding the behavior of investors. Like statistical models, however, economic models rely on statistical properties to be applied in practice. As a result, economic models can be viewed as statistical models with additional economic restrictions imposed on them.¹⁰² The most important economic models are the Capital Asset Pricing Model (CAPM), the Arbitrage Pricing Theory (APT), and Multifactor Pricing Models.

4.4.2.1.1 Capital Asset Pricing Model The *CAPM* was developed by Sharpe (1964), Lintner (1965), and Mossin (1966), and “marks the birth of asset pricing theory.”¹⁰³ Originally, the CAPM was based upon the works of Markowitz (1952). Black (1972) derived a more general CAPM model that does not require risk-free borrowing and lending. In addition, Merton (1973) developed an intertemporal, and Lucas (1978) and Breeden (1979) a consumption-based version of the CAPM. Today, the CAPM remains one of the most widely used tools in practice and is the cornerstone of most finance courses.

As any other asset pricing model, the most useful property of the CAPM is that it enables economists to quantify risk and the required compensation for bearing it.¹⁰⁴ The main implication of the CAPM is that the expected return of a security is linearly related to the covariance of its returns with the return

¹⁰⁰ Adopted from MacKinlay (1997), p. 20, Figure 1.

¹⁰¹ See MacKinlay (1997), p. 17.

¹⁰² See MacKinlay (1997), p. 19.

¹⁰³ See Fama and French (2004), p. 1.

¹⁰⁴ See Campbell et al. (1997), p. 181.

of the market portfolio. Specifically, if the existence of risk-free lending and borrowing is assumed, the expected return of security i takes the form,

$$E(r_i) = r_f + \beta_i(r_m - r_f)$$

$$\beta_i = \frac{Cov(R_i, R_m)}{Var(R_m)}$$

where

- $E(r_i)$: Expected return of security i
- r_f : Risk-free rate
- β_i : Beta coefficient of security i
- r_m : Market return
- $r_m - r_f$: Market risk premium

Thus, the expected return of security i depends primarily on its beta factor, which measures the security's systematic risk. Systematic risk is the part of the security's statistical variance that cannot be eliminated by portfolio diversification. As a result, the CAPM establishes a relationship that rewards only the bearing of systematic, not idiosyncratic, risk.

4.4.2.1.2 Arbitrage Pricing Theory Economists have pointed out several shortcomings of the CAPM.¹⁰⁵ In general, the cross-section of average stock returns does not seem to be explained very well by the CAPM's beta factor alone.¹⁰⁶ As a result, researchers have looked for additional risk factors suited to explain expected returns.

Ross (1976) developed the *Arbitrage Pricing Theory* (APT), which allows for an unlimited number of factors. The APT does not, however, specify which kind of factors these should be.¹⁰⁷ Chen, Roll, and Ross (1986) identify four macroeconomic factors as significant in the return-generating process: industrial production, changes in the risk premium, surprises in the yield curve, unanticipated changes in inflation, and changes in expected inflation.¹⁰⁸ Additional macroeconomic factors may be short-term interest rates, commodity prices, and diversified market indices such as the S&P 500.

Similar to the CAPM, the multiple risk factors are linearly related to the expected return:

$$E(r_i) = \lambda_{i,0} + \lambda_{i,1}F_1 + \lambda_{i,2}F_2 + \dots + \lambda_{i,K}F_K$$

where

- $E(r_i)$: Expected return of security i
- $\lambda_{i,k}$: Factor sensitivity of security i to factor k
- F_k : Realization of factor k
- K : Number of risk factors

The underlying assumptions of the APT are that markets are competitive and frictionless, so that no arbitrage opportunities exist. Like the CAPM, the APT argues that only systematic risk, and not total

¹⁰⁵See Fama and French (1996) for a discussion of the anomalies associated with the CAPM.

¹⁰⁶See, for example, Banz (1981), p. 3, ff., Reinganum (1981), p. 19, ff., and Breeden et al. (1989), p. 231, ff.

¹⁰⁷Using stock price data from 1962-1972, Roll and Ross (1980) find that at least three, maybe four, factors explain expected returns.

¹⁰⁸See Chen et al. (1986), p. 402. Burmeister and Wall (1986) explore the relevance of unexpected changes in the risk premia, the term structure, inflation, and the growth rate of real final sales in an APT setting.

risk, matters.¹⁰⁹ Unlike the CAPM, however, the APT does not require that all investors behave alike. It also does not claim that the capital-weighted market portfolio is the only risky asset that will be held. In addition, the APT does not require the identification of the market portfolio, which can be an extremely difficult undertaking.

While one of the APT's advantages compared to the CAPM is that the APT is based on fewer assumptions, it has been questioned whether the APT is at all testable.¹¹⁰ Moreover, the empirical relevance of the APT has been challenged.¹¹¹ In the German stock market, Steiner and Nowak (1994) find that the explanatory power of the APT does not dominate that of the CAPM.¹¹²

4.4.2.2 Statistical Models

In contrast to economic models, statistical models do not rely on assumptions regarding the behavior of investors. Instead, statistical models are based on statistical assumptions concerning the behavior of asset returns.¹¹³ In particular, statistical models assume that financial returns are distributed jointly multivariate normal, as well as independently and identically throughout time.¹¹⁴ While this assumption is often violated, especially in the case of daily returns, MacKinlay (1997) and Brown and Warner (1985) argue that this does not lead to model misspecification in practice.¹¹⁵ The most important statistical models are the mean adjusted return model, the market adjusted return model, the market model, and multifactor pricing models.

4.4.2.2.1 Mean Adjusted Return Model The *mean adjusted return model* may be the most simplistic statistical model. It infers expected returns from past returns and does not adjust for any other risk factors, whether company- or market-related. In particular, the expected return for any day of the event window is the mean return over the estimation period, and is given by

$$E(R_{i,t}) = 1/T \sum_{\tau=1}^T R_{i,\tau}$$

where

$R_{i,t}$: Return of security i for time t

T : Number of time periods of the estimation window

Estimated abnormal returns are given by

$$AR_{i,t} = R_{i,t} - 1/T \sum_{\tau=1}^T R_{i,\tau}$$

Thus, for any given security i , the expected return is constant and does not change over time. Assuming that the security's beta factor is constant over time, as well as the efficient frontier, the mean adjusted return model is consistent with the CAPM, which would also predict a constant return under these assumptions.¹¹⁶

For short-term event studies employing daily financial data, nominal returns are commonly employed.¹¹⁷

¹⁰⁹See Chen and Ingersoll (1983), p. 987.

¹¹⁰See Shanken (1982), p. 1129, ff.

¹¹¹See Dhrymes et al. (1984), p. 323, ff.

¹¹²See Steiner and Nowak (1994), p. 347, ff.

¹¹³See MacKinlay (1997), p. 17.

¹¹⁴See Campbell et al. (1997), p. 154.

¹¹⁵See MacKinlay (1997), p. 17, and Brown and Warner (1985), pp. 25–26.

¹¹⁶See Brown and Warner (1980), p. 208.

¹¹⁷See MacKinlay (1997), p. 17.

When event studies are based on monthly returns, the model can also be computed with real returns that have been adjusted for the risk-free rate. Although simplistic, the model is often as powerful as more sophisticated models, depending on the reduction of the variance of abnormal returns that the more advanced models achieve.¹¹⁸

4.4.2.2.2 Market Adjusted Return Model The *market adjusted return model* equates the ex-ante expected return of securities with the return of the market portfolio. In contrast to the mean adjusted return model, the market adjusted return model thus allows for time-varying expected returns, which are given by

$$E(R_{i,t}) = R_{m,t}$$

where $R_{m,t}$ denotes the period- t returns of the market index. Thus, the estimated expected return is identical across securities. Estimated abnormal returns are given by

$$AR_{i,t} = R_{i,t} - R_{m,t}$$

If all securities have the same beta factor of one, the market adjusted return model is consistent with the CAPM.¹¹⁹ Moreover, the model can be viewed as a special case of the market model with the estimation parameters α_i and β_i constrained to zero and one, respectively.¹²⁰

While the market adjusted return model adjusts for market risk factors, it does not incorporate any company-specific attributes, which can lead to biases.¹²¹ An advantage of the model is, however, that it does not require any estimation period or historic return data. MacKinlay (1997) points out that this property is useful in event studies related to initial public offerings.¹²²

4.4.2.2.3 Market Model The *market model* has its origins in the single index model developed by Sharpe (1963) and assumes a linear relationship between a security's return and the market return.¹²³ For any security i , the market model equals

$$R_{i,t} = \alpha_i + \beta_i R_{m,t} + \epsilon_{i,t}$$

$$E(\epsilon_{i,t}) = 0$$

$$var(\epsilon_{i,t}) = \sigma_{\epsilon_i}^2$$

where

- $R_{i,t}$: Period- t return of security i
- α_i : Constant component of the return of security i
- β_i : Beta factor measuring the systematic risk of security i
- $R_{m,t}$: Period- t return of the market portfolio
- $\epsilon_{i,t}$: Period- t disturbance term of security i

Thus, the return generating process for each security i consists of a systematic as well as an unsystematic component. The beta factor captures the sensitivity of the return of security i to the market.

¹¹⁸See Brown and Warner (1980), p. 205, ff. for monthly returns and Brown and Warner (1985), p. 3, ff. for daily returns.

¹¹⁹See Brown and Warner (1980), p. 208.

¹²⁰See MacKinlay (1997), p. 18.

¹²¹See MacKinlay (1997), p. 19.

¹²²See MacKinlay (1997), pp. 18–19, and Ritter (1991) for an exemplary study of under-pricing in IPOs.

¹²³See Sharpe (1963), p. 281, ff. Sharpe originally named the single index model “diagonal model.”

The residual return, $\epsilon_{i,t}$, is entirely company-specific and has an expected value of zero. Moreover, the disturbance terms are uncorrelated across securities and with the market return. As a result, the firm-specific part of the return variance is fully diversifiable.

To obtain the market model parameters α_i and β_i , an ordinary least-squares regression is performed. In particular, the security returns, $R_{i,t}$, are regressed on the market return, $R_{m,t}$, over the estimation period. In the U.S., the S&P 500 or a CRSP index is often used as proxy for the market portfolio. In Germany, the choice often falls to the CDAX, the DAX30, or the DAFOX.

The market model parameters are assumed to be fixed over the event window.¹²⁴ Another assumption is that the OLS residuals are homoscedastic, i.e., have a constant variance.¹²⁵ Given the market model parameters, the ex-post expected returns can be calculated as

$$E(R_{i,t}) = \alpha_i + \beta_i R_{m,t}$$

Abnormal returns are given by

$$AR_{i,t} = R_{i,t} - (\alpha_i + \beta_i R_{m,t})$$

The market model represents a potential improvement on other models, since the stock return variance is attributed to market- as well as firm-specific factors. The relative improvement in the detection of abnormal returns depends on the reduction in the variance of abnormal returns. This, in turn, depends on the goodness of fit of the market model regression, as measured by R^2 :¹²⁶

$$R^2 = \beta_i^2 \frac{\sigma_m^2}{\sigma_i^2}$$

where

- σ_m^2 : Variance of the market return, $R_{m,t}$
- σ_i^2 : Variance of the return of security i , $R_{i,t}$

The larger the amount of R^2 , the greater the portion of return variance is due to systematic risk, and the greater the gain of employing the market model.¹²⁷

Although many assumptions of the market model may not hold in reality, this model is the preferred choice of asset pricing model in event studies.¹²⁸ MacKinlay (1997) points out that the use of the CAPM in event studies has almost ceased because of the unrealistic restrictions it imposes on the market model.¹²⁹ In addition, the additional factors of the APT offer few benefits, since most of the variance is explained by market factor.¹³⁰ As a result, the market model has become the most common choice normal performance model alongside the constant mean return model.¹³¹ The market model's drawbacks and methodological shortcomings are addressed in more detail in section 6.6.3.

¹²⁴Iqbal and Dheeriyaa (1991), p. 87, ff., point out that the assumption of a fixed beta factor may often be violated in reality and may constitute a shortcoming of the market model.

¹²⁵Giacotto and Ali (1982), p. 1247, ff., show that if OLS residuals are heteroscedastic, standard test measures have to be adjusted to correctly measure price effects caused by events.

¹²⁶See Roll (1988), p. 541, ff.

¹²⁷See Campbell et al. (1997), p. 155.

¹²⁸Grinblatt and Titman (2001), pp. 177–181, point out that the assumption of uncorrelated disturbance terms across different securities may not hold in reality. Fama (1976), p. 21, finds that daily stock returns for individual securities exhibit substantial departures from normality and that distributions are fat-tailed compared to the normal distribution. See also section 6.6.3 for a discussion of methodological issues of the market model.

¹²⁹See MacKinlay (1997), p. 19. Under the CAPM, $\alpha_i = (1 - \beta_i)r_f$ in the market model equation $R_{i,t} = \alpha_i + \beta_i R_{m,t} + \epsilon_{i,t}$.

¹³⁰See Brown and Weinstein (1985), p. 491, ff.

¹³¹See MacKinlay (1997), p. 15.

4.4.2.2.4 Multifactor Pricing Models Other statistical models are predominately factor models. The motivation behind factor models is to reduce the volatility of excess returns by explaining more of the variance of expected returns.¹³² The market model, for example, is a single factor model based on the market return. Multifactor models commonly add factors for industry classification. In addition, Fama and French have developed a three-factor model that adds firm-specific risk factors to market beta.¹³³ Thus, in contrast to the APT, the Fama-French three-factor model tries to enhance the CAPM by accounting for company-specific—firm size and value—and not macroeconomic risk factors.

The *SMB* factor accounts for firm size and translates for small minus big. It measures the additional return investors have historically received by investing in small companies. In practice, the factor is calculated as the mean return of the smallest 30% of all stocks minus the average return of the largest 30% of stocks. The *HML* factor stands for high minus low and has been constructed to measure the historical value premium associated with investing in value stocks, as proxies by a low market-to-book value ratio. It is computed as the average return of the 50% of stocks with the lowest market-to-book ratio minus the mean return of the 50% of stocks with the highest market-to-book ratio. Thus, the Fama-French three-factor model is given by

$$E(r_i) = r_f + \beta_i(r_m - r_f) + s_iSMB + h_iHML$$

where

- $E(r_i)$: Expected return of security i
- r_f : Risk-free rate
- β_i : Beta coefficient of security i
- r_m : Market return
- $r_m - r_f$: Market risk premium
- s_i : Exposure to SMB factor of security i
- h_i : Exposure to HML factor of security i

Fama and French (1993) argue that size and the market-to-book ratio act as proxies for the role of leverage and financial distress in companies and, thus, are a better measurement of risk than the beta factor alone. While the declaration of the SMB as a risk factor is appealing, since small firms may be more sensitive to outside influences because of their less-diversified operations, the inclusion of the HML factor is controversial. In general, the discussion as to why the two outlined factors in particular accurately capture fundamental risk is still ongoing.¹³⁴

In addition, many economists believe that the development of the three-factor model has been primarily motivated to uphold the EMH. Not surprisingly, Fama and French (1996) find that the three-factor model explains the anomalies associated with earnings/price, cash flow/price, and sales growth, and with long-term return variables.¹³⁵ For Germany, Ziegler et al. (2007) find that the three-factor model has a greater explanatory power with regard to expected returns than the one-factor CAPM. Hussain et al. (2002) and Berkowitz and Qiu (2001) find similar results for the U.K. and Canadian stock markets, respectively.

¹³²MacKinlay (1997), p. 18.

¹³³See Fama and French (1992), p. 427, ff., and Fama and French (1993), p. 3, ff., Fama and French (1996), p. 55, ff.

¹³⁴See, for example, the criticism of Shleifer (2000), pp. 19–20.

¹³⁵See Lakonishok et al. (1994), and De Bondt and Thaler (1985).

4.4.3 Cross-sectional Regression Analysis

In many event studies, estimating and testing abnormal returns are only the first steps. Usually, it is not only of interest whether an event has a significant effect on stock prices, but also how excess returns are related to firm characteristics.¹³⁶ This allows for a test of related economic hypotheses. For this purpose, early event studies mainly relied on subsamples. Events were sorted into portfolios according to the value of the company-specific variable of interest. For these subsamples, CAARs were calculated and compared.

While this approach is still employed today, cross-sectional regressions with excess returns as dependent variables have become more common. While coefficients can be estimated by the OLS method, standard errors require more attention. If the latter are uncorrelated in the cross-section and are homoscedastic, the standard OLS errors can be used to draw statistical inferences. If this is not the case, heteroscedasticity-consistent standard errors, as proposed by White (1980), should be computed.¹³⁷ In addition, biases in the cross-sectional regression analysis may arise if a relationship between firm characteristics and the extent to which the event is anticipated exists.¹³⁸ Karafiath (1994), however, finds that a standard OLS estimation is unbiased if the sample size exceeds 50 and certain conditions are met (Greenwald 1983).

4.5 Tests of Stock Market Efficiency Based on Returns to Directors' Dealings

Disclosed insider transactions have been one of the most researched topics in empirical finance. Most research has been motivated by the efficient markets paradigm. As outlined in section 4.1.3, analyzing the profitability of directors' dealings allows for testing of the strong-form of market efficiency. The returns of mimicking strategies allow for a test of the semistrong-form of the EMH. Researchers typically examine the profitability of insider trades by means of an event study. If the profitability of directors' dealings is studied, the event date is defined as the transaction date. If, on the other hand, the profitability of mimicking strategies is examined, the event date is defined as the disclosure date. This section is concerned with the latter case. Sections 4.5.1 to 4.5.3 examine the empirical literature on returns for outside investors mimicking insider transactions in the U.S., the U.K., and Germany, respectively. For each stock market, the most influential papers are summarized, and the implications of the results are interpreted with regard to the empirical validity of the EMH.

4.5.1 Empirical Evidence from the U.S. Stock Market

Having prescribed the disclosure of insider transaction since the 1930s, the U.S. also features the earliest academic research on the subject. One of the earliest studies, Smith (1941), suggests that insiders are willing to exploit their informational advantage. Lorie and Niederhoffer (1968), Pratt and DeVere (1970), and Finnerty (1976) draw similar conclusions. Wu (1964), however, who examines 50 randomly selected NYSE stocks over the period 1957–1961, finds that insiders do not outperform other traders. Next, two classic papers (Jaffe (1974b) and Seyhun (1988)) as well as two more recent studies (Bettis et al. (1998) and Lakonishok and Lee (2001)) are reviewed.

¹³⁶See Kothari and Warner (2007), pp. 20–23. Bowman (1983) refers to such event studies as *metric explanations studies*.

¹³⁷See MacKinlay (1997), p. 33.

¹³⁸Additional biases that may warrant a cautious interpretation of (standard OLS) cross-sectional regression results are discussed in Henderson (1990), Campbell et al. (1997), Binder (1998), and Kothari and Warner (2007).

4.5.1.1 Jaffe (1974)

While earlier studies on insider trading exist, notably Lorie and Niederhoffer (1968) and Pratt and DeVere (1970), Jaffe was the first to specifically adjust for risk when estimating the (abnormal) returns earned by insiders and outside mimickers by employing the CAPM.¹³⁹ Jaffe finds that information about insider transactions is valuable and can be exploited by outside agents utilizing certain trading strategies, even if transactions costs are taken into account. Thus, his results contradict the strong- as well as semistrong-form of market efficiency.

The author relies on a sample of transactions published in the SEC's *Official Summary on Insider Trading* between 1962 and 1968 by the 200 largest companies contained in the CRSP database at the University of Chicago.¹⁴⁰ The final data set consists of approximately 1,000 firm months and 952 insider transactions. Jaffe also constructs additional samples by applying several filters. One sample consists of large volume trades (transactions with a trading volume of \$20,000 or more), and another data set contains only "*intensive trading months*." A month of a given company is classified as an intensive trading month if it is characterized by at least three more insider purchasers than insider sellers, and vice versa.¹⁴¹

The author reasons that the subsamples contain transactions that are motivated to a greater degree by inside information.¹⁴² The other transactions may be "statistical noise," making it difficult to detect the exploitation of special information.¹⁴³ Finnerty (1976) and others view the intensive trading approach as problematic, since a substantial number of transactions are lost and thus disregarded.¹⁴⁴

For these different samples, the monthly abnormal returns for insiders as well as outsiders are computed on the basis of the CAPM as the equilibrium asset pricing model. Examining the returns to insiders, Jaffe finds that insiders do earn positive abnormal profits, yet only the intensive trading samples yield profits that are larger than the rather arbitrarily postulated transaction costs of 2%.¹⁴⁵ Outsiders can supposedly learn about directors' dealings three months after the transaction has taken place by reading the Official Summary. The results show that the informational value of reported trades is not lost because of the reporting delay. Residuals are positive (purchases and sales are pooled), and statistically different from zero. However, all samples, except the intensive trading data sets, exhibit abnormal returns that are smaller than assumed transaction costs.

The results of Jaffe (1974b) suggest that the U.S. stock market is generally efficient according to the strong- as well as semistrong-form of the EMH, since transactions costs are, in most cases, larger than the gross profits for insiders and outside investors. The positive net profits of the intensive trading months subsamples, however, violate the strong-form of the EMH, and suggest that profitable trading strategies based on directors' dealings signals can be formulated.

4.5.1.2 Seyhun (1986)

The study by Seyhun (1986) not only employs a comprehensive data set, but also incorporates several methodological advances compared to previous literature on insider trading. First, profits for insiders and outsiders are calculated based on daily returns. Second, expected returns are estimated under the market model. Third, improved data availability allows for a more exact definition of the event date. Fourth,

¹³⁹See Jaffe (1974b), pp. 410–428.

¹⁴⁰See Jaffe (1974b), pp. 412–414.

¹⁴¹See Jaffe (1974b), p. 420.

¹⁴²See Jaffe (1974b), pp. 413–414.

¹⁴³See Jaffe (1974b), p. 413.

¹⁴⁴See Finnerty (1976), p. 1146.

¹⁴⁵See Jaffe (1974b), p. 424.

indirect transaction costs in the form of bid-ask spreads are taken into account. Seyhun (1986) concludes that outsiders are unable to profit from published insider transactions, mainly due to transaction costs.

The sample consists of approximately 60,000 trades published between 1975 and 1981 by 769 companies.¹⁴⁶ Earlier studies, such as Jaffe (1974b), had to assume that transactions entered the public domain two months after the month of occurrence.¹⁴⁷ Improved data availability enabled Seyhun (1986) to establish the exact date of the publication of the Official Summary. It was also known when Form 4 of the directors' dealings was submitted to the SEC.¹⁴⁸

The author refers to the studies by Banz (1981) and Reinganum (1981) that expose shortcomings of the CAPM related to firm size and earnings' yield that result in biased estimates of expected returns and could potentially have distorted previous findings on insider trading.¹⁴⁹ Thus, Seyhun (1986) employs the market model to measure expected and abnormal returns. To estimate the market model parameters, 250 post-event and 250 pre-event daily security returns are regressed on a value-weighted portfolio consisting of all New York Stock Exchange (NYSE) and American Stock Exchange (AMEX) stocks. The first set of estimated parameters uses the measure pre-event abnormal returns for the 200 days prior to the insider transaction. The second set of parameters is employed to estimate abnormal returns for the 300 days following the event date. As a robustness test, Seyhun (1986) also considers a range of other benchmark models, such as the Scholes and Williams (1977) market model adjustment, the CAPM, and the mean-returns adjusted model.¹⁵⁰

Regarding company insiders, excess returns of 1.1% (−0.9%) for purchases (sales) are found for the first 20 days following the reporting of the transactions to the SEC. In addition, the results show that insiders buy (sell) after a series of negative (positive) abnormal stock returns, i.e., are contrarian investors. While the returns are statistically significant, they are lower than those found by earlier studies, such as Jaffe (1974b) and Finnerty (1976). Seyhun (1986) contributes those larger excess returns to biases introduced by the asset pricing model used by these studies, the CAPM.¹⁵¹

An important innovation of the study at hand is that the determinants of abnormal returns are examined by a set of regression models. The author finds that trades of chairmen of the board or officer-directors are, on average, more profitable than transactions by other directors or large shareholders.¹⁵² Moreover, Seyhun (1986) finds a positive and statistically significant relationship between abnormal returns and the dollar-trading volume of transactions, and the number of insiders trading in a certain direction.

Firm size, as measured by the natural logarithm of the market value of equity, on the other hand, is negatively related to excess returns. Citing Schultz (1983) and Stoll and Whaley (1983), who find a negative monotone relationship between firm size and the bid-ask spread, Seyhun (1986) infers from his results that greater abnormal profits to insiders result in larger bid-ask spreads.¹⁵³ This notion supports the hypothesis that the bid-ask spread imposes costs on uninformed traders at the expense of informed traders.

Turning to the abnormal returns to outsiders, the results show average excess profits of 0.3% (0.7%) in the first 20 (50) days following the availability of the SEC's Official Summary.¹⁵⁴ Examining longer time periods, returns are generally larger. After 100 days, for example, excess returns to outsiders amount

¹⁴⁶See Seyhun (1986), p. 192.

¹⁴⁷See Jaffe (1974b), p. 425.

¹⁴⁸See Seyhun (1986), p. 190.

¹⁴⁹See Seyhun (1986), p. 194.

¹⁵⁰See Seyhun (1986), p. 198.

¹⁵¹See Seyhun (1986), p. 199.

¹⁵²See Seyhun (1986), pp. 202–206.

¹⁵³See Seyhun (1986), pp. 199–202.

¹⁵⁴See Seyhun (1986), p. 208, Table 7.

to 1.2%. Taking transaction costs into account, however, all abnormal profits fall below zero.¹⁵⁵ The proposed transaction costs include bid-ask spreads as well as commission, but are not computed on a security basis. The author relies on the bid-ask spread estimates of Stoll and Whaley (1983), which depend on company size. The assumed round-trip transaction costs range from 2.7%, for firms with a market capitalization greater than \$1 billion, to 6.8%, for companies with a market capitalization of up to \$25 million. Since Seyhun (1986) also finds no trading strategy based on filters such as firm size, position of the insider, and dollar trading volume, the author concludes that the U.S. stock market is efficient according to the semistrong-form. Earlier contradictory findings are attributed to the omission of realistic bid-ask spreads and the misspecifications arising out of the use of the CAPM.

4.5.1.3 Bettis, Vickrey, and Vickrey (1997)

Bettis et al. (1997) find that outsiders are able to earn abnormal profits, even if transactions costs are taken into account, which contradicts the findings of not only Seyhun (1986) but also Rozeff and Zaman (1988).

The sample includes 5,022 disclosed insider transactions (1,425 purchases and 3,597 sales) between January 1985 and December 1990.¹⁵⁶ Bettis et al. (1997) focus on large volume trades with 10,000 shares or more in companies that are listed either on the NYSE or the AMEX. Instead of obtaining directors' dealings data from the SEC, trading data are collected from the CDA/Investnet database, which is accessible through the Internet. One pleasant feature of this database is that it contains the date on which information about reported insider trades was published online. It is assumed that this date of publication is a more accurate measure for the time the information became widely accessible to the public. Since Brown and Warner (1980) stress that an accurate identification of the event date in question is crucial in any event study, this is potentially a substantial improvement to earlier studies on insider trading.¹⁵⁷

The basis return unit is a week, and expected returns are estimated using the market model.¹⁵⁸ The estimation period consists of 200 weekly observations, and the event period ranges from 52 before and 78 weeks after each event week. The market return is given by an equal-weighted portfolio of all NYSE stocks. The methodology also controls for firm size by adjusting the predicted error terms. Moreover, excess returns are adjusted for round-trip transaction costs, which include two commissions and the sum of the bid-ask spreads. The authors use the transaction costs estimates reported by Stoll and Whaley (1983) for different company sizes.¹⁵⁹ This method is essentially the same as that employed by Seyhun (1986), although the latter study uses only five of the ten reported firm size groups.¹⁶⁰

The empirical results show that insiders do earn statistically significant abnormal returns of 0.88% (−0.75%) for purchases (sales) after a two-week holding period.¹⁶¹ Notably, abnormal profits for insiders grow to 11.67% (−8.52%) for purchases (sales) after 52 weeks. For outsiders, the steady and monotonic increase in excess returns is equally impressive. Other market participants can earn 0.93% (0.40%) by mimicking insider buy (sale) transactions and holding the securities for two weeks.¹⁶² After 52 weeks, abnormal returns reach 11.00% (−8.28%) for purchases (sales). While these returns are adjusted for firm size, they do not incorporate transaction costs.

¹⁵⁵See Seyhun (1986), p. 210.

¹⁵⁶See Bettis et al. (1997), p. 59, Table 1

¹⁵⁷See Brown and Warner (1980), p. 249.

¹⁵⁸See Bettis et al. (1997), p. 59.

¹⁵⁹See Bettis et al. (1997), p. 60, and Stoll and Whaley (1983), pp. 72–73, Table 5.

¹⁶⁰See Seyhun (1986), p. 210.

¹⁶¹See Bettis et al. (1997), p. 60, Table 2.

¹⁶²See Bettis et al. (1997), p. 61, Table 3.

Taking commissions and bid-ask spreads into account, Bettis et al. (1997) find that several abnormal returns for outsiders remain positive and statistically significantly different from zero. Holdings periods of 26 (52) weeks yield positive net abnormal returns of 2.95% (6.96%) for purchases and -2.05% (-4.86%) for sales.¹⁶³ Supposedly, net excess returns turn positive after a holding period of 13 weeks. These results contrast the semi-strong form of the EMH and the findings of Seyhun (1986) and Rozeff and Zaman (1988). The authors attribute their findings largely to their shorter and more accurate reporting delays. While the mean reporting delay of Bettis et al. (1997) is approximately 24 days, that of Seyhun (1986) is three months, and that of Rozeff and Zaman (1988) is two months.

4.5.1.4 Lakonishok and Lee 2001

The study by Lakonishok and Lee (2001) is one of the most comprehensive examinations of directors' dealings found in the literature, consisting of more than one million transactions and spanning two decades. Although the focus of the study lies primarily on the informativeness of aggregate trading by insiders, the authors also briefly touch on market efficiency.

The studied sample consists of directors' dealings reported by NYSE, AMEX, and Nasdaq companies between 1975 and 1995. Transactions are collected from the SEC's Ownership Reporting System, and the final sample includes 1,028,020 transactions.¹⁶⁴ While the data contains information when the notifications were submitted to the SEC, no data item concerning the exact publication of trades is available. In reality, it takes a few days for the information to be disseminated to the public.¹⁶⁵

Abnormal returns are calculated under the market-adjusted return model. The market return is proxied by the daily return of the equally-weighted NYSE/AMEX/Nasdaq CRSP index. The event window consists of five days, starting on the day of the filing of insider transactions.

Excess returns are reported for different groups of insiders, according to firm size and book-to-market ratio. The estimated return residuals for the five-day event window are generally small and do not exceed one percent in any subsample. The authors argue that although several returns are significantly different from zero, they are "not economically meaningful," i.e., they are lower than round-trip transaction costs that would be incurred by outside mimickers.¹⁶⁶ This renders short-term trading strategies unprofitable and the U.S. stock market efficient in this regard.

In addition to the short-term market reaction to reported insider trades, the authors provide extensive summary statistics for their examined sample. The trading volume of insider purchases (sales) on average accounts for 0.6% (1.3%) of a firm's market capitalization. For small companies, the proportion is, at 2.0%, considerably larger. Furthermore, Lakonishok and Lee (2001) find that while the (inflation-adjusted) trading volume of insider sales has tripled in relation to market capitalization, the volume of purchases has remained more or less constant. The increase in insider sales can be, at least partly, traced back to the strengthening of disclosure requirements regarding employee stock options.¹⁶⁷ In addition, increased selling volume can be explained by the trend that managers' remuneration consists, to a larger degree, of company stock or stock options. Thus, insiders sell company stock to diversify their holdings, implying that insider sales are less informative than purchases, since the former are not driven by profit motives. The results of Lakonishok and Lee (2001) confirm this reasoning.¹⁶⁸

Other results of Lakonishok and Lee (2001) include that aggregate insider trading may predict market

¹⁶³See Bettis et al. (1997), p. 62, Table 3.

¹⁶⁴See Lakonishok and Lee (2001), p. 83.

¹⁶⁵See Lakonishok and Lee (2001), p. 88.

¹⁶⁶See Lakonishok and Lee (2001), p. 90.

¹⁶⁷See Lakonishok and Lee (2001), pp. 84–88.

¹⁶⁸See Lakonishok and Lee (2001), p. 107.

movements and that insiders are able to predict cross-sectional returns. Companies with extensive insider purchasing over the last six months outperform companies with large insider selling by 7.8% over one year.¹⁶⁹ Insider trading signals, however, appear to be stronger in small companies, which are typically associated with larger transaction costs and bid-ask spreads in particular. The authors, thus, conclude that the implementation of trading strategies may prove difficult, suggesting that the U.S. stock market is efficient with regards to insider trading signals.¹⁷⁰

4.5.1.5 Other Studies

In addition to the above outlined papers, numerous other studies on the returns to mimicking U.S. insiders exist. Rozeff and Zaman (1988) argue that previous findings of abnormal returns to outside investors arise out of the firm size and price to earnings effect. Adjusting abnormal returns for those potential biases by using control portfolios, excess returns fall below the assumed two percent transaction costs, implying that the U.S. stock market is efficient according to the semistrong-form of the EMH.¹⁷¹

Brick et al. (1989) also find that the measurement of abnormal returns is sensitive to the underlying asset pricing model. The authors test four different variations of the market model: the Jensen performance index, the mean-adjusted return model, the two-parameters model, and the single-parameter model. Only the latter two normal performance models yield positive abnormal returns. Lin and Howe (1990) study the profitability of insider transactions in the OTC market. Although the authors find relatively large excess returns of 2.46% to 3.20% after a twelve-day holding period for insiders themselves, larger bid-ask spreads of about seven percent render the transactions of insiders unprofitable.¹⁷² This also implicitly renders any outsider mimicking strategy of OTC directors' dealings undesirable.

Chang and Suk (1998) pursue a different approach. They do not study directors' dealings as contained in the SEC's Official Summary, but instead examine those contained in the *WSJ's* Insider Trading Spotlight section. The *WSJ* publishes only selected trades with an additional delay compared to the initial publication of trades by the SEC. Nevertheless, Chang and Suk (1998) find statistically significant abnormal returns after sales of -2.19% for a 19-day holding period starting on day three after the reporting by the *WSJ*.¹⁷³ Generally, the market reacts more strongly to the publication of directors' dealings in the *WSJ* than to the initial dissemination by the SEC.

4.5.1.6 Implications for the Efficiency of the U.S. Stock Market

Evidence on the profitability of mimicking trading strategies in the U.S. market appears to be contradictory. Table 4.1 summarizes the results of the presented studies. While Seyhun (1986), Brick et al. (1989), Rozeff and Zaman (1988), Lin and Howe (1990), and Lakonishok and Lee (2001) argue that outsiders will find it difficult to profit from reported directors' dealings Pratt and DeVere (1970), Jaffe (1974b), and Bettis et al. (1997) find that mimicking intensive trading signals and large volume trades, respectively, may prove fruitful. Arguably, the majority of papers doubt that outsiders profit from reported trades. In most instances, transaction costs diminish abnormal return estimates, thus implying that the U.S. stock market is efficient according to the semistrong-form of the EMH.

¹⁶⁹See Lakonishok and Lee (2001), p. 109.

¹⁷⁰See Lakonishok and Lee (2001), p. 109.

¹⁷¹See Rozeff and Zaman (1988), p. 37, Table 3.

¹⁷²See Lin and Howe (1990), p. 1278, Table II.

¹⁷³See Chang and Suk (1998), p. 120, Table 2.

Table 4.1: Empirical Studies on Market Efficiency and Insider Trading in the U.S. Stock Market

Author(s) (Year) <i>Journal</i>	Sample	Data Source	Event Window	Gross Abnormal Returns Purchases (%)	Sales (%)	Net Abnormal Returns Purchases (%)	Sales (%)	Study Focus and Conclusions
Jaffe (1974) <i>Journal of Business</i>	1962-1968 466 purchases, 486 sales	SEC Official Summary	1 month 2 months 8 months	0.10 to 0.98 0.27 to 2.12 0.70 to 4.94 ^a	n/a ^a	-1.90 to -1.02 -1.73 to 0.12 -1.30 to 2.94	n/a ^a	Only the returns of the intensive trading samples remain positive after deducting transaction costs.
Seyhun (1986) <i>Journal of Financial Economics</i>	1975-1981 59,148 purchases and sales	SEC Official Summary	20 days (1;20) 50 days (1;50) 100 days (1;100)	0.30 0.70 1.20 ^b	n/a ^b	n/a	n/a	Transaction costs incorporate bid-ask spreads and generally surpass abnormal returns.
Bettis, Vickrey, and Vickrey (1997) <i>Financial Analysts Journal</i>	1985-1990 1,425 purchases and 3,597 sales	CDA/Investnet	2 weeks 4 weeks 26 weeks	0.93 1.62 7.01	-0.40 -1.08 -5.49	-4.86 -3.19 2.95	4.68 3.04 -2.05	Outsiders can profit from mimicking large volume trades of high-ranking officers after a holding period of about 13 weeks.
Rozeff and Zaman (1988) <i>The Journal of Business</i>	1973-1982 679 intensive trading purchases and sales	SEC Official Summary	1 month 3 months 6 months 12 months	-0.18 to 0.59 0.37 to 0.55 0.23 to 0.44 0.19 to 0.47 ^c	n/a ^c	-2.19 to -1.41 -0.30 to -0.12 -0.11 to 0.11 0.02 to 0.31 ^c	n/a ^c	Profits to outsiders disappear if abnormal returns are adjusted for firm size and the e/p ratio.
Lakonishok and Lee (2001) <i>The Review of Financial Studies</i>	1975-1995 1,028,020 purchases and sales	SEC Ownership Reporting System	5 days (0;4)	-0.58 to 0.52	0.73 to -0.47	n/a	n/a	Trades in small firms are more informative, but may also be associated with larger transaction costs.

The table summarizes the empirical studies on market efficiency and directors' dealings in the U.S. stock market. Reported abnormal returns are those achievable by outside investors, i.e., the event date is specified as the disclosure date of insider transactions. *Gross* abnormal returns are not adjusted for transaction costs, while *net* abnormal returns are.

^a Abnormal returns are pooled. See Jaffe (1974b), p. 426, Table 5.

^b Abnormal returns are pooled. See Seyhun (1986), p. 208, Table 7.

^c Abnormal returns are pooled. See Rozeff and Zaman (1988), p. 37, Table 3.

4.5.2 Empirical Evidence from the U.K. Stock Market

Directors' dealings in the U.K. have been subject to academic research since the eighties. King et al. (1988) find that insiders earn significant and very large abnormal returns. In the case of purchases, excess returns exceed 50% one year after the disclosure of trades.¹⁷⁴ Pope et al. (1990) find contradictory results, showing that returns after insiders sales are profitable and statistically significant, but not returns after purchases.¹⁷⁵ Employing a more comprehensive sample, Gregory et al. (1994) demonstrate that the measurement of abnormal returns may be biased if the size effect is not taken into account. After adjusting for firm size by deducting the return of control portfolios from their abnormal returns, only profits after purchases remain statistically significant.¹⁷⁶

The following discussion focuses in more detail on three recent papers examining excess returns to outsiders in the U.K. stock market. While Gregory et al. (1997) is a classical long-term event study of abnormal returns following directors' dealings, Friederich et al. (2002) and Fidrmuc et al. (2006) concentrate on the market's short-term reaction to disclosed directors' dealings.

4.5.2.1 Gregory, Matatko, and Tonks (1997)

Gregory et al. (1997) perform a long-term event study in order to reconcile the different empirical results found in earlier papers. The authors concentrate on the definition of insider trading signals and pay special attention to the influence of firm size on abnormal returns estimates.

Directors' dealings data are drawn from a sample of 1,683 companies during the 1986 to 1990 period, resulting in approximately 6,700 insider trading signals.¹⁷⁷ Three different variations of insider trading signals are formulated based on the value of shares traded, the number of transactions, and the absolute size of the net transaction volume.

As the base model, a conventional market model is used, which is complemented by the methodologies developed by Dimson and Marsh (1986) and Lakonishok et al. (1994) to account for any potential size effect.¹⁷⁸ The estimation window stretches over 66 months and ends six months prior to the event month.¹⁷⁹ The market return is proxied by the Financial Times All Share Index (FTASI). Abnormal returns are computed for holding periods of 3, 6, 12, and 24 months. In addition, Gregory et al. (1997) present results for an investment strategy, which involves mimicking insider purchases and sales and closing the position as soon as a contradictory signal enters the public domain.

Depending on the definition of insider trading signals, unadjusted profits range from -4.29% to -6.24% for insider sales and a three-month holding period.¹⁸⁰ For purchases, however, excess returns are negative. Adjusting for firm size, abnormal returns after insider sales are significantly reduced and range from -1.20% to -2.49% , yet remain statistically significant.¹⁸¹ Returns after purchases, on the other hand, are enlarged by the Dimson and Marsh (1986) adjustment and range from -1.20% for large volume trades to 3.18 for a net number of transactions of two or more.

Regarding the efficiency of the U.K. stock market, the results of Gregory et al. (1997) do not provide definitive evidence. The drawing of conclusions is especially hindered by the absence of transaction cost estimates, such as bid-ask spreads.

¹⁷⁴See King et al. (1988), p. 179, Table 2.

¹⁷⁵See Pope et al. (1990), p. 378.

¹⁷⁶See Gregory et al. (1994), p. 49, Table 5.

¹⁷⁷See Gregory et al. (1997), pp. 319–320.

¹⁷⁸See Gregory et al. (1997), p. 325.

¹⁷⁹See Gregory et al. (1997), p. 319.

¹⁸⁰See Gregory et al. (1997), pp. 326–327, Table 3.

¹⁸¹See Gregory et al. (1997), pp. 328–329, Table 4.

4.5.2.2 Friederich, Gregory, Matatko, and Tonks (2002)

The study by Friederich et al. (2002) is the first one to examine *daily* abnormal returns to directors' dealings in the U.K. stock market. In addition, the authors are the first to control for bid-ask spreads on a security basis. Previous studies, such as Seyhun (1986) and Bettis et al. (1997), had to rely on the transaction costs estimates of Stoll and Whaley (1983), which are based on firm size. The results show that transaction costs outstrip the profits that can be reaped from mimicking directors' dealings.

The sample consists of the constituents of the FTSE-250 index. This index contains the 250 largest U.K. companies after firms included in the FTSE-100. The focus on "mid-cap" companies is motivated by previous research that shows that more liquid companies exhibit smaller abnormal returns following insider trades. The studied period ranges from October 1986 to December 1994, and signals are defined according to the number of shares traded. This results in a total of 3,409 insider trading events (1,887 purchases and 1,522 sales).

A potential shortcoming of the study is that no data item regarding the time of the dissemination of the insider trading information to the public is available. Thus, it is assumed that the reporting date equals the transaction date. The authors argue that the reporting of transactions generally occurs in "a timely manner" and that any delay in disclosure would only reduce the estimates of excess returns.¹⁸² Expected returns are estimated under the market model and the FTSE-250 as the benchmark index.¹⁸³ Acknowledging that thin and asynchronous trading could bias results, betas are also calculated following Scholes and Williams (1977). The adjustment, however, does not have a significant impact on CAAR estimates.

For the full sample, excess returns are found to be statistically different from zero for at least the first six days following the trade. After six days, CAARs equal 1.13% (−0.73%) for purchases (sales). After twenty days, CAARs grow to 1.96% and −1.46%, respectively, but are not statistically significant.¹⁸⁴ Generally, Friederich et al. (2002) find that the reaction to purchases is stronger than to sales. In addition, purchases (sales) are preceded by a series of negative (positive) abnormal returns, confirming that insiders follow a contrarian investment approach and possess short-term market timing abilities.

The authors also investigate the returns to different trading strategies based on various definitions of insider trading signals, depending on the traded volume, contrarian behavior, and "clustered" trades. The latter signal occurs if a trade is preceded by another trade by, at most, ten days. Mimicking such repeated trades offers the greatest rewards, and excess returns to buy signals amount to 4.52% after 20 days.¹⁸⁵ In addition, the authors also find that medium-sized trades are more informative. This is consistent with the "stealth trading" hypothesis and the findings of Barclay and Warner (1993), which indicate that informed trading is concentrated in medium-sized trades.

Incorporating actual bid-ask spreads in the abnormal return estimation, CAARs are significantly reduced. The only sizable return can be measured for clustered buys and equals 1.32%.¹⁸⁶ However, considering brokerage commissions as well, even this return may either become very small or turn negative. Thus, Friederich et al. (2002) provide evidence that the U.K. stock market is efficient, at least with regard to short-term trading strategies based on directors' dealings.

¹⁸²See Friederich et al. (2002), p. 13.

¹⁸³See Friederich et al. (2002), p. 28.

¹⁸⁴See Friederich et al. (2002), pp. 16–17, Tables 2 and 3.

¹⁸⁵See Friederich et al. (2002), p. 23, Panel A of Table 5.

¹⁸⁶See Friederich et al. (2002), p. 23, Panel C of Table 5.

4.5.2.3 Fidrmuc, Goergen, and Renneboog (2006)

Although Fidrmuc et al. (2006) are primarily concerned with the effect of ownership concentration and director entrenchment on the market's reaction to disclosed insider trades, the authors also offer some evidence concerning the efficiency of the U.K. stock market. In addition, the authors have access to the exact announcement date of insider dealings, as opposed to Friederich et al. (2002).

Directors' dealings observations are supplied by Hemmington Scott, a data service provider, for the period from 1991 to 1998. Trades are aggregated based on the number of shares. The final sample consists of 2,188 net purchases and 2,347 net sales.¹⁸⁷ CAARs are computed under the market model with the FTSE All Share Index as a proxy for the market return.¹⁸⁸ The estimation period includes 180 days, ending 21 days prior to the transaction date. The event period contains 41 days centered on the event day. For robustness checks, market-adjusted returns are computed. Moreover, the methodology of Lakonishok et al. (1994) is applied to control for the influence of firm size on abnormal returns estimates.

The results of primary interest concerning market efficiency are in line with previous research. On average, directors' dealings are preceded by negative abnormal returns and followed by positive abnormal returns. In addition, insider purchases constitute a stronger signal than insider sales, since the latter may be, in many instances, motivated by liquidity considerations. For purchases, CAARs amount to 1.16% (1.65%) after one (four) day(s) and are statistically significantly different from zero. For sales, CAARs equal -0.26% and -0.49% , respectively.¹⁸⁹ Excess returns for large volume trades (larger than 0.1% of the market capitalization) are significantly larger in the case of purchases and amount to 4.62% after only four days. These returns are substantially larger than those found by Friederich et al. (2002).¹⁹⁰

While the abnormal returns following large volume trades are quite substantial, their implications regarding market efficiency remain unclear. Fidrmuc et al. (2006) do not take transaction costs into account, and without any meaningful proxies for transaction costs, no definitive conclusions can be drawn. The study does, however, contain significant results concerning other properties directors' dealings. The findings suggest that the market's reaction to directors' dealings depends on the composition of a firm's ownership structure and that the release of news prior to transactions generally does not reduce abnormal returns. In addition, no evidence supporting the informational hierarchy hypothesis is found.

4.5.2.4 Implications for the Efficiency of the U.K. Stock Market

The evidence on the efficiency of the U.K. stock market with regard to directors' dealings is ambivalent. The findings of early studies, such as King et al. (1988) and Pope et al. (1990), suggest that outsiders can achieve long-term abnormal returns by mimicking insiders. Gregory et al. (1994), however, suggest that directors' dealings are concentrated in small firms, which have generally outperformed the market during the examined period. After controlling for firm size, only small excess returns remain to outsiders, and these may be insufficient to cover transaction costs. Gregory et al. (1997) essentially find the same results. While Hillier and Marshall (2002) and Fidrmuc et al. (2006) find sizable returns to directors and outsiders, respectively, the authors fail to take transaction costs into account.¹⁹¹ Only Friederich et al. (2002) explicitly take transaction costs and bid-ask spreads into account and find that net abnormal

¹⁸⁷See Fidrmuc et al. (2006), pp. 2941–2.

¹⁸⁸See Fidrmuc et al. (2006), p. 2948.

¹⁸⁹See Fidrmuc et al. (2006), p. 2950, Table 3.

¹⁹⁰Friederich et al. (2002) finds abnormal returns for “clustered” buys of 4.52% after 20 days, unadjusted for transaction costs. See Friederich et al. (2002), p. 23, Panel A of Table 5.

¹⁹¹The results of Hillier and Marshall (2002) are not reported here because the authors only present excess return estimates for insiders themselves, and not outside investors. For purchases (sales), Hillier and Marshall (2002) find abnormal returns of 5.74% (-1.37%) after a 20-day holding period. See Hillier and Marshall (2002), p. 90, Table 2b.

profits are negative or close to zero. Thus, although gross abnormal return estimates appear to be much larger than in the U.S., the U.K. stock market can be considered efficient.

Table 4.2: Empirical Studies on Market Efficiency and Insider Trading in the U.K. Stock Market

Author(s) (Year) <i>Journal</i>	Sample	Data Source	Event Window	Gross Abnormal Returns Purchases (%) Sales (%)	Net Abnormal Returns Purchases (%) Sales (%)	Study Focus and Conclusions
Gregory, Matatko, and Tonks (1997) <i>Journal of Business Finance & Accounting</i>	1986-1990 3,722 purchases, 3,034 sales	Stock Ex- change Official Weekly Intelli- gence	3 months 6 months 12 months	-1.20 to 3.18 0.00 to 3.54 -3.96 to 4.92 ^a	n/a n/a	Controlling for firm-size significantly reduces CAARs. Signal definition effects results.
Friederich, Gregory, Matatko and Tonks (2002) <i>European Financial Management</i>	1986-1994 1,887 purchases, 1,522 sales	London Stock Exchange, Di- rectus Ltd	21 days (0;20)	0.98 to 4.52 ^b	-1.68 to 1.32 0.37 to -0.86	Transaction costs in- clude only bid-ask spreads but not commis- sions. Clustered trades are the most informative.
Fidrmuc, Goergen, and Renneboog (2006) <i>The Journal of Finance</i>	1991-1998 2,188 purchases, 2,347 sales	Hemmington Scott	2 days (0;1) 5 days (0;4)	0.79 to 3.12 1.07 to 4.62 ^c	n/a n/a	CAARs depend on a firm's ownership struc- ture. Preceding news releases do not generally impact CAARs.

The table summarizes the empirical studies on market efficiency and directors' dealings in the U.K. stock market. Reported abnormal returns are those achievable by outside investors, i.e., the event date is specified as the disclosure date of insider transactions. *Gross* abnormal returns are not adjusted for transaction costs, while *net* abnormal returns are.

^a CAARs are adjusted for firm size. See Gregory et al. (1997), pp. 328-329, Table 4.

^b See Friederich et al. (2002), p. 23, Table 5.

^c See Fidrmuc et al. (2006), p. 2950, Table 3.

4.5.3 Empirical Evidence from the German Stock Market

To date, eight studies have been conducted on reported directors' dealings in Germany. Rau (2004), Heidorn et al. (2004), and Stotz (2006) examine the market's reaction to insider transactions. Tebroke and Wollin (2005) study the determinants of abnormal returns, such as firm size and the transaction volume of insider trades. Betzer and Theissen (2009) extend this line of research by controlling for a firm's ownership structure. Klinge et al. (2005) take event clustering into account and use non-overlapping observations. Dymke and Walter (2008) investigate the exploitation of private information by insiders, and Betzer and Theissen (2008) research the relationship between excess returns and reporting delay.

4.5.3.1 Rau (2004)

The PhD dissertation by Rau (2004) is presumably the first study of directors' dealings according to §15 of the WpHG in Germany. The dissertation focuses on short-term returns around disclosed insider dealings and finds that insiders sales are more informative than purchases. In addition to directors' dealings, the reporting requirement of the Neuer Markt is analyzed. Since the disclosure requirements differed in several aspects from those in § 15 of the WpHG, they are not summarized here.

The sample includes trades reported during the 18-month period between July 2002 and December 2003. As the data source, the publicly-accessible database of the BaFin is used. The final sample consists of 1,675 purchases and 1,229 sales of 316 companies.¹⁹²

The methodology is based on the market model and the equally-weighted stock market research index (DAFOX) as a proxy for the market return.^{193,194} Since the DAFOX equally weights the returns of its constituent securities, the index return may be more strongly correlated with the returns of the analyzed stocks, as opposed to employing the CDAX.¹⁹⁵ The estimation window incorporates the 230 trading days ending 11 days prior to the event date.

Regarding the returns to insiders themselves, Rau (2004) observes larger abnormal returns for sales than for purchases, contrasting the majority of research on the U.S. and U.K. stock markets. After a holding period of two days, CAARs amount to -1.12% for sales and only 0.62% for purchases.¹⁹⁶ After a holding period of ten days, abnormal returns increase to -2.56% for sales and 0.96% for purchases. The statistical significance is, however, larger for purchases than for sales. After 30 days, CAARs reach statistically significant -7.16% for sales and 2.32% for purchases. Analyzing the effect of firm size on abnormal returns, Rau (2004) finds that large profits seem to cluster in the small companies with a market value of 18,9 million euros and below.¹⁹⁷ For insider sales, however, excess returns seem to be less sensitive to company size.¹⁹⁸ In fact, the market's reaction to sales in medium-sized firms is larger than for small firms in the first 30 days following the disclosure of transactions.

Interestingly, the returns following the publication of insider transactions are generally larger than those after the trading date, yet the statistical significance of CAARs is smaller. For purchases, abnormal returns after a holding period of ten days amount to 1.22% and to 3.03% for sales.¹⁹⁹ Both excess returns are significant at the ten percent level. Rau (2004) also examines a second sample that consists only of transactions that have been published by the DGAP Directors' Dealings service. The DGAP forwards the

¹⁹²See Rau (2004), p. 178.

¹⁹³The DAFOX index is provided by the Institut für Finanzwirtschaft, Banken und Versicherungen at the Universität Karlsruhe.

¹⁹⁴See Rau (2004), pp. 131–137.

¹⁹⁵See Dimson and Marsh (1986), p. 130, Brown and Warner (1980), p. 239, and Armitage (1995), p. 33.

¹⁹⁶See Rau (2004), p. 192, Table 28.

¹⁹⁷See Rau (2004), p. 194, Table 29.

¹⁹⁸See Rau (2004), p. 195, Table 30.

¹⁹⁹See Rau (2004), p. 204, Table 34.

information to several information providers and news services and potentially ensures a more effective dissemination of directors' dealings. For this sample, excess returns after the announcement date are significantly larger. For purchases, the CAAR after ten days equals 3.51%, and for sales, a relatively large -16.47% , thus suggesting that the information outlet of insider transactions is an important factor in the market's reaction.²⁰⁰ The influence of firm size on abnormal returns after the publication of trades is similar to that which is found following the transaction itself, i.e., larger profits seem to cluster in small firms.²⁰¹

Regarding the semistrong-form of the EMH, the results of Rau (2004) indicate that the German market incorporates information relatively slowly, as CAARs slowly accumulate over the holding period. In addition, the abnormal returns, especially for sales and the DGAP data set, seem sizable enough to be exploited by company outsiders. However, while the author offers a gross estimate of total round-trip transaction costs of one percent following Seyhun (1998), returns are not explicitly adjusted for bid-ask spreads.²⁰² Thus, the results and their implications for short-term market efficiency have to be interpreted with caution.

4.5.3.2 Heidorn, Meyer, and Pietrowiak (2004)

After the implementation of directors' dealings legislation in several countries of continental Europe in 2002, Heidorn et al. (2004) offer some initial evidence on the markets' reaction to directors' dealings. The authors examine Italy, the Netherlands, and Germany. The following discussion, however, concentrates on the latter market.

The sample period ranges from July 2002 to March 2004 and includes transactions that are contained in the BaFin database. Heidorn et al. (2004) eliminate transactions in the "wrong direction."²⁰³ For each half of the month, the difference between the number of purchases and sales is calculated. If the resulting number is positive, all insider sales during that half of the month are excluded from the data set, and only the purchases are retained. If the number is negative, the opposite adjustment is performed. The authors claim that this methodology allows for a clear-cut definition of buy and sell signals. The final sample consists of 731 purchases and 651 sales.

Abnormal returns are measured under the market model with the CDAX as a market proxy. The estimation period contains twelve months and ends one month prior to the day of the reporting of transactions. Moreover, Heidorn et al. (2004) employ control portfolios to adjust for company size.

The results show that insiders themselves trade profitably, regardless of whether they buy or sell stock of their own company. For purchases, outsiders are also able to earn statistically significant abnormal returns of 2.98% after twenty days.²⁰⁴ After six months, abnormal returns amount to 9.36%. Profits estimated under the control portfolio model are smaller yet remain statistically significant. After ten days, excess returns equal 1.41% for insider buys, and 1.69% after twenty days. Returns after the publication of sale transactions are relatively small and only in a few cases statistically different from zero. Regarding returns prior to transaction and reporting dates, Heidorn et al. (2004) find the common pattern of stock price reversal also found by U.S. and U.K. research. While transaction costs are not incorporated in the presented excess return estimates, their size and statistical significance in the case of insider purchases appear to contradict stock market efficiency.

²⁰⁰Chang and Suk (1998) also finds that trades published in the *WSJ* cause greater stock price reactions than the initial publication by the SEC. See Rau (2004), p. 207, Table 36.

²⁰¹See Rau (2004), pp. 210 and 212, Tables 38 and 39.

²⁰²See Rau (2004), pp. 140–141.

²⁰³See Heidorn et al. (2004), p. 8.

²⁰⁴See Heidorn et al. (2004), p. 4.

4.5.3.3 Tebroke and Wollin (2005)

Tebroke and Wollin (2005) study short- and medium-term returns after the publication of insider trades. Their results indicate substantial inefficiencies regarding insider purchases, as abnormal returns grow very large over time. Directors' dealings data are obtained from BaFin for the time period of July 2002 to June 2003, and the final sample consists of 612 purchases and 235 sales.²⁰⁵ Instead of relying on the commonly employed market model to measure excess returns, the authors rely on the market-adjusted return model. The market return is given by the CDAX index. Aggregated abnormal returns are computed by the Buy-and-Hold Abnormal Return (BAHR) method.²⁰⁶

Excess returns for purchases are positive and highly statistically significant after three days following the announcement of transactions.²⁰⁷ After five days, abnormal profits for outsiders amount to 1.44% and to 4.55% after twenty days. For sales, the market's reaction is considerably smaller and only in a few instances statistically significant.²⁰⁸ This result confirms the findings of Heidorn et al. (2004) but contradicts that of Rau (2004), who finds the market's reaction to sales is larger than its reaction to buys.

Tebroke and Wollin (2005) also study the effect of the insiders' position, transaction volume, firm size, and free float, on abnormal returns by the means of sub-samples and a cross-sectional regression. Company size is found to be negatively related to return residuals. In many instances, however, the market reacts more strongly to insider trading signals of medium-sized companies than to trades in small firms.²⁰⁹

In summary, abnormal returns of 16.34% after insider purchases and a holding period of 100 days indicate a market anomaly related to directors' dealings. Again, however, the authors fail to adjust for transaction costs.

4.5.3.4 Klinge, Seifert, and Stehle (2005)

Klinge et al. (2005) point out that a potential problem neglected so far in German event studies on directors' dealings is overlapping observations. Thus, the authors construct an "uncontaminated" sample without any overlapping observations to more clearly show the effects of insider trading signals. Similar to the previous research on the German stock market, however, Klinge et al. (2005) find that sizable abnormal returns materialize after the disclosure of directors' dealings, which are larger than those found in the U.S. and U.K. stock markets.

Klinge et al. (2005) examine the time period ranging from July 2002 to June 2004. After data adjustment, 1,434 insider buys and 1,503 insider sales remain in the sample.²¹⁰ The authors call this sample the "regular" sample and construct a second data set that does not contain any overlapping observation. In particular, all trades that feature other transactions of the same firm within an eleven-day window around the announcement day are excluded.²¹¹ After this adjustment, 691 purchases and 726 sales are observed. This data adjustment is performed because the authors argue that overlapping observations may distort the excess return estimates. If, for example, an insider sale is preceded by an insider purchase transaction within the same company, the post-event CAR of the buy transaction could potentially be

²⁰⁵See Tebroke and Wollin (2005), p. 40, Table 1.

²⁰⁶See Tebroke and Wollin (2005), p. 39

²⁰⁷See Tebroke and Wollin (2005), p. 41, Table 2.

²⁰⁸See Tebroke and Wollin (2005), p. 42, Table 3.

²⁰⁹See Tebroke and Wollin (2005), pp. 45–47.

²¹⁰See Klinge et al. (2005), p. 8.

²¹¹See Klinge et al. (2005), p. 13.

lowered by the subsequent sell signal. The actual impact of overlapping observations is, however, difficult to predict.

In terms of methodology, abnormal returns are computed under the market model, the mean adjusted return model, and the market adjusted return model.²¹² The market return is proxied by the return of the CDAX index. Since the results appear to be insensitive to the underlying asset pricing model, only the results under the market model are reported.

Abnormal returns found around insider dealings are similar to previous studies, as insider purchases (sales) are preceded by negative (positive) excess returns and followed by positive (negative) CAARs. For the regular reporting day sample, abnormal returns amount to a statistically insignificant 1.28% for purchases and a statistically highly significant -7.09% for sales after a twenty-day holding period.²¹³ After 60 days, returns grow to 4.49% for purchases and -12.60% for sales. Results for the sample excluding overlapping observations are only reported for days immediately following the announcement date. Post-event CAARs have the expected sign and are, in several instances, statistically significant, yet they seem to decrease with time.²¹⁴ A general finding is, however, also confirmed by the adjusted sample: sales appear to convey a stronger signal to the market than purchases, at least in the short-term.

Klinge et al. (2005) also study the influence of trading intensity, i.e., the number of purchases compared to the number of sales in any given month, and find that it has a strong and statistically significant influence on abnormal returns. In addition, transactions of members of the supervisory board seemingly have a stronger effect on excess returns than those of members of the executive board. This supports the hypothesis that members of the executive board receive a large part of their compensation in stock options and, thus, more often sell shares because of liquidity needs. Moreover, the cross-sectional regression analysis shows that firm size is negatively related to post-event abnormal returns, which is consistent with the notion of higher information asymmetries associated with smaller companies.

The authors interpret their findings as supporting evidence for the efficiency of the German stock market. CAARs of 1.47% for purchases and 2.51% after a holding period of four days, including the announcement day, as found in the adjusted sample, may, however, be exploitable by outsiders. Nevertheless, no definitive conclusion regarding market efficiency can be drawn, as no adjustment for transaction costs is performed.

4.5.3.5 Stotz (2006)

Stotz (2006) estimates abnormal returns to insiders as well as to outside investors and examines the influence of firm size and transaction volume. While transaction costs are taken into account, they are fixed and not estimated on a stock level.

The studied sample consists of directors' dealings disclosed between July 2002 and July 2003 by 232 firms.²¹⁵ After data adjustments, the number of purchases is 787, and that of sales is 189. Stotz (2006) uses the market model to compute abnormal returns and chooses the DAX 30 as the market index.²¹⁶ The use of other indices as market proxies only insignificantly changes results.

Examining profits to outsiders, Stotz (2006) finds that abnormal returns average 2.81% (-2.20%) for purchases (sales) after a holding period of 25 days, excluding the day of the disclosure of transactions.²¹⁷ Assuming round-trip transaction costs of one percent, abnormal returns decrease accordingly, but remain

²¹²See Klinge et al. (2005), p. 9.

²¹³See Klinge et al. (2005), p. 34, Table 10.

²¹⁴See Klinge et al. (2005), p. 35, Table 11.

²¹⁵See Stotz (2006), p. 451.

²¹⁶See Stotz (2006), p. 454.

²¹⁷See Stotz (2006), p. 460, Table A.1.

statistically significant in the case of purchases. Moreover, abnormal returns accumulate over time and are only partly realized immediately after the announcement of transactions.²¹⁸

Large volume trades, i.e., transactions with a volume of 25,000 euros and above, do not seem to convey a stronger signal to the market than smaller trades. Trades in large companies, however, exhibit greater post-event abnormal returns than trades in small companies. For example, return residuals in large companies with a market capitalization of 100 million euros or more amount to 3.71% after transaction costs.²¹⁹ This finding is essentially a reversal of the firm size effect that has been found in earlier studies, such as Seyhun (1986), Gregory et al. (1994), and Rau (2004).

The findings of Stotz (2006) speak against market efficiency, since outsiders are able to profit from supposedly stale information. Transaction costs are, however, not estimated on a security level but are fixed at one percent over all stocks. This transaction cost estimate could potentially underestimate bid-ask spreads in less liquid stocks and consequently distort results.

4.5.3.6 Betzer and Theissen (2009)

Betzer and Theissen (2009) analyze the dealing of German insiders and pay special attention to the impact of firm ownership structure, accounting standards, and the release of post-event earnings announcements, on returns to directors' dealings. The short-term excess returns after the publications of trades are generally found to be statistically different from zero and accumulate over time.

The sample period ranges from July 2002 and June 2004 and includes 4,272 transactions collected from the publicly-accessible BaFin database. If several trades of the same company are reported on the same days, these transactions are aggregated. As a result, 1,355 observations remain in the reporting day sample.²²⁰ The same procedure is performed for transactions of the same firm executed on the same day. This trading day sample contains 2,051 transactions. To compute excess returns, the market model is employed.²²¹ The market return is derived from the CDAX index, and the estimation window encompasses 180 days, ending 20 days prior to the event date.

Examining CAARs prior to the reporting of insider trades, Betzer and Theissen (2009) find negative (positive) excess returns prior to purchases (sales).²²² After the reporting of directors' dealings, CAARs reverse. After a holding period of eleven days (including the reporting day), CAARs amount to 1.93% for purchases and -2.41% for sales. After 21 days, CAARs grow to 3.50% and -3.49% for purchases and sales, respectively. All reported post-event excess returns are statistically highly significant. The authors also construct an adjusted sample to control for event clustering. Post-event CAARs remain, however, virtually unchanged.²²³

Other results of the study include that directors' dealings that precede earnings announcements yield larger abnormal returns, warranting blackout periods as imposed under U.K. legislation.²²⁴ Moreover, the market reaction to directors' dealings is stronger in widely held firms and companies that adhere to international accounting standards. The position of insiders, on the other hand, does not seem to have a significant impact on price effects.

In line with previous research, the findings indicate that mimicking the transactions of insiders may be a profitable endeavor. Post-event abnormal returns are sizable and, in addition, grow over time. These

²¹⁸See Stotz (2006), p. 457, Figure 4.

²¹⁹See Stotz (2006), p. 460, Table A.1.

²²⁰See Betzer and Theissen (2009), p. 7, Table 1.

²²¹See Betzer and Theissen (2009), p. 11.

²²²See Betzer and Theissen (2009), p. 413, Table 3.

²²³See Betzer and Theissen (2009), p. 417, Table 4.

²²⁴See Betzer and Theissen (2009), p. 420.

results contradict the notion of a semi-strong efficient German stock market. Nevertheless, direct and indirect transaction costs, such as bid-ask spreads, are not accounted for by Betzer and Theissen (2009).

4.5.3.7 Betzer and Theissen (2008)

Betzer and Theissen (2008) study the properties of delay in the disclosure of directors' dealings. The authors find that delays are longer in widely-held firms, as no major blockholder closely monitors the managers and their compliance with information requirements of stockholders and the market. Moreover, Betzer and Theissen (2008) find that abnormal returns are unrelated to reporting delays, implying that prices are distorted in the period between the transaction date and the days of disclosure. During the due course of their analysis, Betzer and Theissen (2008) also present an estimate of post-announcement abnormal returns.

The sample consists of 977 purchases and 1,005 sales in the period from July 2002 to June 2004.²²⁵ Directors' dealings data are collected from the BaFin. Daily expected returns are calculated under the market model, with an estimation period of 180 days ending 20 days prior to the announcement of insider transactions.²²⁶ The market return is proxied by the CDAX.

CAAR estimates of 2.40% for purchases and -2.63% for sales after a holding period of 20 days are presented.²²⁷ While these abnormal returns are statistically significantly different from zero, they are not adjusted for transaction costs. Thus, clear-cut implications for the efficiency of the German stock market are difficult to infer.

4.5.3.8 Implications for the Efficiency of the German Stock Market

Several of the papers examining the German stock market report very large abnormal profits after the disclosure of directors' dealings and are summarized in Table 4.3. In many instances, these return estimates surpass the corresponding results for the U.S. and U.K. stock markets. In addition, most studies find a drift in abnormal returns, i.e., profits monotonically increase with time. Accordingly, several authors, such as Rau (2004) and Stotz (2006), suggest that outside investors may profit from the insiders' superior knowledge regarding their firms' prospects. Any profitable trading strategy based upon directors' dealings signals would, however, glaringly violate the semistrong-form of the EMH.²²⁸ Nevertheless, one of the most pressing shortcomings of the presented studies is that transaction costs, and bid-ask spreads in particular, are blatantly neglected. The gross estimate of Stotz (2006) of transaction costs of one percent appears to be rather arbitrary and may prove misleading if large abnormal returns cluster in small companies, as suggested by Rau (2004). To further examine this apparent inefficiency, chapter 6 analyzes the costs that outside investors face when trying to profit from reported insider dealings under the *limits to arbitrage* framework.

²²⁵See Betzer and Theissen (2008), pp. 5 and 7.

²²⁶See Betzer and Theissen (2008), pp. 12–13.

²²⁷See Betzer and Theissen (2008), p. 24, Table 6.

²²⁸See Rau (2004), p. 227, and Stotz (2006), p. 459.

Table 4.3: Empirical Studies on Market Efficiency and Insider Trading in the German Stock Market

Author(s) (Year) <i>Journal</i>	Sample	Data Source	Event Window	Gross Abnormal Returns Purchases (%)	Sales (%)	Net Abnormal Returns Purchases (%)	Sales (%)	Study Focus and Conclusions
Rau (2004)	July 2002– December 2003 1,675 purchases, 1,229 sales	BaFin	2 days (0;1) 10 days (1;10)	0.37 to 3.80 1.22 to 3.51 ^a	-0.09 to -1.61 -3.03 to -16.47	n/a	n/a	CAARs are related to firm size. CAARs of the DGAP sample are generally larger.
Heidorn, Meyer, and Pietrowiak (2004) <i>Arbeitsbericht der Hochschule für Bankwirtschaft</i>	July 2002– March 2004 731 purchases, 651 sales	BaFin	6 days (0;5) 11 days (0;10) 21 days (0;20)	0.61 to 0.79 1.41 to 1.85 1.69 to 2.98 ^b	0.71 to 0.41 0.14 to -0.48 -1.51 to -1.55	n/a	n/a	Returns under the control portfolio model are generally smaller.
Tebroke and Wollin (2005) <i>Die Unternehmung</i>	July 2002–June 2003 612 purchases, 235 sales	BaFin	2 days (0;1) 6 days (0;5) 21 days(0;20)	0.24 0.69 4.55 ^c	0.03 1.07 -2.42	n/a	n/a	BAHR method. CAARs grow significantly over time.
Klinge (2005) <i>Working Paper</i>	July 2002–June 2004 1,434 purchases, 1,503 sales	BaFin	2 days (0;1) 6 days (0;5) 20 days (1;20)	0.55 to 1.30 0.60 to 0.69 1.29 ^d	-0.93 to -1.94 -1.91 to -2.04 -7.09	n/a	n/a	Sales convey a stronger signal to the market than purchases.
Stotz (2006) <i>German Economic Review</i>	July 2002–July 2003 787 purchases, 189 sales	BaFin	26 days (0;25)	1.63 to 4.81 ^e	-1.64 to -3.46	3.81 to 0.63	-0.64 to -2.46	Net CAARs are positive (negative) for purchases (sales). CAARs are greater in large companies.
Betzer and Theissen (2009) <i>European Financial Management</i>	July 2002–June 2004 728 purchases, 627 sales	BaFin	11 days (0;10) 21 days (0;20)	1.71 to 1.93 3.50 to 3.57 ^f	-2.41 to -2.88 -3.40 to -3.49	n/a	n/a	CAARs are larger in widely held firms and prior to earnings announcements.
Betzer and Theissen (2008) <i>Working Paper</i>	July 2002–June 2004 977 purchases, 1,005 sales	BaFin	21 days (0;20)	1.90 to 3.59 ^g	-2.50 to -2.67	n/a	n/a	Reporting delays have no impact on CAARs.

The table summarizes the empirical studies on market efficiency and directors' dealings in the German stock market. Reported abnormal returns are those achievable by outside investors, i.e., the event date is specified as the disclosure date of insider transactions. *Gross* abnormal returns are not adjusted for transaction costs, while *net* abnormal returns are.

^a See Rau (2004), p. 204, Table 34 (all trades), and p. 207, Table 36 (DGAP sample).

^b See Heidorn et al. (2004), p. 18, Table 4 (market model), and p. 19, Table 5 (control portfolio model).

^c See Tebroke and Wollin (2005), p. 41, Table 2, and p. 42, Table 3.

^d See Klinge et al. (2005), p. 34, Table 10 ("regular sample"), and p. 35, Table 11 ("non-overlapping observations sample").

^e See Stotz (2006), p. 460, Table A.1.

^f See Betzer and Theissen (2009), p. 413, Table 3 (normal sample), and p. 417, Table 4 (sample adjusted for event-clustering).

^g See Betzer and Theissen (2008), p. 24, Table 6.

Chapter 5

Empirical Analysis of Strategic Insider Trading around News Announcements

This chapter is concerned with the *strategic trading behavior* of insiders around corporate news events in the German stock market. As outlined in chapter 3, several studies have researched the link between directors' dealings and news releases, ranging from new security issues (Karpoff and Lee (1991)), earnings announcements (Cheng et al. (2005), Elliott et al. (1984), Ke et al. (2003), Noe (1999), Park et al. (1995)), stock repurchases (Lee et al. (1992), Madison et al. (2004)), bankruptcy (Loderer and Sheehan (1989), Seyhun and Bradley (1997)), anti-dumping complaints (Hartigan and Rogers (2003)), dividend announcements (John and Lang (1991)), and M&A activity (Lee et al. (1992)). Generally, insiders are found to adapt their trading behavior to corporate news events. While insiders trade several months and years before news announcements (see, for example, Seyhun and Bradley (1997)), trading activity decreases as the announcement date of news releases approaches (Ke et al. (2003), Huddart et al. (2007)).

For the German stock market, Dymke and Walter (2008) examine directors' dealings transactions that are followed by ad-hoc news disclosures. They find that abnormal returns of insider transactions are larger for trades that are followed by corporate news announcements and argue that German insiders appear to exploit private information.¹ Members of the supervisory board, and other non-executive insiders in particular, seem to engage in the practice of front-running news events.² On similar lines, Betzer and Theissen (2009) identify increased abnormal returns if directors' dealings take place prior to earnings announcements.³

The aim of this chapter is to extend this line of research and to further shed light on the trading strategies pursued by German insiders around corporate news disclosures. Its main distinction from the existing studies of Dymke and Walter (2008) and Betzer and Theissen (2009) is its focus on the level of *trading activity* and the prevalence of *active* and *passive* trading strategies around ad-hoc announcements, instead of estimating excess returns insiders earn by front-running news events. Hence, this study analyzes the topic from a different angle and is able to answer whether insiders systematically exploit

¹See Dymke and Walter (2008), p. 203, and also section 3.8 of this thesis.

²See Dymke and Walter (2008), p. 199, Table 5.

³Betzer and Theissen (2009) examine abnormal returns of insider transactions within U.K. blackout periods, which are defined as the two months prior to annual and interim earnings announcements and the four weeks prior to quarterly announcements. See also section 3.8.

their informational advantage; thus, it offers new insights into the effectiveness of German insider trading regulations.⁴

This study not only examines the illegal front-running of news events, but is also concerned with passive trading, i.e., the delaying of transactions until after the release of news announcements.⁵ This aspect of directors' dealings has so far been completely neglected by research on the German stock market. The following analysis, however, also adds to international research by providing evidence on *short-term* strategic insider trading around a large and varied number of news events.⁶ The data set itself offers an advantage compared to existing research on the topic in that the considered news events are ad-hoc announcements. Per definition, ad-hoc announcements should only reveal private and material information to other market participants. Studying directors' dealings around ad-hoc announcements thus allows to link insider trading directly to the release of private information.⁷ Such a direct link is more difficult to obtain in other jurisdictions.

The remaining chapter is structured as follows. First, hypotheses related to the trading behavior of insiders around corporate news announcements are presented in section 5.1. Next, the study design is outlined in section 5.2, and the data set is described in section 5.3. Descriptive statistics are presented in section 5.4, while section 5.5 outlines the study's methodology. The results of the analysis are discussed and presented in section 5.6, while section 5.7 concludes and elaborates on the implications of the study's findings.

5.1 Hypotheses

This section develops and motivates hypotheses related to the trading behavior of corporate insiders around news events. *Ad-hoc news announcements* are a distinct feature of German capital markets law. As opposed to corporate disclosures that recur on a regular basis, such as annual and interim reports, ad-hoc disclosure requirements are aimed at disseminating material non-public information to the market without delay. Companies are required to publish ad-hoc announcements unless such a dissemination is harmful to the issuer of stock.⁸ The definition of inside information that requires disclosure via an ad-hoc announcement is the same as that which is employed by insider trading legislation. As defined under section 13 of the WpHG, inside information is specific information concerning non-public circumstances, which, if made publicly-available, would likely have a significant effect on security prices.⁹ As a result, any foreknowledge of an upcoming ad-hoc news announcement, such as an M&A or a capital increase announcement, equates the possession of private information. Trading on the basis of such information constitutes illegal insider trading.¹⁰

As outlined in section 2.3.2, German law prescribes prison sentences of up to five years and monetary fines for illegal insider trading. Although these potential penalties are designed to deter illegal trading, the results of Dymke and Walter (2008) and Betzer and Theissen (2009) suggest otherwise. Both studies find instances of directors' dealings preceding ad-hoc announcements and earnings announcements. Moreover,

⁴German insider trading laws, which are largely based on European Law, are summarized in section 2.3.

⁵See also chapter 3 for a discussion of passive insider trading.

⁶The majority of existing studies in this field primarily examine insider transactions that take place months and years before a specific type of news announcements, such as Elliott et al. (1984) and Ke et al. (2003).

⁷This advantage, which is inherent in the use of ad-hoc announcements, is also pointed out by Dymke and Walter (2008).

⁸See section 2.5 for a detailed discussion of German ad-hoc disclosure regulations.

⁹See also section 2.3.2.3 for a definition of inside information under German law.

¹⁰Although required by regulations, not all ad-hoc announcements contain private information that is disseminated to the market. Especially during the high times of *Neuer Markt*, ad-hoc announcements were often abused as marketing instruments. Foreknowledge and trading on such ad-hoc announcements may not constitute illegal trading.

these transactions appear to earn larger abnormal returns than other trades.¹¹

International evidence on insider trading around corporate news events, however, suggests that insiders trade in a *smarter* manner. Insiders appear to exploit their informational advantage concerning upcoming news events while simultaneously minimizing the risk of detection (see, for example, Huddart et al. (2007)). Insider trading cases, for example that of Martha Stewart, show that the risk of detection is real and can not only result in prison terms and monetary fines, but also reputational damage and, in effect, leads to a reduction of human capital. Even an allegation or accusation of illegal insider trading may result in large reputational damages. While these disincentives may be outweighed by the gains from illegal trading, it appears nevertheless sensible that insiders trade in a manner that minimizes the downside risks.

In this context, the following hypotheses are formulated. The first set of hypotheses is related to *pre-announcement* or *active* trading (section 5.1.1), while the second set of hypotheses is designed to examine *post-announcement* or *passive* trading activity (section 5.1.2).

5.1.1 Pre-announcement Trading Activity

Insiders in possession of private and valuable information about pending news releases face conflicting incentives. On the one hand, they stand to profit from trading on their informational advantage by earning excess returns. Depending on the price impact of news announcements, these trading profits can be substantial.¹²

On the other hand, insiders also face several potentially adverse repercussions. These disincentives include the risk of litigation from the regulator, litigation and disciplinary actions by the insider's company, and risks regarding the insider's reputation. The risk of litigation depends on the level of enforcement of the regulator as well as the potential penalty payments provisioned by insider trading laws. As outlined in section 2.3.4 and indicated by the study of Beny (2005), the degree of enforcement of insider trading laws in Germany lacks the effectiveness present in the U.S. and the U.K. but may be considered sufficiently high.¹³ Regarding penalties for illegal insider dealings, the maximum retribution amounts to imprisonment of up to five years and also monetary fines. Additional indirect costs, such as damage to the insider's reputation, job loss, and a general reduction in the insider's future earnings power, may further deter illegal insider trading.

If insiders, who are in possession of valuable non-public information, are considered as rational, risk-neutral, utility maximizing agents, they will choose to exploit their informational advantage if the benefits from abnormal returns are larger than the costs stemming from potentially adverse repercussions. If this assumption is relaxed, and insiders are considered to be risk-averse agents, they will be less inclined to trade. While benefits in the form of excess profits will be obtained with relative certainty, the negative payouts from litigation and public scrutiny are highly uncertain, and volatile. Thus, depending on the degree of risk-averseness, insiders will put more weight on the costs associated with illegal trading. Besides this economic view on insider trading behavior, insiders may as well hold ethical reservations towards unlawful conduct, which should further reduce illegal insider trading. In the real world, corporate insiders most likely can be considered as risk-averse agents.

The above argument suggests that insiders with knowledge about upcoming news event should, on

¹¹See section 3.8 for a detailed discussion of the studies of Dymke and Walter (2008) and Betzer and Theissen (2009).

¹²Dymke and Walter (2008), for example, find that members of the supervisory board, on average, earn cumulated abnormal returns of 12.96% over the 21 days after and including the announcement day. See Dymke and Walter (2008), p. 199, Table 5.

¹³See Beny (2005), pp. 160–161, Table II.

average, choose not to actively trade on that information. Park et al. (1995) argue that the propulsion to trade decreases as the announcement day approaches since the probability of regulatory repercussions increases.¹⁴ In addition, companies often restrict trading by employees prior to news announcements to avoid any negative publicity and because firms themselves may be legally liable if they do not take sufficient precautions to deter illegal trading. Thus, less *informed* trading activity should occur right before news announcements compared to other time periods. Informed trading is defined as pre-announcement transactions in the right direction, i.e purchases prior to positive news and sales before negative news. However, even if insiders with private information refrain from actively trading before company news disclosures, other insiders may not possess this information and may trade randomly before news events.¹⁵ Thus, while it may be imprudent to argue that all insider trading ceases prior to ad-hoc disclosures, it may be argued that informed trading prior to news announcements should be reduced compared to other periods:

Hypothesis 5.1.1.1 *Informed insider trading activity prior to news announcements is reduced compared to other periods.*

While insiders may not have sufficient incentives to front-run news events, they may have similarly small incentives to trade in the *wrong* direction before news events. Such *uninformed* trading is defined as insider purchasing (selling) prior to positive (negative) news events. Consider, for example, an insider who plans to buy (sell) stock. If the insider is aware of an upcoming disclosure that will decrease (increase) the share price, the insider may choose to delay the trade until after the announcement. Such smart trading, also often referred to in the literature as *passive* or *non-trading* (see for example Seyhun (1998) and Madison et al. (2004)), allows insiders to trade at more favorable prices and is not illegal. Although passive trading is technically illegal if transactions are based on private information, the latter case is virtually impossible to prove. If insiders indeed delay transactions to take advantage of an upcoming ad-hoc announcement, it is utterly hard to establish in court that the intent to trade existed and any trade was deliberately delayed. Consequently, passive trading is merely frowned upon, and litigation and reputational risks are relatively low.¹⁶ Thus, given that other circumstances, such as urgent liquidity needs, do not require the insider to trade immediately, the above argument leads to the second hypothesis, which proposes that uninformed insider trading activity is subdued prior to ad-hoc news releases compared to other periods.

Hypothesis 5.1.1.2 *Uninformed insider trading activity prior to news announcements is reduced compared to other periods.*

5.1.2 Post-Announcement Trading Activity

Incentives for insiders after news events are much different from the high-risk pre-announcement period. Once private information is disseminated to the public via an ad-hoc disclosure, insiders face no legal

¹⁴See Park et al. (1995), pp. 589–590.

¹⁵An example of such unwarranted trading prior to a corporate disclosure may be the sale transaction of Noel Forgeard, the former Co-CEO of EADS, who in March 2006 sold shares a few weeks prior to the announcement of delays in delivering the Airbus A380.

¹⁶The reputational risks involved in passive trading may not be low for high-profile managers. A prominent example is the exercise of call options and the subsequent sale of stock by Klaus Zumwinkel, CEO of Deutsche Post AG, at the end of 2007. Zumwinkel engaged in these transactions shortly after it was announced that the German government would introduce minimum wages for the mail sector, which was beneficial to the share price of Deutsche Post. Public outcry was substantial, and the actions of Zumwinkel were extensively and unfavorably discussed in the German press. Although not necessarily passive trading in the classic sense, because Zumwinkel may not have previously known of the decision of the German government, this example shows that passive trading is frowned upon if it comes to the public's attention.

restrictions to trade if they are not in possession of other material inside information. Huddart et al. (2007) refers to this period as “low-jeopardy.”¹⁷ If trades are delayed, many transactions should occur during the post-announcement period, and trading activity after news events should generally be higher. Since insiders have incentives to delay purchases (sales) until after the publication of negative (positive) ad-hoc announcements, the following hypothesis is proposed:

Hypothesis 5.1.2.3 *Informed insider trading after news announcements is increased compared to other periods.*

Along similar lines, insiders should have little motivation to execute uninformed trades after the announcement of news, such as purchasing after good news and selling after negative news. In theory, ad-hoc news announcements should decrease any informational asymmetries between insiders and outside investors. Hence, once the informational advantage of insiders is lost, they should have no propulsion to trade, unless they have delayed a trade they originally planned to execute at an earlier stage.

Hypothesis 5.1.2.4 *Uninformed insider trading activity after news announcements is reduced compared to other periods.*

5.1.3 Influence of Stock Price Impact of News Announcements on Trading Patterns

If insiders do engage in a cost/benefit calculation when engaging in trading around news announcements, the magnitude of abnormal returns caused by the announcement should influence the trading behavior of insiders. Korczak et al. (2009) argue that the relationship between the incidence of insider trading and the informational content conveyed by news disclosures is non-linear.¹⁸ The main reason for this is that news events with a significant stock price impact are associated with high litigation and reputational risk, thus deterring pre-announcement insider trading. Although a significant stock price impact may also reduce post-announcement trading because of reputational risks, it is more likely that it increases post-announcement trading because it offers comparatively large profit opportunities. Along the same line of argument, insiders should have vastly reduced incentive to engage in uninformed trading prior or after significant news releases. Taken together, the result of significant news releases should be that the trading patterns hypothesized above should be more pronounced.

Hypothesis 5.1.3.5 *The trading patterns proposed in hypotheses H 5.1.1.1 to H 5.1.2.2 are more pronounced around news disclosures with a significant stock price impact.*

5.1.4 Overview of Hypotheses

In summary, the above hypotheses facilitate an examination of strategic trading behavior by German insiders around ad-hoc news announcements and also allow for an evaluation of the effectiveness of insider trading regulations. If relatively little informed trading activity takes place prior to ad-hoc announcements, the disincentives stemming from litigation and reputational risk would seem to be sufficiently high to deter illegal conduct. At the same time, a clustering of informed insider transactions after ad-hoc disclosures would suggest that insiders trade smartly when exploiting private information, i.e., they postpone their trades to a low-risk period.

¹⁷See Huddart et al. (2007), p. 5.

¹⁸See Korczak et al. (2009), p. 17, ff.

Table 5.1 presents an overview of the hypotheses defined in sections 5.1.1 and 5.1.2.

Table 5.1: Overview of Hypotheses

Number	Hypothesis
<u>Pre-announcement Trading Activity</u>	
H 5.1.1.1	Informed insider trading activity prior to news announcements is reduced compared to other periods.
H 5.1.1.2	Uninformed insider trading activity prior to news announcements is reduced compared to other periods.
<u>Post-announcement Trading Activity</u>	
H 5.1.2.1	Informed insider trading after news announcements is increased compared to other periods.
H 5.1.2.2	Uninformed insider trading after news announcements is reduced compared to other periods.
<u>Influence of Stock Price Impact of News Disclosures</u>	
H 5.1.3.1	The trading patterns proposed in hypotheses H 5.1.1.1 to H 5.1.2.2 are more pronounced around news announcements with a significant stock price impact.

5.2 Study Design

The hypotheses defined in section 5.1 are aimed at testing whether insiders profit from their informational advantage by trading strategically around news announcements. To test the hypotheses summarized in Table 5.1, this study is structured as follows.

First, the sample and data sources are described in section 5.3. This includes an outline of the employed directors' dealings as well as ad-hoc news announcement data. Arguably, an examination of supposedly *legal* directors' dealings may not be an adequate data set to investigate *illegal* insider dealings. It could be regarded implausible that insiders engage in illegal trading and subsequently make their conduct public by reporting their transactions as directors' dealings. This behavior is, however, what Dymke and Walter (2008) and Betzer and Theissen (2009) find. Dymke and Walter (2008), for example, show that more than 20% of insider transactions are followed by ad-hoc disclosures within 20 trading days and are associated with larger abnormal returns than other trades.¹⁹ Furthermore, corporate insiders may be inclined to camouflage illegal or at least questionable transactions by reporting them to the regulator, thus fostering a perception of legal and lawful behavior. In addition, this study is not only concerned with illegal trading, but also with legal trades and any identifiable patterns around corporate news events. Insiders should have little reservations to report post-announcement transaction since these are generally not considered to be illegal.

The study's methodology is discussed on section 5.5, and descriptive statistics of the data set are presented in section 5.4. The methodology is focused on the measurement of *abnormal* insider trading

¹⁹See Dymke and Walter (2008), p. 197, Table 4.

activity, whereby insider trading activity is captured by several variables that take the number of traded shares, the traded volume and the number of transactions into account. Abnormal trading activity is estimated by subtracting a *normal* level of trading from the observed level of trading activity.

Since trading strategies around ad-hoc news announcements first and foremost depend on the stock price movement caused by the news event, all announcements are subjected to an event study. On this basis, several samples are defined for which pre- and post-announcement trading is examined. The study's results are presented in section 5.6, while section 5.7 concludes and discusses the study's implications.

5.3 Data Set

The data set analyzed in this empirical study consists of ad-hoc news and directors' dealings announcements. The sample selection criteria are outlined in section 5.3.1, and section 5.3.2 describes the data sources as well as the performed data adjustments.

5.3.1 Sample Selection

This study is concerned with insider trading activity around news announcements in the German stock market. To study such trading activity, the empirical study is based on insider trading as well as ad-hoc news disclosure data. In Germany, ad-hoc disclosure legislation has been in effect since the 1990s. Directors' dealings regulations, on the other hand, are much younger and have only been in effect since July 1, 2002, which limits the studied time period. First, the ad-hoc news announcement sample period is determined. Given that the analysis relies on an estimation period of 100 trading days (about 20 weeks or 5 months) for "normal" levels of insider trading activity, the news event sample extends from January 1, 2003, to December 31, 2006, and includes a total of 48 months.

The directors' dealings sample period encloses this period. It begins on July 11, 2002 and ends on January 29, 2007. This time frame includes the required estimation period for a normal level of trading activity (100 trading days), the pre-announcement event period (20 trading days), and the post-announcement event period (20 trading days).

Generally, the sample consists of all ad-hoc announcements and directors' dealings released in the German market during the studied time period. However, some sample selection criteria have to be imposed in order to ensure the integrity and informational content of the data set.

First, directors' dealings are required to relate to German securities. Foreign companies are not analyzed in this study because they may be subject to international corporate governance and directors' dealings legislation, thus potentially distorting trading incentives for insiders. It is also required that transaction prices of directors' dealings are quoted in euros.²⁰

Secondly, this study is only concerned with open-market purchases and sales of common stock or preferred equity, a sample selection criteria that is commonly applied in studies on insider trading.²¹ German law requires insiders to report not only their stock transactions, but also security lendings and trades in financial instruments such as employee stock options (ESOs), derivatives, convertible bonds, and stock allocation rights. Although such transactions may also be used by insiders to benefit from privileged knowledge about ad-hoc announcements, such trades may be motivated by different reasons than plain vanilla open-market transactions. The execution of ESOs, for example, may be motivated by

²⁰These sample selection criteria are necessary because two measures of insider trading activity, the euro value of shares traded and the percentage of market capitalization traded, are based on transaction volumes, the number of shares traded times the share price. See section 5.5.2 for a definition of the variables used to measure insider trading activity.

²¹See, for example, Friederich et al. (2002), Klinge et al. (2005), and Dymke and Walter (2008).

tax or maturity reasons and not influenced by private information about news events. As a result, all non-open-market purchases and sale transactions are discarded from the sample.

As opposed to the empirical study in chapter 6, directors' dealings with a long reporting delay are not excluded from the data set. The reporting delay, which is defined as the number of trading days between the actual date of the transaction and its publication, is not relevant for this study, as it focuses on the execution timing of trades and not their publication to the public.²² Furthermore, trades with small transaction volumes are also not excluded from the data set. Although they may be disregarded by other market participants, insiders themselves may profit from them by earning abnormal returns, albeit a smaller absolute level in euro terms.

These sample selection criteria translate into several data adjustments that are outlined together with the employed data sources in the next section.

5.3.2 Data Sources and Adjustments

5.3.2.1 Directors' Dealings Data

5.3.2.1.1 Data Sources Several sources for data on German directors' dealings exist. These sources mainly differ in their scope of available data records and data integrity. This section discusses the available data sources and motivates the selection of the chosen data provider.

BaFin maintains a publicly-accessible online database that contains all transactions disclosed according to section 15a of the WpHG during the past twelve months at any given point in time.²³ As detailed in section 2.3.3.3, BaFin can be considered as a primary data source for directors' dealings, since insiders have to notify BaFin as well as their respective companies of their transactions within five business days.²⁴ The data integrity can generally be considered to be as good, although several data records are incomplete. In addition, data records are not aggregated. If, for example, an insider splits a large order into several trades, each trade is reported as a single data record.

Another primary source of directors' dealings is the German *business register* (Unternehmensregister).²⁵ Since the Transparenzrichtlinien-Umsetzungsgesetz (TUG) became effective on January 20, 2007, the business register holds capital markets information, including directors' dealings notifications.²⁶ After issuers have transmitted directors' dealings to news media outlets for an European-wide dissemination, issuers are required to communicate the announcement to the business register. While the online platform is easily searchable for directors' dealings notifications, it lacks any workable export function. In addition, the data availability is severely restricted by the relatively recent implementation of the TUG.

As noted above, issuers must transmit directors' dealings information to news services, which ensure an European-wide dissemination of the insiders' share dealings. Thus, these news service may also be regarded as a primary data source. In practice, three major directors' dealings service providers for the German market exist: DGAP, euro adhoc, and hugin. All services maintain publicly-accessible databases that contain the announcements transmitted by the respective news service. While the data integrity can generally be considered sound, the databases offer no export function. Furthermore, the websites

²²In cases in which the trading or reporting were obviously wrong, i.e., the reporting date was prior to the trading date, data entries were adjusted with other sources of directors' dealings.

²³Later transactions are removed from the publicly-available database.

²⁴See section 15a (1) of the WpHG.

²⁵The German business register is an online platform, which is accessible at <http://www.unternehmensregister.de>, as of June 5, 2008. The business register has been in existence since January 1, 2007, and contains electronic versions of company information published in the German federal bulletin (Bundesanzeiger).

²⁶The TUG was ratified on December 15, 2006, and also prescribes that ad-hoc news announcements are submitted to the business register.

of issuers of stock constitute a primary data source for directors' dealings. Companies, however, rarely publish directors' dealings information reaching back longer than one year.

A secondary source for directors' dealings is the "Infopool für meldepflichtige Wertpapiergeschäfte (Directors' Dealings)."²⁷ The database combines data records published on company websites, BaFin's database, and DGAP's database. Company websites often contain transactions that are below the official reporting threshold (25,000 euros per year prior to the AnSVG and 5,000 euros thereafter). Such trades are not necessarily contained in the BaFin database, unless corporate insiders also choose to notify the regulator on a voluntary basis. In practise, however, the majority of voluntary notifications are disclosed to the company as well as the BaFin. Data records are generally aggregated for insiders and for a given trading or reporting day. The data integrity appears to be at least as good as that of the BaFin database.

An alternative data service is provided by 2iQ Research GmbH. Their fee-based directorsdealings.eu service is tailored to institutional and specialized individual investors relying on real-time data feeds. Data records are obtained from BaFin and undergo consistency checks. Nevertheless, several data records contained in the BaFin database appeared to be missing from the data set obtained from directorsdealings.eu.

Because BaFin presents an official and primary source of directors' dealings data and offers acceptable data integrity, the subsequent empirical analysis is based on the records published by BaFin. Its punctual shortcomings in data consistency are overcome by performing double-checks with other directors' dealings sources.²⁸

The BaFin database contains a total of 15,490 trades executed between July 11, 2002 and January 29, 2007. The available data items include, amongst others, the date of the trade as well as the date of reporting, the full name of the insider, the company, the name and local security code of the traded security, the number of shares traded, the share price, its currency, the position of the insider, and the type of transaction.

5.3.2.1.2 Data Adjustments As outlined in section 5.3.1, several sample selection criteria are applied to the initial data set. All data adjustments are also outlined in Table 5.2.

The first sample selection criterion is that directors' dealings are related to German securities and are reported in euro currency. Whether a security is German or foreign is determined by its International Securities Identification Number (ISIN).²⁹ Searching the database for foreign securities yields a total of 2,310 entries, which are removed from the sample. Similarly, 44 transactions in German securities are found to be denoted in foreign currencies and are discarded.

Regarding transactions other than open-market purchases and sales in common stock or preferred equity, 882 records relate to derivatives, which includes the exercise of options as well as the trading of derivative instruments. Two hundred and eighty-nine entries concern stock allocation rights due to capital increases, and 94 trades take place in convertible bonds. In 40 instances, transactions relate to the acceptance of a tender offer according to the Wertpapiererwerbs- und Übernahmegesetz (WpÜG), Germany's takeover law. Furthermore, 155 directors' dealings relate to the lending of securities, and 220 trades are intra-insider transactions. The latter mainly refers to endowments and the transfer of stock from one insider to another, such as, a stock transfer to a spouse or dependent from a primary insider. In

²⁷The database is accessible at <http://www.insiderdaten.de>, as of May 29, 2008.

²⁸Various consistency checks were performed in this study utilizing other sources of directors' dealings, such as insiderdaten.de and company websites, to verify the integrity of the data set.

²⁹The first two letters of the ISIN display the country code of the security.

the context of this study, such transactions can be considered as non-events and are, therefore, discarded from the data set.

Some transactions are “induced” by news events. For example, some trades are announced in ad-hoc news, such as when large shareholders plan to sell a considerable stake. Such trades (14 in total) are removed from the sample because they may distort results. In addition, 270 entries are categorized as “other.” This includes trades related to initial public offerings (IPO) or to greenshoe options, and to duplicate, incomplete, or incorrect records that could not be reconstructed with the help of other data sources. After these adjustments, 11,172 open-market transactions (5,799 purchases and 5,373 sales) remain in the directors’ dealings data set.

While typically event studies of directors’ dealings perform an aggregation of trades to avoid event clustering, no such adjustment is required here, since this study examines trading volumes and the incidence of transactions.³⁰

Table 5.2: Directors’ Dealings Data Set

Total no. of transactions between July 11, 2002 and January 29, 2007	15,490
Foreign ISIN	2,310
Foreign currency	44
Option- or derivative-related	882
Capital increase	289
Convertible bonds	94
Takeovers according to WpÜG	40
Securities lending	155
Intra-insider	220
Induced by news events	14
Other	270
<i>Directors’ Dealings Sample</i>	11,172
Purchases	5,799
Sales	5,373

The table outlines the adjustments applied to the original data set obtained from BaFin. Non open-market trades, such as transactions related to options, derivatives, capital increases, convertible bonds, security lending, and takeovers, are discarded. In addition, intra-insider trades, non open-market purchases and sales, and incomplete transactions are removed. Of the remaining 11,172 directors’ dealings, 5,799 transactions are purchases, and 5,373 are sales.

5.3.2.2 Ad-hoc Announcement Data

5.3.2.2.1 Data Sources In Germany, companies typically rely on special ad-hoc disclosure service providers to distribute their announcements according to section 15 WpHG. The issuer of stock submits the announcement to the service provider, which forwards the release to several news wires simultaneously, such as Bloomberg, Dow Jones, dpa-AFX, Thomson Reuters, and vwd, and ensures an European-wide distribution. The three major providers are *Deutsche Gesellschaft für Ad-hoc-Publizität* (DGAP), *euro*

³⁰See, for example, Betzer and Theissen (2009) and section 6.3.2, for studies involving the aggregation of directors’ dealings transactions.

adhoc, *hugin*. According to Märzheuser and Gutzy (2004), these three providers are the only significant ad-hoc news services in Germany and account for virtually 100% of all published ad-hoc announcements. *Business Wire* is a news provider that entered the German market after the studied period and is, thus, not relevant as a data source for the analysis at hand.

For the studied time period, a total of 11,354 ad-hoc announcements are collected from the databases of the first three mentioned providers. Thereof, 8,747 ad-hoc announcements are transmitted by DGAP, 1,971 by euro *adhoc*, and 636 by *hugin*.³¹ For all entries, the announcement's content and exact date and time to the second are available.

5.3.2.2.2 Data Adjustments As outlined in section 5.5.4, the selected ad-hoc news events are classified into *good* and bad *news* events, depending on the associated abnormal return estimates. Excess return is gauged by a classic event study which entails stock return data requirements. In several cases, these data requirements are not met, which leads to the exclusion of ad-hoc announcements from the data sample. In 43 instances, no stock data at all is available. This occurs, for example, if the ad-hoc announcement is released by a company with traded bonus shares, which has no regular listing of common stock. Another 310 news events are discarded due to insufficient or erroneous return data. Furthermore, 46 news events are excluded because all of the 180 estimation window returns are equal to zero.³²

A large adjustment is made for ad-hoc news releases by companies that do not report any directors' dealings in the time period ranging from July 11, 2002 to January 29, 2007. Such announcements amount to 2,444 events. They are excluded on the assumption that these companies either have internal policies in place restricting directors' dealings, or company insiders voluntarily choose not to trade stock of their own company.³³

Besides the above-mentioned adjustment, announcements are carefully screened to ascertain whether they are a direct result of reported directors' dealings or announce upcoming insider transactions. In several cases, for example, sizeable directors' dealings transactions are separately reported after the trade occurred via an ad-hoc announcement. In such cases, the ad-hoc announcement is removed from the pre-announcement sample, which examines insider trading activity prior to news events (34 events). In other instances, ad-hoc disclosures precede and announce upcoming directors' dealings. In these cases, the news event is excluded from the post-announcement sample, which is used to analyze insider trading activity following news events (16 events).³⁴ The identified events are only removed from the respective pre- and post-announcement sub-samples.

Another adjustment that is related to the event study performed on the ad-hoc announcements is the specification of the event day. Since ad-hoc announcements are disclosed during trading as well as non-trading hours, the date of publication is adjusted to account for German stock exchange opening hours. This study employs only price quotes from the Xetra system, which had daily operating hours from 9:00 a.m. to 8:00 p.m. until November 2, 2003.³⁵ Since then, Xetra trading hours have been shortened, and the last auction is now held at 5:30 p.m. Accordingly, the event date of ad-hoc news is set to the next following day, if the time of publication is after 8:00 p.m. for ad-hoc news prior to November 3,

³¹DGAP was kind enough to provide ad-hoc announcements as a data export from their database. For euro *adhoc* and *hugin*, ad-hoc announcements were collected manually.

³²Events that contain only zero returns during the estimation period are excluded because this severely distorts the beta estimation under the market model.

³³Including these ad-hoc announcements would have little benefit for the purpose of this study, since estimates of abnormal trading activity would be equal to zero in all of these instances.

³⁴In both mentioned cases, the directors' dealings transactions themselves are retained in the sample.

³⁵Xetra is the electronic trading system of Deutsche Börse AG. At the end of 2007, about 91% of the trading volume in German stocks was processed on Xetra. Another 6% was traded on the floor. The remaining share is attributable to foreign stock exchanges and proprietary systems (*Deutsche Börse AG, January 02, 2008*).

2003. For all other ad-hoc announcements, the event date is set to the next following business date if the time of publication is after 5:30 p.m. If ad-hoc announcements are released on a weekend or any other non-trading day, the event date is set to the next following business day.

A potential issue arises because floor trading on Germany's regional exchanges is open until 8:00 p.m. As a result, market participants can react to and trade upon ad-hoc announcements that are released after November 2, 2003 and between 5:30 p.m. and 8:00 p.m. on regional stock exchanges. Since this study only relies on Xetra price quotes, it could be argued that such ad-hoc announcements should be excluded from the data set. However, any price changes in the regional exchange quotations caused by ad-hoc news published after the Xetra closing should be reflected in Xetra prices on the next following day, unless substantial other developments occur in close proximity that distort return observations. Thus, these announcements are not removed from the sample.

The final ad-hoc announcement sample consists of 8,500 events. Thereof, 8,466 events fall into the pre-announcement sample, which is used to examine insider trading prior to ad-hoc releases, and 8,484 fall into the post-announcement sample, which is employed to analyze trading activity after the publication of ad-hoc news.

Table 5.3: Ad-hoc News Data Set

Total no. of ad-hoc announcements between January 1, 2003, to December 31, 2006	11,354
Thereof from DGAP	8,747
Thereof from euro adhoc	1,971
Thereof from hugin	636
<hr/>	
Duplicate announcements	13
No stock data available	43
Insufficient or erroneous stock data	310
Too many zero returns in estimation window	46
Company not associated with directors' dealings	2,444
<hr/>	
<i>Ad-hoc news announcement sample</i>	8,500
Pre-announcement sample	8,466
Post-announcement sample	8,484

The table outlines the ad-hoc news data set, which consists of a pre-announcement as well as a post-announcement sample. News events were collected from the three major ad-hoc news services that operated during the sample period, including *Deutsche Gesellschaft für Ad-hoc-Publizität* (DGAP), *euro adhoc*, and *hugin*. News announcements from DGAP were provided in a database extract from the company. For euro adhoc and hugin, the publicly-available databases were used to extract announcements for the period ranging from January 1, 2003, to December 31, 2006. For this time period, a total of 11,354 announcements are collected. The majority thereof, 8,747 news events, were distributed by the DGAP, while euro adhoc emitted 1,971 and hugin released 636 announcements. Often, ad-hoc releases are published in German as well as in English. To avoid any double counting, only German ad-hoc releases were extracted from the respective data sources. In some sporadic instances, the same ad-hoc announcement is released twice or corrected shortly after the initial publication; 13 such duplicate announcements are identified and excluded from the sample. All ad-hoc releases are categorized into good and bad news events, according to the associated abnormal return, which is calculated under the market model. For 43 events no share price data at all is available, which leads to the exclusion of these events. Another 310 news events are discarded due to insufficient or erroneous return data. Furthermore, 46 news events are excluded because all of the 180 estimation window returns are equal to zero. A large adjustment is made for ad-hoc news releases by companies that do not report any directors' dealings in the time period ranging from July 11, 2002 to January 29, 2007. Such announcements amount to 2,444 events. They are excluded on the assumption that these companies either have internal policies in place restricting directors' dealings, or company insiders voluntarily choose not to trade stock of their own company. News announcements are carefully screened for instances in which news disclosures are induced by directors' dealings, such as when a large insider transaction is pre-announced. This adjustment results in the exclusion of 34 events from the pre-announcement sample, and 16 events from the post-announcement sample.

5.3.2.3 Other Data

Section 5.5.2 defines several variables to measure insider trading activity. One of these variables, the percentage of market capitalization traded, relates reported insider transaction volumes to a firm's market capitalization. The latter data is retrieved from Thompson Financial Datastream.³⁶

Datastream is also used to gather daily dividend adjusted closing prices, which are used to calculate

³⁶The Datastream item "MV" is used as market capitalization item. One potential disadvantage of the data item is that it does not aggregate multiple stock listings, as the data item "MVC" does. However, no historic time-series data is available for the latter item.

returns and abnormal returns associated with ad-hoc disclosures.³⁷ To avoid any biases arising out of nonsynchronous data, only Xetra quotations are obtained from Datastream.³⁸ As recommended by Ince and Porter (2006), stock price data are carefully screened in order to delete zero returns from dead stocks. In addition, Datastream price observations on non-trading days are discarded.

5.4 Descriptive Statistics

The following tables describe the final ad-hoc news and directors' dealings samples. As noted previously, two ad-hoc announcements data sets, one for the examination of insider trading activity prior to news releases and one for the examination of post-announcement trading, are constructed. For each of these samples, Tables 5.4 and 5.5 outline ad-hoc announcements according to their associated abnormal return as measured by $CAR(0;1)$, as well as whether these news events are preceded or followed by insider transactions.³⁹

Table 5.4 is concerned with the pre-announcement sample. First of all, the majority of news events are associated with an absolute excess return not greater than 10%. Only 607 (829) out of a total of 8,466 announcements cause an abnormal stock price reaction that is smaller (larger) than -10% (10%). Furthermore, only 5.4% of all ad-hoc announcements are preceded by insider transactions during the 20 business days leading up to the disclosure. Interestingly, the distribution of news preceded by directors' dealings is relatively stable across the different buckets of abnormal return. As discussed in section 5.1, if insiders are assumed to be law-abiding and risk-averse, it can be argued that the instance of insider trading prior to very price-sensitive news events, i.e., with an absolute $CAR(0;1)$ larger than 10%, should be smaller than observed insider trading prior to other announcements. However, the descriptive statistics presented here do not account for informed and uninformed transactions. Thus, even through the distribution of the number of ad-hoc news preceded by insider trading appears to be relatively uniform across the associated abnormal return of announcements, the data does not necessarily suggest that insiders do not adopt their trading behavior depending on the abnormal returns associated with news announcements.

³⁷Datastream item "RI" is used for dividend adjusted closing prices.

³⁸Section 6.6.3.5 provides further background on why only Xetra prices are employed in this study.

³⁹See section 5.5.4.1 for a discussion of the abnormal return estimation.

Table 5.4: Pre-announcement Ad-hoc News Sample - Descriptive Statistics

Abnormal Return	Number of Ad-hoc Announcements				Total
	Preceded by Transaction		Not Preceded		
	Absolute	%	Absolute	%	
CAR(0;1) < -10%	26	4.3%	581	95.7%	607
-10% >= CAR(0;1) < 0%	192	5.5%	3,311	94.5%	3,503
0% >= CAR(0;1) <= 10%	204	5.8%	3,323	94.2%	3,527
CAR(0;1) > 10%	38	4.6%	791	95.4%	829
Total	460	5.4%	8,006	94.6%	8,466

The table provides descriptive statistics on the pre-announcement sample of the ad-hoc news data set. The number of ad-hoc disclosures is shown, depending on the associated excess returns measured by CAR(0;1). The estimation of abnormal returns is discussed in section 5.5.4.1. In addition, news events are divided into two groups, indicating whether the announcement is preceded by any directors' dealings or not. An announcement is associated with a transaction if a trade occurs during the 20 trading days leading up to the news release.

Notwithstanding these limitations, it becomes apparent that directors' dealings after ad-hoc announcements are more prevalent than before news disclosures (see Table 5.5). In the post-announcement data set, 755 or about 9% of the total 8,484 news events, are succeeded by any sort of insider transaction. This compares to the 5% in the pre-announcement sample. The descriptive statistics also suggest that insiders engage in trading after news events that have a large negative impact on stock prices (11.2% of news events), as opposed to after announcements with a large positive effect on prices (8.0% of news events).

Table 5.5: Post-announcement Ad-hoc News Sample - Descriptive Statistics

Abnormal Return	Number of Ad-hoc Announcements				Total
	Preceded by Transaction		Not Preceded		
	Absolute	%	Absolute	%	
CAR(0;1) < -10%	68	11.2%	539	88.8%	607
-10% >= CAR(0;1) < 0%	328	9.3%	3,181	90.7%	3,509
0% >= CAR(0;1) <= 10%	292	8.3%	3,242	91.7%	3,534
CAR(0;1) > 10%	67	8.0%	767	92.0%	834
Total	755	8.9%	7,729	91.1%	8,484

The table provides descriptive statistics on the post-announcement sample of the ad-hoc news data set. The number of ad-hoc disclosures is shown depending on the associated excess returns measured by CAR(0;1). The estimation of abnormal returns is discussed in section 5.5.4.1. In addition, news events are divided into two groups, indicating whether the announcement is succeeded by any directors' dealings or not. An announcement is associated with a transaction if a trade occurs during the 20 trading days following the news release.

5.5 Methodology

This section discusses the methodology and analysis utilized in this chapter to test the hypotheses outlined in section 5.1. The analysis begins with an examination of ad-hoc news events, which are sampled as described in section 5.3.2.2 and classified into two samples, a pre-announcement as well as a post-announcement data set. For each news event in the pre-announcement data set, insider trading activity is examined prior to the news release. Similarly, for each news event in the post-announcement data set, insider trading activity is examined after the news release. In both cases, the studied time period consists of four weeks (week -4 to week -1 and week 1 to week 4), where one week is defined as five trading days.⁴⁰

For these time periods, it is estimated whether insiders engage in abnormal trading, which is defined as the difference between the observed and a “normal,” i.e., expected, level of trading activity. To measure normal trading activity, a benchmark period stretching over 20 weeks and ending four weeks prior to the ad-hoc news announcement (week -24 to week -5) is defined. An alternative to this time-series benchmark would be to infer normal insider trading from a matched-firm control sample. Loderer and Sheehan (1989), as well as Gosnell et al. (1992), for example, use firms of similar size and with the same Standard Industrial Classification (SIC) code to measure normal insider trading activity. Seyhun and Bradley (1997), however, argue that firms within the same sector are likely to experience similar corporate events (corporate bankruptcy, in their case), and thus, similar levels of abnormal trading.⁴¹ In such cases, the matched-firm measure is less likely to detect abnormal levels of insider trading than under a time-series benchmarking period.

Instead, Seyhun and Bradley (1997) favor a time-series benchmark, which is also adopted in this study. One potential shortcoming of any time-series based measure of normal trading activity is that any general (may it be upward or downward) trend in the level of insider trading activity may distort the estimation. Seyhun (1998), for example, finds for the United States that the average number of shares bought and sold per firm by insiders increased markedly between 1975 and 1995.⁴² While the directors’ dealings sample does display some evidence of increasing trading activity over time, this potential bias is primarily mitigated by focusing on relatively short benchmark and event periods that are also adjacent to each other.⁴³ Thus, the study’s design should ensure that any bias introduced by the market trend should be small or negligible.

To measure the level of insider trading, several variables, as defined as outlined in section 5.5.2, are selected to capture different aspects of trading activity. These variables are subjected to the test statistics outlined in section 5.5.3. To study strategic trading behavior, ad-hoc news events are classified as good and bad news, according to the associated abnormal returns and as described in section 5.5.4. Furthermore, since trading behavior could differ depending on whether insiders engage in buying or selling, trading activity is examined separately for purchases and sales, as discussed in the next section.

⁴⁰For comparison, Seyhun (1992) uses a 30-day event period to study insider trading prior to earnings announcements. See Seyhun (1992), pp. 171–175.

⁴¹See Seyhun and Bradley (1997), p. 193.

⁴²See Seyhun (1998), p. 13, Figure 1.5.

⁴³The average (median) euro trading volumes per year in the directors’ dealings sample are as follows: 2002: 618,391 (28,700); 2003: 389,782 (6,200); 2004: 322,162 (78,223); 2005: 840,210 (5,179); 2006: 1,328,979 (86,500); 2007: 2,864,972 (2,605,500). The large increase in directors’ dealings from 2004 to 2005 is primarily attributable to the introduction of the AnSVG in October 2004. See also section 2.3.3.

5.5.1 Purchases and Sales

Many studies of insider trading around news events, such as Penman (1982), Elliott et al. (1984), and Karpoff and Lee (1991), focus on a *net* measure of insider trading activity, i.e., the difference between the number of insiders purchasing and the number of insiders selling stock, or the difference between the number of shares bought and the number of shares sold.⁴⁴ Agrawal and Jaffe (1995), however, argue that such an aggregation may be associated with a loss of information.⁴⁵

Prior to good news, for example, insiders may adhere to insider trading regulations and trade smart by decreasing their share sales, or they may defy regulations and increase their share purchases. In both cases, a net measure of trading could arrive at similar levels, thus masking the underlying story and leading to different conclusions. In addition, insider trading could also exhibit other patterns. For example, insiders may associate selling shares prior to negative news a more riskier strategy than purchasing shares prior to the release of positive news (or the other way around, for that matter).⁴⁶ If such a disparate perception were to be true, it would not be captured by a net measure of trading. To avoid losing this kind of information, the variables capturing insider trading activity, which are outlined and discussed in the next section, are measured separately for purchases and sales.⁴⁷

5.5.2 Definition of Insider Trading Variables

Previous research measures insider trading by numerous variables. For example, Karpoff and Lee (1991) rely on the number of insiders selling and buying stock, Huddart et al. (2007) use the number of transactions as well as the dollar value of shares traded, Pettit and Venkatesh (1995) use only the latter, and Arshadi and Eysell (1991) and Kaestner and Liu (1996) compute the number of shares traded.⁴⁸ Most studies, however, employ several variables for the measurement of insider trading, since no one methodology has been demonstrated to be superior.⁴⁹ Agrawal and Cooper (2008), for example, rely on the number of insiders trading, the number of shares traded, the dollar value of shares traded, the percentage of outstanding equity traded, and the percentage of insider shareholdings traded.⁵⁰

In a similar manner, this study estimates the level of insider trading activity by computing four measures: the euro value of shares traded, the number of shares traded, the number of insiders trading and the percentage of market capitalization traded.⁵¹

5.5.2.1 Value of Shares Traded

The value of shares traded captures the euro value traded by insiders and may be the most obvious unit to measure insider trading activity. Its computation is based on the following variables: $BVAL_n$ is defined as the weekly average value of shares purchased (sold) of the issuer of stock releasing the ad-hoc announcement n during the estimation period.⁵² $VAL_{n,t}$ is the observed euro value of shares of the issuer of stock releasing the ad-hoc announcement n purchased (sold) during event week t . Based on these

⁴⁴See Penman (1982), p. 485, Elliott et al. (1984), pp. 524–528, and Karpoff and Lee (1991), p. 20.

⁴⁵See Agrawal and Jaffe (1995), p. 299.

⁴⁶See Korczak et al. (2009), p. 7.

⁴⁷Besides Agrawal and Jaffe (1995), other studies that employ separate measure for insider buying and selling include Harlow and Howe (1993) and Madison et al. (2004).

⁴⁸See also chapter 3 for a discussion of variables used to measure insider trading activity by previous research. See Karpoff and Lee (1991), p. 20, Huddart et al. (2007), p. 12, Pettit and Venkatesh (1995), p. 93, Arshadi and Eysell (1991), p. 32, and Kaestner and Liu (1996), pp.784–785.

⁴⁹See Seyhun (1986) and Fowler and Rorke (1988).

⁵⁰See Agrawal and Cooper (2008), pp. 18–19.

⁵¹The percentage of insider shareholdings traded, as calculated by Agrawal and Cooper (2008) and others, cannot be readily applied to Germany because of data availability constraints.

⁵²The euro value of shares traded by insiders is reported by the BaFin Directors' Dealings database.

firm- and time-specific observations, weekly averages across ad-hoc announcements are calculated, and reported in the results in section 5.6. The abnormal euro value of shares traded, $AVAL_{n,t}$, is calculated by subtracting $BVAL_n$ from $VAL_{n,t}$ for each ad-hoc announcement n and event week t (-4 to $+4$). Based on the individual $AVAL_{n,t}$ observations, test statistics are calculated as outlined in section 5.5.3. A potential shortcoming of the euro value of shares traded is that it may be easily distorted by large block trades, i.e., outliers in the data set. The value of shares traded is reported in units of 1,000 euros.

5.5.2.2 Number of Shares Traded

As opposed to the euro value of shares traded, the number of shares purchased (sold) disregards the share price. The variable is calculated as follows: BST_n is defined as the weekly average number of shares purchased (sold) of the issuer of stock releasing the ad-hoc announcement n during the estimation period. $ST_{n,t}$ is the number of shares of the issuer of stock releasing the ad-hoc announcement n purchased (sold) during event week t . Based on these firm- and time-specific observations, weekly averages are calculated across ad-hoc announcements and reported in the results in section 5.6. The abnormal number of shares traded, $AST_{n,t}$, are calculated by subtracting BST_n from $ST_{n,t}$ for each ad-hoc announcement n and event week t (-4 to $+4$). Based on the individual $AST_{n,t}$ observations, test statistics are calculated, as outlined in section 5.5.3. The number of shares traded is reported in units of 1,000 shares.

5.5.2.3 Number of Insiders Trading

In addition to examining the euro value of shares and the number of stocks traded, a measure capturing the number of insiders engaging in trading is constructed. The variable is calculated as follows: BIN_n is defined as the weekly average number of insiders purchasing (selling) shares of the issuer of stock releasing the ad-hoc announcement n during the estimation period. $IN_{n,t}$ is the number of insiders purchasing (selling) related to the ad-hoc announcement n during event week t . Based on these firm- and time-specific observations, weekly averages are calculated across ad-hoc announcements and reported in the results in section 5.6. The abnormal number of insiders purchasing (selling), $AIN_{n,t}$, is calculated by subtracting BIN_n from $IN_{n,t}$ for each ad-hoc announcement n and event week t (-4 to $+4$). Based on the individual $AIN_{n,t}$ observations, test statistics are calculated, as outlined in section 5.5.3.

Seyhun (1992) employs a similar measure that is based on the number of transactions, instead of the number of insiders purchasing or selling stock.⁵³ While the two measures are related, the main difference is that insiders may engage in several transactions. Since the BaFin database often contains directors' dealings transactions by insiders that are split into several tranches, the number of insiders trading may be more valuable than the number of transactions in the German setting.

5.5.2.4 Percentage of Market Capitalization Traded

The percentage of market capitalization traded is related to the euro value of shares traded as well as the number of stocks traded and sets both measures in proportion to the market capitalization (or the number of shares outstanding). The computation of the measure is based on the following variables: BMV_n is defined as the weekly average percentage of market capitalization of the issuer of stock releasing the ad-hoc announcement n during the estimation period. $MV_{n,t}$ is the observed percentage of market capitalization of the issuer of stock releasing the ad-hoc announcement n purchased (sold) during event week t . Based on these firm- and time-specific observations, weekly averages are calculated across ad-hoc

⁵³See Seyhun (1992), pp. 156–157.

announcements and reported in the results in section 5.6. Abnormal values of the percentage of market capitalization traded, $AMV_{n,t}$, are calculated by subtracting BMV_n from $MV_{n,t}$ for each company n and event week t (-4 to $+4$). Based on the individual $AMV_{n,t}$ observations, test statistics are calculated as outlined in the following section.

5.5.3 Test Statistics

As outlined above, for each ad-hoc announcement and event week, *abnormal* trading activity is inferred by subtracting the estimated normal trading activity, as given by the benchmark period, from observed trading. These individual abnormal trading estimates are aggregated cross-sectionally by event time, and arithmetic means are computed. *Observed* trading activity, not abnormal trading activity, during the benchmark period as well as event weeks -4 to 4 are reported in section 5.6. To test whether the corresponding abnormal trading activity estimates are statistically different from zero, a two-tailed t-test and the Wilcoxon signed-rank test are computed.

A potential shortcoming of applying the parametric t-test to the data at hand is that the observed abnormal trading estimates do exhibit non-normality. One reason for this is the fact that insider trading occurs relatively infrequently, which leads to many zero observations during the estimation and the event periods.⁵⁴ This, in turn, causes a clustering of observations at zero for the different trading activity variables. Accordingly, the Kolmogorov–Smirnov, Jarque–Bera, Anderson–Darling, and Cramér–von-Mises tests all reject the hypothesis that the measures of abnormal trading activity originate from a normal distribution at a confidence interval of 1%. This applies to all pre- and post-announcement event weeks, all purchase and sale samples, and also for all four measures of trading activity.

To mitigate the issue of non-normality, the non-parametric Wilcoxon test is calculated in addition to the standard t-test.⁵⁵ The Wilcoxon test is a signed rank test of the null hypothesis that the abnormal trading activity estimates come from a continuous, symmetric distribution with zero median, against the alternative that the distribution does not have zero median. As mentioned above and shown as part of the descriptive statistics presented in section 5.4, many ad-hoc announcements are not associated with any trading activity. Accordingly, the median of the observed trading activity is zero across all trading activity variables and sub-samples. Thus, medians are not reported in addition to arithmetic averages in section 5.6. To nevertheless infer the direction of the Wilcoxon test, the sum of ranks of positive as well as negative abnormal trading estimates are compared.⁵⁶ Given that abnormal insider trading estimates are defined as the actual observed trading activity minus estimated normal trading activity, a sum of ranks of positive residuals that is larger than the sum of ranks of negative residuals supports the hypothesis that abnormal trading estimates have a median larger than zero and vice versa.⁵⁷ In case the Wilcoxon test indicates that the median of abnormal trading activity is smaller than zero, test statistics reported in section 5.6 feature a negative sign. It is noteworthy to point out that the Wilcoxon test is not used to test directional hypotheses, but is instead defined as a two-sided test for the purpose of this study. The sign of the test statistic merely indicates which kind of hypotheses the data would support. Differences in the parametric and non-parametric test statistics are common and may lead to conflicting conclusions regarding the trading activity of insiders.⁵⁸ These differences, however, may indicate whether results

⁵⁴If the measured trading activity during the benchmark and periods is zero, abnormal trading activity estimates are zero as well.

⁵⁵Agrawal and Cooper (2008) and Madison et al. (2004), for example, also make use of the Wilcoxon test in addition to the standard t-test.

⁵⁶See Sheskin (2004), p. 189, ff., and p. 609, ff., for additional background information on the calculation of Wilcoxon test statistic.

⁵⁷See Sheskin (2004), p. 195.

⁵⁸This artefact is also present in other studies in this field. See, for example, Pettit and Venkatesh (1995), Madison et al.

are influenced by individual large outlier observations, or whether a general tendency of insider trading activity exists.

Another bias may arise due to event clustering of ad-hoc announcements. If, for example, an ad-hoc news is followed by another release of the same issuer of stock, abnormal trading activity estimates could be distorted. Post-announcement trading of the first ad-hoc disclosure would at the same time constitute pre-announcement trading of the subsequent news event, thus impacting results. To check the robustness of the results presented in section 5.6, a second sample is constructed. This sample consists only of news events with no other announcement in a ten day window pre and post announcements. While this adjustment does not eliminate all overlapping event periods within a given issuer of stock, it effectively reduces the biases arising out of ad-hoc news clustering. The results related to this second sample are presented in Appendix A and are not qualitatively different from the findings presented in section 5.6.

5.5.4 Positive and Negative News Announcements

To examine whether insiders trade strategically around news announcements, i.e., whether insiders disregard laws prohibiting trading on the basis of private information, or whether they trade smart and delay trades after announcements, news disclosures have to be grouped according to the associated market reaction. In essence, news events are classified as either *positive* announcements, if they trigger a price increase, or *negative* announcements, if they cause the respective stock to slump.

Besides providing a basic framework for analyzing insider trading around news events, the classification into good and bad announcements also facilitates the study of different trading incentives. As pointed out by Cheng and Lo (2006) and Korczak et al. (2009), the litigation risk of selling before negative news and buying before positive news may increase asymmetrically. The main argument is that whenever insiders engage in selling prior to bad news, shareholders suffer real losses, while buying prior to positive news only results in opportunity costs for the trade's counterpart.⁵⁹

Some type of news announcements may be classified into positive and negative news according to their content only. For example, announcements regarding insolvency may, in most instances, be associated with negative stock price reactions. Also, earnings releases are often classified based on the associated earnings surprise, often defined as the difference between actual and expected EPS, as given by I/B/E/S consensus estimates.⁶⁰

Given the variety and number of news events examined in this study, ad-hoc announcements are classified according to the associated abnormal stock price reaction. This classification method, although to some extent also prone to estimation errors, can be considered as objective, since it does not rely on the subjective evaluation of the announcements' content. Next, the methodology underlying the estimation of abnormal returns and the motivation for the applied classification criteria are discussed.

5.5.4.1 Abnormal Return Estimation

In order to gauge the market's reaction to ad-hoc news disclosures, abnormal returns are estimated according to standard event study methodology, as outlined and motivated in detail in section 6.6.2.⁶¹

(2004), and Agrawal and Cooper (2008).

⁵⁹See Cheng and Lo (2006), p. 821, and Korczak et al. (2009), p. 7.

⁶⁰See, for example, Seyhun (1992).

⁶¹The event study framework in general follows Campbell et al. (1997). See also section 4.4 for a general discussion of event study methodology.

Abnormal returns are defined as the difference between observed and estimated normal returns. Normal returns are inferred under the market model, where the expected return is given by

$$E(R_{i,t}) = \alpha_i + \beta_i R_{m,t}$$

where $E(R_{i,t})$ is the predicted return of stock i on day t , and $R_{m,t}$ is the return of the market portfolio on day t . The market portfolio is proxied by the value-weighted CDAX index, as computed by Deutsche Börse AG.

The market model parameters α and β are obtained by running an ordinary least-squares regression. In particular, $R_{i,t}$ is regressed on $R_{m,t}$ during the estimation period, which ranges from t_{-200} to t_{-21} , where t_0 is defined as the release day of the news announcement.⁶² Thus, the estimation window encompasses 181 days and 180 return observations. Also, since the estimation window ends 20 trading days (4 weeks) prior to the news announcement, no overlap between the abnormal return estimation period and the abnormal trading event period exists.

For each news event, abnormal returns for days t_0 and t_1 are calculated and summed to cumulative abnormal return observations:

$$CAR(t_0, t_1) = \sum_{t=t_0}^{t_1} AR_t$$

where AR_t is the abnormal return of the respective company on day t .

5.5.4.2 Classification of News Announcements into Positive and Negative Events

Ad-hoc announcements are classified into *positive* and *negative* news events depending on the estimated $CAR(0;1)$, i.e., the compounded abnormal return on the announcement day and the day thereafter. Taking both days instead of only the announcement day into account controls for any delays in the dissemination the ad-hoc disclosures and should ensure that the informational content of the announcements has been to fully dispersed to the market. Using a longer window of stock returns could lead to a contamination of stock returns by other events.

For different sub-samples, different cut-off abnormal return measures are defined. To achieve the largest possible sample of ad-hoc announcements, the first cut-off $CAR(0;1)$ is defined as zero. Accordingly, positive (negative) news events are defined as ad-hoc announcements that trigger abnormal returns that are larger (lower) than zero. A similar approach is pursued, for example by, Cheng and Lo (2006) and Korczak et al. (2009).

While this methodology yields a large sample, it also has drawbacks. First of all, the inference of abnormal returns is always subject to estimation errors, which could lead to a false classification of news events, which in turn can potentially distort results. Secondly, it can be argued that ad-hoc announcements with a relatively small abnormal return may not offer insiders sufficient incentives to act on their information given the small profit opportunity. Korczak et al. (2009), on the other hand, argue that news events with small absolute abnormal returns are accompanied by less scrutiny from the regulator and thus are more prone to front-running by insiders.⁶³

In theory, very few of such “non-events” should be present in the employed sample of ad-hoc announcements. As outlined in section 2.5, the purpose of ad-hoc disclosures in Germany is to disclose inside

⁶²See section 5.3.2.2.2 for further details on the definition of the event day t_0 of ad-hoc news announcements.

⁶³See Korczak et al. (2009), p. 18, ff.

information without delay.⁶⁴ As the definition of inside information is based on section 13 of the WpHG, which also applies to insider trading regulations, all ad-hoc announcements should be associated with a “significant effect on the stock or market price of the insider securities.”⁶⁵ Empirically, however, this is often not the case (see also the descriptive statistics discussed in section 5.4). Either the inside information leaks and is disseminated to the public before the official ad-hoc announcement, or the content of the disclosure is not deemed to be price-sensitive by the market. The latter case may be especially true if ad-hoc disclosure is misused as a marketing instrument rather than used as a truly informational tool for investors. While this practice has abated since its rampant use during the height of the Neuer Markt, it has not been completely eradicated.⁶⁶

In order to examine whether ad-hoc announcements with relatively large abnormal returns cause insiders to trade differently in their proximity, a second sample is constructed where news events are deemed positive (negative) if $CAR(0;1)$ is larger (smaller) than 10% (−10%). While the resulting sample size is smaller, this approach ensures that news events are truly positive or negative, and offers substantial profit opportunities for insiders who are willing to exploit their informational advantage by either trading prior to ad-hoc disclosures or delaying their trades until after announcements.

5.6 Results

This section reports and discusses the study’s results. To analyze whether and how insiders strategically trade around ad-hoc announcements, several samples are constructed. As mentioned previously, pre- and post-announcement samples are defined in order to study insider trading prior to and after news events, respectively. Additionally, these samples are further broken down into sub-samples, according to the abnormal returns associated with ad-hoc announcements. Section 5.6.1 analyzes insider trading activity by classifying news events as positive (negative) news if the $CAR(0;1)$ is greater (smaller) than zero. Section 5.6.2, on the other hand, requires positive (negative) news to have a $CAR(0;1)$ greater (smaller) than 10% (−10%). For ease of convention, the former sample is often referred to as a “full sample” because it does not discard any news events, while the latter sample is often referred to as a “significant sample” because it only contains news events that cause large stock price reactions.

The motivation for constructing the sample consisting of significant news events only stems from considerations that the first sample potentially may not facilitate a clean differentiation between truly good and bad news events. First of all, news events could be wrongly classified due to measurement errors in the abnormal return estimation. Secondly, abnormal returns may be so small that they do not provide sufficient incentives for insiders to engage in strategic trading around them. The counterargument, however, is that insiders would rather engage in strategic trading in the proximity of ad-hoc releases that move stock prices only modestly in order to not draw attention from investors, the company itself, and the regulator.

For both data sets, pre- as well as post-announcement directors’ dealings for purchases and sales are analyzed separately, using the methodology outlined in section 5.5.

5.6.1 Trading around News Announcements – Full Sample

Tables 5.6 to 5.9 report the results for the sample consisting of all ad-hoc disclosures associated with an absolute $CAR(0;1)$ greater than zero. The tables show average weekly insider trading activity as

⁶⁴See section 15, subsection 1 of the WpHG.

⁶⁵See section 13, subsection 1 of the WpHG.

⁶⁶See Feinendegen and Nowak (2001), Güttler (2005), and Monheim (2007).

measured by the four variables discussed in section 5.5.2 separately for purchase and sale transactions. Trading activity is shown for the estimation period, the total event period, and individual event weeks. It should be noted that observed trading activity, as opposed to abnormal insider trading activity, is presented in the following tables.

5.6.1.1 Trading Prior to Positive News Announcements

Table 5.6 details insider trading activity *prior to positive* news events, which are defined as ad-hoc announcements associated with a $CAR(0;1)$ greater than zero. If insiders have access to private information about impending corporate news events that are expected to cause a positive stock price reaction, they may choose to profit from their knowledge by either (i) increasing their purchases or (ii) decreasing their sales. While the former strategy is associated with litigation and reputational risk, the latter is virtually risk-free.

For the entire event period, the level of purchases is similar to that during the estimation period. The values of shares purchased, for example, equals 22,390 euros during the event period, which is slightly more than during the estimation period (20,593 euros). Examining individual event weeks, however, it becomes apparent that most of the trading activity is clustered in week -1 , which is the event week immediately prior to the release date of ad-hoc announcements. The value of shares purchased and the number of shares bought are highest during this week, and the other two variables are also at an elevated level. The negative sign as well as the high significance of the non-parametric Wilcoxon test statistics, however, suggest that the average reported trading activity is due to large, individual transactions. This applies to week -1 and the entire event period. This result does not for the number of insiders buying, which is at 0.023 for the entire event period higher than during the estimation period at 0.019, and significant at the 5% level under the parametric test.

Evidence regarding the second strategy that may be pursued by insiders, decreasing sales prior to positive news, is less ambiguous. Reported average trading activity for the entire event period is lower than during the estimation period, except for the number of insiders selling. In addition, insider selling is especially low during week -1 . For example, the percentage of market capitalization traded amounts to only 0.023 in the week preceding ad-hoc announcements, while it equals 0.031 during the estimation period. This result is supported by the Wilcoxon test statistic, and in case of the value and number of shares traded, also by the parametric t-test.

5.6.1.2 Trading Prior to Negative News Announcements

Trading activity *prior to negative* news, i.e., ad-hoc announcements with a $CAR(0;1)$ smaller than zero, is reported in Table 5.7. If insiders choose to exploit private information concerning impending negative news events, they may do so by either (i) increasing their selling or (ii) decreasing their purchasing activity. While the former strategy is associated with litigation and reputational risk, the latter is virtually risk-free.

The results show that sales during the entire event period are lower, yet of similar magnitude, than during the estimation period. For three of the four selling activity variables, selling is highest during the week just preceding ad-hoc disclosures. While this observation may again indicate front-running by insiders, the non-parametric tests suggests that the result is attributable to outlier observations.

Regarding purchases prior to unfavorable news announcements, Table 5.7 shows that insiders do reduce uninformed pre-announcement trading. For example, the value of shares purchased during week -1 is at 11,705 euros only about half as large as during the estimation period (20,149 euros). These results are

supported by the Wilcoxon test statistics, which have in all instances a negative sign and are significant at the 1% level.

From the examination of pre-announcement trading activity, two main themes emerge. First, average informed trading activity does not necessarily decrease prior to ad-hoc releases. Indeed, purchasing (selling) prior to good (bad) news appears to increase in the week immediately preceding announcements. The negative signs of the non-parametric test statistic indicate, however, that average trading activity is skewed by individual transactions. Secondly, insiders appear to effectively avoid uninformed trading, i.e., selling (buying) prior to good (bad) news.

Table 5.6: Pre-announcement Trading – Positive Announcements ($CAR(0;1) > 0\%$)

Period	Purchases				Sales			
	Value of Shares Traded	Number of Shares Traded	Number of Insiders Trading	% of Market Cap Traded	Value of Shares Traded	Number of Shares Traded	Number of Insiders Trading	% of Market Cap Traded
Estimation Period								
Week -5 to -24								
Mean	20.593	2.344	0.019	0.015	32.076	3.011	0.022	0.031
Event Period								
Week -4 to -1								
Mean	22.390	1.812	0.023	0.012	27.875	2.420	0.030	0.028
t_{Stat}	0.15	-0.71	2.12**	-0.67	-0.53	-1.32	3.35***	-0.41
$t_{Wilcoxon}$	-15.40***	-16.04***	-7.47***	-16.15***	-14.40***	-14.71***	-5.43	-14.90***
Week -4								
Mean	5.494	1.017	0.026	0.017	36.517	3.365	0.030	0.037
t_{Stat}	-2.73***	-2.15**	2.17**	0.24	0.36	0.41	2.38**	0.39
$t_{Wilcoxon}$	-21.14***	-21.27***	-18.21***	-21.58***	-20.64***	-21.04***	-18.09***	-21.08***
Week -3								
Mean	5.005	1.110	0.022	0.008	14.385	1.950	0.033	0.022
t_{Stat}	-2.75***	-2.63***	1.07	-1.92*	-3.16***	-2.10**	2.26**	-1.32
$t_{Wilcoxon}$	-21.76***	-21.88***	-19.42***	-22.03***	-20.86***	-21.30***	-18.04***	-21.64***
Week -2								
Mean	13.726	2.008	0.024	0.011	47.709	2.585	0.035	0.030
t_{Stat}	-0.75	-0.33	1.48	-0.85	0.64	-0.42	3.16***	-0.07
$t_{Wilcoxon}$	-21.38***	-21.54***	-19.18***	-21.93***	-20.57***	-20.56***	-17.24***	-20.74***
Week -1								
Mean	65.337	3.112	0.021	0.014	12.889	1.781	0.023	0.023
t_{Stat}	0.97	0.45	0.47	-0.12	-2.98***	-2.27**	0.26	-0.71
$t_{Wilcoxon}$	-22.38***	-22.41***	-20.61***	-22.53***	-22.87***	-22.97***	-20.47	-22.99***
No. of News Events	4,356	4,356	4,356	4,356	4,356	4,356	4,356	4,356

This table reports observed trading activity prior to positive news events, which are defined as ad-hoc announcements with a $CAR(0;1)$ greater than zero. Average weekly insider trading activity, as measured by the four variables discussed in section 5.5.2, is reported separately for purchase and sale transactions. Trading activity is shown for the estimation period, the total event period, and individual event weeks. Observed trading activity as opposed to abnormal insider trading activity is presented. The value of shares traded is reported in units of 1,000 euros, the number of shares traded in units of 1,000 shares, and the percentage of market capitalization traded in % points. Implied abnormal trading activity is tested by a parametric t-test (t_{Stat}), and a non-parametric Wilcoxon signed-rank test ($t_{Wilcoxon}$). ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels respectively.

Table 5.7: Pre-announcement Trading – Negative Announcements ($CAR(0;1) < 0\%$)

Period	Purchases				Sales			
	Value of Shares Traded	Number of Shares Traded	Number of Insiders Trading	% of Market Cap Traded	Value of Shares Traded	Number of Shares Traded	Number of Insiders Trading	% of Market Cap Traded
Estimation Period								
Week -5 to -24								
Mean	20.149	2.700	0.019	0.020	53.611	4.145	0.025	0.038
Event Period								
Week -4 to -1								
Mean	13.575	2.128	0.021	0.013	41.434	3.537	0.024	0.037
t_{Stat}	-1.02	-0.86	1.37	-1.68*	-0.67	-0.75	-0.61	-0.17
$t_{Wilcoxon}$	-14.96***	-15.46***	-7.72***	-15.50***	-16.39***	-16.25***	-9.44***	-16.90***
Week -4								
Mean	5.036	0.690	0.024	0.007	41.163	1.756	0.024	0.020
t_{Stat}	-3.40***	-4.13***	1.72*	-3.51***	-0.48	-4.18***	-0.59	-1.96**
$t_{Wilcoxon}$	-20.80***	-20.89***	-18.36***	-21.25***	-22.40***	-22.55***	-20.42***	-22.84***
Week -3								
Mean	22.308	3.181	0.022	0.016	23.100	3.020	0.028	0.039
t_{Stat}	0.13	0.30	1.24	-0.68	-2.73***	-1.33	0.89	0.01
$t_{Wilcoxon}$	-20.79***	-21.04***	-18.92***	-21.09***	-22.11***	-22.23***	-19.88***	-22.52***
Week -2								
Mean	15.251	2.751	0.021	0.012	33.571	4.127	0.025	0.041
t_{Stat}	-0.67	0.05	0.78	-1.54	-0.96	-0.01	-0.14	0.15
$t_{Wilcoxon}$	-20.88***	-21.01***	-19.38***	-21.19***	-22.74***	-23.00***	-20.98***	-23.13***
Week -1								
Mean	11.705	1.890	0.017	0.019	67.905	5.245	0.020	0.049
t_{Stat}	-1.05	-0.79	-0.68	-0.14	0.25	0.48	-1.90*	0.58
$t_{Wilcoxon}$	-21.90***	-21.97***	-19.93***	-22.07***	-23.84***	-23.81***	-22.24***	-23.98***
No. of News Events	4,110	4,110	4,110	4,110	4,110	4,110	4,110	4,110

This table reports observed trading activity following negative news events, which are defined as ad-hoc announcements with a $CAR(0;1)$ smaller than zero. Average weekly insider trading activity, as measured by the four variables discussed in section 5.5.2, is reported separately for purchase and sale transactions. Trading activity is shown for the estimation period, the total event period, and individual event weeks. Observed trading activity as opposed to abnormal insider trading activity is presented. The value of shares traded is reported in units of 1,000 euros, the number of shares traded in units of 1,000 shares, and the percentage of market capitalization traded in % points. Implied abnormal trading activity is tested by a parametric t-test (t_{Stat}), and a non-parametric Wilcoxon signed-rank test ($t_{Wilcoxon}$). ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels respectively.

Having examined insider trading activity preceding ad-hoc announcements, Tables 5.8 and 5.9 present the results for directors' dealings following ad-hoc announcements. Once news announcements are disseminated to the public, insiders face no legal obstacles to trade shares of their own company as long as they do not trade on the basis of any other private information not yet disseminated to the market. Bettis et al. (1998) and others argue that insider trading laws, which do not take passive trading into account, are unjust, since they allow insiders to exploit private information without the fear of prosecution. They argue that allowing insiders to legally profit from non-public information makes stock markets less fair and puts outside investors at a disadvantage.⁶⁷ If insiders do indeed engage in passive trading strategies, a clustering of transactions and trading volumes immediately after ad-hoc releases should be observable.

5.6.1.3 Trading After Positive News Announcements

Trading activity *after positive* ad-hoc releases with a CAR(0;1) greater than zero is detailed in Table 5.8. If insiders do engage in passive trading strategies, increased insider sales should be observable in the weeks after such ad-hoc announcements. The results support this hypothesis. For the entire event period, all trading activity variables are of a higher magnitude than during the estimation period. In addition, the parametric test indicates that this result is significant at the 5% level at least, and for the number of insiders trading, also the Wilcoxon test statistics agree.

The first week immediately following the release of ad-hoc announcements should potentially be associated with the strongest incentives for insiders to sell. Similar to the pre-announcement period, insiders face a trade-off after news events. If they execute trades shortly after the disclosure, they may be publicly accused of passive trading, and their reputation may be damaged. However, the longer insiders wait, the more abnormal return caused by the news event is diluted. Since the reputational risk of passive trading is relatively low, the benefits of trading swiftly should prevail, and most trades should cluster immediately after ad-hoc announcements. Indeed, Table 5.8 shows that abnormal selling activity is highest during the first week following ad-hoc disclosures. For example, the average number of insiders trading during event week 1 is at 0.070 about three times as high as during the estimation period (0.22), and significant at the 1% level under the parametric test. The increased number of shares sold and the percentage of market capitalization sold are also significant at the 5% level under the parametric test. Nevertheless, the negative sign of the Wilcoxon test statistics suggests that the increased selling activity after favorable news is due to large individual transactions; this applies to week 1 as well as the entire event week period.

Following positive news events, insiders should have little reason to increase their purchasing activity, unless they believe that the market does not fully reflect the underlying positive impact of the ad-hoc disclosure on future cash flow realizations. Thus, insider purchasing variables should be lower during the post-event period than during the estimation period. Purchasing, however, appears to be of a magnitude similar to that during the estimation period. Again, trading appears to cluster during week 1, immediately after the announcements.

5.6.1.4 Trading After Negative News Announcements

Directors' dealings *after negative* news announcements should exhibit the opposite pattern as expected after positive releases—purchases should be abnormally high and sales abnormally low. The results presented in Table 5.9 fail to find an increase in buying activity after unfavorable news releases, except

⁶⁷Bettis et al. (1998) propose several amendments to insider trading laws to eliminate passive trading opportunities and ensure an even playing field for market participants. See Bettis et al. (1998), p. 65, ff.

for the number of insiders buying. If anything, insider sales increase after negative news. This result, however, may be due to wrongly classified ad-hoc announcements due to estimation errors in the event study methodology. Indeed, post-announcement purchasing increases after *significantly* unfavorable ad-hoc announcements (see section 5.6.2). In any case, however, the non-parametric tests again suggest that results are driven by outlier observations.

Taken together, the findings regarding post-announcement trading suggest that directors' dealings after positive news announcements increase immediacy after disclosures. For negative news events, however, no clear pattern emerges.

Table 5.8: Post-announcement Trading – Positive Announcements ($CAR(0;1) > 0\%$)

Period	Purchases				Sales			
	Value of Shares Traded	Number of Shares Traded	Number of Insiders Trading	% of Market Cap Traded	Value of Shares Traded	Number of Shares Traded	Number of Insiders Trading	% of Market Cap Traded
Estimation Period								
Week -5 to -24								
Mean	21.331	2.362	0.019	0.015	32.802	3.012	0.022	0.031
Event Period								
Week 1 to 4								
Mean	15.765	2.266	0.037	0.025	78.480	5.418	0.051	0.048
t_{Stat}	-0.76	-0.18	7.31***	1.74*	2.40**	2.68***	9.24***	2.30**
$t_{Wilcoxon}$	-9.33***	-10.66***	-0.55	-11.10***	-5.52	-6.89***	4.11	-7.52***
Week 1								
Mean	36.560	3.527	0.050	0.049	116.091	7.435	0.070	0.078
t_{Stat}	0.79	1.02	6.91***	1.73*	1.50	2.31**	6.93***	2.36**
$t_{Wilcoxon}$	-15.64***	-16.17***	-12.18***	-16.43***	-14.38***	-15.31***	-9.45	-15.72***
Week 2								
Mean	8.192	2.269	0.032	0.023	83.462	4.700	0.046	0.042
t_{Stat}	-2.28**	-0.10	3.73***	0.90	1.51	1.12	5.16***	0.80
$t_{Wilcoxon}$	-19.67***	-20.07***	-17.01***	-20.58***	-17.69***	-18.00***	-14.38***	-18.51***
Week 3								
Mean	7.960	1.791	0.033	0.014	42.823	4.921	0.040	0.032
t_{Stat}	-2.26**	-0.70	3.27***	-0.08	0.57	0.89	4.67***	0.09
$t_{Wilcoxon}$	-20.15***	-20.67***	-17.40***	-20.96***	-17.65***	-18.41***	-14.66***	-18.87***
Week 4								
Mean	10.347	1.478	0.031	0.013	71.546	4.616	0.049	0.039
t_{Stat}	-1.44	-1.52	3.21***	-0.23	1.44	1.33	5.98***	0.93
$t_{Wilcoxon}$	-20.43	-20.86***	-18.00***	-20.99***	-17.37***	-18.00***	-13.66	-18.19***
No. of News Events	4,368	4,368	4,368	4,368	4,368	4,368	4,368	4,368

This table reports observed trading activity following positive news events, which are defined as ad-hoc announcements with a $CAR(0;1)$ greater than zero. Average weekly insider trading activity, as measured by the four variables discussed in section 5.5.2, is reported separately for purchase and sale transactions. Trading activity is shown for the estimation period, the total event period, and individual event weeks. Observed trading activity as opposed to abnormal insider trading activity is presented. The value of shares traded is reported in units of 1,000 euros, the number of shares traded in units of 1,000 shares, and the percentage of market capitalization traded in % points. Implied abnormal trading activity is tested by a parametric t-test (t_{Stat}), and a non-parametric Wilcoxon signed-rank test ($t_{Wilcoxon}$). ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels respectively.

Table 5.9: Post-announcement Trading – Negative Announcements ($CAR(0;1) < 0\%$)

Period	Purchases				Sales			
	Value of Shares Traded	Number of Shares Traded	Number of Insiders Trading	% of Market Cap Traded	Value of Shares Traded	Number of Shares Traded	Number of Insiders Trading	% of Market Cap Traded
Estimation Period								
Week -5 to -24								
Mean	19.260	2.688	0.019	0.020	52.675	4.132	0.025	0.038
Event Period								
Week 1 to 4								
Mean	13.720	2.252	0.043	0.014	73.779	4.980	0.040	0.045
t_{Stat}	-0.92	-0.61	9.65***	-1.63	1.02	0.99	5.99***	0.93
$t_{Wilcoxon}$	-6.30***	-7.55***	2.93***	-8.59***	-11.47***	-12.10***	-2.65	-12.79***
Week 1								
Mean	15.392	2.145	0.059	0.016	56.924	5.874	0.046	0.058
t_{Stat}	-0.49	-0.75	8.56***	-0.70	0.28	1.39	4.59***	1.69*
$t_{Wilcoxon}$	-13.44***	-14.05***	-9.36***	-15.05***	-18.28***	-18.99***	-15.49***	-19.62***
Week 2								
Mean	13.071	1.996	0.042	0.013	70.419	4.928	0.041	0.042
t_{Stat}	-0.86	-0.72	6.13***	-1.22	0.55	0.50	3.78***	0.28
$t_{Wilcoxon}$	-16.44***	-17.01***	-12.81***	-17.42***	-20.16***	-20.23***	-16.91***	-20.70***
Week 3								
Mean	12.216	2.415	0.041	0.011	110.301	6.189	0.039	0.059
t_{Stat}	-1.11	-0.27	4.66***	-1.48	0.89	0.90	3.22***	1.12
$t_{Wilcoxon}$	-17.70***	-18.19***	-15.37***	-18.97***	-20.75***	-20.82***	-17.71***	-21.18***
Week 4								
Mean	14.200	2.454	0.030	0.015	57.472	2.931	0.036	0.022
t_{Stat}	-0.59	-0.21	3.33***	-0.76	0.17	-1.61	2.74***	-2.99***
$t_{Wilcoxon}$	-18.81***	-19.27***	-16.93***	-19.65***	-21.30***	-21.46***	-18.38***	-21.82***
No. of News Events	4,116	4,116	4,116	4,116	4,116	4,116	4,116	4,116

This table reports observed trading activity following negative news events, which are defined as ad-hoc announcements with a $CAR(0;1)$ smaller than zero. Average weekly insider trading activity, as measured by the four variables discussed in section 5.5.2, is reported separately for purchase and sale transactions. Trading activity is shown for the estimation period, the total event period, and individual event weeks. Observed trading activity as opposed to abnormal insider trading activity is presented. The value of shares traded is reported in units of 1,000 euros, the number of shares traded in units of 1,000 shares, and the percentage of market capitalization traded in % points. Implied abnormal trading activity is tested by a parametric t-test (t_{Stat}), and a non-parametric Wilcoxon signed-rank test ($t_{Wilcoxon}$). ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels respectively.

5.6.2 Trading around News Announcements – “Significant” Sample

To investigate whether ad-hoc announcements with a substantial impact on stock prices change the trading behavior of insiders, a second sample is analyzed. This sample only consists of news events with an absolute $CAR(0;1)$ greater than 10% and is referred to as *significant* sample. On the one hand, insider trading activity around ad-hoc news disclosure with a negligible impact on stock prices may not constitute sufficiently large incentive to insiders to exploit their informational advantage. On the other hand, litigation risk may be perceived to be so low by insiders that such news events may be especially prone trading by insiders.

An additional advantage of this sample, compared to the data set used in the previous section, is that the classification of news events into positive and negative news based merely on the sign of the cumulative abnormal return observations may lead to wrongly classified events. Due to measurement errors, which are present in any event study, news events may be classified into the false category, i.e., announcements that are in effect positive may be classified as negative news, and vice versa. Generally, the higher $CAR(0;1)$ threshold should ensure that ad-hoc announcements are more accurately classified.

A disadvantage of the 10% threshold is that the number of events is reduced by ca. 80%, depending on the specific data set. Tables 5.10 to 5.13 present the results of the “significant” sample.

5.6.2.1 Trading Prior to Positive News Announcements

Table 5.10 shows that purchasing activity is greatly reduced *prior to very favorable* events. For example, the average weekly value of shares purchased equals 20,127 euros during the benchmark period, and only 4,073 euros during the total event period. This finding is supported by the Wilcoxon test statistic, and in many instances also by the parametric t-test. Again, it appears that if insiders do engage in front-running of news announcements, they do so right before the ad-hoc disclosure. In the sample at hand, three of the four insider trading variables are highest during week -1 .

Insider selling is also greatly reduced in during pre-announcement period of positive news. For example, the number of shares traded is reduced to 2,524 during the four event weeks versus 3,981 during the estimation period. This result is supported by the test statistics, and especially so by the non-parametric Wilcoxon test, which is statistically significant at the 1% level in most instances.

5.6.2.2 Trading Prior to Negative News Announcements

Trading activity prior to significantly *negative* news, i.e., ad-hoc announcements with a $CAR(0;1)$ smaller than ten percent, is reported in Table 5.11. Considering the entire event period, it appears that informed trading, i.e., insider selling, is relatively unchanged prior to negative news. The reported trading activity variables, however, suggest that selling is reduced during weeks -1 and -2 , while some front-running may take place during week -3 . Considering the large legal risks associated with front-running significantly negative news announcements, insiders may shift some of their trades to earlier periods in order to “hide” their transactions. Indeed, Korczak et al. (2009) and Cheng and Lo (2006) argue that front-running negative news announcements is riskier than exploiting private information regarding positive news, because investors suffer real losses in the latter case.⁶⁸

Surprisingly, average purchasing prior to positive news is of a magnitude similar to that during the estimation period. The Wilcoxon test statistics, however, suggest that this result is driven by outliers. This is further validated by the fact that there is no statistical significance under the parametric t-test.

⁶⁸See Korczak et al. (2009), p. 7 and 21; Cheng and Lo (2006), p. 821.

These results of the “significant” pre-announcement sample show that insiders are less tempted to exploit their informational advantage concerning impending news announcements if the associated absolute stock price reaction is large. This implies that expected benefits and costs increase asymmetrically as the absolute, abnormal return of news disclosures increases. Thus, the results are consistent with Korczak et al. (2009), who also find that litigation and reputational costs outweigh expected profits as the stock price reaction increases.⁶⁹

⁶⁹See Korczak et al. (2009), p. 21.

Table 5.10: Pre-announcement Trading – Positive Announcements ($CAR(0;1) > 10\%$)

Period	Purchases				Sales			
	Value of Shares Traded	Number of Shares Traded	Number of Insiders Trading	% of Market Cap Traded	Value of Shares Traded	Number of Shares Traded	Number of Insiders Trading	% of Market Cap Traded
Estimation Period								
Week -5 to -24								
Mean	20.127	4.370	0.019	0.027	32.020	3.981	0.019	0.041
Event Period								
Week -4 to -1								
Mean	4.073	1.464	0.017	0.017	9.075	2.524	0.027	0.038
t_{Stat}	-1.42	-2.16**	-0.68	-0.93	-2.32**	-1.47	1.79*	-0.15
$t_{Wilcoxon}$	-8.34***	-8.96***	-4.19***	-8.43***	-4.89***	-5.36***	-0.83	-5.52***
Week -4								
Mean	0.420	0.560	0.013	0.002	6.855	2.872	0.016	0.013
t_{Stat}	-1.80*	-3.32***	-1.37	-4.63***	-2.46**	-0.62	-0.66	-2.91***
$t_{Wilcoxon}$	-10.71***	-10.51***	-9.37***	-10.56***	-9.07***	-9.17***	-7.82***	-8.97***
Week -3								
Mean	1.277	0.860	0.014	0.015	7.363	3.077	0.021	0.031
t_{Stat}	-1.72*	-2.80***	-0.83	-0.92	-2.42**	-0.60	0.33	-0.51
$t_{Wilcoxon}$	-10.43***	-10.33***	-9.74***	-10.44***	-7.91***	-8.22***	-7.01***	-8.37***
Week -2								
Mean	11.557	0.865	0.016	0.005	11.963	2.336	0.037	0.089
t_{Stat}	-0.55	-2.81***	-0.68	-3.58***	-1.91*	-1.46	2.26**	0.86
$t_{Wilcoxon}$	-9.80***	-10.26***	-9.03***	-10.32***	-7.01***	-7.32***	-5.38***	-7.46***
Week -1								
Mean	3.037	3.573	0.023	0.045	10.120	1.813	0.034	0.021
t_{Stat}	-1.53	-0.26	0.69	0.51	-2.04**	-2.06**	1.69*	-1.37
$t_{Wilcoxon}$	-9.60***	-9.76***	-8.40***	-9.81***	-8.10***	-8.27***	-6.35***	-8.30***
No. of News Events	829	829	829	829	829	829	829	829

This table reports observed trading activity prior to significantly positive news events, which are defined as ad-hoc announcements with a $CAR(0;1)$ greater than ten percent. Average weekly insider trading activity, as measured by the four variables discussed in section 5.5.2, is reported separately for purchase and sale transactions. Trading activity is shown for the estimation period, the total event period, and individual event weeks. Observed trading activity as opposed to abnormal insider trading activity is presented. The value of shares traded is reported in units of 1,000 euros, the number of shares traded in units of 1,000 shares, and the percentage of market capitalization traded in % points. Implied abnormal trading activity is tested by a parametric t-test (t_{Stat}), and a non-parametric Wilcoxon signed-rank test ($t_{Wilcoxon}$). ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels respectively.

Table 5.11: Pre-announcement Trading – Negative Announcements ($CAR(0;1) < 10\%$)

Period	Purchases				Sales			
	Value of Shares Traded	Number of Shares Traded	Number of Insiders Trading	% of Market Cap Traded	Value of Shares Traded	Number of Shares Traded	Number of Insiders Trading	% of Market Cap Traded
Estimation Period								
Week -5 to -24								
Mean	2.628	1.863	0.015	0.012	13.832	3.457	0.019	0.031
Event Period								
Week -4 to -1								
Mean	2.457	1.340	0.014	0.012	13.114	4.129	0.027	0.050
t_{Stat}	-0.17	-0.72	-0.26	-0.12	-0.18	0.54	1.56	1.13
$t_{Wilcoxon}$	-5.63***	-6.10***	-3.23***	-6.15***	-4.57***	-4.87***	-1.98**	-5.14***
Week -4								
Mean	3.012	0.575	0.013	0.009	16.968	2.459	0.031	0.027
t_{Stat}	0.18	-1.86*	-0.34	-0.46	0.46	-1.09	1.51	-0.41
$t_{Wilcoxon}$	-7.81***	-7.96***	-7.27***	-7.99***	-6.84***	-6.93***	-6.39***	-7.32***
Week -3								
Mean	0.386	0.056	0.015	0.001	24.567	6.746	0.036	0.089
t_{Stat}	-4.35***	-3.77***	0.00	-4.34***	1.21	1.00	1.85*	1.05
$t_{Wilcoxon}$	-7.95***	-8.01***	-7.02***	-8.12***	-6.81***	-7.25***	-6.35***	-7.67***
Week -2								
Mean	3.444	1.899	0.016	0.013	9.009	3.233	0.021	0.048
t_{Stat}	0.37	0.03	0.28	0.06	-0.95	-0.14	0.40	0.73
$t_{Wilcoxon}$	-7.25***	-7.40***	-7.08***	-7.59***	-8.05***	-8.27***	-7.37***	-8.29***
Week -1								
Mean	2.986	2.828	0.012	0.024	1.912	4.079	0.018	0.036
t_{Stat}	0.17	0.37	-0.74	0.55	-4.27***	0.23	-0.13	0.22
$t_{Wilcoxon}$	-7.69***	-7.66***	-7.50***	-7.77***	-8.86***	-9.10***	-8.19***	-9.04***
No. of News Events	607	607	607	607	607	607	607	607

This table reports observed trading activity prior to significantly negative news events, which are defined as ad-hoc announcements with a $CAR(0;1)$ smaller than ten percent. Average weekly insider trading activity, as measured by the four variables discussed in section 5.5.2, is reported separately for purchase and sale transactions. Trading activity is shown for the estimation period, the total event period, and individual event weeks. Observed trading activity as opposed to abnormal insider trading activity is presented. The value of shares traded is reported in units of 1,000 euros, the number of shares traded in units of 1,000 shares, and the percentage of market capitalization traded in % points. Implied abnormal trading activity is tested by a parametric t-test (t_{Stat}), and a non-parametric Wilcoxon signed-rank test ($t_{Wilcoxon}$). ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels respectively.

5.6.2.3 Trading After Positive News Announcements

If insiders trade strategically, directors' dealings after significantly *positive* news events should exhibit an increased number of sales and a decreased number of purchases. Table 5.12 shows that insider sales do increase, in particular, the number of insiders selling and percentage of the market capitalization traded. For example, for the entire event period, the number of insiders trading is at 0.075, more than three times as large as during the estimation period (0.019). Furthermore, both test statistics indicate that this result is significant at the 1% level. Abnormal selling activity appears to be highest during the first week following ad-hoc disclosures. For example, the average percentage of market capitalization during event week 1 is at 0.121%, about three times as high as for the entire event period at 0.041%, and significant at the 1% level under the parametric test. Purchasing activity after positive news announcements is generally unchanged. Surprisingly, however, the number of insiders trading shows an increase in buying activity.

5.6.2.4 Trading After Negative News Announcements

Table 5.13 details observed trading activity after significantly *negative* news announcements. As hypothesized, a sharp increase in buying activity after unfavorable news releases is observable. For example, at 9,055 euros, the value of shares purchased during the entire event period is about three times larger than during the estimation period (2,628 euros). This result is significant at the 5% level under the parametric t-test. Additionally, the number of insiders trading is significant at the 1% level under both test statistics.

Trading appears to be focused on the week immediately following news releases, and decreases thereafter. The average value of shares purchased amounts to 13,497 euros during week 1 and is significant at the 1% level under the parametric t-test. This pattern is consistent with the hypothesis that insiders delay their purchasing decisions until after the announcement of bad news. Alternatively, insiders could take the view that the market's reaction is disproportionate, thus following a contrarian trading strategy.⁷⁰ However, especially for individual event weeks further away from the announcement date, the Wilcoxon test statistic often indicates that increased insider buying is driven by individual transactions.

For insider sales, average trading activity during the entire event period is of a magnitude similar to that during the estimation period. Although the non-parametric Wilcoxon test statistics point to a generally reduced post-event selling activity, it becomes apparent again that post-event directors' dealings are most prevalent during week 1 after ad-hoc disclosures.

In general, the post-announcements data-sets consisting only of "significant" news releases feature stronger trading patterns. Informed trading is present, and uninformed trading is reduced compared to the full sample.

⁷⁰ Among others, Seyhun (1992), Rozeff and Zaman (1998), and Jenter (2005) provide evidence that insiders pursue contrarian trading strategies.

Table 5.12: Post-announcement Trading – Positive Announcements ($CAR(0;1) > 10\%$)

Period	Purchases				Sales			
	Value of Shares Traded	Number of Shares Traded	Number of Insiders Trading	% of Market Cap Traded	Value of Shares Traded	Number of Shares Traded	Number of Insiders Trading	% of Market Cap Traded
Estimation Period								
Week -5 to -24								
Mean	20.050	4.441	0.019	0.028	31.828	3.957	0.019	0.041
Event Period								
Week 1 to 4								
Mean	16.133	2.973	0.032	0.035	39.630	5.460	0.075	0.063
t_{Stat}	-0.29	-0.96	3.06***	0.45	0.58	1.22	5.24***	1.67*
$t_{Wilcoxon}$	-4.41***	-5.64***	-0.25	-5.63***	0.22	-0.58	5.11***	-0.67
Week 1								
Mean	48.473	4.252	0.062	0.087	66.229	13.037	0.127	0.121
t_{Stat}	0.84	-0.10	3.47***	1.01	1.33	2.44**	3.93***	2.48**
$t_{Wilcoxon}$	-6.43***	-6.95***	-4.36***	-7.09***	-2.91***	-3.40***	0.17	-3.50***
Week 2								
Mean	10.254	3.293	0.025	0.032	31.992	4.438	0.076	0.052
t_{Stat}	-0.79	-0.51	1.13	0.23	0.01	0.35	4.08***	0.68
$t_{Wilcoxon}$	-8.91***	-8.93***	-7.67***	-9.04***	-3.84***	-4.32***	-2.19**	-4.51***
Week 3								
Mean	3.548	4.150	0.022	0.017	10.083	1.726	0.043	0.019
t_{Stat}	-1.49	-0.08	0.56	-0.75	-2.15**	-2.57**	2.90***	-2.43**
$t_{Wilcoxon}$	-9.49***	-9.76***	-8.25***	-9.52***	-6.04***	-6.69***	-3.88***	-6.71***
Week 4								
Mean	2.256	0.198	0.020	0.003	50.214	2.640	0.053	0.062
t_{Stat}	-1.63	-3.71***	0.26	-4.47***	0.80	-1.19	2.95***	0.75
$t_{Wilcoxon}$	-10.08***	-10.43***	-9.61***	-10.47***	-6.54***	-6.98***	-4.44***	-6.97***
No. of News Events	834	834	834	834	834	834	834	834

This table reports observed trading activity following significantly positive news events, which are defined as ad-hoc announcements with a $CAR(0;1)$ greater than ten percent. Average weekly insider trading activity, as measured by the four variables discussed in section 5.5.2, is reported separately for purchase and sale transactions. Trading activity is shown for the estimation period, the total event period, and individual event weeks. Observed trading activity as opposed to abnormal insider trading activity is presented. The value of shares traded is reported in units of 1,000 euros, the number of shares traded in units of 1,000 shares, and the percentage of market capitalization traded in % points. Implied abnormal trading activity is tested by a parametric t-test (t_{Stat}), and a non-parametric Wilcoxon signed-rank test ($t_{Wilcoxon}$). ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels respectively.

Table 5.13: Post-announcement Trading – Negative Announcements ($CAR(0;1) < 10\%$)

Period	Purchases				Sales			
	Value of Shares Traded	Number of Shares Traded	Number of Insiders Trading	% of Market Cap Traded	Value of Shares Traded	Number of Shares Traded	Number of Insiders Trading	% of Market Cap Traded
Estimation Period								
Week -5 to -24								
Mean	2.628	1.863	0.015	0.012	13.837	3.459	0.019	0.031
Event Period								
Week 1 to 4								
Mean	9.055	1.278	0.052	0.011	15.758	2.779	0.016	0.047
t_{Stat}	2.20**	-1.15	5.36***	-0.23	0.19	-0.49	-0.90	0.67
$t_{Wilcoxon}$	0.64	-0.71	3.58***	-0.87	-7.16***	-7.19***	-4.32***	-6.72***
Week 1								
Mean	13.497	2.338	0.086	0.023	41.516	6.182	0.025	0.079
t_{Stat}	2.71***	0.52	4.69***	1.13	0.81	0.70	0.62	1.11
$t_{Wilcoxon}$	-1.97**	-2.73***	-0.84	-3.15***	-8.12***	-8.09***	-7.87***	-8.05***
Week 2								
Mean	5.104	1.630	0.054	0.014	1.148	1.803	0.012	0.018
t_{Stat}	1.70*	-0.35	3.79***	0.38	-4.57***	-1.28	-1.43	-1.02
$t_{Wilcoxon}$	-3.43***	-3.96***	-2.30**	-4.04***	-9.05***	-8.96***	-9.00***	-8.93***
Week 3								
Mean	1.295	0.371	0.033	0.003	0.935	0.682	0.010	0.074
t_{Stat}	-2.17**	-2.86***	2.27**	-2.87***	-4.51***	-3.47***	-2.12**	0.59
$t_{Wilcoxon}$	-5.77***	-6.48***	-4.82***	-6.48***	-9.70***	-9.43***	-8.91***	-9.28***
Week 4								
Mean	16.324	0.771	0.035	0.005	19.431	2.448	0.016	0.016
t_{Stat}	1.31	-1.88*	2.32**	-1.88*	0.31	-0.60	-0.48	-1.42
$t_{Wilcoxon}$	-5.40***	-5.69***	-4.76***	-5.95***	-8.70***	-8.71***	-7.76***	-8.61***
No. of News Events	607	607	607	607	607	607	607	607

This table reports observed trading activity following significantly negative news events, which are defined as ad-hoc announcements with a $CAR(0;1)$ smaller than ten percent. Average weekly insider trading activity, as measured by the four variables discussed in section 5.5.2, is reported separately for purchase and sale transactions. Trading activity is shown for the estimation period, the total event period, and individual event weeks. Observed trading activity as opposed to abnormal insider trading activity is presented. The value of shares traded is reported in units of 1,000 euros, the number of shares traded in units of 1,000 shares, and the percentage of market capitalization traded in % points. Implied abnormal trading activity is tested by a parametric t-test (t_{Stat}), and a non-parametric Wilcoxon signed-rank test ($t_{Wilcoxon}$). ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels respectively.

5.6.3 Discussion of Results

Although the presented results are partly ambiguous, they do offer evidence of some underlying themes.

First of all, insiders do engage in pre-announcement informed trading, i.e., purchasing (selling) prior to positive (negative) ad-hoc announcements. Informed directors' dealings remain relatively unchanged prior to news announcements in the full sample. If insiders were sufficiently disincentivized by German laws and regulations, abnormal insider trading activity would be negative for informed transactions.

As opposed to reported average insider trading activity, the non-parametric Wilcoxon test statistic suggests in many instances that uninformed as well as informed directors' dealings are reduced around ad-hoc announcements. Similarly, the descriptive statistics presented in Table 5.4 show that only a few ad-hoc announcements, about 5%, are preceded by directors' dealings.

Taken together, these results are interpreted as evidence that the *incidence* of insider trading prior to news announcements is generally more infrequent than during other time periods, but that the *magnitude* of informed directors' dealings during the pre-announcement period is comparable to that during the estimation period. As such, the latter findings appear to be based on individual transactions and trades and their influence on the reported arithmetic averages. Therefore, it is argued that the results do find evidence supporting hypothesis 5.1.1.1 in terms of the *incidence* of directors' dealings, but not in terms of *magnitude* of trading activity. These observations are only partly consistent with Seyhun (1992), Agrawal and Jaffe (1995), and Madison et al. (2004), who find for the U.S. stock market that insider trading laws effectively prevent such illegal dealings. In the sample of Agrawal and Cooper (2008), however, illegal trading appears to be more common than suggested by previous research.⁷¹

Results for the “significant” sample, however, are different. In this data set, which consists only of ad-hoc disclosures with an absolute abnormal return of at least 10%, evidence on informed pre-announcement trading is more scarce, especially prior to positive news disclosures. Korczak et al. (2009) find similar evidence regarding the trade-off between the benefits of exploiting private information and the cost stemming from litigation and reputational risks.⁷²

Yet, both data sets—the full as well as the “significant” samples—have a common feature, in that informed as well as uninformed trading activity often clusters immediately prior to and after ad-hoc announcements. This is inconsistent with Park et al. (1995), who find that insiders avoid transactions just before the release of news disclosures, because this period of time is associated with the largest amount of litigation and reputational risk.⁷³

Insiders also appear to behave strategically by reducing “uninformed” transactions during the pre-announcement period. By reducing sales (purchases) prior to positive (negative) announcements, insiders exploit their private information while not exposing themselves to litigation and reputational risk, which is consistent with the findings of, for example, Gombola et al. (1997), Harlow and Howe (1993), and Madison et al. (2004).⁷⁴ These results do also support hypothesis 5.1.1.2, which postulates that uninformed trading activity prior to news announcements is reduced. Nevertheless, it is surprising that insiders do engage at all in transactions, which on the face of it result in a loss.

After ad-hoc announcements, when litigation and reputational risks are low, insiders immediately increase their dealings. This finding is also supported by the descriptive statistics presented in table 5.5, which show that about 9% of all ad-hoc announcements are followed by insider transactions. Sivaku-

⁷¹See Agrawal and Cooper (2008), p. 34.

⁷²See Korczak et al. (2009), p. 27.

⁷³See Park et al. (1995), p. 613.

⁷⁴Agrawal and Jaffe (1995), on the other hand, find no decrease in insider sales prior to positive announcements (M&A announcements in their case).

mar and Waymire (1994), for example, also find an increase in insider trading activity after earnings releases.⁷⁵ These results support hypothesis 5.1.2.1.

The results also show, however, that uninformed post-announcement transactions do take place, which contradicts hypothesis 5.1.2.2. The latter result may be due to the fact that insiders trade on the momentum caused by news releases. Alternatively, insiders may not believe that the market's reaction fully reflects the informational content conveyed by the news release. Or they indeed have additional private information that makes such transactions attractive. As a result, part of the "uninformed" post-event trades may not be that uninformed after all. Another explanation for uninformed post-announcement trading is that insiders actively engage in signalling, for example to counterbalance the impact of negative news.

Evidence in favor of hypothesis 5.1.3.1, which states that trading patterns are more persuasive within the "significant" ad-hoc news sample, is mixed. While the reduction of informed active trading appears to be more pronounced prior to positive news announcements than in the full sample, this is not necessarily the case for negative announcements. Informed post-announcement trading seems to be, however, more pronounced if only news events with a large stock price reaction are examined. It could be argued, however, that given the large post-announcement profit opportunities originating from significant ad-hoc announcements, the difference in post-event trading strategies is surprisingly small.⁷⁶

Having summarized the results of the empirical analysis, the next section concludes and discusses the study's implications.

5.7 Conclusion and Implications

This chapter examined the trading behavior of corporate insiders around ad-hoc announcements. Based on existing research and findings, several hypothesis were defined, which have been tested with the outlined data set and methodology. It was argued that insiders face a trade-off in deciding whether to buy or sell stock of their own company prior to news announcements. Given that insiders can anticipate the stock price reaction a given news announcement will cause, they stand to profit if they trade upon this information. The larger the gain, however, the larger the potential risk of getting caught red-handed by the regulator or the general public. It is also argued that the potential costs of front-running news events increase faster relative to the potential gains, depending on the stock price reaction caused by the announcement. Instead of trading prior to announcements, it is hypothesized that insiders strategically delay their transaction until after ad-hoc announcements, in order to avoid regulatory scrutiny while at the same time benefiting from the private information they hold.

The studied sample consists of all ad-hoc announcements released by German companies between January 1, 2003, and December 31, 2006. The final data set consists of about 8,500 announcements. Four different trading activity metrics are defined. These are calculated for a benchmark period and for pre- and post-announcement event periods. Abnormal trading is estimated by deducting the normal level of trading, which is estimated by the benchmark period, from the actually observed trading level.

The results show that insiders do trade strategically around news releases. While they do not reduce the magnitude of their dealings prior to ad-hoc announcements in general, they do so prior to news events that have a substantial impact on stock prices and are associated with high regulatory and reputational risk.

⁷⁵See Sivakumar and Waymire (1994), p. 32.

⁷⁶It should be noted that the difference in abnormal insider trading activity between the full and "significant" sample is not formally tested, but inferred from the reported trading activity variables and the persuasiveness of the statistical tests performed regarding the significance of abnormal trading activity observations.

Nevertheless, the results also indicate that many ad-hoc disclosures are not associated with any directors' dealings during the event period and that the results are mainly driven by a small group of insiders and their transactions. After ad-hoc disclosures, insiders increase their dealing again and, in many instances, trade in the opposite direction of the stock price reaction caused by the news announcement.

Similar to the findings of Dymke and Walter (2008) and Betzer and Theissen (2009), this study's results do warrant a stricter enforcement of the insider trading regime in the German stock market. Both studies find that directors' dealings prior to news announcements earn larger abnormal returns than transactions that take place during other time periods.⁷⁷ This study also finds evidence of corporate insiders illegally front-running news announcements. In addition, it finds that the magnitude of pre-announcement trading is worrying, not necessarily its occurrence, which appears to be relatively low.⁷⁸ While this study does find that insiders refrain from exploiting their informational advantage if regulatory risk is high, this should be of little reconciliation for market participants who are put at a disadvantage by trading with informed counterparties.

The results regarding post-announcement trading are another noteworthy aspect of this study. To the best of the author's knowledge, this study examines one of the most comprehensive data sets for post-announcement trading. Other research in this field, such as Korczak et al. (2009), is often only concerned with pre-announcement trading. The results show that directors' dealings generally increase after the release of ad-hoc announcements and that this trading is mostly informed. This is in line with other studies, such as Sivakumar and Waymire (1994). Although the example of Zumwinkel mentioned earlier in this chapter shows that trading after the release of news announcements can lead to public outcry and reputational damage, this may only apply to high-profile cases.

As such, the results of this study do not necessarily warrant pre-announcement trading bans, which already exist for earnings releases, for example, in the U.K.⁷⁹ In any case, such trading bans would be difficult to implement since, by definition, ad-hoc announcements disclose inside information without delay. Instead, a closer examination of pre-announcement directors' dealings by the regulator, the BaFin, could potentially prove more useful. In addition, regulations restricting the trading gains of insiders resulting from post-announcements transactions, such as those suggested by Bettis et al. (1998), could be warranted.

As with any empirical study, this analysis has its shortcomings and limitations. For example, the Wilcoxon test statistic may be sensitive to the scarce trading around ad-hoc announcements and a more thorough test on how the abnormal return of announcements influences trading behavior is missing. In addition, the sample consists of reported transactions, while most illegal trades may not be reported at all.⁸⁰ Nevertheless, this study constitutes a first and important step in examining trading behavior of corporate insiders, and provides further evidence on the effectiveness of insider trading regulations in the German stock market.

⁷⁷While Dymke and Walter (2008) study directors' dealings prior to ad-hoc announcements, the study of Betzer and Theissen (2009) is only concerned with earnings releases. See also section 3.8.

⁷⁸Statistics on the enforcement of insider trading laws are published by the regulator (BaFin), and show that generally only few insider trading cases are brought forward, and even fewer lead to actual convictions. See also section 2.3.4.3.

⁷⁹See section 2.2.2.1 for a detailed discussion of the insider trading regime and trading ban regulations in the U.K.

⁸⁰Meulbroek (1992) is one of the few studies that examines illegal insider trading that has been prosecuted by the SEC, the U.S. regulator.

Chapter 6

Empirical Analysis of Directors' Dealings and Stock Market Efficiency

Chapter 4 reviewed the existing theory and empirical evidence on market efficiency, costly arbitrage, and directors' dealings and found that evidence collected for the German market indicates that arbitrage opportunities exist for outsiders mimicking published insider transactions.¹ According to Stotz (2006), the average abnormal return net of transaction costs over a 25-day-window following the announcement of a purchase is equal to a statistically significant 1.81%. In addition, it seems that excess returns accumulate slowly after the reporting of insider trades. For example, Betzer and Theissen (2009) report average gross abnormal returns of 2.18% and 2.00% for purchases and sales, respectively, in the first ten days following the announcement.

However, in markets that are efficient according to Fama (1970), prices jump to their new equilibrium after the release of information. In an effort to reconcile the findings for the German market with the notion of market efficiency, this chapter analyzes the largely unexplored relationship between returns to outsiders mimicking insiders and idiosyncratic risk.² Moreover, it is hypothesized that arbitrage risk, as measured by the level of idiosyncratic risk, makes arbitrage costly and hereby prevents investors from exploiting seemingly profitable post-event abnormal returns. As a corollary, it is demonstrated that arbitrage risk is negatively related to the speed of price adjustment after reported corporate dealings. Although the findings of the existing German studies are also evident in the sample examined here, it is argued that mispricings are in the realm of transaction costs. Hence, even though markets do not efficiently react to the release of new information (i.e. insider transactions), marginal traders cannot profit from this mispricing once transaction costs are taken into account.

The analysis is structured as follows. First, hypotheses related to directors' dealings and limits to arbitrage are presented in section 6.1. Next, the study design is outlined in section 6.2, and the data set is described in section 6.3. The variables employed in the analysis are defined in section 6.4, and

¹According to the traditional textbook definition, an arbitrage opportunity is defined as the mispricing of an asset that can be exploited without risk. However, in more recent literature, arbitrage is often referred to as any activity exploiting asset mispricing, even if the outcome of such a trading strategy is risky; cf. e.g. Pontiff (2006) or Shleifer and Vishny (1997). Under this perspective “(risky) arbitrage” and “(positive) alpha” trading become very similar concepts.

²This chapter has been published in large parts as an article in the *German Economic Review* (see Dickgiesser and Kaserer (2009)).

descriptive statistics are presented in section 6.5. Section 6.6 outlines the study's methodology, and the results of the analysis are discussed and presented in section 6.7. Section 6.8 concludes and elaborates on the implications of the study's findings.

6.1 Hypotheses

This section develops and motivates hypotheses related to the effect of arbitrage costs on returns after the disclosure of directors' dealings. The formulated hypotheses are based on empirical evidence as well as the theoretical considerations outlined in chapter 4. First, hypotheses on the market's reaction to reported insider transactions are presented in section 6.1.1. Section 6.1.2 formulates hypotheses concerned with the influence of holding costs, and arbitrage risk in particular, on excess returns after directors' dealings. Hypotheses on the influence of transaction costs on abnormal returns following reported insider trades are developed in section 6.1.3.

Although the majority of hypotheses could be posited as directional hypotheses, they generally are not. This facilitates a consistent and more conservative use of test statistics.³ In addition, all of the formulated hypotheses are tested separately for purchases and sales. Where feasible, the hypotheses are also tested for a pooled sample consisting of both purchases and sales.

6.1.1 The Market's Reaction to Directors' Dealings

Section 4.5 finds that the U.S. and U.K. stock markets are generally efficient in the semistrong-form with regard to directors' dealings. Whenever insider transactions are disclosed to the general public, stock markets react swiftly to incorporate the conveyed information into stock prices. While this process is associated with excess returns, the profits do not appear to be large enough to be exploited by outside investors. This stock price behavior is consistent with the semistrong-form of market efficiency.

The German stock market, on the other hand, appears to react inefficiently to reported directors' dealings. For example, the empirical results of Stotz (2006) and Betzer and Theissen (2009) suggest that outsiders may profit from disclosed insider trades.⁴

First, abnormal returns in the German market appear to be relatively large, both in absolute terms as well as relative terms. Profits even appear to be so large as to compensate for transaction costs. Stotz (2006), for example, finds average abnormal returns of 3.71% net of transaction costs after a holding period of 25 days for purchases mimicking directors' dealings in large companies.⁵ To verify this finding, it is hypothesized that reported directors' dealings cause statistically significant stock price reactions:

Hypothesis 6.1.1.1 *Abnormal returns following the disclosure of directors' dealings are statistically significantly different from zero.*

The second unusual feature of the German stock market is that excess returns accumulate slowly after the release of insider dealings announcements. Betzer and Theissen (2009), for example, report average abnormal returns of 1.93% (−2.41%) for purchases (sales) in the first ten days following the announcement of directors' dealings.⁶ Another ten days later, excess returns accumulate to 3.50% (−3.48%), respectively. In efficient markets, however, stock prices should immediately jump to their new equilibrium level after the disclosure of new and relevant information. In order to verify that this return

³See Laatz (1993), pp. 519–521.

⁴See section 4.5.3 for a discussion of the empirical evidence on returns to directors' dealings in Germany.

⁵See Stotz (2006), p. 460, Table A.1 Panel C.1.

⁶See Betzer and Theissen (2009), p. 413, Table 3.

behavior is also present in the studied data set, the second hypothesis is concerned with the market's slow reaction to directors' dealings.

Hypothesis 6.1.1.2 *Abnormal returns following the disclosure of directors' dealings accumulate slowly over time.*

6.1.2 Holding Costs and Directors' Dealings

Both aspects of stock price behavior outlined above represent market inefficiencies for themselves, in particular if taken together. Arguably, outsiders should be able to profit from reported directors' dealings by means of arbitrage. However, any profitable investment strategy based on publicly-available information would stand in stark contrast to the semistrong-form of market efficiency. This, however, seems to be an unlikely result for the German stock market, which is generally considered to be a highly developed capital market. Therefore, it is hypothesized that large abnormal returns are associated with arbitrage costs, prohibiting rational investors from exploiting the apparent inefficiency by means of arbitrage trading. This section relates holding costs to post-event abnormal returns. As outlined in section 4.3.2, holding costs are of special concern to arbitrageurs because these costs accumulate over time and are proportional to the investment horizon.

Arbitrage risk has been found to be the most important holding cost (Pontiff 2006). This result may also hold in the case of abnormal returns after disclosed insider trades. Mispriced securities generally offer market participants the opportunity to earn risk-free profits by engaging in arbitrage trades. Disregarding liquidity needs, portfolio rebalancing considerations, and deliberate signalling, rational insiders will buy (sell) stock of their own company only if they believe it to be undervalued (overvalued), since insiders put their own wealth at stake.⁷ Thus, directors' dealings can be interpreted as public mispricing signals, and an insider purchase (sales) should, on average, signal an undervaluation (overvaluation) of the respective company. To exploit a mispricing signaled by insider trading, arbitrageurs would take a long (short) position in stocks that have been purchased (sold) by corporate insiders and take opposite positions in close substitutes.

However, section 4.3 shows that arbitrage can be constrained by arbitrage risk, which arises out of imperfect hedging. As noted above, hedging a security's fundamental risk requires close substitutes. If no good substitutes exist, arbitrageurs will be exposed to unhedgeable fundamental risk. Thus, the quality and riskiness of arbitrage trades ultimately depend on the quality of the hedge, which in turn is only as good as the available substitutes. As outlined in section 4.3.2.1, the availability of close substitutes largely depends on a stock's level of idiosyncratic risk.

The above argument suggests that arbitrage risk, as measured by a security's level of idiosyncratic risk, prohibits rational investors from exploiting the observed market inefficiency. This implies that the level of idiosyncratic risk is related to excess returns after reported insider trades.

Hypothesis 6.1.2.1 *Idiosyncratic risk has an effect on the level of abnormal returns following the disclosure of directors' dealings.*

If a stock's idiosyncratic volatility is high, outsiders will be less inclined to engage in price-correcting arbitrage trades. As a result, prices will not immediately converge to their new equilibrium level after the announcement of insider transactions, as suggested by the efficient market hypothesis. Instead, the

⁷From the perspective of the insider, a company's over- or undervaluation may arise because of weak arbitrage forces, i.e., the stock is highly idiosyncratic, or because insiders are in the possession of private information (Ben-David and Roulstone 2007).

market will incorporate the information conveyed by directors' dealings slowly into security prices, and cumulative abnormal returns should increase as longer time periods are considered.

Hypothesis 6.1.2.2 *Idiosyncratic risk has an effect on the speed of price adjustment following the disclosure of directors' dealings.*

Shleifer and Vishny (1997), however, point out that the residual, i.e., unhedgeable, part of fundamental risk consists not only of idiosyncratic risk, but also of systematic risk.⁸ Moreover, Scruggs (2007) finds that noise trader risk is also idiosyncratic as well as systematic.⁹ Thus, systematic risk also limits arbitrage, and greater post-event abnormal returns should be positively related to systematic risk.

Hypothesis 6.1.2.3 *Systematic risk has an effect on the level of abnormal returns following the disclosure of directors' dealings.*

Other barriers to arbitrage are interest rates. Since short-sellers often do not receive full interest on their short-sale proceeds, the risk-free rate reflects the opportunity cost of capital.¹⁰

Hypothesis 6.1.2.4 *The risk-free rate has an effect on the level of abnormal returns following the disclosure of directors' dealings.*

6.1.3 Transaction Costs and Directors' Dealings

In addition to holding costs, transaction costs impede the rapid adjustment of stock prices after the release of directors' dealings.¹¹ The greater the transaction costs, the larger the mispricings should be, as less arbitrage resources are directed to eliminate the mispricing. Garman and Ohlson (1981) show that in equilibrium, with only transaction and no holding costs, prices move within the bounds of the fundamental value plus/minus transaction costs.¹² Transaction costs can be grouped into direct transaction costs, such as commissions and bid-ask spreads, and indirect transaction costs, such as delays in processing orders and adverse market price impact.

Regarding direct transaction costs, Bhushan (1994) and Bhardwaj and Brooks (1992) demonstrate that commissions and bid-ask spreads are inversely related to share price. Thus, abnormal returns after directors' dealings should be larger in companies with small share prices, and vice versa.

Hypothesis 6.1.3.1 *The share price has an effect on the level of abnormal returns following the disclosure of directors' dealings.*

In the case of indirect transaction costs, Kyle (1985), Admati and Pfleiderer (1988), Bhushan (1991), and Foster and Viswanathan (1990) argue that processing delays and market impact are inversely related to the trading volume of stocks. Thus, liquid stocks, as measured by their trading volume, supposedly have lower indirect transaction costs and, therefore, lower limits to arbitrage. As a result, high turnover in stocks should translate into lower post-event abnormal returns, and vice versa.

Hypothesis 6.1.3.2 *Trading volume has an effect on the level of abnormal returns following the disclosure of directors' dealings.*

⁸See Shleifer and Vishny (1997), pp. 49–51 .

⁹See Scruggs (2007), p. 76, ff.

¹⁰See Pontiff (2006), p. 1139.

¹¹See section 4.3.1 for a discussion of transaction costs as limits to arbitrage.

¹²See Garman and Ohlson (1981), p. 271, ff.

Moreover, it is argued that transaction costs, specifically in the form of bid-ask spreads, eliminate returns to arbitrage trading strategies based on disclosed insider transactions. If this hypothesis could be confirmed, it would allow for the reconciliation of the notion of an efficient German stock market with the existing findings on directors' dealings.

Hypothesis 6.1.3.3 *Arbitrage trading strategies based on directors' dealings are rendered unsuccessful by bid-ask spreads.*

6.1.4 Overview of Hypotheses

Table 6.1 presents an overview of the hypotheses defined in sections 6.1.1 to 6.1.3. Although the hypotheses are all non-directional, the last column details the expected sign of the proposed relationship where applicable.

6.2 Study Design

Having presented the hypotheses to be tested by the subsequent analysis, this section outlines the study's design and structure.

Studies on directors' dealings in Germany have emphasized that outside investors mimicking corporate directors are able to earn excess profits. Such a result, provided that it holds, constitutes a serious violation of the semistrong-form of the efficient market hypothesis. Section 6.1, however, hypothesizes that this anomaly is mainly caused by a subset of stocks with large limits to arbitrage and high idiosyncratic volatility in particular. This restrains arbitrageurs from engaging in otherwise profitable and price-correcting trades, causing stock prices to adjust slowly and leaving seemingly profitable trading unexploited.

Analyzing this line of argument is essentially a test of costly arbitrage. In the literature, a common research design is emerging.¹³ First, the size of the anomaly or mispricing is estimated on a security level. If the inefficiency is related to corporate events, usually an event study is performed to measure abnormal returns.¹⁴ Next, the mispricing is related to costs impeding arbitrage. Often, the portfolio sorts, and cross-sectional regression analysis are performed.

Building on this prevailing structure of analysis, this study will first estimate abnormal returns to outsiders mimicking directors' dealings by the means of an event study. Event studies are the standard framework used in corporate finance to evaluate the market's reaction to different corporate events.¹⁵ The event date is defined as the day of the disclosure of the directors' dealings announcements. The analysis yields estimates of abnormal returns after reported purchase and sale transactions. The excess returns are examined with several test statistics to determine whether they are significantly different from zero. This particular analysis allows a test of hypotheses 6.1.1.1 and 6.1.1.2.

Next, estimated excess returns are sorted into portfolio quintiles according to the underlying level of idiosyncratic risk. Average abnormal returns are calculated for the top and bottom quintiles in order

¹³See section 4.3.3 for a review of the limits to arbitrage literature.

¹⁴Mendenhall (2004) and Pontiff and Schill (2003) estimate abnormal returns by the means of an event study. Other researchers, such as Pontiff (1996), Ali et al. (2003), and Mashruwala et al. (2006) rely on different proxies for the size of the studied anomaly.

¹⁵Kothari and Warner (2007) states that "in a corporate context, the usefulness of event studies arises from the fact that the magnitude of abnormal performance at the time of an event provides a measure of the (unanticipated) impact of this type of event on the wealth of the firms' claimholders." See Kothari and Warner (2007), p. 5.

Table 6.1: Overview of Hypotheses

Number	Hypothesis	Expected Sign
<u>The Market's Reaction to Directors' Dealings</u>		
H 6.1.1.1	Abnormal returns following the disclosure of directors' dealings are statistically significantly different from zero.	n/a
H 6.1.1.2	Abnormal returns following the disclosure of directors' dealings accumulate slowly over time.	n/a
<u>Holding Costs and Directors' Dealings</u>		
H 6.1.2.1	Idiosyncratic risk has an effect on the level of abnormal returns following the disclosure of directors' dealings.	+
H 6.1.2.2	Idiosyncratic risk has an effect on the speed of price adjustment following the disclosure of directors' dealings.	-
H 6.1.2.3	Systematic risk has an effect on the level of abnormal returns following the disclosure of directors' dealings.	+
H 6.1.2.4	The risk-free rate has an effect on the level of abnormal returns following the disclosure of directors' dealings.	+
<u>Transaction Costs and Directors' Dealings</u>		
H 6.1.4.1	The share price has an effect on the level of abnormal returns following the disclosure of directors' dealings.	-
H 6.1.4.2	Trading volume has an effect on the level of abnormal returns following the disclosure of directors' dealings.	-
H 6.1.4.3	Arbitrage trading strategies based on directors' dealings are rendered unsuccessful by bid-ask spreads.	n/a

to examine hypotheses 6.1.2.1 and 6.1.2.2. Furthermore, hypothesis 6.1.2.1 is tested by a mean test of difference between the top and bottom quintiles.

The hypotheses of sections 6.1.2 and 6.1.3 are also addressed by a comprehensive cross-sectional regression analysis, which includes control variables for trade-, insider-, and company-specific variables.

Additionally, to test whether arbitrage costs are large enough to deter rational agents from exploiting abnormal returns after directors' dealings, an arbitrage trading strategy is designed. The returns to this strategy are computed with actual bid-ask quotations instead of closing prices.

As noted previously, all of the above outlined analyses are conducted for three different directors' dealings samples. Insider purchases and sales are examined separately as well as taken together in a pooled sample.

6.3 Data Set

This section describes the data set of the empirical study. The sample selection criteria are outlined in section 6.3.1, and section 6.3.2 describes the data sources as well as the applied data adjustments.

6.3.1 Sample Selection

This study is concerned with directors' dealings in the German stock market reported between July 1, 2002, and October 31, 2007. The studied period consists of 54 months, which is representative and more comprehensive than the existing studies of insider trading in the German stock market.¹⁶ Since directors' dealings legislation, according to section 15a of the WpHG, came into effect on July 1, 2002, no prior data is available.¹⁷ Generally, the sample consists of all directors' dealings reported in Germany during the studied time period. Yet, some sample selection criteria have to be imposed in order to ensure the integrity and informational content of the data set.

First, reported directors' dealings are required to be related to German securities. Foreign stocks may be subject to international corporate governance and directors' dealings legislation, potentially impacting their informational value. In addition, transaction prices have to be quoted in euros.¹⁸

Second, this study is concerned only with open-market purchases and sales of common stock or preferred equity. German law requires insiders to report not only their stock transactions, but also their security lendings and trades in financial instruments, such as employee stock options (ESOs), derivatives, convertible bonds, and stock allocation rights. The lending of stock obviously conveys little or no information to outside investors. Similarly, transactions in non-stock securities may convey different information to outside investors than plain vanilla open-market purchases and sales. The execution of ESOs, for example, may be due to tax or maturity reasons and not profit motives.¹⁹ As a result, all non-open-market purchases and sale transactions are discarded from the sample.

Third, transactions with a reporting delay of more than 30 days are removed from the sample. The reporting delay is defined as the number of trading days between the actual date of the transaction and

¹⁶The most comprehensive study of directors' dealings in the German market to date is that of Dymke and Walter (2008), which ranges from July 2002 to April 2005.

¹⁷See section for a discussion of the evolution of directors' dealings legislation in Germany. Prior to July 1, 2002, only companies listed on the Neuer Markt segment were subject insider dealings reporting requirements. Rau (2004) provides an empirical study of the Neuer Markt reporting obligations.

¹⁸This sample selection criteria is necessary because transaction volume, or the number of shares traded times the share price, is included as the control variable in the cross-sectional regression analysis in section 6.7.3.

¹⁹Gregory et al. (1994) find that option-related transactions are not significantly related to abnormal returns. This sample selection criteria is commonly applied in studies on insider trading ((Friederich et al. 2002); (Klinge et al. 2005); (Dymke and Walter 2008)).

its publication. In theory, this time period should not exceed five business days since the AnSVG came into effect. In reality, however, reporting delays can be substantial, and in some instances, amount to several years. Directors' dealings with long reporting delays are excluded from the sample because (i) such dealings supposedly have a lower informational value to outside investors because the information on which the insider traded may have already been incorporated into the share price, and (ii) long reporting delays might arise because either the transaction date or the reporting date is misspecified in the data source.²⁰

Fourth, directors' dealings with an aggregated transaction volume of 1,000 euros or less are not included in the empirical analysis, because such transactions may be disregarded by the market due to their low informational value.²¹

The outlined sample selection criteria translate into several data adjustments that are outlined alongside the employed data sources in the following section.

6.3.2 Data Sources and Adjustments

6.3.2.1 Directors' Dealings Data

6.3.2.1.1 Data Sources Several sources for data on German directors' dealings exist. These sources mainly differ in their scope of available data records and data integrity. This section discusses the available data sources and explains the selection of the chosen data provider.

BaFin maintains a publicly-accessible online database that contains all transactions disclosed, according to section 15a of the WpHG, during the past twelve months at any given point in time.²² As detailed in section 2.3.3.3, BaFin can be considered as a primary data source for directors' dealings, since insiders have to notify BaFin as well as the issuer of stock within five business days of their dealings.²³ The data integrity can generally be considered good, although several data records are incomplete. In addition, data records are not aggregated. If, for example, an insider splits a large order into several trades, each trade is reported as a single data record.

Another primary source of directors' dealings is the German *business register* (Unternehmensregister).²⁴ Since the Transparenzrichtlinien-Umsetzungsgesetz (TUG) became effective on January 20, 2007, the business register holds capital markets information, including directors' dealings notifications.²⁵ After issuers have transmitted directors' dealings to the news media for a European-wide dissemination, issuers are required to communicate the announcement to the business register. While the online platform is easily searchable for directors' dealings notifications, it lacks any workable export function. In addition, the data availability is severely restricted by the late implementation of the TUG.

As noted above, issuers must transmit directors' dealings information to news services, which ensure a European-wide dissemination of the insiders' share dealings. Thus, these news services may also be regarded as a primary data source. In practice, three major directors' dealings service providers for the German market exist: DGAP, euro adhoc, and hugin. All services maintain publicly-accessible databases,

²⁰In cases in which the trading or reporting were obviously wrong, i.e., the reporting date was prior to the trading date, data entries were adjusted with other sources of directors' dealings.

²¹This sample selection criterion concerns only aggregate trading volumes. If, for example, several transactions with a trading volume of 1,000 euros are reported on the same day, the single trades are not discarded.

²²Later transactions are removed from the publicly-available database.

²³See section 15a (1) of the WpHG.

²⁴The German business register is an online platform, which is accessible at <http://www.unternehmensregister.de>, as of June 5, 2008. The business register has been in existence since January 1, 2007, and contains electronic versions of company information published in the German federal bulletin (Bundesanzeiger).

²⁵The TUG was ratified on December 15, 2006, and also prescribes that ad-hoc news announcements are submitted to the business register.

which contain the announcements transmitted by the respective news service. While the data integrity can generally be considered as sound, the database offers no export function.

Furthermore, the websites of issuers of stock constitute a primary data source for directors' dealings. Companies, however, rarely publish directors' dealings information reaching back longer than one year. Furthermore, combing through company websites appears to be a rather uneconomical use of research resources.

A secondary source for directors' dealings is the "Infopool für meldepflichtige Wertpapiergeschäfte (Directors' Dealings)."²⁶ The database combines the data records published on the company website, BaFin's database, and DGAP's database. The company website often contains transactions that are below the official reporting threshold (25,000 euros per year prior to the AnSVG and 5,000 euros thereafter). Such trades are not necessarily contained in the BaFin database, unless corporate insiders also choose to notify the regulator on a voluntary basis. In practise, however, the majority of voluntary notifications are disclosed to the company as well as the BaFin. Data records are generally aggregated for insiders and for a given trading or reporting day. The data integrity appears to be at least as good as that of the BaFin database.

An alternative data service is provided by 2iQ Research GmbH. Their fee-based directorsdealings.eu service is tailored to institutional and specialized individual investors relying on real-time data feeds. Data records are obtained from BaFin and undergo consistency checks. Nevertheless, several data records contained in the BaFin database appeared to be missing from the data set obtained from directorsdealings.eu.

Because BaFin presents an official and primary source of directors' dealings data and offers acceptable data integrity, the subsequent empirical analysis is based on the records published by BaFin. Its punctual shortcomings in data consistency are overcome by performing double-checks with other directors' dealings sources.²⁷

The BaFin database contains a total of 18,619 entries for the studied time period. The available data items include, amongst others, the date of the trade as well as the date of reporting, the full name of the insider, the company, the name and local security code of the traded security, the number of shares traded, the share price, its currency, the position of the insider, and the type of transaction.

6.3.2.1.2 Data Adjustments As outlined in section 6.3.1, several sample selection criteria are applied to the initial data set. All data adjustments are outlined in Table 6.2.

The first sample selection criterion is that directors' dealings are related to German securities and are reported in euro currency. Whether a security is German or foreign is determined by its International Securities Identification Number (ISIN).²⁸ Searching the database for foreign securities yields a total of 2,729 entries, which are removed from the sample. Similarly, 57 transactions in German securities are found to be denoted in foreign currencies and are discarded.

Regarding transactions other than open-market purchases and sales in common stock or preferred equity, 1,151 records are related to derivatives, which includes the exercise of options as well as the trading of derivative instruments. Three hundred and one entries concern stock allocation rights due to capital increases, and 103 trades take place in convertible bonds. In 49 instances, transactions are related to the acceptance of a tender offer, according to the Wertpapiererwerbs- und Übernahmegesetz (WpÜG), Germany's takeover law. Furthermore, 206 directors' dealings regarding the lending of securities and 236

²⁶The database is accessible at <http://www.insiderdaten.de>, as of May 29, 2008.

²⁷Various consistency checks were performed in this study utilizing other sources of directors' dealings, such as insiderdaten.de and company websites, to verify the integrity of the data set.

²⁸The first two letters of the ISIN display the country code of the security.

trades are intra-insider transactions. The latter mainly refers to endowments and the transfer of stocks from one insider to another, such as a stock transfer to a spouse or dependent from a primary insider. A total of 259 entries were categorized as “other.” This section includes trades related to initial public offerings (IPO) or to greenshoe options and to duplicate, incomplete, or incorrect records that could not be reconstructed with the help of other data sources. After these adjustments, 14,679 open-market purchases and sales remain in the sample.

Another 644 trades exhibit a reporting delay of more than 30 days and are excluded from the analysis. In some instances, trades are reported on a weekend or holiday. In these cases, the announcement day is set to the following business day.

The remaining 14,035 observations are aggregated along the reporting day and company dimension.²⁹ The aggregation is necessary because, in many instances, several trades that were executed on different dates are reported on the same day. Moreover, different insiders of the same company often report trades on the same day, and in some single instances, transactions are split into several trades, each for which a data entry exists. Treating each data entry as an event would lead to severe event clustering, which could heavily distort the event study results as well as the subsequent analysis.

The aggregation of trades entails the summing of all transactions reported on a given day by a company. Trading volumes are used to determine whether trades of a given company amount to a purchase or sale transactions. The trading volume is summed by assigning a negative sign to the trading volumes of sales and a positive sign to the trading volume of purchases on a given day. If the summed trading volume is negative, the event is classified as a sale, and vice versa. Because the reporting delay is included as a variable in the cross-sectional regression analysis of section 6.7.3, the trading day is set to the most recent trading date of the transactions being aggregated. The aggregation of trades is by far the largest data adjustment and eliminates almost half (7,780 transactions) of the data set.

Of the aggregated trades, 439 events are discarded because they exhibit a summed trading volume of 1,000 euros or less. Another 332 events are lost because of non-existent or insufficient stock price data, and 356 trades are eliminated because of severe thin trading. Severe thin trading is defined as stock exhibiting more than 160 zero return observations of the 180 return observations of the estimation window.³⁰

After these data adjustments, 5,128 transactions (2,782 purchases and 2,346 sales) of 438 firms remain in the sample for the event study analysis in section 6.7.1. Because of data unavailability regarding the independent regression variables, the cross-sectional analysis sample in section 6.7.3 consists of 4,796 transactions (2,611 purchases and 2,185 sales).

6.3.2.2 Other Data

In addition to BaFin, data is also obtained from Thompson Financial Datastream and Worldscope. Datastream is used to gather daily dividend adjusted closing prices, unadjusted prices, and bid-ask quotations.³¹ To avoid any biases arising out of nonsynchronous data, only Xetra quotations are obtained from Datastream.³²

As recommended by Ince and Porter (2006), the stock price data is carefully screened in order to delete zero returns from dead stocks. In addition, Datastream price observations on non-trading days

²⁹Chang and Suk (1998), Lakonishok and Lee (2001), and Betzer and Theissen (2009) perform a similar aggregation.

³⁰See section 6.6 for an outline of the event study methodology.

³¹Datastream item “RI” is used for dividend adjusted closing prices, item “P” for unadjusted closing prices, item “PA” for ask quotations, and item “PB” for bid quotations.

³²Section 6.6.3.5 motivates the use of Xetra prices only.

Table 6.2: Directors' Dealings Data Set

Total no. of transactions between July 01, 2002 and October 31, 2007	18,619
Foreign ISIN	2,729
Foreign currency	57
Option- or derivative-related	1,151
Capital increase	301
Convertible bonds	103
Takeovers according to WpÜG	49
Securities lending	206
Intra-insider	236
Other	259
Reporting delay of more than 30 days	644
Lost through aggregation	7,780
Aggregated transaction volume of 1,000 euros or less	439
No or insufficient stock data	332
160 or more zero return observations during the estimation window	356
<i>Event Study Sample</i>	5,128
Purchases	2,549
Sales	2,363
Missing data for independent regression variables	332
<i>Cross-sectional Regression Sample</i>	4,796
Purchases	2,611
Sales	2,185

The table outlines the adjustments applied to the original data set obtained from BaFin. Non open-market trades, such as transactions related to options, derivatives, capital increases, convertible bonds, security lending, and takeovers, are discarded. In addition, intra-insider trades and other non open-market purchases and sales are removed, as are trades with a reporting delay greater than 30 business days. The remaining trades are aggregated along the company and reporting day dimension. Of the summed trades, observations with a trading volume of 1,000 euros or less are discarded because of their low informational value. A further 332 events are lost because of no or insufficient stock price data, and 356 trades are eliminated because of severe thin trading. The event study in section 6.7.1 examines 5,128 transactions (2,782 purchases and 2,346 sales). 332 events are lost due to data unavailability regarding independent regression variables. As a result, the cross-sectional analysis sample in section 6.7.3 consists of 4,796 transactions (2,611 purchases and 2,185 sales).

are discarded. Datastream is also used to obtain trading volume figures and the three-month EURIBOR rate.³³

Several accounting data items, such as the market-to-book value ratio and interest coverage figures, are collected from Worldscope.

6.4 Definition of Variables

This section outlines the construction of the empirical proxies for arbitrage risk, opportunity cost of capital, and transaction costs. In addition, several control variables are defined. These control variables are known to effect abnormal returns after reported directors' dealings and can be categorized into three (not mutually exclusive) groups: trade-, insider-, and company-specific variables. While the arbitrage risk variable is used throughout this empirical analysis, the other variables are mainly designed as independent regression variables for the analysis in section 6.7.3.

Next, the construction of each variable is outlined, and its inclusion is motivated. Moreover, the expected sign for the effect on post-event CARs is indicated. Table 6.3 summarizes the constructed variables.

6.4.1 Holding Cost Variables

Holdings costs accrue continuously over the duration of an arbitrage trade and are proportionate to the investment horizon. The variables designed to capture holding costs are *arbitrage risk*, *systematic risk*, and the *opportunity cost of capital*.

6.4.1.1 Idiosyncratic Risk

As outlined in section 4.3.2.1, arbitrage risk stems from imperfect hedging. Put differently, arbitrage risk is the volatility of stock returns remaining after adjusting for stock returns of close substitutes. To construct an empirical proxy measure for arbitrage risk, the methodology of Pontiff (1996) and Wurgler and Zhuravskaya (2002) is adapted, who use a stock's idiosyncratic risk. The theoretically more vested alternative would be to measure a firm's arbitrage risk as the residual variance from a regression of stock returns on the returns of a close substitute or a basket of close substitutes. Wurgler and Zhuravskaya (2002), however, show that both measures of arbitrage risk are highly correlated (0.98) and yield very similar results.

Therefore, the empirical proxy for arbitrage risk is constructed as the residual variance of a market model regression of stock returns on market returns (*IRISK*). In particular, the returns of the days t_{-261} to t_{-21} relative to the reporting day of the insider transaction t_0 are regressed against the CDAX performance index. The reported results are robust to different lengths of the return windows used to estimate *IRISK*.³⁴

Because the distribution of *IRISK* has a high positive skewness and kurtosis, the natural logarithm of the variable is taken, and included in the regression analysis (*IRISKLOG*). In addition, *IRISKLOG* is centered on zero to ease the interpretation of the results. Again, the findings are robust to the inclusion of either *IRISK* or *IRISKLOG* in the cross-sectional regression analysis, although they are more pronounced if the log version of idiosyncratic risk is used.

³³Datastream items "VOFF," "VOSG," "VODD," "VOMU," "VOBL," "VOHB," and "VOHN" are used to obtain trading volume data. Item "EIBOR3M" is used for the three-month EURIBOR rate.

³⁴*IRISK* is also computed with shorter return windows comprising 90 and 180 days. The results of cross-sectional regression reported in section 6.7.3 remain, however, qualitatively unchanged.

In accordance with hypothesis 6.1.2.1, it is expected that large abnormal returns after directors' dealings are concentrated in highly idiosyncratic stocks. Thus, the regression coefficient of *IRISKLOG* is expected to be positive.

6.4.1.2 Systematic Risk

Systematic risk (*SYRSK*), which is the part of the volatility of stock returns that can be hedged relatively easily, is also included in the regression analysis. *SYRSK* is computed as the total variance of stock returns minus the variance of the residuals (*IRISK*). For the same reasons as above, the natural logarithm of *SYRSK* is taken, and the variable is centered on zero (*SYRSKLOG*). This also allows a direct comparison of the coefficients of arbitrage risk and systematic risk.

In practice, systematic risk should also matter to arbitrageurs, although less so than idiosyncratic risk (Shleifer and Vishny 1997). Therefore, a positive relationship between *SYRSKLOG* and the dependent CAR variable is expected, yet less pronounced than the relationship between excess returns and *IRISK*.

6.4.1.3 Risk-free Rate

Pontiff (1996) argues that high (low) interest rates imply larger (smaller) holding costs for arbitrageurs because of margin requirements and because traders do not receive full interest on short-sale proceeds. Therefore, mispricings should be greater and should continue to exist for a longer time if interest rates are high.

Thus, a positive relationship between the level of interest rates and the size of abnormal returns following directors' dealings is expected. The risk-free rate is proxied by the three-month EURIBOR, measured one day prior to the reporting date of directors' dealings.

6.4.2 Transaction Cost Variables

The cross-sectional analysis uses daily closing prices that ignore transaction costs, such as commissions, bid-ask spreads, and illiquidity. Because these implicit and explicit charges make arbitrage costly, two proxy variables for transaction costs are included in the cross-sectional regression analysis.

6.4.2.1 Direct Transaction Costs

Bhushan (1994) and Bhardwaj and Brooks (1992) demonstrate that direct transaction costs such as commissions and bid-ask spreads, are inversely related to share price. Thus, *SPRICE*, the average (unadjusted) stock price over the days t_{-120} to t_{-21} , is included in the analysis. The variable is expected to be positively related to post-event CARs.

6.4.2.2 Indirect Transaction Costs

Illiquidity in stocks can lead to delays in the processing of orders, which can cause adverse price effects. Therefore, illiquidity poses an indirect transaction cost that is captured by the variable *VOLUME* (Admati and Pfleiderer 1988; Bhushan 1991). *VOLUME* is defined as the mean euro trading volume of a company's stock over the days t_{-120} to t_{-21} . The trading volume data is derived by aggregating the volume of all German stock exchanges on which the respective stock is traded. *VOLUME* should be negatively related to abnormal returns.

6.4.3 Control Variables

To avoid any biases in the cross-sectional regression analysis, several control variables are constructed. These regressors can be categorized into trade-, insider-, and company-specific variables.

6.4.3.1 Trade-specific Variables

The first group of control variables is related to the characteristics of insider trades. While the majority of these variables have been examined in previous studies of directors' dealings in Germany, a new proxy variable for companies in financial distress is introduced.

6.4.3.1.1 Insider Sales Studies of the U.S. and U.K. stock markets, such as those by Seyhun (1986) and Fidrmuc et al. (2006), find more pronounced price effects after the announcement of insider purchases than sales. This property is attributed to the assumption that purchases constitute a more credible signal because they are primarily initiated because of profit motives. The decision to sell, on the other hand, may also be motivated by liquidity needs or diversification considerations.

To account for any differences in the explanatory power of insider purchases and sales, the dummy variable *INSALE* is included in the pooled regression models. *INSALE* is set to one for sale transactions and is expected to be negatively related to absolute CARs.

6.4.3.1.2 Relative Trade Size Theoretical considerations suggest that relatively larger insider transactions convey greater informational value to other market participants because directors put more of their own capital at risk. Thus, larger trades should result in larger post-event excess returns. To make the size of trades comparable across different companies, the transaction volume is expressed as a fraction of the market value of equity, where the denominator is the mean market capitalization over the 100 days from t_{-120} to t_{-21} . It is expected that the sign of the coefficient of this variable, *TRADSZ*, is positive.

6.4.3.1.3 Reporting Delay The time between the actual date of the transaction and its reporting could have explanatory power with respect to abnormal returns. As insiders delay the reporting of their trades, informational value could be lost because of corporate news, events, or other directors' dealings in the meantime. Thus, the variable *DELAY*, which is the number of business days between the trade and its reporting, is included in the cross-sectional regression analysis. The variable's coefficient is expected to be negative.³⁵

6.4.3.1.4 Past returns Rozeff and Zaman (1998) demonstrate that abnormal returns after directors' dealings are negatively related to past returns and conclude that insiders follow a well-informed contrarian approach to investing. To account for this relationship, a stock's past performance is computed as the market adjusted abnormal return in the 60 trading days from t_{-81} to t_{-21} . The variable is denoted as *PASTRET* and is expected to exhibit a negative regression coefficient.³⁶

³⁵As mentioned in the description of the data set in section 6.3, trades with a delay of more than 30 business days are excluded from the analysis. Moreover, the trading day is set to the most recent transaction date if several trades are being aggregated over the reporting day dimension.

³⁶Since CARs following sales are multiplied by -1 in the cross-sectional regression analysis in section 6.7.3, the same adjustment is made for *PASTRET*.

6.4.3.2 Insider-specific Variables

The informational hierarchy hypothesis suggests that the quality of information conveyed by a transaction depends on the type of insider who trades (Seyhun 1986). Supposedly, members of the executive board possess information superior to that which is available to members of the supervisory board or the management. Thus, trades by executives should trigger larger price effects. On the other hand, Jeng et al. (2003) propose that better-informed insiders, such as CEOs, refrain from exploiting their comparative advantage because they find themselves subject to increased scrutiny from regulators and the public.

The effect of an insider's position on abnormal returns is captured by a set of three dummy variables for members of the executive board (*POSEB*), the supervisory board (*POSSB*), and the management (*POSMNG*). Transactions executed by other insiders are the base case. If different groups of insiders report their trades on the same day, the dummy variable of the presumably best informed group is set to one and the others to zero.

Although the coefficients of the dummy variables are expected to be positive, it is difficult to predict their relationships to each other in terms of significance and size.

6.4.3.3 Company-specific Variables

Next, variables that capture a company's most important characteristics are outlined. Attributes such as firm size, market-to-book ratio, and financial stability can influence the magnitude of price effects after directors' dealings.

6.4.3.3.1 Market Value of Equity To control for any size effects, the market value of equity (*MV*) is included in the regression analysis.³⁷ *MVLOG* is the (centered) natural logarithm of the average market value of equity over the 100 days from t_{-120} to t_{-21} relative to the reporting date t_0 .

Since larger companies are, on average, more closely followed by analysts, information asymmetries between insiders and outside investors should be relatively smaller. Thus, smaller abnormal returns after directors' dealings in large firms are expected, and the regression coefficient of *MVLOG* is predicted to be negative.

6.4.3.3.2 Market-to-Book Value of Equity The market-to-book value of equity is known to predict future returns. Rosenberg et al. (1985) find that stocks with a low market-to-book ratio out-perform the market. In addition, Friederich et al. (2002) argue that insiders purchase (sell) stock when they believe it to be undervalued (overvalued). Thus, larger abnormal returns should occur in value stocks, as measured by low market-to-book values.

The variable *MTBV* is defined as the average market-to-book ratio over the days t_{-120} to t_{-21} and is expected to be negatively related to abnormal returns.³⁸

6.4.3.3.3 Financial Distress Stock prices of firms in financial distress and insolvency may react more sensitively to insider trading signals than stocks of healthy companies (Fidrmuc et al. 2006). Purchases in poorly performing firms may indicate that insiders, who supposedly possess superior information, believe that a company turnaround is possible, and vice versa. The dummy variable, *DISTR*, is constructed to examine the relationship between returns to directors' dealings and financial distress.

³⁷Firm size could also pick up transaction cost effects. Schultz (1983) and Stoll and Whaley (1983), for example, show that there is a negative monotonic relationship between firm size and the bid-ask spread.

³⁸Observations where *MTBV* is negative, zero, or greater than 15 are excluded from the analysis.

The dummy variable is set to one if the company's interest coverage ratio is below one in the two consecutive years prior to the reporting date. The interest coverage ratio is defined as a firm's earnings before interest and taxes (EBIT) divided by its interest expenses.³⁹ The relationship between CARs and the proxy for financial distress is expected to be positive.

6.5 Descriptive Statistics

Table 6.4 contains summary statistics for the cross-sectional regression sample consisting of a total of 4,796 observations. For completeness, a breakdown of statistics for purchases and sales only is also provided. The (unlogged) proxy variable for arbitrage risk, *IRISK*, has a mean value of 0.0012. At 0.0001, the average systematic risk is considerably smaller. This is consistent with the notion that a stock's total volatility is primarily determined by its level of idiosyncratic risk. The average daily three-month EURIBOR is 2.94%, and the median share price is about ten euros. The average relative trade size is, at 1.375%, markedly higher for sales than for purchases at 0.45%. The sample also displays significant differences between sales and purchases in the case of past returns. Medium (market adjusted) abnormal returns prior to purchases are -0.51% and -8.49% for purchases. Almost 53% of the reported trades involved transactions by members of the executive board. The average firm in the sample has a market value of common equity of 2,926 million euros and a market-to-book ratio of 2.56. A relatively large proportion of insider trades, 11.41%, take place in financially distressed firms.

Table 6.5 displays the correlation coefficients of selected variables. Idiosyncratic risk is negatively correlated with firm size and stock trading volume, which could imply that the arbitrage risk clusters in small and thinly-traded stocks. The cross-sectional regression analysis controls for this and other potential relationships between regressors and the dependent abnormal return measures.

³⁹Theory suggests the use of earnings before interest, taxes, depreciation, and amortization (EBITDA) instead of EBIT. Rajan and Zingales (1995), however, document that the two measures are highly correlated. Furthermore, Jostarndt (2006) argues that the use of Ebit as the nominator is more appropriate for the German market because in recent years, many firms have defaulted as a result of unexpectedly high depreciations of goodwill.

Table 6.3: Definition of Variables

Variable	Definition	Expected Sign
<u>Holding Cost Variables</u>		
IRISK	Residual variance of a standard market model regression of stock returns on market returns for the time window from t_{-261} to t_{-21} .	+
IRISKLOG	Logged and centered transformation of IRISK.	+
SYRSRK	Total variance of stock returns for the time window from t_{-261} to t_{-21} minus the variance of the residuals (IRISK).	+
SYRSRKLOG	Logged and centered transformation of SYRSRK.	+
RF	Short-term risk-free interest rate proxied by the 3-month EURIBOR measured on day t_{-1} .	+
<u>Transaction Cost Variables</u>		
SPRICE	Average (unadjusted) stock price for t_{-120} to t_{-21} .	+
VOLUME	Average stock trading volume in millions of euros over the days t_{-120} to t_{-21} .	-
<u>Trade-specific Variables</u>		
INSALE	Indicator variable for sale transactions.	-
TRADSZ	Transaction volume divided by the market value of equity. The denominator is the mean market capitalization from t_{-120} to t_{-21} .	+
DELAY	Reporting delay between transaction date and reporting day t_0 .	-
PASTRET	Market adjusted abnormal return over the days t_{-81} to t_{-21} .	-
<u>Insider-specific Variables</u>		
POSEB	Indicator variable for transactions initiated by members of the executive board.	+
POSSB	Indicator variable for transactions initiated by members of the supervisory board.	+
POSMNG	Indicator variable for transactions initiated by members of the management, excluding members of the executive board.	+
<u>Firm-specific Variables</u>		
MV	Average market value of equity in millions of euros over the days t_{-120} to t_{-21} .	-
MVLOG	Logged and centered transformation of MV.	-
MTBV	Average market-to-book value over the days t_{-120} to t_{-21} .	-
DISTR	Dummy variable set to one for companies with an interest coverage ratio below one for two consecutive years prior to the insider trade.	+

Table 6.4: Descriptive Statistics

Variable	All Trades			Purchases			Sales		
	Mean	Median	Std. Dev.	Mean	Median	Std. Dev.	Mean	Median	Std. Dev.
IRISK	0.0012	0.0006	0.0050	0.0011	0.0006	0.0019	0.0013	0.0006	0.0070
SYRSK	0.0001	0.0000	0.0001	0.0001	0.0000	0.0001	0.0001	0.0000	0.0001
RF	0.0294	0.0276	0.0083	0.0313	0.0306	0.0084	0.0271	0.0219	0.0075
SPRICE	19.166	10.286	31.867	17.170	8.744	28.191	21.552	12.765	35.627
VOLUME	17.313	0.2635	59.166	14.720	0.2311	51.928	20.412	0.3307	66.674
INSALE	0.4556	0.0000	0.4981	-	-	-	-	-	-
TRADSZ	0.0087	0.0005	0.0441	0.0045	0.0003	0.0265	0.0137	0.0008	0.0582
DELAY	3.4062	2.0000	3.9482	3.2290	2.0000	3.9649	3.6178	3.0000	3.9185
PASTRET	-0.0414	-0.0394	0.2323	-0.0051	-0.0255	0.2195	-0.0849	-0.0552	0.2396
POSEB	0.5271	1.0000	0.4993	0.5523	1.0000	0.4974	0.4970	0.0000	0.5001
POSSB	0.3211	0.0000	0.4669	0.3194	0.0000	0.4663	0.3231	0.0000	0.4678
POSMNG	0.0227	0.0000	0.1490	0.0119	0.0000	0.1083	0.0357	0.0000	0.1856
MV	2926.0	98.335	9043.3	2584.2	81.530	8302.7	3334.3	141.38	9841.9
MTBV	2.5613	1.9157	2.0886	2.4657	1.7709	2.1666	2.6756	2.1450	1.9857
DISTR	0.1141	0.0000	0.3179	0.1249	0.0000	0.3306	0.1011	0.0000	0.3016

The table presents descriptive statistics for the independent variables used in the cross-sectional regression analysis. Figures are presented for all trades, purchases only, and sales only. Directors' dealings data are collected from BaFin, stock related data from Thomson Financial Datastream, and accounting data from Worldscope. The definition of variables can be found in Table 6.3.

Table 6.5: Correlation Table

	IRISK	SYRSK	RF	SPRICE	VOLUME	INSALE	TRADSZ	DELAY	PASTRET	MVLOG	MTBV	DISTR
IRISK	1.00											
SYRSK	0.101	1.00										
RF	-0.044	0.000	1.00									
SPRICE	-0.085	0.078	0.088	1.00								
VOLUME	-0.059	0.221	0.038	0.348	1.00							
INSALE	0.017	-0.049	-0.257	0.068	0.048	1.00						
TRADSZ	0.056	-0.023	-0.031	-0.051	-0.055	0.104	1.00					
DELAY	0.039	0.006	-0.092	-0.005	0.002	0.049	0.017	1.00				
PASTRET	-0.252	0.010	0.036	-0.010	0.032	-0.171	-0.028	-0.007	1.00			
MVLOG	-0.064	0.218	0.019	0.354	0.961	0.041	-0.059	0.013	0.041	1.00		
MTBV	-0.051	0.042	0.155	0.101	0.011	0.050	-0.009	-0.050	-0.011	0.019	1.00	
DISTR	0.144	0.056	0.003	-0.163	-0.100	-0.037	0.036	0.042	0.008	-0.110	-0.033	1.00

The table presents correlation coefficients for the independent variables used in the cross-sectional regression analysis. The definition of variables can be found in Table 6.3.

6.6 Methodology

The flow of the empirical analysis is to first estimate abnormal returns to directors' dealings via an event study and subsequently examine the influence of idiosyncratic risk on the measured excess returns. This section outlines the methodology employed to calculate returns and residuals returns, and presents the test statistics used to assess their statistical significance. In addition, several common methodological issues associated with tests of significance are addressed.

6.6.1 Return Calculation

Stock returns can be calculated either on an arithmetic or logarithmic basis. Continuously compounded returns are more consistent with a normal distribution than arithmetic returns, which is an important underlying assumption of parametric test statistics.⁴⁰ Brown and Warner (1985) and Thompson (1988), however, find that the method of return computation makes little difference in event studies. Moreover, Dissanaik and Le Fur (2003) point out that logarithmic returns may not be well-specified if a study's aim is to test whether events are persistently associated with excess returns.⁴¹ Also, Barber and Lyon (1997) show that continuously calculated returns lead to systematically reduced abnormal return estimates.⁴² As a result, discrete stock returns are calculated.

Moreover, stock returns are calculated on the basis of Xetra prices. In Germany, several regional stock exchanges named according to their place of business exist, including Berlin-Bremen, Düsseldorf, Hamburg-Hannover, Munich, Stuttgart, and Frankfurt. While the first five are commonly referred to as regional stock exchanges, the Frankfurter Wertpapierbörse (FWB) is the largest and most important marketplace in Germany. Including the FWB's electronic Xetra trading system, the stock exchange has a 97% market share of the stock trading in domestic shares stocks.⁴³ Electronic Xetra trading alone accounts for 83% of the trading volume.⁴⁴ One of the major differences between Xetra and local stock quotations is that Xetra has shorter trading hours. Deutsche Börse indices, such as the DAX and CDAX, however, are calculated on the basis of Xetra prices. Estimating the market model parameters with local quotations and Xetra would lead to biases arising of nonsynchronous data.⁴⁵ As a result, only Xetra prices are employed to calculate the arithmetic returns.

6.6.2 Abnormal Returns Measure

Normal returns are estimated under the market model. Brown and Warner (1985) find that the market model is "both well-specified and relatively powerful under a wide variety of conditions," and the discussion in section 4.4.2 shows that this particular statistical model has become a common choice to estimate expected returns.⁴⁶ In general, the event study framework summarized by Campbell et al. (1997) is followed.⁴⁷

While this empirical study is primarily concerned with the estimation of post-event abnormal returns, i.e., the returns following the publication of directors' dealings, the event window also captures pre-

⁴⁰See Fama (1976), pp. 17–20.

⁴¹See Dissanaik and Le Fur (2003), p. 1165, ff.

⁴²See Barber and Lyon (1997), p. 350, and Hauser (2003), p. 145–146.

⁴³See "22 Percent Rise in Turnover on Xetra in December," *Deutsche Börse*, January 2, 2008. Accessible at http://deutsche-boerse.com/dbag/dispatch/en/listcontent/gdb_navigation/home/Content_Files/10_homepage/News/13_press/January_2008/pm_news_cashmarket_turnover_dec2007.htm, as of May 10, 2008.

⁴⁴See Hauke Reimer, "Im Schatten der Großmacht," *WirtschaftsWoche*, February 17, 2007.

⁴⁵See Scholes and Williams (1977) for a discussion of the econometric problems arising out of nonsynchronous trading.

⁴⁶See Brown and Warner (1985), p. 3.

⁴⁷See section 4.4 for a general discussion of event study methodology.

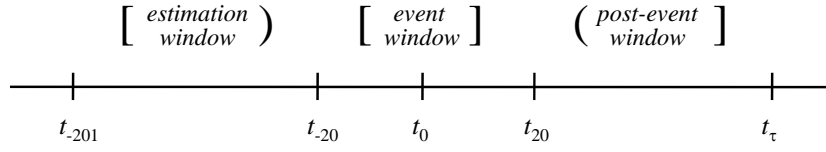


Figure 6.1: Event Study Time Line

event returns in order to ensure comparability with other studies on insider trading in Germany. In particular, the event window is composed of 41 days centered on the event date t_0 , which is defined as the announcement day of insider transactions.

Under the market model, the unexpected component of return of security i on day t is given by

$$AR_{i,t} = R_{i,t} - E(R_{i,t})$$

where $E(R_{i,t})$ is the expected or predicted return and $R_{i,t}$ is the observed or actual return.

The expected return is given by

$$E(R_{i,t}) = \alpha_i + \beta_i R_{m,t}$$

where $R_{m,t}$ is the return of the market portfolio on day t . Campbell and Wesley (1993) recommend the use of an equally-weighted market index in the absence of normality of abnormal returns, which could well be the case in the studied sample.⁴⁸ For the German market, however, the availability of equally-weighted indices is limited. The DAFOX index, for example, is only partly available for the studied sample period. Because of data quality considerations, the value-weighted CDAX index, which is computed by Deutsche Börse AG, was preferred to equally-weighted indices calculated by data providers, such as Datastream.

To obtain the market model parameters α and β , an ordinary least-squares regression is run. In particular, $R_{i,t}$ is regressed on $R_{m,t}$ during the estimation period, which ranges from t_{-200} to t_{-21} . Thus, the estimation window encompasses 181 days and 180 return observations.

To test the null hypothesis that CAARs are abnormal (i.e., systematically different from 0), securities are aggregated in the cross-section and across time. For N securities, the cross-sectional average abnormal return for day t is given by

$$AAR_t = \frac{1}{N} \sum_{i=1}^N AR_{i,t}$$

To examine return windows extending over multiple days, CAARs measures of differing lengths are computed:⁴⁹

$$CAAR(t_1, t_2) = \sum_{t=t_1}^{t_2} AAR_t$$

The null hypothesis of zero abnormal returns is examined by a standard test statistic that is given by

⁴⁸Mandelbrot (1966), Fama (1965), and Fama (1976) find that the distribution of daily stock returns is more fat-tailed compared to the normal distribution.

⁴⁹The *cumulative abnormal return* method can be traced back to the classic paper of Fama et al. (1969).

$$t_{CAAR} : \frac{CAAR(t_1, t_2)}{\sqrt{\sigma_{CAAR}^2(t_1, t_2)}}$$

where

$$\sigma_{CAAR}^2(t_1, t_2) = (t_2 - t_1)\sigma_{AAR}^2(t)$$

and $\sigma_{AAR}^2(t)$ is the variance of the average abnormal return on day t .

6.6.3 Robustness Checks

The above parametric test statistic is based on several distributional assumptions, including that returns are jointly normally, independently, and identically distributed. If these underlying assumptions do not hold, the test statistic may be biased and misspecified. Next, several methodological issues are discussed, and where appropriate, robustness checks are presented.

6.6.3.1 Event Clustering

Event clustering refers to two phenomena. The first notion of event clustering is that event windows overlap *across* the studied securities. Such overlaps render the cross-sectional independence assumption for abnormal returns invalid, since the covariances across securities are non-zero and standard errors are not estimated correctly.⁵⁰ Brown and Warner (1985), however, conclude that cross-sectional event clustering is far less serious for daily than for monthly data. For the studied sample, 17% of the trading days feature only one reported trade, and in 50% of all cases, three trades or fewer are reported on the same date across securities. In addition, Bernard (1987) argues that diversification across different industries also mitigates inference issues. This should apply to the sample studied in this analysis, as it generally includes all German firms reporting insider trades, irrespective of a company's sector. Moreover, Friederich et al. (2002) points out that the event itself—directors' dealings—should ease any influence stemming from cross-sectional dependence, since insider trades are most likely motivated by firm-specific events rather than market movements.⁵¹

Nevertheless, this particular form of event clustering is addressed by computing an additional test statistic. The non-parametric test proposed by Corrado (1989) assigns ranks to the excess returns of an individual security, including abnormal returns during the estimation window. This procedure takes cross-sectional dependence into account by transforming the distribution of abnormal returns into a uniform distribution of rank values.⁵² The results of Campbell and Wesley (1993) confirm that the rank statistics is well-specified in the presence of cross-sectional event clustering.

Moreover, a more sophisticated approach is used in order to address potential cross-sectional correlation between observations with any time overlap by applying a joint generalized least-squares (JGLS) estimation.⁵³ For that purpose, abnormal returns are estimated directly via the equation $\tilde{R}_{i,t} = \alpha_i + \beta_i \tilde{R}_{m,t} + \tilde{A}R_{i,t} \delta_{i,t} + \epsilon_{i,t}$, where $\delta_{i,t}$ is an indicator variable set equal to one, if the observation date t is an event date and zero otherwise. By putting no restrictions on the structure of the covariance matrix of disturbances – with the exception of assuming no autocorrelation – cross-sectional correlation is allowed for. For testing the null-hypothesis of zero abnormal returns, a t-test is used.

The second notion of event clustering relates to overlapping event windows within the *same* studied

⁵⁰See Collins and Dent (1984), p. 38, ff., and Bernard (1987), p. 1, ff.

⁵¹See Friederich et al. (2002), p. 20.

⁵²See Corrado (1989), pp. 387–388.

⁵³The approach proposed by Malatesta (1986) and further developed by Ingram and Ingram (1993) and others is followed.

security.⁵⁴ Such event clustering potentially distorts CARs, which in turn could introduce biases in the event study and regression analysis results. Generally, pre- and post-event abnormal returns are asymmetrical in that pre-event CARs for purchases (sales) are typically negative (positive), and post-event CARs are generally positive (negative) for purchases (sales). Thus, if several directors' dealings, be they either purchases, sales, or both, occur within a given security in close succession, abnormal returns may cancel each other out or reinforce themselves. For the studied sample, the average trade per year and company is, at 1.97, relatively low. Nevertheless, several instances of event clustering within a company can be observed.

To deal with overlapping event windows within the same security, a control sample is constructed that contains only directors' dealings, with no other reported trades of the same company in the time window ranging from t_{-20} to t_{+20} .⁵⁵ The adjusted sample consists of 1,390 (720 purchases and 670 sales) non-overlapping observations, and the average trade per company and year is reduced to 0.62 (see Appendix B, Table B.2). As this sample generally consists of fewer observations, problems arising out of cross-sectional event clustering are also mitigated. Of all event days, 54% exhibit only one trade, and in 94% of all instances, only three trades or fewer occur on the same date. The results of this robustness sample generally confirm the findings based on the unadjusted sample.

6.6.3.2 Non-normality

The normality assumption of returns is important, as results are otherwise only asymptotic.⁵⁶ Fama (1976), however, shows that daily returns are more non-normal than monthly returns. Dyckman et al. (1984), on the other hand, conclude that non-normality of daily excess returns introduces only small biases.⁵⁷ On similar lines, simulations performed by Brown and Warner (1985) and Campbell and Wesley (1993) show that excess returns quickly converge to normality when aggregated over 100 stocks or more. This attribute should apply to the relatively large study sample as well as the control sample. Nevertheless, the robustness of the results is verified by the above-mentioned Corrado (1989) rank statistics, which do not rely on the normality assumption of abnormal returns.

6.6.3.3 Event Induced Changes in Variance

The announcement of directors' dealings may lead to event-induced heteroscedasticity, i.e., the variance of the estimation is different from that of the event window. Such an effect violates the assumption of identically distributed abnormal returns and potentially leads to a misspecification of the parametric test statistic. Boehmer et al. (1991) propose a test statistic, which is robust to changes in variance. Campbell and Wesley (1993), however, find that the above outlined rank test statistic is also insensitive to event-induced heteroscedasticity.

6.6.3.4 Autocorrelation

Serial dependence in abnormal returns is especially relevant if multi-day CAARs are examined, which is the case in this empirical analysis.⁵⁸ Jensen (1969) as well as Brown and Warner (1985), for example, do find small negative autocorrelation in market model excess returns. The authors, however, also

⁵⁴Klinge et al. (2005), Fidrmuc et al. (2006), and Betzer and Theissen (2009) address this methodological issue.

⁵⁵Klinge et al. (2005) and Betzer and Theissen (2009) construct similar control samples with non-overlapping observations.

⁵⁶See MacKinlay (1997), p. 35.

⁵⁷See Dyckman et al. (1984), p. 29.

⁵⁸See Brown and Warner (1985), p. 19.

demonstrate that controlling explicitly for time-series dependence offers only insignificant benefits.⁵⁹ Likewise, Campbell and Wesley (1993) find that the specification of test statistics is not influenced by the presence of moderate autocorrelation in residuals.⁶⁰

6.6.3.5 Thin and Non-synchronous Trading

Non-synchronous trading occurs if prices are recorded at time intervals of different or irregular lengths.⁶¹ Closing prices may be recorded at different points in time, or some stocks may not be traded at all on a given day. Such non-trading may lead to biases in the estimated event study betas and may also increase or decrease serial dependence.⁶² Scholes and Williams (1977) and Dimson (1979) define consistent beta estimators in the presence of non-synchronous trading. Both estimators generally move betas of thinly-traded stocks upward by ten to twenty percent, resulting in lower abnormal returns.⁶³ Dyckman et al. (1984) and Jain (1986), on the other hand, find that the adjustment of Scholes and Williams (1977) is generally negligible. Also, Campbell and Wesley (1993) conclude that the adjustment fails to improve the inferences drawn from parametric test statistics.

Again, thin and non-synchronous trading is addressed by computing the non-parametric test statistic of Corrado (1989). Campbell and Wesley (1993) argue that under the market model, the rank test is best specified in the presence of thin trading. However, for the sake of conservative estimates of excess returns, stocks with severe thin trading are excluded from the analysis. As outlined in section 6.3.2, securities with 160 or more zero returns during the estimation window are excluded from the analysis. To minimize the impact of non-synchronous trading, only Xetra quotations are used, as these are also employed to calculate the CDAX index, which acts as a proxy for the market return. Trading hours of regional exchanges differ from those of the FWB's electronic trading platform.

6.7 Results

Having outlined the design of the study (section 6.2), the independent variables of the regression analysis (section 6.4), and the event study methodology (section 6.6), the results of the various analysis are presented next.

6.7.1 Event Study Analysis

Abnormal returns for different event windows are reported in Table 6.6. While this study focuses on post-event CAARs, pre-event excess returns are also reported to facilitate comparability with previous research. Figures 6.2 and 6.3 depict abnormal returns over time.

Panel A of Table 6.6 reports abnormal returns under the market model approach. Pre-event abnormal returns from t_{-20} to t_{-1} accumulate to -2.51% (1.95%) for purchases (sales) compared to a post-event CAAR(0;20) of 1.99% (-3.12%). With the exception of CAAR(0), all abnormal return measures are statistically different from zero at the one percent level, regardless of the employed test statistic. This finding confirms hypothesis 6.1.1.1. Moreover, the results confirm the findings of previous studies that insiders are able to time their transactions well and decide to trade after a period of significant abnormal returns. Moreover, the market seems to react more strongly to the announcement of insider sales.

⁵⁹See Brown and Warner (1985), p. 20.

⁶⁰See Campbell and Wesley (1993), p. 91.

⁶¹See MacKinlay (1997), pp. 35–36.

⁶²See Binder (1998), p. 129.

⁶³See Scholes and Williams (1977), pp. 321–322, Tables 2 and 3.

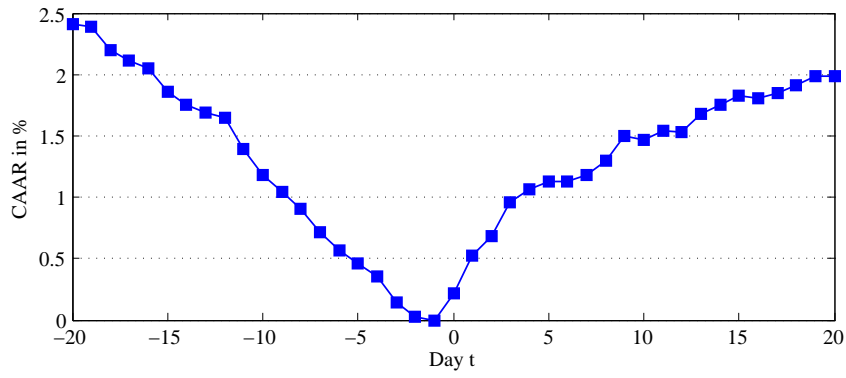


Figure 6.2: CAARs for Purchase Transactions

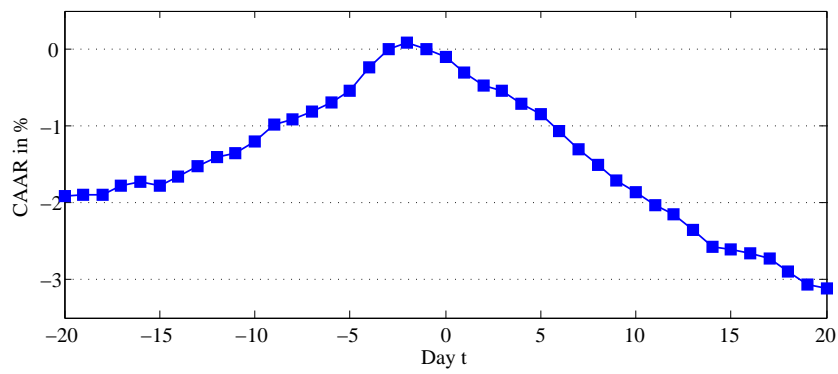


Figure 6.3: CAARs for Sale Transactions

Although studies for the US and UK stock markets have consistently found greater abnormal returns for purchases than for sales, this result confirms the findings of previous studies for the German market. Rau (2004), Betzer and Theissen (2009) and Klinge et al. (2005) all find the market's reaction to be more pronounced with regards to sales than to purchases, at least over longer event windows.

On the event day, the market reacts in the expected direction. CAAR(0) amounts to 0.22% (significant) for purchase and -0.10% (not significant) for sale transactions.⁶⁴ Overall, abnormal returns are more pronounced around sales than purchases. This includes pre- and post-event CAARs. In relationship to CAAR(0;10) and CAAR(0;20), however, the market's immediate reaction to reported insider trades on the event date t_0 is relatively small. At first glance, this suggests that the price discovery after the announcement of corporate dealings is inefficient and slow, which should open up the opportunity for outsiders to profit from reported insider trades (hypothesis 6.1.1.2). In fact, the academic as well as the practitioner oriented literature is pointing in this direction. In this study, however, it is argued that these results may be in accordance with the view of an informational efficient market, as proposed by Jensen (1978), because it is not clear whether such price adjustment patterns can really be exploited by outside investors. Therefore, in the remaining part of this chapter, it will first be shown that observed abnormal returns are clustered among stocks with high arbitrage risk, and second, that this effect cannot be exploited once transaction costs are taken into account.

It should be noted that event returns are almost unchanged—with respect to size as well as significance—if they are calculated under the JGLS-approach explained in the preceding section, as can be seen from Panel B of Table 6.6. Furthermore, results are very similar if all directors' dealings, including transactions with a reporting delay greater than 30 trading days, are examined (see Appendix B, Table B.1).

⁶⁴In unreported results, CAARs also remain significant if the event date is set to one day after the reporting day.

Table 6.6: Event Study Results

	CAAR(-20;-1)	CAAR(-10;-1)	CAAR(0)	CAAR(0;5)	CAAR(0;10)	CAAR(0;20)	Observations
Panel A: Abnormal Event Returns under Independent Disturbances							
Purchases							
CAAR	-2.51%	-1.40%	0.22%	1.13%	1.46%	1.99%	2,782
t_{CAAR}	-8.78	-6.89	3.45	7.18	6.89	6.78	
t_{Rank}	-7.27	-6.26	2.48	5.09	4.87	5.00	
Sales							
CAAR	1.95%	1.36%	-0.10%	-0.85%	-1.87%	-3.12%	2,346
t_{CAAR}	5.79	5.71	-1.31	-4.59	-7.48	-9.04	
t_{Rank}	5.24	5.51	-0.97	-3.33	-5.54	-5.91	
Panel B: Abnormal Event Returns under Cross-Sectional Dependent Disturbances (JGLS)							
Purchases							
CAAR	-2.58%	-1.37%	0.23%	1.16%	1.54%	2.20%	2,782
t_{CAAR}	-8.62	-5.86	3.07	7.7	7.70	7.90	
Sales							
CAAR	2.31%	1.52%	0.10%	-0.83%	-1.87%	3.28%	2,346
t_{CAAR}	7.00	6.50	1.33	5.08	9.20	11.38	

Panel A gives the cumulated abnormal event returns under the traditional market model approach, while for Panel B, a joint generalized least-squares (JGLS) approach is employed, thus allowing for cross-sectional dependence of disturbances. The event date, t_0 , is defined as the day of reporting of insider transactions. Insider trades published on the same day of any one company are aggregated. Trades with a transaction volume of 1,000 euros or less are not included in the analysis. The $CDA\bar{X}$ is used as the proxy for the market portfolio. t_{CAAR} is the standard test statistic, as outlined in section 6.6 and t_{Rank} is the non-parametric test proposed by Corrado (1989).

6.7.2 CAARs for Arbitrage Risk Portfolios

This section analyzes CAARs for different levels of arbitrage risk by sorting trades into quintiles according to the level of idiosyncratic risk of the underlying stock. This procedure is repeated for all trades and for purchases and sales only.⁶⁵ Quintile 1 contains trades associated with lowest arbitrage risk, and quintile 5 contains trades with highest arbitrage risk, as measured by the proxy variable *IRISK*. In addition, the CAARs of both quintiles are compared by the means of a one-sided test of difference in means. Results are reported in Table 6.7.

Excess returns after directors' dealings prove to be highly sensitive to the level of arbitrage risk. The difference in CAARs is, in all instances, highly significant at the 1% level and ranges in the pooled sample from 1.77% for CAAR(0;5) to 4.90% for CAAR(0;20). The greatest difference can be observed for sales with a spread of 6.09% in CAAR(0;20). It is also shown in Table 6.7 that results, i.e. differences in CAARs between the high and low arbitrage risk quintile, are almost unchanged, if instead of the traditional market model based CAARs, abnormal returns resulting from a JGLS approach are used (see Appendix B, Table B.4).

In general, the difference in returns is larger for sales than for purchases. This implies a stronger relationship between arbitrage risk and excess returns in the case of sales than in the case of purchases. This finding will be confirmed in the cross-sectional regression analysis in section 6.7.3. In addition, the results demonstrate that returns accumulate over time in highly idiosyncratic stocks but remain more or less constant if arbitrage risk is low (hypothesis 6.1.2.2). In fact, CAAR(0;20) is smaller than CAAR(0;10) in the low arbitrage risk purchases sample, while the opposite is true in all the high arbitrage risk samples. These findings are consistent with the notion that prices adjust slowly if arbitrage forces are weak because of high idiosyncratic risk. If arbitrage risk is low, on the other hand, prices adjust quickly to their new equilibrium level and subsequently follow a random walk.

⁶⁵In case of aggregating sales and purchases, abnormal returns of sales are multiplied by minus one.

Table 6.7: CAARs for Arbitrage Risk Portfolios

	CAAR(0;5)	CAAR(0;10)	CAAR(0;20)	Mean	Idiosyncratic Risk Statistics (*10 ³)			Observations
					Median	Std. Dev.	Min.	
All Trades								
Arbitrage Risk Q1 (Low)	0.32%	0.65%	0.71%	0.17	0.18	0.07	0.03	0.27
<i>t</i> _{CAAR}	3.27	4.88	3.84					
<i>t</i> _{Rank}	2.65	3.85	2.60					1,006
Arbitrage Risk Q5 (High)	2.10%	3.64%	5.61%	4.05	2.54	1.05	1.55	3.01
<i>t</i> _{CAAR}	4.29	5.51	6.14					
<i>t</i> _{Rank}	3.88	4.96	5.93					1,006
Difference	1.77%	2.99%	4.90%					
<i>t</i> _{Diff}	4.75	5.92	6.90					
Difference JGLS	1.54%	2.63%	4.53%					
<i>t</i> _{Diff}	3.59	4.73	5.75					
Purchases								
Arbitrage Risk Q1 (Low)	0.48%	0.82%	0.64%	0.18	0.19	0.07	0.04	0.28
<i>t</i> _{CAAR}	3.45	4.35	2.44					
<i>t</i> _{Rank}	2.55	3.15	1.68					546
Arbitrage Risk Q5 (High)	2.26%	3.15%	4.52%	3.68	2.67	3.29	1.54	4.99
<i>t</i> _{CAAR}	3.65	3.75	3.90					
<i>t</i> _{Rank}	3.32	2.85	4.03					546
Difference	1.78%	2.33%	3.88%					
<i>t</i> _{Diff}	3.97	3.67	4.02					
Difference JGLS	1.47%	1.84%	3.23%					
<i>t</i> _{Diff}	2.49	2.30	2.94					
Sales								
Arbitrage Risk Q1 (Low)	0.09%	0.38%	0.62%	0.15	0.15	0.07	0.03	0.27
<i>t</i> _{CAAR}	0.62	2.02	2.40					
<i>t</i> _{Rank}	1.41	2.57	2.00					460
Arbitrage Risk Q5 (High)	1.83%	4.07%	6.72%	4.48	2.40	1.50	1.60	301.19
<i>t</i> _{CAAR}	2.36	3.88	4.63					
<i>t</i> _{Rank}	2.00	3.82	4.12					460
Difference	1.74%	3.69%	6.09%					
<i>t</i> _{Diff}	3.05	5.16	6.14					
Difference JGLS	1.60%	3.51%	6.03%					
<i>t</i> _{Diff}	2.56	4.59	5.37					

Post-event CARs (estimated under the traditional market model approach) are ranked into quintiles based on the level of idiosyncratic risk associated with the underlying stock. Arbitrage Risk Q1 contains trades with the lowest levels of arbitrage risk and Arbitrage Risk Q5 contains trades with highest levels of arbitrage risk as measured by *IRISK*. The ranking procedure is repeated for purchases, sales, and all trades; in the latter case, CARs for sales are multiplied by minus one before they are aggregated. The definition of *IRISK* can be found in Table 6.3. For the top and bottom quintiles, the average CARs (CAARs) are computed. *t*_{CAAR} is a standard test statistic, as outlined in section 6.6, and *t*_{Rank} is the non-parametric test proposed by Corrado (1989). The difference between the top and bottom arbitrage risk quintiles is tested by the means of a one-sided t-test. Difference JGLS calculates this difference on the basis of CARs calculated under the joint generalized least-squares (JGLS) approach.

6.7.3 Cross-sectional Regression Analysis

This section examines the relationship between arbitrage risk and returns to reported insider trades by means of a cross-sectional regression. Because of the higher explanatory power, as indicated by adjusted R^2 , $CAR(0;10)$ and $CAR(0;20)$ are dependent variables. For both CAR variables, both a pooled regression and one for purchases and sales only are run. To accommodate the interpretation of the results, abnormal returns after sales are multiplied by minus one. Thus, coefficients should be of the same sign, regardless of the examined regression model. As outlined in the discussion of variables in section 6.4, the analysis includes proxies for holding and transaction costs as well as several control variables (trade-, insider-, and company-specific variables). A summary of the independent regression variables can be found in Table 6.3. Regression results are reported in Table 6.8.

In support of the previous results and hypothesis 6.1.1.1, the data indicate that arbitrage risk is strongly and positively related to post-event CARs. *IRISKLOG* is significant in all regression models at the five percent level at least. Moreover, arbitrage risk has a substantial effect on post-event CARs, as indicated by its regression coefficient. Furthermore, it can be deduced from the regression results that the relevance of arbitrage risk strengthens as longer event windows are being considered (hypothesis 6.1.2.2). T-statistics as well as regression coefficients increase with time. This is consistent with arbitrage risk being a type of holding cost that is proportional to the investment horizon (Pontiff and Schill 2003).

Regarding the effect of systematic risk on CARs, marked differences are noted between sales and purchases. Although systematic risk is significant and positive in the purchase samples, it has no effect on CARs in the case of reported insider sales. Thus, hypothesis 6.1.2.3 can be confirmed for purchases, but not for sales samples. For both types of transactions, however, the influence of systematic risk is smaller than that of idiosyncratic risk. These findings partly confirm that while both systematic and idiosyncratic risk matter to arbitrageurs, the latter part of total volatility matters more because it is more difficult to hedge.

Except for the $CAR(0;20)$ pooled and purchase sample, the short-term risk-free rate, another holding cost item, does not have a significant impact on abnormal returns, and hypothesis 6.1.2.4 cannot be confirmed. Along similar lines, the regression analysis fails to find a statistically significant relationship between CARs and transaction costs. Nevertheless, the regression coefficients of share price (*SPRICE*), which controls for direct transaction costs such as brokerage commission, have the expected positive sign, with the exception of the $CAR(0;20)$ sales sample. The same applies for *VOLUME*, which picks up indirect transaction costs such as illiquidity, except for the $CAR(0;10)$ sales sample. Nevertheless, hypotheses 6.1.3.1 and 6.1.3.2 cannot be confirmed.

The event study analysis has shown that reported insider sales are followed by greater abnormal returns than insider purchases. The findings of the pooled regressions, however, demonstrate that after controlling for the influence of other variables, the type of transaction has no direct effect on CARs. As a consequence, the event study results must be driven by other factors, such as higher arbitrage risk or more extreme past returns associated with sale transactions.

Several other trade-specific variables have a higher explanatory power. The relative size of trades is significant and positive for the $CAR(0;10)$ purchases sample. This suggests that relatively larger trades trigger larger price reactions. The negative *TRADSZ* coefficient for sales, however, suggests the contrary. Betzer and Theissen (2009) find the same nonuniform result.⁶⁶

The results on past returns, on the other hand, are more consistent. As expected, past stock performance

⁶⁶See Betzer and Theissen (2009), p. 425, Table 7.

is negatively related to post-event CARs.⁶⁷ In addition, the regression coefficients are, in all instances, statistically significant at the one percent level.

Although Seyhun (1986) and Lin and Howe (1990) partially confirm the informational hierarchy hypothesis for U.S. data, Fidrmuc et al. (2006) and Betzer and Theissen (2009) find no evidence for the U.K. and German markets. The results of Table 6.8 also offer no support for the informational hypothesis. Generally, the regression coefficients indicate that trades by members of the executive board and the supervisory board are followed by smaller (absolute) abnormal returns than transactions by members of the management.

Evaluating the effect of company-specific variables on abnormal returns, firm size (*MVLOG*) features the expected sign. The negative regression coefficients suggest that CARs shrink as larger companies are considered. Previous studies generally find corresponding evidence (Seyhun 1986; Betzer and Theissen 2009).

The relationship between the market-to-book value ratio and abnormal returns is significant but has different economic implications for sales and purchases. Value stocks, as measured by a low *MTBV* ratio, are followed by smaller price movements in the case of sales and larger movements in the case of purchases. The reverse is true for insider trades in high-growth or overvalued stocks, as measured by a high *MTBV* ratio. Thus, positive insider trading signals move stock prices less if valuations are already exceedingly high. Market participants seem, however, to be more sensitive to negative signals in growth stocks, as these securities may be associated with greater risk.

The market's response to purchases and sale transactions also differs for companies in financial distress. If a firm's interest coverage ratio is below one, positive purchasing signals are met with caution, and abnormal returns are smaller than otherwise. Sales, on the other hand, convey an additional negative signal for a company already in jeopardy. Accordingly, prices react more extremely, and absolute abnormal returns are higher. However, only the results for $CAR(0;10)$ of the sales samples are statistically significant.

It should generally be noted that the results of the cross-sectional regression analysis do not materially change if returns calculated under a JGLS approach are used as a dependent variable (see Appendix B, Table B.3).

⁶⁷Klinge et al. (2005) finds similar results for the German market.

6.7.4 Application of Arbitrage Trading Strategy

The cross-sectional regression analysis confirms the existence of a statistically significant relationship between arbitrage risk and abnormal returns following directors' dealings. On the basis of this result, however, it cannot be decided whether signals conveyed by insider trades can be exploited by outside investors. Therefore, this section further investigates the relevance of arbitrage risk by constructing a straightforward arbitrage trading strategy based on directors' dealings. By comparing the returns to the trading strategy depending on the underlying level of idiosyncratic risk and by adjusting for transaction costs, conclusions can be drawn regarding the impact of arbitrage risk on arbitrage opportunities.

First, a zero-investment arbitrage trading strategy is designed as follows: insider purchases (sales) are mimicked by taking a long (short) position in the company's stock on the day of the announcement. To hedge the associated market risk of the stock investment, an opposite position in the CDAX index is taken.⁶⁸ After twenty trading days, both positions are liquidated.⁶⁹

Average returns to the trading strategy are calculated using dividend adjusted closing prices, and actual bid-ask quotations are employed in order to account for transaction costs.⁷⁰ It should be noted that several thinly-traded stocks exhibit extremely large bid-ask spreads. For the sake of making the analysis as conservative as possible, all trades with a bid-ask spread of 10% or more on the announcement day are excluded, as a sophisticated investor would probably not invest in such stocks.

In a first step, all trades are weighted equally. In addition to total returns, average returns to the stock investment and the hedging position are reported separately. Results based on the whole research period from July, 1, 2002 to October, 31, 2007 are outlined in Table 6.9. Disregarding transaction costs, i.e. calculating the returns on the basis of closing prices, the arbitrage trading strategy yields a significant positive return in 11 out of the 15 trading strategies taken into consideration. Moreover, the return difference between the highest arbitrage risk quintile and the lowest arbitrage risk quintile is also significant at a 5%-level, at least. More specifically, for the pooled sample, the return difference is 2.41% (significant at the 1%-level), while for the sample of purchases, the return difference even increases to 3.20% (significant at the 1%-level). For the sample of sales, however, the return difference is only 1.64% (significant at the 5%-level). These observations confirm the previous finding that highly idiosyncratic stocks are associated with larger post-event returns (hypothesis 6.1.2.1).

By taking the bid-ask spreads into account, however, results change substantially. None of the 15 trading strategies generates a significant return anymore. Moreover, the return difference between the highest arbitrage risk quintile and the lowest arbitrage risk quintile is also no longer significant, and in two out of three cases, not even positive. This finding is consistent with the notion that idiosyncratic risk makes trading in a stock more costly. Although clear-cut proof of the link between the level of idiosyncratic risk and the bid-ask spread is beyond the scope of this study, the results show that no excess profits are obtainable from an arbitrage trading strategy based on reported insider trades (hypothesis 6.1.4.3). This, however, does not mean that information about insider trades is valueless for all investors. For instance, long-term investors, such as mutual funds, may use this information for the timing of their investment decisions. In this case, transaction costs are almost irrelevant, as these investors would invest their funds on the stock market anyway.

It may be interesting to see whether these results are stable over time. For that purpose, the observation

⁶⁸Since the CDAX is a broad index covering all German shares admitted to the Prime and General Standard, there are no investment instruments, and thus no shorting instruments, available to the general public yet. Thus, this can be regarded as a conservative setting for testing arbitrage opportunities.

⁶⁹Results are not significantly altered, if instead of a 20-day trading period a 40-day period would be used.

⁷⁰The bid-ask spread is only one element of direct transaction costs, which also include brokerage commissions and additional costs for short-selling. By omitting these additional costs, the analysis can be considered to be more conservative.

Table 6.8: Cross-sectional Regression Analysis Results

Dependent Variable	CAR(0;10)			CAR(0;20)		
	Pooled	Purchases	Sales	Pooled	Purchases	Sales
Constant	0.026***	0.053***	-0.009	0.053***	0.103***	-0.010
<i>t-statistic</i>	2.69	3.95	-0.69	3.97	5.65	-0.54
Holding Cost Variables						
IRISKLOG	0.011***	0.008**	0.013***	0.017***	0.013***	0.019***
<i>t-statistic</i>	4.65	2.55	3.64	5.33	2.89	3.97
SYRSKLOG	0.001	0.003***	0.000	0.003**	0.006***	-0.001
<i>t-statistic</i>	1.84	2.81	-0.29	2.41	4.15	-0.87
RF	-0.134	-0.278	0.157	-0.610**	-1.071***	0.198
<i>t-statistic</i>	-0.71	-1.07	0.56	-2.33	-3.02	0.51
Transaction Cost Variables						
SPRICE	0.000	0.000	0.000	0.000	0.000	0.000
<i>t-statistic</i>	0.71	0.51	0.12	0.68	0.61	-0.02
VOLUME	0.000	0.000	0.000	0.000	0.000**	0.000
<i>t-statistic</i>	0.60	1.27	-0.19	1.41	2.27	0.13
Trade-Specific Variables						
INSALE	0.000	-	-	0.003	-	-
<i>t-statistic</i>	-0.09	-	-	0.77	-	-
TRADSZ	-0.037	0.168**	-0.085**	-0.100**	0.158	-0.159***
<i>t-statistic</i>	-1.12	2.17	-2.43	-2.19	1.49	-3.30
DELAY	-0.001	0.000	-0.001**	-0.001**	0.000	-0.002***
<i>t-statistic</i>	-1.47	-0.15	-2.31	-1.99	-0.28	-3.09
PASTRET	-0.067***	-0.065***	-0.075***	-0.128***	-0.123***	-0.148***
<i>t-statistic</i>	-10.60	-6.90	-8.30	-14.73	-9.51	-11.91
Insider-Specific Variables						
POSEB	0.005	-0.002	0.012**	0.011*	0.007	0.016*
<i>t-statistic</i>	1.12	-0.25	2.03	1.74	0.80	1.91
POSSB	0.000	-0.001	0.002	0.007	0.018*	0.000
<i>t-statistic</i>	-0.04	-0.11	0.28	1.05	1.79	0.03
POSMNG	0.010	0.026	0.009	0.003	0.043	-0.005
<i>t-statistic</i>	0.92	1.29	0.76	0.19	1.58	-0.28
Company-Specific Variables						
MVLOG	-0.001	-0.004**	0.002	-0.002	-0.008**	0.003
<i>t-statistic</i>	-0.73	-2.17	1.17	-1.24	-3.15	1.20
MTBV	-0.002***	-0.004***	0.001	-0.004***	-0.009***	0.003*
<i>t-statistic</i>	-2.74	-4.36	1.05	-4.26	-7.03	1.80
DISTR	0.004	0.000	0.012*	0.001	-0.011	0.024**
<i>t-statistic</i>	0.86	-0.07	1.72	0.21	-1.26	2.47
Adjusted R^2	4.05%	3.85%	5.98%	7.19%	7.18%	10.68%
Average VIF	1.68	1.72	1.80	1.68	1.72	1.80
Maximum VIF	4.06	3.80	4.61	4.06	3.80	4.61
No. of Observations	4,796	2,611	2,185	4,796	2,611	2,185

The table presents results for the cross-sectional regressions with CAR(0;10) and CAR(0;20) as dependent variables. Definitions of the regressors, which include holding cost, transaction cost, and trade-, insider-, and company-specific variables, can be found in Table 6.3. The pooled sample consists of all transactions, whereby the CARs on sales are multiplied by -1. CARs of insider sales are multiplied by minus one. VIF stands for variance inflation factor. ***, **, and * denote significance at the 1%, 5%, and 10% level respectively.

period is split in two parts, such that the number of observations is almost equal in both sub-periods. Results are reported in Tables 6.10 and 6.11. By and large, it could be said that results do not change to a large extent. However, there is one important insight that should be emphasized. It appears that the profitability of the zero-investment trading strategy has decreased over time. Based on closing prices, 10 out of 15 trading strategies are profitable in the first sub-period, while in the second, this ratio goes down to 5 out of 15. Also, the return difference between the highest arbitrage risk quintile and the lowest arbitrage risk quintile is notably larger in the first subperiod compared to the second subperiod, at least for the trading strategies based on all trades and on purchases. This is also true, if trading strategy returns taking bid/ask spreads into account are considered. By taking transaction costs into account, profitability in most cases is not significant anymore, although it should be said that in the first sub-period, 4 out of 15 strategies generate significant positive returns, and the return difference for purchases between the highest arbitrage risk quintile and the lowest arbitrage risk quintile is equal to 2.40% and significant at the 5%-level. In the second sub-period, however, only 2 out of 15 trading strategies are profitable. To sum up, these findings give some indications that the profitability of trading strategies based on the announcement of insider transactions has decreased over time, probably because some institutional investors have become active in this field over the last years. However, it is important to note that even in the first sub-period, the results clearly show that, at least for sales, no profitable trading strategy could be implemented once transaction costs are taken into account.

In a second step, the results of value-weighted trade portfolios are examined. At first glance, one could argue that high arbitrage risk firms might tend to have lower market capitalization. If this is the case, the results reported above would clearly indicate that the profitability of such a value-weighted trading strategy should be smaller than that of an equally-weighted strategy. However, as reported in Table 6.5, there is only a small negative correlation between a firm's idiosyncratic risk (as a proxy for arbitrage risk) and its market capitalization. Hence, looking at the returns of a value-weighted investment strategy could generate additional insights. Results are reported in Table 6.12. Interestingly, looking at returns calculated on the basis of closing prices, the return difference between the highest arbitrage risk quintile and the lowest arbitrage risk quintile is almost unchanged with respect to the equally-weighted investment strategy, although the significance level is lower in all three cases (5% to 10%). Nevertheless, looking at the single investment strategies for the different arbitrage risk quintiles reveals that profitability in this case disappears even if transactions costs are neglected. In fact, only 3 out of 15 investment strategies generate a significant positive return. Therefore, it is not surprising that once transaction costs are taken into account, profitability almost totally disappears (only 1 out of 15 strategies generates a positive return significant at the 10%-level).

Table 6.9: Average Returns to Arbitrage Trading Strategies: Sample Period 01-Jul-2002 – 31-Oct-2007

	Closing Prices			Bid-Ask Prices			Observations
	Return on Stock	Return on Hedge	Total Return	Return on Stock	Return on Hedge	Total Return	
All Trades							
Arbitrage Risk Q1 (Low)	0.31%	0.08%	0.39%**	-0.23%	0.08%	-0.14%	881
Arbitrage Risk Q2	1.03%***	-0.31%	0.72%***	-0.02%	-0.31%	-0.33%	881
Arbitrage Risk Q3	0.61%*	-0.39%	0.22%	-0.58%	-0.39%	-0.96%	881
Arbitrage Risk Q4	1.79%***	-0.12%	1.67%***	0.18%	-0.12%	0.06%	881
Arbitrage Risk Q5 (High)	2.15%***	0.26%	2.41%***	-0.35%	0.26%	-0.09%	881
Difference Q5 – Q1	1.84%***	0.18%	2.02%***	-0.13%	0.18%	0.05%	
Purchases							
Arbitrage Risk Q1 (Low)	2.43%***	-1.46%	0.97%***	1.57%***	-1.46%	0.11%	469
Arbitrage Risk Q2	2.44%***	-1.36%	1.08%***	1.15%***	-1.36%	-0.21%	469
Arbitrage Risk Q3	2.78%***	-2.08%	0.70%*	1.21%***	-2.08%	-0.87%	469
Arbitrage Risk Q4	2.87%***	-1.65%	1.23%***	1.06%*	-1.65%	-0.58%	469
Arbitrage Risk Q5 (High)	3.46%***	-0.25%	3.20%***	0.73%	-0.25%	0.47%	469
Difference Q5 – Q1	1.02%	1.21%***	2.24%***	-0.85%	1.21%***	0.36%	
Sales							
Arbitrage Risk Q1 (Low)	-1.68%	1.71%***	0.03%	-1.91%	1.71%***	-0.20%	412
Arbitrage Risk Q2	-0.96%	1.18%***	0.21%	-1.64%	1.18%***	-0.46%	412
Arbitrage Risk Q3	-1.76%	1.39%***	-0.38%	-2.57%	1.39%***	-1.18%	412
Arbitrage Risk Q4	0.26%	1.74%***	2.00%***	-1.16%	1.74%***	0.58%	412
Arbitrage Risk Q5 (High)	0.99%	0.64%***	1.64%***	-1.22%	0.64%***	-0.58%	412
Difference Q5 – Q1	2.67%***	-1.07%	1.60%***	0.69%	-1.07%	-0.38%	

The table gives average returns to zero-investment trading strategies. Stocks are ordered according to their idiosyncratic risk (as a proxy for arbitrage risk). Results are presented using either dividend adjusted closing prices or actual bid-ask prices. No other transaction costs are taken into account. The trading strategy in every arbitrage risk quintile is defined as follows: insider purchases (sales) are mimicked by taking a long (short) position in the company's stock on the day of the announcement. The fundamental risk associated with the investment is hedged with an opposite position in the CDAX index. Trades associated with a bid-ask spread of 10% or more on the day of the announcement are disregarded. After twenty trading days, both positions are liquidated. All trades are equally-weighted. Whether the return difference between the highest arbitrage risk quintile and the lowest arbitrage risk quintile is larger than zero is tested by a one-sided test of difference in means. The average return of single quintile trading strategies is tested by a one-sided t-test. ***, **, * and * denote significance at the 1%, 5%, and 10% levels, respectively.

Table 6.10: Average Returns to Arbitrage Trading Strategies: Sample Period 01-Jul-2002 – 09-Dec-2005

	Closing Prices			Bid-Ask Prices			Observations
	Return on Stock	Return on Hedge	Total Return	Return on Stock	Return on Hedge	Total Return	
All Trades							
Arbitrage Risk Q1 (Low)	1.00%***	-0.02%	0.99%***	0.26%	-0.02%	0.25%	444
Arbitrage Risk Q2	0.27%	-0.06%	0.21%	-0.90%	-0.06%	-0.96%	444
Arbitrage Risk Q3	1.14%**	-0.16%	0.98%**	-0.09%	-0.16%	-0.25%	444
Arbitrage Risk Q4	1.20%*	0.64%***	1.84%***	-0.70%	0.64%***	-0.06%	444
Arbitrage Risk Q5 (High)	3.82%***	0.28%	4.10%***	0.93%	0.28%	1.20%**	444
Difference Q5 – Q1	2.82%***	0.29%	3.11%***	0.67%	0.29%	0.96%	
Purchases							
Arbitrage Risk Q1 (Low)	3.89%***	-1.63%	2.26%***	2.79%***	-1.63%	1.16%**	209
Arbitrage Risk Q2	1.89%***	-1.75%	0.14%	0.43%	-1.75%	-1.32%	209
Arbitrage Risk Q3	5.13%***	-2.03%	3.10%***	3.73%***	-2.03%	1.70%**	209
Arbitrage Risk Q4	2.67%***	-0.30%	2.37%***	0.59%	-0.30%	0.28%	209
Arbitrage Risk Q5 (High)	6.65%***	0.30%	6.95%***	3.25%***	0.30%	3.55%***	209
Difference Q5 – Q1	2.76%***	1.93%***	4.69%***	0.46%	1.93%***	2.40%***	
Sales							
Arbitrage Risk Q1 (Low)	-1.70%	1.57%***	-0.14%	-2.13%	1.57%***	-0.56%	235
Arbitrage Risk Q2	-1.03%	1.41%***	0.38%	-1.96%	1.41%***	-0.55%	235
Arbitrage Risk Q3	-3.40%	1.54%***	-1.86%	-4.51%	1.54%***	-2.97%	235
Arbitrage Risk Q4	0.23%	1.48%***	1.72%**	-1.47%	1.48%***	0.01%	235
Arbitrage Risk Q5 (High)	1.65%	0.18%	1.83%**	-0.81%	0.18%	-0.63%	235
Difference Q5 – Q1	3.36%***	-1.39%	1.97%*	1.32%	-1.39%	-0.07%	

The table gives average returns to zero-investment trading strategies. Stocks are ordered according to their idiosyncratic risk (as a proxy for arbitrage risk). Results are presented using either dividend adjusted closing prices or actual bid-ask prices. No other transaction costs are taken into account. The trading strategy in every arbitrage risk quintile is defined as follows: insider purchases (sales) are mimicked by taking a long (short) position in the company's stock on the day of the announcement. The fundamental risk associated with the investment is hedged with an opposite position in the CDAX index. Trades associated with a bid-ask spread of 10% or more on the day of the announcement are disregarded. After twenty trading days, both positions are liquidated. All trades are equally-weighted. Whether the return difference between the highest arbitrage risk quintile and the lowest arbitrage risk quintile is larger than zero is tested by a one-sided test of difference in means. The average return of single quintile trading strategies is tested by a one-sided t-test. ***, **, * and * denote statistical significance at the 1%, 5%, and 10% levels respectively.

Table 6.11: Average Returns to Arbitrage Trading Strategies: Sample Period 10-Dec-2005 – 31-Oct-2007

	Closing Prices			Bid-Ask Prices			Observations
	Return on Stock	Return on Hedge	Total Return	Return on Stock	Return on Hedge	Total Return	
All Trades							
Arbitrage Risk Q1 (Low)	-0.18%	0.37%**	0.19%	-0.48%	0.37%**	-0.11%	437
Arbitrage Risk Q2	1.72%***	-0.74%	0.98%***	0.65%	-0.74%	-0.09%	437
Arbitrage Risk Q3	0.67%*	-0.22%	0.45%	-0.28%	-0.22%	-0.50%	437
Arbitrage Risk Q4	0.86%*	-0.36%	0.50%	-0.77%	-0.36%	-1.13%	437
Arbitrage Risk Q5 (High)	1.27%**	-0.70%	0.58%	-0.57%	-0.70%	-1.27%	437
Difference Q5 – Q1	1.45%***	-1.07%	0.38%	-0.09%	-1.07%	-1.15%	
Purchases							
Arbitrage Risk Q1 (Low)	0.89%**	-1.08%	-0.19%	0.35%	-1.08%	-0.73%	256
Arbitrage Risk Q2	3.40%***	-1.51%	1.89%***	1.98%***	-1.51%	0.47%	256
Arbitrage Risk Q3	2.19%***	-1.40%	0.78%*	0.80%	-1.40%	-0.61%	256
Arbitrage Risk Q4	1.53%***	-1.91%	-0.38%	-0.47%	-1.91%	-2.38%	256
Arbitrage Risk Q5 (High)	0.76%	-1.99%	-1.23%	-1.23%	-1.99%	-3.22%	256
Difference Q5 – Q1	-0.14%	-0.91%	-1.04%	-1.58%	-0.91%	-2.49%	
Sales							
Arbitrage Risk Q1 (Low)	-0.75%	1.79%***	1.04%***	-0.83%	1.79%***	0.96%**	177
Arbitrage Risk Q2	-0.97%	0.64%***	-0.33%	-1.45%	0.64%***	-0.81%	177
Arbitrage Risk Q3	-1.65%	1.40%***	-0.25%	-1.98%	1.40%***	-0.58%	177
Arbitrage Risk Q4	-0.56%	2.25%***	1.69%**	-1.69%	2.25%***	0.56%	177
Arbitrage Risk Q5 (High)	2.43%**	1.13%***	3.56%***	0.80%	1.13%***	1.93%**	177
Difference Q5 – Q1	3.18%***	-0.66%	2.51%**	1.63%*	-0.66%	0.97%	

The table gives average returns to zero-investment trading strategies. Stocks are ordered according to their idiosyncratic risk (as a proxy for arbitrage risk). Results are presented using either dividend adjusted closing prices or actual bid-ask prices. No other transaction costs are taken into account. The trading strategy in every arbitrage risk quintile is defined as follows: insider purchases (sales) are mimicked by taking a long (short) position in the company's stock on the day of the announcement. The fundamental risk associated with the investment is hedged with an opposite position in the CDAX index. Trades associated with a bid-ask spread of 10% or more on the day of the announcement are disregarded. After twenty trading days, both positions are liquidated. All trades are equally-weighted. Whether the return difference between the highest arbitrage risk quintile and the lowest arbitrage risk quintile is larger than zero is tested by a one-sided test of difference in means. The average return of single quintile trading strategies is tested by a one-sided t-test. ***, **, * and * denote statistical significance at the 1%, 5%, and 10% levels respectively.

Table 6.12: Average Market Weighted Returns to Arbitrage Trading Strategies: Sample Period 01-Jul-2002 – 31-Oct-2007

	Closing Prices			Bid-Ask Prices			Observations
	Return on Stock	Return on Hedge	Total Return	Return on Stock	Return on Hedge	Total Return	
All Trades							
Arbitrage Risk Q1 (Low)	-0.18%	0.30%	0.12%	-0.40%	0.30%	-0.10%	881
Arbitrage Risk Q2	1.03%	-1.17%	-0.15%	0.67%	-1.17%	-0.51%	881
Arbitrage Risk Q3	2.54%**	-1.60%	0.94%	1.91%***	-1.60%	0.31%	881
Arbitrage Risk Q4	-3.53%	2.23%**	-1.30%	-3.83%	2.23%**	-1.60%	881
Arbitrage Risk Q5 (High)	2.32%**	0.09%	2.40%***	0.83%	0.09%	0.91%	881
Difference Q5 – Q1	2.50%***	-0.22%	2.29%**	1.23%	-0.22%	1.01%	
Purchases							
Arbitrage Risk Q1 (Low)	2.15%***	-1.68%	0.46%	1.59%***	-1.68%	-0.09%	469
Arbitrage Risk Q2	3.22%**	-2.36%	0.85%	2.78%*	-2.36%	0.41%	469
Arbitrage Risk Q3	5.98%***	-3.47%	2.52%**	5.21%***	-3.47%	1.74%*	469
Arbitrage Risk Q4	-2.99%	1.77%	-1.23%	-3.29%	1.77%	-1.52%	469
Arbitrage Risk Q5 (High)	3.60%**	-0.17%	3.44%**	1.92%	-0.17%	1.76%	469
Difference Q5 – Q1	1.45%	1.52%**	2.97%*	0.33%	1.52%**	1.85%	
Sales							
Arbitrage Risk Q1 (Low)	-1.83%	1.72%***	-0.10%	-1.80%	1.72%***	-0.08%	412
Arbitrage Risk Q2	-2.07%	0.40%	-1.67%	-2.35%	0.40%	-1.94%	412
Arbitrage Risk Q3	-2.85%	1.53%**	-1.33%	-3.19%	1.53%**	-1.66%	412
Arbitrage Risk Q4	-3.91%	2.61%***	-1.30%	-4.22%	2.61%***	-1.61%	412
Arbitrage Risk Q5 (High)	1.52%	-0.02%	1.50%	0.09%	-0.02%	0.06%	412
Difference Q5 – Q1	3.34%***	-1.75%	1.60%*	1.89%	-1.75%	0.14%	

The table gives average returns to zero-investment trading strategies. Stocks are ordered according to their idiosyncratic risk (as a proxy for arbitrage risk). Results are presented using either dividend adjusted closing prices or actual bid-ask prices. No other transaction costs are taken into account. The trading strategy in every arbitrage risk quintile is defined as follows: insider purchases (sales) are mimicked by taking a long (short) position in the company's stock on the day of the announcement. The fundamental risk associated with the investment is hedged with an opposite position in the CDAX index. Trades associated with a bid-ask spread of 10% or more on the day of the announcement are disregarded. After twenty trading days, both positions are liquidated. All trades are weighted according to the market capitalization of the respective firm on the announcement day. Whether the return difference between the highest arbitrage risk quintile and the lowest arbitrage risk quintile is larger than zero is tested by a one-sided test of difference in means. The average return of single quintile trading strategies is tested by a one-sided t-test. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels respectively.

6.8 Conclusion and Implications

This chapter addresses the question of whether outside investors can profit from reported insider transactions in the German market, since previous studies find large abnormal returns after published directors' dealings. Any trading strategy based upon publicly-available information and yielding excess returns would, however, constitute a serious violation of the efficient market hypothesis. It is argued that observed post-event price effects in the context of director's dealings do not constitute evidence against the efficient market hypothesis, at least according to the definition put forward by Jensen (1978). In fact, it is shown that this effect is not exploitable within a zero-investment trading strategy due to arbitrage risk. Specifically, it is hypothesized that large abnormal returns cluster in highly idiosyncratic stocks that are associated with considerable arbitrage risk, prohibiting outsiders to take advantage of the slow price adjustment.

While the event study analysis reiterated the existence of large abnormal returns in the range of 1.46% to 3.12% after the announcement of insider transactions, the arbitrage risk portfolio analysis demonstrates that highly idiosyncratic stocks yield significantly larger post-event abnormal returns than stocks associated with low arbitrage risk. In fact, the return difference between the quintiles with highest and lowest idiosyncratic risk is in the range of 2.99% to 4.90 and highly significant. In addition, the speed of price adjustment proves to be much faster if arbitrage risk is low.

The robustness of this positive relationship between abnormal returns and arbitrage risk is verified in the cross-sectional analysis that controls for other factors potentially influencing excess returns. It is identified that very few other factors besides arbitrage risk, such as systematic risk, past returns, and the market-to-book ratio, have a significant impact on excess returns.

The implementation of a zero-investment trading strategy based on the announcement of directors' dealings also shows that outsiders will hardly be able to profit from reported insider transactions. It turns out that such a trading strategy, in most cases, generates significant positive returns as long as transaction costs are neglected. These returns, again, are highest for the stocks with highest arbitrage risk. In fact, the investment strategy in the highest arbitrage risk quintile generates a significant outperformance of 2.41% of the assumed long position for all trade types. However, the outperformance totally disappears in all risk quintiles, if bid-ask spreads are taken into account. Finally, some weak evidence that the profitability of such a zero-investment trading strategy has decreased over time is presented.

These results are consistent with the notion that highly idiosyncratic stocks are difficult to hedge, impeding arbitrageurs from engaging in price-correcting trades. This causes a slow price discovery and large post-event excess returns. While arbitrage risk certainly does not eliminate all arbitrage trading, the costs stemming from arbitrage risk reduce the threshold of economic feasibility and thus the quantity and intensity of such trades.

The implications for academia are twofold. First, a further examination of the role of arbitrage risk in alleged market inefficiencies appears to be promising. While several anomalies have been researched in this regard, others have not been studied yet, most notably the firm size effect.⁷¹ In addition, future research on directors' dealings in the German market ought to include bid-ask spreads in order to avoid biased results and the drawing of false conclusions.

The implications for practice are mainly that investors should rely only with caution on directors' dealings as an investment tool. The most profitable trading and investment opportunities may be more apparent than real, as profits are diminished by arbitrage risk and large bid-ask spreads. Nevertheless, this study cannot discard the notion that all trading strategies based on directors' dealings are flawed.

⁷¹See section 4.2.2.1 for a discussion of the firm size effect.

Most certainly, however, these should prove extremely difficult to find. Evidence of this is provided by investment trust certificates for the German market, which have performed poorly so far.⁷²

In summary, this study provides evidence that the German stock market is efficient in the sense that prices reflect publicly-available information to the point where the marginal benefit of acting on information exceeds marginal costs (Jensen (1978)).

⁷²Investment trust certificates have been issued by Commerzbank and Deutsche Bank.

Chapter 7

Conclusion and Implications

7.1 Conclusion

This dissertation focused on two distinct aspects of directors' dealings: their timing and occurrence around news announcements, and their relevance with regards to outside investors and market efficiency.

Although the results are partly ambiguous, one of the primary insights gained from the empirical examination of *directors' dealings in the proximity of news disclosures* is that insiders do trade strategically around ad-hoc announcements. Informed insider trading, i.e., purchasing (selling) prior to positive (negative), is only reduced prior to highly price sensitive news announcements, which draw increased scrutiny from the regulator and the public. If the German insider trading regime and its enforcement were a sufficient deterrent, informed pre-announcement directors' dealings should be reduced regardless of price impact of news disclosures. The results show that front-running of news announcements is mainly observable in terms of the *magnitude* of trading, yet not in terms of its *occurrence*. Besides actively trading prior to news disclosure, insiders also reduce uninformed pre-announcement trading, i.e., insiders sell (buy) less prior to good (bad) news events. Consequently, these transactions are delayed and executed immediately after ad-hoc announcements, when litigation and reputational risks are low.

The study of the role of *arbitrage risk* in the context of abnormal returns following reported directors' dealings yields important conclusions regarding the *efficiency of the German stock market*. Previous studies suggest that outside investors can profit from reported insider transactions by engaging in mimicking strategies, which would constitute a serious violation of the efficient markets paradigm.¹ Although the directors' dealings sample employed in chapter 6 also exhibits large post-event abnormal returns in the range of 1.46% to 3.12%, it is demonstrated that the slow price adjustment is not exploitable by a zero-investment trading strategy due to *arbitrage risk*. Specifically, the results show that large excess returns cluster in stocks that are associated with considerable arbitrage risk, prohibiting outsiders to take advantage of the apparent inefficiency. This is largely due to the finding that highly idiosyncratic stocks are associated with large bid-ask spreads, which diminish excess returns. These observations lead to the main conclusion that the German stock market, with regards to directors' dealings, is efficient according to the definition put forward by Jensen (1978):

“A market is efficient with respect to information set Θ_t , if it is impossible to make economic profits by trading on the basis of information set Θ_t ”.

¹See, for example, Betzer and Theissen (2009), Klinge et al. (2005), and Stotz (2006).

where “economic profits” are defined as risk-adjusted returns net of all costs, such as transaction costs.²

7.2 Implications

Future theoretical as well empirical research should benefit from the findings presented in this dissertation. The following section discusses the study’s implications for the two empirical studies conducted separately.

7.2.1 Directors’ Dealings around News Announcements

7.2.1.1 Implications for Research and Theory

Although the analysis of directors’ dealings around corporate news events can only be considered as a first step in examining the trading behavior of German insiders around ad-hoc announcements, it does lead to several important implications for research and theory.

First of all, a further study of *passive trading strategies* appears to be promising. Similar to other stock markets, insiders in Germany avoid litigation and reputational risks by increasing their trading activity immediately following transactions. The nature of post-announcement transaction does, however, deserve further examination. Since observed uninformed pre-announcement trading, i.e., purchasing prior to bad news and selling prior to good news, decreases, the increase in post-announcement trading appears to be evidence of passive trading, i.e., the strategic delaying of transactions on the basis of private information regarding upcoming news events. Alternatively, however, insiders may view the excess returns resulting from news events as an opportunity to engage in contrarian transactions, i.e. buying (selling) stock of their own company after a series of negative (positive) abnormal returns, which may not necessarily be related to the strategic delaying of transactions. To study this relationship, a further examination of excess returns caused by news events and the following trading activity and associated insider profits is warranted.

Secondly, passive trading by insiders impedes a fair and orderly functioning of capital markets, since it puts one group of investors, in this case insiders, at an advantage compared to other investors.³ One potential solution may be the introduction of *post-announcement trading bans*. In effect, insiders would not be allowed to engage in transactions for a certain period of time after ad-hoc announcements or earnings releases. However, whether such black-out periods would lead to opportunity costs for insiders remains open to future research. In addition, the profitability of post-announcement insider trades has yet to be examined for the German stock market. Although such measures could potentially increase equality between outside investors and insiders, it could impede market efficiency because valuable directors’ dealings signals are lost. Whether the benefits of increased equality outweigh the costs stemming from a reduced price efficiency would also have to be analyzed.

Another avenue for further research concerns the studied *data set*. While data regarding revealed illegal insider trading is scarce and difficult to obtain, the sample could easily be extended to include transactions in options and derivatives.⁴ Given their more complex nature, insiders could strive to conceal trades that are motivated by non-public information by investing in such financial instruments,

²See Jensen (1978), p. 96.

³Cf. Bettis et al. (1998).

⁴Meulbroek (1992) is one of the few studies that examines illegal insider trading, which has been prosecuted by the SEC, the U.S. regulator.

instead of conducting straight forward equity trades.⁵ Since corporate insiders are required to report their transactions in derivatives in Germany as well as many other jurisdictions, this data should be easily obtainable.

7.2.1.2 Implications For Practice

The empirical analysis of insider trading around ad-hoc announcements also has several important implications for *investors* and, in particular, for the *regulator* charged with prosecuting illegal insider trading.

Most importantly, German laws and regulations do not prevent *informed pre-announcement insider trading*. Although only about 5% of ad-hoc announcements are preceded by directors' dealings, the observed level of pre-announcement trading activity, especially in the week immediately preceding news events, is worrisome. If the insider trading regime as well as its enforcement would serve as a sufficient deterrent, pre-announcement trading activity should arguably be much lower. A caveat to the results presented in chapter 5 is that ad-hoc announcements are designed to increase market efficiency by disclosing private information to the general public without delay. Therefore, some insiders may engage in pre-announcement trading without having knowledge of impending ad-hoc releases. However, trading activity does not appear to be random prior to news announcements.

Considering that the regulator charged with combating illegal insider trading, the *BaFin*, only initiated between 60 and 77 new investigation p.a. between 2006 and 2008, corporate insiders may feel that the risk of litigation is relatively negligible.⁶ This hypothesis is also reinforced by the findings of Betzer and Theissen (2009) and Dymke and Walter (2008), who show that insiders earn larger abnormal return when trading prior to earnings and ad-hoc announcements, respectively. As a result, BaFin should increase its enforcement activities as well as the legal sanctions at its disposal in order to ensure pre-announcement trading by insiders is not attributable to the exploitation of private information. Given that resources at BaFin, at as at any other regulator, are constrained, an increased focus on high-profile and highly publicized cases, as for example the case of Martha Stewart in the U.S., may serve as an effective strategy in order to ensure the integrity and transparency of the German capital market. Alternatively, a case could be made for the introduction pre-announcement insider trading bans, such as those existing in the U.K.⁷ However, given that ad-hoc announcements are unscheduled, as opposed to scheduled event such as earnings releases, trading bans for ad-hoc disclosures in general do not appear to be feasible.

Even if illegal front-running of news events could be effectively prohibited, insiders could still exploit their informational advantage by delaying their transactions until after news disclosures. Evidence of such *passive trading* is present in the empirical analysis conducted as part of this dissertation. At the moment, such trading may entail reputational risk, but little or no legal risk. As mentioned in section 7.2.1.1, the introduction of post-announcement trading-bans, could potentially increase equality among market participants.

While it is convenient to blame the regulator for failing to detect potentially abusive behavior by insiders, responsibility also lies with the companies themselves. Companies have to take precautions to deter illegal trading by employees. In other jurisdictions, privately imposed trading bans around scheduled announcements appear to be more wide-spread than in Germany.⁸

⁵The studies of Aboody et al. (2008) and Carpenter and Remmers (2001) study whether the *exercise* of stock options is based on private information.

⁶See Bundesanstalt für Finanzdienstleistungsaufsicht (2009), p. 161. New investigation initiated: 2006: 60, 2007: 61, 2008: 77. Discontinued cases: 2006: 30, 2007: 41, 2008: 42.

⁷Cf. Hillier and Marshall (2002).

⁸Cf. Bettis et al. (1998) and Beny (2005).

7.2.2 Directors' Dealings and Market Efficiency

7.2.2.1 Implications For Research and Theory

The study of arbitrage risk in the context of excess returns observed after the publication of directors' dealings announcements leads to four important implications for academia.

First, future research on directors' dealings in German stock market, but also elsewhere, ought to account for *transaction costs*. The analysis shows that the implementation of a zero-investment trading strategy based on reported directors' dealings in most cases leads to positive abnormal returns, but only if transaction costs are neglected. Taking bid-ask spreads into account, the outperformance disappears completely. Failing to take the bid-ask spread as well as other transaction costs into account may easily lead to biased results and misleading conclusions.

Second, a further examination of the role of *arbitrage risk* in alleged market inefficiencies appears to be promising. Several market inefficiency have already been examined in the context of arbitrage risk, such as the index inclusion effect (Wurgler and Zhuravskaya 2002), the accrual anomaly (Mashruwala et al. 2006), and the book-to-market anomaly (Ali et al. 2003). Others, however, have yet to be studied in relation to arbitrage risk, with the firm size effect being a prominent example.

Third, the attributes of arbitrage risk, and *idiosyncratic risk* in particular, should be the subject of further research. While many authors, such as Shleifer and Vishny (1997) and (Mendenhall 2004), argue that idiosyncratic risk matters because arbitrageurs do not have a sufficiently large number of projects available to them and are thus not diversified.⁹ Pontiff (2006), on the other hand, argues that the portfolio weight of a security associated with idiosyncratic risk is independent of the number of projects available to the arbitrageur, which implies that idiosyncratic risk cannot be diversified.¹⁰ Since no consensus has been established in this regard, it is left to further empirical as well as theoretical research to determine whether arbitrage risk stemming from idiosyncratic volatility is indeed not diversifiable or hedgeable.

Fourth, the relationship between *bid-ask spreads* and idiosyncratic risk should be explored in more detail. The results show that idiosyncratic risk makes arbitrage costly and manifests itself in the form of increased bid-ask spreads. A deeper understanding of this relationship would be valuable. Potentially, idiosyncratic risk represents an underlying component of the bid-ask spread. Alternatively, however, arbitrage risk merely acts as proxy for another component of the bid-ask spread, such as inventory holding costs incurred by liquidity suppliers, such as designated sponsors on the Xetra trading platform.¹¹

7.2.2.2 Implications for Practice

For practice, the most important implication that can be drawn from the analysis conducted in chapter 6 is that investors should rely with caution on directors' dealings as an investment tool.

The most profitable opportunities cluster in stocks that are associated with large arbitrage risk and bid-ask spreads. As a result, excess returns are diminished and become insignificant. In particular, returns for the tested zero-investment trading strategy are not significantly different from zero. Thus, investors cannot, on average, earn abnormal returns by purchasing (shorting) stocks that are bought (sold) by insiders, while at the same time taking an opposite position in a close substitute or a market index to hedge themselves.

That reported insider transactions are often a less effective tool for investors than often suggested is

⁹See Shleifer and Vishny (1997), p.51, and Mendenhall (2004), p. 876.

¹⁰See Pontiff (2006), pp. 43–45.

¹¹See, for example, Ho and Stoll (1983).

also reflected in the performance of German directors' dealings investment certificates.¹² Although the particular investment strategies differ, they are all based on directors' dealings signals in one way or another and focus on a specific market segment. The performance of such investment certificates has not been stellar and in many cases these securities have underperformed their respective benchmark indices.

Nevertheless, this study cannot discard the notion that all trading strategies based on directors' dealings are awed. Most certainly, however, these should prove extremely difficult to find. This result supports the above mentioned notion of *market efficiency* by Jensen (1978).

¹²In Germany, Commerzbank, Credit Suisse, Deutsche Bank, and Deutsche Börse have issued insider investment trust certificates.

Appendices

Appendix A

Additional Results Related to Chapter 5

Table A.1: Pre-announcement Trading – Positive Announcements ($CAR(0;1) > 0\%$) – Adjusted for Event Clustering

Period	Purchases				Sales			
	Value of Shares Traded	Number of Shares Traded	Number of Insiders Trading	% of Market Cap Traded	Value of Shares Traded	Number of Shares Traded	Number of Insiders Trading	% of Market Cap Traded
Estimation Period								
Week -5 to -24								
Mean	26.942	2.448	0.018	0.017	34.380	2.377	0.019	0.024
Event Period								
Week -4 to -1								
Mean	3.154	0.519	0.019	0.009	11.649	1.747	0.025	0.027
t_{Stat}	-2.44**	-3.20***	0.34	-1.60	-2.56**	-1.08	2.05**	0.29
$t_{Wilcoxon}$	-10.37***	-10.26***	-5.25***	-10.15***	-8.69***	-8.85***	-3.49***	-9.08***
Week -4								
Mean	3.084	0.418	0.019	0.016	24.598	3.182	0.030	0.058
t_{Stat}	-2.44**	-3.34***	0.11	-0.03	-0.80	0.57	2.24**	0.88
$t_{Wilcoxon}$	-13.76***	-13.77***	-12.13***	-13.70***	-11.78***	-12.13***	-9.99***	-12.46***
Week -3								
Mean	2.159	0.522	0.016	0.008	8.405	2.075	0.019	0.024
t_{Stat}	-2.56**	-3.02***	-0.54	-1.47	-2.93***	-0.36	0.15	-0.01
$t_{Wilcoxon}$	-13.88***	-13.79***	-12.60***	-13.68***	-12.89***	-13.00***	-11.88***	-13.21***
Week -2								
Mean	5.733	0.431	0.019	0.003	6.192	0.753	0.027	0.013
t_{Stat}	-1.95*	-3.21***	0.28	-4.44***	-3.25***	-3.77***	1.81*	-1.73*
$t_{Wilcoxon}$	-13.72	-13.73***	-11.67***	-14.00***	-12.54***	-12.38***	-10.26***	-12.57***
Week -1								
Mean	1.642	0.705	0.022	0.010	7.403	0.977	0.026	0.014
t_{Stat}	-2.61***	-2.56**	0.82	-1.21	-3.03***	-2.64***	1.44	-1.39
$t_{Wilcoxon}$	-14.07***	-13.81***	-12.46***	-13.93***	-13.06***	-13.14***	-11.20***	-13.18***
No. of News Events	1,825	1,825	1,825	1,825	1,825	1,825	1,825	1,825

This table reports observed trading activity prior to positive news events, which are defined as ad-hoc announcements with a $CAR(0;1)$ greater than zero. The news event sample has been adjusted to only include ad-hoc announcements that are not followed or preceded by another ad-hoc disclosure of the same company within a 20-day window. Average weekly insider trading activity, as measured by the four variables discussed in section 5.5.2, is reported separately for purchase and sale transactions. Trading activity is shown for the estimation period, the total event period, and individual event weeks. Observed trading activity as opposed to abnormal insider trading activity is presented. The value of shares traded is reported in units of 1,000 euros, the number of shares traded in units of 1,000 shares, and the percentage of market capitalization traded in % points. Implied abnormal trading activity is tested by a parametric t-test (t_{Stat}), and a non-parametric Wilcoxon signed-rank test ($t_{Wilcoxon}$). ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels respectively.

Table A.2: Pre-announcement Trading – Negative Announcements ($CAR(0;1) < 0\%$) – Adjusted for Event Clustering

Period	Purchases				Sales			
	Value of Shares Traded	Number of Shares Traded	Number of Insiders Trading	% of Market Cap Traded	Value of Shares Traded	Number of Shares Traded	Number of Insiders Trading	% of Market Cap Traded
Estimation Period								
Week -5 to -24								
Mean	14.621	2.061	0.018	0.019	47.925	3.467	0.022	0.035
Event Period								
Week -4 to -1								
Mean	10.390	1.487	0.016	0.009	68.914	3.247	0.020	0.028
t_{Stat}	-0.47	-0.54	-1.07	-1.57	0.47	-0.15	-1.01	-0.66
$t_{Wilcoxon}$	-10.17***	-10.25***	-5.82***	-10.08***	-10.03***	-10.12***	-6.12***	-10.40***
Week -4								
Mean	5.536	0.351	0.019	0.004	75.909	1.397	0.019	0.007
t_{Stat}	-1.45	-3.21***	0.23	-2.56**	0.42	-2.74***	-0.83	-4.91***
$t_{Wilcoxon}$	-12.60***	-12.82***	-11.39***	-12.83***	-13.03***	-13.23***	-12.02***	-13.51***
Week -3								
Mean	1.105	0.232	0.014	0.002	28.278	3.256	0.022	0.040
t_{Stat}	-2.63***	-3.60***	-1.08	-3.72***	-0.81	-0.12	0.01	0.21
$t_{Wilcoxon}$	-13.40***	-13.33***	-12.03***	-13.40***	-12.78***	-13.08***	-11.71***	-13.22***
Week -2								
Mean	15.841	2.750	0.015	0.011	13.186	1.937	0.018	0.026
t_{Stat}	0.09	0.39	-0.76	-1.22	-2.28**	-1.64	-0.71	-0.67
$t_{Wilcoxon}$	-13.11***	-13.17***	-12.48***	-13.15***	-14.18***	-14.12***	-13.37***	-14.12***
Week -1								
Mean	19.077	2.613	0.014	0.020	158.283	6.396	0.018	0.039
t_{Stat}	0.25	0.25	-1.35	0.03	0.71	0.58	-0.91	0.21
$t_{Wilcoxon}$	-13.20***	-13.11***	-12.07***	-13.13***	-14.02***	-13.97***	-12.81***	-13.99***
No. of News Events	1,520	1,520	1,520	1,520	1,520	1,520	1,520	1,520

This table reports observed trading activity prior to negative news events, which are defined as ad-hoc announcements with a $CAR(0;1)$ smaller than zero. The news event sample has been adjusted to only include ad-hoc announcements that are not followed or preceded by another ad-hoc disclosure of the same company within a 20-day window. Average weekly insider trading activity, as measured by the four variables discussed in section 5.5.2, is reported separately for purchase and sale transactions. Trading activity is shown for the estimation period, the total event period, and individual event weeks. Observed trading activity as opposed to abnormal insider trading activity is presented. The value of shares traded is reported in units of 1,000 euros, the number of shares traded in units of 1,000 shares, and the percentage of market capitalization traded in % points. Implied abnormal trading activity is tested by a parametric t-test (t_{Stat}), and a non-parametric Wilcoxon signed-rank test ($t_{Wilcoxon}$). ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels respectively.

Table A.3: Post-announcement Trading – Positive Announcements ($CAR(0;1) > 0\%$) – Adjusted for Event Clustering

Period	Purchases				Sales			
	Value of Shares Traded	Number of Shares Traded	Number of Insiders Trading	% of Market Cap Traded	Value of Shares Traded	Number of Shares Traded	Number of Insiders Trading	% of Market Cap Traded
Estimation Period								
Week -5 to -24								
Mean	28.775	2.500	0.018	0.017	36.161	2.385	0.019	0.024
Event Period								
Week 1 to 4								
Mean	15.528	2.355	0.038	0.028	103.598	5.467	0.050	0.044
t_{Stat}	-1.19	-0.16	4.98***	1.10	1.70*	2.26**	6.57***	1.97**
$t_{Wilcoxon}$	-5.03***	-5.68***	0.50	-6.28***	-2.04**	-2.61***	4.64***	-2.91***
Week 1								
Mean	24.831	2.111	0.049	0.046	158.076	8.325	0.072	0.058
t_{Stat}	-0.22	-0.42	4.56***	1.06	0.99	1.61	4.95***	1.89*
$t_{Wilcoxon}$	-9.61***	-9.74***	-7.12***	-9.83***	-7.47***	-8.09***	-3.75***	-8.16***
Week 2								
Mean	12.065	3.902	0.035	0.040	158.740	7.032	0.049	0.055
t_{Stat}	-1.52	0.62	3.13***	1.00	1.58	1.40	4.31***	1.11
$t_{Wilcoxon}$	-11.41***	-11.66***	-9.17***	-12.25***	-9.12***	-9.18***	-6.94***	-9.48***
Week 3								
Mean	8.433	2.579	0.034	0.017	20.135	2.151	0.037	0.023
t_{Stat}	-1.84*	0.04	2.26**	0.00	-1.47	-0.30	3.45***	-0.06
$t_{Wilcoxon}$	-12.05***	-12.41***	-10.18***	-12.62***	-10.10***	-10.49***	-8.01***	-10.73***
Week 4								
Mean	16.783	0.828	0.032	0.007	77.442	4.358	0.043	0.040
t_{Stat}	-0.74	-2.16**	2.04**	-2.39**	1.29	1.31	3.65***	1.18
$t_{Wilcoxon}$	-13.01***	-13.23***	-11.93***	-13.25***	-10.49***	-10.59***	-8.27***	-10.87***
No. of News Events	1,833	1,833	1,833	1,833	1,833	1,833	1,833	1,833

This table reports observed trading activity following positive news events, which are defined as ad-hoc announcements with a $CAR(0;1)$ greater than zero. The news event sample has been adjusted to only include ad-hoc announcements that are not followed or preceded by another ad-hoc disclosure of the same company within a 20-day window. Average weekly insider trading activity, as measured by the four variables discussed in section 5.5.2, is reported separately for purchase and sale transactions. Trading activity is shown for the estimation period, the total event period, and individual event weeks. Observed trading activity as opposed to abnormal insider trading activity is presented. The value of shares traded is reported in units of 1,000 euros, the number of shares traded in units of 1,000 shares, and the percentage of market capitalization traded in % points. Implied abnormal trading activity is tested by a parametric t-test (t_{Stat}), and a non-parametric Wilcoxon signed-rank test ($t_{Wilcoxon}$). ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels respectively.

Table A.4: Post-announcement Trading – Negative Announcements ($CAR(0;1) < 0\%$) – Adjusted for Event Clustering

Period	Purchases				Sales			
	Value of Shares Traded	Number of Shares Traded	Number of Insiders Trading	% of Market Cap Traded	Value of Shares Traded	Number of Shares Traded	Number of Insiders Trading	% of Market Cap Traded
Estimation Period								
Week -5 to -24								
Mean	14.592	2.057	0.018	0.019	47.831	3.460	0.022	0.035
Event Period								
Week 1 to 4								
Mean	14.802	1.917	0.049	0.008	21.205	2.394	0.029	0.030
t_{Stat}	0.02	-0.12	6.70***	-2.30**	-1.79*	-1.39	2.02**	-0.49
$t_{Wilcoxon}$	-2.71***	-3.42***	3.17***	-4.41***	-8.54***	-8.74***	-3.38***	-9.18***
Week 1								
Mean	10.830	1.493	0.064	0.009	19.288	2.248	0.041	0.034
t_{Stat}	-0.60	-0.78	5.75***	-2.00**	-1.83*	-0.90	2.54**	-0.04
$t_{Wilcoxon}$	-6.81***	-7.38***	-4.51***	-8.55***	-11.06***	-11.45***	-9.11***	-11.90***
Week 2								
Mean	3.962	0.769	0.042	0.009	34.402	2.166	0.029	0.019
t_{Stat}	-2.05**	-2.42**	4.12***	-1.96*	-0.54	-1.23	1.13	-1.76*
$t_{Wilcoxon}$	-8.78***	-9.20***	-6.76***	-9.57***	-12.87***	-12.87***	-11.49***	-13.07***
Week 3								
Mean	15.284	1.995	0.053	0.003	12.275	2.431	0.022	0.046
t_{Stat}	0.05	-0.04	3.45***	-3.32***	-2.47**	-0.87	0.01	0.37
$t_{Wilcoxon}$	-9.97***	-10.22***	-8.06***	-10.48***	-13.40***	-13.33***	-11.94***	-13.68***
Week 4								
Mean	29.133	3.410	0.035	0.011	18.855	2.730	0.025	0.019
t_{Stat}	0.75	0.58	2.75***	-1.23	-1.80*	-0.60	0.51	-1.61
$t_{Wilcoxon}$	-10.33***	-10.47***	-8.96***	-10.87***	-12.86***	-12.79***	-11.56***	-12.89***
No. of News Events	1,523	1,523	1,523	1,523	1,523	1,523	1,523	1,523

This table reports observed trading activity following negative news events, which are defined as ad-hoc announcements with a $CAR(0;1)$ smaller than zero. The news event sample has been adjusted to only include ad-hoc announcements that are not followed or preceded by another ad-hoc disclosure of the same company within a 20-day window. Average weekly insider trading activity, as measured by the four variables discussed in section 5.5.2, is reported separately for purchase and sale transactions. Trading activity is shown for the estimation period, the total event period, and individual event weeks. Observed trading activity as opposed to abnormal insider trading activity is presented. The value of shares traded is reported in units of 1,000 euros, the number of shares traded in units of 1,000 shares, and the percentage of market capitalization traded in % points. Implied abnormal trading activity is tested by a parametric t-test (t_{Stat}), and a non-parametric Wilcoxon signed-rank test ($t_{Wilcoxon}$). ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels respectively.

Appendix B

Additional Results Related to Chapter 6

Table B.1: Event Study Results including Events with a Reporting Delay Greater than 30 Days

	CAAR(-20;-1)	CAAR(-10;-1)	CAAR(0)	CAAR(0;5)	CAAR(0;10)	CAAR(0;20)	Observations
Purchases							
CAAR	-2.47%	-1.39%	0.22%	1.10%	1.43%	1.92%	2819
t_{CAAR}	-8.69	-6.89	3.46	7.08	6.75	6.58	
t_{Rank}	-7.24	-6.29	2.45	5.10	4.91	4.94	
Sales							
CAAR	1.86%	1.33%	-0.13%	-0.86%	-1.87%	-3.15%	2392
t_{CAAR}	5.40	5.45	-1.64	-4.55	-7.31	-8.91	
t_{Rank}	5.15	5.42	-1.21	3.49	5.59	6.02	

The table presents the event study results for the sample including events with a reporting delay greater than 30 days. CAARs are computed for insider purchases and sales, respectively. The event date, t_0 , is defined as the day of reporting of insider transactions. Insider trades published on the same day of any one company are aggregated. Trades with a transaction volume of 1,000 euros or less are not included in the analysis. The $CDAX$ is used as the proxy for the market portfolio. t_{CAAR} is a standard test statistic, as outlined in section 6.6, and t_{Rank} is the non-parametric test proposed by Corrado (1989).

Table B.2: Cross-sectional Regression Analysis Results

Dependent Variable	CAR(0;10)			CAR(0;20)		
	Pooled	Purchases	Sales	Pooled	Purchases	Sales
Constant	0.017	0.050	-0.027	0.042	0.087**	-0.015
<i>t-statistic</i>	0.87	1.59	-1.14	1.61	2.22	-0.48
Holding Cost Variables						
IRISKLOG	0.012**	0.017**	0.005	0.011**	0.014	0.005
<i>t-statistic</i>	2.45	2.36	0.79	1.74	1.55	0.59
SYRSKLOG	-0.001	-0.001	-0.002	0.001	0.003	-0.002
<i>t-statistic</i>	-0.71	-0.25	-0.82	0.31	0.86	-0.62
RF	0.254	-0.078	0.834	-0.357	-0.891	0.660
<i>t-statistic</i>	0.63	-0.13	1.57	-0.69	-1.20	0.92
Transaction Cost Variables						
SPRICE	0.000	0.000	0.000	0.000	0.000	0.000
<i>t-statistic</i>	0.26	0.75	-0.88	-0.09	0.24	-0.72
VOLUME	0.000	0.000	0.000	0.000	0.000	0.000
<i>t-statistic</i>	0.64	1.15	-0.39	0.87	1.52	-0.29
Trade-Specific Variables						
INSALE	-0.007	-	-	-0.003	-	-
<i>t-statistic</i>	-1.11	-	-	-0.38	-	-
TRADSZ	-0.016	0.163	-0.037	-0.075	0.254	-0.126*
<i>t-statistic</i>	-0.31	1.07	-0.76	-1.12	1.34	-1.90
DELAY	-0.002**	-0.001	-0.002***	-0.001	0.000	-0.003***
<i>t-statistic</i>	-2.45	-1.12	-2.72	-1.59	0.02	-2.84
PASTRET	-0.079***	-0.089***	-0.088***	-0.134***	-0.136***	-0.154***
<i>t-statistic</i>	-6.17	-4.10	-5.58	-8.09	-5.02	-7.23
Insider-Specific Variables						
POSEB	0.006	0.007	0.007	0.020	0.027	0.015
<i>t-statistic</i>	0.60	0.43	0.54	1.50	1.32	0.85
POSSB	0.007	0.008	0.005	0.016	0.028	0.003
<i>t-statistic</i>	0.63	0.45	0.41	1.13	1.31	0.15
POSMNG	0.011	0.023	0.010	-0.004	0.026	-0.015
<i>t-statistic</i>	0.45	0.47	0.40	-0.13	0.43	-0.42
Company-Specific Variables						
MVLOG	0.000	-0.003	0.005	-0.002	-0.007	0.004
<i>t-statistic</i>	0.18	-0.80	1.33	-0.46	-1.42	0.93
MTBV	-0.004**	-0.007**	-0.001	-0.004**	-0.013***	0.001
<i>t-statistic</i>	-2.15	-2.53	-0.67	-2.05	-3.47	0.21
DISTR	-0.006	-0.017	0.008	0.000	-0.010	0.019
<i>t-statistic</i>	-0.64	-1.15	0.57	0.02	-0.54	1.02
Adjusted R^2	3.45%	3.81%	4.72%	5.39%	5.97%	8.54%
Average VIF	1.67	1.70	1.83	1.67	1.70	1.83
Maximum VIF	3.73	3.68	4.25	3.73	3.68	4.25
No. of Observations	1,390	720	670	1,390	720	670

The table presents results for the cross-sectional regressions with CAR(0;10) and CAR(0;20) as dependent variables for a sample that is adjusted for event clustering. This control sample contains only directors' dealings, with no other reported trades of the same company in the time window ranging from t_{-20} to t_{+20} . Definitions of the regressors, which include holding cost, transaction costs, and trade-, insider-, and company-specific variables, can be found in Table 6.3. The pooled sample consists of all transactions, whereby the CARs on sales are multiplied by -1. CARs of insider sales are multiplied by minus one. VIF stands for variance inflation factor. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels respectively.

Table B.3: Cross-sectional Regression Analysis Results for CARs Calculated under SUR

Dependent Variable	CAR(0;10)			CAR(0;20)		
	Pooled	Purchases	Sales	Pooled	Purchases	Sales
Constant	0.03***	0.05***	-0.01	0.06***	0.11***	-0.00
<i>t-statistic</i>	2.89	3.94	-0.34	4.40	5.83	-0.03
Holding Cost Variables						
IRISKLOG	0.01***	0.01*	0.01***	0.02***	0.01***	0.02***
<i>t-statistic</i>	4.11	1.94	3.50	4.84	2.26	3.97
SYSRSKLOG	0.00	0.03**	0.00	0.00**	0.01***	-0.00
<i>t-statistic</i>	1.55	2.38	-0.21	2.15	3.79	-0.83
RF	-0.14	-0.27	0.13	-0.65***	-1.12***	0.18
<i>t-statistic</i>	-0.75	-1.03	0.47	-2.49	-3.19	0.45
Transaction Cost Variables						
SPRICE	0.00	0.00	0.00	0.00	0.00	0.00
<i>t-statistic</i>	0.61	0.46	0.04	0.56	0.59	-0.12
VOLUME	0.00	0.00	0.00	0.00	0.00**	0.00
<i>t-statistic</i>	0.49	0.99	-0.03	1.37	2.00	0.39
INSALE	0.00	-	-	0.00	-	-
<i>t-statistic</i>	-0.10	-	-	0.87	-	-
TRADSZ	-0.06	0.14*	-0.08**	-0.10**	0.11	-0.15***
<i>t-statistic</i>	-1.07	1.88	-2.21	-2.21	1.04	-3.09
DELAY	-0.00	0.00	-0.00**	-0.00**	0.00	-0.00***
<i>t-statistic</i>	-1.50	-0.30	-2.16	-2.14	-0.56	-2.99
PASTRET	-0.06***	-0.05***	-0.06***	-0.12***	-0.11***	-0.13***
<i>t-statistic</i>	-8.92	-5.53	-7.05	-13.33	-8.41	-10.68
Insider-Specific Variables						
POSEB	0.01	-0.00	0.01**	0.01*	0.01	0.02*
<i>t-statistic</i>	1.06	-0.31	2.03	1.68	0.83	1.82
POSSB	-0.00	-0.00	0.00	0.01	0.02*	-0.00
<i>t-statistic</i>	-0.14	-0.20	0.13	0.90	1.83	-0.30
POSMNG	0.01	0.03	0.01	0.00	0.05*	-0.01
<i>t-statistic</i>	1.07	1.42	0.81	0.26	1.67	-0.32
Company-Specific Variables						
MVLOG	-0.00	-0.00**	0.00	-0.00	-0.01***	0.00
<i>t-statistic</i>	-0.91	-2.18	0.95	-1.53	-3.23	0.92
MTBV	-0.00**	-0.00***	0.00	-0.00***	-0.01	0.00
<i>t-statistic</i>	-2.15	-3.42	0.77	-3.62	-6.07	1.51
DISTR5	0.00	-0.00	0.01	-0.00	-0.02*	0.02**
<i>t-statistic</i>	0.49	-0.44	1.57	-0.18	-1.72	2.39
Adjusted R^2	3.05%	2.58%	4.83%	6.15%	5.72%	9.45%
Average VIF	1.68	1.72	1.80	1.68	1.72	1.80
Maximum VIF	4.06	3.80	4.61	4.06	3.80	4.61
No. of Observations	4,796	2,611	2,185	4,796	2,611	2,185

The table presents results for the cross-sectional regressions with CAR(0;10) and CAR(0;20) as dependent variables. CARs are calculated under a seemingly unrelated regression model. Definitions of the regressors, which include holding cost, transaction costs and trade-, insider- and company-specific variables, can be found in Table 6.3. The pooled sample consists of all transactions, whereby the CARs on sales are multiplied by -1. CARs of insider sales are multiplied by minus one. VIF stands for variance inflation factor. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels respectively.

Table B.4: CAARs Calculated under JGLS for Arbitrage Risk Portfolios

	Idiosyncratic Risk Statistics (*10 ³)					Observations			
	CAAR(0;5)	CAAR(0;10)	CAAR(0;20)	Mean	Median		Std. Dev.	Min.	Max.
All Trades									
Arbitrage Risk Q1 (Low)	0.37%	0.73%	0.87%	0.17	0.18	0.07	0.03	0.27	1,006
Arbitrage Risk Q2	0.69%	1.14%	1.72%	0.37	0.37	0.06	0.27	0.48	1,006
Arbitrage Risk Q3	0.63%	0.87%	1.69%	0.63	0.62	0.10	0.48	0.80	1,006
Arbitrage Risk Q4	1.33%	2.21%	3.70%	1.10	1.03	0.23	0.80	1.55	1,006
Arbitrage Risk Q5 (High)	1.91%	3.36%	5.40%	4.05	2.54	1.05	1.55	301.19	1,006
Difference Q5 - Q1	1.54%	2.63%	4.53%	3.88	2.36	1.04	1.52	300.92	
t_{Diff}	3.59	4.73	5.75						
Purchases									
Arbitrage Risk Q1 (Low)	0.55%	0.94%	0.86%	0.18	0.19	0.07	0.04	0.28	546
Arbitrage Risk Q2	0.84%	1.37%	1.74%	0.37	0.36	0.06	0.28	0.48	546
Arbitrage Risk Q3	0.63%	0.60%	1.28%	0.64	0.64	0.10	0.48	0.83	546
Arbitrage Risk Q4	1.64%	1.97%	3.04%	1.12	1.05	0.22	0.83	1.54	546
Arbitrage Risk Q5 (High)	2.03%	2.78%	4.09%	3.68	2.68	3.29	1.54	49.89	546
Difference Q5 - Q1	1.47%	1.84%	3.23%	3.51	2.49	3.22	1.50	49.61	
t_{Diff}	2.49	2.30	2.94						
Sales									
Arbitrage Risk Q1 (Low)	0.12%	0.44%	0.79%	0.15	0.15	0.07	0.03	0.27	460
Arbitrage Risk Q2	0.60%	0.96%	1.78%	0.37	0.38	0.06	0.27	0.47	460
Arbitrage Risk Q3	0.61%	1.28%	2.39%	0.61	0.59	0.09	0.47	0.77	460
Arbitrage Risk Q4	1.01%	2.58%	4.60%	1.07	1.01	0.23	0.77	1.59	460
Arbitrage Risk Q5 (High)	1.72%	3.95%	6.82%	4.48	2.40	15.03	1.60	301.19	460
Difference Q5 - Q1	1.60%	3.51%	6.03%	4.33	2.25	14.96	1.57	300.93	
t_{Diff}	2.56	4.59	5.37						

CAARs, calculated under a seemingly unrelated regression model, are ranked into quintiles based on the level of idiosyncratic risk associated with the underlying stock. Arbitrage Risk Q1 contains trades with the lowest levels of arbitrage risk, and Arbitrage Risk Q5 contains trades with highest levels of arbitrage risk, as measured by *IRISK*. The ranking procedure is repeated for all trades, purchases only, and sales only. The definition of *IRISK* can be found in Table 6.3. For the top and bottom quintiles, the average CAARs (CAARs) are computed. The difference between the top and bottom arbitrage risk quintiles is tested by the means of a one-sided t-test.

Appendix C

SEC Form 4

Appendix D

BaFin Directors' Dealings Notification Form

Notification concerning transactions by persons performing managerial responsibilities pursuant to section 15a of the WpHG

By fax to BaFin (+49[0]228/4108-62963) and the issuer

1. Details of the person subject to the disclosure requirement			
SURNAME, forename or company name ¹		Date of birth ²	
Address ³			
Name of contact/telephone number ⁴			
2. Reason for the disclosure requirement			
2a) <input type="checkbox"/> Person performing managerial responsibilities⁵			
Position (please place "x" as appropriate)	Member of a managing body <input type="checkbox"/>	Member of an administra- tive or supervisory body <input type="checkbox"/>	Personally liable partner <input type="checkbox"/>
	Senior executive (brief description of type of function)		<input type="checkbox"/>
2b) <input type="checkbox"/> Natural person closely associated (also complete 2e)⁶			
Relationship (please place "x" as appropriate)	Spouse or registered partner <input type="checkbox"/>	Relative <input type="checkbox"/>	Dependent child <input type="checkbox"/>
			Other relative <input type="checkbox"/>
2c) <input type="checkbox"/> Legal person, company or institution closely associated⁷			
Relationship (please place "x" as appropriate)	To a person performing managerial responsibilities (also complete 2e) <input type="checkbox"/>		
	To a natural person with a close relationship (also complete 2d and 2e)		<input type="checkbox"/>
2d) Natural person closely associated, triggering the disclosure requirement for the legal person, company or institution⁸ (only to be completed by legal persons, companies or institutions with a close relationship)			
SURNAME, forename,		Date of birth	
Relationship (please place "x" as appropriate)	Spouse or registered partner <input type="checkbox"/>	Relative <input type="checkbox"/>	Dependent child <input type="checkbox"/>
			Other relative <input type="checkbox"/>
2e) Person performing managerial responsibilities, triggering the disclosure requirement⁹ (to be completed by all persons with a close relationship)			
SURNAME, forename,		Date of birth	
Position (please place "x" as appropriate)	Member of a managing body <input type="checkbox"/>	Member of an administra- tive or supervisory body <input type="checkbox"/>	Personally liable partner <input type="checkbox"/>
	Senior executive (brief description of type of function)		<input type="checkbox"/>
3. Issuer subject to the publication requirement:			
Name ¹⁰			
Address (Street, postal code, city/town, country) ¹¹			

Annex to Disclosure Form for transactions conducted by persons performing managerial responsibilities pursuant to § 15a WpHG

SURNAME, forename or company name of the person subject to the disclosure requirement ¹²	Date ¹³
---	--------------------

Details of the transaction

Description of the financial instrument (FI)

ISIN of the FI ¹⁴	Description of the FI ¹⁵
------------------------------	-------------------------------------

Description of the derivative (only for derivatives transactions)

ISIN of the underlying instrument ¹⁶	Description of the underlying instrument ¹⁷	
Strike price ¹⁸	Price multiplier ¹⁹	Expiration date ²⁰

Details of the transaction

Type of transaction ²¹	Date ²²	Place ²³
Price ²⁴	Currency ²⁵	No of items ²⁶
		Total amount traded ²⁷
Explanation for publication: ²⁸		

Details of the transaction

Description of the financial instrument (FI)

ISIN of the FI	Description of the FI
----------------	-----------------------

Description of the derivative (where necessary)

ISIN of the underlying instrument	Description of the underlying instrument	
Strike price	Price multiplier	Expiration date

Details of the transaction

Type of transaction	Date	Place
Price	Currency	No of items
		Total amount traded
Explanation for publication:		

Date, signature

Appendix E

Sample Directors' Dealings Notice

DGAP-DD: DaimlerChrysler AG deutsch

Mitteilung über Geschäfte von Führungspersonen nach §15a WpHG

Directors'-Dealing-Mitteilung übermittelt durch die DGAP.

Für den Inhalt der Mitteilung ist der Mitteilungspflichtige verantwortlich.

Angaben zum Mitteilungspflichtigen

Name: Kirchmann
Vorname: Dr. Albert
Firma: DaimlerChrysler AG
Funktion: Finanzen & Controlling

Angaben zum mitteilungspflichtigen Geschäft

Bezeichnung des Finanzinstruments: Aktie
ISIN des Finanzinstruments: DE0007100000
Geschäftsart: Erwerb
Datum: 08.03.2007
Kurs/Preis: 52,19
Währung: EUR
Stückzahl: 300
Gesamtvolumen: 15657,00
Ort: Frankfurt

Angaben zum veröffentlichungspflichtigen Unternehmen

Emittent: DaimlerChrysler AG
Mercedesstrasse 137
70327 Stuttgart
Germany
ISIN: DE0007100000
WKN: 710000
Index: STOXX50, DAX

Ende der Directors'-Dealing-Mitteilung (c)DGAP 14.03.2007

Die Erfassung dieser Mitteilung erfolgte über <http://www.dd-meldung.de> bzw.
<http://www.directors-dealings.de>
ID 1668

Appendix F

Sample Ad-hoc Announcement

EADS - Revised Airbus A380 delivery schedule

Ad hoc announcement transmitted by DGAP - a company of EquityStory AG.
The issuer is solely responsible for the content of this announcement.

EADS - Revised Airbus A380 delivery schedule

Revised A380 delivery schedule expected not to impact EADS' EBIT* 2006 outlook
- Resulting EBIT* shortfall to be compensated in 2006 financial year
- Revised A380 delivery schedule will impact profitability in following years

EADS expects that the revised A380 delivery schedule announced by Airbus will not lead to a change in the Group's 2006 EBIT* guidance due to management actions being taken at Airbus and due to the overall performance of the Group.

Following a detailed review of the A380 production and delivery programme, Airbus revised the A380 delivery schedule for the period 2006 to 2009. According to this plan one aircraft is to be delivered in 2006. In 2007, A380 deliveries will likely be limited to nine. Compared to the initial delivery target there will be shortfalls of five to nine aircraft deliveries in 2008 and of around five aircraft in 2009.

From 2007 to 2010, EADS anticipates annual shortfalls of EBIT* contribution from the A380 programme of about baseline plan. The shortfalls result from the shift of margin to later years, excess costs tied to the recovery action and the late delivery charges which are to be negotiated with customers. Possible contract terminations under the new timetable have not been taken into account in this estimate.

EADS expects free cash flow shortfalls, relative to the original baseline plan, of less than in 2008, and decreasing sharply thereafter. To date 15 A380 have been assembled, while production of sections for aircraft serial number 36 has already started.

The financial impacts will need to be validated and updated as certain milestones are passed, such as the outcome of discussions with customers, feedback from the ongoing testing programme of the integrated cabin, and the progress of the recovery action set up by Airbus.

* EADS uses EBIT pre-goodwill impairment and exceptionals as a key indicator of its economic performance. The term 'exceptionals' refers to such items as depreciation expenses of fair value adjustments relating to the EADS merger, the Airbus Combination and the formation of MBDA, as well as impairment charges thereon.

Contact: Michael Hauger EADS +49 89 60 73 42 35
(c)DGAP 13.06.2006

Language: English

Issuer: European Aeronautic Defence and Space Company

Beechavenue 130-132

1119 PR Schiphol Rijk Niederlande

Phone: 00 800 00 02 2002

Fax: +49 (0)89 607 - 26481

email: ir@eads.net

WWW: www.eads.com

ISIN: NL0000235190

WKN: 938914

indices: MDAX

Listed: Amtlicher Markt in Frankfurt (Prime Standard); Freiverkehr in Berlin-Bremen, Hannover, Düsseldorf, Hamburg, München, Stuttgart

End of News DGAP News-Service

Bibliography

- Aboody, D., J. Hughes, J. Liu, and W. Su (2008, December). Are executive stock option exercises driven by private information? *Review of Accounting Studies* 13(4), 551–570.
- Ackert, L. and Y. Tian (2000). Arbitrage and valuation in the market for Standard and Poor's Depository Receipts. *Financial Management* 29(3), 71–87.
- Admati, A. R. and P. Pfleiderer (1988). A theory of intraday patterns: Volume and price variability. *The Review of Financial Studies* 1(1), 3–40.
- Agrawal, A. and T. Cooper (2008, July). Insider trading before accounting scandals. Working Paper.
- Agrawal, A. and J. F. Jaffe (1995). Does section 16b deter insider trading by target managers? *Journal of Financial Economics* 39(2-3), 295–319.
- Alexander, K. (2001). Insider dealing and market abuse: The Financial Services and Markets Act 2000. *ESRC Centre for Business Research, University of Cambridge Working Paper No. 222*.
- Ali, A., L.-S. Hwang, and M. A. Trombley (2003). Arbitrage risk and the book-to-market anomaly. *Journal of Financial Economics* 69(2), 355–373.
- Allen, S. and R. Ramanan (1990). Earnings surprises and prior insider trading: Tests of joint informativeness. *Contemporary Accounting Research* 6(2), 518–543.
- Allen, S. and R. Ramanan (1995). Insider trading, earnings changes, and stock prices. *Management Science* 41(4), 653–668.
- Amihud, Y. and H. Mendelson (1986, December). Asset pricing and the bid-ask spread. *Journal of Financial Economics* 17(2), 223–249.
- Armitage, S. (1995). Event study methods and evidence on their performance. *Journal of Economic Surveys* 9(1), 25–52.
- Arneth, S. (2001). *Die Marktwirkung von Insiderhandel an Wertpapierbörsen*. Ph. D. thesis.
- Arshadi, N. and T. H. Eysell (1991). Regulatory deterrence and registered insider trading: The case of tender offers. *Financial Management* 20(2), 30–39.
- Asquith, P. (1983). Merger bids, uncertainty, and stockholder returns. *Journal of Financial Economics* 11(1-4), 51–83.
- Asquith, P., R. F. Bruner, and D. W. Mullins (1983). The gains to bidding firms from merger. *Journal of Financial Economics* 11(1-4), 121–139.
- Asquith, P., P. A. Pathak, and J. R. Ritter (2005). Short interest, institutional ownership, and stock returns. *Journal of Financial Economics* 78, 243–276.
- Assmann, H.-D. and U. H. Schneider (2006). *Wertpapierhandelsgesetz Kommentar*. Verlag Dr. Otto Schmidt.

- Au, A. S., J. A. Doukas, and Z. M. Onayev (2007, December). Daily short interest, idiosyncratic risk, and stock returns. Working Paper.
- Ausubel, L. M. (1990). Insider trading in a rational expectations economy. *The American Economic Review* 80(5), 1022–1041.
- Bagehot, W. (1971). The only game in town. *Financial Analysts Journal* 27(2), 12–22.
- Bainbridge, S. (2000). Insider Trading. In *Encyclopedia of Law and Economics III*, pp. 772–812. Edward Elgar Publishing, Cheltenham.
- Baker, M. and S. Savasoglu (2002). Limited arbitrage in mergers and acquisitions. *Journal of Financial Economics* 64(1), 91–115.
- Ball, R. (1978). Anomalies in relationships between securities' yields and yield-surrogates. *Journal of Financial Economics* 6(2-3), 103–126.
- Ball, R. and P. Brown (1968). An empirical evaluation of accounting income numbers. *Journal of Accounting Research* 6(2), 159–178.
- Ball, R. and S. Kothari (1991). Security returns around earnings announcements. *The Accounting Review* 66(4), 718–738.
- Balmforth, B., B. M. Burton, S. R. Cross, and D. M. Power (2007). Evidence on UK directors' compliance with disclosure timing regulations. *Journal of Financial Regulation and Compliance* 15(4), 381–393.
- Banz, R. W. (1981). The relationship between return and market value of common stocks. *Journal of Financial Economics* 9(1), 3–18.
- Barber, B. M. and J. D. Lyon (1997). Detecting long-run abnormal stock returns: The empirical power and specification of test statistics. *Journal of Financial Economics* 43(3), 341–372.
- Barber, B. M. and T. Odean (2000). Trading is hazardous to your wealth: The common stock investment performance of individual investors. *Journal of Finance* 55(2), 773–806.
- Barber, B. M. and T. Odean (2001). Boys will be boys: Gender, overconfidence, and common stock investment. *The Quarterly Journal of Economics* 116(1), 261–292.
- Barberis, N. C. and R. Thaler (2003a). A survey of behavioral finance. In G. Constantinides, M. Harris, and S. Rene (Eds.), *Handbook of the Economics of Finance*, pp. 1053–1123. Elsevier B.V., Amsterdam.
- Barberis, N. C. and R. Thaler (2003b). A survey of behavioural finance. National Bureau of Economic Research Working Paper 9222.
- Barclay, M. J. and J. B. Warner (1993). Stealth trading and volatility : Which trades move prices? *Journal of Financial Economics* 34(3), 281–305.
- Barth, M. E., J. A. Elliott, and M. W. Finn (1999). Market rewards associated with patterns of increasing earnings. *Journal of Accounting Research* 37(2), 387–413.
- 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* 32(3), 663–682.
- Basu, S. (1983, June). The relationship between earnings' yield, market value and return for NYSE common stocks : Further evidence. *Journal of Financial Economics* 12(1), 129–156.

- Beaver, W. H. (1968). The information content of annual earnings announcements. *Journal of Accounting Research* 6, 67–92.
- Beaver, W. H., R. Clarke, and W. F. Wright (1979). The association between unsystematic security returns and the magnitude of earnings forecast errors. *Journal of Accounting Research* 17(2), 316–340.
- Beechey, M., D. Gruen, and J. Vickery (2000, January). The efficient market hypothesis: A survey. Working Paper.
- Ben-David, I. and D. Roulstone (2007, November). Idiosyncratic risk and corporate transactions. Working Paper.
- Beneish, M. D., E. G. Press, and M. E. Vargus (2007, December). Does the threat of litigation explain insider selling and earnings management in distressed firms? Working Paper.
- Bennett, J. A. and R. W. Sias (2007, July). Why do anomalies survive? The idiosyncratic risk of arbitrage portfolios. Working Paper.
- Beny, L. N. (2005). Do insider trading laws matter? Some preliminary comparative evidence. *American Law and Economics Review* 7(1), 144–183.
- Berk, J. and P. DeMarzo (2007). *Corporate Finance*. Pearson Addison Wesley, Boston.
- Berkowitz, M. K. and J. Qiu (2001, December). Common risk factors in explaining Canadian equity returns. Working Paper.
- Bernard, V. L. (1987). Cross-sectional dependence and problems in inference in market-based accounting research. *Journal of Accounting Research* 25(1), 1–48.
- Bernard, V. L. and J. K. Thomas (1990, December). Evidence that stock prices do not fully reflect the implications of current earnings for future earnings. *Journal of Accounting and Economics* 13(4), 305–340.
- Bettis, C. (1995). A test of the validity of friendly takeover rumors. *Financial Analysts Journal* 51(6), 53–58.
- Bettis, C., D. Vickrey, and D. W. Vickrey (1997). Mimickers of corporate insiders who make large-volume trades. *Financial Analysts Journal* 53(5), 57–66.
- Bettis, J. C. and S. Y. Chang (1996, February). Insider trading regulations. *Internal Auditor* 53(1).
- Bettis, J. C. and W. A. Duncan (1996). Effect of legal sanctions on takeover target insider purchases. *Journal of Accounting and Finance Research*, 1–9.
- Bettis, J. C., W. A. Duncan, and W. K. Harmon (1998). The effectiveness of insider trading regulations. *Journal of Applied Business Research* 14(4), 53–70.
- Betzer, A. and E. Theissen (2008, February). Sooner or later - Delays in trade reporting by corporate insiders. Working Paper.
- Betzer, A. and E. Theissen (2009, March). Insider trading and corporate governance: The case of Germany. *European Financial Management* 15(2), 402–429.
- Bhardwaj, R. K. and L. D. Brooks (1992). The January anomaly: Effects of low share price, transaction costs, and bid-ask bias. *Journal of Finance* 47(2), 553–575.
- Bhattacharya, U. and H. Daouk (2002). The world price of insider trading. *Journal of Finance* 57(1), 75–108.

- Böhmer, E. and Y. Löffler (1999). Kursrelevante Ereignisse bei Unternehmensübernahmen: Eine empirische Analyse des deutschen Kapitalmarktes. *Zeitschrift für betriebswirtschaftliche Forschung* 51(4), 299–324.
- Bhushan, R. (1991). Trading costs, liquidity, and asset holdings. *The Review of Financial Studies* 4(2), 343–360.
- Bhushan, R. (1994). An informational efficiency perspective on the post-earnings announcement drift. *Journal of Accounting and Economics* 18(1), 45–65.
- Binder, J. J. (1998). The event study methodology since 1969. *Review of Quantitative Finance and Accounting* 11(2), 111–137.
- Black, F. (1972). Capital market equilibrium with restricted borrowing. *Journal of Business* 45(3), 444–455.
- Black, F. (1986). Noise. *Journal of Finance* 41(3), 529–543.
- Boehmer, E., J. Masumeci, and A. B. Poulsen (1991). Event-study methodology under conditions of event-induced variance. *Journal of Financial Economics* 30(2), 253–272.
- Boudreaux, K. J. (1973). Discounts and premiums on closed-end mutual funds: A study in valuation. *Journal of Finance* 28(2), 515–522.
- Bowman, R. G. (1983). Understanding and conducting event studies. *Journal of Business Finance & Accounting* 10(4), 561–584.
- Bradshaw, M. T., S. A. Richardson, and R. G. Sloan (2001). Do analysts and auditors use information in accruals? *Journal of Accounting Research* 39(1), 45–74.
- Brav, A., C. Geczy, and P. A. Gompers (2000, May). Is the abnormal return following equity issuances anomalous? *Journal of Financial Economics* 56(2), 209–249.
- Brav, A. and P. A. Gompers (1997). Myth or reality? The long-run underperformance of initial public offerings: Evidence from venture and nonventure capital-backed companies. *Journal of Finance* 52(5), 1791–1821.
- Brav, A. and J. B. Heaton (2006, June). The limits of the limits of arbitrage. Working Paper.
- Breeden, D. T. (1979). An intertemporal asset pricing model with stochastic consumption and investment opportunities. *Journal of Financial Economics* 7(3), 265–296.
- Breeden, D. T., M. R. Gibbons, and R. H. Litzenberger (1989). Empirical test of the consumption-oriented CAPM. *Journal of Finance* 44(2), 231–262.
- Breetwor, C. (1991). SEC changes 'insider' reporting requirements. *Management Review* 80(5), 46–48.
- Brick, I. E., M. Statman, and D. G. Weaver (1989). Event studies and model misspecification: Another look at the benefits of outsiders from public information about insider trading. *Journal of Business Finance & Accounting* 16(3), 399–424.
- Brown, S. and J. Warner (1985). Using daily stock returns : The case of event studies. *Journal of Financial Economics* 14, 3–31.
- Brown, S. J. and J. B. Warner (1980). Measuring security price performance. *Journal of Financial Economics* 8, 205–158.
- Brown, S. J. and M. I. Weinstein (1985). Derived factors in event studies. *Journal of Financial Economics* 14(3), 491–495.

- Bundesanstalt für Finanzdienstleistungsaufsicht (2002). Schreiben der Bundesanstalt für Finanzdienstleistungsaufsicht zu den Mitteilungs- und Veröffentlichungspflichten gemäß § 15a WpHG vom 27. Juni 2002.
- Bundesanstalt für Finanzdienstleistungsaufsicht (2005, July). Emittentenleitfaden.
- Bundesanstalt für Finanzdienstleistungsaufsicht (2008, April). Jahresbericht der Bundesanstalt für Finanzaufsicht 2007.
- Bundesanstalt für Finanzdienstleistungsaufsicht (2009, May). Jahresbericht der Bundesanstalt für Finanzaufsicht 2008.
- Burmeister, E. and K. D. Wall (1986). The arbitrage pricing theory and macroeconomic factor measures. *The Financial Review* 21(1), 1–20.
- Campbell, C. J. and C. E. Wesley (1993). Measuring security price performance using daily NASDAQ returns. *Journal of Financial Economics* 33(1), 73–92.
- Campbell, J. Y. (2000). Asset pricing at the millennium. *Journal of Finance* 55(4), 1515–1567.
- Campbell, J. Y., A. W. Lo, and A. C. MacKinlay (1997). *The Econometrics of Financial Markets*. Princeton University Press, Princeton.
- Carlton, D. W. and D. R. Fischel (1983). The regulation of insider trading. *Stanford Law Review* 35(5), 857–895.
- Carpenter, J. N. and B. Remmers (2001). Executive stock option exercises and inside information. *Journal of Business* 74(4), 513–534.
- Chan, K. C. and N.-F. Chen (1991). Structural and return characteristics of small and large firms. *Journal of Finance* 46(4), 1467–1484.
- Chan, L. K. C., N. Jegadeesh, and J. Lakonishok (1996, December). Momentum strategies. *Journal of Finance* 51(5), 1681–1713.
- Chang, M. and I. Watson (2007, January). What are insider trades around profit warnings really telling us? Working Paper.
- Chang, S. and D. Y. Suk (1998). Stock prices and the secondary dissemination of information: The Wall Street Journal’s “Insider Trading Spotlight” column. *The Financial Review* 33(3), 115–128.
- Chatman Thomsen, L. (2006, September). Testimony concerning insider trading. In *Before the U.S. Senate Committee on the Judiciary*.
- Chen, N.-F. and J. Ingersoll, Jonathan E. (1983). Exact pricing in linear factor models with finitely many assets: A note. *Journal of Finance* 38(3), 985–988.
- Chen, N.-F., R. Roll, and S. A. Ross (1986). Economic forces and the stock market. *Journal of Business* 59(3), 383–403.
- Cheng, L. T. W., R. W. F. Szeto, and T. Y. Leung (2005). Insider trading activities before the simultaneous announcements of earnings and dividends. *Review of Pacific Basin Financial Markets & Policies* 8(2), 279–307.
- Cheng, Q. and K. Lo (2006). Insider trading and voluntary disclosures. *Journal of Accounting Research* 44(5), 815–848.
- Chopra, N., J. Lakonishok, and J. R. Ritter (1992). Measuring abnormal performance : Do stocks overreact? *Journal of Financial Economics* 31(2), 235–268.

- Clarke, J., C. Dunbar, and K. M. Kahle (2001, December). Long-run performance and insider trading in completed and canceled seasoned equity offerings. *Journal of Financial and Quantitative Analysis* 36(4), 415–430.
- Cohen, D. A., A. Dey, T. Z. Lys, and S. V. Sunder (2007, July). Earnings announcement premia and the limits to arbitrage. *Journal of Accounting and Economics* 43(2-3), 153–180.
- Collins, D. W. and W. T. Dent (1984). A comparison of alternative testing methodologies used in capital market research. *Journal of Accounting Research* 22(1), 38–84.
- Collins, D. W. and P. Hribar (2000, February). Earnings-based and accrual-based market anomalies: One effect or two? *Journal of Accounting and Economics* 29(1), 101–123.
- Corrado, C. J. (1989). A nonparametric test for abnormal security-price performance in event studies. *Journal of Financial Economics* 23(2), 385–395.
- Cramburg, F. z. and F. Hannich (2002). *Studien des Deutschen Aktieninstituts Heft 19*, Volume Heft 19, Chapter Directors' Dealings, Eine juristische und empirische Analyse des handels von Organmitgliedern mit Aktien des eigenen Unternehmens. Rosen, Rüdiger.
- Dann, L. Y., R. W. Masulis, and D. Mayers (1991). Repurchase tender offers and earnings information. *Journal of Accounting and Economics* 14(3), 217–251.
- D'Avolio, G. (2002). The market for borrowing stock. *Journal of Financial Economics* 66(2-3), 271–306.
- De Bondt, W. F. M. and R. Thaler (1985). Does the stock market overreact? *Journal of Finance* 40(3), 793–805.
- De Bondt, W. F. M. and R. H. Thaler (1987). Further evidence on investor overreaction and stock market seasonality. *Journal of Finance* 42(3), 557–581.
- De Long, J. B., A. Shleifer, L. H. Summers, and R. J. Waldmann (1990). Noise trader risk in financial markets. *The Journal of Political Economy* 98(4), 703–738.
- De Long, J. B. D., A. Shleifer, L. H. Summers, and R. J. Waldmann (1991). The survival of noise traders in financial markets. *Journal of Business* 64(1), 1–19.
- DeAngelo, H., L. DeAngelo, and D. J. Skinner (1996). Reversal of fortune dividend signaling and the disappearance of sustained earnings growth. *Journal of Financial Economics* 40(3), 341–371.
- Denis, D. K., J. J. McConnell, A. V. Ovtchinnikov, and Y. Yu (2003). S&P 500 index additions and earnings expectations. *Journal of Finance* 58(5), 1821–1840.
- Dennis, D. K. and J. J. McConnell (1986). Corporate mergers and security returns. *Journal of Financial Economics* 16(2), 143–187.
- Dhrymes, P. J., I. Friend, and N. B. Gultekin (1984). A critical reexamination of the empirical evidence on the arbitrage pricing theory. *Journal of Finance* 39(2), 323–346.
- Dickgiesser, S. and C. Kaserer (2009). Market efficiency reloaded: Why insider trades do not reveal exploitable information. *German Economic Review Early View*.
- Dimson, E. (1979, June). Risk measurement when shares are subject to infrequent trading. *Journal of Financial Economics* 7(2), 197–226.
- Dimson, E. and P. Marsh (1986, September). Event study methodologies and the size effect: The case of UK press recommendations. *Journal of Financial Economics* 17(1), 113–142.

- Dissanaike, G. and A. Le Fur (2003). On the use of the log car measure in event studies. *Journal of Business Finance and Accounting* 30(7-8), 1165–1170.
- Dodd, P. (1980). Merger proposals, management discretion and stockholder wealth. *Journal of Financial Economics* 8(2), 105–137.
- Doffou, A. (2003). Insider trading: A review of theory and empirical work. *Journal of Accounting and Finance Research* 11(1), 1–18.
- Duan, Y., G. Hu, and R. McLean (2007, November). Costly arbitrage and idiosyncratic risk: Evidence from short sellers. Working Paper.
- Dubow, B. and N. Monteiro (2006, March). Measuring market cleanliness. *FSA Occasional Papers* 23, 1–37.
- Dyckman, T., D. Philbrick, and J. Stephan (1984). A comparison of event study methodologies using daily stock returns: A simulation approach. *Journal of Accounting Research* 22, 1–30.
- Dymke, B. M. and A. Walter (2008). Insider trading in Germany - Do corporate insiders exploit inside information? *2nd Annual Conference on Empirical Legal Studies Paper* 1(2), 187–205.
- Edmister, R. O., A. S. Graham, and W. L. Pirie (1996). Trading cost expectations: Evidence from S&P 500 index replacement stock announcements. *Journal of Economics & Finance* 20(2), 75–85.
- Elliott, J., D. Morse, and G. Richardson (1984). The association between insider trading and information announcements. *The Rand Journal of Economics* 15(4), 521–536.
- Eyssell, T. H. (1990). Corporate insiders, toehold acquisitions, and information leakage: Do insiders tip their hands? *Akron Business and Economic Review* 2, 90–103.
- Fama, E. F. (1965). The behavior of stock-market prices. *Journal of Business* 38(1), 34–105.
- Fama, E. F. (1970). Efficient capital markets: A review of theory and empirical work. *Journal of Finance* 25(2), 383–417.
- Fama, E. F. (1976). *Foundations of Finance*. Basic Books, New York.
- Fama, E. F. (1991). Efficient capital markets: II. *Journal of Finance* 46(5), 1575–1617.
- Fama, E. F. (1998). Market efficiency, long-term returns, and behavioral finance. *Journal of Financial Economics* 49(3), 283–306.
- Fama, E. F., L. Fisher, M. C. Jensen, and R. Roll (1969). The adjustment of stock prices to new information. *International Economic Review* 10(1), 1–21.
- Fama, E. F. and K. R. French (1992, June). The cross-section of expected stock returns. *Journal of Finance* 47(2), 427–465.
- Fama, E. F. and K. R. French (1993, February). Common risk factors in the returns on stocks and bonds. *Journal of Financial Economics* 33(1), 3–56.
- Fama, E. F. and K. R. French (1996). Multifactor explanations of asset pricing anomalies. *Journal of Finance* 51(1), 55–84.
- Fama, E. F. and K. R. French (2004, January). The capital asset pricing model: Theory and evidence. CRSP Working Paper No. 550.
- Fama, E. F. and A. B. Laffer (1971). Information and capital markets. *Journal of Business* 44, 289–98.
- Farrar, J. H., N. Furey, B. Hannigan, and P. Wylie (1998). *Farrar's Company Law*. Butterworths, London.

- Feinendegen, S. and E. Nowak (2001, März). Publizitätspflichten börsennotierter Aktiengesellschaften im Spannungsfeld zwischen Regelberichterstattung und Ad-hoc-Publizität – Überlegungen zu einer gesetzeskonformen und kapitalmarktorientierten Umsetzung. *Johann Wolfgang Goethe-Universität Frankfurt am Main, Working Paper Series: Finance & Accounting* 70, 1–33.
- Fidrmuc, J. P., M. Goergen, and L. Renneboog (2006). Insider trading, news releases, and ownership concentration. *Journal of Finance* 61(6), 2931–2973.
- Figlewski, S. (1978). Market “efficiency” in a market with heterogeneous information. *The Journal of Political Economy* 86(4), 581–597.
- Financial Services Authority (2007). Financial Services Authority Annual Report 2006/07.
- Finnerty, J. E. (1976). Insiders and market efficiency. *Journal of Finance* 31(4), 1141–1148.
- Fleischer, H. (2002). Directors’ dealings. *Zeitschrift für Wirtschaftsrecht* 28, 1217–1229.
- Foster, F. D. and S. Viswanathan (1990). A theory of the interday variations in volume, variance, and trading costs in securities markets. *The Review of Financial Studies* 3(4), 593–624.
- Fowler, D. J. and C. H. Rorke (1988). Insider trading profits on the Toronto Stock Exchange, 1967–1977. *Canadian Journal of Administrative Sciences* 5(1), 13—25.
- Friederich, S., A. Gregory, J. Matatko, and I. Tonks (2002). Short-run returns around the trades of corporate insiders on the London Stock Exchange. *European Financial Management* 8, 7–30.
- Friedman, M. (1953). The case for flexible exchange rates. In *Essays in Positive Economics*. University of Chicago Press, Chicago.
- Garman, M. B. and J. A. Ohlson (1981, September). Valuation of risky assets in arbitrage-free economies with transactions costs. *Journal of Financial Economics* 9(3), 271–280.
- Giaccotto, C. and M. M. Ali (1982). Optimum distribution-free tests and further evidence of heteroscedasticity in the market model. *Journal of Finance* 37(5), 1247–1257.
- Givoly, D. and D. Palmon (1985). Insider trading and the exploitation of inside information: Some empirical evidence. *Journal of Business* 58(1), 69–87.
- Gombola, M., H. W. Lee, and F.-Y. Liu (1997). Evidence of selling by managers after seasoned equity offering announcements. *Financial Management* 26(3), 37–53.
- Gosnell, T., A. J. Keown, and J. M. Pinkerton (1992). Bankruptcy and insider trading: Differences between exchange-listed and OTC firms. *Journal of Finance* 47(1), 349–362.
- Gower, L. C. B. and P. L. Davies (2003). *Gower and Davies’ Principles of Modern Company Law*. Sweet & Maxwell, London.
- Graham, B. and D. L. Dodd (1934). *Security Analysis: Principles and Techniques*. McGraw-Hill, New York.
- Greenwald, B. C. (1983, August). A general analysis of bias in the estimated standard errors of least squares coefficients. *Journal of Econometrics* 22(3), 323–338.
- Gregory, A., J. Matatko, and I. Tonks (1997). Detecting information from directors’ trades: Signal definition and variable size effects. *Journal of Business Finance & Accounting* 24(3), 309–342.
- Gregory, A., J. Matatko, I. Tonks, and R. Purkis (1994). UK directors’ trading: The impact of dealings in smaller firms. *The Economic Journal* 104(422), 37–53.

- Grinblatt, M. and S. Titman (2001). *Financial Markets and Corporate Strategy*. McGraw-Hill, New York.
- Güttler, A. (2005). Wird die Ad-hoc-Publizität korrekt umgesetzt? *Zeitschrift für betriebswirtschaftliche Forschung* (57), 237–259.
- Harlow, W. and J. S. Howe (1993). Leveraged buyouts and insider nontrading. *The Journal of the Financial Management Association* 22(1), 109–118.
- Hartigan, J. C. and C. L. Rogers (2003). Equity purchases by insiders and the filing of antidumping petitions. *Review of International Economics* 11(5), 789–810.
- Hauser, S. E. (2003). *Informationsverarbeitung am neuen Markt: Eine empirische Analyse der Determinanten von Kursreaktionen auf Ad-hoc-Meldungen*. DUV.
- Heidorn, H., B. Meyer, and A. Pietrowiak (2004, August). Performance-Effekte nach Directors Dealings in Deutschland, Italien und den Niederlanden. *Arbeitsbericht der Hochschule für Bankwirtschaft* 57, 1–29.
- Henderson, Glenn V., J. (1990). Problems and solutions in conducting event studies. *The Journal of Risk and Insurance* 57(2), 282–306.
- Hienzsch, A. (2006a). *Das deutsche Insiderhandelsverbot in der Rechtswirklichkeit*. Nomos.
- Hienzsch, A. (2006b). Das Scheitern der Staatsanwaltschaften bei der Verfolgung von Börsenkriminalität — eine empirische Problemanalyse mit Lösungsvorschlägen am Beispiel des Insiderhandelsverbotes. *HRRS* 7(4), 144–151.
- Hillier, D. and A. Marshall (1998). The timing of directors' trades. *Journal of Business Law*, 454–467.
- Hillier, D. and A. P. Marshall (2002). Are trading bans effective? Exchange regulation and corporate insider transactions around earnings announcements. *Journal of Corporate Finance* 8(4), 393–410.
- Hirschey, M. and J. K. Zaima (1989). Insider trading, ownership structure, and the market assessment of corporate sell-offs. *Journal of Finance* 44(4), 971–980.
- Hirshleifer, D., A. Subrahmanyam, and S. Titman (2006, August). Feedback and the success of irrational investors. *Journal of Financial Economics* 81(2), 311–338.
- Hirshleifer, J. (1971). The private and social value of information and the reward to inventive activity. *The American Economic Review* 61(4), 561–574.
- Ho, T. and H. R. Stoll (1983). The dynamics of dealer markets under competition. *Journal of Finance* 38, 1053–1074.
- Holthausen, R. W. and R. E. Verrecchia (1988). The effect of sequential information releases on the variance of price changes in an intertemporal multi-asset market. *Journal of Accounting Research* 26(1), 82–106.
- Hopt, K. J. (1995). Grundsatz- und Praxisprobleme nach dem Wertpapierhandelsgesetz - insbesondere Insidergeschäfte und Ad-hoc-Publizität. *Zeitschrift für das gesamte Handelsrecht und Wirtschaftsrecht* 159(2), 135–163.
- Hu, J. and T. H. Noe (1997). The insider trading debate. *Federal Reserve Bank of Atlanta Economic Review Forth Quarter*, 34–45.
- Huddart, S., B. Ke, and C. Shi (2007). Jeopardy, non-public information, and insider trading around SEC 10-K and 10-Q filings. *Journal of Accounting and Economics* 43(1), 3–36.

- Hussain, S. I., J. S. Toms, and S. Diacon (2002, January). Financial distress, market anomalies and single and multifactor asset pricing models: New evidence. Working Paper.
- Ince, O. S. and R. B. Porter (2006). Individual equity return data from Thomson Datastream: Handle with care! Working Paper.
- Ingram, M. A. and V. C. Ingram (1993). Consistent estimation of residual variance in regulatory event studies. *Journal of Financial Research* 16(2), 151–160.
- Iqbal, Z. and P. L. Dheeriyaa (1991). A comparison of the market model and random coefficient model using mergers as an event. *Journal of Economics and Business* 43(1), 87–93.
- Jabbour, A. R., A. Jalilvand, and J. A. Switzer (2000). Pre-bid price run-ups and insider trading activity: Evidence from Canadian acquisitions. *International Review of Financial Analysis* 9(1), 21–43.
- Jackson, D. and J. Madura (2003). Profit warnings and timing. *Financial Review* 38(4), 497–513.
- Jackson, H. E. (2005). Variation in the intensity of financial regulation: Preliminary evidence and potential implications. *Harvard Law and Economics Discussion Paper No. 521*, 1–33.
- Jaffe, J. F. (1974a). The effect of regulation changes on insider trading. *The Bell Journal of Economics and Management Science* 5(1), 93–121.
- Jaffe, J. F. (1974b). Special information and insider trading. *Journal of Business* 47(3), 410–428.
- Jain, P. C. (1986). Analyses of the distribution of security market model prediction errors for daily returns data. *Journal of Accounting Research* 24(1), 76–96.
- Jain, P. C. (1987). The effect on stock price of inclusion in or exclusion from the S&P 500. *Financial Analysts Journal* 43(1), 58–65.
- Jegadeesh, N. (1992). Does market risk really explain the size effect? *Journal of Financial and Quantitative Analysis* 27(3), 337–351.
- Jegadeesh, N. and S. Titman (1993). Returns to buying winners and selling losers: Implications for stock market efficiency. *Journal of Finance* 48(1), 65–91.
- Jegadeesh, N. and S. Titman (2001). Profitability of momentum strategies: An evaluation of alternative explanations. *Journal of Finance* 56(2), 699–720.
- Jeng, L. A., A. Metrick, and R. Zeckhauser (2003). Estimating the returns to insider trading: A performance-evaluation perspective. *Review of Economics and Statistics* 85(2), 453–471.
- Jensen, M. C. (1969). Risk, the pricing of capital assets, and the evaluation of investment portfolios. *Journal of Business* 42(2), 167–247.
- Jensen, M. C. (1978). Some anomalous evidence regarding market efficiency. *Journal of Financial Economics* 6, 95–101.
- Jensen, M. C. (1994). Arbitrage, information theft, and insider trading. In *The New Palgrave Dictionary of Money and Finance*, pp. 50–52. Macmillan, New York.
- Jensen, M. C. and R. S. Ruback (1983). The market for corporate control : The scientific evidence. *Journal of Financial Economics* 11(4), 5–50.
- Jenter, D. (2005). Market timing and managerial portfolio decisions. *Journal of Finance* 60(4), 1903–1949.

- John, K. and L. H. P. Lang (1991). Insider trading around dividend announcements: Theory and evidence. *Journal of Finance* 46(4), 1361–1389.
- John, K. and B. Mishra (1990). Information content of insider trading around corporate announcements: The case of capital expenditures. *Journal of Finance* 45(3), 835–855.
- Jones, C. P. and R. H. Litzenberger (1970). Quarterly earnings reports and intermediate stock price trends. *Journal of Finance* 25(1), 143–148.
- Jostarndt, P. (2006). Financial distress, corporate control, and management turnover: A German panel analysis. Munich Business Research, Working Paper.
- Kaestner, R. and F.-Y. Liu (1996). Going private restructuring: The role of insider trading. *Journal of Business Finance & Accounting* 23(5/6), 779–806.
- Kahle, K. M. (2000). Insider trading and the long-run performance of new security issues. *Journal of Corporate Finance* 6(1), 25–53.
- Kahneman, D. and M. W. Riepe (1998). Aspects of investor psychology. *Journal of Portfolio Management* 24(4), 52–65.
- Kahneman, D. and A. Tversky (1979). Prospect theory: An analysis of decision under risk. *Econometrica* 47(2), 263–291.
- Kalay, A. and U. Loewenstein (1985). Predictable events and excess returns: The case of dividend announcements. *Journal of Financial Economics* 14(3), 423–449.
- Karafiath, I. (1994). On the efficiency of least squares regression with security abnormal returns as the dependent variable. *Journal of Financial and Quantitative Analysis* 29(2), 279–300.
- Karpoff, J. and D. Lee (1991). Insider trading before new issue announcements. *Financial Management* 20(1), 18–26.
- Kaserer, C. and C. Klingler (2008). The accrual anomaly under different accounting standards - Lessons learned from the German experiment. *Journal of Business Finance & Accounting Online Early*.
- Ke, B., S. Huddart, and K. Petroni (2003). What insiders know about future earnings and how they use it: Evidence from insider trades. *Journal of Accounting and Economics* 35(3), 315–346.
- Keim, D. B. and A. Madhavan (1998). The cost of institutional equity trades. *Financial Analysts Journal* 54(4), 50–69.
- Keown, A. J. and J. M. Pinkerton (1981). Merger announcements and insider trading activity: An empirical investigation. *Journal of Finance* 36(4), 855–869.
- King, M., A. Roell, J. Kay, and C. Wyplosz (1988). Insider trading. *Economic Policy* 3(6), 163–193.
- Klinge, M., U. Seifert, and R. Stehle (2005, November). Abnormal returns in the vicinity of insider transactions: Unbiased estimates for Germany. Working Paper.
- Korczak, A., P. Korczak, and M. Lasfer (2009, October). The strategic trading of insiders around news announcements. Working Paper.
- Kothari, S. P. and J. B. Warner (2007, May). Econometrics of event studies. In B. E. Eckbo (Ed.), *Handbook of Corporate Finance: Empirical Corporate Finance*, pp. 3–36. Elsevier B.V., Amsterdam. Working Paper.
- Kyle, A. S. (1985, nov). Continuous auctions and insider trading. *Econometrica* 53(6), 1315–1336.

- Kyle, A. S. and F. A. Wang (1997). Speculation duopoly with agreement to disagree: Can overconfidence survive the market test? *Journal of Finance* 52(5), 2073–2090.
- La Porta, R., F. Lopez-De-Silanes, and A. Shleifer (2006). What works in securities laws? *Journal of Finance* 61(1), 1–32.
- Laatz, W. (1993). *Empirische Methoden: Ein Lehrbuch für Sozialwissenschaftler*. Harri Deutsch, Frankfurt.
- Lakonishok, J. and I. Lee (2001). Are insider trades informative? *The Review of Financial Studies* 14(1), 79–111.
- Lakonishok, J., A. Shleifer, and R. W. Vishny (1994, December). Contrarian investment, extrapolation, and risk. *Journal of Finance* 49(5), 1541–1578.
- Lakonishok, J. and T. Vermaelen (1990). Anomalous price behavior around repurchase tender offers. *Journal of Finance* 45(2), 455–477.
- Lee, C. M. C., A. Shleifer, and R. H. Thaler (1990). Anomalies: Closed-end mutual funds. *The Journal of Economic Perspectives* 4(4), 153–164.
- Lee, C. M. C., A. Shleifer, and R. H. Thaler (1991). Investor sentiment and the closed-end fund puzzle. *Journal of Finance* 46(1), 75–109.
- Lee, D. S., W. H. Mikkelson, and M. M. Partch (1992). Managers’ trading around stock repurchases. *Journal of Finance* 47(5), 1947–1961.
- Lee, I. (1997). Do firms knowingly sell overvalued equity? *Journal of Finance* 52(4), 1439–1466.
- Leland, H. E. (1992). Insider trading: Should it be prohibited? *The Journal of Political Economy* 100(4), 859–887.
- Lin, J.-C. and J. S. Howe (1990, September). Insider trading in the OTC market. *Journal of Finance* 45(4), 1273–1284.
- Linklaters (2005, April). The new market abuse and disclosure regime in the UK.
- Lintner, J. (1965). The valuation of risk assets and the selection of risky investments in stock portfolios and capital budgets. *Review of Economics and Statistics* 47(1), 13–37.
- Liu, J. and F. A. Longstaff (2004). Losing money on arbitrage: Optimal dynamic portfolio choice in markets with arbitrage opportunities. *The Review of Financial Studies* 17(3), 611–641.
- Lo, A. W. (2000). Finance: A selective survey. *Journal of the American Statistical Association* 95(450), 629–635.
- Lo, A. W. and A. C. MacKinlay (1990). Data-snooping biases in tests of financial asset pricing models. *The Review of Financial Studies* 3(3), 431–467.
- Loderer, C. F. and D. P. Sheehan (1989). Corporate bankruptcy and managers’ self-serving behavior. *Journal of Finance* 44(4), 1059–1075.
- Lorie, J. H. and V. Niederhoffer (1968, April). Predictive and statistical properties of insider trading. *Journal of Law and Economics* 11(1), 35–53.
- Loughran, T. and J. R. Ritter (1995). The new issues puzzle. *Journal of Finance* 50(1), 23–51.
- Lowenstein, R. (2001). *When Genius Failed: The Rise and Fall of Long-Term Capital Management*. Random House, New York.

- Lucas, Robert E., J. (1978). Asset prices in an exchange economy. *Econometrica* 46(6), 1429–1445.
- Lustgarten, S. and V. Mande (1995). Financial analysts' earnings forecasts and insider trading. *Journal of Accounting and Public Policy* 14(3), 233–261.
- MacKinlay, A. C. (1997). Event studies in economics and finance. *Journal of Economic Literature* 35(1), 13–39.
- Madison, T., G. Roth, and A. Saporoschenko (2004). Bank mergers and insider nontrading. *Financial Review* 39(2), 203–229.
- Malatesta, P. H. (1986, March). Measuring abnormal performance: The event parameter approach using joint generalized least squares. *Journal of Financial and Quantitative Analysis* 21(1), 27–38.
- Malkiel, B. G. (1977). The valuation of closed-end investment-company shares. *Journal of Finance* 32(3), 847–859.
- Malkiel, B. G. (2003). The efficient market hypothesis and its critics. *Journal of Economic Perspectives* 17(1), 59–82.
- Mandelbrot, B. (1966). Forecasts of future prices, unbiased markets, and “martingale” models. *Journal of Business* 39(1), 242–255.
- Manne, H. G. (1966). *Insider trading and the stock market*. Free Press, New York.
- Markowitz, H. (1952). Portfolio selection. *Journal of Finance* 7(1), 77–91.
- Mashruwala, C., S. Rajgopal, and T. Shevlin (2006). Why is the accrual anomaly not arbitrated away? The role of idiosyncratic risk and transaction costs. *Journal of Accounting and Economics* 42(1-2), 3–33.
- McLaughlin, R., A. Safieddine, and G. K. Vasudevan (1996). The operating performance of seasoned equity issuers: Free cash flow and post-issue performance. *The Journal of the Financial Management Association* 25(4), 41–53.
- McLean, R. D. (2008, February). The limits to arbitrage, long-term reversal, and momentum. Working Paper.
- Mendenhall, R. R. (2004). Arbitrage risk and post-earnings-announcement drift. *Journal of Business* 77(4), 875–894.
- Merton, R. C. (1973). An intertemporal capital asset pricing model. *Econometrica* 41(5), 867–887.
- Merton, R. C. (1987). On the current state of the stock market rationality hypothesis. In R. Dornbusch, S. Fischer, and J. Bossons (Eds.), *Macroeconomics and Finance: Essays in Honor of Franco Modigliani*, pp. 93–124. MIT Press, Cambridge.
- Meulbroek, L. K. (1992). An empirical analysis of illegal insider trading. *Journal of Finance* 47(5), 1661–1699.
- Mikkelson, W. H. and M. M. Partch (1986). Valuation effects of security offerings and the issuance process. *Journal of Financial Economics* 15(1-2), 31–60.
- Miller, E. M. (1977, September). Risk, uncertainty, and divergence of opinion. *Journal of Finance* 32(4), 1151–1168.
- Mitchell, M. L. and E. Stafford (2000). Managerial decisions and long-term stock price performance. *Journal of Business* 73(3), 287–329.

- Monheim, B. (2007). *Kölner Reihe Band 116*, Chapter Ad-hoc-Publizität nach dem Anlegerschutzverbesserungsgesetz, pp. 1–416. Verlag Versicherungswirtschaft, Karlsruhe.
- Monteiro, N., Q. Zaman, and S. Leitterstorf (2007, March). Updated measurement of marker cleanliness. *FSA Occasional Paper 25*, 1–60.
- Mossin, J. (1966). Equilibrium in a capital asset market. *Econometrica* 34(4), 768–783.
- Märzheuser, M. and J. Gutzy (2004). Ad-hoc-Dienstleister in Deutschland. Studien Heft 1.
- Newkirk, T. C. and M. A. Robertson (1998). Insider trading - A U.S. perspective. In *16th International Symposium on Economic Crime*.
- Nicholson, S. F. (1960). Price-earnings ratios. *Financial Analysts Journal* 16(4), 43–45.
- Noe, C. F. (1999). Voluntary disclosures and insider transactions. *Journal of Accounting and Economics* 27(3), 305–326.
- Nowak, E. (2001). Eignung von Sachverhalten in Ad-hoc-Mitteilungen zur erheblichen Kursbeeinflussung. *Zeitschrift für Bankrecht und Bankwirtschaft* 13(6), 449–524.
- Odean, T. (1998). Are investors reluctant to realize their losses? *Journal of Finance* 53(5), 1775–1798.
- Osterloh, F. (2007). *Directors' Dealings*. Duncker & Humboldt, Berlin.
- Park, S., H. J. Jang, and M. P. Loeb (1995). Insider trading activity surrounding annual earnings announcements. *Journal of Business Finance & Accounting* 22(4), 587–614.
- Penman, S. H. (1982). Insider trading and the dissemination of firms' forecast information. *Journal of Business* 55(4), 479–503.
- Penman, S. H. (1984). Abnormal returns to investment strategies based on the timing of earnings reports. *Journal of Accounting and Economics* 6(3), 165–183.
- Persons, O. S. (1997, July). SEC's insider trading enforcements and target firms' stock values. *Journal of Business Research* 39(3), 187–194.
- Peterson, P. P. (1989). Event studies: A review of issues and methodology. *Quarterly Journal of Business & Economics* 28(3), 36–66.
- Pettit, R. R. and P. C. Venkatesh (1995). Insider trading and long-run return performance. *Financial Management* 24(2), 88–103.
- Pfister, B. (1981). Stand der Insiderdiskussion. *Zeitschrift für Unternehmens- und Gesellschaftsrecht* 10(2), 319–347.
- Pincus, M., S. Rajgopal, and M. Venkatachala (2007). The accrual anomaly: International evidence. *Accounting Review* 82(1), 169–203.
- Pontiff, J. (1996). Costly arbitrage: Evidence from closed-end funds. *The Quarterly Journal of Economics* 111(4), 1135–1151.
- Pontiff, J. (1997). Excess volatility and closed-end funds. *The American Economic Review* 87(1), 155–169.
- Pontiff, J. (2006). Costly arbitrage and the myth of idiosyncratic risk. *Journal of Accounting and Economics* 42(1-2), 35–52.
- Pontiff, J. and M. J. Schill (2003, October). Arbitrage holding costs and long run returns: Evidence from seasoned equity offerings. Working Paper.

- Pope, P. F., R. C. Morris, and D. A. Peel (1990). Insider trading: Some evidence on market efficiency and directors' share dealings in Great Britain. *Journal of Business Finance & Accounting* 17(3), 359–380.
- Pownall, G., C. Wasley, and G. Waymire (1993). The stock price effects of alternative types of management earnings forecasts. *The Accounting Review* 68(4), 896–912.
- Pratt, E. J. (1966). Myths associated with closed-end investment company discounts. *Financial Analysts Journal* 22(4), 79–82.
- Pratt, S. P. and C. W. DeVere (1970). Relations between insider trading and rates of returns for NYSE common stocks, 1960-1966. In *Modern Developments in Investment Management*, pp. 268–279. Praeger, New York.
- Przewlocka, M. (2007). Die rechtliche regelung von directors' dealings in deutschland und polen — unter berücksichtigung der neuerungen durch das transparenzrichtlinie-umsetzungsgesetz. *Beiträge zum Transnationalen Wirtschaftsrecht* 67, 1–64.
- Rajan, R. G. and L. Zingales (1995, December). What do we know about capital structure? Some evidence from international data. *Journal of Finance* 50(5), 1421–1460.
- Rau, M. (2004). *Directors' Dealings am deutschen Aktienmarkt. Empirische Analyse meldepflichtiger Wertpapiergeschäfte*. Ph. D. thesis, Universität Zürich.
- Reinganum, M. (1981). Misspecification of capital asset pricing: Empirical anomalies based on earnings yields and market values. *Journal of Financial Economics* 9(1), 19–46.
- Ritter, J. R. (1991). The long-run performance of initial public offerings. *Journal of Finance* 46(1), 3–27.
- Roll, R. (1988). R^2 . *Journal of Finance* 43(3), 541–566.
- Roll, R. and S. A. Ross (1980). An empirical investigation of the arbitrage pricing theory. *Journal of Finance* 35(5), 1073–1103.
- Rosenberg, B., K. Reid, and R. Lanstein (1985). Persuasive evidence of market inefficiency. *Journal of Portfolio Management* 11(3), 9–17.
- Ross, S. A. (1976). The arbitrage theory of capital asset pricing. *Journal of Economic Theory* 13(3), 341–360.
- Rozeff, M. and M. Zaman (1998). Overreaction and insider trading: Evidence from growth and value portfolios. *Journal of Finance* 53(2), 701–716.
- Rozeff, M. S. and M. A. Zaman (1988, January). Market efficiency and insider trading: New evidence. *Journal of Business* 61(1), 25–44.
- Samuelson, P. A. (1965). Proof that properly anticipated prices fluctuate randomly. *Industrial Management Review* 6(2), 41–49.
- Sanders, Ralph W., J. and J. S. Zdanowicz (1992). Target firm abnormal returns and trading volume around the initiation of change in control transactions. *Journal of Financial and Quantitative Analysis* 27(1), 109–129.
- Schlüter, U. (2002). *Börsenhandelsrecht*. Beck Juristischer Verlag, München.
- Scholes, M. and J. Williams (1977, December). Estimating betas from nonsynchronous data. *Journal of Financial Economics* 5(3), 309–327.

- Scholes, M. S. (1972). The market for securities: Substitution versus price pressure and the effects of information on share prices. *Journal of Business* 45(2), 179–211.
- Schultz, P. (1983). Transaction costs and the small firm effect: A comment. *Journal of Financial Economics* 12(1), 81–88.
- Schuster, G. (1996). *Die internationale Anwendung des Börsenrechts*. Springer, Berlin, Heidelberg, New York.
- Schwert, G. W. (2003). Anomalies and market efficiency. In *Handbook of the Economics of Finance*, Chapter 15, pp. 937–972. Elsevier B.V., Amsterdam.
- Scruggs, J. T. (2007, February). Noise trader risk: Evidence from the Siamese twins. *Journal of Financial Markets* 10(1), 76–105.
- Securities and Exchange Commission (2007, November). 2007 Performance and Accountability Report.
- Seyhun, H. N. (1986). Insiders' profits, costs of trading, and market efficiency. *Journal of Financial Economics* 16(2), 189–212.
- Seyhun, H. N. (1988). The information content of aggregate insider trading. *Journal of Business* 61(1), 1–24.
- Seyhun, H. N. (1990). Do bidder managers knowingly pay too much for target firms? *Journal of Business* 63(4), 439–464.
- Seyhun, H. N. (1992). The effectiveness of the insider-trading sanctions. *Journal of Law and Economics* 35(1), 149–182.
- Seyhun, H. N. (1998). *Investment Intelligence from Insider Trading*. MIT Press, Cambridge.
- Seyhun, H. N. and M. Bradley (1997). Corporate bankruptcy and insider trading. *Journal of Business* 70(2), 189–216.
- Shanken, J. (1982). The arbitrage pricing theory: Is it testable? *Journal of Finance* 37(5), 1129–1140.
- Sharpe, W. F. (1963). A simplified model for portfolio analysis. *Management Science* 9(2), 277–293.
- Sharpe, W. F. (1964). Capital asset prices: A theory of market equilibrium under conditions of risk. *Journal of Finance* 19(3), 425–442.
- Sheskin, D. J. (2004). *Handbook of Parametric and Nonparametric Statistical Procedures, 3rd Edition*. CRC Press, New York.
- Shiller, R. J. (1981). Do stock prices move too much to be justified by subsequent changes in dividends? *The American Economic Review* 71(3), 421–436.
- Shiller, R. J., S. Fischer, and B. M. Friedman (1984). Stock prices and social dynamics. *Brookings Papers on Economic Activity* 1984(2), 457–510.
- Shleifer, A. (1986). Do demand curves for stocks slope down? *Journal of Finance* 41(3), 579–590.
- Shleifer, A. (2000). *Inefficient Markets - An Introduction to Behavioral Finance*. Oxford University Press, Oxford.
- Shleifer, A. and R. W. Vishny (1990). Equilibrium short horizons of investors and firms. *The American Economic Review* 80(2), 148–153.
- Shleifer, A. and R. W. Vishny (1997). The limits of arbitrage. *Journal of Finance* 52(1), 35–55.
- Simon, S. (2005). Die neue Ad-hoc Publizität. *Der Konzern* 13.

- Sivakumar, K. and J. Vijayakumar (2001). Insider trading, analysts' forecast revisions, and earnings changes. *Journal of Accounting, Auditing & Finance* 16(2), 167–187.
- Sivakumar, K. and G. Waymire (1994). Insider trading following material news events: Evidence from earnings. *Financial Management* 23(1), 23–32.
- Sloan, R. G. (1996). Do stock prices fully reflect information in accruals and cash flows about future earnings? *The Accounting Review* 71(3), 289–315.
- Smith, C. W. (1986). Investment banking and the capital acquisition process. *Journal of Financial Economics* 15(1-2), 3–29.
- Smith, F. (1941). *Management Trading, Stock-Market Prices, and Profits*. Yale University Press, New Haven.
- Steiner, M. and T. Nowak (1994). Zur Bestimmung von Risikofaktoren am deutsche Aktienmarkt auf Basis der Arbitrage Pricing Theorie. *Die Betriebswirtschaft* 54, 347–362.
- Stevens, G. V. G. (1998). On the inverse of the covariance matrix in portfolio analysis. *Journal of Finance* 53(5), 1821–1827.
- Stoll, H. R. (1989). Inferring the components of the bid-ask spread: Theory and empirical tests. *Journal of Finance* 44(1), 115–134.
- Stoll, H. R. and R. E. Whaley (1983). Transaction costs and the small firm effect. *Journal of Financial Economics* 12(1), 57–79.
- Stotz, O. (2006). Germany's new insider law: The empirical evidence after the first year. *German Economic Review* 7(4), 449–462.
- Subrahmanyam, A. (2007). Behavioural finance: A review and synthesis. *European Financial Management* 14(1), 12–29.
- Summers, S. L. and J. T. Sweeney (1998, January). Fraudulently misstated financial statements and insider trading: An empirical analysis. *The Accounting Review* 73(1), 131–146.
- Tebroke, H.-J. and A. Wollin (2005). Directors' Dealings, Informationseffizienz and Handelsstrategien. *Die Unternehmung* 59(1), 31–54.
- Thompson, J. E. (1988). More methods that make little difference in event studies. *Journal of Business Finance & Accounting* 15(1), 77–86.
- Thompson, R. (1978). The information content of discounts and premiums on closed-end fund shares. *Journal of Financial Economics* 6(2-3), 151–186.
- Treynor, J. L. and F. Black (1973). How to use security analysis to improve portfolio selection. *Journal of Business* 46(1), 66–86.
- Tuckman, B. and J.-L. Vila (1992, September). Arbitrage with holding costs: A utility-based approach. *Journal of Finance* 47(4), 1283–1302.
- Udpa, S. C. (1996). Insider trading and the information content of earnings. *Journal of Business Finance & Accounting* 23(8), 1069–1095.
- Wang, G. (1984). Dirks v. Securities & Exchange Commission: An outsider's guide to insider trading liability under rule 10b-5. *American Business Law Journal* 22(4), 569–582.
- White, H. (1980). A heteroskedasticity-consistent covariance matrix estimator and a direct test for heteroskedasticity. *Econometrica: Journal of the Econometric Society* 48(4), 817–838.

- Wu, H. (1964). Corporate insider trading in the stock market 1957-1961. *National Banking Review* 2, 373–385.
- Wurgler, J. and E. Zhuravskaya (2002). Does arbitrage flatten demand curves for stocks? *Journal of Business* 75(4), 583–608.
- Xie, H. (2001). The mispricing of abnormal accruals. *Accounting Review* 76(3), 357–373.
- Xu, J. (2006, June). The effects of the Insider Trading Sanctions Act of 1984. Working Paper.
- Ziegler, A., M. Schröder, A. Schulz, and R. Stehle (2007). Multifaktormodelle zur Erklärung deutscher Aktienrenditen: Eine empirische Analyse. *Schmalenbachs Zeitschrift für betriebswirtschaftliche Forschung* 59, 355–389.
- Ziemons, H. (2004). Neuerungen im Insiderrecht und bei der Ad-hoc-Publizität durch die Marktmissbrauchsrichtlinie und das Gesetz zur Verbesserung des Anlegerschutzes. *Neue Zeitschrift für Gesellschaftsrecht* 537.
- Zweig, M. E. (1973). An investor expectations stock price predictive model using closed-end fund premiums. *Journal of Finance* 28(1), 67–78.