



TECHNISCHE  
UNIVERSITÄT  
DARMSTADT

# **The importance of governance and risk management in corporate finance: An empirical analysis of financing and interest rate risks**

vom Fachbereich für Rechts- und Wirtschaftswissenschaften der  
Technischen Universität Darmstadt

zur Erlangung des akademischen Grades  
Doctor rerum politicarum  
(Dr. rer. pol.)

*Genehmigte Dissertation*

von Christian Happ, M.Sc.  
geboren am 03. November 1985 in Greifswald, Deutschland

Tag der Einreichung: 14. April 2016  
Tag der mündlichen Prüfung: 29. Juni 2016  
Erstgutachter: Prof. Dr. Dirk Schiereck  
Zweitgutachter: Prof. Dr. Andreas Pfnür

Darmstadt, 2016

D17

## Table of contents

List of tables .....	IV
List of figures .....	V
List of abbreviations .....	VI
1 Introduction .....	1
1.1 Motivation and scope .....	1
1.2 Outline of the dissertation .....	4
2 The influence of ownership and capital structure on firm performance – A literature review .....	7
2.1 Introduction .....	7
2.2 The basics of capital structure and ownership structure .....	10
2.2.1 Capital structure .....	10
2.2.2 Ownership structure .....	13
2.3 Capital structure and firm performance: The role of debt .....	17
2.3.1 The effect of debt inside the firm .....	18
2.3.2 The effect of debt on the firm's market position .....	21
2.4 Ownership structure and firm performance: The role of equity owners .....	23
2.4.1 Managerial ownership .....	24
2.4.2 Large shareholders .....	26
2.4.3 Changes in ownership over time .....	32
2.5 The relation between leverage and ownership .....	36
2.6 Endogeneity .....	37
2.6.1 Causes of endogeneity .....	39
2.6.2 Remedies for endogeneity .....	40
2.6.3 Two selected models concerning endogeneity .....	43
2.6.3.1 Transaction cost theory .....	43

2.6.3.2	A structural model of the firm.....	45
2.7	Open issues and discrepancies in the literature.....	45
2.8	Conclusion .....	52
3	Seasoned equity offerings and corporate governance: Evidence from European real estate companies.....	54
3.1	Introduction.....	54
3.2	Theoretical background.....	57
3.2.1	Theory and empirical evidence of seasoned equity offerings .....	57
3.2.2	Hypotheses .....	63
3.3	Data .....	65
3.4	Methodology .....	66
3.4.1	Event study .....	66
3.4.2	Regression analysis .....	67
3.5	Results.....	69
3.5.1	Descriptive statistics .....	69
3.5.2	Shareholder wealth effects of secondary offerings.....	73
3.5.3	The impact of corporate governance on shareholder wealth effects .....	75
3.6	Conclusion .....	82
4	What drives expectations of future monetary policy? Evidence from federal funds derivatives and the zero lower bound.....	84
4.1	Introduction.....	84
4.2	Theoretical background and literature review .....	87
4.2.1	The market for federal funds derivatives.....	87
4.2.2	Related literature.....	89
4.3	Data .....	96
4.3.1	Macroeconomic announcements .....	96
4.3.2	Federal funds futures .....	99
4.3.3	Federal funds options .....	100

4.4	Methodology .....	101
4.4.1	Federal funds futures .....	101
4.4.2	Federal funds options .....	102
4.4.2.1	Option implied probabilities.....	102
4.4.2.2	The impact of macroeconomic announcements .....	104
4.5	Option implied probabilities estimates .....	107
4.6	The impact of macroeconomic surprises on monetary policy expectations .....	109
4.7	Conclusion .....	115
5	Concluding remarks .....	117
	References .....	121
	Appendix .....	142
A1.	Weighting of future contracts .....	142
A2.	Overview of FOMC meetings, decisions, and the assigned option contracts for probability estimation .....	143
A3.	Trading days and recovered probability estimates in the sample period .....	145
A4.	The impact of macroeconomic announcements on federal funds futures.....	146
A5.	The impact of cumulative employment and inflation information on the target rate probability .....	153
	Declaration of Honor .....	155

## List of tables

Table 3.1: Explanatory variables for the multiple regression analysis .....	68
Table 3.2: Distribution of events across offering type and market phase .....	70
Table 3.3: Distribution of events across countries and offering type .....	71
Table 3.4: Sample characteristics by offering type .....	72
Table 3.5: Announcement effects of seasoned equity offerings (N=142).....	73
Table 3.6: Results of the multiple OLS regression (Regression coefficients, t-values in parentheses).....	76
Table 4.1: Selected literature on macroeconomic announcements effects on fixed income securities and derivatives .....	92
Table 4.2: Descriptive statistics of macroeconomic indicators .....	97
Table 4.3: Expected change in probability $p^A$ of the ex post actually chosen target rate conditional on the sign of macroeconomic surprise and state of monetary policy .....	105
Table 4.4: Regression results.....	111
Table A.1: FOMC meeting dates and assignment of option contracts for probability estimation .....	143
Table A.2: Distribution of trading days, options trades and recovered probability estimates .....	145
Table A.3: Macroeconomic announcement effects on federal funds futures .....	147
Table A.4: Macroeconomic announcement effects on federal funds futures in the pre-crisis period.....	149
Table A.5: Macroeconomic announcement effects on federal funds futures in the crisis and ZLB period .....	151
Table A.6: The impact of cumulative information on option implied probabilities.....	153

## List of figures

Figure 1.1: Overview of the main chapters of the dissertation.....	4
Figure 3.1: Development of real estate indices and quarterly number of SEO announcements during the sample period from 1997 to 2013.....	70
Figure 3.2: Cumulative average abnormal returns over the event window [-10/+10] .....	75
Figure 4.1: Trading volume of 1-month federal funds futures contracts and federal funds target rate .....	88
Figure 4.2: Estimated target rate probabilities for the FOMC meeting in June 2005 .....	107
Figure 4.3: Development of the probability of the actually chosen target rate over time ( $p^A$ ) .....	108
Figure 4.4: Development of target rate probabilities from February to June 2005 .....	109

## List of abbreviations

2SLS	Two-stage least squares
AR/AAR	(Average) abnormal return
BMP	Boehmer/Masumeci/Poulsen (1991) (test)
bp	Basis points
CAR/CAAR	Cumulative (average) abnormal return
CapEx	Capital expenditures
CEO	Chief executive officer
CEPR	Centre for Economic Policy Research
CFO	Chief financial officer
CME	Chicago Mercantile Exchange
CPI	Consumer Price Index
DAX	Deutscher Aktienindex
Dimax	Deutscher Immobilienaktienindex
ECB	European Central Bank
Epix	Europäischer Immobilienaktienindex
EST	Eastern Standard Time
E&G	Ellwanger & Geiger
EUR	Euro
FE	Fixed effects
Fed	Federal Reserve
FFC	Federal funds call (option)
FFF	Federal funds future

FFO	Funds from operations
FFP	Federal funds put (option)
FFR	Federal funds rate
FOMC	Federal Open Market Committee
GDP	Gross domestic product
GMM	Generalized method of moments
HML	High minus low (i.e. value factor)
IPO	Initial public offering
IV	Instrumental variable
JF	The Journal of Finance
JFE	The Journal of Financial Economics
LBO	Leveraged buyout
MBO	Management buyouts
MKT	Market (factor)
MM	Modigliani and Miller
M&A	Mergers and acquisitions
NAPM	National Association of Purchasing Managers (Index)
NPV	Net present value
OECD	Organization for Economic Co-operation and Development
OLS	Ordinary least squares
PMI	(Chicago) Purchasing manager index
PP	Private placement
PPI	Producer Price Index



RDD	Regression discontinuity design
REIT	Real estate investment trust
RFS	The Review of Financial Studies
ROA	Return on assets
ROE	Return on equity
SEO	Seasoned equity offering
SMB	Small minus big (i.e. size factor)
UMD	Up minus down (i.e. momentum factor)
USD	US-Dollar
ZLB	Zero lower bound

# 1 Introduction

## 1.1 Motivation and scope

This dissertation deals with the role and importance of corporate governance and risk management from an empirical corporate finance perspective. Corporate finance and corporate governance literature are usually based on the assumption that ownership and control of a firm are separated (Shleifer/Vishny 1997).<sup>1</sup> The owners of a firm delegate control to the management. Due to asymmetrically distributed information and incomplete contracts, agency problems arise which can hamper the owners' objective of shareholder value maximization (Jensen/Meckling 1976). In this setup, the term corporate governance refers to the set of internal and external mechanisms and provisions that aim at safeguarding the interests of the firm's suppliers of finance (Shleifer/Vishny 1997). In this sense, corporate governance comprises prerequisites that debt and equity holders demand before entrusting their money to a firm and its managers. In contrast, risk management denotes managers' efforts to limit their firm's exposure to certain risks, e.g. interest rate risk, exchange rate risk, commodity price risk, in order to reduce variability of the firm's cash flows (Froot et al. 1993). This enhances firm value if reduced variability enables the firm to take advantage of valuable investment opportunities. This typically holds due to the fact that internally available funds for investments vary and external financing is costly (Froot et al. 1993). By reducing downside potential, risk management also helps managers meeting (corporate) governance-related requirements. Thus, corporate risk management and corporate governance are both tools that aim at controlling risks and the associated threat of decreasing returns on investment from the perspective of the firm's management and the firm's suppliers of finance, respectively.

As the field of corporate governance and risk management comprises a wide range of topics, I want to stress three specific aspects that will be addressed in the main chapters of this dissertation:

1. The contribution of capital structure and ownership structure to corporate governance

---

<sup>1</sup> Although one can legally distinguish between firm, company, and corporation, the terms are used interchangeably as synonyms throughout this dissertation.

2. The role of corporate governance in external financing: The case of seasoned equity offerings (SEOs)
3. Interest rate risk management: Anticipating central banks' target rate setting

These three governance and risk-related issues were chosen due to their vital role in the recent financial crisis. Following the recovery after the burst of the internet bubble in the early 2000s, the United States and Europe enjoyed economic upswing and prosperity. In 2006 and 2007, however, enormous risks in the US housing and subprime mortgage market materialized and gradually became noticeable as borrowers defaulted (Demyanyk/Van Hemert 2011). Due to the global interconnectedness of financial institutions and markets as well as the popular securitization of mortgage loans, the US subprime mortgage crisis caused severe financial turmoil that ultimately led to a global financial and economic crisis (Keys et al. 2010). The economy has recovered since then. However, the crisis' repercussions, such as the near-bankruptcy of Greece and central banks' target rates near zero percent, are still tangible. Although the main objective of this dissertation is not an in-depth analysis of the financial crisis, the investigated topics have certainly been affected by the crisis and the obtained results reflect the effects on corporations and the economy. Thus, this dissertation contributes to the academic literature by offering new insights as to how the crisis has shaped the prerequisites and requirements for risk management and corporate governance. Moreover, the financial crisis revealed which kinds of risk are particularly important for global and interconnected financial markets. In this respect, my dissertation also has implications for regulators concerning the prevention of future financial crises.

The three selected topics constitute some of the most important risks corporations have to cope with. First, the initial two topics deal with the type and availability of financing which is a matter of survival for corporations. Especially during times of financial turmoil, a lack of internally available funds forces firms to forgo valuable investment opportunities, which decreases firm value (Campello et al. 2010; Duchin et al. 2010). In order to avoid this, the question is addressed whether and how capital structure and ownership structure can contribute to corporate governance and thereby to the success of a company.<sup>2</sup> The first topic focuses on the status quo of capital and ownership structure and their respective value contribution. The second subject subsequently sheds light on the relation of corporate govern-

---

<sup>2</sup> Capital structure denotes the proportion of debt to equity a firm uses to finance its operations. Ownership structure designates the distribution of equity by investor type and concentration of shares.

ance and access to additional funds by issuing new shares. It is thus concerned with changes in capital structure and possibly in ownership structure.

Second, the risk of interest rate changes likewise represents a major challenge to corporations. Central bank actions are an important factor in this respect. Monetary policy makers intend to achieve price stability and sustainable economic growth usually by changing the (short-term) target interest rate. In this way, they attempt to affect the short end of the yield curve (Cook/Hahn 1989), which in turn can have an effect on longer-term interest rates (Kuttner 2001; Swanson/Williams 2014). Changes in medium- and long-term interest rates are of great importance since they affect firms' funding and consequently their investment opportunities. Therefore, forecasting future monetary policy actions is beneficial to firms in order to develop future financing and investment strategies. During the course of the previous financial crisis, regulators tried to limit the negative effects by taking unprecedented steps in fiscal and monetary policy. At times in concerted actions, central banks decreased target rates in order to avoid a credit crunch, stimulate lending and thereby foster investment and consumption. Due to the severity of the crisis, target rates in Europe and in the US hit new historic lows in 2008 and 2009 and eventually reached the zero lower bound (ZLB).<sup>3</sup> Until today short-term interest rates have not yet departed from the lower bound.<sup>4</sup> Accordingly, expected target rate changes are asymmetrically distributed. Besides, there is evidence that monetary policy follows a different regime during financial crises than it does during normal times (Martin/Milas 2013). Hence, the adaption of monetary policy forecasting models is indispensable in order to form reasonable expectations of future interest rates and debt financing opportunities. By applying appropriate models, firms are enabled to hedge interest rate risk and adjust their funding and investment strategy accordingly. This represents the final type of risk covered in this dissertation.

To sum up, in the main part of my dissertation I will deal with the aforementioned governance and risk-related topics. Each of the main chapters of my dissertation is dedicated to one of the three aspects. The next section provides a brief outline of the dissertation and describes how the three main chapters are organized and related to each other.

---

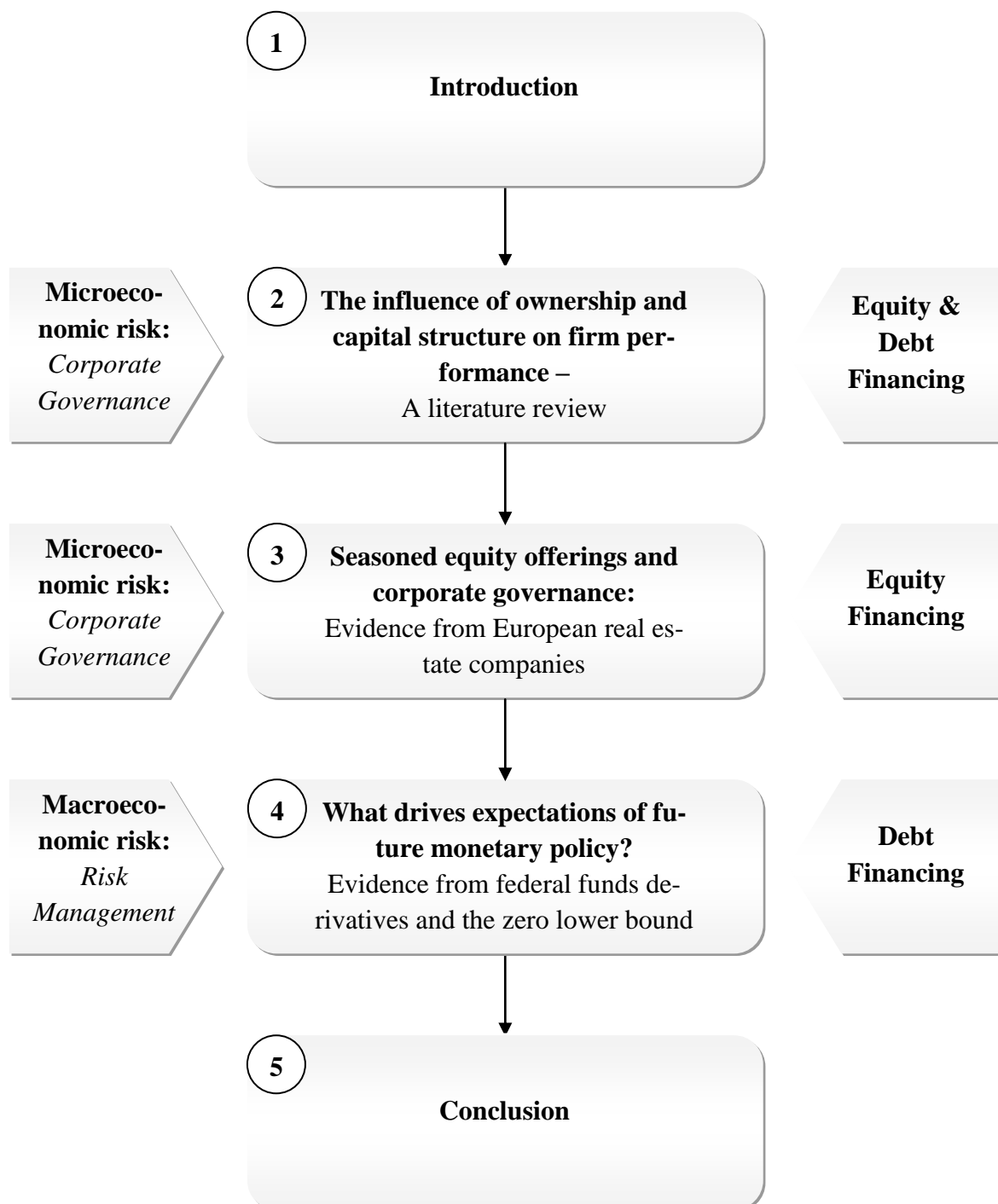
<sup>3</sup> The Federal Reserve and the Bank of England (BoE) decided for their last rate cuts in late 2008 and early 2009, respectively. This effectively constituted the ZLB with target rates between 0 and 0.25% in the US and 0.5% in the UK. In contrast, the European Central Bank (ECB) retained its main refinancing rate at 1% at that time and gradually decreased its target rate to 0% from 2011 to 2016 (European Central Bank 2016).

<sup>4</sup> While the Fed increased its target rate in December 2015 for the first time in nearly ten years, the ECB and the BoE have not yet opted for an increase in the target rate (as of April 2016).

## 1.2 Outline of the dissertation

Figure 1.1 shows a graphical representation of the three main chapters of this dissertation. The fields on the left-hand side of Figure 1.1 represent the distinction between microeconomic and macroeconomic risk that will be analyzed. The right-hand side adopts a corporate finance perspective and assigns the main chapters to debt and equity financing.

**Figure 1.1: Overview of the main chapters of the dissertation**



Chapters 2 and 3 are devoted to microeconomic risk and represent the corporate governance perspective of the dissertation. Broadly speaking, the corresponding chapters study effective management and governance of firms from a shareholder value perspective. The research question that the second chapter intends to answer is whether there is a systematic relationship between the financing structure of a firm, i.e. its capital structure and its ownership structure, and its value. Put differently, can managers increase firm performance and value by reasonably managing capital and ownership structure? Subsequently, chapter 3 addresses the related question whether good corporate governance can facilitate additional equity financing. Rephrased, the question becomes: Is well-functioning corporate governance a credible signal that helps avoiding losses in shareholder value when firms issue new equity?

Macroeconomic risk is addressed in chapter 4. The chapter is concerned with forecasting monetary policy actions. Instead of directly analyzing implications for shareholder value, this chapter develops a forecasting or warning tool which managers and regulators can use to protect shareholder value and react depending on economic development and market expectations, respectively. More specifically, chapter 4 deals with interest rate risk as implied by expected target rate changes by the Federal Reserve (Fed). As explained above, the Fed's monetary policy is intended to influence overall credit conditions through its impact on the term structure of interest rates. The research question addressed in this final chapter is how the announcement of macroeconomic indicators affects monetary policy expectations across different economic conditions. Taking into account the results of this investigation, managers can develop interest rate forecasting tools that incorporate the firm's expectations of future economic development. Since the risk of changing interest rates affects all firms and investors in an economy, it is categorized as macroeconomic risk throughout this dissertation. In order to detect this risk early enough to prevent decreases in firm value, firms can put in place effective risk management tools. Chapter 4 provides an instrument for this purpose. By covering one of the major risk factors associated with debt financing, the chapter additionally completes the picture of chapters 2 and 3 that primarily deal with equity financing.

Furthermore, the three selected topics of this dissertation can be classified alternatively. While chapters 2 and 4 highlight the relevance of governance and supervision in financial markets in general, chapter 3 is concerned with an additional aspect of major importance: the real estate sector. The crises in Europe and in the US were fostered or even caused by

housing market distortions. Risks associated with real estate valuation, the related lending standards, and securitization were identified as one of the major causes of the recent crisis (Duchin et al. 2010; Keys et al. 2010; Demyanyk/Van Hemert 2011; Dell’Ariccia et al. 2012). Apart from the financial crisis, housing and real estate are of great importance for several reasons. First, housing constitutes a sizeable share of the total economy amounting to nearly 16% of the US gross domestic product (GDP) in the fourth quarter of 2015 (U.S. Bureau of Economic Analysis 2016).<sup>5</sup> Therefore, it is an economically meaningful industry. Second, research suggests that real estate is an important asset class that should be included in efficient portfolios (e.g. Kallberg et al. 1996; Hudson-Wilson et al. 2003; Armonat/Pfnür 2004). Third, the value of firms’ real estate assets affects corporate investment through its eligibility to serve as collateral for debt financing (Chaney et al. 2012). Thus, real estate is also of great importance in the field of corporate finance. In order to account for its relevance, chapter 3 is devoted to real estate. By studying listed real estate companies, the chapter is located at the intersection of stock and real estate markets.

In addition to investigating several distinct topics, this dissertation is characterized by a variety of different methodologies. Chapter 2 begins with a comprehensive survey of literature. Thus, results and conclusions are drawn from a meta-analysis. Chapters 3 and 4 employ daily and intraday event study methodology in order to determine the impact of a specific sample of public announcements on capital markets. The event studies are subsequently followed by cross-sectional and panel regressions, respectively, which augment the investigation by identifying determinants of the documented announcement effects. Despite the methodologically different approaches, the commonality of all chapters is their reliance on capital market data.<sup>6</sup> This is a powerful tool in financial research as data is widely available.

Overall, governance and risk management seem to represent important corporate functions from the perspective of shareholders and other stakeholders. In the main part of this dissertation (chapters 2 to 4), I intend to provide supportive evidence for this by analyzing three specific subjects in detail. Finally, chapter 5 summarizes and concludes.

---

<sup>5</sup> This comprises personal consumption expenditures on housing and utilities services (12.3%) as well as gross private domestic residential investments (3.5%).

<sup>6</sup> Even chapter 2 indirectly relies on capital market data by reviewing mostly empirical finance literature.

## **2 The influence of ownership and capital structure on firm performance – A literature review**

### **2.1 Introduction**

The modern corporation is characterized by the separation of ownership and control. In their famous work, Berle and Means (1932) argue that dispersed ownership has a negative impact on firm performance because many small shareholders cannot effectively control the management. Managers pursue personal objectives which are, at times, detrimental to the shareholders' goal of profit maximization. Consequently, a lack of control results in decreases in shareholder value. The emerging literature following Berle and Means describes the behavior of firms that are not (entirely) controlled by their owners and the consequences of this behavior. The most popular article in this context is probably by Jensen and Meckling (1976) who base their argumentation on agency problems between managers (the agents) and owners (the principals), i.e. managers follow their own interests rather than acting on behalf of the shareholders. In consequence, resources are not allocated efficiently and firm value is destroyed. However, the separation of ownership and control is usually inevitable due to the separation of capital and entrepreneurship. Entrepreneurs or managers possess expertise in their respective business area whereas financiers have the necessary funds available (Shleifer/Vishny 1997). Thus, the two parties agree on a contract exchanging capital for ownership rights, i.e. control and cash flow rights (Hart 2001). In case capital is supplied on the basis of a debt contract, there is initially no transfer of control rights. Only if the entrepreneur (borrower) violates certain contractual arrangements (covenants), the lender may get control rights (Shleifer/Vishny 1997). A financing contract thus enables entrepreneurs to found and run their business and financiers to participate in the success of the business since the contract grants them some of the firm's cash flows. How safe is this guaranty? How can the financiers make sure that they get back their investment plus a return? The set of mechanisms to accomplish this is called corporate governance (Shleifer/Vishny 1997). The part of corporate governance related to debt and equity financing is the topic of interest of the present chapter.

The suppliers of finance want to assure that firm value is maximized which, in turn, maximizes their return. In order to achieve this, the managers who control the firm's operations need to be incentivized. Particular importance is attached to managerial equity ownership



since it aligns the incentives of managers with those of outside shareholders (Jensen/Meckling 1976). Moreover, the use of debt financing and thus the choice of an optimal capital structure play a major role. Debt puts pressure on managers to perform well as they face the legal obligation to make interest payments and repay the principle (Jensen 1986). To safeguard their interests, debt holders monitor the management and use covenants to prevent managerial pursuit of value-destroying objectives (Park 2000). Thus, through incentive alignment, monitoring, and control, the ownership structure and the capital structure of a firm represent an important piece of a firm's corporate governance framework. This framework aims at ensuring that the value of the firm is maximized. It is this intersection of corporate governance and corporate finance that motivates the present literature review. Since Modigliani and Miller (1958), economists try to understand how firms' financing decisions and structures influence performance and value. This chapter contributes to this research field by providing an overview of the scientific progress that has been made, both theoretically and empirically.

Academics have struggled finding a universal theory on capital structure as well as ownership structure that is able to reconcile the various empirical findings (see e.g. Harris/Raviv 1991). Recently, there has been promising research with the most striking theoretical insight being that there is in fact no cross-sectional relation between leverage, ownership structure, and firm performance (Coles et al. 2012). The main idea is that the financial policies within the firm are simultaneously optimized in order to maximize firm value. Thus, any cross-sectional differences between firms only reflect differences in the respective environment the firms operate in. Although the underlying idea is not new (see Demsetz 1983; Demsetz/Lehn 1985), the structural model by Coles et al. (2012) may help to achieve a wider acceptance of this fact or, alternatively, incite other researchers even more to find counterevidence.

In the preceding decades, a vast amount of literature on capital structure, ownership structure, and/or performance has emerged. However, notably fewer studies have explicitly dealt with this triangular relation and the inherent interdependence. In particular, it lacks an overview of all these studies and their results. I aim at filling this gap with this literature review. In order to limit the huge number of studies related to these topics, I focus on papers from The Journal of Finance (JF), the Journal of Financial Economics (JFE), and The Review of Financial Studies (RFS). In case of frequently cited studies, I also consider papers from other renowned finance journals such as the Journal of Financial and Quantita-

tive Analysis, the Journal of Banking and Finance, and the Journal of Corporate Finance. Furthermore, studies that solely examine specific countries and/or industries are disregarded.<sup>7</sup>

Several literature reviews are somehow related to the present one. Among the most prominent are the capital structure surveys by Harris and Raviv (1991), Myers (2001), Parsons and Titman (2009), and Graham and Leary (2011). Other related surveys deal with corporate governance (Shleifer/Vishny 1997), the board of directors (Hermalin/Weisbach 2003), block holders (Holderness 2003), block holders and corporate governance (Edmans 2014), family firms (Gama/Galvao 2012), or the interaction of capital structure and strategy (Parsons/Titman 2011).<sup>8</sup> To the best of my knowledge, there is only one literature review which explicitly considers the impact of ownership structure on firm performance as well as on capital structure. As a vast amount of relevant literature has emerged since this survey by Short (1994), an update is imperative. I contribute to the literature by structuring this research area, providing an overview of recent theoretical models and empirical findings and comparing these to earlier studies. Thereby, I illustrate how the understanding of the relation between capital structure, ownership structure, and performance has changed over time. For this purpose, differences in research designs and methodologies are stressed. Finally, I highlight unsettled issues and offer opportunities for future research.

The chapter proceeds as follows. Section 2.2 recaps the fundamental theories of capital structure and ownership structure and illustrates the potential linkage to firm performance. Section 2.3 reviews studies that explicitly deal with the effect that the use of debt can have on firm performance. Section 2.4 investigates the influence of the allocation of the firm's equity on performance. Section 2.5 explores the link between the two financial policies, i.e. capital and ownership structure. Section 2.6 focuses on endogeneity, its causes (2.6.1) and econometric remedies (2.6.2) and why it is highly relevant in the context of this literature review. In subsection 2.6.3, two models are briefly introduced that have gained considerable attention. These papers account for potential simultaneity of the firm's financial policies and thereby fundamentally question some of the earlier documented relations presented in sections 2.3, 2.4, and 2.5. Finally, section 2.7 points out unresolved questions and issues in the literature before section 2.8 concludes.

---

<sup>7</sup> The only notable exception is subsection 2.2.2 where some country-specific studies on ownership structure are discussed. I deem this justifiable since the ownership types that dominate in different countries vary significantly.

<sup>8</sup> See also Hart (2001) for a survey on financial contracting.

## 2.2 The basics of capital structure and ownership structure

This section addresses the fundamental theories and topics in capital structure as well as ownership structure research. It is intended to serve as a basis for sections 2.3 and 2.4 that deal with the performance link of those two financial policies in detail.

### 2.2.1 Capital structure

A review of capital structure literature always needs to start with the seminal paper by Modigliani and Miller (1958) (henceforth MM). According to their theory, assuming perfect and frictionless capital markets, capital structure does not matter because investors could undo any capital structure change on their own account whenever arbitrage opportunities emerge. Whether or not a firm is highly indebted does neither influence the value of the firm nor its cost of capital. Although this seems to be at odds with real world at first glance, the major contribution of their paper was the derivation of the conditions under which capital structure does not matter.<sup>9</sup> Subsequently, other theories of capital structure have emerged that gradually relax some of the MM assumptions and demonstrate how a firm's leverage ratio can matter.

First, the (static) tradeoff theory introduces (discriminating) taxes and costs of financial distress that did not exist in the frictionless MM world. However, their value implications can be substantial when leverage varies (e.g. Scott 1976). Since interest payments are tax deductible, firm value increases when firms lever up. On the other hand, the probability of bankruptcy increases substantially at high debt levels. This raises the costs of financial distress and therefore reduces firm value. Thus, firm value is maximized when the marginal value of tax shields of further increasing leverage is exactly offset by the enhanced costs of financial distress (Myers 2001).<sup>10</sup>

Accordingly, the functional form of firm value is an inverted U-shape of the firm's leverage ratio.<sup>11</sup>

---

<sup>9</sup> For a discussion of the real world "contradictions" to MM propositions, especially dividends, bankruptcy, and taxes, see Miller (1988). For an amendment of their model to allow for taxes and further discussion, see also Modigliani and Miller (1963); Miller (1977).

<sup>10</sup> See e.g. Kim (1978) and DeAngelo and Masulis (1980) for models of optimal capital structure including taxes. For theoretical models deriving a positive relation between leverage and probability of bankruptcy see e.g. Ross (1977) and Harris and Raviv (1990). Empirical evidence is provided e.g. by Marsh (1982), and Titman and Wessels (1988).

<sup>11</sup> Some models also include agency costs and benefits in the tradeoff of an optimal capital structure.

Second, the pecking order theory by Myers and Majluf (1984) and Myers (1984) assumes information asymmetries between the firm's insiders and its outsiders. In this setting, external investors, as opposed to the management, are neither able to value the firm's assets in place nor its growth opportunities. As managers seek to protect current shareholders' wealth, they would only issue equity if the firm is overvalued. The announcement of a security issue thus conveys negative information to outside investors. Therefore, these announcements are typically followed by share price drops (see e.g. Smith (1986a) for an overview). As debt holders' claims are fixed and senior to those of shareholders, debt is less information sensitive. Thus, the announcement of debt issues produces less negative stock price reactions.<sup>12</sup> The following pecking order results for financing decisions. First, internal financing is preferred since information asymmetries matter only for external financing. Second, if internal funds are not sufficient, debt is chosen as its issuance conveys less negative information to the market than an equity issue. Third, only the remaining financing gaps are closed using (external) equity. In consequence, the pecking order theory predicts a negative relation between profitability and leverage ratio. Since profitable firms, *ceteris paribus*, have more internal funds available to finance investment activities, they are less dependent on external financing and take on less debt. In contrast to the tradeoff theory, which assumes that firms have an optimal or target capital structure, the pecking order theory implies that a firm's capital structure is driven by its need to finance new investments using external funds.

Third, Baker and Wurgler (2002) formulated the market timing hypothesis. Based on asymmetric information, their theory assumes that managers persistently time the market when making financing decisions. The resulting capital structure is thus the outcome of managers grasping opportunities to issue overpriced equity and repurchasing it in the opposite case. In this model, however, share prices do not fully reflect the negative information after the issue announcement. Consequently, managers can actually shift wealth from new to existing shareholders (Denis 2012).<sup>13</sup> In contrast, Welch (2004) comes to the conclusion that changes in firms' capital structures are to a great extent driven by share price movements. Accordingly, changes in a firm's market value of equity without coun-

---

<sup>12</sup> In fact, if debt is assumed to be riskless no stock price reaction is predicted.

<sup>13</sup> Dittmar and Thakor (2007) propose an alternative theory in which managers issue equity when they want to finance a new project and expect investors to agree with their evaluation of the project's prospects. Since investor agreement can cause high stock prices their theory coincides with the empirical finding that equity is issued when stock prices are high.

terbalancing actions by the management are the main driver of changes in the leverage ratio in the short- to medium-term.

The previous three main theories have enjoyed great popularity due to their intuitive appeal. Nevertheless, neither of them alone has been able to explain the numerous facets of empirically observed capital structure patterns satisfactory.<sup>14</sup> Still, they are “useful conditional theories” (Myers 2001, p. 81). The tradeoff model is primarily challenged by the persistent empirical finding of a negative relation between profitability and leverage (e.g. Titman/Wessels 1988; Rajan/Zingales 1995; Graham/Leary 2011). In case of higher profitability, there is more profit that could be shielded from taxes by increasing leverage. This would predict exactly the opposite relation. Furthermore, firms’ leverage ratios are usually too low to fully exploit all potential tax benefits. According to Graham (2000), firms forgo a 15% increase in firm value because of deviations from their optimal capital structure. The agency cost of additional debt are likely too small to justify such low leverage ratios and the associated forgone benefits (Parrino/Weisbach 1999). The pecking order theory faces the issue that it cannot explain the observation of firms that are essentially all-equity financed and further issue equity instead of debt (e.g. Fama/French 2002; Strebulaev/Yang 2013). Still, the pecking order model has been found to explain the choice between debt and equity more accurately than the static tradeoff theory (Shyam-Sunder/Myers 1999). On the contrary, Fama and French (2002) conclude that each model has the aforementioned major flaw in its predictions. Due to many common empirical predictions that have been supported by empiricists, it is difficult to prefer one over the other. Finally, the market timing hypothesis is not able to adequately predict the decisions of firms to issue equity (Denis 2012). The short-term need for cash seems to be a much more important driver of this decision (DeAngelo et al. 2010).

In consequence, academics have adjusted the basic models by further relaxing the MM assumptions. According to the dynamic tradeoff model, firms still have a target capital structure but they face adjustment costs, e.g. issuance and transaction costs (e.g. Fischer et al. 1989; Leary/Roberts 2005). In case the costs of further moving toward the target leverage ratio outweigh the associated benefits, firms will prefer to maintain their status quo. An optimal *range* of capital structure emerges (Leary/Roberts 2005). Thus, there is only a gradual adjustment towards an optimal debt equity ratio with the speed of adjustment de-

---

<sup>14</sup> See Graham and Harvey (2001) for evidence of actual capital structure policies from a survey of chief financial officers (CFO).

pending on adjustment costs (Flannery/Rangan 2006; Faulkender et al. 2012).<sup>15</sup> Empirically, however, these adjustment costs do not seem to be large enough to justify the observed deviations from target capital structure and, moreover, adjustment is often even made in the “wrong” direction (Hovakimian 2004; Denis 2012). Furthermore, the target leverage ratio may change over time (Hovakimian et al. 2001).<sup>16</sup> This view is also supported by recent evidence by DeAngelo and Roll (2015) who question the wide-spread belief that a firm’s leverage ratio is time-invariant. In contrast, they document significant variation over longer time periods. Consequently, models with time-varying target leverage ratios are best-suited to describe the evolution of firms’ capital structures over time, followed by models with dynamic target ranges and static models with moderate speed of adjustment.<sup>17</sup>

Overall, dynamic capital structure models foster the reconciliation of theory and empirical evidence but they still do not get beyond the status of conditional theories. Certainly, there are far more theories on capital structure.<sup>18</sup> However, I do not intend to offer a complete overview here, but instead focus on the relation to ownership structure and performance.

### **2.2.2 Ownership structure**

The majority of academic studies dealing with ownership structure focuses on stakes owned by one or several top executives, the management or the board of directors. Due to the direct link between managerial decision making and the firm’s operations, and thus its performance, it seems natural to study managerial ownership first. However, equity ownership has many facets and other stakeholder groups should also be taken into account when investigating ownership structure and its influence on firm performance. The presence of large shareholders (block holders), institutional investors, family, or government owners has been shown in various studies to influence performance in some way. In this subsection, I describe the basic ownership types that have aroused the interest of academics. Ad-

---

<sup>15</sup> The adjustment costs, in turn, may vary depending on the firm’s financing needs (or surplus) and whether the firm’s current leverage ratio is above or below its target level (Byoun 2008). Also, the country in which the firm operates can be a determinant of the adjustment speed of capital structure (Öztekin/Flannery 2012). For example, institutional and legal conditions influence the costs and benefits of adjusting leverage which can slow down or accelerate this process.

<sup>16</sup> Strebulaev (2007) argues that the dynamic tradeoff model can remedy the major flaw of the static version. Accordingly, an increasing profitability leads to a higher market value of equity which in turn lowers the firm’s leverage ratio when no offsetting capital structure adjustments are implemented due to the associated costs.

<sup>17</sup> For additional evidence of long-term capital structure variation see also Graham et al. (2015).

<sup>18</sup> For an overview of non-tax related models see Harris and Raviv (1991). Graham and Leary (2011) provide a survey of recent empirical studies.

ditionally, I outline their typical performance impact. The ownership types as well as structures that prevail in different countries vary to a great extent.

Studying the ultimate ownership of large corporations in 27 wealthy economies La Porta et al. (1999) document the prevalence of controlling shareholders, typically families or the State, whereas ownership by financial institutions is less common.<sup>19</sup> In Europe, Faccio and Lang (2002) document that family and dispersed ownership are the dominating types of shareholdings. According to their study, large and financial firms are rather widely held whereas families more often own stakes in small and non-financial firms. In East Asia, Claessens et al. (2000) find that voting rights often exceed cash flow rights, especially in small and family firms. Further, they discover that in two thirds of the cases a firm is controlled by only one shareholder. In Japan, Prowse (1992) finds a high degree of ownership concentration. Among large shareholders financial institutions seem to play a dominant role which can be attributed to regulatory and legal conditions.<sup>20</sup> In comparison to the U.S., managerial ownership plays a secondary role. Contrary to the preceding study, *ultimate* ownership in Japan has been shown to be primarily widely dispersed (Claessens et al. 2000). This finding highlights the importance of distinguishing between ultimate and “simple” ownership in order to draw consistent conclusions.

Next, the theoretical foundation of the link between these various ownership types and performance is addressed. As mentioned above, Berle and Means (1932) stated that dispersed ownership has a negative impact on firm performance. However, Demsetz and Lehn (1985) suggest that “in a rational world” the existence of diffuse ownership structures does not imply inefficiency but is instead driven by value maximization. They argue that the costs of a more diffuse ownership structure, e.g. managers engaging in value decreasing activities due to a lack of control, are offset by the associated benefits, such as lower costs of raising capital. Accordingly, the extent to which the various costs and benefits of diffuse versus concentrated ownership apply to different firms determines the observed range of ownership structures. Varying structures thus only reflect different firm characteristics and/or different environmental conditions under which the firms operate. In equilibrium,

---

<sup>19</sup> Ultimate ownership means that if firm A’s shares are held by firm B then firm B’s ownership structure is further examined and so forth in order to finally determine the ultimate owner(s) of firm A (La Porta et al. 1999).

<sup>20</sup> Prowse (1992) further emphasizes the imperative distinction whether Japanese firms are independent or part of corporate groups, so-called keiretsu, as corporate governance mechanisms differ accordingly. In the case of ownership structure, however, he detects no significant differences. For evidence on the persistence and implications of Japanese corporate groups see e.g. McGuire and Dow (2003). An analysis of the inherent governance structures is provided by Berglöf and Perotti (1994).

each ownership structure is set in a way to maximize firm value. In support of this argument, Demsetz and Lehn (1985) do not find a significant relation between accounting profit rates and ownership. This result is also consistent with Demsetz (1983).<sup>21</sup>

The most prominent paper dealing with (managerial) ownership is by Jensen and Meckling (1976) who derive their conclusions from agency theory. They argue as follows. As ownership and control are separated, managers run (control) the firm on shareholders' behalf, but they own only a small fraction of its equity. Consequently, managers participate only partly in any change in equity value caused by their actions. As managers seek to maximize their own personal utility, they do not shy away from (equity) value decreasing behavior (e.g. empire building, shirking, consumption of perquisites) if it increases their personal utility. This gives rise to conflicts of interest. Thereby, the shareholders' goal of maximizing firm value is endangered. These conflicts of interest occur between managers and (outside) shareholders on the one hand, and equity holders and debt holders on the other hand.<sup>22</sup> In order to mitigate this problem, the objectives of managers and shareholders need to be aligned. Thus, managers need to be incentivized by increasing the sensitivity of their private wealth, and thus of their utility, to performance and overall value of the firm. This can be accomplished by performance-related pay, e.g. bonus payments, and equity-based compensation (e.g. Jensen/Murphy 1990; Kaplan 1994; Mehran 1995; Hall/Liebman 1998).<sup>23</sup> By granting managers a sizeable equity stake in the firm, agency problems are alleviated because managers' wealth depends on firm value.<sup>24</sup> In this way, they benefit from maximizing the value of the firm and act in line with shareholders' interests.

A complementing approach to incentivizing managers is external control through monitoring by shareholders. Small shareholders are typically assumed to be too uninformed and their actions are too uncoordinated to monitor efficiently. Even if they actually supervise the firm's management and observe misbehavior, they can hardly intervene because they do not possess sufficient voting rights. Large shareholders, on the contrary, have the resources and capability as well as the required voting power for disciplining the management. Therefore, they engage in monitoring. However, the anticipation of this behavior

---

<sup>21</sup> Demsetz (1983) was among the first to state that ownership and firm performance are endogenous variables. I explore this issue in detail in section 2.6.

<sup>22</sup> In the context of this literature review, I focus on the former conflict.

<sup>23</sup> For a counter view, see the model by Oyer (2004).

<sup>24</sup> For an analysis of the relation between equity-based compensation and managerial ownership see Ofek and Yermack (2000). An excellent review of theoretical and empirical studies on executive compensation is provided by Murphy (1999), a more focused review on equity-based compensation and incentives is presented by Core et al. (2003).



induces small shareholders not to monitor at all, which is known as free rider problem (Shleifer/Vishny 1997). Shleifer and Vishny (1986) show that the presence of large shareholders has a positive impact on firm value as well as a negative impact on small shareholders. The former finding supports the notion of efficient monitoring, the latter, however, points to a third type of agency conflict, i.e. between small and large shareholders.

The other aforementioned owner types likewise have a considerable impact on performance. The concept of banks monitoring borrowers is well established since Diamond (1984). Additionally, banks have been shown to be efficient monitors as large shareholders (Gorton/Schmid 2000).<sup>25</sup> In contrast, the implications of family ownership are not clear. For example, a negative impact was documented by Holderness and Sheehan (1988) whereas Anderson and Reeb (2003) detect a positive relation. Villalonga and Amit (2006) suggest that differentiation between family ownership, control, and management is essential in order to determine the impact on performance. Specifically, control rights in excess of cash flow rights appear to have an inverse effect on performance (Claessens et al. 2002; Lins 2003; Villalonga/Amit 2006; King/Santor 2008).<sup>26</sup> This is not only true for family firms but seems valid for all kind of firms (Gompers et al. 2010). Cronqvist and Nilsson (2003) estimate the associated agency costs to be in the range of 6 to 25 % of firm value for the median firm.<sup>27</sup>

Additionally, a founder chief executive officer (CEO) effect has been documented to enhance firm value whereas heirs as top executives have the opposite effect (e.g. Villalonga/Amit 2006; Fahlenbrach 2009). Burkart et al. (2003) suggest that this is due to the biased choice of heirs as top managers as opposed to externally hiring a more skilled professional manager. Empirical support is provided by Pérez-González (2006). The author confirms that nepotism deteriorates firm performance since it precludes effective labor market competition. Additional evidence suggests that if the founder of the firm retains a seat at the board of directors the externally hired CEO is better incentivized through pay-

---

<sup>25</sup> Gorton and Schmid (2000) examine the German market to derive their conclusions. However, La Porta et al. (1999) note that the exercise of control through shareholding banks is rather unusual in the developed countries they study. The German universal banking system obviously constitutes an exception. Notable differences exist between countries such as Germany and Japan as compared to the US since the US legal system imposes restrictions on bank equity ownership. Consequently, US banks play a less active role in corporate governance (e.g. Kroszner/Strahan 2001).

<sup>26</sup> Mechanisms resulting in higher control rights than cash flow rights include e.g. dual class shares, pyramidal structures, cross-shareholdings, or holdings through several control chains (e.g. La Porta et al. 1999; Faccio/Lang 2002; King/Santor 2008).

<sup>27</sup> See Grossman and Hart (1988) as well as Harris and Raviv (1988b) for theoretical models concerning the (value) effects of the one share/one vote policy and deviations therefrom.

for-performance and CEO retention policy (Li/Srinivasan 2011). This might be another explanation why heir-CEO firms underperform. Furthermore, founders or heirs may use their influence to make corporations less transparent for outside investors. This facilitates the extraction of private benefits of control such that corporate performance is harmed (Anderson et al. 2009).

In contrast to family ownership, government ownership has consistently been shown to have a negative impact on firm performance (e.g. Shleifer/Vishny 1997; Chen 2001).<sup>28</sup> Consistent with this finding, abandoning state ownership, i.e. privatizing firms, is accompanied by increases in performance (e.g. Megginson et al. 1994).<sup>29</sup> The reason is that control over state-owned firms is in fact exercised by bureaucrats whose interests are often politically motivated (Shleifer/Vishny 1994; Boubakri et al. 2013; Borisova et al. 2015). The bureaucrats in charge can exert enormous control but have virtually no cash flow rights since any profit accrues to the country's treasury (Shleifer/Vishny 1997). As in the context of family firms, this divergence has a value decreasing effect.

After having illustrated the basic capital structure theories and important types of equity ownership, including their relation to performance, the subsequent section will deal with models and empirical studies that explicitly scrutinize the link between leverage and performance as well as ownership structure and performance.

### **2.3 Capital structure and firm performance: The role of debt**

As explained above, the two traditional models of capital structure, i.e. the pecking order and the tradeoff theory, yield contradicting predictions concerning the use of debt and firm performance. So the question that arises is which role does the capital structure play on agents within the firm and how does this affect performance? In order to gain insights to this issue, I first dwell on several studies that directly examine this relationship. In the second part, I review papers that investigate the impact of debt on the firm's performance with respect to its position in the market, i.e. its product market power as well as its vulnerability in the takeover market.

---

<sup>28</sup> One notable exception is Borisova et al. (2015) who document that during times of financial turmoil (domestic) government equity ownership can reduce the costs of corporate borrowing. The authors interpret this effect as an implicit debt guarantee by the government. During normal times, however, the effect is reversed.

<sup>29</sup> Megginson and Netter (2001) provide a detailed survey of the literature on privatization.

### **2.3.1 The effect of debt inside the firm**

The most popular model is presumably the free cash flow theory by Jensen (1986). In this model, managers have the opportunity and willingness to invest the firm's free cash flows whether or not the firm has profitable investment opportunities, i.e. projects with a positive net present value (NPV). Managers seek to build empires and are able to pursue their objective due to a lack of monitoring and other disciplining mechanisms. Consequently, managers' investment decisions can destroy shareholder value because of overinvestment. The use of debt can mitigate this problem. Because managers commit themselves to a predetermined repayment schedule, part of the firm's free cash flows has to be used to service debt obligations. The reduced free cash flows restrict managerial discretion and thus prevent shareholder value destruction through overinvestment.<sup>30</sup> Hence, the use of debt has a positive impact on firm value. As in the tradeoff model, however, extremely high leverage ratios might offset the positive effect and instead be harmful to firm value because the management will also forgo positive NPV projects and thus underinvest (Myers 1977; Stulz 1990). The firm's optimal capital structure is determined by trading off the (agency) costs and benefits of debt (Jensen/Meckling 1976; Harris/Raviv 1991). McConnell and Servaes (1995) provide empirical evidence in support of this notion. However, they attribute the two contrasting effects of leverage (over- or underinvestment) to the availability of positive NPV projects to the firm. In high growth firms, i.e. firms with many profitable projects, the use of leverage might lead to underinvestment and thus result in reduced firm values. On the other hand, firms that only have few profitable projects can alleviate the underinvestment problem by increasing leverage. Thus, the optimal choice of leverage depends on the firm's growth options.

Alternative to underinvestment, Jensen and Meckling (1976) suggest the asset substitution problem as a different kind of agency cost of debt. As before, the management (on behalf of the shareholders) has incentives to invest in a risky project even if its NPV is negative. Due to their residual claim, equity holders gamble on unlikely but highly profitable project outcomes such that, on expectation, they receive a positive return. However, since the overall NPV is negative, equity holders can only profit at the expense of debt holders. The latter thus bear the entire cost in case of the more likely negative project outcome. If debt holders anticipate this behavior, they will pay less at issuance of the debt. Consequently,

---

<sup>30</sup> The concept of debt bonding in order to discipline management has also been suggested by Grossman and Hart (1982).

equity holders ultimately bear the costs of their behavior. Other models based on the idea that debt helps to reduce overinvestment and thus mitigates value declines through agency problems have been developed by Stulz (1990), and Zwiebel (1996). In both models, debt restricts managerial actions to create value (“disciplinary effect”, Edmans (2011)). In contrast, Edmans (2011) develops a theory in which risky debt provides the managers with more discretion. With risky debt outstanding equity ownership becomes more concentrated and a large equity holder has incentives to evaluate more accurately whether low short-term earnings are due to bad management or whether the investment is just long-term oriented. Thus, managers do not have to be afraid to be replaced when their investments do not generate immediate short-term profits. In this case, debt increases discretion which enhances firm value (“concentration effect”, Edmans (2011)).

Ross (1977) proposes an alternative model based on asymmetric information between firm insiders and outside investors. By issuing debt, the firm can signal its quality to the market because the management is confident of being able to fulfill the resulting obligations. This perception will lead to higher firm valuation. Empirical evidence in accordance with this model was provided by Harvey et al. (2004) for emerging market firms. They investigate how shareholder value is influenced by changes in capital structure through debt issues. Support for two distinct hypotheses is provided. First, the certification hypothesis states that firms issuing bonds for the first time experience an increase in equity value. As higher transparency and disclosure standards apply to the firm as well as the requirement to achieve a minimum annual performance in order to make the debt-related payments, investors revise their firm valuation upwards. Second, the recontracting hypothesis assumes that firms announcing subsequent debt issues will gain in value because they have successfully proven to be able to meet the aforementioned higher transparency and performance requirements. Overall, Harvey et al. (2004) find evidence supporting the notion that the use of debt can remedy reductions in firm value by aligning managerial incentives and alleviating overinvestment problems. An alternative signaling model has been put forward by Leland and Pyle (1977). In order to obtain external financing, the entrepreneur (the manager) has to signal her project’s quality by retaining a greater equity share. This signaling effect increases firm value. However, if she retains a greater equity share more debt needs to be raised due to the need for external funds. On the other hand, from the entrepreneur’s signal which causes a higher shareholder value it follows that more cash can be raised from selling the remaining equity. Under certain conditions, their model yields an equilibrium in

which firms with better quality projects also have higher debt levels. Thus, a positive relation between firm value and leverage arises.<sup>31</sup>

In contrast to the preceding models based on signaling and incentive alignment, the Harris and Raviv (1990) model assumes value generation due to active intervention by debt holders. Managers stick to their positions and are reluctant to discontinue the firm's operations even if this was the optimal strategy. In such a situation, debt provides creditors with the opportunity to liquidate the firm and thereby mitigates the agency problem between debt holders and managers. Thus, by disciplining the management, debt leads to increases in firm value.

So far, debt has been treated as one single security in order to determine its impact on firm value. However, debt is not standardized. There is bank lending versus capital market financing through bonds, short-term versus long-term, junior versus senior debt and so forth. Consequently, models have been developed that evaluate the efficacy of different types of debt in reducing asymmetric information or agency problems. For example, Flannery (1986) examines the maturity choice of debt in a signaling model. Accordingly, under certain conditions, firms are able to signal their good quality by issuing more short-term debt.<sup>32</sup> However, Barclay and Smith (1995) find little empirical evidence of signaling of firm quality by means of the maturity structure of corporate debt. But they document patterns consistent with a preference for short-term debt when information asymmetries are high. On the other hand, Hart and Moore (1995) deal with the effects of debt of different seniority in an agency setting while Stulz and Johnson (1985) analyze the effects of secured and unsecured debt on firm value. These models conclude that some profitable projects need to be forgone if the firm cannot fund the project with further senior or secured debt. This seems to be consistent with the prediction of the pecking order theory in that riskless debt is preferred over risky debt since it is less information sensitive. In the sense of the free cash flow theory, the model by Wang (2011) predicts that debt with higher coupon rates helps to increase firm value as it reduces the opportunity for managerial rent extraction.

---

<sup>31</sup> Harris and Raviv (1991) point out that only under the assumption of costly personal borrowing by the entrepreneur the Leland and Pyle (1977) model can be interpreted as a model of a firm's capital structure. Otherwise, it considers total debt, i.e. personal debt of the entrepreneur and corporate debt.

<sup>32</sup> This is because in the presence of information asymmetries the market will incorporate a higher probability of decline in creditworthiness (or default) into the required return on long-term debt (Flannery 1986). Hence, good quality firms try to avoid these costs of long-term debt.

Besides, the identity and dispersion of debt holders could also influence the degree to which control over the management is successfully exerted (Short 1994). In his seminal model, Diamond (1984) proved that banks are more efficient monitors than atomistic lenders are. In general, it has been argued that concentrated debt holders can control the management more efficiently due to the non-existence of disagreement between multiple lenders or free rider problems (Stiglitz 1985). Hence, one would expect firms with a more concentrated debt structure to achieve higher performance. This point is also stressed by Park (2000), who develops a model of debt seniority and maturity and concludes that monitoring is optimally implemented by one single senior debt holder. Furthermore, contrary to the traditional corporate finance view, Nini et al. (2012) point out that debt holders can in fact exert control well before a firm is in default. By setting up covenants in the credit arrangements, they can intervene in case of violation. The authors document that investments, leverage, and payout decrease whereas CEO turnover and performance increase following violations of financial covenants. Thus, debt holders actively and successfully engage in corporate governance. Covenants as well as collateral thereby serve as incentives to monitor (Rajan/Winton 1995). However, when debt holders have veto power over the firm's decisions, the effect on firm value tends to become negative (Berkovitch/Israel 1996). Therefore, firms aim to restrict the influence of banks by optimally choosing the source of debt and its seniority (Rajan 1992).

Another source of influence on managerial decision making is the concern for reputation. According to this view, the circumvention of bankruptcy is one of the management's top priorities. Managers tend to be conservative with respect to project choice and avoid taking on too much debt (Hirshleifer/Thakor 1992). This is especially true if managers are risk averse since they have put their entire human capital in the firm and are thus relatively undiversified (Amihud/Lev 1981; Friend/Lang 1988).

In sum, through monitoring, incentive alignment, signaling, reputational concerns of the management, threat of bankruptcy, or some combination of those, debt acts as a disciplining mechanism and reduces firm value discounts caused by agency costs and/or asymmetric information.

### **2.3.2 The effect of debt on the firm's market position**

Brander and Lewis (1986) paved the way for a different branch of corporate finance literature dealing with the effects of leverage on the product market performance of a firm ver-

sus its competitors, or more generally with the interaction between corporate financial policies and the product market strategy.<sup>33</sup> In brief, these models derive that leverage affects the payoffs to the firm's equity and debt holders and thereby changes the firm's equilibrium strategy with respect to product quantity and/or price. Since managers primarily focus on maximizing the value of equity, instead of overall firm value, debt-related payments by levered firms change the equity payoff structure and consequently influence managers' decisions with respect to the product market strategy (Harris/Raviv 1991). Theoretical and empirical studies provide evidence that firms employ leverage in order to compete more aggressively (e.g. Brander/Lewis 1986; Smith et al. 2012). Thereby, firms boost output, i.e. sales, in some cases even at the expense of a temporary decline in profitability.

Campello (2006) concludes that the effect of leverage on firm performance is non-monotonic. By increasing leverage, a firm can outperform its rivals with respect to sales increases in a competitive environment. Above a certain leverage ratio, however, the effect is reversed and the firm's product market performance decreases relative to that of its competitors. The finding of an inverted U-shaped relation between leverage and product market performance reconciles empirical evidence (Chevalier 1995a, b; Kovenock/Phillips 1995; Phillips 1995; Kovenock/Phillips 1997) with the theoretical predictions by Brander and Lewis (1986). The empirical papers document, contrary to Brander and Lewis (1986), that high leverage can lead to less aggressive product market behavior, reduced investments and production, and finally strengthen the competitors' positions. Furthermore, when exposed to an exogenous shock such as deregulation, highly levered firms are less likely to survive (Zingales 1998). Evidently, leverage enhances a firm's product market performance up to a certain point. However, as proved by the empirical studies, there is also a downside when debt levels become too high. Accordingly, firms weigh up the costs and benefits of debt in order to choose an optimal debt level in a competitive environment.

Furthermore, corporate debt can play an important role in corporate control contests. Several theoretical models argue unanimously that the managers of firms that become targets of a takeover attempt increase leverage in order to avoid losing control over the firm as well as their job-related personal benefits. In Harris and Raviv (1988a), managers issue debt and subsequently repurchase equity in order to increase their fraction of voting rights

---

<sup>33</sup> Other early theoretical papers on this topic include Titman (1984); Maksimovic (1988); Maksimovic and Titman (1991). An extensive review on this branch of research is offered by Maksimovic (1995).

in the firm. In Stulz (1988), one possibility to obtain a higher equity stake for the management is also to increase leverage. The optimal leverage ratio maximizes the value of outside shareholders' equity in order to make it more expensive for the bidder to buy the remaining shares outstanding and thus less likely to complete the takeover. Likewise, the model by Israel (1991) predicts higher gains to the target firm's shareholders and a lower probability of a successful takeover in response to leverage increases but for somewhat different reasons.<sup>34</sup> However, these changes in capital structure are mostly temporary and do not affect the long-term capital structure of the firm (Harris/Raviv 1991). Overall, these models predict increases in leverage in response to a takeover threat. This enhances the expected shareholder value because target shareholders capture the gains of a rising stock price in case of a successful takeover. For failed takeover attempts, Safieddine and Titman (1999) also find superior stock performance. They conclude that, by increasing leverage, managers do not entrench themselves but commit themselves to delivering a higher performance. This is consistent with the free cash flow theory. In line with the aforementioned models, Garvey and Hanka (1999) show that firms that are protected by antitakeover laws decrease their leverage ratios while unprotected firms do the opposite. This provides empirical evidence for the view that managers dislike debt-induced performance pressures but are willing to accept them when their firm faces a takeover threat that could endanger their position.<sup>35</sup>

## **2.4 Ownership structure and firm performance: The role of equity owners**

As set out above, the separation of ownership and control constitutes the major feature of the modern corporation and might lead to inefficiencies resulting in firm value reduction.<sup>36</sup> The reason is that the costs and benefits of control do not accrue to the same extent to the respective decision maker (Jensen/Meckling 1976; Fama/Jensen 1983). The monetary incentives set by share ownership reveal two basic ways of how ownership might influence firm performance. First, ownership in the hands of the management partly reunifies ownership and control. Thereby, the problems arising from their separation in the first place mostly disappear. Managerial incentives are aligned to those of other shareholders and

---

<sup>34</sup> For an insightful description of the three models as well as their predictions and underlying assumptions, see Harris and Raviv (1991, pp. 319-325).

<sup>35</sup> See also the model by Zwiebel (1996).

<sup>36</sup> Unless otherwise indicated, I refer to ownership as the resulting cash flow rights from owning shares of a company. In the base case, I assume no difference between cash flow and voting rights.



inefficiencies are reduced because the differential accrual of costs of and benefits from management's decisions diminishes. When managers' wealth is directly related to firm value the objectives of shareholders and managers become congruent. Unfortunately, perfect incentive alignment is rarely feasible. This emphasizes the necessity of the second channel of impact, i.e. monitoring. External shareholders, who own the firm, monitor the managers, who control the firm, in order to prevent inefficient managerial decisions caused by managers' self-interest and too much discretion. As small shareholders likely face free rider problems, monitoring is primarily carried out by owners of larger stakes in the firm. This is due to two reasons. First, large shareholders combine sufficient voting rights in order to intervene. Second, the absolute wealth invested in the respective firm fans the fear of potentially huge losses and thereby fosters the desire for control which makes active monitoring more likely. As Shleifer and Vishny (1997, p. 758) have put it, large shareholders "have both the interest in getting their money back and the power to demand it." In the following, I will initially elaborate on these two basic lines of corporate ownership literature, i.e. managerial and large shareholdings.<sup>37, 38</sup> Subsequently, I will address another aspect of corporate ownership, namely takeovers. A takeover which is related to changes in ownership structure or the threat of a looming takeover also acts as a disciplining mechanism to the management. Leveraged buyouts as a special type of takeovers are additionally related to changes in capital structure which makes them particularly relevant in the context of this literature review.

#### **2.4.1 Managerial ownership**

As explained in subsection 2.2.2, the concept of incentive alignment through managerial ownership has been put forward by Jensen and Meckling (1976).<sup>39</sup> However, the relation between managerial ownership and performance thereby established is not linear. Managers' effort to engage in firm value maximization cannot be increased continuously merely by granting them a greater stake in the firm. At higher ownership levels, other incentive mechanisms set in which may finally outweigh the beneficial incentive alignment effect. The existence of a non-linear relation between ownership and firm value has been found by

---

<sup>37</sup> Of course, corporate ownership structures are not solely determined by the interests of different shareholder groups. External factors, such as the political system, legal restrictions, or economic (de-)regulation, etc. also influence corporate ownership (as well as capital structure) (e.g. Roe 1990; Shleifer/Vishny 1997). But for the purpose of this literature review, I focus on firm-related governance issues and only briefly touch on the impact of environmental differences or changes.

<sup>38</sup> The terms large shareholders and managerial shareholders are used mutually exclusive in this literature review.

<sup>39</sup> Morck et al. (1988) as well as some other studies refer to the same concept as "convergence of interests".

Morck et al. (1988); Wruck (1989); McConnell and Servaes (1990); Hermalin and Weisbach (1991); McConnell and Servaes (1995), among others. The two studies by McConnell and Servaes document an inverted U-shaped relation between managerial ownership and value supporting the notion that there are two opposing effects.<sup>40</sup> Moreover, a bell-shaped relation suggests the existence of a value-maximizing level of managerial ownership. At lower ownership levels, the incentive alignment effect leads to a rising firm value when managerial ownership is increased. However, beyond the optimum, a further increase in ownership has a negative impact on firm value. This can be attributed to managerial entrenchment effects (e.g. Shleifer/Vishny 1989; Claessens et al. 2002). Entrenched managers make “themselves valuable to shareholders and costly to replace” (Shleifer/Vishny 1989, p.123). They engage in activities to secure their positions. This subsequently enables them to extract private benefits of control. Such behavior may include the choice of a lower-than-optimal leverage ratio because managers want to reduce risks since they are relatively undiversified (e.g. Berger et al. 1997; Brailsford et al. 2002), the expropriation of minority shareholders (Shleifer/Vishny 1997), the consumption of corporate resources (e.g. Fama/Jensen 1983; Yermack 2006), making manager-specific investments (Shleifer/Vishny 1989), or the prevention of value-enhancing takeovers (e.g. Dann/DeAngelo 1988; Harris/Raviv 1988a; Malatesta/Walkling 1988; Ryngaert 1988; Stulz 1988; Slovin/Sushka 1993). All of these activities can lead to decreases in firm value. Benson and Davidson III (2009) and Kim and Lu (2011) suggest risk aversion as the reason for the value discounts at higher managerial ownership levels. When the CEO possesses a huge ownership stake and accordingly a sizeable portion of voting rights she will choose a low-risk strategy for the firm and only invest in low-risk projects. Thereby, she reduces the risk of her own portfolio which is relatively badly diversified given her equity stake in the firm. However, the firm will forgo risky but profitable investment opportunities and thereby suffer from value decreases. Accordingly, an optimal choice of managerial ownership is imperative in order to maximize the value of the firm.<sup>41</sup> In the context of

---

<sup>40</sup> The results of Morck et al. (1988), Wruck (1989), and Hermalin and Weisbach (1991) also find a positive relation between firm value and ownership at low ownership levels and a negative relation at higher ownership levels. However, the relation turns positive again at even higher ownership levels. The three papers estimate piecewise linear regression models instead of a quadratic model, as in McConnell and Servaes (1990, 1995). This makes a direct comparison difficult.

<sup>41</sup> It should be noted that there are different empirical approaches to determining “managerial ownership”. In some cases it includes only the shares owned by the CEO, other papers use the shares owned by the entire board of directors. However, the underlying concept of incentive alignment versus entrenchment, or risk aversion, is the same. I deal with problems arising from an inconsistent definition of ownership categories in section 2.7.

stock market returns, Lilienfeld-Toal and Ruenzi (2014) provide additional evidence of the importance of managerial ownership. They show that a trading strategy that is long in high managerial ownership firms and short in no ownership firms yields considerable abnormal returns. Likewise, they are able to show that their findings are attributable to incentive effects of managerial ownership.

#### **2.4.2 Large shareholders**

Large shareholders might have a considerable influence on the firm. They are able to discipline the managers, e.g. by the threat of replacing them in case of insufficient performance or incompetence (Cornelli et al. 2013). In this way, they can influence the firm's operations and its performance. Naturally, a substantial amount of research has been devoted to this topic. It has been argued that dispersed ownership makes monitoring costly and inefficient (Berle/Means 1932). That is why this task is primarily left to large shareholders. Through the concentration of cash flow and voting rights, large shareholders are able and willing to control and discipline the management. Thereby, agency problems between managers and external shareholders are mitigated which can lead to enhanced performance as well as increases in shareholder value. However, the term large shareholder can comprise many different owner types such as individual or corporate shareholders, families, or the State. As discussed in subsection 2.2.2, different types of shareholders pursue different objectives and thus might have a differential impact on performance. Hence, it is crucial to identify the type of large shareholder when investigating its performance impact (Short 1994). Furthermore, distinguishing between controlling majority shareholders and large minority shareholders seems imperative.

For the latter type, Shleifer and Vishny (1986) develop a model showing that those shareholders have a positive impact on firm value. If the management is not maximizing profits, large shareholders can step in and implement operational improvements either through negotiations with the current management or by replacing it after a takeover. Large shareholders are willing to bear those monitoring costs because they participate in the resulting value increases. For majority shareholders, Holderness and Sheehan (1988) empirically find no significant differences in accounting returns and valuation as compared to firms characterized by a diffuse ownership structure.<sup>42</sup> This finding is consistent with entrenchment effects of the largest shareholder (Claessens et al. 2002). They do, however, find

---

<sup>42</sup> According to their classification, every firm that does not have a shareholder owning at least 20 % of the firm's stocks is widely held.

some differences based on the identity of the major shareholder, i.e. whether it is an individual or a corporate owner.

Zeckhauser and Pound (1990) emphasize the necessity to distinguish between firms from industries with low or high asset specificity, as measured by research and development intensity. They argue that efficient monitoring by large shareholders becomes increasingly difficult for firms with highly specific assets because management's decisions are hard to understand and evaluate from the outside investors' perspective. Hence, in this case large shareholders might not be able to contribute to a better performance through monitoring.<sup>43</sup> Confirming their hypothesis, they report a positive effect by large shareholders only for firms from industries with low asset specificity.

In addition to their findings on managerial ownership, McConnell and Servaes (1990, 1995) document a positive impact by institutional shareholders on firm value. On the other hand, the presence of block holders does not seem to play a crucial role. On the contrary, Pound (1988) provides evidence for two hypotheses regarding the collusion of large institutional shareholders with the firm's management. This contradicts the concept of efficient monitoring. According to their strategic alignment and their conflict of interest hypothesis, large institutional block holders vote in favor of the current management during a proxy contest. This is either due to strategic cooperation with the management, or because of an "asymmetric" disclosure of the voting.<sup>44</sup> As a consequence, the probability that a proxy fight takes place as well as that the dissident succeeds decrease. Anticipating this, a potential dissident is less likely to initiate a proxy fight. Thus, the pressure on inefficient managers should be lower in the presence of large institutional investors allowing for more managerial discretion. This suggests a negative relation to firm performance which is exactly what Pound finds. Further evidence of institutional shareholders voting in favor of the management can be found in Brickley et al. (1988) who analyze votings concerning anti-takeover amendments. Their findings indicate that institutional investors might neglect their monitoring role in favor of an existing or potential business relationship with the firm. However, if the management's proposal seems to be detrimental to shareholders' interests, institutions more likely oppose (Brickley et al. 1988). Likewise, foreign or independent

---

<sup>43</sup> Quite similarly, Kahn and Winton (1998) suppose that the "transparency" of a firm, i.e. whether it is large and covered by many analysts, influences the decision of institutional investors to intervene when management is doing poorly.

<sup>44</sup> According to Pound (1988), the firm's management can observe the institutional investor's voting whereas the shareholders of the institution cannot. This incentivizes the institutional shareholder of the firm to vote in favor of the management in order not to endanger the business relationship.

institutional investors, such as mutual funds, who are less likely bound to the firm have been documented to be more active monitors (e.g. Chen et al. 2007; Cornett et al. 2007; Ferreira/Matos 2008) and can therefore adopt riskier investment strategies in order to foster performance and growth (Boubakri et al. 2013). These findings highlight the important distinction between dependent and independent institutional investors when investigating their role as monitors. Further support for the heterogeneity of institutional investors is provided by Woidtke (2002). She documents a differential impact on firm value by private versus public pension funds as institutional shareholders. She argues that this difference is likely due to different objectives that the fund administrators pursue. While private pension fund managers are incentivized to monitor the firm by performance-based compensation, public funds' actions are also driven by political and social motives (Woidtke 2002). Concerning the question as to how block holders exercise influence over the management, Hartzell and Starks (2003) find that institutional shareholders alleviate agency problems through their influence on executive compensation. Moreover, it has been documented that higher institutional ownership is associated with lower informational asymmetries and greater stock liquidity which can facilitate monitoring (Boone/White 2015).

Cronqvist and Fahlenbrach (2009) further emphasize the heterogeneity within the group of large investors. By studying *individual* block holders of firms, the authors conclude that large shareholders have distinct approaches of how to invest and govern a firm. These differences among large shareholders can lead to variation in firm performance. Specifically, block holders who possess a larger share of the firm, who are members of the board, or who are directly involved in the management exhibit a larger effect on financial policies, such as the choice of leverage, and firm performance. The authors interpret these features as characteristics that determine the block holder's ability to monitor and intervene effectively.

Another essential distinction concerns the prevailing level of shareholder protection. In countries with weak investor protection the impact of ownership concentration in general (Boubakri et al. 2005; Durnev/Kim 2005) as well as the impact of block holders (Lins 2003) on performance is more pronounced.<sup>45,46</sup> Moreover, McConnell and Servaes (1995)

---

<sup>45</sup> In this sense, Lins (2003) suggests that ownership concentration might act as a substitute for alternative means of corporate governance, such as investor protection. The issue as to whether alternative corporate governance mechanisms act as substitutes or complements will be addressed in section 2.7.

<sup>46</sup> La Porta et al. (2002) and Shleifer and Wolfenzon (2002) develop models that directly investigate the link between investor protection and firm valuation.

suggest that a firm's investment opportunity set, i.e. whether it has many profitable projects to invest in or not, could determine the influence of institutional investors, and large shareholders. They conjecture that large shareholders could mitigate the overinvestment problem prevailing in low growth firms. However, splitting their sample into low- and high growth firms, they find only limited support for their hypothesis.

So far, I have only considered active intervention by large shareholders in response to managerial inefficiencies. However, there is a second possibility of how large shareholders can react to mismanagement: they could simply sell their stake in the firm (e.g. Kahn/Winton 1998; Maug 1998; Faure-Grimaud/Gromb 2004; Chen et al. 2007; Ferreira/Matos 2008; Bharath et al. 2013). If managerial remuneration (partly) depends on the stock price the threat of a large shareholder selling her stake could discipline the management if it implies a credible threat of a stock price drop (Faure-Grimaud/Gromb 2004; Admati/Pfleiderer 2009). By means of buying or selling on the basis of private information, the block holder can make the firm's stock price converge towards its fundamental value instead of reflecting only current earnings (Edmans 2009). In this way, large shareholders force the management to adopt a long-term perspective instead of running after short-term profits. Edmans and Manso (2011) refer to this as "disciplinary trading", Kandel et al. (2011) as "voice through exit".

In a liquid stock market, the option to "sell and run away" could reduce large shareholders' incentives to intervene actively, supposedly creating a tradeoff between liquidity and control (Bhide 1993; Bolton/von Thadden 1998).<sup>47</sup> The exit option seems attractive because the block holder bears the entire costs of monitoring but captures only a part of the benefits of a successful intervention (proportional to the size of her equity stake). However, Maug (1998) shows that liquidity actually enhances the effectiveness of corporate governance. According to his model, the large shareholder can benefit from her monitoring activities because her transactions have no price impact in a liquid stock market. Thus, she can increase her stake in the firm before the stock market learns about her value-increasing interventions (Maug 1998). In this way, she can capture a greater stake of the benefits from future stock price rises. Bharath et al. (2013) as well as Edmans et al. (2013) provide empirical support for the link between liquidity and governance through exit by analyzing

---

<sup>47</sup> Bolton and von Thadden (1998) suggest that in a liquid stock market where ownership is dispersed (e.g. the US or the UK) the threat of takeovers acts as controlling mechanism instead.

exogenous liquidity shocks. Furthermore, their results reveal that active intervention and exit are two different mechanisms of corporate governance.

Another strand of literature introduces multiple large shareholders as opposed to conventional models that usually assume either dispersed ownership or one large shareholder in combination with many small ones. In firms with several large owners, different forms of interaction between these block holders seem plausible: a classical free rider problem could arise (Winton 1993), large shareholders could form controlling coalitions in order to extract corporate resources for private benefits (Zwiebel 1995; Bennedsen/Wolfenzon 2000), or block holders could monitor each other (Pagano/Röell 1998; Maury/Pajuste 2005). Depending on which interaction mechanism is assumed to prevail, different predictions about the effect on firm value and performance emerge. Although the presence of several block holders might be harmful to monitoring and intervention due to free rider problems, Edmans and Manso (2011) show that through competitive disciplinary trading the firm's stock price incorporates more information. Eventually, the disciplining effect on the management is greater as compared to the case of one large shareholder, or several colluding block holders. In another model, Dhillon and Rossetto (2015) theoretically show that a second smaller block holder can emerge endogenously when agency conflicts and the difference in risk preferences between one big block holder and many small shareholders are severe. Unlike small shareholders, the biggest block holder is relatively undiversified and therefore prefers less risk. In this situation, a smaller block holder is able to mitigate the conflict of interest. This leads to a more risky investment strategy and ultimately to higher firm value.<sup>48</sup> Empirically, Laeven and Levine (2008) show that a sizeable proportion (about one third) of European firms have multiple large owners. They find that firms with several large shareholders have higher firm values than firms with a single block holder. However, the difference between the cash flow rights of the two largest owners seems to play a crucial role as the documented results only apply to firms with a small difference. Conversely, a large difference in cash flow rights is associated with a negative impact on firm value. The authors argue that their results are consistent with the model by Bennedsen and Wolfenzon (2000). Furthermore, Noe (2002) shows that activism by strategic investors does not increase monotonically in the size of the stake. In fact, when there are several large shareholders the smallest shareholders are most active. This is consistent with en-

---

<sup>48</sup> Moreover, the model explains under which circumstances different types of ownership structures, e.g. solely one block holder or entirely dispersed ownership, emerge.

trenchment effects governing the behavior of the largest shareholder (Claessens et al. 2002).

One notable exception to the large shareholder literature has emerged. In the standard models of corporate ownership structure, the impact of small shareholders is often neglected due to their allegedly little voting impact, the lack of coordinated action, and the resulting free rider problem. Hence, these standard models draw the conclusion that small shareholders have no influence on corporate governance. Kandel et al. (2011) question this widespread belief and hypothesize that a homogenous group of small shareholders reacts to information in the same way as one large shareholder. On the basis of similar characteristics, a hidden coordination mechanism is formed which makes those shareholders act jointly as one group. Due to a similar age, wealth level, or location, the small shareholders' actions unintentionally become coordinated and a credible threat of a stock price decrease arises if all small shareholders sell on the same piece of negative information. In this way, they can actually discipline the firm's management, and influence the decision making process and finally firm performance. Kandel et al. (2011) identify shareholders' age as "unifying" characteristic.

The presence of large shareholders likewise comes at a price.<sup>49</sup> So far, it has been argued that large investors can mitigate managerial inefficiencies by means of their power to control the management and to intervene. In consequence, their presence is supposed to cause performance increases. However, the objectives they pursue need not always coincide with those of all other shareholders (Shleifer/Vishny 1997). Instead, large shareholders may exploit their control power and try to generate private benefits of control. Shleifer and Vishny (1997) identify three types of costs of large investors: direct expropriation, engagement in non-value-maximizing behavior (just like managerial shareholders), and the resulting effects on the incentives of other stakeholders. The pursuit of private benefits of control may include large shareholders initiating payments of special dividends to themselves, entrenchment effects (Berger et al. 1997; Claessens et al. 2002), preventing value-increasing takeovers (Stulz 1988; Slovin/Sushka 1993), or the preference of an existing business relationship to the firm over disciplining its inefficient management (Brickley et

---

<sup>49</sup> Admati et al. (1994) analyze costs to large shareholders, such as holding an undiversified portfolio. Instead, I focus on costs that accrue to the firm due to the presence of a large shareholder, i.e. concentrated ownership.



al. 1988; Pound 1988).<sup>50</sup> Moreover, incentives of stakeholders, such as those of managers and employees, could suffer if the block holder cannot credibly convince them that she will not act for her private benefit ex post (Shleifer/Vishny 1997). In anticipation of an impending exploitation, stakeholders reduce their effort ex ante causing firm performance to deteriorate. For example, Burkart et al. (1997) present a model in which the prospect of discretion incentivizes the management to search for valuable investment opportunities or, more generally, to make firm-specific investments which is beneficial to firm value. However, if the management is exposed to excessive monitoring by large shareholders, managers will probably not exert the same effort. The model thus derives a “tradeoff between control and initiative” (Burkart et al. 1997, p. 694). In the case of small shareholders, the threat of expropriation might make the investors demand a higher return on their investment. This can lead to an increase in the firm’s cost of capital, or in the extreme case make small shareholders unwilling to supply equity capital to the firm. The same applies to potential creditors if they perceive a credible threat that the large shareholder will expropriate them, e.g. by undertaking highly risky projects (risk shifting) (Shleifer/Vishny 1997).<sup>51</sup> In summary, it should be noted that despite their often cited role as performance enhancing monitors, large shareholders may be motivated by different incentives depending on their specific type and their relation to the firm. Furthermore, their presence is also associated with the disadvantages of a more concentrated ownership. Accordingly, their overall effect may not always be beneficial.

### 2.4.3 Changes in ownership over time

Many of the aforementioned empirical studies have drawn their conclusions on the relation between ownership and performance based on cross-sectional analyses. This can be problematic for several reasons, such as uncertainty about the direction of causality (see e.g. Jensen/Warner 1988). I will elaborate on this issue in much more detail in section 2.6. One possible remedy is to look at *changes* in ownership and the associated *changes* in firm value (McConnell et al. 2008; Fahlenbrach/Stulz 2009). Therefore, in a first step, this subsection presents both theoretical and empirical papers on corporate takeovers and block pur-

---

<sup>50</sup> Barclay and Holderness (1989) find an average premium of 20% paid in block trades which they attribute to the existence of private benefits of control accruing solely to the owner of the block.

<sup>51</sup> For example, Anderson et al. (2003) show that publicly traded companies with a founding family owner have lower costs of debt financing since these owners are committed to the firm. On the contrary, outside block holders do not have such a lowering impact on the cost of debt. Furthermore, if the largest ultimate owner has control rights significantly in excess of cash flow rights the costs of borrowing to the firm increase (Lin et al. 2011). In general, firms with government ownership likewise face higher costs of borrowing (Borisova et al. 2015).

chases and their respective performance impact. This allows gaining additional insights into the relation between ownership and performance. Moreover, in the sense of my corporate governance framework takeovers can be viewed as an external control mechanism for disciplining the firm's management when internal mechanisms, such as monitoring by the board of directors or by shareholders, have failed (e.g. Jensen/Ruback 1983; Morck et al. 1989; Köke 2004). Again, there is such large body of literature on this very topic that I can only consider a few papers in this subsection of my review. Comprehensive literature reviews that specifically focus on corporate ownership changes comprise Jensen and Ruback (1983), Jarrell et al. (1988), and Martynova and Renneboog (2008) on takeovers, or Palepu (1990) on leveraged buyouts (LBOs); see also Jensen (1988) for a summary on the causes and consequences of takeovers.

In the context of takeovers, the theoretical model by Stulz (1988) relates the probability of a successful tender offer and the premium offered to the proportion of voting rights the management controls. Since the management does not want to give up control, managers try to accumulate a greater stake in the firm when they face a takeover threat. Thus, a potential bidder has to pay a higher premium at low to moderate levels of managerial ownership. This premium will be reflected in the firm's market valuation *ex ante*. At very high levels of managerial ownership, however, any takeover attempt is unlikely to succeed. Hence, the firm's market valuation no longer incorporates a takeover premium. Thus, Stulz (1988) derives the inverted U-shaped relation between managerial ownership and firm value from a takeover model. This relation has also been documented empirically (see subsection 2.4.1). Slovin and Sushka (1993) also provide supportive empirical evidence. They analyze firms that become targets of takeover bids following the death of an inside block holder and find a positive share price effect around this time. The authors thus conclude that their findings are consistent with the model by Stulz (1988) in the sense of entrenched managers preventing valuable takeovers. A somewhat similar model has been proposed by Harris and Raviv (1988a). It also focuses on managerial behavior when the firm faces a takeover bid. Similarly, a looming takeover leads to an increase in managerial ownership resulting in a positive shareholder wealth effect due to the expected takeover premium. However, the model's emphasis is on capital structure. Managers repurchase outside equity in order to increase their stake in the firm. The necessary funds are raised by issuing debt. In this way, leverage in combination with managerial ownership serves as a takeover defense. Another model by Israel (1992) assumes that managers set both ownership structure

and capital structure in order to profit from potential takeover attempts. The voting rights enable managers to block undesirable takeovers whereas leverage increases the price a potential bidder has to pay. Israel (1992) emphasizes that capital and ownership structure are related to the outcome of corporate control contests and thus to firm value and should therefore not be analyzed in isolation.

Empirically, mergers and acquisitions have been found in numerous studies to increase target shareholder value and performance (e.g. Jensen/Ruback 1983; Servaes 1991; Healy et al. 1992). Typically, researchers argue that value creations are caused by (expected future) productivity increases (e.g. Maksimovic/Phillips 2001; Maksimovic et al. 2011). Recently, in a more detailed analysis, Li (2013) finds that this is achieved through more efficient use of capital and labor input whereas output remains fairly constant.

Leveraged buyouts and management buyouts (MBO) are special types of corporate control transactions. These buyouts are typically financed by a considerable amount of debt which has a disciplinary effect on the management (Jensen 1986, 1997). After the LBO, leverage typically remains at augmented levels (Cohn et al. 2014). Additionally, the transactions substantially change the firm's ownership structure. First, they are usually characterized by a significant increase in managerial ownership which fosters incentive alignment (Palepu 1990). Second, large equity investors, so-called buyout specialists, hold a significant equity stake in the firm which enhances active monitoring (Cotter/Peck 2001). In line with this reasoning, buyouts have consistently been found to increase performance and value (e.g. Kaplan 1989; Lichtenberg/Siegel 1990; Smith 1990). However, Ofek (1994) raises the question whether this is actually due to organizational changes implemented following the buyout or whether the management has inside information about the future prospects of the firm and simply profits from it by taking the firm private. This questions the direction of causality. The author finds evidence in support of the former hypothesis since failed MBOs do not generate any performance improvements.<sup>52</sup> Following a successful restructuring of the firm that was taken private, managers and buyout specialists want to cash in their gains and either sell the firm to a private investor or conduct an initial public offerings (IPO). For the latter case, called reverse LBOs, Muscarella and Vetsuypens (1990) find increases in profitability over the years when the firm has been private (as this information is disclosed in the IPO prospectus). This is again consistent with the view that LBO-induced organiza-

---

<sup>52</sup> Lee (1992) arrives at a similar conclusion with a somewhat different study design.

tional changes create a more efficient governance structure. Similar evidence is provided by Degeorge and Zeckhauser (1993).<sup>53</sup>

However, most of the aforementioned studies have analyzed transactions of the 1980s wave of buyouts and takeovers. In a recent paper, Guo et al. (2011) raise the question whether these results still hold for a newer sample from 1990 to 2006. They document that operating performance improvements are not significantly superior to those of benchmark firms. Decomposing buyout returns, they additionally find that rising industry valuations as well as tax gains from higher leverage ratios have approximately the same relative importance as enhanced operating performance. Thus, while part of the performance improvements can be attributed to less agency problems as a result of enhanced monitoring and incentive alignment, a sizeable proportion of the financial success comes from industry development and the exploitability of debt-related tax advantages. This casts doubt on the persistence of value creation through buyouts, especially in periods of financial and credit crises (Guo et al. 2011). Moreover, Cohn et al. (2014) conclude that improved operating performance documented in previous studies is restricted to the sample of LBOs with publicly available financial statements. In contrast, the performance improvement over all LBOs is only slight.

Another important aspect in this line of research is the market for partial corporate control. As changes in corporate governance are not only accomplished by a complete change of control, purchases of minority equity blocks are also relevant. Empirical evidence indicates that these transactions are accompanied by increases in shareholder value as well as operating performance (Holderness/Sheehan 1985; Barclay/Holderness 1991; Bethel et al. 1998; Drees et al. 2013). This is especially true when the new block holder takes on an active controlling role. This supports the notion of value increases due to monitoring activities by the new block holder which eliminates prevailing inefficiencies in the target firm (see also Cornelli et al. 2013).<sup>54</sup>

In a theoretical model, Burkart et al. (2000) show that assuming corporate control through public block trades is better suited to enhance firm value than negotiated trades are. This is

---

<sup>53</sup> Post IPO performance of reverse LBOs is studied e.g. by Degeorge and Zeckhauser (1993), and Holthausen and Larcker (1996).

<sup>54</sup> Germany constitutes a notable exception. In this market characterized by concentrated ownership and weaker shareholder protection (as compared to the US), share block sales do not induce similar control changes that lead to overall shareholder value increases (Franks/Mayer 2001a). Hence, the legal environment has to be taken into account when evaluating the effectiveness of the market for corporate control.

because the former mechanism increases ownership concentration and thereby lowers the level of extractable private benefits. Additional related evidence is provided by Wruck (1989) and Hertz and Smith (1993) who find positive value effects following private placements of equity (as opposed to negative effects when public offerings are announced, see e.g. Masulis and Korwar (1986)). This is consistent with the notion that increases in ownership concentration lead to enhanced monitoring activities.

## **2.5 The relation between leverage and ownership**

Apart from a few exceptions, the focus of this chapter has been on how both leverage and ownership individually impact the performance and/or value of a firm.<sup>55</sup> However, these two financial policies could also be interdependent which would further increase the complexity of the relation between capital structure, ownership structure, and performance. Assuming that firms have an optimal capital structure (independent of the underlying theory), managers could have several motives for deviating from the optimal leverage ratio. These motives arise due to managers' pursuit of personal objectives instead of adhering to shareholder value maximization. First, low leverage ratios could be preferred because risk-averse managers are typically relatively undiversified since they often hold a notable fraction of the firm's equity and have their entire human capital invested in the firm (e.g. Fama 1980; Friend/Lang 1988; Berk et al. 2010).<sup>56</sup> Hence, they try to limit the risk of their own portfolios by lowering leverage.<sup>57</sup> Second, managers dislike the performance pressure imposed on them by corporate debt in the sense of the free cash flow theory (Jensen 1986). As entrenched managers' discretion is restricted by debt they prefer lower leverage ratios. Alternatively, in corporate control contests managers might choose to increase leverage beyond optimal levels in order to augment their voting power (Harris/Raviv 1988a; Stulz 1988).

The empirical findings on this issue have been somewhat contradictory. A negative relation between leverage and managerial ownership has been documented by Friend and Lang (1988) as well as Berger et al. (1997). They attribute this to managerial entrenchment. On the other hand, some studies find evidence of a positive relation between leverage and

---

<sup>55</sup> These exceptions comprise the signaling model by Leland and Pyle (1977), or the takeover models by Harris and Raviv (1988a), Stulz (1988), and Israel (1992).

<sup>56</sup> Holderness et al. (1999) point out that due to lower volatility and better hedging opportunities managerial equity holdings have actually increased during the course of the twentieth century (contrary to the Berle/Means hypothesis). Nonetheless, diversification remains an issue of concern for top managers.

<sup>57</sup> Put differently, managers face "human costs of bankruptcy" (Berk et al. 2010).

managerial ownership (e.g. Kim/Sorensen 1986; Agrawal/Knoeber 1996; Short et al. 2002), or a non-monotonic inverted U-shaped relation (Brailsford et al. 2002). In an effort to reconcile these empirical findings, several theoretical models have been proposed. Zwiebel (1996) and Morellec (2004) suggest a trade-off theory in which managers balance their personal incentive to build empires and their wish to remain in control. Hence, they still issue sufficient debt in order to avoid challenges from the market for corporate control. In a further model, Morellec et al. (2012) demonstrate that moderate agency costs can actually account for the low leverage ratios observed empirically. Thus, a tradeoff model seems to reconcile the contradictory findings. On the one hand, managers are entrenched and pursue their own objectives. On the other hand, they do not deviate too much from optimal financing policies in order to avoid being replaced (see also Wang 2011). Thus, leverage first rises with increasing managerial ownership. However, beyond a certain ownership level the threat of a control challenge decreases because managers control a sufficiently large fraction of voting rights and, consequently, leverage also decreases.

In the presence of large shareholders, however, leverage ratios are significantly higher (Friend/Lang 1988; Brailsford et al. 2002). This is consistent with the view that large shareholders monitor and discipline the management which mitigates agency problems. On the other hand, if the block holder has control rights in excess of cash flow rights she tries to avoid too much lender monitoring by banks and instead prefers financing through public debt (Lin et al. 2013). This supports the view that large shareholders likewise entrench themselves (Claessens et al. 2002). Moreover, Berger et al. (1997) document that managerial entrenchment reducing shocks, such as takeover attempts, dismissal of the CEO, introduction of higher performance incentives, or the appointment of a large stockholder to the board, increase firms' leverage ratios. By analyzing the relation in the light of external shocks, the authors also dissipate concerns for endogeneity. In the following section, I deal with this issue in more detail.

## 2.6 Endogeneity

*“[E]ndogeneity [...] can [be] loosely define[d] as a correlation between the explanatory variables and the error term in a regression. Endogeneity leads to biased and inconsistent parameter estimates that make reliable inference virtually impossible. In many cases, endogeneity can be severe enough to reverse even qualitative inference.”*  
(Roberts/Whited 2012, p.6)

In the previous sections, the employed empirical methodologies have mostly been disregarded. Thus, it has not been considered whether researchers have controlled for potential endogeneity or not. However, as suggested by the above citation, the applied methodology can have a critical impact on the results of empirical corporate finance studies and consequently on the conclusions that can be drawn. The majority of the aforementioned early papers did not address this issue. These studies use ordinary least squares (OLS) regressions (e.g. Morck et al. 1988; McConnell/Servaes 1990) and do not consider the potential pitfalls to this approach (in detail).<sup>58</sup> This does not necessarily mean that these results are incorrect, but the papers do often not consider alternative explanations for their regression results. Applying additional tests could uncover spurious results and disprove causal relations.

Considering the relation between capital structure, ownership structure, and performance, how does endogeneity change or affect the results from the previous sections? In order to answer this question, I focus again on a few prominent papers selected from renowned finance journals that have addressed this issue in this specific field. Hence, I do not intend to provide a complete overview on endogeneity in the field of corporate finance.<sup>59</sup> The reason why I deal with this issue in a separate section is to highlight its importance and provide some insights as to how the research field has evolved over time. As econometric methodologies continue to progress, it seems natural that the results of older studies are challenged. However, still today there are proponents of both lines of research: Those who believe in a causal relation between, for example, ownership and firm value and those who deny it. To begin with, I review the causes and consequences of endogeneity (2.6.1) as well as some remedies that have been proposed (2.6.2). In subsection 2.6.3, I briefly deal with two popular papers and their contribution to the debate on endogeneity. First, I briefly present a theory that tries to reconcile the two aforementioned opposing academic opinions (subsection 2.6.3.1). Second, subsection 2.6.3.2 presents a structural model by Coles et al. (2012) that challenges most of the previous literature on endogeneity and the suggested standard methodologies to overcome it.

---

<sup>58</sup> Morck et al. (1988) note that ownership and firm value might be jointly determined by various external factors and add control variables to their regression, such as research and development expenditures, advertising expenditures, and the leverage ratio.

<sup>59</sup> The interested reader is referred to the extensive survey by Roberts and Whited (2012).

### 2.6.1 Causes of endogeneity

In the research field of financial policies and firm value, endogeneity may arise due to simultaneity, unobservable heterogeneity, and reverse causality (Wintoki et al. 2012).<sup>60</sup> First, simultaneity occurs when the dependent and the independent variable are jointly determined in equilibrium (Roberts/Whited 2012). Among the first to emphasize this issue in the context of firm ownership and performance were Demsetz (1983) and Demsetz and Lehn (1985).<sup>61</sup> They argue that ownership is determined in a way that maximizes firm value. Each transaction in which shares of a (public or private) company are sold is guided by the overall objective of shareholders to maximize profits. Accordingly, the emerging ownership structure reflects the profit maximizing behavior of the firm's shareholders (Demsetz/Villalonga 2001). Therefore, firms with inefficient ownership structures should disappear in efficient capital markets and there should be no predictable patterns between ownership and performance. Empirical evidence in support of this notion is provided by Demsetz and Lehn (1985), and Demsetz and Villalonga (2001).

A second cause of endogeneity can be unobserved heterogeneity. It occurs when the dependent and the independent variable in a regression are affected by the same (exogenous) factor that cannot be measured directly. This suggests that empirically documented patterns between ownership and performance could be spurious due to the failure to account for unobservable firm characteristics and/or the environment in which the firm operates. Himmelberg et al. (1999) emphasize the importance of this topic. They provide an example in which a firm's market power might simultaneously affect its performance, since the firm can extract higher rents from its customers, and its ownership structure. As the disciplinary effect of market competition on managers is impeded by the firm's market power, managers enjoy a higher level of discretion. Therefore, higher levels of managerial ownership are required in order to align managers' incentives. Hence, higher market power causes higher managerial ownership as well as higher performance. If the heterogeneity in market power between firms is not accounted for empirical tests will show a positive relation between ownership and performance which is, in fact, spurious. Related theoretical argumentation and empirical evidence can also be found in Palia (2001). Both papers conclude that there

---

<sup>60</sup> Roberts and Whited (2012) also name omitted variables and measurement errors as sources of endogeneity. I assume these to be subcategories of heterogeneity. That is, in trying to account for (unobserved) heterogeneity some variables might be either omitted or measured incorrectly.

<sup>61</sup> Jensen and Warner (1988) also raise concerns about the validity of cross-sectional analyses in order to infer causal relations between ownership and firm value.



is in fact no relation between ownership and performance even though OLS regressions show statistically significant coefficient estimates.

Third, reverse causality also causes endogeneity. In the context of ownership and performance, researchers have often assumed that the former causes the latter, e.g. through convergence of interests and entrenchment effects. However, the causality might also run in the opposite direction. Hermalin and Weisbach (1991) as well as Demsetz and Villalonga (2001) illustrate this with two examples: insider trading and management compensation. If managers know the future prospects of the firm and buy shares on the basis of their private information high expected future performance will induce higher managerial ownership, not vice versa.<sup>62</sup> Likewise, when managers get compensated with stock options good firm performance can lead to increases in managerial ownership when managers exercise their options, everything else being equal. Evidence in support of this notion is provided by Loderer and Martin (1997), and Cho (1998). Although I have focused on the relation between ownership and performance to illustrate the issue of endogeneity, it also applies to the relation of performance and leverage (see e.g. Berger/Bonaccorsi di Patti 2006; Parsons/Titman 2011), performance and other financial policies (e.g. Jensen et al. 1992; Wang 2011), as well as performance and other aspects of corporate governance (e.g. Agrawal/Knoeber 1996; Wintoki et al. 2012). Ultimately, the argument by Demsetz (1983) implies that all financial policies of the firm are set in a way to maximize shareholder value.

### **2.6.2 Remedies for endogeneity**

In consequence, a lot of tests, alternative methodologies and research designs as well as more sophisticated models have been proposed in order to remedy the effects of potential endogeneity. An initial approach was to study time-series evidence.<sup>63</sup> In comparison to cross-sectional analyses, it is less likely flawed simply because “time does not run backward” (Koop 2005, p. 187). This means that due to their chronological order, it is clear that past events can cause present or future ones, not vice versa. This is why subsection 2.4.3 on corporate control transactions is included in this survey. When such a transaction takes place and organizational restructurings are subsequently implemented, performance increases are likely caused by the preceding events. Another way to circumvent the

---

<sup>62</sup> Ofek (1994) investigates this hypothesis for the performance of firms after MBOs (see subsection 2.4.3).

<sup>63</sup> Some early studies used cross-sectional data from different individual years (e.g. 1976 and 1986) in order to check their results for robustness (e.g. McConnell/Servaes 1990; Hermalin/Weisbach 1991).

endogeneity problem is to study the effects of unpredictable exogenous shocks (e.g. Kole/Lehn 1997; Zingales 1998; Garvey/Hanka 1999; Campello 2003). In such situations, exogenous environmental changes (e.g. (de-)regulation or macroeconomic shocks) provide an opportunity to study changes in leverage and/or ownership and their subsequent impact on performance. Difference-in-differences estimators are a popular tool to investigate the effect caused by exogenous environmental shifts. Alternatively, it has been suggested to examine samples of firms in which financial policies are less likely to suffer from endogeneity. In a study of non-listed Chinese firms, the authors argue that ownership is predominantly exogenously determined due to the restrictive institutional market characteristics and the non-existence of a secondary market for the firm's shares (Hu/Zhou 2008). In contrast to US studies on ownership and performance, concerns for endogeneity are alleviated and the assumed direction of causation seems more robust.

The use of panel data in regressions takes the idea of time-series evidence one step further (e.g. Himmelberg et al. 1999; Palia 2001; King/Santor 2008). Moreover, these regression models can incorporate (firm) fixed or random effects in order to account for unobserved heterogeneity. However, Zhou (2001) questions the conclusion of Himmelberg et al. (1999) by illustrating that by using their methodology, it would be highly unlikely to detect any relation between ownership and performance even if it actually existed.<sup>64</sup> The author agrees that endogeneity is an important issue, but the use of panel data regressions with firm fixed effects (FE) does not solve the problem. Additionally, Börsch-Supan and Köke note that even if firm fixed effects are constant over time (which is a necessary condition for their application) “estimating fixed effects does not explain why there is variation between firms” (2002, p. 303). In the context of corporate governance, this leaves the most relevant question unanswered, i.e. which differences in firm policies and/or characteristics are the main drivers of performance enhancement (Börsch-Supan/Köke 2002).

---

<sup>64</sup> Zhou (2001) argues that the use of firm fixed effects eliminates any cross-sectional variation from the sample. However, since cross-sectional differences in managerial ownership are substantially greater than yearly changes within the same firm, they are the main reason for differing managerial incentives. Accordingly, when managers maximize their expected *long-term* utility, small year-to-year changes in ownership do not alter managerial incentives remarkably and hence do not significantly influence the firm's performance. Zhou thus concludes that the results of Himmelberg et al. (1999) do not prove that managerial ownership may not have an influence on performance through the alignment of incentives. In order to alleviate this concern, Benson and Davidson III (2009) apply pay-performance semi-elasticity as a measure for managerial incentives which exhibits a greater within firm variation. In this way, the authors confirm the finding of an inverted U-shaped relation, even after controlling for endogeneity.

Furthermore, it has been criticized that former studies analyze *levels* of ownership and *levels* of performance (in the cross-section of firms) in order to draw inferences on how *changes* in managerial ownership might lead to *changes* in firm performance. However, different levels of managerial ownership could be caused by unobserved heterogeneity between firms (Demsetz 1983; Himmelberg et al. 1999). In this case, changing the level of managerial ownership would not improve performance in the predicted manner. In order to overcome this problem, it has been proposed to directly examine changes in ownership and the related changes in firm value (McConnell et al. 2008; Fahlenbrach/Stulz 2009). The latter study investigates the impact on firm value by previous year's changes in managerial ownership. The authors argue that changes in managerial ownership do not become publicly known instantaneously. Thus, the ownership change and the resulting alignment of incentives will only have an effect in the subsequent year. In contrast, it is unlikely that changes in firm value in year  $t+1$  cause changes in ownership in year  $t$  which alleviates concerns for endogeneity.<sup>65</sup> McConnell et al. (2008) employ event study methodology to measure the abnormal share price effect when insider share purchases are announced. By measuring the effect over a time period of only 6 days, the short-term change in shareholder value can be directly attributed to the purchase announcement because confounding events less likely occur during a 6-day event window or can be controlled for.

Another econometric tool that has been proposed to account for endogeneity is the use of instrumental variables (IV). An IV replaces the endogenous independent variable in the regression and should be sufficiently correlated to it.<sup>66</sup> However, the IV must not be correlated to the error term (Roberts/Whited 2012). While a lot of researchers in accounting and corporate finance use IVs (e.g. Himmelberg et al. 1999; Palia 2001; Anderson et al. 2003; Bhagat/Bolton 2008), they rarely justify their use economically or by appropriate diagnostic tests (Larcker/Rusticus 2010). Larcker and Rusticus (2010) point out that if the employed IVs are also (slightly) endogenous, the resulting estimates could be even more biased than those received from standard OLS regressions without adjustments. They also draw the attention to a common pitfall when IVs are used as a robustness check: Just because the IV results are similar to those obtained from OLS regressions does not necessarily mean that endogeneity is not an issue. Instead, the IV could be invalid and thus fails to remedy the endogeneity bias. Accordingly, the remaining challenge to the researcher is to

---

<sup>65</sup> Furthermore, by focusing on large managerial ownership changes (greater than 2.5 % in absolute value), the authors circumvent the aforementioned concern by Zhou (2001).

<sup>66</sup> IVs are often used in two-stage least square regressions, see below (Roberts/Whited 2012).

find valid instruments. In this context, Börsch-Supan and Köke note that “potentially all firm-specific variables are endogenous” (2002, p. 303).<sup>67, 68</sup> They thus conclude that only variables that are actually determined outside the firm, such as variables concerning the macroeconomic or the regulatory environment, are reliable instruments. This refers back to the above mentioned exogenous shocks as ideal natural situations to investigate the relation between leverage, ownership, and performance.

If endogeneity problems are caused by simultaneity, the model to be estimated can consist of several simultaneous equations.<sup>69</sup> In this case, OLS estimates are inconsistent and researchers often apply two-stage least squares (2SLS) estimation (Gujarati/Porter 2009). In the first stage, the endogenous variable is regressed on all predetermined (exogenous) variables of the system of simultaneous equations. In the second stage, the resulting fitted values of the endogenous variable are used as instruments in the other equation(s) (Gujarati/Porter 2009). Papers employing 2SLS regressions include Jensen et al. (1992); Agrawal and Knoeber (1996); Kovenock and Phillips (1997); Loderer and Martin (1997); Cho (1998); Demsetz and Villalonga (2001); Palia (2001); Woidtke (2002); Harvey et al. (2004); Campello (2006); Bhagat and Bolton (2008); Gompers et al. (2010); Kandel et al. (2011); Kim and Lu (2011) among others. However, caution should be exercised since the application of 2SLS to small samples or the existence of further endogenous independent variables may produce biased coefficient estimates (Gujarati/Porter 2009; Roberts/Whited 2012).

## **2.6.3 Two selected models concerning endogeneity**

### **2.6.3.1 Transaction cost theory**

As illustrated above, the use of econometric refinements casts doubt on the formerly established relations between capital structure, ownership structure, and performance as well as firm value. Nonetheless, the former results are based on the solid theoretical foundation of agency theory, or more specifically the hypotheses of convergence of interests and managerial entrenchment (e.g. Morck et al. 1988; McConnell/Servaes 1990). Thus, they have an economically intuitive appeal which makes it difficult for researchers to discard them be-

---

<sup>67</sup> Cheung and Wei (2006) provide support for this view by showing that firm characteristics that are usually significant determinants of insider ownership become insignificant in their model specification that allows for ownership adjustment costs. Such a model is presented in subsection 2.6.3.1.

<sup>68</sup> Campello (2006) tries to tackle this problem by using GMM estimation.

<sup>69</sup> Typically, there is one equation for each endogenous variable in which this variable is the regressand (Gujarati/Porter 2009).

cause of simultaneity concerns, consistent with the equilibrium approach by Demsetz (1983). The transaction cost theory by Core and Larcker (2002) attempts to reconcile these two competing lines of research. It adds two important assumptions to the existing literature. First, optimal managerial ownership may change over time, i.e. it is dynamic rather than static.<sup>70</sup> Second, firms face costs when they want to adjust their ownership structure (just like they bear costs for adjusting their capital structure). In line with the equilibrium approach, the theory by Core and Larcker (2002) implies that the ownership structure of a firm (including managerial ownership) is set in a way to maximize firm value. Hence, initially they assume no cross-sectional relation between managerial ownership and firm value. However, after the contracts are fixed, managerial ownership may diverge from its optimum. This could cause distortions in managerial incentives and consequently a decline in firm value (consistent with the agency literature). Thus, in order to re-establish equilibrium firms need to adjust their contracts. However, as firms incur costs they will only adjust their ownership structure when the associated costs are offset by the subsequent gain in firm value. In consequence, the firm value can remain below its maximum due to a suboptimal ownership structure when transaction costs prevent continuous rebalancing.<sup>71</sup> Empirical evidence in support of this view is also provided by Core and Larcker (2002) who analyze the adoption of target ownership plans. Subsequent to these mandatory executive ownership increases, the authors find enhanced stock and accounting performance. Tong (2008) analyzes share purchases and sales by CEOs in order to determine the impact of persistent suboptimal ownership on firm value. While Core and Larcker (2002) as well as McConnell et al. (2008) only provide evidence that increases in managerial ownership are associated with subsequent increases in firm value, Tong (2008) shows that deviations from optimal ownership levels in both directions are related to a lower firm value. In turn, when CEO ownership changes towards the optimum level positive abnormal stock returns can be observed (Tong 2008). Further support for the transaction cost theory is presented by Cheung and Wei (2006) who use a system-GMM (generalized method of moments) approach to analyze the relation between insider ownership and firm value. However, the transaction cost theory has also been challenged for exaggerating the importance of such costs. Using a simple numerical example, Coles et al. (2012) illustrate that it is highly un-

---

<sup>70</sup> See e.g. Helwege et al. (2007) for a detailed analysis of the dynamics of managerial ownership over the lifetime of a firm.

<sup>71</sup> Core and Larcker (2002) point out that the theory by Demsetz (1983) can be interpreted as a model without adjustment cost wherein continuous re-contracting of ownership is possible. In contrast, the view by Morck et al. (1988) (among others) implies infinite adjustment costs and consequently no re-contracting at all.

likely that the observed range of variation in managerial ownership can be explained by the existence of reasonable adjustment costs.

### **2.6.3.2 A structural model of the firm**

Finally, a model is briefly presented that has gained considerable attention. Based on the idea by Demsetz (1983) that ownership and firm value are jointly determined in equilibrium, Coles et al. (2012) specify a structural model of the firm. In an agency setting, they suppose that shareholders jointly select the size of the firm (as a result of aggregate investment decisions) and managerial ownership (as part of the compensation contract) such that firm value is maximized. These three items are thus endogenous and depend on exogenous firm parameters. The authors determine the (unobservable) productivity of managerial input and of investment (the input parameters of the firm's production function) such that the outcome of the structural model (the optimal choices of CEO ownership and investment) is consistent with their actual sample data. With the productivity parameters thereby obtained, their model produces the inverted-U shape between managerial ownership and firm value that has often been documented. However, the relation is spurious since the two variables are simultaneously determined by the unobservable productivity parameters. Moreover, the authors show that none of the standard remedies for simultaneity (i.e. proxy variables for unobservable heterogeneity, panel regressions with firm fixed effects, or instrumental variables) are able to uncover the spuriousness of the relation. When these standard techniques are applied the results still suggest the existence of an inverted-U shape. This emphasizes the importance of the use of adequate econometric methods and even more crucially an underlying model of the firm that is able to incorporate all relevant issues.

## **2.7 Open issues and discrepancies in the literature**

After having dealt with methodological issues in the previous section, this section reviews papers that address issues concerning the measurement of the key variables of interest of this review, i.e. capital structure, ownership and firm performance. Emphasis is put on the questions which difficulties can arise and why popular estimation methods could be flawed. Differences in the measures used or the estimation procedures applied can also complicate direct comparisons between empirical studies. Finally, further governance-related aspects that might have an impact on the corporate governance function of capital

and ownership structure will be discussed as well as whether these different mechanisms can be viewed as substitutes or complements.

To begin, I focus on the variables used and how they are typically defined. The definitions of all three variables of interest usually differ across studies. First, the definition of ownership is probably the one with least congruence.<sup>72</sup> Concerning managerial ownership, the ownership of the CEO only (e.g. Zhou 2001; Tong 2008; Kim/Lu 2011), of all current and previous CEOs who are still on the board (Hermalin/Weisbach 1991), of all directors of the firm (Morck et al. 1988), or of all directors and officers (e.g. McConnell/Servaes 1990; Agrawal/Knoeber 1996; Himmelberg et al. 1999; Helwege et al. 2007; Fahlenbrach/Stulz 2009) have been investigated. This can be problematic for several reasons. On the one hand, to consider only CEO ownership essentially assumes that solely the incentives of the CEO matter. According to this view, shareholders would only try to incentivize the CEO and assume that this would prevent any non-value-maximizing behavior within the firm.<sup>73</sup> On the other hand, taking into account the share ownership of the entire board of directors and the firm's top management assumes that all directors and officers pursue the same objectives. This is somewhat unlikely considering the potential heterogeneity of the board, e.g. representatives of large shareholders versus top managers (Demsetz/Villalonga 2001).<sup>74</sup> In a recent study of bank ownership and corporate governance, Benson and Davidson III (2009) highlight the importance of lower-level managerial ownership (e.g. of vice presidents). They distinguish this measure from higher-level managerial ownership (of chief officers) and conclude that only the former has a significant impact on a bank's risk taking behavior and, finally, on its probability of default. As lower-level management has typically more direct influence on a firm's daily operations, this approach seems promising for future research on the relation between leverage, ownership, and firm value as well.

Moreover, other papers promote the idea that the commonly used ownership measure, i.e. managerial stock ownership as percentage of shares outstanding, is an insufficient proxy for managers' incentives. Fahlenbrach and Stulz (2009) point out that not all shifts in relative managerial ownership cause changes in incentives. Managers' stake can also decrease

---

<sup>72</sup> A similar issue in the context of large shareholders has been raised in the survey by Short (1994, pp. 223-224).

<sup>73</sup> On the contrary, Kim and Lu (2011) argue that CEO ownership is a more relevant determinant of firm value as the top executive is involved in all decisions. Total insider ownership, on the contrary, can be biased e.g. by a fluctuating number of insiders. The authors argue that such effects complicate the analysis of the impact of ownership on firm value and performance.

<sup>74</sup> Similar concerns are raised by Morck et al. (1988) and Short (1994).

e.g. when the firm issues shares. This does not necessarily imply that managerial incentives deteriorate. According to the authors, it is the sensitivity of managers' personal wealth to firm value that matters. When this sensitivity is unaffected, changes in relative managerial ownership do not matter. Thus, it is not sufficient to analyze changes in (relative) managerial ownership but instead to distinguish between different reasons for those changes, e.g. whether managers actively sell or purchase shares (Fahlenbrach/Stulz 2009). In addition to stocks, Palia (2001) also considers CEO stock options. He argues that his measure, called pay-performance sensitivity, is better suited as a proxy for the provided performance incentives than stock ownership only. Based on Hall and Liebman (1998), Benson and Davidson III (2009) propose another measure that focuses on the *dollar value* of managerial ownership (stocks and options) and how this dollar value changes if firm value varies by 1%. Their so-called pay-performance semi-elasticity accounts for the fact that small percentage-wise changes in the value of large firms can cause the dollar value of managerial stakes to vary substantially. The risks and chances of portfolio value changes in dollar terms, rather than changes in the fractions of managerial ownership, motivate managers. Thus, the authors deem their proxy more accurate to measure managerial incentives. Furthermore, it is less vulnerable to the Zhou critique (see subsection 2.6.2).

Second, the definition of other shareholder groups is not consistent in the literature either. There is no unique threshold value for defining large shareholders which might be a reason for conflicting empirical results regarding their performance impact (Short 1994).<sup>75</sup> Moreover, such inconsistent empirical definitions can facilitate data mining in the sense that researchers employ those ownership levels that produce the desired results. Furthermore, distinctions within one group of shareholders are crucial as they might pursue different objectives. As documented above, different behavior and performance patterns have been found for dependent versus independent institutional investors (e.g. Woidtke 2002; Chen et al. 2007). Likewise, family firm performance might depend on the issue whether the firm is owned, controlled, or only managed by a family and whether the founder is still involved (e.g. Villalonga/Amit 2006).

---

<sup>75</sup> To give some examples: ownership of at least 15% of common stock (Zeckhauser/Pound 1990), or at least 5 % of common stock (McConnell/Servaes 1990); for institutional investors: the fraction of shares owned by the largest block holder (i.e.  $\geq 5\%$  of equity) (Cremers/Nair 2005), the five largest block holders (Hartzell/Starks 2003), or the sum of all block holdings (Ferreira/Matos 2008). Chen et al. (2007) use all three prior measures.



A third important issue concerns the distinction between cash flow and control rights in general (e.g. Claessens et al. 2000; King/Santor 2008) as well as whether simple or ultimate ownership is analyzed (La Porta et al. 1999). When ownership is only defined as the percentage of shares outstanding (of one of the aforementioned groups/individuals) the potential existence of multiple share classes (or other control-enhancing mechanisms) and the resulting effect on managerial incentives and firm value is neglected. Finally, the source of ownership data could also influence the insights generated by empirical investigations (Anderson/Lee 1997). On the contrary, Kole (1995) concludes that while differences in ownership databases exist it is unlikely that they cause contradicting empirical findings in the context of ownership and performance.

Measures of leverage likewise contain pitfalls. First, Welch (2011) points out that most capital structure studies use the ratio of financial debt-to-assets as a proxy for leverage which is not equivalent to one minus the equity-to-assets ratio. The reason is that in addition to equity and financial liabilities, non-financial liabilities can make up a considerable part of the right-hand side of firms' balance sheets. In consequence, excluding non-financial liabilities from a firm's leverage ratio implicitly adds them to the residual, which is equity. Thus, measures of firms' indebtedness are biased downwards. Furthermore, Graham and Leary (2011) suggest adding the interest part or the capitalized value of operating leases to the numerator of leverage ratios in order not to understate firms' debt ratios. They find several papers that consider this measure to be better suited (Graham et al. 1998; Rauh/Sufi 2010, 2012; Rampini/Viswanathan 2013). Second, treating corporate debt as homogeneous neglects the existence of different types of debt with distinct features (see subsection 2.3.1). The use of one single leverage ratio in empirical studies thereby ignores the debt dynamics that can occur even when the total debt ratio remains constant (Rauh/Sufi 2010). Third, since market values of debt are commonly approximated by their book values, the findings of cross-country studies could be influenced by the presence of different accounting standards (Myers 2001). Fourth, Welch (2007) documents that longer-term capital structure studies might suffer severely from survivorship biases. According to him, about one tenth of the firms disappears during the course of one year (and is replaced by a roughly similar proportion of firms that newly appears). Particularly the omission of disappearing firms which are presumably often highly indebted might bias the results of long-term investigations. Finally, it might be wrong to suppose that all underlying relations in the context of capital structure are linear. Equivalently to ownership studies, non-

linearity could be present in the relation of capital structure and its determinants (Welch 2007).

Strebulaev (2007) emphasizes a potential pitfall in the interpretation of the results of cross-sectional capital structure studies if the prevailing dynamics are neglected. According to the dynamic tradeoff theory, firms do not adjust their leverage ratios continuously but only at certain points in time. At these so-called “refinancing points” (Strebulaev 2007, p. 1748), firms rebalance their capital structure in a way predicted by theory. However, as the “refinancing cycles” (Strebulaev 2007, p. 1748) of firms are not synchronized it is difficult to interpret cross-sectional results and to compare them to theoretical predictions.<sup>76</sup> By using simulated data from a structural model, Strebulaev (2007) demonstrates that such results can even be in contradiction to the underlying model.

In the context of firm performance, a variety of different measures have been used. Widely employed measures comprise the return on assets (ROA) or the return on equity (ROE) as measures of accounting profitability, cumulative abnormal (stock) returns (CARs), buy and hold (excess) stock returns, and Jensen’s alpha (e.g. Holthausen/Larcker 1996), the earnings-price ratio (e.g. Zeckhauser/Pound 1990), firms’ production efficiency (e.g. Margaritis/Psillaki 2010), or a firm’s sales growth relative to its industry peers as measure of product market performance (Campello 2003, 2006). These measures represent different aspects of firm performance and can be broadly grouped into operating and market-based performance. Taking into account different studies thus provides a more complete view of firm performance. However, accounting performance measures should always be interpreted carefully as accounting practices may vary and the management may be able to manage earnings to some extent (“window dressing”).

The most widely used measure for firm performance is Tobin’s Q. It is calculated as the ratio of the firm’s market value of assets to the replacement value of assets. The numerator is typically calculated as the book value of debt and of preferred stock (as estimates of their market values) plus the market value of common equity (e.g. Demsetz/Villalonga 2001).<sup>77</sup> The replacement value of assets in the denominator is often approximated by the book val-

---

<sup>76</sup> At a certain point in time, one firm could be rebalancing its capital structure towards its optimum. On the other hand, at the same time 100 firms passively move farther away from their optimal leverage ratio (e.g. Welch 2004). In the cross-section, such dynamics could be interpreted as firms adjusting their capital structure in the “wrong” direction.

<sup>77</sup> Gompers et al. (2010) use a slightly different calculation for the numerator by summing up the book value of assets and the market value of common stock and then deducting the book value of common stock and deferred taxes.

ue of assets. While Tobin's Q enjoys great popularity, Demsetz and Villalonga (2001) point out that it is not free from biases either. First, through the inclusion of the market value of equity it can be biased by investor psychology to some extent. Second, it may similarly suffer from accounting-related issues since book values enter the calculation for the replacement costs of assets and the market value of debt (Demsetz/Villalonga 2001). Similar concerns regarding the use of book values are raised by Gompers et al. (2010) who argue that due to discrepancies between book values and market values of intangible assets, Tobin's Q can be flawed especially in the denominator (the replacement costs of assets). The authors infer that such errors will cause greater standard errors in regressions, wherein Tobin's Q is the regressand. Consequently, statistical inference becomes more complicated. In case the flaw in Tobin's Q is concentrated within certain industries, e.g. due to the reliance on intangible assets, the authors suggest to use an industry-adjusted measure. Additionally, the effects of outliers could be alleviated by using logarithmic transformation of Tobin's Q in regressions (Gompers et al. 2010). Perfect and Wiles (1994) as well as Lewellen and Badrinath (1997) provide in-depth analyses of different approaches to estimate Tobin's Q. They present findings of how robust rankings of firms and regressions are when different estimation procedures of Tobin's Q are employed. The latter paper also suggests a new method to estimate Tobin's Q that is able to determine the replacement costs of fixed assets and inventories more accurately. Furthermore, due to significant differences between the estimates from various procedures, the authors raise the question whether a thorough reexamination of older studies would be in order (see also Perfect et al. 1995).<sup>78</sup>

Finally, the question arises whether alternative corporate governance mechanisms can be viewed as complements or substitutes. In this literature review, I have focused on leverage and managerial as well as block ownership as *internal* governance mechanisms. While stock ownership and stock-based compensation incentivize the management to maximize firm value, monitoring by debt holders and external shareholders further increases this performance pressure. As illustrated by the structural model by Coles et al. (2012) (see subsection 2.6.3.2), capital structure and ownership structure are jointly optimized in equilibrium in order to maximize firm value. However, one may wonder, for example, whether the shareholders of zero-leverage firms balance the missing debt-related pressure on the

---

<sup>78</sup> See also Erickson and Whited (2012) who discuss measurement errors in Tobin's Q when it enters regressions as explanatory variable and three remedies in order to obtain unbiased coefficient estimates.

management by granting managers a greater ownership stake. Alternatively, the firm's environment could provide sufficient incentives such that the low leverage ratio is induced by environmental factors. I.e. there are external governance devices offsetting the lack of internal mechanisms.<sup>79</sup> Consistent with this argumentation, Giroud and Mueller (2011) find out that weak-governance firms underperform, but only in industries that can be classified as non-competitive.<sup>80</sup> This indicates that competition serves as additional mechanism to incentivize managers. Moreover, Lilienfeld-Toal and Ruenzi (2014) show that managerial ownership is especially valuable when external governance and product market competition are weak. This suggests a complementary role. Kim and Lu (2011) document that product market competition (which they use as a proxy for external governance) can alleviate the negative firm value effects occurring when managerial ownership is high. Additionally, at low levels of ownership the positive incentive alignment effect disappears in the presence of strong external governance. This supports the substitution hypothesis. On the contrary, Cremers and Nair (2005) present evidence for a complementary interaction of institutional shareholder monitoring (internal governance) and the threat of takeovers (external governance). Similarly, Shleifer and Vishny (1997) conclude that the presence of block holders and legal investor protection are complementary ingredients of corporate governance.<sup>81</sup> In a theoretical model, Cohn and Rajan (2013) conclude that the prevailing level of external governance determines whether internal (through the board of directors) and external governance (through an activist shareholder) interact as complements or substitutes. Certainly, there are many more governance mechanisms.<sup>82</sup> In addition to ownership-related mechanisms and leverage, Agrawal and Knoeber (1996) analyze the influence of outside directors, managerial labor markets, and the market for corporate control on firm performance. In a simultaneous estimation setting, they find evidence in support of the notion that all control mechanisms are jointly optimized except for outside directors.<sup>83</sup> Holderness et al. (1999) directly analyze whether higher managerial ownership replaces other governance mechanisms. However, they find no supportive evidence and conclude

---

<sup>79</sup> Note that in subsections 2.3.2 and 2.4.3, several papers were discussed wherein the relation runs in the opposite direction. That is, how do managers make use of leverage and their shareholdings (internal mechanisms) to weaken external governance, such as the threat of takeovers and product market competition?

<sup>80</sup> See also Giroud and Mueller (2010).

<sup>81</sup> The authors argue that which mechanism is more prevalent varies across countries, e.g. Germany vs. the USA. Thereby, one mechanism may substitute for the lesser presence of the other. However, both are essential components of corporate governance. See also Lins (2003) for emerging markets evidence.

<sup>82</sup> For an overview of corporate governance mechanisms see Denis (2001).

<sup>83</sup> It seems to be worth mentioning that the authors also show that the results from standard OLS regressions suggest the existence of cross-sectional relations which are in fact spurious.

that alternative means of corporate governance are complementary, i.e. if the use of one mechanism rises the others are also used more and vice versa. Holderness et al. (1999) propose the explanation that different types of governance mechanisms reward different aspects of managerial behavior. Consequently, an imbalance in governance mechanisms could lead to undesirable outcomes since managers might put their efforts only into certain activities.

To sum up, leverage and ownership structure are two of the most important corporate financial policies that constitute complementary internal corporate governance mechanisms. Both have a significant impact on managerial incentives and thereby on firm performance. But in order to determine their impact empirically, one should bear in mind that they are jointly optimized and thus endogenous. Two other aspects are crucial. First, market frictions can keep firms from adjusting towards an optimal capital and/or ownership structure. Second, other internal as well as external governance mechanisms also influence the choice of capital and ownership structure.

## **2.8 Conclusion**

The ownership structure and the capital structure of a firm are means of internal corporate governance to optimize firm performance and to maximize firm value. Evidence based on methodology that accounts for endogeneity indicates that these two financial policies are jointly optimized in equilibrium. That means capital and ownership structure are set consistently to maximize firm value taking into account the specific characteristics of the firm and the environment it operates in. These environmental factors comprise, among others, product market competition (Hart 1983), institutional settings such as the legal system and investor protection (La Porta et al. 1997; Shleifer/Vishny 1997; La Porta et al. 1998; La Porta et al. 2002), the threat of takeovers (Jensen/Ruback 1983), and managerial labor markets (Fama 1980).<sup>84</sup> Since these factors serve an external governance role, they can influence the optimal choice of capital structure and ownership structure of the firm. Failure to account for differences in these factors across firms could therefore produce spurious empirical results concerning the relation of capital structure, ownership structure, and firm performance. Based on inadequate methodology, some papers have suggested the existence of inefficient corporate financial policies and management incapable of eradicat-

---

<sup>84</sup> Thomsen and Pedersen (2000) and Börsch-Supan and Köke (2002) make a similar point in the context of managerial control mechanisms.

ing this flaw. However, as Demsetz and Lehn (1985) have argued in the context of diffuse ownership, any structure that persists in the long-run is supposedly optimal since otherwise rationally functioning capital markets would force it to disappear. Nevertheless, deviation from the optimum of capital and ownership structure can always occur due to changes in the firm's environment. This deviation persists as long as the costs for readjustment exceed the loss in value caused by the deviation. As soon as the benefits outweigh the costs, firms rebalance their capital and ownership structure in order to regain their equilibrium state.

The present literature review has focused on two specific financial policies of the firm. I have emphasized the importance of considering endogeneity in the context of internal corporate governance. Future surveys could build on this work and review studies that consider additional endogenous variables that might also serve a governance role, such as the firm's payout policy, corporate cash holdings, or the composition of the board of directors. Furthermore, one may criticize that the choice of literature could be biased. Since the papers were primarily selected from US journals (JF, JFE, RFS), the vast majority of these articles are based on samples that predominantly comprise US firms which could bias the results. A future literature review could therefore focus on cross-country differences and thereby highlight the importance of institutional settings (see e.g. Durnev/Kim 2005; Öztekin/Flannery 2012), or alternatively address the question as to how capital and ownership structure interact with other internal and external corporate governance mechanisms in detail.

Several avenues of future empirical research open up. First, adding measures of middle management ownership as an explanatory variable to studies on the relation of leverage, ownership, and performance might provide new insights. Second, regression discontinuity design (RDD) seems a useful econometric methodology that becomes increasingly popular in corporate governance as well as corporate financial policy research (e.g. Roberts/Sufi 2009; Black/Kim 2012; Irani/Oesch 2013; Boone/White 2015). Since it alleviates endogeneity issues (Roberts/Whited 2012), its empirical application seems promising for further clarification of the relation between leverage, ownership, and performance.

### 3 Seasoned equity offerings and corporate governance: Evidence from European real estate companies

#### 3.1 Introduction

In the late 1980s and the beginning of the 1990s, Switzerland, Japan, and several other OECD countries have suffered from fierce real estate crises (e.g. Renaud 1997; Brown 2000; Van den Noord 2006; Borowiecki 2009). More recently, the US subprime crisis marked the beginning of a worldwide financial crisis (see e.g. Demyanyk/Van Hemert 2011). Accompanied by the bursts of housing bubbles in Ireland and Spain, the sovereign debt crisis in Europe deteriorated the situation on real estate markets (e.g. Conefrey/Gerald 2010). Financing conditions aggravated and made European real estate companies struggle. Several firms, such as German IVG Immobilien, Spanish Reyax Urbis and Martinsa Fadesa had to file for bankruptcy during or in the aftermath of the crisis. Tightening credit conditions, the write down of property assets as well as equity investors unwilling to supply new capital are usually cited as the main reasons for the difficulties firms have faced (e.g. Acharya et al. 2009; Duchin et al. 2010).<sup>85</sup>

In this chapter, I investigate whether the latter reason that market participants refrain from investing in real estate firms' equity is generally true or alternatively, whether investor behavior depends on firm characteristics and quality indicators. Therefore, I analyze a sample of 142 seasoned equity offerings by European real estate companies from 1997 to 2013 and the related stock market effects. Usually, announcements of SEOs are associated with negative stock price reactions (see e.g. Asquith/Mullins 1986; Masulis/Korwar 1986; Mikkelsen/Partch 1986; Bayless/Chaplinsky 1996). The announcement is bad news for shareholders since their claims are diluted. According to the pecking order theory, managers would only issue equity when internal or debt-related funds do not suffice to meet the financing needs (Myers 1984; Myers/Majluf 1984). Additionally, shareholders might perceive a SEO announcement as a signal of insufficient current as well as future earnings, as suggested by the implied cash flow hypothesis (Miller/Rock 1985). In both models, outside shareholders try to infer inside information from corporate actions as information is asymmetrically distributed. The stock price generally drops when negative information is con-

---

<sup>85</sup> See e.g. Laux and Leuz (2009) for a discussion on the implications of fair value accounting in the context of the recent financial crisis.

veyed, but the level of information asymmetry might be distributed unevenly over time and companies.

In the presence of information asymmetries and possibly diverging incentives, corporate governance is a crucial mechanism for ensuring shareholder value maximization. It is widely accepted that managerial share ownership and external block ownership are two of the most important means of corporate governance (e.g. Shleifer/Vishny 1997; Lemmon/Lins 2003; Lins 2003). While the former works through aligning managerial incentives with those of outside shareholders, the latter is based on active monitoring by blockholders. Thereby, managers are prevented from spending SEO proceeds on unprofitable projects or other value-reducing activities. The central motive for this empirical research is thus to investigate whether corporate governance is able to limit SEO-related decreases in firm value and hence to increase the success of equity offerings as perceived by managers and shareholders.

The recent financial crisis provides a perfect opportunity to analyze this question. The level of asymmetric information has likely increased, shareholders are much more parsimonious than they are during market upswings, and managers try to avoid capital increases when equity prices have depreciated. If corporate governance turns out to be a success factor, this is good news for all stakeholders. Well governed firms would therefore not face constrained access to equity markets. This would also alleviate concerns of governments and central banks with respect to the issue of pro-cyclical equity markets. My research question thus tackles an issue of particular importance to both managers and regulators: the role of corporate governance with respect to the functioning of equity markets.

In order to answer this question, I focus on listed real estate companies because the effect of asymmetric information might be most pronounced in this industry due to its specific characteristics. Property assets represent the major part of the balance sheets of real estate companies. They are mostly illiquid and traded on relatively opaque markets. As the American market has been scrutinized extensively (see e.g. Howe/Shilling 1988; Allen/Rutherford 1992; Ghosh et al. 1999; Ghosh et al. 2013), the focus of this chapter is on the European real estate sector. For initial public offerings, Ritter (2003) points out that there are significant differences between European and US equity offerings. Thus, I contribute to the literature in several ways. First, I analyze the impact of corporate governance on shareholder wealth effects surrounding SEO announcements in general and during the



recent financial crisis. This could provide useful insights to the more fundamental question of how managers and regulators should behave during business cycles. Second, I conduct a 4-factor model event study to estimate shareholder wealth effects. In this way, expected returns can be determined more accurately and the resulting abnormal returns are not due to the failure to account for the size, value, or momentum effect. Third, I focus on the European market which differs substantially from the US market with respect to general institutional characteristics (e.g. Shleifer/Vishny 1997; Enriques/Volpin 2007). Further, Europe is not (yet) dominated by the legal form of real estate investment trusts (REITs) which are more transparent than other property companies. Finally, the analysis of a European sample provides a unique opportunity to analyze the effects of corporate governance in very different legal systems and institutional settings at the same time. To the best of my knowledge, this is the first study that analyzes this specific sample during this highly relevant time period.

The findings show negative announcement effects of -1% throughout the entire sample period. Considering the 3-day period ending on the event day, the average abnormal price drop is even -1.5%. Market timing in general and the recent financial crisis in particular do not have an impact on the observed announcement effects. Most importantly, firms that are subject to active monitoring by inside blockholders and that do not have abundant cash reserves experience less negative announcement effects. Excess cash holdings might be interpreted as a threat of managerial overinvestment or the potential to extract private benefits of control (Pinkowitz et al. 2006; Dittmar/Mahrt-Smith 2007; Harford et al. 2008). In evaluating the implications of a capital increase, investors seem to focus on effective corporate governance as well as the absence of alternative sources of financing. If a firm lacks both, it is more likely to suffer from overinvestment problems according to the free cash flow hypothesis (Jensen 1986). Moreover, the intended use of the offering proceeds expressed by the management in the disclosure statement does not play a role. Apparently, the management does not succeed to dispel shareholders' concerns regarding overinvestment with the help of this measure. In contrast to prior empirical evidence, a negative size effect is found. Hence, larger firms experience more negative announcement effects. This seems to be unique to the real estate sector which is still perceived to be a "people's business", at least for smaller and medium-sized companies.

In summary, access to equity capital markets has not been limited during the sample period. Firms are thus not forced to engage in pro-cyclical financing if they are able to con-

vince investors of their funding need as well as of the soundness of their corporate governance to prevent overinvestment and other value-reducing corporate actions. It is reassuring to both managers and regulators that even during a fierce financial and confidence crisis equity capital markets do not cease to function.

These results extend recent capital market research on real estate firms. The finding of corporate governance as a mitigating factor complements the results of Goodwin (2013) concerning the value uncertainty hypothesis. If asymmetric information between corporate insiders and outsiders is high prior to a SEO, corporate governance might be a complementing factor to large offer price discounts. Accordingly, if shareholders can rely on active monitoring and incentivized managers, they might require less discounting to participate in the SEO. Furthermore, Anglin et al. (2011) provide evidence that sound REIT governance serves to reduce asymmetric information. My results show that this might also apply to equity issues where reduced levels of asymmetric information are associated with attenuated shareholder wealth losses. Thereby, my research also supports the general idea of corporate governance as a value enhancing factor in the real estate sector (Friday/Sirmans 1998; Feng et al. 2005; Kohl/Schaefer 2012). The chapter proceeds as follows. In the first part of section 3.2, I review the relevant literature with a particular focus on the real estate sector. Based on this, hypotheses are developed in the second part of section 3.2. Subsequently, the sample data (section 3.3) and the empirical methodology (section 3.4) are described. Section 3.5 presents descriptive statistics and the results before section 3.6 summarizes the findings and concludes.

## **3.2 Theoretical background**

### **3.2.1 Theory and empirical evidence of seasoned equity offerings**

Fundamental research on the capital issuance process began in the 1980s. The most popular model has been developed by Myers (1984) and Myers and Majluf (1984). According to their pecking order theory, internal funds (i.e. retained earnings) are the first choice when firms want to finance new investments. If external funds are necessary to meet the firm's financing needs, debt is preferred over equity. Thus, stock issues are the financing choice of last resort. This pecking order results from asymmetrically distributed information between managers and external investors. The latter are not able to reliably determine the value of the firm. Since the management has inside information and acts in the interest of the firm's existing shareholders, equity would only be issued if the firm is cur-

rently overvalued by the market. In consequence, equity issue announcements are perceived as negative signals. In contrast to equity, debt claims are fixed and thus less sensitive to uncertainty about the firm's true value. However, solely internal financial resources minimize the expected funding costs (e.g. issuance costs) making it management's first choice.

Furthermore, the implied cash flow hypothesis has been derived from the Miller and Rock (1985) model which is also based on informational asymmetries. It states that if a firm unexpectedly increases external financing, this might reveal that the management is more pessimistic about current as well as future earnings. If the market draws this very inference, the stock price drops at the time of the SEO announcement (Miller/Rock 1985; Jain 1992; Ghosh et al. 1999). A further model that is often related to capital increases is the free cash flow hypothesis by Jensen (1986). It implies that if firms have abundant free cash flows at their disposal, managers might be tempted to overinvest and thereby reduce the value of the firm. In the context of equity issues, investors should thus consider whether the firm has valuable investment opportunities and whether there is a lack of internal funds. Otherwise, empire building motives could be suspected. In sum, all three theories predict negative stock market reactions to SEO announcements. A point all theories have in common is the predicted negative relation between internal funds and capital market reaction.

Empirical research of security issues is extensive. In a review of empirical studies, Smith (1986b) provides evidence for the pecking order theory. Common stock issue announcements show by far the most negative stock price reactions. Prominent studies of SEOs comprise Asquith and Mullins (1986), Masulis and Korwar (1986), as well as Mikkelsen and Partch (1986). They document negative abnormal returns around the announcement day of -1.6% to -3.6%. Subsequently, those results were confirmed by several other papers, such as Kalay and Shimrat (1987), Korajczyk et al. (1991), Eckbo and Masulis (1992), Jain (1992), Jegadeesh et al. (1993), Denis (1994), Slovin et al. (1994), Bayless and Chaplinsky (1996), Altinkılıç and Hansen (2003), D'Mello et al. (2003), Heron and Lie (2004), and Demiralp et al. (2011). All these studies find negative announcement effects between -1% and -3%.<sup>86</sup>

---

<sup>86</sup> More SEO literature including both theoretical models and empirical studies are to be found in the comprehensive literature reviews by Eckbo and Masulis (1995) as well as Eckbo et al. (2007).

Further empirical research thereafter tried to uncover the reasons and determinants of negative value effects. It focuses on firm characteristics as well as performance and behavior prior and subsequent to SEOs. The latter analyzes long-run performance patterns of SEO firms. As this chapter studies short-term stock price effects, I only briefly review some prominent articles that can also be related to the explanation of short-term effects. Loughran and Ritter (1995) document that firms conducting an IPO or SEO subsequently underperform a matching sample of non-offering firms in terms of stock market performance (see also Spiess/Affleck-Graves 1995; Kang et al. 1999). They label their finding the “new issues puzzle”. In a follow-up study, they also find declining operating performance after equity offerings (Loughran/Ritter 1997). This decrease is in sharp contrast to improvements in stock as well as operating performance prior to the offering. It could therefore be interpreted as managers exploiting the opportunity to issue overvalued equity (Spiess/Affleck-Graves 1995; Lee 1997). Lee (1997) argues that free cash flow problems in the sense of Jensen (1986) aggravate after the proceeds of the equity offering are available to the firm’s management. Thereby, managerial discretion over free cash flows and subsequently overinvestment could cause inferior performance (Fu 2010). This would be in line with theoretical models that try to explain short-term effects. Denis and Sarin (2001) argue that poor earnings announcements in the years following the SEO might account for the underperformance, at least for small firms. They contend that investor overoptimism regarding firms’ prospects diminishes over time when poor earnings are realized after the SEO. Accordingly, the performance decline would be due to biased investor expectations that slowly disappear when uncertainty resolves.

Related papers attribute the puzzle to methodological issues concerning risk adjustment. Eckbo et al. (2000) argue that the technique of matching firms prior to the offering to compare issuing and non-issuing firms ex post is flawed (see also Jegadeesh 2000). Through an equity issue, a firm lowers its leverage ratio and increases its stock’s liquidity. Thereby, default and stock liquidity risk decrease which lowers the firm’s systematic risk and thus its expected return. Therefore, the observed return pattern only reflects a decrease in systematic risk and is not an indication of investor underreaction (Eckbo et al. 2000). A similar explanation to the new issues puzzle is based on real option theory. Firm value can be considered as the sum of the firm’s assets in place and its growth opportunities which can be valued as real options (Carlson et al. 2006). If firms use the offering proceeds to invest, the real option is exercised and it is converted into assets in place (Carlson et al. 2006).

Therefore, the risk of the firm is reduced and its expected return decreases (see also Carlson et al. 2010).<sup>87</sup>

A further strand of literature analyzes firm characteristics and other determinants that affect the short-term stock price reactions to SEO announcements. According to the theoretical predictions by Myers and Majluf (1984), negative announcement effects are caused by asymmetrically distributed information between the management and outside investors. Hence, the number of SEOs conducted might have an impact on the observed effect. Frequent equity issuers could succeed in mitigating informational asymmetries through information disclosure in offering prospectuses and during road shows, or through increased analyst coverage (D'Mello et al. 2003). Thereby, negative value effects could be reduced. D'Mello et al. (2003) corroborate this hypothesis. The decrease in shareholder value becomes smaller with each following SEO announcement, which they attribute to reduced informational asymmetry.<sup>88</sup> Furthermore, business cycles as well as equity market up- and downturns might play a role if managers try to time the market (Baker/Wurgler 2002). In expansionary periods, managers predominantly issue equity in order to maximize the proceeds when share prices have appreciated. There is less uncertainty about firm value and thus less asymmetric information. In line with this prediction, Choe et al. (1993) and Henderson et al. (2006) find more capital increases during these periods. The former also document less negative announcement effects.

Korajczyk et al. (1991) provide evidence that SEOs preferably take place shortly after earnings announcements when asymmetric information has presumably decreased. Accordingly, they find that market reactions to announcements at a later date are more negative. Likewise, D'Mello and Ferris (2000) document that less analyst coverage and less consensus are related to stronger declines in prices. As analyst consensus and coverage may reduce informational asymmetries this mitigates negative wealth effects when SEOs are announced. Lee and Masulis (2009) use the quality and accuracy of firms' accounting information as a proxy for asymmetric information. In line with their hypothesis, they find more negative announcement effects for firms with lower accounting quality. Another in-

---

<sup>87</sup> Yet another risk-based explanation by Lyandres et al. (2008) is based on a low minus high investment factor that earns a positive return. Since issuing firms invest significantly more than non-issuing firms, this factor explains a major part of the new issues puzzle (Lyandres et al. 2008).

<sup>88</sup> On the contrary, Slovin et al. (1991) provide empirical evidence for commercial banks that repeat issuers experience negative announcement effects while first-time issuers do not. However, D'Mello et al. (2003) argue that these results may be due to the sample construction and different firm characteristics of first-time issuers and repeat issuers that the authors do not control for.

indicator of asymmetric information is management insider trading. Lee (1997) argues that if managers privately sell equity prior to a SEO and their firm subsequently underperforms, then they might intentionally have sold overpriced shares. He finds empirical evidence in support of his conjecture. Moreover, Loderer and Mauer (1992) find that dividend-paying firms experience more negative announcement effects than non-dividend-paying firms. This seems to be consistent with the idea that firms should only issue equity if they have profitable investment opportunities and otherwise rather forgo the costly issuance of shares.

Starting with Wruck (1989) and Hertz and Smith (1993), researchers tried to uncover whether all types of SEOs cause the same capital market reactions. Both papers find that capital increases via private placements are associated with positive stock price reactions as opposed to negative announcement effects in response to public offerings. Wruck (1989) documents that ownership concentration increases following private placements and concludes that the positive value effect is caused by increased monitoring activities by blockholders. Hertz and Smith (1993) provide similar evidence, but additionally conclude that positive abnormal returns might be an indication of undervaluation of the firm. Managers might be able to credibly signal this during private negotiations prior to the placement. However, in the long run stock performance declines which can be attributed to investor overoptimism when private placements are announced (Hertz et al. 2002). Subsequent research casts doubt on the monitoring hypothesis. Wu (2004) finds that active blockholders, such as pension funds and venture capitalists, actually decrease their holdings following private equity placements. Instead, evidence suggests that managers make use of private placements to increase their own holdings and wealth by participating in private placements that are issued at higher discounts. For a sample of Japanese firms, Kang et al. (1999) find positive short-term and negative long-term abnormal returns regardless of whether equity is issued publicly or privately. At least for Japan, this also undermines the private information as well as the monitoring hypothesis.

After this brief overview of important cross-industry studies, the focus is shifted to SEO research in the real estate industry henceforth. The majority of studies deals with the American real estate sector, especially with REITs. Among the first articles on US REITs was Howe and Shilling (1988). They find negative announcement effects of -1.9% for equity issues while debt issues are associated with positive stock market reactions of 1.7%. Allen and Rutherford (1992) extend the investigation to US real estate corporations that

issue common stock, straight and convertible bonds, lines of credit, and mortgages. The latter two do not produce any significant announcement returns. On the contrary, convertible bond (-2.5%) and stock (-1.9%) issue announcements are accompanied by significant share price drops whereas debt issues show positive wealth effects (0.6%). Thus, the results reinforce the findings of Howe and Shilling (1988) and are also broadly consistent with the empirical support of the pecking order theory in Smith (1986b). Ooi et al. (2010) present evidence in favor of the market timing hypothesis (see also Boudry et al. 2010). They show that financing decisions of REITs, i.e. the issue and repurchase of equity and debt, are predominantly driven by market timing considerations. But in the long run REITs also strive for a target leverage ratio which supports the tradeoff theory. Ghosh et al. (1999) also find negative announcement effects for a sample of SEOs by US REITs. The authors additionally show that the returns are positively related to underwriter rank and negatively influenced by percentage offer size, firm size, and insider ownership. Overall, their findings lend support to the information asymmetry hypothesis as well as the implied cash flow hypothesis (Ghosh et al. 1999).

Consistent with the results of cross-industry studies, SEO underpricing is also an issue for REITs (Ghosh et al. 1998; Ghosh et al. 2000; Goodwin 2013). However, there seem to be some specific features to the real estate industry. For example, Friday et al. (2000) document that operating performance does not deteriorate after REIT SEOs. The authors argue that their contrary results might be due to limited managerial discretion over internal funds as imposed by REIT legislation. Subsequently, Ghosh et al. (2013) reexamine this puzzle and find decreasing operating performance, consistent with cross-industry evidence. They contend that the findings by Friday et al. (2000) may be due to their particular sample period during which REITs have experienced a substantial upswing. Additionally, performance measures and benchmarks may be flawed. Ghosh et al. (2013) thus conclude that REITs' operating performance after SEOs is not different from the one in other industries. Zhu et al. (2010) find evidence of earnings manipulation by REITs around the time of SEOs. This could be an indication of window dressing and therefore a reason for declining operating performance. For private equity placements by REITs, Marciukaityte et al. (2007) find negative announcement returns. This is inconsistent with evidence from other industries. A possible explanation could be that a more concentrated ownership structure following the offering is rather costly than beneficial (Shleifer/Vishny 1997; Friday et al. 1999). However, in the long run operating as well as stock market performance ameliorate which the

authors attribute to managers' market timing abilities and subsequent skills to invest in value-increasing projects.<sup>89</sup>

### 3.2.2 Hypotheses

Based on the previous literature review, hypotheses are developed to guide the empirical investigation. Finally, I intend to answer the following questions: When the four empirically well-documented factors in expected returns (i.e. market, size, value, and momentum) are accurately accounted for, which effects do capital increases have on the value of European real estate companies? Does corporate governance by means of active monitoring and insider ownership mitigate the typically documented wealth losses?

Two main hypotheses result. First, SEOs produce negative announcement effects as predicted by Myers and Majluf (1984). One explanation for these wealth losses is that managers could overinvest if the firms' free cash flows, including SEO proceeds, exceed their valuable investment opportunities (Jensen 1986). The second main hypothesis arises from the free cash flow theory. Each factor that decreases (increases) the potential for managerial overinvestment, such as effective corporate governance, will alleviate (amplify) SEO-related wealth losses. Therefore, I focus on variables that can be related to overinvestment. First, market timing is considered (see Baker/Wurgler 2002). It is tested whether abnormal returns during expansionary market phases are less negative because of good prospects of the overall economy. This investigation is particularly interesting in the light of the recent financial crisis as supportive evidence could be interpreted as a driver of pro-cyclical financing. On the other hand, managers might consider the stock performance of their firm as compared to the overall market. If the decision to issue equity is solely driven by the firm's market valuation instead of the existence of valuable investments, managers might also be suspected of market timing. If investors anticipate this behavior, more negative announcement effects can be expected if a firm has previously outperformed the market. Second, I consider insider ownership as it is one of the most important means of corporate governance. If ownership is rather concentrated, a SEO could be perceived less negatively due to active monitoring by blockholders and thus less overinvestment problems. On the other hand, firms with low insider holdings could suffer from less effective governance due to a lack of blockholders and missing managerial incentives. Hence, announcement returns could be more negative. As ownership effects have been shown to be non-linear due to

---

<sup>89</sup> For a comprehensive review of further REIT related research, see also Zietz et al. (2003).



opposing effects such as incentive alignment and entrenchment (e.g. McConnell/Servaes 1990; Friday et al. 1999), I will also control for this possibility. Third, problems associated with excessive free cash flows seem more likely if a company has alternative sources of funds. Excess cash holdings might be interpreted as a threat of managerial overinvestment or the potential to extract private benefits of control (Pinkowitz et al. 2006; Dittmar/Mahrt-Smith 2007; Harford et al. 2008). Therefore, I test whether corporate cash holdings and operating profitability (funds from operations), as a measure of the capability of generating internal funds, have a negative impact on SEO announcement effects. Fourth, the uses of SEO proceeds might also have an impact on announcement effects. The price-to-book ratio is often interpreted as a proxy for firms' investment opportunities (e.g. Denis 1994). Thus, high price-to-book firms might suffer less from overinvestment problems because they have profitable investment opportunities. So I suppose that these firms' stock prices react less negatively. In line with Loderer and Mauer (1992), I assume high dividend paying firms to experience more negative returns. If the management is reluctant to cut or omit dividends, but instead issues costly equity to finance operations, this could reduce firm value. Fifth, less negative capital market reactions are expected if firms actively reduce asymmetric information by providing information to dispel shareholders concerns regarding overinvestment. One possibility is to place shares privately. By means of private negotiations, the management could credibly convey information with respect to valuable investment opportunities. Alternatively, firms can publicly announce the intended use of the offering proceeds. Thereby, managerial discretion over the offering proceeds is limited and shareholders' fears of overinvestment could be alleviated. Finally, it is a common view that Germany's corporate governance system is weaker in terms of shareholder protection rights as compared to the one of other countries (see e.g. Shleifer/Vishny 1997; Porta et al. 1999; Franks/Mayer 2001b). Therefore, I expect a more negative reaction when the issuing firm is from Germany.

In order to determine the importance of the aforementioned governance-related factors accurately, additional factors are controlled for that have turned out to be important in cross-sectional analyses. Large firms are assumed to be more transparent due to higher analyst coverage and stricter accounting standards. So the firm's market capitalization is added to control for possibly different levels of asymmetric information. Leverage is also an important factor as it is an indicator of firms' financial flexibility and risk. Moreover, it might play a role in the real estate sector whether an issuer is focused on commercial or on

residential real estate. Issuers with a focus on commercial properties likely face a higher business risk because cash flows in the commercial sector usually exhibit a higher volatility. Additionally, I control for issuers that are REITs. Since REITs have high mandatory payout ratios, they mainly have to rely on external financing. Finally, offer size as measured by the percentage increase in the number of shares outstanding is controlled for. Greater offers could indicate a lack of other financing sources or even financial emergency.

### 3.3 Data

The sample of firms consists of the components of the real estate indices Ellwanger & Geiger (E&G) Dimax 70 and E&G Epix 50 which comprise German and European real estate companies, respectively.<sup>90</sup> Since seven firms are included in both indices, a sample of 113 firms results. In order to be included in E&G indices, these firms have to generate at least 75% of their revenues from real estate activities and be publicly listed with an appropriate level of free float, according to E&G. For these 113 firms, I search for capital increases that occurred between 1 January 1997 and 31 December 2013 in the Thomson One Banker database. I manually validate all the resulting events by confirming their announcement dates, and all offering characteristics such as offer price, number of shares offered etc., as well as whether there have been confounding events.<sup>91</sup> Events which were wrongly classified as SEOs, such as block sales of secondary shares, sales of treasury shares, and exercises of management or employee stock options or convertible bonds are excluded. Likewise, equity issues in exchange for a different company's stocks or assets as well as mixed offers are removed from the sample. I thereby obtain a sample of 142 events that have been verified. Each of these events additionally fulfills the following criteria: stock price data has to be available for at least 260 trading days prior to the announcement day; the capital increase is in exchange for cash; country-specific data has to be available in order to calculate abnormal returns (for further details see the following section 3.4).

The stock price data for the respective firms is obtained from Thomson Reuters Datastream.<sup>92</sup> For further analyses, company-specific data is also required, e.g. the firm's

---

<sup>90</sup> The indices are calculated and published by the German private bank Ellwanger & Geiger and can be downloaded from their website. I use the index composition as of November 2013.

<sup>91</sup> For this purpose, I conducted an extensive search on the respective corporate website, Nexis (formerly LexisNexis), and the website of the respective national exchange commission, such as French *Autorité des Marchés Financiers* (AMF) and Spanish *Comisión Nacional del Mercado de Valores* (CNMV), or the website of German *Deutsche Gesellschaft für Ad-hoc-Publizität* (DGAP) where all ad-hoc announcements are published. In some cases, a google web search has also been conducted.

<sup>92</sup> The total return index is used in order to adjust for dividend payments, stock splits, etc.

leverage ratio or its market-to-book ratio, which are received from Worldscope as well as business cycle data from Datastream. All issue-related data has been verified with the respective corporate announcements. Finally, data for calculating 4-factor model abnormal returns are obtained from Andrea Frazzini's data library.<sup>93</sup>

### 3.4 Methodology

#### 3.4.1 Event study

By means of event study methodology, one can quantify the effect a corporate announcement has on the announcing company's value. According to the (semi-strong) efficient market hypothesis, stock prices adjust immediately as soon as new information is publicly released (Fama 1970). Thus, by estimating the expected return  $E(R_{i,t})$  of stock  $i$  on day  $t$  and subtracting it from its actual return on this day  $R_{i,t}$ , one can determine the abnormal return of a stock on the day of information disclosure, as well as on the days surrounding the announcement (i.e. the event window). This abnormal return can be interpreted as the change in firm value induced by the released information. As actual returns are readily available, the challenge is to estimate expected returns. A 4-factor return model is employed for this purpose which is well suited to describe the cross-section of expected returns (Carhart 1997; Asness/Frazzini 2013). Mathematically, the concept is an extension of the 1-factor market model as described in MacKinlay (1997):

$$R_{i,t} = \alpha_i + \beta_i \cdot MKT_{c(i),t} + \gamma_i \cdot SMB_{c(i),t} + \delta_i \cdot HML_{c(i),t} + \lambda_i \cdot UMD_{c(i),t} + v_{i,t} \quad (3.1)$$

$$E(R_{i,t}) = \hat{\alpha}_i + \hat{\beta}_i \cdot MKT_{c(i),t} + \hat{\gamma}_i \cdot SMB_{c(i),t} + \hat{\delta}_i \cdot HML_{c(i),t} + \hat{\lambda}_i \cdot UMD_{c(i),t} \quad (3.2)$$

$MKT_{c(i),t}$  is the return of the market index in excess of the risk-free rate on day  $t$  of country  $c$  where firm  $i$  is located. The daily returns of the other three factors size  $SMB_{c(i),t}$ , value  $HML_{c(i),t}$ , and momentum  $UMD_{c(i),t}$  are obtained by forming value-weighted zero-investment portfolios in each country.<sup>94</sup> The portfolios are long in small (value; high return) stocks and short in big (growth; low return) stocks. Portfolios are rebalanced on a monthly basis. Breakpoints for portfolio classification are updated each year. For further details on this procedure see Fama and French (1992, 1993, 1996) as well as Asness and Frazzini (2013) and Asness et al. (2014). All four factors are obtained from Andrea

<sup>93</sup> The data can be downloaded from [http://www.econ.yale.edu/~af227/data\\_library.htm](http://www.econ.yale.edu/~af227/data_library.htm).

<sup>94</sup> I use the HML factor according to the Fama and French (1996) methodology. However, the results do hardly change when the HML factor based on the Asness and Frazzini (2013) methodology is employed.

Frazzini's data library. From equation (3.1), the parameters  $\alpha$ ,  $\beta$ ,  $\gamma$ ,  $\delta$  and  $\lambda$  for each firm  $i$  are estimated by regressing the returns of the respective factor portfolios for all days  $t$  of the estimation period on the corresponding actual returns  $R_{i,t}$ . Inserting the estimated parameter values into equation (3.2) yields the expected return  $E(R_{i,t})$  of firm  $i$  on day  $t$  of the event window.

The length of the estimation window is set to 250 trading days. It thus covers an entire year and thereby controls for seasonal factors in the calculation of abnormal returns. The abnormal return results simply from subtracting the expected return  $E(R_{i,t})$  from the actual return  $R_{i,t}$  on day  $t$ :

$$AR_{i,t} = R_{i,t} - E(R_{i,t}) \quad (3.3)$$

Finally, the individual abnormal returns  $AR_{i,t}$  are averaged over all  $N$  events and  $T$  days of the event window which extends from day  $t_1$  to  $t_2$ , denoted as  $[t_1/t_2]$ . This produces the cumulative average abnormal returns (CAAR):

$$CAAR_{t_1,t_2} = \frac{1}{N} \sum_{t=t_1}^{t_2} \sum_{i=1}^N AR_{i,t} \quad (3.4)$$

The main event window has a length of 21 trading days from 10 days before to 10 days after the announcement day  $t=0$   $[-10/10]$ . The null hypothesis assumes that all abnormal returns are equal to zero. For hypothesis testing different statistical tests are employed. First, I use a standard two-sided  $t$ -test. Second, the Boehmer et al. (1991) [BMP] test statistic is calculated which accounts for event-induced variance increases. Third, the non-parametric test by Corrado (1989) is also employed in order to ensure that the results hold regardless of the underlying assumptions concerning the distribution of returns.

### 3.4.2 Regression analysis

In the second part of the empirical analysis, the abnormal returns are regressed on several explanatory variables in order to identify determinants of shareholder wealth effects. The abnormal return on the event day ( $t=0$ ) of firm  $i$  are used to run the following cross-sectional OLS regression with clustered standard errors. This is to account for a potential firm effect since several firms in the sample announce multiple SEOs (Petersen 2009):

$$AR_{i,t} = \alpha_0 + \sum_{j=1}^k \beta_j \cdot Var_{i,t,j} + \varepsilon_{i,t} \quad (3.5)$$

$Var_j$  represents the  $k$  independent variables,  $\alpha_0$  is the regression constant,  $\beta_j$  are the regression coefficients, and  $\varepsilon$  is the error term. An overview of all variables, their definitions, and their expected influence is provided in Table 3.1 below. The third column summarizes the hypotheses from subsection 3.2.2. Since I conjecture a non-linear relationship between insider shareholdings and announcement effects, the variable is included in both linear and squared form.

**Table 3.1: Explanatory variables for the multiple regression analysis**

Variable	Definition	Expected influence
<i>Exp</i>	<i>Dummy</i> : 1 if announcement is during expansionary market phase as indicated by the Centre for Economic Policy Research (CEPR), 0 otherwise <sup>95</sup>	+
<i>ExcR</i>	Excess Return: Return of the firm's stock in excess of the market index return during the estimation window <sup>96</sup>	-
<i>%Insider</i>	Percentage of shares held by insiders <sup>97</sup>	Non-linear
<i>Cash</i>	Cash and short-term investments relative to total assets	-
<i>FFO</i>	Funds from operations relative to total assets	-
<i>P/B</i>	Price-to-book ratio	+
<i>DivY</i>	Dividend yield	-
<i>PP</i>	<i>Dummy</i> : 1 if private placement, 0 otherwise	+
<i>Purp_#</i>	<i>Dummy</i> : 1 if firm announces what the offering proceeds will be used for, 0 otherwise (# indicates a specific category: 1 – mergers & acquisitions (M&A); 2 – capital expenditures (CapEx); 3 – leverage; 4 – general)	+
<i>GER</i>	<i>Dummy</i> : 1 if German issuer, 0 otherwise	-
<i>Ln(Size)</i>	Logarithm of market capitalization	+

<sup>95</sup> The data can be obtained from the CEPR website: <http://www.cepr.org/content/euro-area-business-cycle-dating-committee>.

<sup>96</sup> The excess return is thus calculated as:  $ER_{-260,-11} = R_{-260,-11}^{firm} - R_{-260,-11}^{market}$ .

<sup>97</sup> Insider shareholdings include shares held by officers, directors, pension or benefit plans, shares in trust, shares held by other corporations (except insurance companies), and shareholdings by individuals that exceed 5%.

(Table 3.1 continued)

<i>Lev</i>	One minus the proportion of equity relative to total assets	-
<i>Commercial</i>	<i>Dummy</i> : 1 if announcing firm's business is mainly focused on commercial real estate, 0 otherwise	-
<i>REIT</i>	<i>Dummy</i> : 1 if announcing firm is a REIT, 0 otherwise	+
<i>Offer size</i>	Number of shares issued as percentage of shares outstanding	-

All firm-specific explanatory variables (e.g. funds from operations) are from the fiscal year prior to the year when the SEO was announced. The leverage ratio is calculated according to Welch (2011) as 100% minus equity over total assets. All announcement-specific variables originate from the respective corporate announcement or related press releases. In the following section, the empirical results are presented and discussed. To begin with, some descriptive statistics are shown.

### 3.5 Results

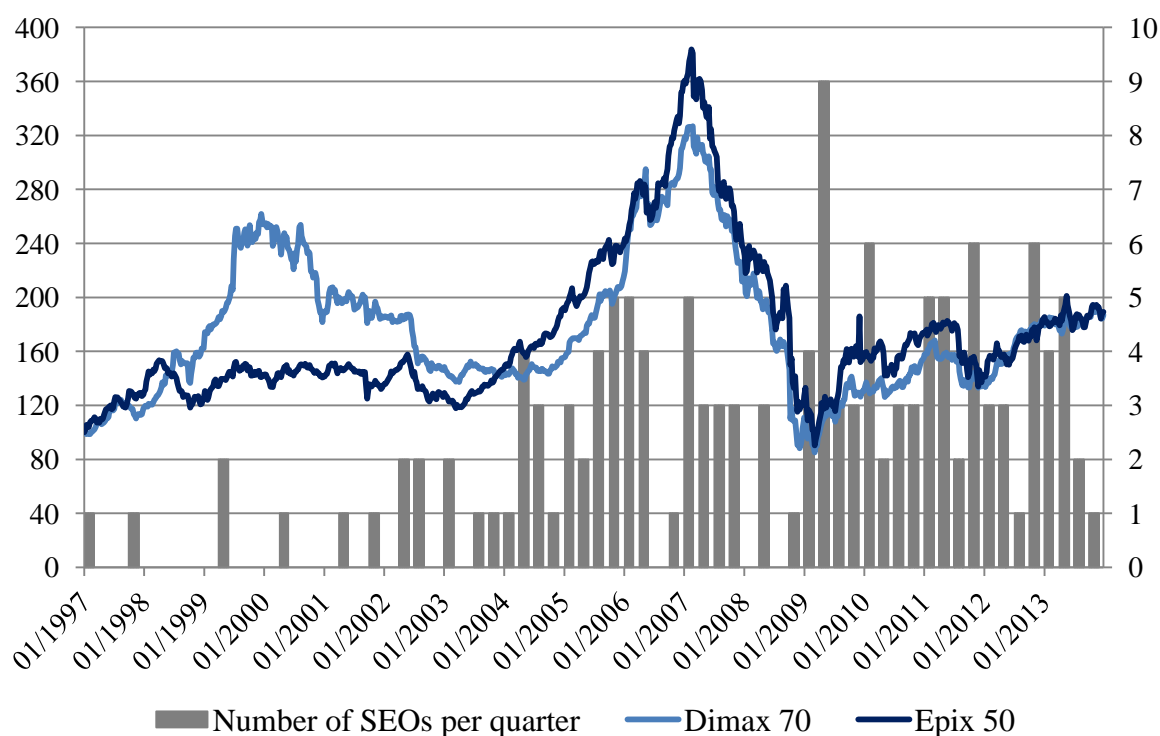
#### 3.5.1 Descriptive statistics

As mentioned above, the sample period from 1997 to 2013 is characterized by some substantial ups and downs in the real estate sector. Figure 3.1 illustrates the development of the real estate indices E&G Epix 50 and E&G Dimax 70 as well as the quarterly number of SEO announcements. Graphically, it seems as if the real estate indices and the number of SEO announcements commove to some extent. Furthermore, from 2003 on there are only four quarters in which none of the sample firms has announced a SEO: Q2 2003, Q3 2006, Q1 2008, and Q3 2008.<sup>98</sup> These points in time coincide with some of the major downturns of the real estate indices. Managers seem to be reluctant to increase capital during market turmoil. Particularly in Q3 2008, firms probably postponed equity issues in order to attract higher investor demand after the stock market would recover. This could be an indication of market timing behavior by European real estate companies. When equity prices rise, conditions for a capital increase improve and firms are more likely and willing to issue new equity. In subsection 3.5.3, I will test whether this observation is also confirmed by a

<sup>98</sup> The apparent lack of SEO announcements from 1997 to 2002 is also due to limited data availability on corporate websites and Nexis.

significant relationship between the market phase and SEO announcement returns as suggested by the market timing hypothesis.

**Figure 3.1: Development of real estate indices and quarterly number of SEO announcements during the sample period from 1997 to 2013**



Moreover, the level of asymmetric information likely varies depending on the market phase. Therefore, the management could prefer a different offering method in order to provide more information to investors during times of allegedly high informational asymmetries. Table 3.2 shows the distribution of public and private offerings over expansionary and recessionary market phases according to the CEPR.

**Table 3.2: Distribution of events across offering type and market phase**

	Offering type		
	Public offering	Private placement	Total
Recessionary market phase	21 (53.85%)	18 (46.15%)	39 (100%)
Expansionary market phase	73 (70.87%)	30 (29.13%)	103 (100%)
Total	94 (66.20%)	48 (33.80%)	142 (100%)

In line with my assumption, only 29% of SEOs are privately placed during expansionary phases. On the contrary, almost half of the offerings (46%) are conducted privately when the market is in a recessionary state. Apparently, managers prefer private placements when the level of asymmetric information is high prior to the offering. By means of private negotiations, the management can reduce information asymmetries by providing detailed information to investors. The following subsections will offer an insight as to whether the offering type also affects the associated shareholder wealth effects.

Table 3.3 illustrates the distribution of equity offerings across countries as well as offering type. The sample of 142 capital increases consists of 48 private placements and 94 public equity offerings. Public offerings (predominantly in the form of rights offerings) represent the dominating offering type accounting for approximately two thirds of the sample. Since the majority of the sample firms is from Germany (the Dimax 70 firms), it is not surprising that approximately half of the equity offerings are announced by German real estate companies. This will be accounted for in the subsequent analysis. Furthermore, the inclusion of the Dimax 70 provides the opportunity to investigate private placements in detail as German firms frequently make use of this offering method. Second most equity offerings are announced by Austrian firms, followed by Finnish and UK firms. Announcements by real estate companies from other countries represent only a minor fraction of the sample with 2 to 5 offerings per country. With the exception of Finland, the Netherlands, and Norway, public offerings are the dominating type in the sample under investigation.

**Table 3.3: Distribution of events across countries and offering type**

	Public offerings	Private placements	Total
Austria	18	0	18
Belgium	3	0	3
Denmark	3	1	4
Finland	6	7	13
France	3	0	3
Germany	44	30	74
Greece	2	0	2
Netherlands	0	3	3



(Table 3.3 continued)

Norway	2	3	5
Spain	2	0	2
Switzerland	4	0	4
UK	7	4	11
Total	94	48	142

Table 3.4 provides an overview of the offering characteristics: the mean and median number of offered shares, the relative size of the offering, and the offer price discount relative to the share's closing price two days prior to the SEO announcement. The number of offered shares is substantially skewed. Some exceptionally huge equity offerings seem to boost the mean number of shares while the median number amounts to a relatively moderate 5.6 million and 3.1 million shares for public offerings and private placements, respectively. In terms of relative offer size, the skewness is less pronounced. Public offerings are relatively larger than private placements. The median offer is one new share for three old shares for the former, but only one for ten for the latter offering type.

**Table 3.4: Sample characteristics by offering type**

		Public offerings (N=94)	Private place- ments (N=48)	Overall (N=142)
Number of shares offered	Mean	191,950,279	16,168,638	132,531,132
	Median	5,596,212	3,141,744	5,289,039
Relative offer size <sup>99</sup>	Mean	44.93%***	11.88%	33.76%
	Median	33.33%***	10.00%	17.08%
Relative dis- count (t = -2) <sup>100</sup>	Mean	12.39%***	2.27%	8.78%
	Median	9.61%***	3.90%	5.96%

\*\*\* indicates statistically significant differences at the 1% level.

<sup>99</sup> The difference in means in relative offer size is statistically significant showing that the fractional capital increase is substantially larger for public than it is for private offerings (t-value 4.87). The same holds for the median test. The Wilcoxon rank sum test produces a z-score of 7.81.

<sup>100</sup> The relative discount is calculated as the percentage spread of the issue price as compared to the stock's closing price two days prior to the SEO announcement. It is significantly larger for public offerings (N=93) than for private placements (N=47) with a t-value of 3.69. Likewise, the medians of the two subsamples are significantly different (z-score 2.79). The number of offerings for which the discount could be calculated is reduced by one for each offering type due to missing data.

Since private placements often exclude existing shareholders' preemptive rights, they dilute their claims. Therefore, the management seems to be cautious in these cases and limits the size of these offerings accordingly. Furthermore, private placements are offered at a lower discount than public SEOs are. This is probably due to the opportunity to provide additional information to investors during private negotiations. Thereby, asymmetric information can be reduced and less discounting is necessary (see Goodwin 2013). For the greater public offerings, investors demand has to be attracted by granting higher discounts on the issue price.

### 3.5.2 Shareholder wealth effects of secondary offerings

Table 3.5 provides an overview of abnormal stock returns in response to announcements of seasoned equity offerings. The results show that the stock market reacts highly negatively (columns 2 and 3). On the event day ( $t = 0$ ), stocks of announcing real estate companies experience a statistically significant AAR of -1.03% (t-value -3.32). Approximately two thirds of the abnormal returns on this day are negative (column 7).

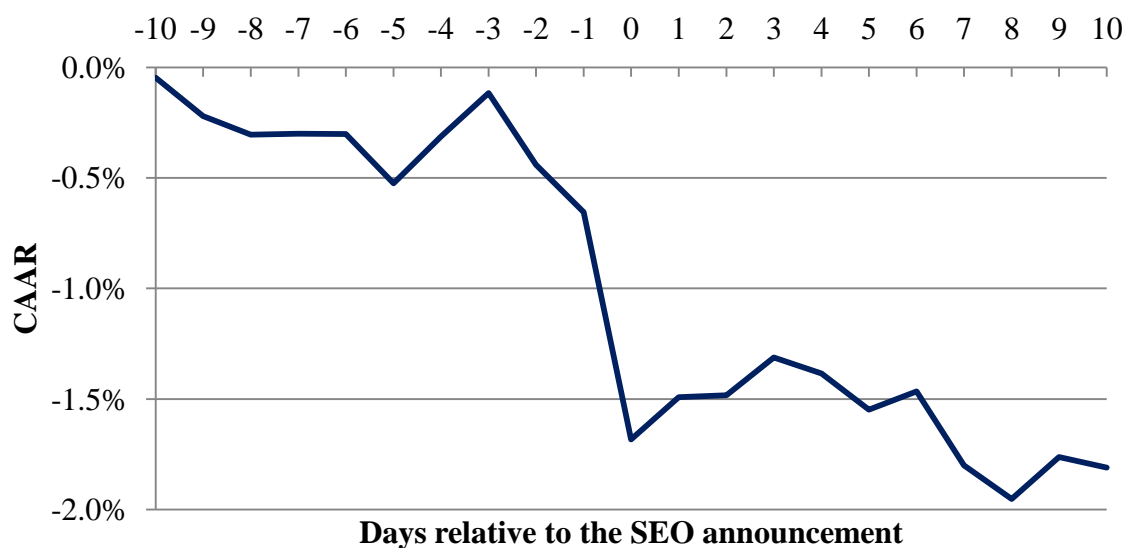
**Table 3.5: Announcement effects of seasoned equity offerings (N=142)**

Event window	CAAR	Median CAR	BMP-test	t-test	Corrado-test	% negative
[-10/+10]	-1.81%	-1.46%	-2.32**	-2.07**	-1.83*	59.15%
[-5/+5]	-1.25%	-1.47%	-2.25**	-1.89*	-1.44	60.56%
[-3/+3]	-1.00%	-0.86%	-2.19**	-1.81*	-1.22	62.68%
[-1/+1]	-1.05%	-0.58%	-3.10***	-3.01***	-1.50	60.56%
[-2/-2]	-0.32%	-0.16%	-1.55	-1.41	-1.96*	56.34%
[-1/-1]	-0.21%	-0.13%	-1.20	-1.14	-0.75	53.52%
[0/0]	-1.03%	-0.51%	-3.64***	-3.32***	-3.70***	64.79%
[+1/+1]	0.19%	0.14%	1.21	1.02	1.84*	42.96%
[+2/+2]	0.01%	0.00%	-0.13	0.04	0.14	50.00%
[-2/-1]	-0.54%	-0.49%	-2.11**	-1.95*	-1.91*	56.34%
[-2/0]	-1.57%	-1.16%	-4.11***	-3.71***	-3.70***	63.38%

Table 3.5 shows the cumulative average and median abnormal return in response to SEO announcements over different event windows. Abnormal returns are tested for statistical significance using the Boehmer et al. (1991) [BMP]test, the cross-sectional t-test, and the non-parametric Corrado (1989) test. \*\*\*, \*\*, \* indicate statistical significance at the 1%, 5%, and 10% level, respectively.

This emphasizes that the capital market reaction is significantly negative on average, even after accounting for the four well-documented factors in stock returns. The Boehmer et al. (1991) test that adjusts for event-induced variance increases and the non-parametric Corrado (1989) test also confirm the statistically significant effect on the event day. The significance also extends to the larger 3-, 7-, 11-, and 21-day event windows surrounding the announcement (rows 1-4). Scrutinizing the single-day abnormal returns before and after the announcement reveals that the statistical significance is substantially driven by the highly negative AAR on the announcement day  $t=0$ . Although there is weak evidence of post-announcement recovery on day 1, this effect is too small to be interpreted as indication of an initial overreaction. Besides, there is some evidence of negative pre-announcement returns ( $t=-2$ ). In both cases solely the Corrado test yields marginal significance.

Figure 3.2 illustrates the CAARs over the entire event window  $[-10/+10]$ . The post-announcement effect is negligible and amounts to only  $-0.13\%$  over the  $[+1/+10]$ -period. The pre-announcement returns are slightly higher. Especially the  $[-2/-1]$ -window yields a cumulative abnormal return of  $-0.54\%$  which is statistically significant at the 10% level according to all of the three tests. Thus, part of the negative shareholder wealth effect can be observed prior to the official announcement which could indicate an information leakage. This could occur if private negotiations become publicly known prior to the corporate announcement. Overall, there is some evidence that the entire announcement effect extends over three days  $[-2/0]$  and amounts to  $-1.54\%$ . But most of the price drop occurs on the event day. By contrast, there is no evidence of abnormal post-announcement returns. It can thus be concluded that the market is efficient. It incorporates new information after the announcement immediately and does not over- or underreact. The results confirm the first main hypothesis and are in line with prior literature on seasoned equity offerings. However, the decrease in value is not as severe as documented in prior cross-industry as well as real estate studies. Even over the entire event window the loss in value does not exceed 2%. There could be several explanations for this finding. First, earlier research mostly employs 1-factor market models to estimate expected returns. Since I use a 4-factor model for this purpose, the resulting expected returns are more precise because more factors are accounted for. The abnormal return which represents the difference between expected and actual return could thus be smaller. However, this is not the case. A standard market model event study produces very similar results.

**Figure 3.2: Cumulative average abnormal returns over the event window [-10/+10]**

Second, one may argue that the results are due to the combined consideration of private and public offerings. But consistent with Marciukaityte et al. (2007), I find a uniformly negative capital market reaction in both subsamples when the sample is split to consider the two offering types separately. As the explanatory power of univariate tests is limited, I do not discuss these results here, but postpone the detailed discussion to the multivariate analysis in subsection 3.5.3. In sum, methodological and data-related explanations can be ruled out for these findings. Thus, although the sample contains a period of financial turmoil and a severely affected industry, SEO announcement effects are not as negative as documented by prior research. In the next subsection, I will try to uncover potential reasons for this.

### 3.5.3 The impact of corporate governance on shareholder wealth effects

In the following, I intend to determine whether corporate governance is able to mitigate the observed negative announcement effects. As indicated above by descriptive statistics, secondary offerings are relatively heterogeneous. Certain offering or firm characteristics might foster managerial incentives to overinvest while other factors play a mitigating role. The following table shows the results of the multiple OLS regression from equation (3.5). Five different models are presented. Models 1 to 3 comprise the full sample, except for one observation dropping out due to data availability (one missing *FFO* value). Models 4 and 5 are based on the subsample for which the variable insider ownership (*%Insider*) is available. This leads to a sample of 99 observations. Model 5 serves as a robustness check.

**Table 3.6: Results of the multiple OLS regression**  
**(Regression coefficients, t-values in parentheses)**

Variable	(1)	(2)	(3)	(4)	(5)
Exp	0.0067 (0.64)	-	0.0086 (0.82)	0.0174 (1.19)	0.0114 (0.87)
PP	0.0179 * (1.70)	0.0070 (1.25)	0.0217 ** (2.12)	0.0089 (0.62)	0.0067 (0.49)
Exp&PP	-0.0185 (-1.56)	-	-0.0204 * (-1.73)	-0.0192 (-1.14)	-0.0189 (-1.13)
ExcR	-	-0.0026 (-1.42)	-	-	-
%Insider	-	-	-	-0.0993 ** (-2.08)	-
(%Insider) <sup>2</sup>	-	-	-	0.1261 ** (2.17)	-
Cash	-0.1089 *** (-3.55)	-0.1190 *** (-3.91)	-0.1034 *** (-3.35)	-0.2773 *** (-2.98)	-0.2590 *** (-3.03)
FFO	-0.1304 (-1.26)	-0.1271 (-1.17)	-0.1374 (-1.23)	-0.3694 (-1.14)	-0.3341 (-1.09)
P/B	0.0037 (0.90)	0.0071 (1.33)	0.0027 (0.70)	0.0045 (1.06)	0.0048 (1.04)
DivY	-0.0021 (-1.28)	-0.0025 (-1.48)	-0.0021 (-1.19)	-0.0027 (-1.25)	-0.0031 (-1.48)
Purp_1 (M&A)	-	-	0.0125 (1.22)	-	-
Purp_2 (CapEx)	-	-	-0.0023 (-0.24)	-	-
Purp_3 (Leverage)	-	-	0.0002 (0.02)	-	-
Purp_4 (General)	-	-	-0.0055 (-0.62)	-	-
GER	-0.0157 (-1.48)	-0.0146 (-1.55)	-0.0149 (-1.45)	-0.0135 (-1.05)	-0.0159 (-1.24)
Ln(Size)	-0.0071 *** (-2.84)	-0.0074 *** (-3.05)	-0.0074 *** (-2.86)	-0.0092 ** (-2.49)	-0.0100 *** (-3.06)
Lev	-0.0678 *** (-2.79)	-0.0738 *** (-3.14)	-0.0706 *** (-2.88)	-0.0722 * (-1.77)	-0.0784 ** (-2.07)
Commercial	-0.0163 (-1.56)	-0.0161 (-1.62)	-0.0161 (-1.53)	-0.0071 (-0.44)	-0.0059 (-0.33)

(Table 3.6 continued)

REIT	-0.0016 (-0.15)	-0.0015 (-0.15)	-0.0020 (-0.18)	-0.0044 (-0.32)	-0.0022 (-0.18)
Offer size	-0.0004 (-0.06)	-0.0008 (-0.13)	0.0007 (0.11)	-0.0080 (-1.13)	-0.0064 (-0.78)
Constant	0.0935 *** (4.46)	0.1015 *** (4.33)	0.0959 *** (4.41)	0.1262 *** (3.96)	0.1266 *** (4.28)
N	141	141	141	99	99
F-statistic	3.20 ***	4.14 ***	3.87 ***	4.85 ***	3.75 ***
Adj. R <sup>2</sup>	19.74%	19.79%	18.68%	21.92%	19.23%

Table 3.6 shows the regression coefficients and associated *t*-statistics (in parentheses) for the regression  $AR_{i,t} = \alpha_0 + \sum \beta_j \cdot Var_{i,t,j} + \varepsilon_t$  with standard errors clustered at the firm level (see equation 3.5). The dependent variable is the abnormal return of firm *i* on the event day  $t=0$ . Models 1 to 3 comprise the entire sample, whereas Models 4 and 5 contain only those events for which the announcing firm's insider ownership (%Insider) was available. Detailed definitions of the independent variables *j* can be extracted from Table 3.1. \*\*\*, \*\*, \* indicate statistical significance at the 1%, 5%, and 10% level, respectively.

It contains the same subsample as model 4, but excludes %Insider and the squared term like the first three models. The regression results show mixed evidence with respect to all hypothesized determinants. However, the results overall confirm the importance of corporate governance to mitigate SEO-related value losses. Following the observation of a possible relationship between the offering type and the market phase (see Table 3.2), I included an interaction term (*Exp&PP*) for private placements during expansionary market phases in models 1, 3, 4, and 5.<sup>101</sup> The interaction term shows the expected negative sign, but it is only marginally significant in model 3. Thus, private placements are not only conducted less frequently during expansionary market phases, but there is also some evidence that they are associated with more negative announcement returns during these times. On the contrary, the expected effect of market timing cannot be confirmed. In all regression specifications the respective coefficient is statistically insignificant. Consequently, market timing does not affect the capital market reaction to real estate SEOs. This finding is robust to the different definitions of market timing that have been used: the overall business cycle (*Exp*) and the firm's one-year excess return (*ExcR* in model 2). However, real estate managers seem to time the market by choosing the appropriate offering method. When the dis-

<sup>101</sup> The interaction term is also a dummy variable that is one if the SEO is a private placement during an expansionary market phase and zero otherwise.

tinct effect of private placements during boom phases is controlled for, the private placement dummy (*PP*) has a significantly positive and hence mitigating effect on abnormal returns in models 1 and 3. Thus, managers seem to be able to employ private negotiations effectively in order to reduce the level of asymmetric information and alleviate negative announcement effects to some extent. By contrast, the statistical significance disappears entirely in models 4 and 5. So the results should be interpreted with caution. Further research is necessary to shed light on this issue. My results indicate that the effects of market timing and offering method could be more complex and should therefore be analyzed in more detail.<sup>102</sup>

Concerning insider ownership, both the linear and the squared term are statistically significant at the 5% level in model 4. Moreover, this model has the largest F-value as well as the highest adjusted  $R^2$  with nearly 22%. While the linear term exhibits a negative sign, the squared term is positive. Therefore, a U-shaped relation between insider ownership and announcement returns results. The inflection point of the curve is at 39.4% insider ownership. This indicates that SEO announcements are followed by even more negative price reactions if ownership is rather dispersed (i.e. at lower levels of insider ownership). On the contrary, if the firm's ownership structure is concentrated at intermediate to high levels, announcement returns become less negative. This effect can be interpreted to be due to active monitoring by blockholders. Effective corporate governance by large shareholding companies or individuals might prevent overinvestment. Thereby, SEO-related wealth losses are alleviated. However, active monitoring cannot remedy negative announcement effects if ownership is too dispersed. Additionally, if the insider is an officer, high ownership levels lead to the alignment of managerial interests with those of other shareholders (Jensen/Meckling 1976). If managers as well as other blockholders hold sizeable stakes in the firm prior to the announcement, they will be particularly interested in limiting the related wealth loss. The results confirm the hypothesis and emphasize the role of corporate governance as a valuable factor. As opposed to other research on ownership structure, I do not face endogeneity problems. As the event study analyzes the short-term impact of unpredictable corporate announcements on firm value, the relationship could not work in the

---

<sup>102</sup> When a financial crisis dummy is used instead of *Exp* or *ExcR* in models 1 to 3, the coefficients of *Crisis*, *PP*, and the interaction term (models 1 and 3 only) are not significant. The significances of other variables do not change. Since the financial crisis represents only part of the recessionary phases during the sample period, I prefer the *Exp* dummy and do not present the other results separately.

opposite direction. Besides, the lagged values of insider ownership from the year prior to the announcement are used. Therefore, endogeneity is not an issue in this study.

The results for *Cash* also support the overall conjecture. The higher the proportion of cash and short-term assets, the more negative is the abnormal announcement return. Shareholders seem to fear overinvestment problems when firms raise additional funds in spite of having a lot of cash (equivalents) at their disposal. Accordingly, the share price depreciates more at the time of announcement. This is consistent with the free cash flow hypothesis by Jensen (1986) and with empirical evidence of excess corporate cash holdings as a possible indication of agency problems (Pinkowitz et al. 2006; Dittmar/Mahrt-Smith 2007; Harford et al. 2008). Similarly, funds from operations are a measure of operating profitability and thus firms' capability of generating internal funds. Highly profitable firms that raise external capital might therefore suffer from overinvestment problems. However, the present findings do not support this assumption. I document a negative sign for *FFO* in all regression specifications, but the coefficient lacks statistical significance. Thus, there is no empirical support for the overinvestment hypothesis with respect to operating profitability.

The next group of variables comprises factors related to the use of funds. First, the price-to-book ratio (*P/B*) is often considered an indicator of firms' investment opportunities. However, *P/B* has no statistically significant impact on SEO announcement returns. Thus, I find no support for the assumption that growth firms might suffer less from overinvestment issues. This finding is consistent with Denis (1994) who shows that positive effects associated with investment opportunities are spurious and driven by small firms that experience insignificant announcement effects. Second, dividends represent another potential use of funds. Equity issuing firms with high dividend yields might be suspected of sticking to their payout policy instead of having valuable investment opportunities. Although the sign of the coefficients of *DivY* seems to support this line of reasoning, the statistical tests do not. The respective p-values do not fall below 14%. Overall, there is no evidence that variables related to the use of funds affect the observed stock price reactions.

However, firms frequently declare the intended use of the offering proceeds in the ad-hoc announcement. This additional information could alleviate investors' concerns. In order to test this assumption, I scrutinize the firms' announcements in detail. With respect to the purpose of the offering, i.e. the intended use of funds, five categories emerge. From these categories, four dummy variables are derived: Mergers and acquisitions (*Purp\_1*, *M&A*,



mentioned 11 times), property acquisitions and investments (*Purp\_2, CapEx*, 23 times), reduction of leverage or debt-related payments (*Purp\_3, Leverage*, 35 times), general corporate purpose (*Purp\_4, General*, 48 times), and the default case no statement (25 times). Model 3 illustrates that these dummy variables have no significant influence on the announcement effects.<sup>103</sup> Likewise, a partial F-test does not reject the null hypothesis of no explanatory power of the entirety of the four purpose dummies (F-value = 1.03).<sup>104</sup> I interpret this as follows. Since a SEO announcement is generally bad news to the market, the management frequently elaborates on what the offering proceeds will be used for (in the present sample in more than 80% of the cases). In this way, managers attempt to dispel shareholders' concerns regarding overinvestment or market timing issues. However, the results indicate that the market does not trust this information. It rather relies on key indicators of the firm, such as relative cash holdings, to infer management's motives to issue new equity. There is no reaction to the explicit statements on the intended use of funds. Thus, the market seems to be efficient in that it evaluates the firm's fundamentals and cannot be misled by positive prospects expressed by the management. This finding is in line with Masulis and Korwar (1986) for SEOs as well as with Dann and Mikkelsen (1984) for convertible and straight debt issues.

Finally, it was tested whether German SEOs are perceived more negatively due to the allegedly weaker corporate governance system. The German dummy variable consistently exhibits a negative sign, but is not statistically significant at conventional levels. Thus, there is no evidence for the assumption that weak shareholder protection rights in Germany are a driver of negative SEO announcement effects. Accordingly, the German corporate governance system seems to work effectively. Alternative mechanisms, such as the presence of block shareholders, ensure the maximization of shareholder value (Shleifer/Vishny 1997).

Among the control variables, the most surprising finding is the negative coefficient of firm size (*Ln(Size)*). The effect is highly statistically significant throughout all estimated models. The strongly negative impact on shareholder wealth effects contradicts previous expectations as well as most empirical findings. However, it is in line with the results of Ghosh

<sup>103</sup> The same results are obtained when the purpose dummies are included in the smaller sample of models 4 and 5. The t-values of the coefficients are always below 1 in absolute value.

<sup>104</sup> Several different specifications of the purpose dummies were also tried (e.g. one dummy variable for investments (*Purp\_1, 2, and 4*) and one dummy for debt-related payments (*Purp\_3*); or only one dummy if a purpose was stated (i.e. all four purpose categories)). However, the result of no additional explanatory power of the purpose dummy/dummies remained unchanged.

et al. (1999) for SEOs by US REITs. The results indicate that larger firms experience more negative abnormal returns in spite of potentially higher transparency and greater analyst coverage. A possible explanation could be access to debt financing. Small firms have typically only access to bank lending, whereas larger firms can also issue bonds. In the context of the pecking order theory, large firms that announce a SEO would thus be regarded being unable to raise debt from two alternative sources. In contrast, small firms would only be unable to receive additional bank loans. Therefore, SEO announcements by large firms could be perceived more negatively. Additionally, the negative size effect could be related to the relatively low level of transparency in the real estate sector where the majority of transaction data is not publicly available. Thus, for analysts it might be easier to estimate the true value of a firm's property assets if the number of assets is limited and more easily assessable. Accordingly, information asymmetry could be lower which would lead to less negative announcement effects for small firms. Furthermore, it should be noted that the sample firms are comparably small with a mean (median) market capitalization of only 980 million (445 million) USD as of yearend 2013.<sup>105</sup> Therefore, the finding of a negative size effect does not necessarily contradict earlier findings, but instead suggests that an overall size effect might be non-linear or industry-specific.

The coefficient of the leverage ratio is negative and statistically significant in all models. This seems consistent with the view that highly levered firms might be forced to fund their operations by issuing new equity. This could be either due to pressure by banks and other lenders or because there is no other source of capital available. Both might be perceived as a negative signal causing stock prices to decline more heavily. Notably, the t-values of the leverage coefficients decline in models 4 and 5. In the former case, the coefficient only remains significant at the 10% level. This highlights the importance of the ownership variable. Omitting an important determinant in the regression could create spuriously high statistical significances of other variables. The significance of all other variables in models 4 and 5 except for the afore-noted *PP* remains virtually constant. This confirms the previously documented effects and interpretations.

Furthermore, I have controlled for the issuer type, i.e. whether the issuer is focused on commercial real estate. The coefficient of *Commercial* is negative in all five models, but exhibits no statistical significance. This indicates that the respective real estate subsector

---

<sup>105</sup> In contrast, the German DAX30 companies had a mean (median) market capitalization of 47.5 billion (38.8 billion) USD as of yearend 2013.

and the associated risk have no impact on shareholders' reaction. As a second issuer control variable, a REIT dummy was included in order to determine whether REITs and non-REITs exhibit distinct announcement effects. The respective coefficient is not statistically significant either. Thus, REITs do not have an impact. Furthermore, only 28 of 142 sample SEOs have been announced by REITs. This emphasizes that REITs are not as established in continental Europe as they are in the US.

In addition to firm characteristics, I have also controlled for the relative size of the offering (*Offer Size*). I discover no impact of this variable. Although this finding is consistent with the results of Masulis and Korwar (1986) for industrial firms, it is surprising. I expected a more negative reaction if the proportion of new shares to old shares is higher, as documented by Ghosh et al. (1999) for REIT SEOs in the US. I anticipated similar results for European SEOs due to greater dilution and the negative price effect when supply of shares is substantially increased and the respective demand function has a negative slope (Asquith/Mullins 1986). But the empirical results do not support this conjecture. The previously mentioned corporate governance considerations, most importantly those related to corporate cash holdings and insider ownership, seem to play a dominant role in this context. Thus, if the management can convince investors that their cash contributions will not be squandered, the relative size of the offering has no impact on the announcement effect.

### **3.6 Conclusion**

In this chapter, I analyze the shareholder wealth effects of SEO announcements by real estate corporations between 1997 and 2013. I find a significantly negative abnormal return of -1% on the event day. Considering the 3-day period ending on the event day, the average decline is even -1.5%. This result is relatively stable over time. The financial crisis that originated in the US real estate sector in 2006 does not seem to have changed the capital market reactions to SEO announcements in Europe. Moreover, there is no convincing evidence of market timing behavior. Although credit conditions have tightened and the level of mistrust has increased, the supply of equity capital for real estate companies has not collapsed. These findings indicate that factors related to corporate governance and overinvestment issues are of particular importance in this context. Especially insider ownership and corporate cash holdings proved to be major determinants of the market reaction when real estate firms announce SEOs. I detect a U-shaped relation between abnormal announcement returns and the percentage of shares held by insiders. Accordingly, medium to

high levels of insider ownership produce less negative wealth effects on average. A rather concentrated ownership structure may thus be beneficial due to managerial incentive alignment and active monitoring. By limiting managerial discretion over SEO funds, the threat of overinvestment is reduced and announcement effects become less negative. On the contrary, with a more dispersed ownership structure this mechanism is attenuated which causes more negative wealth effects. Hence, the analysis reveals that firms that are less likely subject to overinvestment problems experience more favorable announcement effects due to sizeable insider shareholdings. In support of this argument, I find that considerable cash holdings are perceived as indication of internally available funds and thus lead to more negative investor reactions. Furthermore, there is evidence that SEOs by highly levered firms are associated with more severe price decreases. The most surprising result, however, is a highly negative firm size effect. Possibly, this finding is unique to the real estate sector which is still perceived to be a “people’s business” and suffers from a lack of transparency and publicly available data regarding transactions and valuation. Future research on a different sample of real estate companies and time period could help explaining this counterintuitive finding.

In summary, shareholders care most about governance and the availability of alternative sources of funds. However, they do not consider the intended use of the offering proceeds expressed in the disclosure statements. This is because badly governed firms could still squander the proceeds for value destroying purposes. Thus, even during periods of financial turmoil, the capital market remains accessible for real estate corporations with good corporate governance. This finding is important in the light of the extensive discussions about the recent financial and confidence crisis as to how investors, firms, and regulators should prepare for future bursts of housing and equity bubbles. Sound management and corporate governance are thus the cornerstones for successful development of real estate corporations through the cycles of the property and the stock market.

## **4 What drives expectations of future monetary policy? Evidence from federal funds derivatives and the zero lower bound**

### **4.1 Introduction**

For the last 30 years, the Federal Reserve has pursued its monetary policy objectives primarily by setting the target federal funds rate (Board of Governors of the Federal Reserve System 2005). At eight regular meetings per year, the Federal Open Market Committee (FOMC) decides whether the target rate needs to be adjusted in order to promote price stability and ensure a high level of employment. By tightening (easing) conditions in the interbank market, the Fed intends to influence overall credit market conditions (e.g. Cook/Hahn 1989; Kuttner 2001) in order to ultimately slow down (stimulate) the real economy.

Derivatives on the federal funds rate have been proven to be an effective tool for extracting market expectations of future monetary policy actions by the Fed in the past. By analyzing prices of federal funds futures and options, the expected path of future monetary policy can be predicted (e.g. Krueger/Kuttner 1996; Robertson/Thornton 1997; Carlson et al. 2005; Emmons et al. 2006). Further, it has been shown that monetary policy expectations react to the release of macroeconomic news as implied by the Taylor (1993) rule. Accordingly, inflationary and expansionary announcements lead to tighter expected monetary policy, whereas deflationary and recessionary news are associated with an expected decrease in the target rate (e.g. Kearney/Lombra 2003; Carlson et al. 2005; Taylor 2010; Smales 2013). However, the vast majority of prior research analyzes time periods prior to the recent financial crisis. This casts doubt on the general validity of previous results for two reasons. First, the severity of the following economic downturn led the Fed to lower the target rate to nearly zero percent. This is in contrast to previous periods under consideration. The respective analyses were based on the assumption of an unconstrained policy rate that could be altered in both directions in response to changes in the macroeconomic environment. The zero lower bound possibly undermines previously documented relations of monetary policy expectations and macroeconomic news due to the new constraint to policy makers (Bauer/Rudebusch 2015). Second, recent research provides evidence that monetary

policy follows different regimes during normal times and financial crises (Martin/Milas 2013). The arrival at the ZLB in the US in 2008 might indicate such a regime switch. The Federal Reserve was forced to apply unconventional measures of monetary policy in order to pursue its objectives (Gertler/Karadi 2011). This raises the question whether the way in which monetary policy expectations are formed has likewise changed due to the financial crisis and the resulting recession in the US.

To the best of my knowledge, this is the first study to investigate this topic using expectations as implied in the prices of federal funds derivatives. Thus, this analysis represents the main contribution of the chapter. Besides, I contribute to the literature in two additional ways. First, I directly assess the impact of 28 macroeconomic indicators on option implied probabilities of future target rates. While Carlson et al. (2005) run a dummy regression to determine the effect of only four types of macroeconomic news, I consider solely the unexpected component of economic indicators. It has been concluded that this is more appropriate since market participants should not react to announcements that coincide with their expectations (Balduzzi et al. 2001; Kuttner 2001; Fatum/Scholnick 2008). Second, this is one of the first studies to simultaneously analyze federal funds futures and options. In this way, it is possible to cross-check whether the documented announcement effects on federal funds options are also perceptible with federal funds futures and vice versa. Furthermore, futures and options implied expectations complement each other very well. By making use of options, one is able to recover precise expectations of the outcome of the upcoming FOMC meeting. On the other hand, futures are limited to extracting the broad direction of future monetary policy, but they can be employed to recover market expectations for the more distant future. Prior literature mostly focuses only on one derivative type.

My investigation comprises the following steps. Using an intraday data set from 2003 to 2011, I first investigate federal funds futures in order to determine which macroeconomic announcements increase or decrease the expected future target rate. This provides an initial overview of expected monetary policy and its drivers. Second, I employ federal funds options in order to recover more precise measures of expected monetary policy. As first proposed by Carlson et al. (2005), federal funds options can be used to estimate the risk-neutral probability density function of the future target federal funds rate. After estimating these option implied probabilities, I analyze how they react to the release of important US macroeconomic indicators. This offers valuable insights as to which kind of macroeconomic news drives the probability the market attaches to possible outcomes of the upcoming

FOMC meeting. Finally, the role of the financial crisis and the ZLB as a constraint to policy makers is scrutinized for both futures and options.

The results of futures and options consistently show that the employment report is the most influential indicator upon announcement during normal times, i.e. prior to the crisis. This reveals a Taylor rule that emphasizes the importance of economic output as opposed to inflation. The Chicago Purchasing Manager Index (PMI) likewise has a considerable impact. Subsequent to 2007, however, the picture changes completely. Previously documented important indicators lose their significance. Option implied probabilities do not react in response to standard macroeconomic announcements anymore. Thus, the way in which expectations in the market for federal funds derivatives are formed has changed. Two alternative ways of interpretation exist. First, monetary policy has become less predictable since the beginning of the financial crisis in 2007. Financial turmoil, the stream of unexpected negative news as the crisis unfolded, and the Fed that even changed the target rate at unscheduled meetings caused a new regime as to how market participants form their expectations. The second interpretation offers an opposing line of argumentation. Since the arrival at the ZLB, the Fed can no longer make use of the target rate as its main policy instrument. As a further decrease was not possible and the economic outlook made an increase extremely unlikely, the target federal funds rate actually became perfectly predictable for a considerable period of time. Hence, market participants expected the target rate to remain at the ZLB. This caused target rate probabilities not to react to the release of macroeconomic news anymore. This interpretation is consistent with prior evidence from the UK (Martin/Milas 2013; Sihvonen/Vähämaa 2014). Particularly, it emphasizes the point of Martin and Milas (2013) who conclude that two monetary policy regimes exist since the 1990s – “a ‘financial crisis’ and a ‘no-crisis’ regime” (p. 654). Thus, my results add new empirical evidence to the literature and indicate that the same applies to the United States. Recently, the first target rate hike since 2006 raises the question whether predictability will improve after the consequences of the Great Recession eventually tail off and the Fed regains full flexibility in target rate setting.

The remainder of the chapter is structured as follows. Section 4.2 provides some background information on federal funds derivatives and briefly reviews the related literature. Section 4.3 presents the data set. Section 4.4 describes the methodology of estimating probabilities from federal funds option prices, and illustrates the event study methodology used for assessing the impact of macroeconomic announcements on future prices and on

option implied probabilities. Subsequently, sections 4.5 and 4.6 present the results of the recovered probabilities and the event studies of futures and options. Finally, section 4.7 concludes.

## **4.2 Theoretical background and literature review**

Initially, some terminology and conventions of the federal funds market and the associated derivatives are explained. The Fed obliges depository institutions to hold a predetermined amount of balances at their respective Federal Reserve Bank, called required reserve balances. Depository institutions can borrow (lend) balances from (to) each other at the federal funds rate in case of a deficit (surplus). The Federal Open Market Committee sets the target federal funds rate for these overnight loans and controls the effective federal funds rate primarily through open market operations (Board of Governors of the Federal Reserve System 2005). By setting the federal funds rate, the Fed is able to influence the short end of the yield curve (Cook/Hahn 1989). Thereby, it tries to affect bank lending in order to enhance or decelerate consumption and investments to accomplish the overall objective of sustainable economic growth, employment, and stable prices.

### **4.2.1 The market for federal funds derivatives**

Federal funds derivatives serve the primary purpose of managing risks associated with the required reserve balances. The underlying of federal funds futures (FFF) is the time-weighted average effective federal funds rate (FFR) of the calendar month in which the respective future contract expires, henceforth the contract month. FFF are quoted as 100 minus the average effective FFR. As this chapter is concerned with expectations of future monetary policy, I will not refer to the official price quote but instead to the average effective FFR implied in the future's quote. Henceforth, I will refer to it as implied futures rate.<sup>106</sup> Federal funds futures are subject to daily cash settlement. Settlement is calculated based on the implied futures rate and a notional amount of \$ 5 million for the contract month (30/360 convention).

Federal funds options are American-style futures options. The underlying of a federal funds option is a federal funds future that matures in the same month like the option.<sup>107</sup> If a federal funds call (FFC) is exercised, the FFC buyer (call long position) is entitled to a

---

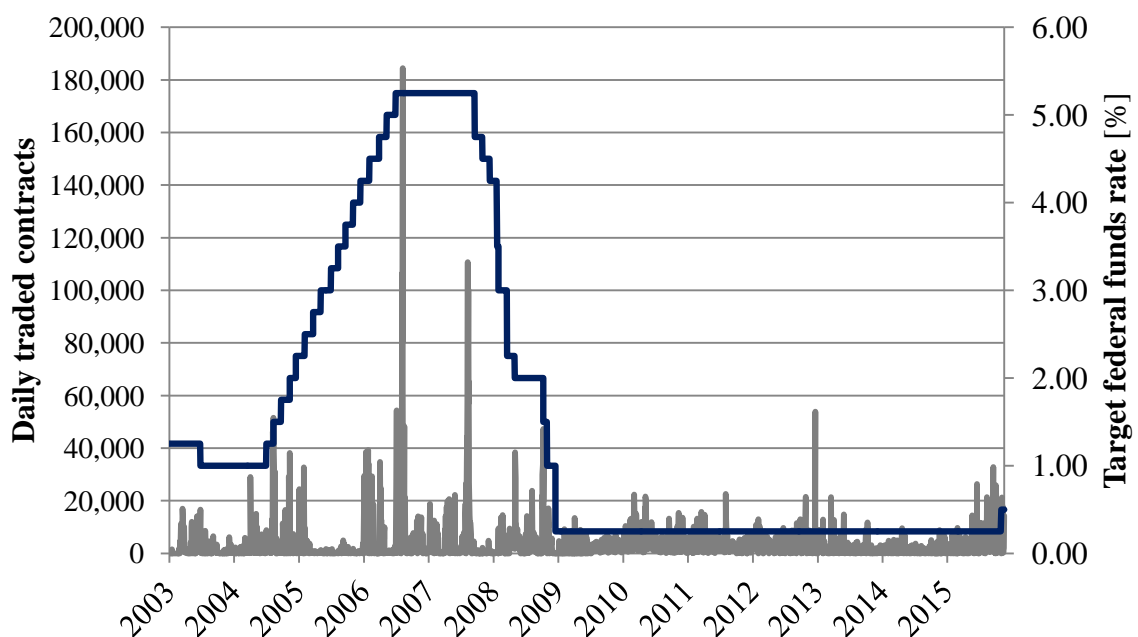
<sup>106</sup> Accordingly, the implied futures rate is calculated as  $F = 100 - \text{future price}$ .

<sup>107</sup> Recently, the CME has also introduced two types of so-called mid-curve options. The underlying of these options are federal funds futures that mature 6 or 12 months after the options expires.



cash payment amounting to the current settlement price of the future minus the strike price and delivery of the FFF. On the contrary, the federal funds put (FFP) buyer is entitled to sell a FFF at the strike price and receive a cash settlement equal to the strike price minus the future price (Hull 2012). Federal funds options are quoted in percentage points of the notional amount of \$ 5 million for the contract month (30/360 convention). For example, the USD value of an FFC quoted at 1.65 is  $\$ 5,000,000 \times 30/360 \times 0.01 \times 1.65$  which is equal to \$ 6,875.

**Figure 4.1: Trading volume of 1-month federal funds futures contracts and federal funds target rate<sup>108</sup>**



Prior to the approach of the ZLB, federal funds derivatives enjoyed an increasing popularity. Trading of futures on the federal funds rate (see Figure 4.1) and options on those futures was very active. As explained above, the main purpose of trading federal funds derivatives is to hedge interest rate risk in the interbank market. Besides, market supervisors and analysts use federal funds derivatives to extract market expectations about the future path of the target federal funds rate. The link between federal funds futures and expected monetary policy can be described as follows. The implied futures rate reflects expectations of the average effective FFR of the contract month. The actual effective FFR is usually equal to the target rate, although small deviations can occur. Thus, the implied futures rate can be interpreted as a measure of the market's expectation of future monetary policy

<sup>108</sup> The trading volume data was obtained from [www.quandl.com](http://www.quandl.com). It should be noted that this website is not listed among the officially licensed data distributors of the Chicago Mercantile Exchange (CME).

(Krueger/Kuttner 1996; Robertson/Thornton 1997). It is a market-based measure of the expected target rate in the contract month. However, several papers note that deviations can occur both between the implied futures rate and the future effective FFR and between the effective FFR and the target rate. Consequently, FFF can only approximately predict monetary policy. As the objective of this chapter is to analyze drivers of monetary policy expectations, I calculate changes in expectation over a short-time horizon when macroeconomic news or monetary policy actions are announced. In the short-term, systematic biases of FFF-related measures cancel out (Piazzesi/Swanson 2008; Hamilton 2009). Therefore, the aforementioned deviations are of minor importance and the market-based expectations extracted from FFF are a useful measure in the context of this study (see also Gürkaynak et al. 2007).

The general relationship between FFF prices and expected monetary policy can thus be summarized as follows. If prices of federal funds futures increase (decrease), this indicates a more accommodative (tighter) monetary policy in the future (e.g. Taylor 2010). Accordingly, if investors expect a target rate increase (decrease), they will assume a short (long) position in the future or a long position in federal funds puts (calls) (see also Sultan 2012). Price changes of federal funds futures allow for an easy inference of monetary policy expectations. On the other hand, the benefits of futures are limited to extracting information about the broad direction of future monetary policy, i.e. whether the target rate is more likely to decrease or to increase. By using federal funds options, the entire probability density function of future FOMC meetings can be recovered. This is particularly useful if more than two distinct future target rates are considered to be likely (Carlson et al. 2005).

#### **4.2.2 Related literature**

This chapter touches on three strands of literature. First, the impact of macroeconomic announcements on different asset classes is a research area that has attracted a great deal of attention. Similar to the analysis in this chapter, recent papers usually use high-frequency (i.e. mostly intraday) data to analyze how quickly new information is incorporated into prices or how volatility measures react. For fixed income securities, Balduzzi et al. (2001) is one of the most relevant studies. The authors find that especially inflation and Non-farm Payrolls announcements have an immediate effect on the prices of Treasury bonds of different maturities. In contrast, increased volatility persists for some time after the announcement. With respect to stock markets, Hussain (2011) and Kontonikas et al. (2013)

have recently published evidence of macroeconomic announcements effects.<sup>109</sup> Overall, their findings suggest that stock prices and volatility measures adjust immediately to macroeconomic or monetary policy announcements. This highlights the benefits of using high-frequency data to rule out confounding event issues (see also Fleming/Remolona 1997; Smales 2013). Concerning stock market volatility, Kearney and Lombra (2004) provide evidence for a significantly positive change in implied volatility to announcements of employment data but not to those of inflation. Vähämaa and Äijö (2011) find that implied volatility declines after FOMC meetings in the US. However, their results suggest a positive relationship between the surprises of monetary policy and the change in implied volatility.<sup>110</sup>

The second strand of literature represents forecasting future monetary policy actions. In their popular study, Krueger and Kuttner (1996) showed that federal funds futures can be employed to recover monetary policy expectations. Although some papers point out challenges to extracting expectations from futures, such as the existence of a term premium or the deviation of the target rate from the effective FFR, it has been concluded that federal funds futures are very useful for this purpose (Robertson/Thornton 1997; Hamilton 2009). Since federal funds options were introduced in 2003, they can also be employed for forecasting. Carlson et al. (2005) and Emmons et al. (2006) illustrate in detail how probability density functions for upcoming FOMC meetings can be extracted from option prices (see subsection 4.4.2.1 for a detailed description). However, evidence as to how these probabilities are affected by macroeconomic news or events is only preliminary. This chapter intends to fill this gap. Therefore, it represents an intersection of the first two strands of literature.

Table 4.1 provides an overview of previous empirical investigations that also deal with the impact of macroeconomic announcements on US Treasury (derivative) securities or on comparable instruments from different countries. These papers are thus most closely related to the present one. Their most important findings can be summarized as follows. First, the majority of past empirical literature suggests that, despite the Fed's double target of monetary policy, the US employment situation is perceived as primary objective of the

---

<sup>109</sup> Important papers that investigate daily stock price reactions to monetary policy announcements include e.g. Schwert (1981), Pearce and Roley (1983), McQueen and Roley (1993), Jensen and Johnson (1995), Thorbecke (1997), Bomfim (2003), Bernanke and Kuttner (2005), and Kurov (2010).

<sup>110</sup> Concerning foreign exchange markets, the most popular works comprise Ito and Roley (1987), Almeida et al. (1998), Andersen and Bollerslev (1998), and Andersen et al. (2003) among others.

Federal Reserve. Accordingly, employment-related announcements, i.e. mostly Non-farm Payrolls and Civilian Unemployment, induce more significant effects than inflation announcements do, i.e. Consumer and Producer Price Index (CPI, PPI), (e.g. Ederington/Lee 1993; Kearney/Lombra 2003; Taylor 2010; Evans 2011). Apparently, inflation plays an inferior role in monetary policy considerations according to market perception. Second, announced information is immediately incorporated into prices, whereas volatility tends to remain at an increased level for a certain time after the announcement (e.g. Ederington/Lee 1993; Fleming/Remolona 1999; Balduzzi et al. 2001; Smales 2013). The latter effect is particularly pronounced for unscheduled meetings (Ederington/Lee 1996). Third, macroeconomic announcements are a significant driver of (intraday) volatility (e.g. Ederington/Lee 1993; Bollerslev et al. 2000; Arnold/Vrugt 2010; Evans 2011). Among the papers in Table 4.1, the subsequent empirical analysis is most closely related to Carlson et al. (2005) and Taylor (2010). In a comparable analysis that also makes use of option implied information, Beber and Brandt (2006) examine so-called state-price dependencies of longer-term Treasury bond futures options. State-price dependencies are combined measures of both preferences and expectations of market participants. The authors document that uncertainty decreases in response to macroeconomic announcements, irrespective of whether the news is positive or negative. Additional analyses reveal that macroeconomic announcements affect not only expectations but also market participants' implied risk aversion. To draw an interim conclusion, there is abundant literature on fixed income securities and macroeconomic announcement effects. However, the majority of the papers' periods under consideration does not contain the financial crisis and the following recession. This is a serious shortcoming which the present chapter tries to alleviate.

Particularly, the research field of monetary policy expectations is highly affected by the ZLB which represents the third strand of literature this chapter is related to. Since the Fed has lowered its target rate to the range of 0 to 25 basis points in December 2008, plenty of papers studying the implications of the ZLB have emerged. The majority of these papers deals with the question as to how monetary policy can work around the alleged constraint imposed by the ZLB. Swanson and Williams (2014) emphasize that not only current actual interest rates but also expected future short-term rates matter. Accordingly, the Fed can still influence short-term rates by managing expectations of future monetary policy. The authors empirically illustrate that one- and two-year US Treasury yields were rather unconstrained by the ZLB until 2011.

**Table 4.1: Selected literature on macroeconomic announcements effects on fixed income securities and derivatives**

<b>Study</b>	<b>Sample period, Country</b>	<b>Analyzed security (Number of macro-economic indicators considered)</b>	<b>Data frequency</b>	<b>Main results</b>
Ederington and Lee (1993)	1988-1991, USA	Treasury bond, Eurodollar, and DM futures (19)	Intraday	Macroeconomic announcements are the key driver of (realized) futures volatility. Employment announcements have a greater impact on interest rate futures than those of inflation. Prices adjust quickly, but increased volatility persists after announcements.
Ederington and Lee (1996)	1988-1992, USA	Treasury bond, Eurodollar, and DM futures and futures options (12)	Daily	Implied volatility decreases after scheduled announcements, whereas it increases after unscheduled announcements. Employment announcements have the greatest effect on Treasury bond futures, followed by PPI and CPI announcements.
Fleming and Remolona (1999)	1993-1994, USA	5-year Treasury notes (3)	Intraday	Prices adjust immediately to announcements. In a second post announcement stage, there is increased trading volume and price volatility.
Bollerslev et al. (2000)	1994-1997, USA	US Treasury bond futures (27)	Intraday	US macroeconomic announcements are a major source of intraday volatility. Employment report and Humphrey-Hawkins testimony have the greatest impact. PPI, employment cost, retail sales, and NAPM survey follow.
Balduzzi et al. (2001)	1991-1995, USA	2-month, 2-, 10, and 30-year US Treasuries (26)	Intraday	Eight US macroeconomic announcements have a significant impact on prices of all Treasury instruments. Prices adjust immediately, whereas increased volatility persists after the announcement. The most influential announcements are Non-farm Payrolls and PPI.
Kuttner (2001)	1989-2000, USA	Federal funds futures (1)	Daily	There is a significant price effect of FOMC announcement surprises on FFF.
Kearney and Lombra (2003)	1988-2002, USA	Federal funds futures (2)	Daily	Employment announcements have a significant impact on futures, inflation announcement do not.

*(Table 4.1 continued)*

Carlson et al. (2005)	2003-2004, USA	Options on federal funds futures (3)	Daily	The option implied probability of the next actual target rate decision increases significantly upon the announcement of employment and inflation figures, and upon speeches of the FOMC chairman.
Emmons et al. (2006)	2003-2006, USA	Options on federal funds futures (several, mostly single, events)	Daily	Detailed (graphical) analysis of changes in option implied probabilities: Specific events such as hurricane Katrina, congressional testimony of Chairman Bernanke, statements of the Federal Reserve to signal monetary policy intentions, and single macroeconomic announcements seem to influence the recovered probabilities.
Faust et al. (2007)	1987-2002, USA	2 US spot exchange rates and 7 interest rate futures (including FFF) (10)	Intraday	Expansionary or inflationary US macroeconomic surprises lead to USD appreciation and higher short- and long-term interest rates. Effects are stable over the sample period.
Arnold and Vrugt (2010)	1970-2005, USA	1-, 5-, 10-, and 30- year Treasury Bonds (7)	Quarterly	Monetary policy uncertainty, extracted from macroeconomic survey data, is the major determinant of treasury bond volatility.
Taylor (2010)	1998-2006, USA	Federal funds futures (30)	Intraday	Employment and FOMC announcements are most important; GDP and inflation announcements play only a minor role.
Evans (2011)	1998-2006, USA	10-year treasury bond futures, S&P 500 E-mini, and EUR-USD futures (32)	Intraday	One third of jumps in US future markets is associated with US macroeconomic news. GDP advanced, Non-farm Payrolls, and unemployment rate (among others) significantly affect jump size. CPI and PPI play an inferior role.
Smales (2012b) (see also Smales 2012a)	2004-2010, Australia	4 interest rate futures of different maturity (1)	Intraday	Especially short-maturity futures react significantly to monetary policy announcements; volatility is more affected by bad news.
Smales (2013)	2004-2010, Australia	4 interest rate futures of different maturity (24)	Intraday	Prices adjust quickly after scheduled announcements. Short-maturity contracts and the financial crisis period are associated with stronger price effects, in particular to CPI, GDP, and employment announcements.

(Table 4.1 continued)

Sihvonen and Vähämaa (2014)	1993-2012, UK	3-month Libor fu- tures options (4)	Monthly	Expectations of future interest rates, implied in Libor futures option prices, react in line with Taylor rules of monetary policy. Expectations of output gap and inflation as well as perceived market uncertainty shape option implied probabilities. Subsequent to 2007, the documented effects of inflation and output measures become insignificant.
--------------------------------	------------------	----------------------------------------	---------	-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

Table 4.1 provides an overview of previous empirical studies that also deal with the impact of macroeconomic announcements on government or treasury fixed income (derivative) securities from different countries. These papers are thus most closely related to the analysis in this chapter. The table's columns provide information on the papers' sample periods and countries, the underlying fixed income (derivative) securities the price and/or volatility effects of which are studied, the number of macroeconomic indicators considered, the data frequency used for the analysis, and the main findings that are relevant for the analysis in this chapter.

Moreover, large asset purchase programs by the Fed, such as the maturity expansion program, have also helped mitigate the effects of the ZLB through their influence on longer-term yields (Wright 2012; Swanson/Williams 2014; Foley-Fisher et al. 2016). Gertler and Karadi (2011) develop a theoretical model for unconventional monetary policy. They illustrate how central bank intervention works, its advantages over private financial intermediation, and circumstances under which central bank intervention is optimal. Emphasizing the importance of such a model, Martin and Milas (2013) conclude that UK monetary policy followed two different regimes since 1990. Prior to 2007, UK policy followed a Taylor rule and responded to the output gap and inflation. However, since the beginning of the financial crisis monetary policy reacted to measures of financial stress, significantly less to the output gap, and not to inflation. While Martin and Milas (2013) model the policy rate using a GMM-approach, Sihvonen and Vähämaa (2014) employ option implied interest rate expectations to similarly analyze UK policy rate setting behavior. Using monthly data, they likewise document that interest rate expectations react to inflation, output gap, and financial uncertainty in accordance with a Taylor-type rule. Furthermore, they similarly find evidence of a regime switch since the beginning of the financial crisis and the entry into force of the ZLB. Comparable evidence of the stock market is provided by Kontonikas et al. (2013). Unlike during normal times, they find that stock prices did not rise in response to target rate cuts during the financial crisis. Recently, a model for US monetary policy forecasting at the ZLB has been developed by Bauer and Rudebusch (2015). The authors use a shadow rate dynamic term structure model that accounts for the non-negativity and thus asymmetrical distribution and variation of the target rate at the ZLB. Moreover, they emphasize that including macroeconomic information in their model considerably improves forecasting power at the ZLB. This is due to the fact that at the ZLB, unlike during normal periods, interest rates cannot incorporate all relevant macroeconomic information as a consequence of the binding constraint. Taking this into account, the authors are able to produce reasonable forecasts of the Fed's departure from the ZLB.

While most of the aforementioned papers dealing with the ZLB focus on evaluating alternative strategies of monetary policy making or, as in the latter case, policy rate forecasting, I intend to investigate how monetary policy expectations are affected by the ZLB and how the effects of public information releases have changed in this context. The next two sections describe the data and methodology used for this purpose.



## 4.3 Data

### 4.3.1 Macroeconomic announcements

I consider 28 macroeconomic announcements from Thomson Reuters Datastream called Reuters US IFR Survey. The data comprises the actual announcements as well as consensus forecasts for a sample period from 24 November 2003 to 31 January 2011.<sup>111</sup> The choice of macroeconomic indicators is largely in line with Taylor (2010). The exact announcement times were not included in Datastream. They are obtained from the Economic Calendar Archive of Briefing.com, Inc. Table 4.2 provides an overview of the macroeconomic indicators used. Several announcement dates of macroeconomic indicators, such as those of Chicago PMI, Treasury Budget, and Consumer Credit, were flawed. Therefore, manual verification and correction of the time series was necessary. For the subsequent investigation of announcement effects only the unexpected component, i.e. the surprise, of a macroeconomic announcement is relevant (see e.g. Fatum/Scholnick 2008). According to the semi-strong efficient market hypothesis, a change in prices is only to be expected if the announcement deviates from analysts' previous forecasts. Perfectly anticipated announcements do not contain any new information and should thus not cause any market reaction. I therefore calculate the unexpected component of an announcement following Balduzzi et al. (2001):

$$S_{i,t} = \frac{(a_{i,t} - f_{i,t})}{\sigma_i} \quad (4.1)$$

The surprise component of the announced macroeconomic indicator  $i$  at time  $t$  is computed as the difference between the actually announced value  $a_{i,t}$  and a consensus forecast  $f_{i,t}$ . To calculate  $S_{i,t}$ , this measure is standardized by dividing by the standard deviation ( $\sigma_i$ ) of the entire time series  $(a_i - f_i)$ .<sup>112</sup> Since macroeconomic variables are measured in different units, the standardization allows for easier interpretation of the regression coefficients. Following Taylor (2010), I define positive (negative) macroeconomic surprises  $S_i$  to be expansive or inflationary (contractionary or deflationary) signs. Therefore, I adjust the calculated surprise measures of Civilian Unemployment and Business Inventories through multiplication with minus one. Otherwise, a rise in these figures would imply a contractionary sign.

<sup>111</sup> The sample period is determined by federal funds derivatives data purchased from the CME.

<sup>112</sup> Since the standard deviation of the time series of surprises in variable  $i$  is a constant, the standardization procedure neither affects the significance of coefficients nor the  $R^2$  of the regression (Balduzzi et al. 2001).

**Table 4.2: Descriptive statistics of macroeconomic indicators**

Macroeconomic indicator	Announcing institution	Frequency	Announcement time (EST)	Number of announcements	Unit of measurement	Std. deviation	Surprise < 0	Surprise = 0	Surprise > 0
GDP preliminary	Bureau of Economic Analysis	Quarterly	8:30	29	Change in %	0.3277	15	3	11
GDP advanced	Bureau of Economic Analysis	Quarterly	8:30	29	Change in %	0.8563	18	1	10
GDP final	Bureau of Economic Analysis	Quarterly	8:30	29	Change in %	0.3061	11	10	8
Current Account	Bureau of Economic Analysis	Quarterly	8:30	29	Billion \$	49.2868	13	1	15
Personal Consumption	Bureau of Economic Analysis	Monthly	8:30	87	Change in %	0.1876	35	19	33
Personal Income	Bureau of Economic Analysis	Monthly	8:30	87	Change in %	0.3720	29	20	38
Civilian Unemployment	Bureau of Labor Statistics	Monthly	8:30	86	% Unemployed	0.1531	22	29	35
97 Non-Farm Payrolls	Bureau of Labor Statistics	Monthly	8:30	86	Change in thousands	88.2645	56	0	30
Consumer Price Index	Bureau of Labor Statistics	Monthly	8:30	86	Change in %	0.1441	30	24	32
Producer Price Index	Bureau of Labor Statistics	Monthly	8:30	86	Change in %	0.4749	35	5	46
Productivity preliminary	Bureau of Labor Statistics	Quarterly	8:30	28	Change in %	1.0310	7	1	20
Productivity revised	Bureau of Labor Statistics	Quarterly	8:30	29	Change in %	0.5387	12	3	14
Consumer Confidence	Conference Board	Monthly	10:00	87	Index	5.1769	42	0	45
Index of Leading Indicators	Conference Board	Monthly	10:00	86	Change in %	0.2266	36	23	27
Chicago PMI	ISM Chicago & Kingsbury International, Ltd. <sup>113</sup>	Monthly	9:45/10:00 <sup>114</sup>	87	Index	4.2856	30	0	57

<sup>113</sup> In 2011, Kingsbury International was acquired by Deutsche Börse.

<sup>114</sup> Since 2007 the Chicago PMI is announced at 9:45 a.m. (EST).

(Table 4.2 continued)

Macroeconomic indicator	Announcing institution	Frequency	Announcement time (EST)	Number of announcements	Unit of measurement	Std. deviation	Surprise < 0	Surprise = 0	Surprise > 0
Capacity Utilization	Federal Reserve	Monthly	9:15	86	%	0.3486	41	8	37
Industrial Production	Federal Reserve	Monthly	9:15	86	Change in %	0.4002	35	11	40
Consumer Credit	Federal Reserve	Monthly	15:00	86	Change in billion \$	6.1797	51	0	35
Existing Home Sales	National Association of Realtors	Monthly	10:00	87	Million houses	0.2331	38	3	46
New Home Sales	U.S. Census Bureau	Monthly	10:00	87	Million houses	0.0612	50	0	37
Housing Starts	U.S. Census Bureau	Monthly	8:30	86	Million houses	0.0821	44	0	42
Construction Spending	U.S. Census Bureau	Monthly	10:00	86	Change in %	0.9783	35	5	46
Business Inventories	U.S. Census Bureau	Monthly	8:30/10:00 <sup>115</sup>	86	Change in %	0.2729	37	15	34
Durable Goods Orders	U.S. Census Bureau	Monthly	8:30	87	Change in %	2.9278	52	2	33
Factory Orders	U.S. Census Bureau	Monthly	10:00	86	Change in %	0.7386	35	4	47
Retail Sales	U.S. Census Bureau	Monthly	8:30	86	Change in %	0.6348	41	4	41
Trade Balance	U.S. Census Bureau/ Bureau of Economic Analysis	Monthly	8:30	86	Billion \$	3.3462	39	1	46
Treasury Budget	U.S. Department of Treasury	Monthly	14:00	86	Billion \$	25.1486	45	0	41
<b>Total</b>				2,072			934	192	946

The table shows the 28 macroeconomic indicators under investigation as well as the respective announcing institution, frequency and time of announcements, the number of announcements during the sample period from 24 November 2003 to 31 January 2011, the indicators' units of measurement, the standard deviation  $\sigma_i$  of the time series of the total surprise, and the number of positive, negative, and zero-surprises. The surprise measures of Civilian Unemployment and of Business Inventories were multiplied by minus one in order to ensure that positive (negative) surprises indicate an expansionary (contractionary) sign.

<sup>115</sup> From 2000 to 2002, Business Inventories announcements took place at 8:30 a.m. (EST). Between 2003 and 2005 announcement times changed between 8:30 and 10:00 a.m. (EST). Subsequently, the figures were permanently released at 10:00 a.m. (EST).

### 4.3.2 Federal funds futures

For the analysis of the 30-day federal funds futures, I study prices of all electronically traded contracts (CME Globex) from 24 November 2003 to 31 January 2011. Data was provided by the CME Group. For the purpose of an intraday analysis, I preprocess the trading data as follows. First, I generate distinct time series of future contracts according to their time to maturity. The reason is that contracts of dissimilar maturity will certainly react differently in response to macroeconomic announcements because they reflect monetary policy expectations of different duration. Federal funds futures always expire at the end of a calendar month. For instance, in January 2010 the time series with one month to maturity comprises all contracts that expire at the end of January 2010. At the beginning of February, the time series with one month to maturity is rolled over and subsequently contains all contracts that expire at the end of February 2010. Hence, the underlying of the one-month (1m) future time series is always the effective federal funds rate of the upcoming month. The 1m time series therefore contains market expectations of monetary policy one month ahead. This rolling procedure is applied analogously to contracts with longer time to maturity in order to receive estimates of monetary policy expectations in two, three, four months and so on.

Second, the constructed time series need to be equidistant. This is to ensure that the analyses are based on uniform data such that future price reactions in response to macroeconomic announcements can be measured over the same time period. For this purpose, 5-minute intervals are formed. For example, the implied futures rate at 10.00 a.m. takes into account all trades carried out between 9:55:01 and 10:00:00 a.m. In line with the semi-strong efficient market hypothesis, the 10 a.m. futures rate therefore reflects all information available at that time. If there are several transactions with different implied interest rates in a single 5-minute interval, the last quote is used as the implied futures rate for this interval.<sup>116</sup> On the other hand, if there is no transaction in a 5-minute interval, the futures rate of the most recent transaction is used. This procedure is based on the assumption that market participants only trade if new information is disclosed. If no transaction takes place, there was probably no new information and the most recent implied futures rate is accurate given the available level of information.

---

<sup>116</sup> The analysis has also been run when the trading volume weighted average of the implied futures rate in every 5-minute interval has been used. The results remained virtually identical.

A potential disadvantage of the aforementioned rolling procedure is that the time series have varying time to maturity. Continuing the prior example, on 1 January 2010 the time to maturity of a one-month contract amounted to 30 days. On 30 January, it decreased to only one day and subsequently rose to 27 days at the beginning of February 2010. Since this could pose a problem to the empirical analysis, I additionally create synthetic time series with constant maturity. For the synthetic one-month time series, the prices of the actual one-month and two-month time series and, if required, of the three-month time series are weighted using their remaining time to maturity.<sup>117</sup> The resulting time series then has a constant maturity of 30 days. This is to ensure that futures react identically to announcements at the beginning of the month and to those at the end of the month. The time to maturity of the synthetic two-month time series amounts to 60 days; that of the three-month time series is 90 days and so forth.

#### **4.3.3 Federal funds options**

Federal funds option data covers the same period from 24 November 2003 to 31 January 2011. Option data is also available on an intraday basis. However, the number of trades per day varies significantly over the sample period and is not sufficient to construct intraday measures of option implied probabilities. In order to create a valid time series of option implied probabilities, I conduct the analysis on a daily basis. For this purpose, I use federal funds calls and puts data in order to obtain one aggregate probability measure for each day. The detailed methodology of how daily probability measures are determined is explained in subsection 4.4.2.1. Similar to the conversion of future price quotes into implied futures rates, option data is also adjusted. This is to establish a straightforward link to the implied future target rate. Option data is transformed by first deducting the quoted strike price from 100. Second, calls need to be reclassified as puts and vice versa. Option prices do not have to be converted (for the derivation see Carlson et al. 2005, Appendix 1).

Two further issues exist with respect to the following analysis. First, federal funds options are American options which allow for early exercise. In line with Carlson et al. (2005), I assume that the American option premium is very small and can therefore be neglected (see also Beber/Brandt 2006). Second, a risk premium may exist in the option market. As this study is concerned with daily changes in options prices and the derived option implied probabilities, this should not pose a problem. Under the assumption that the risk premium

---

<sup>117</sup> For details on the methodology, see Appendix A1.

does not vary significantly in the short-term (see e.g. Hamilton 2009), this should not bias the results. The argument similarly applies to the American option premium.

Prior to the empirical analysis, option price data is checked for validity by examining whether the following five criteria are met (see Carlson et al. 2005). First, an option's price must be greater than or equal to its exercise value. Second, option prices have to be monotone and, third, convex when considered as a function of the strike price. Fourth, the put-call-parity of options with an identical strike and maturity that are traded on the same day needs to be fulfilled. Fifth, for two options which only differ in their strike price, the difference in the options' prices must not be higher than the difference of the strike prices. With all these criteria in mind, I will next describe how option implied probabilities are estimated for the subsequent macroeconomic event study. Prior to this, the measurement of abnormal future price effects is addressed.

## 4.4 Methodology

### 4.4.1 Federal funds futures

Initially, I determine the federal funds future reaction around macroeconomic announcements. In order to receive a measure of the abnormal announcement effect, I subtract the average price change of federal funds futures on days without macroeconomic announcements from the respective change on the announcement day. This approach is comparable to a constant mean model in stock event studies. This abnormal future price change is then regressed on the different macroeconomic surprises  $S_i$  using robust standard errors.

$$(F_{t_2}^M - F_{t_1}^M) - \frac{1}{B} \sum_{b=1}^B (F_{b < t_2}^M - F_{b < t_1}^M) = \alpha + \sum_{i=1}^{28} \beta_i S_{i,t} + \varepsilon_t \quad (4.2)$$

$F_t^M$  denotes the implied rate of the future with synthetic maturity  $M$  at time  $t$ . The event window extends from 30 minutes ( $t_1$ ) prior to the announcement until 60 minutes ( $t_2$ ) after the event. For calculating the “normal” or expected price reaction, I use the future price change around the same time of the day on all non-announcement days  $b$  prior to the respective announcement. However, a maximum of 250 days are considered, i.e.  $B \leq 250$ . Subscript  $i$  refers to the macroeconomic indicator that is announced at time  $t$ .

## 4.4.2 Federal funds options

### 4.4.2.1 Option implied probabilities

The estimation procedure follows the seminal paper in this research area by Carlson et al. (2005). The price of a (European) call and a put option on a future can be determined by multiplying the discounted exercise value of the option by the probability that the option will be in the money at maturity. This requires an assumption of the density function  $f(F_T)$  of the underlying future price  $F_T$ . Assuming risk-neutrality, federal funds option prices can be expressed as illustrated in equation (4.3) for calls ( $C$ ) and equation (4.4) for puts ( $P$ ).

$$C(t, T, X, F_T) = \int_0^{\infty} \max(0, F_T - X) df(F_T) \cdot e^{-r(T-t)} \quad (4.3)$$

$$P(t, T, X, F_T) = \int_0^{\infty} \max(0, X - F_T) df(F_T) \cdot e^{-r(T-t)} \quad (4.4)$$

The option's underlying is the future  $F_t$  the value of which depends on the average effective federal funds rate in the contract month.  $X$  denotes the strike price of the option.  $T-t$  refers to the remaining time to maturity and  $r$  is the short-term interest rate used for discounting.

Since it is common practice that the FOMC changes the target rate only in multiples of 25 basis points, it is reasonable to assume that the number of possible values of  $F_T$  is discrete. Therefore, the calculation of today's option price simplifies to:

$$C(t, T, X, F_T) = \sum_{j=1}^N p_j \cdot \max(0, F_{T,j} - X) \cdot e^{-r(T-t)} \quad (4.5)$$

$$P(t, T, X, F_T) = \sum_{j=1}^N p_j \cdot \max(0, X - F_{T,j}) \cdot e^{-r(T-t)} \quad (4.6)$$

Thus, the option price is calculated as probability  $p$  of state  $j$  multiplied by the discounted exercise value of the option in state  $j$  summed up over all  $N$  states. All parameters are known except for the probabilities. Therefore, when several traded options are available, one can estimate the probabilities the market implicitly attaches to the implied futures rate  $F_T$  and thus to future values of the target federal funds rate.<sup>118</sup> Suppose a trading day on

---

<sup>118</sup> The underlying of federal funds futures is the day-weighted average of the effective federal funds rate in the contract month. If a FOMC meeting takes place during the contract month, the future value depends on the weighted average of the target rate before the FOMC meeting and the target rate after the meeting. If no

which five options with different strike prices are traded. Furthermore, one assumes three different FOMC meeting outcomes with associated probabilities  $p_j$  ( $j = 1, 2, 3$ ). By means of an OLS regression, one can estimate the daily probabilities using equation (4.7) (see Carlson et al. 2005). The extensive matrix notation can then be replaced by the general case in equation (4.8), where  $Y$  denotes the compounded option price matrix,  $X$  represents the payoff matrix, and  $p$  denotes the probability matrix (see also Carlson et al. 2005).

$$\begin{bmatrix} \frac{C(t, T, X_1, F_T)}{e^{-r(T-t)}} \\ \frac{C(t, T, X_2, F_T)}{e^{-r(T-t)}} \\ \frac{C(t, T, X_3, F_T)}{e^{-r(T-t)}} \\ \frac{P(t, T, X_4, F_T)}{e^{-r(T-t)}} \\ \frac{P(t, T, X_5, F_T)}{e^{-r(T-t)}} \end{bmatrix} = \begin{bmatrix} \max(0, F_{T,1} - X_1) & \max(0, F_{T,2} - X_1) & \max(0, F_{T,3} - X_1) \\ \max(0, F_{T,1} - X_2) & \max(0, F_{T,2} - X_2) & \max(0, F_{T,3} - X_2) \\ \max(0, F_{T,1} - X_3) & \max(0, F_{T,2} - X_3) & \max(0, F_{T,3} - X_3) \\ \max(0, X_4 - F_{T,1}) & \max(0, X_4 - F_{T,2}) & \max(0, X_4 - F_{T,3}) \\ \max(0, X_5 - F_{T,1}) & \max(0, X_5 - F_{T,2}) & \max(0, X_5 - F_{T,3}) \end{bmatrix} \cdot \begin{bmatrix} p_1 \\ p_2 \\ p_3 \end{bmatrix} \quad (4.7)$$

$$Y = X \cdot p \quad (4.8)$$

However, not all option contracts traded on a specific day are used for probability estimation. Since federal funds options expire in a specific calendar month and FOMC meetings are scheduled in advance, the following two criteria can be defined (see Carlson et al. 2005). Only if these criteria are met, the respective option enters the estimation procedure in equation (4.8). First, during the remaining time to maturity of the option contract, there has to be only one FOMC meeting. This is to ensure that the target rate prior to the FOMC meeting is known with certainty.<sup>119</sup> Therefore, no probability estimation is possible for trading days prior to an unscheduled FOMC meeting.<sup>120</sup> In consequence, each option contract is assigned to a single FOMC meeting the outcome of which it is to predict. On the other hand, the outcome of one FOMC meeting can be predicted by one or two option contracts. Second, if an option contract expires after the FOMC meeting, this option contract will not be used for estimation on the days following the FOMC meeting it was to predict.

---

meeting takes place during the contract month, the future value depends solely on the after-meeting rate of the previous FOMC meeting.

<sup>119</sup> The implied futures rate  $F_T$  depends on the weighted average of the effective federal funds rate. If the target rate prior to the meeting was unknown, one could not calculate the underlying  $F_T$ .

<sup>120</sup> This is particularly relevant for the period of the financial crisis from 2007 to 2009 when several unscheduled FOMC meetings took place (see Appendix A2 for an overview).



A detailed illustration of the assignment of option contracts to the respective FOMC meetings can be found in Table A.1 in Appendix A2.

The daily set of possible target rate outcomes  $j$  is obtained according to Carlson et al. (2005). The upper bound on a specific day is defined by the highest strike price of a call option rounded up to the closest multiple of 25 bp. The lower bound is determined conversely by rounding down the lowest strike price of a put option to the closest multiple of 25 bp. The range of possible target rates for which probabilities are to be estimated is thus given by all 25 bp increments between (and including) the lower and the upper bound.

Moreover, there have to be at least five validly priced options in order to estimate the probabilities correctly. With less options per day the estimation might become imprecise (Carlson et al. 2005). Since no other restrictions are imposed on the coefficient estimates, it may occur that single estimates are negative or that the sum of coefficients deviates slightly from one. However, this does not pose a problem to the empirical investigation.

#### **4.4.2.2 The impact of macroeconomic announcements**

The recovery of daily probability estimates according to Carlson et al. (2005) constitutes the initial step. The main research interest of this chapter is to identify the drivers of daily probabilities changes. For this purpose, I focus on the daily probability of the target rate that was actually chosen at the upcoming FOMC meeting, referred to as  $p^A$ . Thereby, I contribute to the literature by analyzing the dynamics of option implied target rate probabilities and assess the role of macroeconomic surprises in this context. This is to answer the fundamental question as to which macroeconomic surprises actually drive market expectations towards the ex post actually chosen target federal funds rate. Put differently, I intend to identify the macroeconomic indicators which the market considers most important for monetary policy decisions.

For this purpose, macroeconomic surprises, as defined in equation (4.1), need to be scaled. Three different monetary policy states have to be distinguished: target rate cut, target rate hike, or no change at the upcoming FOMC meeting. A positive surprise, e.g. an unexpected decrease in the unemployment rate, would increase the probability  $p^A$  of the actually chosen target rate if the Fed intends to raise the target rate soon. On the contrary, it would decrease probability  $p^A$  if the FOMC were to cut the target rate at the upcoming meeting. The expected impact of surprises thus depends on the prevailing monetary policy state.

This relationship can be summarized as follows. In case of a target rate increase at the upcoming FOMC meeting, a positive (negative) macroeconomic surprise should increase (decrease) the probability  $p^A$ . In case of a target rate decrease at the upcoming FOMC meeting, a positive (negative) macroeconomic surprise should decrease (increase) the probability  $p^A$ . If the target rate remains unchanged at the upcoming FOMC meeting, a surprise equal to zero would increase the associated probability as it contains no further indication in support of a rate hike or cut. The following table illustrates the expected relationship:

**Table 4.3: Expected change in probability  $p^A$  of the ex post actually chosen target rate conditional on the sign of macroeconomic surprise and state of monetary policy**

Target rate decision at the upcoming FOMC meeting	Macroeconomic surprise $> 0$	Macroeconomic surprise $= 0$	Macroeconomic surprise $< 0$
Target rate hike	$p^A \uparrow$	$p^A \downarrow$ or unchanged	$p^A \downarrow$
No target rate change	$p^A \downarrow$	$p^A \uparrow$ or unchanged	$p^A \uparrow$
Target rate cut	$p^A \downarrow$	$p^A \downarrow$ or unchanged	$p^A \uparrow$

Accordingly, surprise measures  $S_{i,t}$  calculated as illustrated in equation (4.1) are multiplied by minus one if the target rate is lowered or remains unchanged at the upcoming FOMC meeting:

$$S_{i,t}^{scaled} = S_{i,t} \cdot hike_t \quad (4.9)$$

$$hike_t = \begin{cases} 1, & \text{if target rate is increased at the upcoming FOMC meeting} \\ -1, & \text{otherwise} \end{cases} \quad (4.10)$$

Note that this definition implies that probability  $p^A$  is supposed to increase in case of a negative macroeconomic surprise when the target rate will not be changed at the upcoming FOMC meeting. The reason for this is the presence of the zero lower bound in the sample period (December 2008 until January 2011). During this period, the target rate is close to

zero and any negative information would therefore increase the probability that the target rate will further remain at the ZLB.<sup>121</sup>

With these scaled surprise measures, I now analyze which macroeconomic surprises have the greatest impact on changes in the probability that the market attaches to the target rate that is actually chosen at the upcoming FOMC meeting. I therefore run the following panel regression with fixed effects using robust standard errors:

$$\Delta p_{f,t}^A = \alpha_0 + \alpha_f + \sum_{i=1}^{28} \beta_i \cdot S_{i,t}^{scaled} + \gamma_1 Days_t + \gamma_2 Days_t \cdot p_{f,initial}^A + \varepsilon_{f,t} \quad (4.11)$$

$\Delta p^A$  is the change in probability from day  $t-1$  to  $t$ . Subscript  $f$  refers to the respective FOMC meeting that is to be predicted on day  $t$ .  $\beta_i$  represent the regression coefficients of interest. They measure the impact of macroeconomic surprises associated with indicators  $i$ . Due to the construction of the scaled surprise measures, the sign of  $\beta$  is expected to be positive. Thus, if an announcement implies a positive (negative) scaled surprise, probability  $p^A$  should increase (decrease) such that  $\Delta p^A$  becomes positive (negative).  $Days_t$  refers to the number of days until the FOMC meeting takes place the outcome of which is to be predicted. The variable captures all residual information that market participants process prior to the target rate decision. It controls for the fact that market participants might react differently to new information when the target rate decision is four weeks ahead as compared to a decision in only a few days.  $p_{f,initial}^A$  indicates the first available daily probability estimate of FOMC meeting  $f$ . It is thus the estimate with the longest time distance to the meeting date. The reason to include this variable is to account for a possibly different effect conditional on the market's initial perception of the next monetary policy decision. If the market initially attaches a probability of 90% to the ex post actually chosen target rate, subsequent macroeconomic announcements might have a small impact. In contrast, the impact should be much higher when the market initially only attaches a probability of 50% to that target rate.

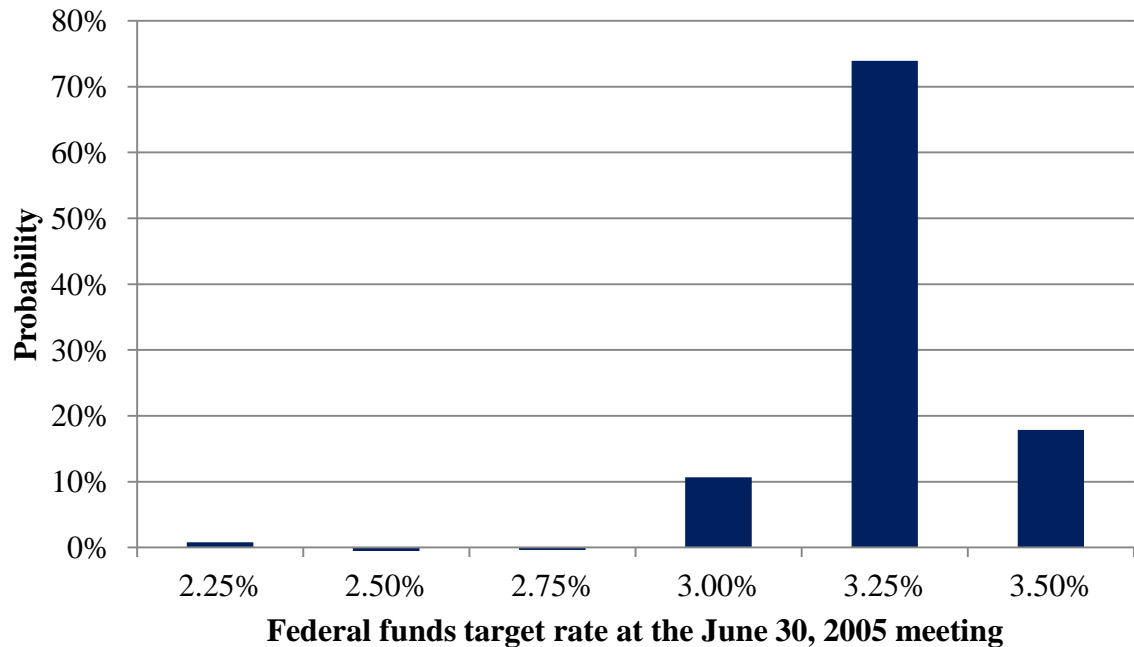
---

<sup>121</sup> As a robustness test, I adjusted the scaling measure for the 'no target rate change' state prior to the ZLB. This period comprises the first eight months of 2007 which were characterized by no-change monetary policy, but a target rate cut was forthcoming in September 2007. I adjusted the scaling measure such that both positive and negative macroeconomic surprises would now decrease probability  $p^A$  of an unchanged target rate. The results remained qualitatively the same.

## 4.5 Option implied probabilities estimates

By estimating equation (4.8), the daily probabilities of possible future target rates of each FOMC meeting in the sample period are obtained. Due to variation in trading activity and after applying the aforementioned validation procedure of option prices, valid probability estimates could be recovered for 974 trading days in the sample period.<sup>122</sup> Exemplarily, Figure 4.2 illustrates the results of the June 2005 meeting estimated using option data from May 6, 2005. The target rate had recently been raised to 3% and the upcoming FOMC meeting would vote for a further 25 basis points increase. Even seven weeks prior to the meeting date, the market implicitly attached a probability of approximately 74% to this outcome. A 50 bp hike was also considered, but the associated probability was perceived much lower. The implied probability of no target rate change amounted to only approximately 10%. In order to give a complete overview of the obtained estimates, the outcomes of a 25, 50, and 75 bp cut are also depicted. However, the probabilities of these outcomes were virtually zero.

**Figure 4.2: Estimated target rate probabilities for the FOMC meeting in June 2005**



*Figure 4.2 shows the probability density function as of May 6, 2005 of the target federal funds rate to be chosen at the June 30, 2005 meeting of the FOMC. The current target rate*

<sup>122</sup> See Appendix A3 for an overview of recovered probabilities over the years.

was at 3% by that time and the upcoming meeting would vote for a 25 basis points increase in the target rate (i.e.  $p^A = 3.25\%$ ).

Figure 4.2 only shows the estimated probabilities on one specific day. As the FOMC meeting approaches, the probability estimates usually change. The probability of the actually chosen target rate typically converges towards one over time. Due to macroeconomic announcements and the collection of additional information, market participants gradually learn more about the current state of the economy. Therefore, they are able to improve their monetary policy forecasts and the option implied expectations converge towards the actual outcome of the upcoming FOMC meeting. Figure 4.3 illustrates the median development of probability  $p^A$  associated with the actual target rate outcome until the meeting date.

**Figure 4.3: Development of the probability of the actually chosen target rate over time ( $p^A$ )**

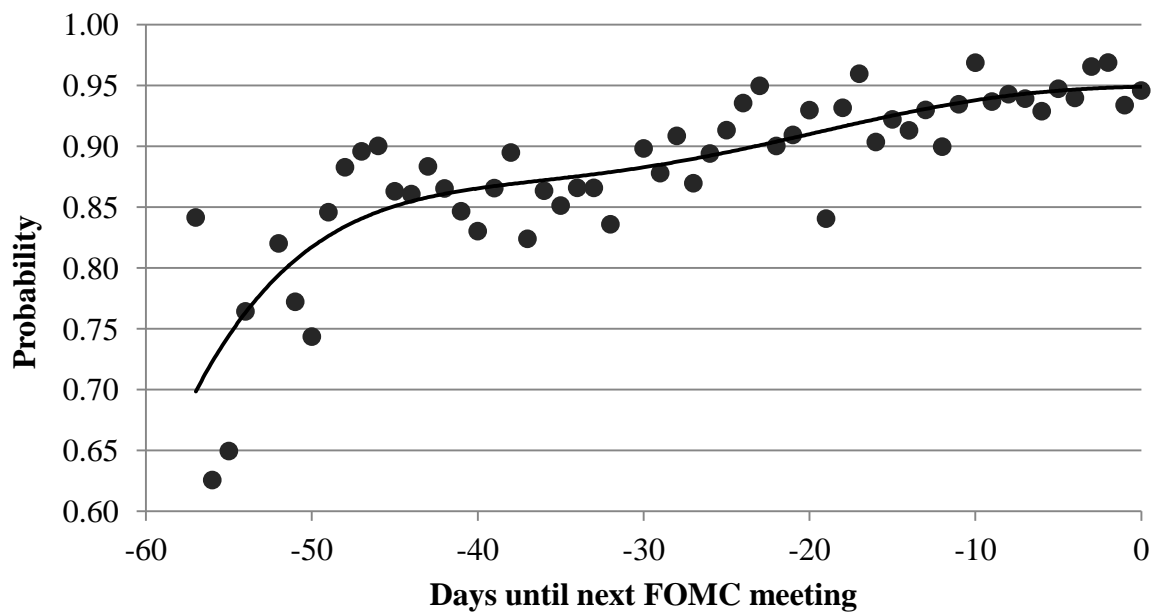


Figure 4.3 shows how probability  $p^A$  of the ex post actually chosen target rate typically changes prior to a FOMC meeting. The points depicted above represent the (cross-sectional) median of all probability estimates  $p^A$  with identical time to the upcoming FOMC meeting, i.e. the median over all FOMC meetings. The solid black line is a fitted polynomial trend line to illustrate the development of probability  $p^A$ .

Finally, Figure 4.4 illustrates how different target rate probabilities change over time. For this purpose, the probabilities of three consecutive FOMC meetings in March, May, and

June 2005 are depicted. As can be seen from these three figures, the probability estimates usually vary from day to day. In the next section, I investigate whether announcements of macroeconomic indicators systematically contribute to these variations and to the usual convergence towards one of probability  $p^A$ . Although there has been anecdotal evidence by Carlson et al. (2005) and to some extent by Emmons et al. (2006), this is the first study to analyze the impact of the news component of macroeconomic announcements over a longer period of time including the recent financial crisis.

**Figure 4.4: Development of target rate probabilities from February to June 2005**

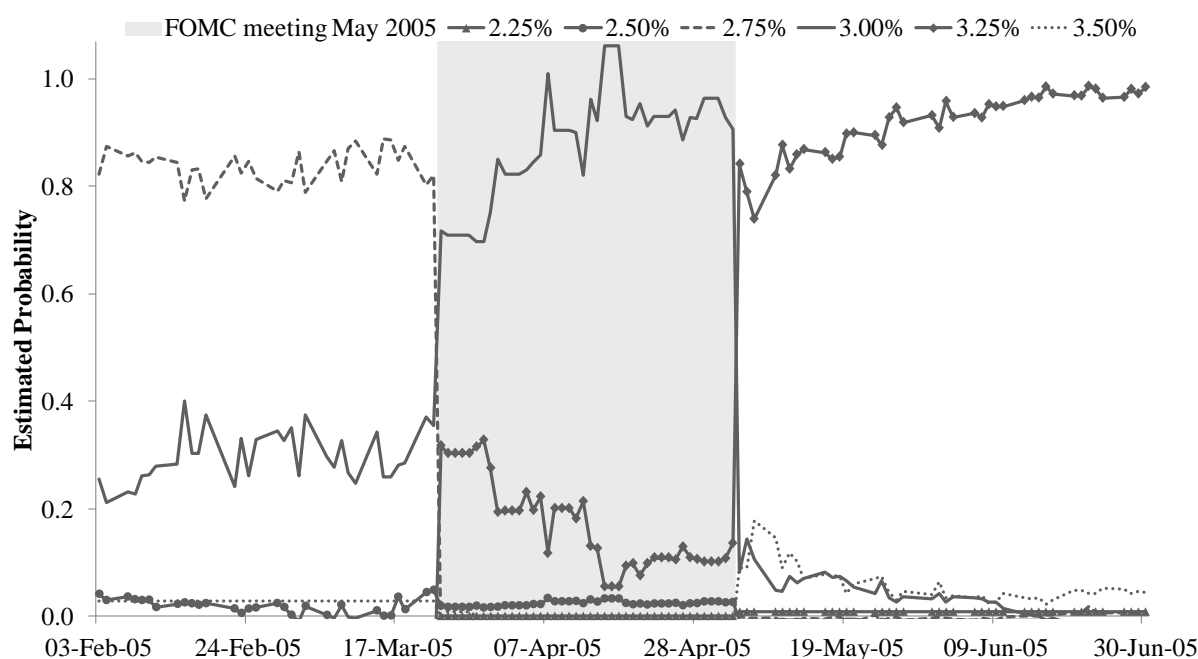


Figure 4.4 shows the development of option implied probabilities for different target rates for a sample of three consecutive FOMC meetings (March 22, May 3, and June 30, 2005). The shaded area indicates the days subsequent to the first and prior to the second FOMC meeting.

#### 4.6 The impact of macroeconomic surprises on monetary policy expectations

Initially, I briefly discuss the macroeconomic announcement effects on federal funds futures. For the sake of brevity, these results have been moved to Appendix A4 (Tables A.3, A.4, and A.5). As expected, all significant coefficients show a positive sign indicating that expansionary (recessionary) announcements are indeed associated with expected tighter

(more accommodative) monetary policy. The results emphasize the importance of the two labor market-related indicators Non-farm Payrolls and Civilian Unemployment. This finding is consistent with a number of previous studies such as Taylor (2010). For synthetic maturities of one to six months, these announcements are associated with highly significant effects on the implied futures rate. Hence, in the short- to medium-term market participants expect the FOMC to respond to developments on the labor market. The sentiment indicators Chicago PMI and to a lesser extent Consumer Confidence also have a sizeable and statistically significant impact on the expected future target rate. Further, with increasing maturity of the analyzed futures additional macroeconomic indicators exhibit a significant reaction. The greatest effects are documented for Retail Sales, Durable Goods Orders, and Existing Home Sales. In line with these findings, the goodness of fit of the models with three to six months to maturity is greater than it is for the models with one or two months.<sup>123</sup> This can be interpreted as market participants adjusting mainly their one-quarter ahead monetary policy expectations in response to macroeconomic news. Notably, with respect to real economic indicators GDP-related announcements do not seem to move the federal funds futures markets. This is noteworthy since GDP is often considered to be a good proxy for the output gap in the context of the Taylor rule. Furthermore, CPI and PPI announcements do not have a significant effect in any of the future contracts under consideration either. This is astonishing given the Fed's inflation objective.

Following the futures event study, the regression model in equation (4.11) is run in order to examine whether the documented effects can be confirmed for federal funds options.<sup>124</sup> The daily change in probability  $p^A$  is the dependent variable in the regression analysis. The independent variables of interest are the scaled surprise measures of macroeconomic announcements. The set up of the analysis thus enables me to directly evaluate the importance of macroeconomic surprises for the evolution of option implied monetary policy expectations. The results are shown in Table 4.4. Model (1) comprises the entire sample period. Models (2) and (3) represent subsamples of the years 2003 to 2006 and 2007 to 2011, respectively. Initially focusing on models (1) and (2), Civilian Unemployment and Non-farm Payrolls announcements exhibit a statistically significant impact.

---

<sup>123</sup> The model fit has an inverted U-shape with a maximum adjusted  $R^2$  at the four-month futures model (see Table 7).

<sup>124</sup> In order to verify that the option estimation procedure works reasonably and that there are no sample- or data-specific distortions, I reproduce the analysis of Carlson et al. (2005). The results are very similar for the period prior to the financial crisis and can be found in the Appendix A5.

**Table 4.4: Regression results**

		(1) Change in probability $p^A$	(2) Change (before 2007)	(3) Change (after 2007)
<b>GDP</b>	GDP preliminary	-0.0056 (-0.284)	0.0131 (1.398)	-0.0237 (-1.067)
	GDP advanced	-0.0022 (-0.359)	0.0087 (0.535)	-0.0135 (-1.011)
	GDP final	-0.0135 (-1.067)	-0.0308* (-1.871)	0.0212 (0.779)
<b>Trade &amp; Consumers</b>	Current Account	0.1120 (1.508)	0.0961 (1.181)	0.2500 (1.317)
	Personal Consumption	0.0071 (0.576)	0.0001 (0.017)	0.0392* (1.831)
	Personal Income	-0.0092 (-1.258)	-0.0014 (-0.291)	-0.0222 (-0.877)
<b>Labor Markets</b>	Civilian Unemployment	0.0497** (2.086)	0.0703*** (2.900)	0.0234 (0.810)
	Non-farm Payrolls	0.0450* (1.785)	0.0644** (2.345)	-0.0651 (-0.681)
<b>Inflation</b>	CPI	0.0046 (0.686)	0.0113 (1.681)	-0.0375 (-0.777)
	PPI	-0.0007 (-0.094)	0.0012 (0.287)	-0.0016 (-0.0490)
<b>Productivity</b>	Productivity preliminary	0.0016 (0.171)	-0.0035 (-0.266)	0.0061 (0.526)
	Productivity revised	-0.1070 (-1.013)	0.0056 (0.228)	-0.3900*** (-9.169)
<b>Sentiment Indicators</b>	Consumer Confidence	0.0153 (1.091)	-0.0024 (-0.265)	0.0453 (1.216)
	Index of Leading Indicators	0.0102 (0.688)	0.0031 (0.126)	0.0157 (0.873)
	Chicago PMI	0.0144* (1.833)	0.0235*** (3.130)	-0.0303* (-1.739)
<b>Federal Reserve</b>	Consumer Credit	0.0048 (0.594)	0.0042 (0.378)	0.0088 (0.639)
	Capacity Utilization	-0.0004 (-0.018)	-0.0135 (-0.793)	0.0397 (0.667)
	Industrial Production	0.0084 (0.367)	0.0298 (1.399)	-0.0212 (-0.478)



(Table 4.4 continued)

<b>Housing</b>	Existing Home Sales	0.0162 (0.680)	0.0060 (0.486)	0.0185 (0.542)
	New Home Sales	-0.0034 (-0.572)	0.0023 (0.406)	-0.0076 (-0.475)
	Housing Starts	0.0029 (0.532)	0.0085 (1.577)	-0.0126 (-0.475)
	Construction Spending	0.0185 (0.881)	-0.0102 (-0.450)	0.1140 (1.684)
<b>Orders &amp; Sales</b>	Business Inventories	-0.0019 (-0.175)	-0.0034 (-0.463)	0.0034 (0.110)
	Durable Goods Orders	-0.0120 (-1.047)	-0.0008 (-0.099)	-0.0258 (-0.900)
	Factory Orders	-0.0034 (-0.452)	-0.0018 (-0.269)	-0.0017 (-0.112)
	Retail Sales	-0.0361*** (-2.867)	-0.0277** (-2.190)	-0.0494** (-2.230)
<b>Trade &amp; Budget</b>	Trade Balance	0.0060 (1.109)	0.0047 (0.829)	0.0151 (0.899)
	Treasury Budget	-0.0009 (-0.365)	0.0039 (0.267)	-0.0014 (-1.299)
<b>Controls</b>	Days until next FOMC	0.0003 (0.609)	0.0004 (0.922)	-0.0012** (-2.374)
	Days until next FOMC $\times$ initial probability	-0.0005 (-0.742)	-0.0004 (-0.855)	0.0010 (1.549)
	Constant	0.0014 (0.254)	-0.0017 (-0.308)	0.0243** (2.644)
	Observations	929	592	337
	Adjusted R <sup>2</sup>	0.84%	3.41%	2.79%
	Number of FOMC meetings	43	22	22
	FOMC FE	Yes	Yes	Yes
	Year FE	Yes	Yes	Yes

Table 4.4 shows the results of the panel regression model from equation (4.11) with robust *t*-statistics in parentheses. The regression controls for FOMC meeting fixed effects as well as year fixed effects. Model (1) comprises the entire sample. Models (2) and (3) represent subsamples. The former includes probabilities estimates between 2003 and 2006. The latter comprises estimates between 2007 and 2011. \*\*\*, \*\*, \* indicate statistical significance at the 1%, 5%, and 10% level, respectively.

This result is also economically meaningful. It implies that a surprise of one standard deviation (i.e. a deviation of ca. 88,000 in Non-farm Payrolls, or a 0.15 percentage points deviation in Civilian Unemployment, see Table 4.2) increases the market-perceived probability of the actually chosen target rate by about 5 to 7 percentage points. This finding is consistent with previous empirical evidence with respect to the importance of labor market-related announcements for monetary policy expectations (e.g. Taylor 2010). In line with the findings of Taylor (2010) for futures but in contrast to Carlson et al. (2005), inflation announcements, i.e. CPI and PPI, do not seem to affect option implied probabilities. This is surprising given the twofold objectives of the Fed of full employment and stable prices. In terms of market expectations, however, only new information about the former seems to matter.

Moreover, announcements of the Chicago PMI seem to have a significant impact on probability estimates of the actually chosen target rate. The results reveal that a surprise of one standard deviation increases the perceived probability by approximately 2 percentage points. This finding supports the notion of the index being a timely indicator of current economic sentiment. The finding of a consistently negative impact of Retail Sales announcements is counterintuitive. By definition, all macroeconomic indicators were expected to have a positive sign. The significantly negative coefficient implies a decrease in the target rate probability  $p^A$  in case of a positive surprise. This is in contrast to the expansionary sign that a higher than expected Retail Sales announcement indicates. On the contrary, Retail Sales were found to have a significantly positive effect on the implied futures rate but only for maturities of two or more months (see Table A.3). As the maturity of the employed option contracts is typically smaller than six weeks (i.e. the usual time interval between two FOMC meetings), the results of futures and options are not necessarily contradictory. Instead, they highlight that Retail Sales announcements matter for longer-term monetary policy expectations.

To some extent, the overall results seem to be driven by the first half of the sample as can be inferred from the comparison of models (1) and (2). The latter contains only the years 2003 to 2006 and the results are quite similar to those of the first model. In contrast, model (3) comprises only the subsequent years 2007 to 2011. Hence, it includes the financial crisis as well as the approach and entry into force of the ZLB. During this period, the previously observed effects seem to vanish. Most macroeconomic indicators lose their statistical significance.

In model (3), solely surprises related to Retail Sales exhibit statistical significance and the same sign like in the former two models. However, as mentioned before significantly negative coefficients are not economically meaningful. Besides, there is merely one positive coefficient with marginal significance, i.e. the one of personal consumption. The only other relevant finding is the statistical significance of the number of days until the next FOMC meeting takes place. As this variable becomes smaller when the meeting's date approaches, a negative sign is in line with expectations. The opposing results of the pre-crisis and crisis subsample in models (2) and (3) are consistent with Martin and Milas (2013) who document that monetary policy making differs according to crisis and none-crisis regimes.

The findings related to the crisis and the ZLB (model 3) can be attributed to two factors. First, due to methodological reasons fewer probability estimates could be recovered. Because of infrequent trading and a considerable number of unscheduled FOMC meetings, a lot of trading days had to be excluded from probability estimation (see Appendix A3). Second, the ZLB may be the cause of reduced trading activity in federal funds derivatives since the target rate could hardly decrease further and a quick liftoff from the ZLB was also unlikely. Thus, banks might reduce trading as federal funds risk management becomes less important. Overall, the results of model (3) support the notion that monetary policy expectations are less responsive to traditional indicators. Hence, federal funds options cannot be applied as usual for recovering expectations during times of financial turmoil. The significance of the variable *days until the next FOMC meeting* could support this interpretation. The variable captures all residual incoming information that is not explicitly included in the regression models. Thus, other indicators or economic developments that are not accounted for in the analysis could possibly influence the target rate probabilities. However, the identification of such indicators (if they exist) is beyond the scope of this study.

The contrasting findings of the crisis and pre-crisis period are also supported by the analysis of federal funds futures (see Tables A.4 and A.5). The pre-crisis results likewise emphasize the importance of the two labor market-related indicators as well as of the Chicago PMI. For longer-term implied futures rates, Durable Goods Orders, Retail Sales, Existing and New Home Sales, and notably GDP advanced also have an effect. For the crisis period, the same indicators exert an influence but statistical significance is considerably reduced. Most importantly, the maximum adjusted  $R^2$  of the models drops from approximately 30% (model (4): 4m futures) in the pre-crisis period to less than 6% in the crisis period (model (6): 6m future). Thus, the explanatory power is severely lower during the crisis. This sup-

ports the hypothesis that monetary policy has become less predictable by standard indicators since the beginning of the financial crisis. The findings of the crisis period are also consistent with Swanson and Williams (2014) with regard to the fact that longer-term futures are more responsive to macroeconomic announcements than short-term futures are. This is consistent with the notion that until 2011 market participants still expected the target rate to pick up in only a few quarters (see also Bauer/Rudebusch 2015).

Less explanatory power of standard indicators also offers an additional interpretation. That is that the future target rate has become perfectly predictable. The Fed was no longer able to make monetary policy by setting the target federal funds rate. There was no further downside potential because the target rate was virtually at zero percent. Additionally, no one expected the Fed to increase the target rate soon. Thus, market participants expected a considerable period without any change in the target rate. Therefore, target rate probabilities did not react to the release of macroeconomic information. Supporting this hypothesis, the initial probability  $p^A$  on the first day of estimation for each FOMC meeting amounts to 81% on average since the target rate is at the ZLB. In contrast, it was only 77% prior to this period.<sup>125</sup> Due to the ZLB, the Fed was forced to engage in unconventional monetary policy. Large asset purchase programs, such as the maturity expansion program, or active management of expectations concerning future monetary policy became the main instruments of monetary policy then (Gertler/Karadi 2011; Wright 2012; Swanson/Williams 2014; Foley-Fisher et al. 2016). As the Fed started to make unconventional monetary policy, expectations could no longer be recovered using federal funds derivatives. Recently, the first target rate increase in almost ten years fuels hopes that federal funds derivatives can again be employed to recover monetary policy expectations soon.

## 4.7 Conclusion

In this chapter, I analyze the effects of macroeconomic announcements on monetary policy expectations as implied in federal funds future and option prices. Particular emphasis is put on the distinction between a period of economic upswing (2003-2006) and the financial crisis the combat of which led to the ZLB (2007-2011). My results provide evidence that the way in which expectations about future monetary policy are formed has changed during the financial crisis. In particular, I find strong evidence for the importance of the em-

---

<sup>125</sup> However, due to the relatively small sample size of 30 estimated FOMC meeting outcomes prior to the arrival at the ZLB and 15 estimated meeting outcomes afterwards, the difference in means is not statistically significant.

ployment report and the Chicago PMI during normal times. The findings are consistently reported for both federal funds futures and options. However, the documented effects vanish during the financial crisis. The impact of macroeconomic announcements on monetary policy expectations largely disappears. When the financial crisis unfolded and the ZLB was reached, market-based measures of monetary policy expectations ceased reacting to macroeconomic news. This can be interpreted as market participants expecting a considerable period of monetary policy without any target rate change irrespective of the development of macroeconomic indicators. This seems reasonable in view of the overall negative economic outlook and a target rate virtually at zero percent. My results are consistent with findings of Martin and Milas (2013) and support the notion of differing US monetary policy regimes depending on the state of the economy.

The question as to whether federal funds derivatives will regain their predictive power for monetary policy will be of particular interest as soon as the Fed regains full flexibility in target rate setting. As the first target rate increase in December 2015 is only the initial lift-off from the ZLB, I leave this issue for future research.

## 5 Concluding remarks

This dissertation has dealt with corporate governance and risk management from an empirical corporate finance perspective. Three specific aspects have been scrutinized in detail: (1) the governance role of capital and ownership structure and their respective contribution to firm value, (2) the importance of corporate governance in the process of equity capital increases, and (3) the management of interest rate risk by means of forecasting target rate changes by monetary policy authorities. Corporate governance in general and interest rate risk management in particular have attracted great attention during the recent global financial and economic crisis which merits their detailed investigation in this dissertation. Overall, the results of the previous chapters have stressed that governance and risk management represent important corporate functions from the perspective of shareholders and other stakeholders.

Chapter 2 has revealed that capital structure and ownership structure constitute important components of the overall corporate governance framework of the firm. Based on the prevailing separation of ownership and control in (listed) corporations, the chapter has focused on the resulting agency problems and provided an overview of how capital and ownership structure can alleviate these problems. With respect to capital structure, the use of debt can restrict managers' discretion over the use of free cash flows by means of the resulting payment obligations. Likewise, managerial discretion can be reduced through covenants that prevent excessive risk taking and/or require minimum performance levels. Concerning ownership structure, chapter 2 has provided a detailed overview of how different types of shareholders can influence firm performance, how these types may interact, and how they might ultimately benefit or harm the overall objective of firm value maximization. Managerial ownership mitigates agency problems by aligning the incentives of the management with those of outside shareholders. Large or block shareholders that have sufficient voting power can monitor and discipline the management and thereby contribute to firm value maximization. The major contribution of chapter 2 is the finding that there is no single optimal financial policy applicable to all types of firms – neither for capital structure (i.e. a target leverage ratio) nor for ownership structure (i.e. concentrated versus dispersed ownership). Overall, it can therefore be concluded that managers cannot generate value simply by setting an optimal capital and ownership structure. Instead, corporate financial policies are jointly optimized in equilibrium and additionally depend on the pre-

vailing level of alternative internal and external corporate governance mechanisms and provisions. Moreover, the chapter emphasizes the importance of endogeneity in the context of empirical investigations in this research field. The literature review reveals that failure to account for endogeneity in the management's choice of financial policies and pursuit of firm value maximization can lead to false conclusions. Recent empirical studies employ advanced methodology and/or study designs in order to account for endogeneity. This paves the way for future research on this highly relevant topic.

In chapter 3, the role of governance in the context of seasoned equity offerings is scrutinized. As opposed to chapter 2, the focus is on *changes* in capital and possibly in ownership structure caused by equity capital increases. Using a 4-factor model event study, average decreases in shareholder value of one percent are documented upon announcement of seasoned equity offerings. Further analyses illustrate that companies with a rather concentrated ownership structure, lower leverage, and less disposable cash experience less negative announcement effects. Therefore, the results suggest that firms with good corporate governance, as indicated by concentrated ownership which facilitates effective monitoring, and a lower probability of overinvestment problems, as indicated by lower cash amounts on firms' balance sheets, are less likely suspected of squandering the offering proceeds. The chapter therefore concludes that investors evaluate the potential for active monitoring by shareholders on the one hand and the risk of empire building by the management on the other hand when they assess the impact of capital increases. Thus, companies with sound corporate governance and investment policy suffer lower losses in shareholder value. Moreover, they were consistently able to issue equity, even during periods of financial turmoil such as the financial crisis. This is not self-evident in the real estate sector which was among the most severely affected industries during the crisis. Therefore, the findings are a positive signal for both managers and regulators. Good corporate governance is thus not only a driver of firm value. It also facilitates the process of raising new external funds which in turn is a prerequisite for investments that safeguard the company's existence and future success.

Chapter 4 subsequently highlights the risk management perspective of this dissertation by focusing on interest rate changes as a major macroeconomic risk factor. The risk of changing interest rates and uncertain debt financing is fundamental in the field of corporate finance. The rapid deterioration of credit market conditions during the recent financial crisis has additionally emphasized that interest rate risk management should be an essential ele-

ment of the corporate risk department. A suitable instrument for this purpose is presented in chapter 4 of this dissertation. More specifically, the chapter studies target interest rate decisions by the Federal Reserve. These monetary policy decisions significantly affect interest rates on debt markets and thus the financing opportunities of companies (e.g. Kuttner 2001; Swanson/Williams 2014). In order to predict changes of the federal funds target rate, market expectations of future monetary policy are recovered using the prices of federal funds derivatives. If these prices change upon the release of macroeconomic news, such as employment or inflation data, monetary policy expectations likewise vary. Establishing a systematic relationship between announcements of macroeconomic indicators and monetary policy expectations is the central objective of chapter 4. Moreover, the chapter has put particular emphasis on differences of monetary policy expectations in the period of economic upswing from 2003 to 2006 as compared to the subsequent years comprising the financial and economic crisis (2007 to 2011). The analysis reveals several important findings. Prior to 2007, the results provide evidence that monetary policy expectations are generally consistent with a Taylor rule in which employment-related news dominate whereas inflation-related announcements only have a minor impact. However, the findings change significantly with the beginning of the financial crisis and the approach of the ZLB in 2007 and 2008. Monetary policy expectations as implied by federal funds derivatives do hardly react to macroeconomic announcements anymore. These results suggest that market participants expected a considerable period of monetary policy without any target rate changes irrespective of the macroeconomic development. This seems reasonable due to the overall negative economic outlook by that time and a target rate virtually at zero percent. The results contribute to previous empirical investigations and findings and provide new evidence for the existence of different US monetary policy regimes depending on the state of the economy. The onset of the financial crisis seems to have triggered such a regime switch. Consequently, the chapter also stresses the importance of adapting interest rate forecasting tools to account for possible policy regime switches, asymmetric distribution of future interest rates, and the implementation of unconventional monetary policy by central banks. Only in this way, reasonable expectations of future interest rates and debt financing opportunities can be formed and firms are enabled to hedge interest rate risk and adjust their funding and investment strategy accordingly.

In summary, corporate governance and risk management are of great importance in the context of corporate finance and the management of firms. Supportive evidence of their



relevance is provided across the three main chapters of this dissertation, the different topics and scopes of which eventually offer an integrated view on this subject. Especially the recent financial crisis has emphasized the significance of corporate governance for both the financial policies of the firm and new external funding. In addition, careful monitoring of interest rate risk is similarly indispensable due to the overall relevance of debt financing. Shareholders, managers and other stakeholders should therefore focus on a sustainable implementation of corporate governance and risk management. Only in this way, resources can be allocated and employed effectively and efficiently in order to maximize the company's value which ultimately benefits all stakeholders.

.

## References

- Acharya, Viral/ Philippon, Thomas/ Richardson, Matthew/ Roubini, Nouriel (2009): The Financial Crisis of 2007-2009: Causes and Remedies. In: Financial Markets, Institutions & Instruments 18 (2): 89-137.
- Admati, Anat R./ Pfleiderer, Paul (2009): The “Wall Street Walk” and Shareholder Activism: Exit as a Form of Voice. In: The Review of Financial Studies 22 (7): 2645-2685.
- Admati, Anat R./ Pfleiderer, Paul/ Zechner, Josef (1994): Large Shareholder Activism, Risk Sharing, and Financial Market Equilibrium. In: Journal of Political Economy 102 (6): 1097-1130.
- Agrawal, Anup/ Knoeber, Charles R. (1996): Firm Performance and Mechanisms to Control Agency Problems between Managers and Shareholders. In: Journal of Financial and Quantitative Analysis 31 (3): 377-397.
- Allen, Marcus T./ Rutherford, Ronald C. (1992): The impact of financing decisions on the security returns of real estate corporations. In: The Journal of Real Estate Finance and Economics 5 (4): 393-400.
- Almeida, Alvaro/ Goodhart, Charles/ Payne, Richard (1998): The Effects of Macroeconomic News on High Frequency Exchange Rate Behavior. In: Journal of Financial and Quantitative Analysis 33 (3): 383-408.
- Altinkılıç, Oya/ Hansen, Robert S. (2003): Discounting and underpricing in seasoned equity offers. In: Journal of Financial Economics 69 (2): 285-323.
- Amihud, Yakov/ Lev, Baruch (1981): Risk Reduction as a Managerial Motive for Conglomerate Mergers. In: The Bell Journal of Economics 12 (2): 605-617.
- Andersen, Torben G./ Bollerslev, Tim (1998): Deutsche Mark–Dollar Volatility: Intraday Activity Patterns, Macroeconomic Announcements, and Longer Run Dependencies. In: The Journal of Finance 53 (1): 219-265.
- Andersen, Torben G./ Bollerslev, Tim/ Diebold, Francis X./ Vega, Clara (2003): Micro Effects of Macro Announcements: Real-Time Price Discovery in Foreign Exchange. In: American Economic Review 93 (1): 38-62.
- Anderson, Ronald C./ Duru, Augustine/ Reeb, David M. (2009): Founders, heirs, and corporate opacity in the United States. In: Journal of Financial Economics 92 (2): 205-222.
- Anderson, Ronald C./ Lee, D. Scott (1997): Ownership Studies: The Data Source Does Matter. In: Journal of Financial and Quantitative Analysis 32 (3): 311-329.
- Anderson, Ronald C./ Mansi, Sattar A./ Reeb, David M. (2003): Founding family ownership and the agency cost of debt. In: Journal of Financial Economics 68 (2): 263-285.
- Anderson, Ronald C./ Reeb, David M. (2003): Founding-Family Ownership and Firm Performance: Evidence from the S&P 500. In: The Journal of Finance 58 (3): 1301-1327.
- Anglin, Paul/ Edelstein, Robert/ Gao, Yanmin/ Tsang, Desmond (2011): How Does Corporate Governance Affect the Quality of Investor Information? The Curious Case of REITs. In: Journal of Real Estate Research 33 (1): 1-23.
- Armonat, Stefan/ Pfnür, Andreas (2004): Asset allocation versus entrepreneurial decisions in real estate investment. In: Briefings in Real Estate Finance 4 (2): 131-146.
- Arnold, Ivo J. M./ Vrugt, Evert B. (2010): Treasury Bond Volatility and Uncertainty about Monetary Policy. In: Financial Review 45 (3): 707-728.

- Asness, Clifford S./ Frazzini, Andrea (2013): The Devil in HML's Details. In: Journal of Portfolio Management 39 (4): 49-68.
- Asness, Clifford S./ Frazzini, Andrea/ Pedersen, Lasse H. (2014): Quality Minus Junk. Working Paper Series. Available at SSRN: <http://ssrn.com/abstract=2312432>.
- Asquith, Paul/ Mullins, Jr., David W. (1986): Equity issues and offering dilution. In: Journal of Financial Economics 15 (1-2): 61-89.
- Baker, Malcolm/ Wurgler, Jeffrey (2002): Market Timing and Capital Structure. In: The Journal of Finance 57 (1): 1-32.
- Balduzzi, Pierluigi/ Elton, Edwin J./ Green, T. Clifton (2001): Economic News and Bond Prices: Evidence from the U.S. Treasury Market. In: Journal of Financial and Quantitative Analysis 36 (4): 523-543.
- Barclay, Michael J./ Holderness, Clifford G. (1989): Private benefits from control of public corporations. In: Journal of Financial Economics 25 (2): 371-395.
- Barclay, Michael J./ Holderness, Clifford G. (1991): Negotiated Block Trades and Corporate Control. In: The Journal of Finance 46 (3): 861-878.
- Barclay, Michael J./ Smith, Clifford W. (1995): The Maturity Structure of Corporate Debt. In: The Journal of Finance 50 (2): 609-631.
- Bauer, Michael D./ Rudebusch, Glenn D. (2015): Monetary Policy Expectations at the Zero Lower Bound. Available at SSRN: <http://ssrn.com/abstract=2334540>.
- Bayless, Mark/ Chaplinsky, Susan (1996): Is There a Window of Opportunity for Seasoned Equity Issuance? In: The Journal of Finance 51 (1): 253-278.
- Beber, Alessandro/ Brandt, Michael W. (2006): The effect of macroeconomic news on beliefs and preferences: Evidence from the options market. In: Journal of Monetary Economics 53 (8): 1997-2039.
- Bennedsen, Morten/ Wolfenzon, Daniel (2000): The balance of power in closely held corporations. In: Journal of Financial Economics 58 (1-2): 113-139.
- Benson, Bradley W./ Davidson III, Wallace N. (2009): Reexamining the managerial ownership effect on firm value. In: Journal of Corporate Finance 15 (5): 573-586.
- Berger, Allen N./ Bonaccorsi di Patti, Emilia (2006): Capital structure and firm performance: A new approach to testing agency theory and an application to the banking industry. In: Journal of Banking & Finance 30 (4): 1065-1102.
- Berger, Philip G./ Ofek, Eli/ Yermack, David L. (1997): Managerial Entrenchment and Capital Structure Decisions. In: The Journal of Finance 52 (4): 1411-1438.
- Berglöf, Erik/ Perotti, Enrico (1994): The governance structure of the Japanese financial keiretsu. In: Journal of Financial Economics 36 (2): 259-284.
- Berk, Jonathan B./ Stanton, Richard/ Zechner, Josef (2010): Human Capital, Bankruptcy, and Capital Structure. In: The Journal of Finance 65 (3): 891-926.
- Berkovitch, Elazar/ Israel, Ronen (1996): The design of internal control and capital structure. In: The Review of Financial Studies 9 (1): 209-240.
- Berle, Adolf A./ Means, Gardiner C. (1932): The modern corporation and private property. Macmillan. New York.
- Bernanke, Ben S./ Kuttner, Kenneth N. (2005): What Explains the Stock Market's Reaction to Federal Reserve Policy? In: The Journal of Finance 60 (3): 1221-1257.
- Bethel, Jennifer E./ Liebeskind, Julia Porter/ Opler, Tim (1998): Block Share Purchases and Corporate Performance. In: The Journal of Finance 53 (2): 605-634.
- Bhagat, Sanjai/ Bolton, Brian (2008): Corporate governance and firm performance. In: Journal of Corporate Finance 14 (3): 257-273.
- Bharath, Sreedhar T./ Jayaraman, Sudarshan/ Nagar, Venky (2013): Exit as Governance: An Empirical Analysis. In: The Journal of Finance 68 (6): 2515-2547.

- Bhide, Amar (1993): The hidden costs of stock market liquidity. In: Journal of Financial Economics 34 (1): 31-51.
- Black, Bernard/ Kim, Woonchan (2012): The effect of board structure on firm value: A multiple identification strategies approach using Korean data. In: Journal of Financial Economics 104 (1): 203-226.
- Board of Governors of the Federal Reserve System (2005): The Federal Reserve System: Purposes and Functions. Ninth edition. Washington, D.C.
- Boehmer, Ekkehart/ Masumeci, Jim/ Poulsen, Annette B. (1991): Event-study methodology under conditions of event-induced variance. In: Journal of Financial Economics 30 (2): 253-272.
- Bollerslev, Tim/ Cai, Jun/ Song, Frank M. (2000): Intraday periodicity, long memory volatility, and macroeconomic announcement effects in the US Treasury bond market. In: Journal of Empirical Finance 7 (1): 37-55.
- Bolton, Patrick/ von Thadden, Ernst-Ludwig (1998): Blocks, Liquidity, and Corporate Control. In: The Journal of Finance 53 (1): 1-25.
- Bomfim, Antulio N. (2003): Pre-announcement effects, news effects, and volatility: Monetary policy and the stock market. In: Journal of Banking & Finance 27 (1): 133-151.
- Boone, Audra L./ White, Joshua T. (2015): The effect of institutional ownership on firm transparency and information production. In: Journal of Financial Economics 117 (3): 508-533.
- Borisova, Ginka/ Fotak, Veljko/ Holland, Kateryna/ Megginson, William L. (2015): Government ownership and the cost of debt: Evidence from government investments in publicly traded firms. In: Journal of Financial Economics 118 (1): 168-191.
- Borowiecki, Karol Jan (2009): The Determinants of House Prices and Construction: An Empirical Investigation of the Swiss Housing Economy. In: International Real Estate Review 12 (3): 193-220.
- Börsch-Supan, Axel/ Köke, Jens (2002): An Applied Econometricians' View of Empirical Corporate Governance Studies. In: German Economic Review 3 (3): 295-326.
- Boubakri, Narjess/ Cosset, Jean-Claude/ Guedhami, Omrane (2005): Postprivatization corporate governance: The role of ownership structure and investor protection. In: Journal of Financial Economics 76 (2): 369-399.
- Boubakri, Narjess/ Cosset, Jean-Claude/ Saffar, Walid (2013): The role of state and foreign owners in corporate risk-taking: Evidence from privatization. In: Journal of Financial Economics 108 (3): 641-658.
- Boudry, Walter I./ Kallberg, Jarl G./ Liu, Crocker H. (2010): An Analysis of REIT Security Issuance Decisions. In: Real Estate Economics 38 (1): 91-120.
- Brailsford, Timothy J./ Oliver, Barry R./ Pua, Sandra L. H. (2002): On the relation between ownership structure and capital structure. In: Accounting & Finance 42 (1): 1-26.
- Brander, James A./ Lewis, Tracy R. (1986): Oligopoly and Financial Structure: The Limited Liability Effect. In: The American Economic Review 76 (5): 956-970.
- Brickley, James A./ Lease, Ronald C./ Smith Jr, Clifford W. (1988): Ownership structure and voting on antitakeover amendments. In: Journal of Financial Economics 20: 267-291.
- Brown, David T. (2000): Liquidity and Liquidation: Evidence from Real Estate Investment Trusts. In: The Journal of Finance 55 (1): 469-485.
- Burkart, Mike/ Gromb, Denis/ Panunzi, Fausto (1997): Large Shareholders, Monitoring, and the Value of the Firm. In: The Quarterly Journal of Economics 112 (3): 693-728.

- Burkart, Mike/ Gromb, Denis/ Panunzi, Fausto (2000): Agency Conflicts in Public and Negotiated Transfers of Corporate Control. In: The Journal of Finance 55 (2): 647-677.
- Burkart, Mike/ Panunzi, Fausto/ Shleifer, Andrei (2003): Family Firms. In: The Journal of Finance 58 (5): 2167-2202.
- Byoun, Soku (2008): How and When Do Firms Adjust Their Capital Structures toward Targets? In: The Journal of Finance 63 (6): 3069-3096.
- Campello, Murillo (2003): Capital structure and product markets interactions: evidence from business cycles. In: Journal of Financial Economics 68 (3): 353-378.
- Campello, Murillo (2006): Debt financing: Does it boost or hurt firm performance in product markets? In: Journal of Financial Economics 82 (1): 135-172.
- Campello, Murillo/ Graham, John R./ Harvey, Campbell R. (2010): The real effects of financial constraints: Evidence from a financial crisis. In: Journal of Financial Economics 97 (3): 470-487.
- Carhart, Mark M. (1997): On Persistence in Mutual Fund Performance. In: The Journal of Finance 52 (1): 57-82.
- Carlson, John B./ Craig, Ben R./ Melick, William R. (2005): Recovering market expectations of FOMC rate changes with options on federal funds futures. In: Journal of Futures Markets 25 (12): 1203-1242.
- Carlson, Murray/ Fisher, Adlai/ Giammarino, R. O. N. (2006): Corporate Investment and Asset Price Dynamics: Implications for SEO Event Studies and Long-Run Performance. In: The Journal of Finance 61 (3): 1009-1034.
- Carlson, Murray/ Fisher, Adlai/ Giammarino, Ron (2010): SEO Risk Dynamics. In: Review of Financial Studies 23 (11): 4026-4077.
- Chaney, Thomas/ Sraer, David/ Thesmar, David (2012): The Collateral Channel: How Real Estate Shocks Affect Corporate Investment. In: American Economic Review 102 (6): 2381-2409.
- Chen, Jian (2001): Ownership Structure as Corporate Governance Mechanism: Evidence from Chinese Listed Companies. In: Economics of Planning 34 (1-2): 53-72.
- Chen, Xia/ Harford, Jarrad/ Li, Kai (2007): Monitoring: Which institutions matter? In: Journal of Financial Economics 86 (2): 279-305.
- Cheung, W. K. Adrian/ Wei, K. C. John (2006): Insider ownership and corporate performance: Evidence from the adjustment cost approach. In: Journal of Corporate Finance 12 (5): 906-925.
- Chevalier, Judith A. (1995a): Capital Structure and Product-Market Competition: Empirical Evidence from the Supermarket Industry. In: The American Economic Review 85 (3): 415-435.
- Chevalier, Judith A. (1995b): Do LBO Supermarkets Charge More? An Empirical Analysis of the Effects of LBOs on Supermarket Pricing. In: The Journal of Finance 50 (4): 1095-1112.
- Cho, Myeong-Hyeon (1998): Ownership structure, investment, and the corporate value: An empirical analysis. In: Journal of Financial Economics 47 (1): 103-121.
- Choe, Hyuk/ Masulis, Ronald W./ Nanda, Vikram (1993): Common stock offerings across the business cycle: Theory and evidence. In: Journal of Empirical Finance 1 (1): 3-31.
- Claessens, Stijn/ Djankov, Simeon/ Fan, Joseph P. H./ Lang, Larry H. P. (2002): Disentangling the Incentive and Entrenchment Effects of Large Shareholdings. In: The Journal of Finance 57 (6): 2741-2771.

- Claessens, Stijn/ Djankov, Simeon/ Lang, Larry H. P. (2000): The separation of ownership and control in East Asian Corporations. In: Journal of Financial Economics 58 (1–2): 81-112.
- Cohn, Jonathan B./ Mills, Lillian F./ Towery, Erin M. (2014): The evolution of capital structure and operating performance after leveraged buyouts: Evidence from U.S. corporate tax returns. In: Journal of Financial Economics 111 (2): 469-494.
- Cohn, Jonathan B./ Rajan, Uday (2013): Optimal Corporate Governance in the Presence of an Activist Investor. In: Review of Financial Studies 26 (4): 985-1020.
- Coles, Jeffrey L./ Lemmon, Michael L./ Meschke, J. Felix (2012): Structural models and endogeneity in corporate finance: The link between managerial ownership and corporate performance. In: Journal of Financial Economics 103 (1): 149-168.
- Conefrey, Thomas/ Gerald, John Fitz (2010): Managing Housing Bubbles in Regional Economies under EMU: Ireland and Spain. In: National Institute Economic Review 211 (1): 91-108.
- Cook, Timothy/ Hahn, Thomas (1989): The effect of changes in the federal funds rate target on market interest rates in the 1970s. In: Journal of Monetary Economics 24 (3): 331-351.
- Core, John E./ Larcker, David F. (2002): Performance consequences of mandatory increases in executive stock ownership. In: Journal of Financial Economics 64 (3): 317-340.
- Core, John/ Guay, Wayne/ Larcker, David (2003): Executive equity compensation and incentives: A survey. In: Federal Reserve Bank of New York Economic Policy Review 9 (1): 27-50.
- Cornelli, Francesca/ Kominek, Zbigniew/ Ljungqvist, Alexander (2013): Monitoring Managers: Does It Matter? In: The Journal of Finance 68 (2): 431-481.
- Cornett, Marcia Millon/ Marcus, Alan J./ Saunders, Anthony/ Tehranian, Hassan (2007): The impact of institutional ownership on corporate operating performance. In: Journal of Banking & Finance 31 (6): 1771-1794.
- Corrado, Charles J. (1989): A nonparametric test for abnormal security-price performance in event studies. In: Journal of Financial Economics 23 (2): 385-395.
- Cotter, James F./ Peck, Sarah W. (2001): The structure of debt and active equity investors: The case of the buyout specialist. In: Journal of Financial Economics 59 (1): 101-147.
- Cremers, K. J. Martijn/ Nair, Vinay B. (2005): Governance Mechanisms and Equity Prices. In: The Journal of Finance 60 (6): 2859-2894.
- Cronqvist, Henrik/ Fahlenbrach, Rüdiger (2009): Large Shareholders and Corporate Policies. In: The Review of Financial Studies 22 (10): 3941-3976.
- Cronqvist, Henrik/ Nilsson, Mattias (2003): Agency Costs of Controlling Minority Shareholders. In: Journal of Financial and Quantitative Analysis 38 (4): 695-719.
- D'Mello, Ranjan/ Ferris, Stephen P. (2000): The Information Effects of Analyst Activity at the Announcement of New Equity Issues. In: Financial Management 29 (1): 78-95.
- D'Mello, Ranjan/ Tawatnuntachai, Oranee/ Yaman, Devrim (2003): Does the Sequence of Seasoned Equity Offerings Matter? In: Financial Management 32 (4): 59-86.
- Dann, Larry Y./ DeAngelo, Harry (1988): Corporate financial policy and corporate control: A study of defensive adjustments in asset and ownership structure. In: Journal of Financial Economics 20: 87-127.
- Dann, Larry Y./ Mikkelsen, Wayne H. (1984): Convertible debt issuance, capital structure change and financing-related information: Some new evidence. In: Journal of Financial Economics 13 (2): 157-186.

- DeAngelo, Harry/ DeAngelo, Linda/ Stulz, René M. (2010): Seasoned equity offerings, market timing, and the corporate lifecycle. In: Journal of Financial Economics 95 (3): 275-295.
- DeAngelo, Harry/ Masulis, Ronald W. (1980): Optimal capital structure under corporate and personal taxation. In: Journal of Financial Economics 8 (1): 3-29.
- DeAngelo, Harry/ Roll, Richard (2015): How Stable Are Corporate Capital Structures? In: The Journal of Finance 70 (1): 373-418.
- DeGeorge, Francois/ Zeckhauser, Richard (1993): The Reverse LBO Decision and Firm Performance: Theory and Evidence. In: The Journal of Finance 48 (4): 1323-1348.
- Dell'Ariccia, Giovanni/ Igan, Deniz/ Laeven, L. U. C. (2012): Credit Booms and Lending Standards: Evidence from the Subprime Mortgage Market. In: Journal of Money, Credit and Banking 44 (2-3): 367-384.
- Demiralp, Ilhan/ D'Mello, Ranjan/ Schlingemann, Frederik P./ Subramaniam, Venkat (2011): Are there monitoring benefits to institutional ownership? Evidence from seasoned equity offerings. In: Journal of Corporate Finance 17 (5): 1340-1359.
- Demsetz, Harold (1983): The Structure of Ownership and the Theory of the Firm. In: Journal of Law and Economics 26 (2): 375-390.
- Demsetz, Harold/ Lehn, Kenneth (1985): The Structure of Corporate Ownership: Causes and Consequences. In: Journal of Political Economy 93 (6): 1155-1177.
- Demsetz, Harold/ Villalonga, Belén (2001): Ownership structure and corporate performance. In: Journal of Corporate Finance 7 (3): 209-233.
- Demyanyk, Yuliya/ Van Hemert, Otto (2011): Understanding the Subprime Mortgage Crisis. In: Review of Financial Studies 24 (6): 1848-1880.
- Denis, David J. (1994): Investment Opportunities and the Market Reaction to Equity Offerings. In: Journal of Financial and Quantitative Analysis 29 (2): 159-177.
- Denis, David J. (2012): The Persistent Puzzle of Corporate Capital Structure: Current Challenges and New Directions. In: Financial Review 47 (4): 631-643.
- Denis, David J./ Sarin, Atulya (2001): Is the Market Surprised by Poor Earnings Realizations Following Seasoned Equity Offerings? In: The Journal of Financial and Quantitative Analysis 36 (2): 169-193.
- Denis, Diane K. (2001): Twenty-five years of corporate governance research ... and counting. In: Review of Financial Economics 10 (3): 191-212.
- Dhillon, Amrita/ Rossetto, Silvia (2015): Ownership Structure, Voting, and Risk. In: Review of Financial Studies 28 (2): 521-560.
- Diamond, Douglas W. (1984): Financial Intermediation and Delegated Monitoring. In: The Review of Economic Studies 51 (3): 393-414.
- Dittmar, Amy/ Mahrt-Smith, Jan (2007): Corporate governance and the value of cash holdings. In: Journal of Financial Economics 83 (3): 599-634.
- Dittmar, Amy/ Thakor, Anjan (2007): Why Do Firms Issue Equity? In: The Journal of Finance 62 (1): 1-54.
- Drees, Friedel/ Mietzner, Mark/ Schiereck, Dirk (2013): Effects of corporate equity ownership on firm value. In: Review of Managerial Science 7 (3): 277-308.
- Duchin, Ran/ Ozbas, Oguzhan/ Sensoy, Berk A. (2010): Costly external finance, corporate investment, and the subprime mortgage credit crisis. In: Journal of Financial Economics 97 (3): 418-435.
- Durnev, Art/ Kim, E. Han (2005): To Steal or Not to Steal: Firm Attributes, Legal Environment, and Valuation. In: The Journal of Finance 60 (3): 1461-1493.
- Eckbo, B. Espen/ Masulis, Ronald W. (1992): Adverse selection and the rights offer paradox. In: Journal of Financial Economics 32 (3): 293-332.

- Eckbo, B. Espen/ Masulis, Ronald W. (1995): Seasoned equity offerings: A survey. In: Jarrow, R. A., Maksimovic, V. and Ziemba, W. T. (Eds.): *Finance, Handbooks in Operations Research and Management Science*, ninth edition, Volume 9: 1017-1072. North-Holland. Amsterdam.
- Eckbo, B. Espen/ Masulis, Ronald W./ Norli, Øyvind (2000): Seasoned public offerings: Resolution of the 'new issues puzzle'. In: *Journal of Financial Economics* 56 (2): 251-291.
- Eckbo, B. Espen/ Masulis, Ronald W./ Norli, Øyvind (2007): Security offerings. In: Eckbo, B. E. (Ed.): *Handbook of Corporate Finance: Empirical Corporate Finance* Volume 1: 233-373. North Holland. Amsterdam.
- Ederington, Louis H./ Lee, Jae Ha (1993): How Markets Process Information: News Releases and Volatility. In: *The Journal of Finance* 48 (4): 1161-1191.
- Ederington, Louis H./ Lee, Jae Ha (1996): The Creation and Resolution of Market Uncertainty: The Impact of Information Releases on Implied Volatility. In: *Journal of Financial and Quantitative Analysis* 31 (04): 513-539.
- Edmans, Alex (2009): Blockholder Trading, Market Efficiency, and Managerial Myopia. In: *The Journal of Finance* 64 (6): 2481-2513.
- Edmans, Alex (2011): Short-term termination without deterring long-term investment: A theory of debt and buyouts. In: *Journal of Financial Economics* 102 (1): 81-101.
- Edmans, Alex (2014): Blockholders and Corporate Governance. In: *Annual Review of Financial Economics* 6 (1): 23-50.
- Edmans, Alex/ Fang, Vivian W./ Zur, Emanuel (2013): The Effect of Liquidity on Governance. In: *Review of Financial Studies* 26 (6): 1443-1482.
- Edmans, Alex/ Manso, Gustavo (2011): Governance Through Trading and Intervention: A Theory of Multiple Blockholders. In: *The Review of Financial Studies* 24 (7): 2395-2428.
- Emmons, William R./ Lakdawal, Aeimit K./ Neely, Christopher J. (2006): What Are the Odds? Option-Based Forecasts of FOMC Target Changes. In: *Federal Reserve Bank of St. Louis Review* 88 (6): 543-561.
- Enriques, Luca/ Volpin, Paolo (2007): Corporate Governance Reforms in Continental Europe. In: *Journal of Economic Perspectives* 21 (1): 117-140.
- Erickson, Timothy/ Whited, Toni M. (2012): Treating Measurement Error in Tobin's q. In: *Review of Financial Studies* 25 (4): 1286-1329.
- European Central Bank (2016): Key ECB interest rates. Retrieved from <https://www.ecb.europa.eu/stats/monetary/rates/html/index.en.html> (accessed April 9, 2016).
- Evans, Kevin P. (2011): Intraday jumps and US macroeconomic news announcements. In: *Journal of Banking & Finance* 35 (10): 2511-2527.
- Faccio, Mara/ Lang, Larry H. P. (2002): The ultimate ownership of Western European corporations. In: *Journal of Financial Economics* 65 (3): 365-395.
- Fahlenbrach, Rüdiger (2009): Founder-CEOs, Investment Decisions, and Stock Market Performance. In: *Journal of Financial and Quantitative Analysis* 44 (02): 439-466.
- Fahlenbrach, Rüdiger/ Stulz, René M. (2009): Managerial ownership dynamics and firm value. In: *Journal of Financial Economics* 92 (3): 342-361.
- Fama, Eugene F. (1970): Efficient Capital Markets: A Review of Theory and Empirical Work. In: *The Journal of Finance* 25 (2): 383-417.
- Fama, Eugene F. (1980): Agency Problems and the Theory of the Firm. In: *Journal of Political Economy* 88 (2): 288-307.
- Fama, Eugene F./ French, Kenneth R. (1992): The Cross-Section of Expected Stock Returns. In: *The Journal of Finance* 47 (2): 427-465.



- Fama, Eugene F./ French, Kenneth R. (1993): Common risk factors in the returns on stocks and bonds. In: Journal of Financial Economics 33 (1): 3-56.
- Fama, Eugene F./ French, Kenneth R. (1996): Multifactor Explanations of Asset Pricing Anomalies. In: The Journal of Finance 51 (1): 55-84.
- Fama, Eugene F./ French, Kenneth R. (2002): Testing Trade-Off and Pecking Order Predictions about Dividends and Debt. In: The Review of Financial Studies 15 (1): 1-33.
- Fama, Eugene F./ Jensen, Michael C. (1983): Separation of Ownership and Control. In: Journal of Law and Economics 26 (2): 301-325.
- Fatum, Rasmus/ Scholnick, Barry (2008): Monetary policy news and exchange rate responses: Do only surprises matter? In: Journal of Banking & Finance 32 (6): 1076-1086.
- Faulkender, Michael/ Flannery, Mark J./ Hankins, Kristine Watson/ Smith, Jason M. (2012): Cash flows and leverage adjustments. In: Journal of Financial Economics 103 (3): 632-646.
- Faure-Grimaud, Antoine/ Gromb, Denis (2004): Public Trading and Private Incentives. In: The Review of Financial Studies 17 (4): 985-1014.
- Faust, Jon/ Rogers, John H./ Wang, Shing-Yi B./ Wright, Jonathan H. (2007): The high-frequency response of exchange rates and interest rates to macroeconomic announcements. In: Journal of Monetary Economics 54 (4): 1051-1068.
- Feng, Zhilan/ Ghosh, Chinmoy/ Sirmans, C. F. (2005): How Important is the Board of Directors to REIT Performance? In: Journal of Real Estate Portfolio Management 11 (3): 281-293.
- Ferreira, Miguel A./ Matos, Pedro (2008): The colors of investors' money: The role of institutional investors around the world. In: Journal of Financial Economics 88 (3): 499-533.
- Fischer, Edwin O./ Heinkel, Robert/ Zechner, Josef (1989): Dynamic Capital Structure Choice: Theory and Tests. In: The Journal of Finance 44 (1): 19-40.
- Flannery, Mark J. (1986): Asymmetric Information and Risky Debt Maturity Choice. In: The Journal of Finance 41 (1): 19-37.
- Flannery, Mark J./ Rangan, Kasturi P. (2006): Partial adjustment toward target capital structures. In: Journal of Financial Economics 79 (3): 469-506.
- Fleming, Michael J./ Remolona, Eli M. (1997): What moves the bond market? In: Federal Reserve Bank of New York Economic Policy Review 3 (4): 31-50.
- Fleming, Michael J./ Remolona, Eli M. (1999): Price Formation and Liquidity in the U.S. Treasury Market: The Response to Public Information. In: The Journal of Finance 54 (5): 1901-1915.
- Foley-Fisher, Nathan/ Ramcharan, Rodney/ Yu, Edison: (2016): The impact of unconventional monetary policy on firm financing constraints: Evidence from the maturity extension program. In: Journal of Financial Economics *forthcoming*.
- Franks, Julian/ Mayer, Colin (2001a): Ownership and Control of German Corporations. In: The Review of Financial Studies 14 (4): 943-977.
- Franks, Julian/ Mayer, Colin (2001b): Ownership and Control of German Corporations. In: Review of Financial Studies 14 (4): 943-977.
- Friday, H. Swint/ Howton, Shawn D./ Howton, Shelly W. (2000): Anomalous evidence on operating performance following seasoned equity offerings: The case of REITs. In: Financial Management 29 (2): 76-87.
- Friday, Swint/ Sirmans, Stacy (1998): Board of Director Monitoring and Firm Value in REITs. In: Journal of Real Estate Research 16 (3): 411-428.

- Friday, Swint/ Sirmans, Stacy/ Conover, Mitchell (1999): Ownership Structure and the Value of the Firm: The Case of REITs. In: Journal of Real Estate Research 17 (1): 71-90.
- Friend, Irwin/ Lang, Larry H. P. (1988): An Empirical Test of the Impact of Managerial Self-interest on Corporate Capital Structure. In: The Journal of Finance 43 (2): 271-281.
- Froot, Kenneth A./ Scharfstein, David S./ Stein, Jeremy C. (1993): Risk Management: Coordinating Corporate Investment and Financing Policies. In: The Journal of Finance 48 (5): 1629-1658.
- Fu, Fangjian (2010): Overinvestment and the Operating Performance of SEO Firms. In: Financial Management 39 (1): 249-272.
- Gama, Ana Paula Matias/ Galvao, Jorge Manuel Mendes (2012): Performance, valuation and capital structure: survey of family firms. In: Corporate Governance 12 (2): 199-214.
- Garvey, Gerald T./ Hanka, Gordon (1999): Capital Structure and Corporate Control: The Effect of Antitakeover Statutes on Firm Leverage. In: The Journal of Finance 54 (2): 519-546.
- Gertler, Mark/ Karadi, Peter (2011): A model of unconventional monetary policy. In: Journal of Monetary Economics 58 (1): 17-34.
- Ghosh, Chinmoy/ Nag, Raja/ Sirmans, C. F. (1999): An Analysis of Seasoned Equity Offerings by Equity REITs, 1991 to 1995. In: The Journal of Real Estate Finance and Economics 19 (3): 175-192.
- Ghosh, Chinmoy/ Nag, Raja/ Sirmans, C. F. (2000): The Pricing of Seasoned Equity Offerings: Evidence from REITs. In: Real Estate Economics 28 (3): 363-384.
- Ghosh, Chinmoy/ Nag, Raja/ Sirmans, C.F. (1998): Are REIT Seasoned Equity Offerings Underpriced? In: Real Estate Finance 27 (2): 19-23.
- Ghosh, Chinmoy/ Roark, Scott/ Sirmans, C. F. (2013): On The Operating Performance of REITs Following Seasoned Equity Offerings: Anomaly Revisited. In: The Journal of Real Estate Finance and Economics 46 (4): 633-663.
- Giroud, Xavier/ Mueller, Holger M. (2010): Does corporate governance matter in competitive industries? In: Journal of Financial Economics 95 (3): 312-331.
- Giroud, Xavier/ Mueller, Holger M. (2011): Corporate Governance, Product Market Competition, and Equity Prices. In: The Journal of Finance 66 (2): 563-600.
- Gompers, Paul A./ Ishii, Joy/ Metrick, Andrew (2010): Extreme Governance: An Analysis of Dual-Class Firms in the United States. In: The Review of Financial Studies 23 (3): 1051-1088.
- Goodwin, Kimberly (2013): Discounting and Underpricing of REIT Seasoned Equity Offers. In: Journal of Real Estate Research 35 (2): 153-172.
- Gorton, Gary/ Schmid, Frank A. (2000): Universal banking and the performance of German firms. In: Journal of Financial Economics 58 (1-2): 29-80.
- Graham, John R. (2000): How Big Are the Tax Benefits of Debt? In: The Journal of Finance 55 (5): 1901-1941.
- Graham, John R./ Harvey, Campbell R. (2001): The theory and practice of corporate finance: evidence from the field. In: Journal of Financial Economics 60 (2-3): 187-243.
- Graham, John R./ Leary, Mark T. (2011): A Review of Empirical Capital Structure Research and Directions for the Future. In: Annual Review of Financial Economics 3 (1): 309-345.

- Graham, John R./ Leary, Mark T./ Roberts, Michael R. (2015): A century of capital structure: The leveraging of corporate America. In: Journal of Financial Economics 118 (3): 658-683.
- Graham, John R./ Lemmon, Michael L./ Schallheim, James S. (1998): Debt, Leases, Taxes, and the Endogeneity of Corporate Tax Status. In: The Journal of Finance 53 (1): 131-162.
- Grossman, Sanford J./ Hart, Oliver D. (1982): Corporate financial structure and managerial incentives. In: McCall, J. (Ed.): The economics of information and uncertainty: 107-140. University of Chicago Press.
- Grossman, Sanford J./ Hart, Oliver D. (1988): One share-one vote and the market for corporate control. In: Journal of Financial Economics 20: 175-202.
- Gujarati, Damodar N./ Porter, Dawn C. (2009): Basic Econometrics. Fifth Edition. McGraw-Hill International Edition. Boston.
- Guo, Shourun/ Hotchkiss, Edith S./ Song, Weihong (2011): Do Buyouts (Still) Create Value? In: The Journal of Finance 66 (2): 479-517.
- Gürkaynak, Refet S./ Sack, Brian P./ Swanson, Eric T. (2007): Market-Based Measures of Monetary Policy Expectations. In: Journal of Business & Economic Statistics 25 (2): 201-212.
- Hall, Brian J./ Liebman, Jeffrey B. (1998): Are CEOs Really Paid Like Bureaucrats? In: The Quarterly Journal of Economics 113 (3): 653-691.
- Hamilton, James D. (2009): Daily Changes in Fed Funds Futures Prices. In: Journal of Money, Credit and Banking 41 (4): 567-582.
- Harford, Jarrad/ Mansi, Sattar A./ Maxwell, William F. (2008): Corporate governance and firm cash holdings in the US. In: Journal of Financial Economics 87 (3): 535-555.
- Harris, Milton/ Raviv, Artur (1988a): Corporate control contests and capital structure. In: Journal of Financial Economics 20: 55-86.
- Harris, Milton/ Raviv, Artur (1988b): Corporate governance: Voting rights and majority rules. In: Journal of Financial Economics 20: 203-235.
- Harris, Milton/ Raviv, Artur (1990): Capital Structure and the Informational Role of Debt. In: The Journal of Finance 45 (2): 321-349.
- Harris, Milton/ Raviv, Artur (1991): The Theory of Capital Structure. In: The Journal of Finance 46 (1): 297-355.
- Hart, Oliver (2001): Financial Contracting. In: Journal of Economic Literature 39 (4): 1079-1100.
- Hart, Oliver D. (1983): The Market Mechanism as an Incentive Scheme. In: The Bell Journal of Economics 14 (2): 366-382.
- Hart, Oliver/ Moore, John (1995): Debt and Seniority: An Analysis of the Role of Hard Claims in Constraining Management. In: The American Economic Review 85 (3): 567-585.
- Hartzell, Jay C./ Starks, Laura T. (2003): Institutional Investors and Executive Compensation. In: The Journal of Finance 58 (6): 2351-2374.
- Harvey, Campbell R./ Lins, Karl V./ Roper, Andrew H. (2004): The effect of capital structure when expected agency costs are extreme. In: Journal of Financial Economics 74 (1): 3-30.
- Healy, Paul M./ Palepu, Krishna G./ Ruback, Richard S. (1992): Does corporate performance improve after mergers? In: Journal of Financial Economics 31 (2): 135-175.
- Helwege, Jean/ Pirinsky, Christo/ Stulz, René M. (2007): Why Do Firms Become Widely Held? An Analysis of the Dynamics of Corporate Ownership. In: The Journal of Finance 62 (3): 995-1028.

- Henderson, Brian J./ Jegadeesh, Narasimhan/ Weisbach, Michael S. (2006): World markets for raising new capital. In: Journal of Financial Economics 82 (1): 63-101.
- Hermalin, Benjamin E./ Weisbach, Michael S. (1991): The Effects of Board Composition and Direct Incentives on Firm Performance. In: Financial Management 20 (4): 101-112.
- Hermalin, Benjamin E./ Weisbach, Michael S. (2003): Boards of Directors as an Endogenously Determined Institution: A Survey of the Economic Literature. In: Federal Reserve Bank of New York Economic Policy Review 9 (1): 7-26.
- Heron, Randall A./ Lie, Erik (2004): A Comparison of the Motivations for and the Information Content of Different Types of Equity Offerings. In: The Journal of Business 77 (3): 605-632.
- Hertzel, Michael/ Lemmon, Michael/ Linck, James S./ Rees, Lynn (2002): Long-Run Performance following Private Placements of Equity. In: The Journal of Finance 57 (6): 2595-2617.
- Hertzel, Michael/ Smith, Richard L. (1993): Market Discounts and Shareholder Gains for Placing Equity Privately. In: The Journal of Finance 48 (2): 459-485.
- Himmelberg, Charles P./ Hubbard, R. Glenn/ Palia, Darius (1999): Understanding the determinants of managerial ownership and the link between ownership and performance. In: Journal of Financial Economics 53 (3): 353-384.
- Hirshleifer, David/ Thakor, Anjan V. (1992): Managerial conservatism, project choice, and debt. In: The Review of Financial Studies 5 (3): 437-470.
- Holderness, Clifford G. (2003): A survey of blockholders and corporate control. In: Federal Reserve Bank of New York Economic Policy Review 9 (1): 51-64.
- Holderness, Clifford G./ Kroszner, Randall S./ Sheehan, Dennis P. (1999): Were the Good Old Days That Good? Changes in Managerial Stock Ownership since the Great Depression. In: The Journal of Finance 54 (2): 435-469.
- Holderness, Clifford G./ Sheehan, Dennis P. (1985): Raiders or saviors? The evidence on six controversial investors. In: Journal of Financial Economics 14 (4): 555.
- Holderness, Clifford G./ Sheehan, Dennis P. (1988): The role of majority shareholders in publicly held corporations: An exploratory analysis. In: Journal of Financial Economics 20: 317-346.
- Holthausen, Robert W./ Larcker, David F. (1996): The financial performance of reverse leveraged buyouts. In: Journal of Financial Economics 42 (3): 293-332.
- Hovakimian, Armen (2004): The Role of Target Leverage in Security Issues and Repurchases. In: The Journal of Business 77 (4): 1041-1072.
- Hovakimian, Armen/ Opler, Tim/ Titman, Sheridan (2001): The debt-equity choice. In: Journal of Financial and Quantitative Analysis 36 (1): 1-24.
- Howe, John S./ Shilling, James D. (1988): Capital Structure Theory and REIT Security Offerings. In: The Journal of Finance 43 (4): 983-993.
- Hu, Yifan/ Zhou, Xianming (2008): The performance effect of managerial ownership: Evidence from China. In: Journal of Banking & Finance 32 (10): 2099-2110.
- Hudson-Wilson, Susan/ Fabozzi, Frank J./ Gordon, Jacques N. (2003): Why Real Estate? In: The Journal of Portfolio Management 29 (5): 12-25.
- Hull, John C. (2012): Options, Futures, and Other Derivatives. Eighth edition. Pearson/Prentice Hall. Upper Saddle River, NJ.
- Hussain, Syed Mujahid (2011): Simultaneous monetary policy announcements and international stock markets response: An intraday analysis. In: Journal of Banking & Finance 35 (3): 752-764.
- Irani, Rustom M./ Oesch, David (2013): Monitoring and corporate disclosure: Evidence from a natural experiment. In: Journal of Financial Economics 109 (2): 398-418.

- Israel, Ronen (1991): Capital Structure and the Market for Corporate Control: The Defensive Role of Debt Financing. In: The Journal of Finance 46 (4): 1391-1409.
- Israel, Ronen (1992): Capital and Ownership Structures, and the Market for Corporate Control. In: The Review of Financial Studies 5 (2): 181-198.
- Ito, Takatoshi/ Roley, V. Vance (1987): News from the U.S. and Japan: Which moves the yen/dollar exchange rate? In: Journal of Monetary Economics 19 (2): 255-277.
- Jain, Prem C. (1992): Equity issues and changes in expectations of earnings by financial analysts. In: Review of Financial Studies 5 (4): 669-683.
- Jarrell, Gregg A./ Brickley, James A./ Netter, Jeffrey M. (1988): The Market for Corporate Control: The Empirical Evidence Since 1980. In: The Journal of Economic Perspectives 2 (1): 49-68.
- Jegadeesh, Narasimhan (2000): Long-Term Performance of Seasoned Equity Offerings: Benchmark Errors and Biases in Expectations. In: Financial Management 29 (3): 5-30.
- Jegadeesh, Narasimhan/ Weinstein, Mark/ Welch, Ivo (1993): An empirical investigation of IPO returns and subsequent equity offerings. In: Journal of Financial Economics 34 (2): 153-175.
- Jensen, Gerald R./ Johnson, Robert R. (1995): Discount rate changes and security returns in the U.S., 1962–1991. In: Journal of Banking & Finance 19 (1): 79-95.
- Jensen, Gerald R./ Solberg, Donald P./ Zorn, Thomas S. (1992): Simultaneous Determination of Insider Ownership, Debt, and Dividend Policies. In: Journal of Financial and Quantitative Analysis 27 (2): 247-263.
- Jensen, Michael C. (1986): Agency Costs of Free Cash Flow, Corporate Finance, and Takeovers. In: The American Economic Review 76 (2): 323-329.
- Jensen, Michael C. (1988): Takeovers: Their Causes and Consequences. In: The Journal of Economic Perspectives 2 (1): 21-48.
- Jensen, Michael C. (1997): Eclipse of the public corporation. In: Harvard Business Review (Sept.-Oct. 1989), revised.
- Jensen, Michael C./ Meckling, William H. (1976): Theory of the firm: Managerial behavior, agency costs and ownership structure. In: Journal of Financial Economics 3 (4): 305-360.
- Jensen, Michael C./ Murphy, Kevin J. (1990): Performance Pay and Top-Management Incentives. In: The Journal of Political Economy 98 (2): 225-264.
- Jensen, Michael C./ Ruback, Richard S. (1983): The market for corporate control: The scientific evidence. In: Journal of Financial Economics 11 (1–4): 5-50.
- Jensen, Michael C./ Warner, Jerold B. (1988): The distribution of power among corporate managers, shareholders, and directors. In: Journal of Financial Economics 20: 3-24.
- Kahn, Charles/ Winton, Andrew (1998): Ownership Structure, Speculation, and Shareholder Intervention. In: The Journal of Finance 53 (1): 99-129.
- Kalay, Avner/ Shimrat, Adam (1987): Firm value and seasoned equity issues: Price pressure, wealth redistribution, or negative information. In: Journal of Financial Economics 19 (1): 109-126.
- Kallberg, Jarl G./ Liu, Crocker H./ Greig, D. Wylie (1996): The Role of Real Estate in the Portfolio Allocation Process. In: Real Estate Economics 24 (3): 359-377.
- Kandel, Eugene/ Massa, Massimo/ Simonov, Andrei (2011): Do small shareholders count? In: Journal of Financial Economics 101 (3): 641-665.
- Kang, Jun-Koo/ Kim, Yong-Cheol/ Stulz, René M. (1999): The underreaction hypothesis and the new issue puzzle: Evidence from Japan. In: Review of Financial Studies 12 (3): 519-534.

- Kaplan, Steven N. (1989): The effects of management buyouts on operating performance and value. In: Journal of Financial Economics 24 (2): 217-254.
- Kaplan, Steven N. (1994): Top Executive Rewards and Firm Performance: A Comparison of Japan and the United States. In: Journal of Political Economy 102 (3): 510-546.
- Kearney, Adrienne A./ Lombra, Raymond E. (2003): Fed funds futures and the news. In: Atlantic Economic Journal 31 (4): 330-337.
- Kearney, Adrienne A./ Lombra, Raymond E. (2004): Stock market volatility, the news, and monetary policy. In: Journal of Economics and Finance 28 (2): 252-259.
- Keys, Benjamin J./ Mukherjee, Tanmoy/ Seru, Amit/ Vig, Vikrant (2010): Did Securitization Lead to Lax Screening? Evidence from Subprime Loans. In: The Quarterly Journal of Economics 125 (1): 307-362.
- Kim, E. Han (1978): A Mean-Variance Theory of Optimal Capital Structure and Corporate Debt Capacity. In: The Journal of Finance 33 (1): 45-63.
- Kim, E. Han/ Lu, Yao (2011): CEO ownership, external governance, and risk-taking. In: Journal of Financial Economics 102 (2): 272-292.
- Kim, Wi Saeng/ Sorensen, Eric H. (1986): Evidence on the Impact of the Agency Costs of Debt on Corporate Debt Policy. In: Journal of Financial and Quantitative Analysis 21 (2): 131-144.
- King, Michael R./ Santor, Eric (2008): Family values: Ownership structure, performance and capital structure of Canadian firms. In: Journal of Banking & Finance 32 (11): 2423-2432.
- Kohl, Nicolas/ Schaefer, Wolfgang (2012): Corporate Governance and Market Valuation of Publicly Traded Real Estate Companies: Evidence from Europe. In: The Journal of Real Estate Finance and Economics 44 (3): 362-393.
- Köke, Jens (2004): The market for corporate control in a bank-based economy: a governance device? In: Journal of Corporate Finance 10 (1): 53-80.
- Kole, Stacey/ Lehn, Kenneth (1997): Deregulation, the Evolution of Corporate Governance Structure, and Survival. In: The American Economic Review 87 (2): 421-425.
- Kole, Stacey R. (1995): Measuring managerial equity ownership: a comparison of sources of ownership data. In: Journal of Corporate Finance 1 (3-4): 413-435.
- Kontonikas, Alexandros/ MacDonald, Ronald/ Saggu, Aman (2013): Stock market reaction to fed funds rate surprises: State dependence and the financial crisis. In: Journal of Banking & Finance 37 (11): 4025-4037.
- Koop, Gary (2005): Analysis of economic data. Second Edition. John Wiley & Sons, Ltd.
- Korajczyk, Robert A./ Lucas, Deborah J./ McDonald, Robert L. (1991): The effect of information releases on the pricing and timing of equity issues. In: Review of Financial Studies 4 (4): 685-708.
- Kovenock, Dan/ Phillips, Gordon M. (1995): Capital Structure and Product-Market Rivalry: How Do We Reconcile Theory and Evidence? In: The American Economic Review 85 (2): 403-408.
- Kovenock, Dan/ Phillips, Gordon M. (1997): Capital structure and product market behavior: an examination of plant exit and investment decisions. In: The Review of Financial Studies 10 (3): 767-803.
- Kroszner, Randall S./ Strahan, Philip E. (2001): Bankers on boards: monitoring, conflicts of interest, and lender liability. In: Journal of Financial Economics 62 (3): 415-452.
- Krueger, Joel T./ Kuttner, Kenneth N. (1996): The Fed funds futures rate as a predictor of federal reserve policy. In: Journal of Futures Markets 16 (8): 865-879.
- Kurov, Alexander (2010): Investor sentiment and the stock market's reaction to monetary policy. In: Journal of Banking & Finance 34 (1): 139-149.

- Kuttner, Kenneth N. (2001): Monetary policy surprises and interest rates: Evidence from the Fed funds futures market. In: Journal of Monetary Economics 47 (3): 523-544.
- La Porta, Rafael/ Lopez-De-Silanes, Florencio/ Shleifer, Andrei (1999): Corporate Ownership Around the World. In: The Journal of Finance 54 (2): 471-517.
- La Porta, Rafael/ Lopez-De-Silanes, Florencio/ Shleifer, Andrei/ Vishny, Robert W. (1997): Legal Determinants of External Finance. In: The Journal of Finance 52 (3): 1131-1150.
- La Porta, Rafael/ Lopez-De-Silanes, Florencio/ Shleifer, Andrei/ Vishny, Robert W. (2002): Investor Protection and Corporate Valuation. In: The Journal of Finance 57 (3): 1147-1170.
- La Porta, Rafael/ Lopez-De-Silanes, Florencio/ Shleifer, Andrei/ Vishny, Robert W. (1998): Law and Finance. In: Journal of Political Economy 106 (6): 1113-1155.
- Laeven, Luc/ Levine, Ross (2008): Complex Ownership Structures and Corporate Valuations. In: The Review of Financial Studies 21 (2): 579-604.
- Larcker, David F./ Rusticus, Tjomme O. (2010): On the use of instrumental variables in accounting research. In: Journal of Accounting and Economics 49 (3): 186-205.
- Laux, Christian/ Leuz, Christian (2009): The crisis of fair-value accounting: Making sense of the recent debate. In: Accounting, Organizations and Society 34 (6-7): 826-834.
- Leary, Mark T./ Roberts, Michael R. (2005): Do Firms Rebalance Their Capital Structures? In: The Journal of Finance 60 (6): 2575-2619.
- Lee, D. Scott (1992): Management Buyout Proposals and Inside Information. In: The Journal of Finance 47 (3): 1061-1079.
- Lee, Gemma/ Masulis, Ronald W. (2009): Seasoned equity offerings: Quality of accounting information and expected flotation costs. In: Journal of Financial Economics 92 (3): 443-469.
- Lee, Inmoo (1997): Do Firms Knowingly Sell Overvalued Equity? In: The Journal of Finance 52 (4): 1439-1466.
- Leland, Hayne E./ Pyle, David H. (1977): Informational Asymmetries, Financial Structure, and Financial Intermediation. In: The Journal of Finance 32 (2): 371-387.
- Lemmon, Michael L./ Lins, Karl V. (2003): Ownership Structure, Corporate Governance, and Firm Value: Evidence from the East Asian Financial Crisis. In: The Journal of Finance 58 (4): 1445-1468.
- Lewellen, Wilbur G./ Badrinath, S. G. (1997): On the measurement of Tobin's q. In: Journal of Financial Economics 44 (1): 77-122.
- Li, Feng/ Srinivasan, Suraj (2011): Corporate governance when founders are directors. In: Journal of Financial Economics 102 (2): 454-469.
- Li, Xiaoyang (2013): Productivity, restructuring, and the gains from takeovers. In: Journal of Financial Economics 109 (1): 250-271.
- Lichtenberg, Frank R./ Siegel, Donald (1990): The effects of leveraged buyouts on productivity and related aspects of firm behavior. In: Journal of Financial Economics 27 (1): 165-194.
- Lilienfeld-Toal, Ulf von/ Ruenzi, Stefan (2014): CEO Ownership, Stock Market Performance, and Managerial Discretion. In: The Journal of Finance 69 (3): 1013-1050.
- Lin, Chen/ Ma, Yue/ Malatesta, Paul/ Xuan, Yuhai (2011): Ownership structure and the cost of corporate borrowing. In: Journal of Financial Economics 100 (1): 1-23.
- Lin, Chen/ Ma, Yue/ Malatesta, Paul/ Xuan, Yuhai (2013): Corporate ownership structure and the choice between bank debt and public debt. In: Journal of Financial Economics 109 (2): 517-534.

- Lins, Karl V. (2003): Equity Ownership and Firm Value in Emerging Markets. In: Journal of Financial and Quantitative Analysis 38 (1): 159-184.
- Loderer, Claudio F./ Mauer, David C. (1992): Corporate Dividends and Seasoned Equity Issues: An Empirical Investigation. In: The Journal of Finance 47 (1): 201-225.
- Loderer, Claudio/ Martin, Kenneth (1997): Executive stock ownership and performance tracking faint traces. In: Journal of Financial Economics 45 (2): 223-255.
- Loughran, Tim/ Ritter, Jay R. (1995): The New Issues Puzzle. In: The Journal of Finance 50 (1): 23-51.
- Loughran, Tim/ Ritter, Jay R. (1997): The Operating Performance of Firms Conducting Seasoned Equity Offerings. In: The Journal of Finance 52 (5): 1823-1850.
- Lyandres, Evgeny/ Sun, Le/ Zhang, Lu (2008): The New Issues Puzzle: Testing the Investment-Based Explanation. In: Review of Financial Studies 21 (6): 2825-2855.
- MacKinlay, A. Craig (1997): Event Studies in Economics and Finance. In: Journal of Economic Literature 35 (1): 13-39.
- Maksimovic, Vojislav (1988): Capital Structure in Repeated Oligopolies. In: The RAND Journal of Economics 19 (3): 389-407.
- Maksimovic, Vojislav (1995): Financial structure and product market competition. In: Jarrow, R. A., Maksimovic, V. and Ziemba, W. T. (Eds.): Handbooks in Operations Research and Management Science Vol. 9: 887-920. Elsevier.
- Maksimovic, Vojislav/ Phillips, Gordon (2001): The Market for Corporate Assets: Who Engages in Mergers and Asset Sales and Are There Efficiency Gains? In: The Journal of Finance 56 (6): 2019-2065.
- Maksimovic, Vojislav/ Phillips, Gordon/ Prabhala, N. R. (2011): Post-merger restructuring and the boundaries of the firm. In: Journal of Financial Economics 102 (2): 317-343.
- Maksimovic, Vojislav/ Titman, Sheridan (1991): Financial policy and reputation for product quality. In: The Review of Financial Studies 4 (1): 175-200.
- Malatesta, Paul H./ Walkling, Ralph A. (1988): Poison pill securities: Stockholder wealth, profitability, and ownership structure. In: Journal of Financial Economics 20: 347-376.
- Marciukaityte, Dalia/ Higgins, Eric J./ Friday, H. Swint/ Mason, Joseph R. (2007): Positive Performance and Private Equity Placements: Outside Monitoring or Inside Expertise? In: Journal of Real Estate Portfolio Management 13 (4): 389-400.
- Margaritis, Dimitris/ Psillaki, Maria (2010): Capital structure, equity ownership and firm performance. In: Journal of Banking & Finance 34 (3): 621-632.
- Marsh, Paul (1982): The Choice Between Equity and Debt: An Empirical Study. In: The Journal of Finance 37 (1): 121-144.
- Martin, Christopher/ Milas, Costas (2013): Financial crises and monetary policy: Evidence from the UK. In: Journal of Financial Stability 9 (4): 654-661.
- Martynova, Marina/ Renneboog, Luc (2008): A century of corporate takeovers: What have we learned and where do we stand? In: Journal of Banking & Finance 32 (10): 2148-2177.
- Masulis, Ronald W./ Korwar, Ashok N. (1986): Seasoned equity offerings: An empirical investigation. In: Journal of Financial Economics 15 (1-2): 91-118.
- Maug, Ernst (1998): Large Shareholders as Monitors: Is There a Trade-Off between Liquidity and Control? In: The Journal of Finance 53 (1): 65-98.
- Maury, Benjamin/ Pajuste, Anete (2005): Multiple large shareholders and firm value. In: Journal of Banking & Finance 29 (7): 1813-1834.
- McConnell, John J./ Servaes, Henri (1990): Additional evidence on equity ownership and corporate value. In: Journal of Financial Economics 27 (2): 595-612.



- McConnell, John J./ Servaes, Henri (1995): Equity ownership and the two faces of debt. In: Journal of Financial Economics 39 (1): 131-157.
- McConnell, John J./ Servaes, Henri/ Lins, Karl V. (2008): Changes in insider ownership and changes in the market value of the firm. In: Journal of Corporate Finance 14 (2): 92-106.
- McGuire, J./ Dow, S. (2003): The persistence and implications of Japanese keiretsu organization. In: Journal of International Business Studies 34 (4): 374-388.
- McQueen, Grant/ Roley, V. Vance (1993): Stock prices, news, and business conditions. In: Review of Financial Studies 6 (3): 683-707.
- Meggison, William L./ Nash, Robert C./ Van Randenborgh, Matthias (1994): The Financial and Operating Performance of Newly Privatized Firms: An International Empirical Analysis. In: The Journal of Finance 49 (2): 403-452.
- Meggison, William L./ Netter, Jeffry M. (2001): From State to Market: A Survey of Empirical Studies on Privatization. In: Journal of Economic Literature 39 (2): 321-389.
- Mehran, Hamid (1995): Executive compensation structure, ownership, and firm performance. In: Journal of Financial Economics 38 (2): 163-184.
- Mikkelsen, Wayne H./ Partch, M. Megan (1986): Valuation effects of security offerings and the issuance process. In: Journal of Financial Economics 15 (1-2): 31-60.
- Miller, Merton H. (1977): Debt and Taxes. In: The Journal of Finance 32 (2): 261-275.
- Miller, Merton H. (1988): The Modigliani-Miller Propositions After Thirty Years. In: The Journal of Economic Perspectives 2 (4): 99-120.
- Miller, Merton H./ Rock, Kevin (1985): Dividend Policy under Asymmetric Information. In: The Journal of Finance 40 (4): 1031-1051.
- Modigliani, Franco/ Miller, Merton H. (1958): The Cost of Capital, Corporation Finance and the Theory of Investment. In: The American Economic Review 48 (3): 261-297.
- Modigliani, Franco/ Miller, Merton H. (1963): Corporate Income Taxes and the Cost of Capital: A Correction. In: The American Economic Review 53 (3): 433-443.
- Morck, Randall/ Shleifer, Andrei/ Vishny, Robert W. (1988): Management ownership and market valuation: An empirical analysis. In: Journal of Financial Economics 20: 293-315.
- Morck, Randall/ Shleifer, Andrei/ Vishny, Robert W. (1989): Alternative Mechanisms for Corporate Control. In: The American Economic Review 79 (4): 842-852.
- Morellec, Erwan (2004): Can Managerial Discretion Explain Observed Leverage Ratios? In: The Review of Financial Studies 17 (1): 257-294.
- Morellec, Erwan/ Nikolov, Boris/ Schürhoff, Norman (2012): Corporate Governance and Capital Structure Dynamics. In: The Journal of Finance 67 (3): 803-848.
- Murphy, Kevin J. (1999): Executive compensation. In: Orley, C. A. and David, C. (Eds.): Handbook of Labor Economics Vol. 3 (Part B): 2485-2563. Elsevier.
- Muscarella, Chris J./ Vetsuypens, Michael R. (1990): Efficiency and Organizational Structure: A Study of Reverse LBOs. In: The Journal of Finance 45 (5): 1389-1413.
- Myers, Stewart C. (1977): Determinants of corporate borrowing. In: Journal of Financial Economics 5 (2): 147-175.
- Myers, Stewart C. (1984): The Capital Structure Puzzle. In: The Journal of Finance 39 (3): 574-592.
- Myers, Stewart C. (2001): Capital Structure. In: The Journal of Economic Perspectives 15 (2): 81-102.

- Myers, Stewart C./ Majluf, Nicholas S. (1984): Corporate financing and investment decisions when firms have information that investors do not have. In: Journal of Financial Economics 13 (2): 187-221.
- Nini, Greg/ Smith, David C./ Sufi, Amir (2012): Creditor Control Rights, Corporate Governance, and Firm Value. In: The Review of Financial Studies 25 (6): 1713-1761.
- Noe, Thomas H. (2002): Investor Activism and Financial Market Structure. In: The Review of Financial Studies 15 (1): 289-318.
- Ofek, Eli (1994): Efficiency Gains in Unsuccessful Management Buyouts. In: The Journal of Finance 49 (2): 637-654.
- Ofek, Eli/ Yermack, David (2000): Taking Stock: Equity-Based Compensation and the Evolution of Managerial Ownership. In: The Journal of Finance 55 (3): 1367-1384.
- Ooi, Joseph T. L./ Ong, Seow-Eng/ Li, Lin (2010): An Analysis of the Financing Decisions of REITs: The Role of Market Timing and Target Leverage. In: The Journal of Real Estate Finance and Economics 40 (2): 130-160.
- Oyer, Paul (2004): Why Do Firms Use Incentives That Have No Incentive Effects? In: The Journal of Finance 59 (4): 1619-1650.
- Öztekin, Özde/ Flannery, Mark J. (2012): Institutional determinants of capital structure adjustment speeds. In: Journal of Financial Economics 103 (1): 88-112.
- Pagano, Marco/ Röell, Ailsa (1998): The Choice of Stock Ownership Structure: Agency Costs, Monitoring, and the Decision to Go Public. In: The Quarterly Journal of Economics 113 (1): 187-225.
- Palepu, Krishna G. (1990): Consequences of leveraged buyouts. In: Journal of Financial Economics 27 (1): 247-262.
- Palia, Darius (2001): The Endogeneity of Managerial Compensation in Firm Valuation: A Solution. In: The Review of Financial Studies 14 (3): 735-764.
- Park, Cheol (2000): Monitoring and Structure of Debt Contracts. In: The Journal of Finance 55 (5): 2157-2195.
- Parrino, Robert/ Weisbach, Michael S. (1999): Measuring investment distortions arising from stockholder–bondholder conflicts. In: Journal of Financial Economics 53 (1): 3-42.
- Parsons, Chris/ Titman, Sheridan (2011): Capital Structure and Corporate Strategy. In: Eckbo, B. E. (Ed.): Handbook of Empirical Corporate Finance: Empirical Corporate Finance Vol. 2: 203-234. North Holland.
- Parsons, Christopher/ Titman, Sheridan (2009): Empirical capital structure: A review. Foundations and Trends in Finance, Vol. 3 (1). Now Publishers Inc.
- Pearce, Douglas K./ Roley, V. Vance (1983): The Reaction of Stock Prices to Unanticipated Changes in Money: A Note. In: The Journal of Finance 38 (4): 1323-1333.
- Pérez-González, Francisco (2006): Inherited Control and Firm Performance. In: The American Economic Review 96 (5): 1559-1588.
- Perfect, Steven B./ Peterson, David R./ Peterson, Pamela P. (1995): Self-tender offers: The effects of free cash flow, cash flow signalling, and the measurement of Tobin's q. In: Journal of Banking & Finance 19 (6): 1005-1023.
- Perfect, Steven B./ Wiles, Kenneth W. (1994): Alternative constructions of Tobin's q: An empirical comparison. In: Journal of Empirical Finance 1 (3–4): 313-341.
- Petersen, Mitchell A. (2009): Estimating Standard Errors in Finance Panel Data Sets: Comparing Approaches. In: Review of Financial Studies 22 (1): 435-480.
- Phillips, Gordon M. (1995): Increased debt and industry product markets an empirical analysis. In: Journal of Financial Economics 37 (2): 189-238.

- Piazzesi, Monika/ Swanson, Eric T. (2008): Futures prices as risk-adjusted forecasts of monetary policy. In: Journal of Monetary Economics 55 (4): 677-691.
- Pinkowitz, Lee/ Stulz, René/ Williamson, Rohan (2006): Does the Contribution of Corporate Cash Holdings and Dividends to Firm Value Depend on Governance? A Cross-country Analysis. In: The Journal of Finance 61 (6): 2725-2751.
- Porta, Rafael La/ Lopez-de-Silanes, Florencio/ Shleifer, Andrei (1999): Corporate Ownership around the World. In: The Journal of Finance 54 (2): 471-517.
- Pound, John (1988): Proxy contests and the efficiency of shareholder oversight. In: Journal of Financial Economics 20: 237-265.
- Prowse, Stephen D. (1992): The Structure of Corporate Ownership in Japan. In: The Journal of Finance 47 (3): 1121-1140.
- Rajan, Raghuram G. (1992): Insiders and Outsiders: The Choice between Informed and Arm's-Length Debt. In: The Journal of Finance 47 (4): 1367-1400.
- Rajan, Raghuram G./ Zingales, Luigi (1995): What Do We Know about Capital Structure? Some Evidence from International Data. In: The Journal of Finance 50 (5): 1421-1460.
- Rajan, Raghuram/ Winton, Andrew (1995): Covenants and Collateral as Incentives to Monitor. In: The Journal of Finance 50 (4): 1113-1146.
- Rampini, Adriano A./ Viswanathan, S. (2013): Collateral and capital structure. In: Journal of Financial Economics 109 (2): 466-492.
- Rauh, Joshua D./ Sufi, Amir (2010): Capital Structure and Debt Structure. In: The Review of Financial Studies 23 (12): 4242-4280.
- Rauh, Joshua D./ Sufi, Amir (2012): Explaining Corporate Capital Structure: Product Markets, Leases, and Asset Similarity. In: Review of Finance 16 (1): 115-155.
- Renaud, Bertrand (1997): The 1985 to 1994 Global Real Estate Cycle: An Overview. In: Journal of Real Estate Literature 5 (1): 13-44.
- Ritter, Jay R. (2003): Differences between European and American IPO Markets. In: European Financial Management 9 (4): 421-434.
- Roberts, Michael R./ Sufi, Amir (2009): Control Rights and Capital Structure: An Empirical Investigation. In: The Journal of Finance 64 (4): 1657-1695.
- Roberts, Michael R./ Whited, Toni M. (2012): Endogeneity in empirical corporate finance. Simon School Working Paper No. FR 11-29. Available at SSRN: <http://ssrn.com/abstract=1748604>.
- Robertson, John C./ Thornton, Daniel L. (1997): Using federal funds futures rates to predict Federal Reserve actions. In: Federal Reserve Bank of St. Louis Review 79 (6): 45-53.
- Roe, Mark J. (1990): Political and legal restraints on ownership and control of public companies. In: Journal of Financial Economics 27 (1): 7-41.
- Ross, Stephen A. (1977): The Determination of Financial Structure: The Incentive-Signalling Approach. In: The Bell Journal of Economics 8 (1): 23-40.
- Ryngaert, Michael (1988): The effect of poison pill securities on shareholder wealth. In: Journal of Financial Economics 20: 377-417.
- Safieddine, Assem/ Titman, Sheridan (1999): Leverage and Corporate Performance: Evidence from Unsuccessful Takeovers. In: The Journal of Finance 54 (2): 547-580.
- Schwert, G. William (1981): The Adjustment of Stock Prices to Information About Inflation. In: The Journal of Finance 36 (1): 15-29.
- Scott, James H., Jr. (1976): A Theory of Optimal Capital Structure. In: The Bell Journal of Economics 7 (1): 33-54.

- Servaes, Henri (1991): Tobin's Q and the Gains from Takeovers. In: The Journal of Finance 46 (1): 409-419.
- Shleifer, Andrei/ Vishny, Robert W. (1986): Large Shareholders and Corporate Control. In: Journal of Political Economy 94 (3): 461-488.
- Shleifer, Andrei/ Vishny, Robert W. (1989): Management entrenchment: The case of manager-specific investments. In: Journal of Financial Economics 25 (1): 123-139.
- Shleifer, Andrei/ Vishny, Robert W. (1994): Politicians and Firms. In: The Quarterly Journal of Economics 109 (4): 995-1025.
- Shleifer, Andrei/ Vishny, Robert W. (1997): A Survey of Corporate Governance. In: The Journal of Finance 52 (2): 737-783.
- Shleifer, Andrei/ Wolfenzon, Daniel (2002): Investor protection and equity markets. In: Journal of Financial Economics 66 (1): 3-27.
- Short, Helen (1994): Ownership, control, financial structure and the performance of firms. In: Journal of Economic Surveys 8 (3): 203-249.
- Short, Helen/ Keasey, Kevin/ Duxbury, Darren (2002): Capital structure, management ownership and large external shareholders: a UK analysis. In: International Journal of the Economics of Business 9 (3): 375-399.
- Shyam-Sunder, Lakshmi/ Myers, Stewart C. (1999): Testing static tradeoff against pecking order models of capital structure. In: Journal of Financial Economics 51 (2): 219-244.
- Sihvonen, Jukka/ Vähämaa, Sami (2014): Forward-Looking Monetary Policy Rules and Option-Implied Interest Rate Expectations. In: Journal of Futures Markets 34 (4): 346-373.
- Slovin, Myron B. / Sushka, Marie E. (1993): Ownership Concentration, Corporate Control Activity, and Firm Value: Evidence from the Death of Inside Blockholders. In: The Journal of Finance 48 (4): 1293-1321.
- Slovin, Myron B./ Sushka, Marie E./ Bendeck, Yvette M. (1994): Seasoned common stock issuance following an IPO. In: Journal of Banking & Finance 18 (1): 207-226.
- Slovin, Myron B./ Sushka, Marie E./ Polonchek, John A. (1991): The information content of multiple seasoned common stock offerings by bank holding companies. In: Journal of Banking & Finance 15 (3): 633-646.
- Smales, Lee A. (2012a): 30-Day Interbank futures: Investigating the process of price discovery following RBA cash target rate announcements. In: Journal of International Financial Markets, Institutions and Money 22 (4): 1006-1023.
- Smales, Lee A. (2012b): RBA monetary policy communication: The response of Australian interest rate futures to changes in RBA monetary policy. In: Pacific-Basin Finance Journal 20 (5): 793-808.
- Smales, Lee A. (2013): Impact of Macroeconomic Announcements on Interest Rate Futures: High-Frequency Evidence from Australia. In: Journal of Financial Research 36 (3): 371-388.
- Smith, Abbie J. (1990): Corporate ownership structure and performance: The case of management buyouts. In: Journal of Financial Economics 27 (1): 143-164.
- Smith, David J./ Chen, Jianguo/ Anderson, Hamish D. (2012): The relationship between capital structure and product markets: Evidence from New Zealand. In: Review of Quantitative Finance and Accounting 38 (1): 1-24.
- Smith, Jr., Clifford W. (1986a): Investment banking and the capital acquisition process. In: Journal of Financial Economics 15 (1-2): 3-29.
- Smith, Jr., Clifford W. (1986b): Investment banking and the capital acquisition process. In: Journal of Financial Economics 15 (1-2): 3-29.

- Spiess, D. Katherine/ Affleck-Graves, John (1995): Underperformance in long-run stock returns following seasoned equity offerings. In: Journal of Financial Economics 38 (3): 243-267.
- Stiglitz, Joseph E. (1985): Credit Markets and the Control of Capital. In: Journal of Money, Credit and Banking 17 (2): 133-152.
- Strebulaev, Ilya A. (2007): Do Tests of Capital Structure Theory Mean What They Say? In: The Journal of Finance 62 (4): 1747-1787.
- Strebulaev, Ilya A./ Yang, Baozhong (2013): The mystery of zero-leverage firms. In: Journal of Financial Economics 109 (1): 1-23.
- Stulz, René M. (1988): Managerial control of voting rights: Financing policies and the market for corporate control. In: Journal of Financial Economics 20: 25-54.
- Stulz, René M. (1990): Managerial discretion and optimal financing policies. In: Journal of Financial Economics 26 (1): 3-27.
- Stulz, René M./ Johnson, Herb (1985): An analysis of secured debt. In: Journal of Financial Economics 14 (4): 501-521.
- Sultan, Jahangir (2012): Options on federal funds futures and interest rate volatility. In: Journal of Futures Markets 32 (4): 330-359.
- Swanson, Eric T./ Williams, John C. (2014): Measuring the Effect of the Zero Lower Bound on Medium- and Longer-Term Interest Rates. In: American Economic Review 104 (10): 3154-3185.
- Taylor, John B. (1993): Discretion versus policy rules in practice. In: Carnegie-Rochester Conference Series on Public Policy 39: 195-214.
- Taylor, Nicholas (2010): The Determinants of Future U.S. Monetary Policy: High-Frequency Evidence. In: Journal of Money, Credit and Banking 42 (2-3): 399-420.
- Thomsen, Steen/ Pedersen, Torben (2000): Ownership structure and economic performance in the largest european companies. In: Strategic Management Journal 21 (6): 689-705.
- Thorbecke, Willem (1997): On Stock Market Returns and Monetary Policy. In: The Journal of Finance 52 (2): 635-654.
- Titman, Sheridan (1984): The effect of capital structure on a firm's liquidation decision. In: Journal of Financial Economics 13 (1): 137-151.
- Titman, Sheridan/ Wessels, Roberto (1988): The Determinants of Capital Structure Choice. In: The Journal of Finance 43 (1): 1-19.
- Tong, Zhenxu (2008): Deviations from optimal CEO ownership and firm value. In: Journal of Banking & Finance 32 (11): 2462-2470.
- U.S. Bureau of Economic Analysis (2016): Table 1.5.5. Gross Domestic Product, Expanded Detail. Retrieved from <http://www.bea.gov/iTable/iTable.cfm?ReqID=9&step=1#reqid=9&step=3&isuri=1&903=35> (accessed February 11, 2016).
- Vähämaa, Sami/ Äijö, Janne (2011): The Fed's policy decisions and implied volatility. In: Journal of Futures Markets 31 (10): 995-1010.
- Van den Noord, Paul (2006): Are House Prices Nearing a Peak? A Probit Analysis for 17 OECD Countries. Organisation for Economic Co-operation and Development, Economics Department Working Papers No. 488.
- Villalonga, Belen/ Amit, Raphael (2006): How do family ownership, control and management affect firm value? In: Journal of Financial Economics 80 (2): 385-417.
- Wang, Hao (2011): Managerial entrenchment, equity payout and capital structure. In: Journal of Banking & Finance 35 (1): 36-50.
- Welch, Ivo (2004): Capital Structure and Stock Returns. In: Journal of Political Economy 112 (1): 106-132.

- Welch, Ivo (2007): Common flaws in empirical capital structure research. AFA 2008 New Orleans Meetings Paper.
- Welch, Ivo (2011): Two Common Problems in Capital Structure Research: The Financial-Debt-To-Asset Ratio and Issuing Activity Versus Leverage Changes. In: International Review of Finance 11 (1): 1-17.
- Wintoki, M. Babajide/ Linck, James S./ Netter, Jeffrey M. (2012): Endogeneity and the dynamics of internal corporate governance. In: Journal of Financial Economics 105 (3): 581-606.
- Winton, Andrew (1993): Limitation of Liability and the Ownership Structure of the Firm. In: The Journal of Finance 48 (2): 487-512.
- Woidtke, Tracie (2002): Agents watching agents?: evidence from pension fund ownership and firm value. In: Journal of Financial Economics 63 (1): 99-131.
- Wright, Jonathan H. (2012): What does Monetary Policy do to Long-term Interest Rates at the Zero Lower Bound? In: The Economic Journal 122 (564): F447-F466.
- Wruck, Karen Hopper (1989): Equity ownership concentration and firm value: Evidence from private equity financings. In: Journal of Financial Economics 23 (1): 3-28.
- Wu, YiLin (2004): The choice of equity-selling mechanisms. In: Journal of Financial Economics 74 (1): 93-119.
- Yermack, David (2006): Flights of fancy: Corporate jets, CEO perquisites, and inferior shareholder returns. In: Journal of Financial Economics 80 (1): 211-242.
- Zeckhauser, Richard J./ Pound, John (1990): Are large shareholders effective monitors? An investigation of share ownership and corporate performance. In: Hubbard, R. G. (Ed.): Asymmetric information, corporate finance, and investment: 149-180. University of Chicago Press.
- Zhou, Xianming (2001): Understanding the determinants of managerial ownership and the link between ownership and performance: comment. In: Journal of Financial Economics 62 (3): 559-571.
- Zhu, Yuan Wei/ Ong, Seow Eng/ Yeo, Wee Yong (2010): Do REITs Manipulate Their Financial Results Around Seasoned Equity Offerings? Evidence from US Equity REITs. In: The Journal of Real Estate Finance and Economics 40 (4): 412-445.
- Zietz, Emily/ Sirmans, Stacy/ Friday, Swint (2003): The Environment and Performance of Real Estate Investment Trusts. In: Journal of Real Estate Portfolio Management 9 (2): 127-165.
- Zingales, Luigi (1998): Survival of the Fittest or the Fattest? Exit and Financing in the Trucking Industry. In: The Journal of Finance 53 (3): 905-938.
- Zwiebel, Jeffrey (1995): Block Investment and Partial Benefits of Corporate Control. In: The Review of Economic Studies 62 (2): 161-185.
- Zwiebel, Jeffrey (1996): Dynamic Capital Structure under Managerial Entrenchment. In: The American Economic Review 86 (5): 1197-1215.

## Appendix

### A1. Weighting of future contracts

The implied futures rates ( $fr$ ) are linearly weighted using their remaining time to maturity ( $ttn$ ). For the sake of clarity, the methodology is illustrated using the example of the one-month synthetic time series ( $fr_{syn}^{1m}$ ).  $fr^{xm}$  denotes the implied futures rate of the contract with  $x$  months to maturity. In order to generate the synthetic time series, the weighting procedure is applied to each 5-minute interval of the sample period.

$$fr_{syn}^{1m} = x_{1m} \cdot fr^{1m} + x_{2m} \cdot fr^{2m} + x_{3m} \cdot fr^{3m} \quad (A.1)$$

with:

$$x_{1m} = \max \left\{ 0, \frac{ttn^{2m} - 30days}{ttn^{2m} - ttn^{1m}} \right\} \quad (A.2)$$

$$x_{2m} = \min \left\{ 1 - x_{1m}, \frac{ttn^{3m} - 30days}{ttn^{3m} - ttn^{2m}} \right\} \quad (A.3)$$

$$x_{3m} = \max \{ 0, 1 - x_{1m} - x_{2m} \} \quad (A.4)$$

## A2. Overview of FOMC meetings, decisions, and the assigned option contracts for probability estimation

**Table A.1: FOMC meeting dates and assignment of option contracts for probability estimation**

FOMC meeting date	Unscheduled meeting	Target rate change (bp)	Target rate after FOMC	Assigned option contract(s)	
December 9, 2003	-	0	1.00%	<i>dropped</i>	
January 28, 2004	-	0	1.00%	<i>dropped</i>	
March 16, 2004	-	0	1.00%	Mar-04	Apr-04
May 4, 2004	-	0	1.00%	May-04	
June 30, 2004	-	+25	1.25%	Jul-04	
August 10, 2004	-	+25	1.50%	Aug-04	
September 21, 2004	-	+25	1.75%	Sep-04	Oct-04
November 10, 2004	-	+25	2.00%	Nov-04	
December 14, 2004	-	+25	2.25%	Dec-04	Jan-05
February 2, 2005	-	+25	2.50%	Feb-05	
March 22, 2005	-	+25	2.75%	Mar-05	Apr-05
May 3, 2005	-	+25	3.00%	May-05	
June 30, 2005	-	+25	3.25%	Jul-05	Jun-05
August 9, 2005	-	+25	3.50%	Aug-05	
September 20, 2005	-	+25	3.75%	Sep-05	Oct-05
November 1, 2005	-	+25	4.00%	Nov-05	
December 13, 2005	-	+25	4.25%	Dec-05	Jan-06
January 31, 2006	-	+25	4.50%	Feb-06	
March 28, 2006	-	+25	4.75%	Mar-06	Apr-06
May 10, 2006	-	+25	5.00%	May-06	
June 29, 2006	-	+25	5.25%	Jun-06	Jul-06
August 8, 2006	-	0	5.25%	Aug-06	
September 20, 2006	-	0	5.25%	Sep-06	
October 25, 2006	-	0	5.25%	Oct-06	
December 12, 2006	-	0	5.25%	Dec-06	Nov-06
January 31, 2007	-	0	5.25%	Feb-07	
March 21, 2007	-	0	5.25%	Mar-07	Apr-07
May 9, 2007	-	0	5.25%	May-07	
June 28, 2007	-	0	5.25%	Jun-07	Jul-07
August 7, 2007	-	0	5.25%	Aug-07	
August 10, 2007	yes	0	5.25%	<i>removed</i>	
August 16, 2007	yes	0	5.25%	<i>removed</i>	
September 18, 2007	-	-50	4.75%	Sep-07	Oct-07
October 31, 2007	-	-25	4.50%	Nov-07	



(Table A.1 continued)

December 6, 2007	yes	0	4.50%	removed	
December 11, 2007	-	-25	4.25%	Dec-07	
January 9, 2008	yes	0	4.25%	removed	
January 21, 2008	yes	-75	3.50%	removed	
January 30, 2008	-	-50	3.00%	Jan-08	Feb-08
March 10, 2008	yes	0	3.00%	removed	
March 18, 2008	-	-75	2.25%	Mar-08	Apr-08
April 30, 2008	-	-25	2.00%	May-08	
June 25, 2008	-	0	2.00%	Jun-08	Jul-08
July 24, 2008	yes	0	2.00%	removed	
August 5, 2008	-	0	2.00%	Aug-08	
September 16, 2008	-	0	2.00%	Sep-08	
September 29, 2008	yes	0	2.00%	removed	
October 7, 2008	yes	-50	1.50%	removed	
October 29, 2008	-	-50	1.00%	Oct-08	Nov-08
December 16, 2008	-	-75 / -100	0 / 0.25%	Dec-08	
January 16, 2009	yes	0	0 / 0.25%	removed	
January 28, 2009	-	0	0 / 0.25%	Jan-09	Feb-09
February 7, 2009	yes	0	0 / 0.25%	removed	
March 18, 2009	-	0	0 / 0.25%	Mar-09	
April 29, 2009	-	0	0 / 0.25%	Apr-09	May-09
June 3, 2009	yes	0	0 / 0.25%	removed	
June 24, 2009	-	0	0 / 0.25%	Jun-09	Jul-09
August 12, 2009	-	0	0 / 0.25%	Aug-09	
September 23, 2009	-	0	0 / 0.25%	Sep-09	Oct-09
November 4, 2009	-	0	0 / 0.25%	Nov-09	
December 16, 2009	-	0	0 / 0.25%	Dec-09	
January 27, 2010	-	0	0 / 0.25%	Jan-10	Feb-10
March 16, 2010	-	0	0 / 0.25%	Mar-10	
April 28, 2010	-	0	0 / 0.25%	Apr-10	May-10
May 10, 2010	yes	0	0 / 0.25%	removed	
June 23, 2010	-	0	0 / 0.25%	Jun-10	Jul-10
August 10, 2010	-	0	0 / 0.25%	Aug-10	
September 21, 2010	-	0	0 / 0.25%	Sep-10	Oct-10
October 15, 2010	yes	0	0 / 0.25%	removed	
November 3, 2010	-	0	0 / 0.25%	Nov-10	
December 14, 2010	-	0	0 / 0.25%	Dec-10	
January 26, 2011	-	0	0 / 0.25%	Jan-11	Feb-11
March 15, 2011	-	0	0 / 0.25%	Mar-11	

Table A.1 provides an overview of all FOMC meetings from November 2003 to March 2011. Additionally, it shows the meetings' decisions, the resulting target rate, the type of

*FOMC meeting (scheduled or unscheduled), and which option contract(s) have been used to predict the meetings' outcomes. The first two FOMC meetings were dropped due to insufficient data availability. Unscheduled meetings had to be removed because they cannot be predicted.*

### **A3. Trading days and recovered probability estimates in the sample period**

**Table A.2: Distribution of trading days, options trades and recovered probability estimates**

<b>Year</b>	<b>Number of trading days</b>	<b>Number of estimated probabilities</b>	<b>% of recovered probability estimates</b>	<b>Average daily number of option trades</b>
2003	26	0	0%	157.58
2004	253	169	67%	214.54
2005	252	250	99%	174.58
2006	252	195	77%	172.51
2007	253	198	78%	222.88
2008	253	1	0%	71.49
2009	254	36	14%	100.32
2010	253	109	43%	537.35
2011	20	16	80%	887.05
<b>Total</b>	1,816	974	54%	219.98

*Table A.2 shows the number of trading days, the number and percentage of recovered daily probability estimates, and the average daily number of option trades by year. The reasons for the low percentage of recovered probabilities in some years are twofold. In the early stage of the sample period, options were not that heavily traded. The same is true for the years of the financial crisis. With less than five different (validly priced) options per day, probability estimation was not possible. Second, the FOMC held 14 unscheduled meetings between 2007 and 2010, nine of which took place in 2007 and 2008 (see Appendix A2). In advance of unscheduled meetings no probability estimation is possible due to the unknown ex ante target rate.*

#### **A4. The impact of macroeconomic announcements on federal funds futures**

The following three tables show the results of the federal funds futures regression represented in equation (4.2). Table A.3 illustrates the results for the entire sample (2003 to 2011). The two subsequent tables depict the subsample results for the years 2003 to 2006 prior to the financial crisis (Table A.4) and the years 2007 to 2011 that include the financial crisis and the period of unconventional monetary policy and the approach of the zero lower bound (Table A.5). Future price effects are measured over a 90-minute event window from 30 minutes prior to the announcement to 60 minutes after the announcement. Models (1) to (6) correspond to the results of the future contracts with synthetic constant maturity of one to six months. Thereby, the effect of macroeconomic announcements can be assessed for different forecasting horizons of expected future monetary policy. As the explanatory power of regression models decreases for future contracts with a maturity of more than four months, as can be inferred from comparing the models' adjusted  $R^2$ , and the liquidity of future contracts with maturities of more than six months declines considerably, the results of futures with longer maturities have been omitted.

The results reveal that expansionary (recessionary) or inflationary (deflationary) macroeconomic news lead to an increase (decrease) in the implied futures rate. This is tantamount to expectations of tighter (more accommodative) future monetary policy. The most influential macroeconomic indicators are Non-farm Payrolls and the Civilian Unemployment, followed by the sentiment indicators Chicago PMI and Consumer Confidence. In contrast, inflation-related announcements do not seem to matter with respect to monetary policy expectations. Overall, the observed effects of future prices are consistent with the findings based on federal funds option implied probabilities for the entire sample period.

The results in Tables A.4 and A.5 support the previous findings using federal funds options. The overall results (Table A.3) seem to be driven by the first half of the sample period (2003 to 2006) since the respective results are very similar to those of the entire sample. The results in Table A.5 (2007 to 2011) comprise the financial crisis as well as the period of the ZLB. The pre-crisis results stress the importance of the two labor market-related indicators and the Chicago PMI. For longer maturities, Durable Goods Orders, Retail Sales, Existing and New Home Sales, and GDP advanced also have an impact. For the crisis period, the statistical significance of these indicators is considerably reduced.

**Table A.3: Macroeconomic announcement effects on federal funds futures**

		(1) 1 month	(2) 2 months	(3) 3 months	(4) 4 months	(5) 5 months	(6) 6 months
<b>GDP</b>	GDP preliminary	0.0743 (0.865)	0.0573 (0.495)	0.1416 (1.193)	0.0833 (0.616)	0.1612 (1.013)	0.1399 (0.677)
	GDP advanced	0.0922 (1.269)	0.1775 (1.586)	0.3150* (1.669)	0.3036 (1.474)	0.2507 (1.186)	0.3556* (1.805)
	GDP final	-0.0133 (-0.121)	-0.0212 (-0.163)	-0.1358 (-0.867)	0.1024 (0.922)	0.1300 (1.028)	-0.0226 (-0.104)
<b>Trade &amp; Consumers</b>	Current Account	-0.2483 (-0.401)	0.4070 (0.527)	0.3871 (0.408)	0.0860 (0.067)	0.6170 (0.447)	2.4443 (1.200)
	Personal	-0.0070 (-0.188)	0.0182 (0.368)	0.0063 (0.089)	0.1793 (1.150)	-0.0138 (-0.119)	-0.1425 (-0.753)
	Consumption						
	Personal Income	0.0420 (0.894)	-0.0386 (-0.556)	0.0326 (0.246)	-0.1307 (-0.931)	-0.0033 (-0.027)	0.0117 (0.058)
<b>Labor Markets</b>	Civilian Unem- ployment	0.3496** (2.467)	0.4656** (2.345)	0.6465*** (2.626)	0.8868*** (2.915)	1.0239*** (2.946)	1.0633*** (2.855)
	Non-farm Payrolls	0.4913*** (2.663)	1.1050*** (3.954)	1.8525*** (4.905)	2.6920*** (5.789)	2.4892*** (4.420)	2.0984*** (4.012)
<b>Inflation</b>	CPI	0.0097 (0.158)	0.0975 (0.982)	0.2011 (1.318)	0.1965 (1.200)	0.1721 (1.031)	0.2529 (1.283)
	PPI	0.0403 (0.878)	0.0941 (1.234)	0.1724 (1.584)	0.1815 (1.308)	0.2628 (1.575)	0.3380 (1.449)
<b>Productivity</b>	Productivity preliminary	0.0051 (0.087)	-0.0084 (-0.088)	-0.0150 (-0.159)	-0.1094 (-1.430)	-0.1285 (-1.324)	-0.0518 (-0.559)
	Productivity revised	0.0881 (0.801)	0.1070 (0.794)	0.1495 (0.866)	0.2002 (1.312)	0.1599 (0.827)	-0.0151 (-0.082)
<b>Sentiment Indicators</b>	Consumer	0.1539 (1.170)	0.3282* (1.872)	0.2522 (1.438)	0.3736** (2.056)	0.4790** (2.345)	0.4591** (2.030)
	Confidence						
	Index of Leading	-0.0105 (-0.637)	-0.0001 (-0.006)	0.0457 (1.243)	0.0334 (0.761)	0.0065 (0.119)	-0.0408 (-0.541)
	Indicators						
<b>Federal Reserve</b>	Chicago PMI	0.0821 (1.573)	0.1662*** (2.655)	0.2188** (2.039)	0.3801*** (3.633)	0.4054*** (3.287)	0.4237** (2.080)
	Consumer Credit	0.0278 (0.684)	0.0581 (0.629)	0.0725 (0.641)	0.0300 (0.224)	0.0710 (0.524)	0.0583 (0.555)
	Capacity	0.0879 (1.024)	0.0768 (0.571)	0.1563 (1.085)	0.2351 (1.503)	0.3070* (1.671)	0.2951 (1.542)
	Utilization						
	Industrial Production	-0.1069 (-1.344)	-0.0538 (-0.426)	-0.0471 (-0.299)	0.0138 (0.078)	0.0996 (0.475)	0.1917 (0.883)

(Table A.3 continued)

<b>Housing</b>	Existing Home	0.0221	0.0562	-0.0574	0.2261***	0.4127***	0.4725***
	Sales	(0.625)	(1.186)	(-0.397)	(2.741)	(3.150)	(3.054)
	New Home Sales	-0.0072	0.0097	0.0878*	0.1800***	0.1906	0.1465
		(-0.211)	(0.239)	(1.662)	(2.594)	(1.203)	(1.010)
	Housing Starts	0.0543	0.0732	0.1048	0.1219	0.1535	0.0823
		(0.905)	(0.865)	(1.002)	(0.984)	(1.289)	(0.699)
<b>Orders &amp; Sales</b>	Construction	-0.0485	-0.0207	-0.1063	-0.0511	0.0078	0.0337
	Spending	(-0.848)	(-0.189)	(-0.798)	(-0.330)	(0.037)	(0.119)
	Business	-0.0150	-0.0313	0.0064	-0.0123	-0.0828	-0.0819
	Inventories	(-0.387)	(-0.555)	(0.120)	(-0.174)	(-0.863)	(-0.719)
	Durable Goods	0.0866	0.1460	0.3593***	0.5478***	0.6968***	0.7220***
	Orders	(1.598)	(1.451)	(3.178)	(3.562)	(3.629)	(2.926)
<b>Trade &amp; Budget</b>	Factory Orders	-0.0076	0.0384	0.0568	0.0732	0.0235	-0.0357
		(-0.145)	(0.623)	(0.776)	(0.881)	(0.197)	(-0.255)
	Retail Sales	0.0898	0.1591**	0.2073**	0.3173**	0.4630***	0.5673***
		(1.451)	(1.987)	(2.131)	(2.524)	(2.967)	(2.948)
	Trade Balance	0.0484	0.1034	0.1792**	0.1929**	0.1852*	0.1222
		(1.171)	(1.474)	(1.994)	(1.962)	(1.718)	(0.923)
<b>Budget</b>	Treasury Budget	-0.0523	-0.0726*	0.0045	-0.0506	-0.0753	-0.0334
		(-1.241)	(-1.722)	(0.090)	(-0.763)	(-0.914)	(-0.351)
	Constant	-0.0024	-0.0073	0.0019	0.0290	0.0321	0.0015
		(-0.142)	(-0.309)	(0.064)	(0.819)	(0.773)	(0.032)
	Observations	1,632	1,632	1,632	1,632	1,632	1,632
	F value	1.931***	3.878***	6.640***	9.576***	7.022***	5.082***
	Adjusted R <sup>2</sup>	1.57%	4.71%	8.83%	12.83%	9.37%	6.55%

Table A.3 shows the results of the federal funds futures regression in equation (4.2) for the entire sample (2003 to 2011). The analysis uses synthetic time series with constant maturity of 1 to 6 months. Heteroscedasticity-robust *t*-statistics are depicted in parentheses. \*\*\*, \*\*, \* indicate statistical significance at the 1%, 5%, and 10% level, respectively.

**Table A.4: Macroeconomic announcement effects on federal funds futures in the pre-crisis period**

		(1)	(2)	(3)	(4)	(5)	(6)
		1 month	2 months	3 months	4 months	5 months	6 months
<b>GDP</b>	GDP preliminary	-0.0139 (-0.153)	0.0233 (0.214)	0.2107 (0.926)	0.2512 (0.681)	0.1316 (0.281)	0.1208 (0.185)
	GDP advanced	0.2051 (1.022)	0.3351 (1.231)	0.7363** (2.482)	0.9384** (2.530)	0.9417** (2.333)	0.5109*** (2.646)
	GDP final	-0.2268*** (-2.830)	-0.2979 (-1.626)	-0.5346* (-1.827)	-0.1257 (-0.519)	0.0439 (0.159)	-0.4119 (-1.037)
<b>Trade &amp; Consumers</b>	Current Account	-1.1126*** (-3.365)	-0.7619* (-1.666)	-0.4756 (-0.722)	-0.8203 (-0.720)	-1.3348 (-0.809)	-1.1017 (-0.727)
	Personal Consumption	-0.0266 (-0.961)	-0.0415 (-0.797)	-0.0090 (-0.078)	0.2529 (0.815)	-0.0444 (-0.257)	-0.0012 (-0.006)
	Personal Income	0.1635*** (4.082)	0.0935 (1.101)	0.3712* (1.768)	-0.0369 (-0.140)	0.1862 (0.876)	0.4255 (1.150)
<b>Labor Markets</b>	Civilian Unemployment	0.9186* (1.701)	1.6734*** (2.701)	2.8691*** (4.653)	3.5768*** (5.439)	3.3120*** (3.787)	3.2008*** (2.751)
	Non-farm Payrolls	0.5515** (2.255)	1.5719*** (4.543)	2.8654*** (5.986)	4.2719*** (8.679)	3.5079*** (3.943)	2.4708*** (3.433)
<b>Inflation</b>	CPI	-0.0319 (-0.736)	0.0190 (0.199)	0.0546 (0.421)	0.0535 (0.325)	0.0377 (0.227)	0.0856 (0.401)
	PPI	0.0502 (1.135)	0.0525 (0.672)	0.1193 (0.899)	0.1783 (1.063)	0.2921 (1.309)	0.2947 (1.033)
<b>Productivity</b>	Productivity preliminary	-0.0165 (-0.137)	-0.1692*** (-3.517)	-0.0725 (-0.933)	-0.231*** (-3.388)	-0.2642 (-1.446)	-0.3171** (-2.287)
	Productivity revised	-0.2638 (-1.24)	-0.3996** (-2.208)	-0.3012 (-0.932)	-0.4637 (-1.113)	-0.8381 (-1.628)	-1.2447** (-2.039)
<b>Sentiment Indicators</b>	Consumer Confidence	-0.0231 (-0.510)	0.0725 (1.109)	-0.0692 (-0.343)	0.1913 (1.292)	0.3491 (1.402)	0.3814 (1.340)
	Index of Leading Indicators	-0.0329 (-0.766)	-0.0435 (-0.898)	0.0470 (0.569)	0.0755 (0.627)	-0.0339 (-0.194)	-0.2074 (-0.622)
	Chicago PMI	-0.0031 (-0.078)	0.1948*** (2.613)	0.3163** (2.031)	0.5292*** (4.012)	0.4606*** (2.75)	0.5386 (1.5250)
<b>Federal Reserve</b>	Consumer Credit	0.0303 (0.652)	0.0157 (0.354)	0.0560 (0.983)	0.0244 (0.340)	0.0070 (0.079)	0.0256 (0.267)
	Capacity Utilization	0.0092 (0.21)	0.0204 (0.242)	0.0689 (0.523)	0.1394 (0.690)	0.2378 (0.762)	0.1976 (0.625)
	Industrial Production	0.0299 (0.512)	0.0586 (0.649)	0.0125 (0.083)	0.1009 (0.480)	0.2267 (0.765)	0.2576 (0.923)

(Table A.4 continued)

<b>Housing</b>	Existing Home Sales	0.0491 (0.963)	0.1587** (2.576)	-0.3039 (-0.674)	0.348** (2.046)	0.6339*** (2.632)	0.4499* (1.874)
	New Home Sales	0.0253 (0.799)	0.0594** (2.019)	0.1598** (2.386)	0.2329*** (3.028)	0.2330 (1.147)	0.1571 (0.957)
	Housing Starts	-0.0371 (-1.125)	-0.0365 (-0.907)	-0.0207 (-0.335)	-0.0190 (-0.199)	0.0613 (0.585)	0.0444 (0.377)
	Construction Spending	0.0721 (1.054)	0.0418 (0.336)	0.1350 (0.537)	0.0383 (0.127)	0.3653 (0.630)	0.3421 (0.428)
	Business Inventories	-0.0076 (-0.211)	0.0362 (0.474)	0.1081 (0.998)	-0.0030 (-0.018)	-0.1500 (-0.657)	-0.0560 (-0.205)
	Durable Goods Orders	0.0577 (1.429)	0.0449 (0.701)	0.277*** (3.049)	0.3439*** (2.747)	0.5257*** (3.011)	0.6009** (2.077)
<b>Orders &amp; Sales</b>	Factory Orders	0.0102 (0.355)	0.0975** (2.177)	0.1105 (1.621)	0.0912 (1.006)	0.0117 (0.069)	-0.1431 (-0.972)
	Retail Sales	-0.0268 (-0.569)	0.0398 (0.478)	0.1399 (1.232)	0.4098** (2.531)	0.6848*** (2.857)	0.6673*** (2.703)
	Trade Balance	0.0266 (0.808)	0.0662 (1.411)	0.1474** (2.068)	0.1851* (1.948)	0.1236 (1.056)	0.0360 (0.206)
<b>Trade &amp; Budget</b>	Treasury Budget	-0.0306 (-0.636)	-0.0283 (-0.255)	0.0481 (0.248)	0.0669 (0.238)	0.1360 (0.415)	0.3482 (1.326)
	Constant	-0.0065 (-0.415)	-0.0243 (-1.023)	-0.0195 (-0.492)	-0.0065 (-0.127)	-0.0224 (-0.362)	-0.0448 (-0.663)
Observations		700	700	700	700	700	700
F value		3.903***	7.531***	10.508***	11.898***	5.721***	3.21***
Adjusted R <sup>2</sup>		10.42%	20.74%	27.58%	30.39%	15.90%	8.13%

Table A.4 shows the results of the federal funds futures regression in equation (4.2) for the subsample period 2003 to 2006. The analysis uses synthetic time series with constant maturity of 1 to 6 months. Heteroscedasticity-robust *t*-statistics are depicted in parentheses. \*\*\*, \*\*, \* indicate statistical significance at the 1%, 5%, and 10% level, respectively.

**Table A.5: Macroeconomic announcement effects on federal funds futures in the crisis and ZLB period**

		(1)	(2)	(3)	(4)	(5)	(6)
		1 month	2 months	3 months	4 months	5 months	6 months
<b>GDP</b>	GDP preliminary	0.1079 (0.937)	0.0728 (0.469)	0.1201 (0.878)	0.0281 (0.222)	0.1842 (1.444)	0.1559 (1.073)
	GDP advanced	0.0461 (0.63)	0.1097 (1.015)	0.1411 (0.905)	0.0408 (0.2830)	-0.0396 (-0.293)	0.2804 (1.238)
	GDP final	0.0891 (0.6170)	0.1096 (0.741)	0.0538 (0.892)	0.2077** (2.343)	0.1648 (1.198)	0.1587 (0.605)
<b>Trade &amp; Consumers</b>	Current Account	0.3200 (0.298)	1.0907 (0.781)	0.6174 (0.356)	0.2506 (0.115)	1.5419 (0.671)	4.6159 (1.296)
	Personal Consumption	0.0173 (0.285)	0.0696 (0.928)	0.0413 (0.514)	0.1084 (0.788)	0.0042 (0.026)	-0.2401 (-0.798)
	Personal Income	-0.0176 (-0.308)	-0.1056 (-1.167)	-0.1317 (-0.898)	-0.1591 (-1.061)	-0.0920 (-0.590)	-0.1605 (-0.600)
<b>Labor Markets</b>	Civilian Unemployment	0.2221** (2.009)	0.2280 (1.452)	0.2226 (1.282)	0.4087* (1.715)	0.5901* (1.916)	0.6025* (1.759)
	Non-farm Payrolls	0.6061* (1.760)	0.9453** (1.974)	1.3796** (2.507)	1.7007*** (2.667)	2.0270*** (2.879)	2.3516*** (2.932)
<b>Inflation</b>	CPI	0.0105 (0.077)	0.1380 (0.673)	0.3331 (1.044)	0.3192 (0.993)	0.2998 (0.934)	0.4376 (1.264)
	PPI	0.0259 (0.341)	0.1195 (0.978)	0.2111 (1.300)	0.1958 (0.937)	0.2580 (1.075)	0.3766 (1.094)
<b>Productivity</b>	Productivity preliminary	0.0104 (0.155)	0.0387 (0.315)	-0.0023 (-0.018)	-0.0803 (-0.811)	-0.1021 (-0.890)	0.0195 (0.185)
	Productivity revised	0.1160 (0.919)	0.1377 (0.875)	0.1780 (0.917)	0.2286 (1.264)	0.2214 (1.016)	0.0743 (0.364)
<b>Sentiment Indicators</b>	Consumer Confidence	0.2349 (1.293)	0.4436* (1.832)	0.3954* (1.770)	0.4584* (1.847)	0.5481** (2.059)	0.5081* (1.720)
	Index of Leading Indicators	-0.0056 (-0.322)	0.0108 (0.438)	0.0360 (0.986)	0.0280 (0.610)	0.0187 (0.322)	-0.0127 (-0.179)
	Chicago PMI	0.1768* (1.766)	0.1412 (1.413)	0.1267 (1.061)	0.2232 (1.585)	0.3458** (1.99)	0.2995* (1.773)
<b>Federal Reserve</b>	Consumer Credit	0.0261 (0.461)	0.0770 (0.565)	0.0780 (0.466)	0.0284 (0.143)	0.0965 (0.485)	0.0687 (0.456)
	Capacity Utilization	0.1241 (0.920)	0.0997 (0.464)	0.2057 (0.944)	0.2857 (1.299)	0.3342 (1.464)	0.3481 (1.472)
	Industrial Production	-0.1607 (-1.485)	-0.0955 (-0.557)	-0.0793 (-0.396)	-0.0271 (-0.118)	0.0530 (0.196)	0.1573 (0.552)



(Table A.5 continued)

<b>Housing</b>	Existing Home Sales	0.0105 (0.236)	0.0098 (0.19)	0.0545 (1.019)	0.1745** (2.181)	0.3187** (2.422)	0.4831** (2.434)
	New Home Sales	-0.0413 (-0.849)	-0.0342 (-0.336)	0.0111 (0.114)	0.1240 (1.006)	0.1493 (0.635)	0.1628 (0.550)
	Housing Starts	0.2768 (1.323)	0.3240 (1.066)	0.3617 (0.985)	0.4263 (1.063)	0.3130 (0.883)	0.0399 (0.130)
	Construction Spending	-0.1063 (-1.295)	-0.0557 (-0.372)	-0.2239 (-1.313)	-0.1010 (-0.548)	-0.1672 (-0.935)	-0.1119 (-0.540)
	Business Inventories	-0.0167 (-0.335)	-0.0508 (-0.650)	-0.0245 (-0.334)	-0.0158 (-0.201)	-0.0617 (-0.645)	-0.0867 (-0.687)
	Durable Goods Orders	0.1195 (1.005)	0.2807 (1.282)	0.4644** (1.978)	0.8465*** (2.938)	0.9354** (2.558)	0.8858** (2.164)
<b>Orders &amp; Sales</b>	Factory Orders	-0.0174 (-0.213)	0.0097 (0.105)	0.0343 (0.324)	0.0745 (0.611)	0.0392 (0.238)	0.0420 (0.197)
	Retail Sales	0.1557 (1.590)	0.218* (1.788)	0.2327* (1.647)	0.2684 (1.608)	0.3602** (1.991)	0.5224** (2.099)
	Trade Balance	0.0609 (0.947)	0.1227 (1.102)	0.1950 (1.393)	0.1933 (1.318)	0.2154 (1.335)	0.1678 (0.891)
<b>Trade &amp; Budget</b>	Treasury Budget	-0.0552 (-1.163)	-0.0783* (-1.723)	-0.0009 (-0.019)	-0.0661 (-1.030)	-0.1035 (-1.278)	-0.0863 (-0.894)
	Constant	-0.0009 (-0.032)	-0.0022 (-0.061)	0.0109 (0.261)	0.0453 (0.949)	0.0611 (1.126)	0.0204 (0.341)
Observations		932	932	932	932	932	932
F value		1.148	1.445*	2.043***	2.547***	2.871***	3.080***
Adjusted R <sup>2</sup>		0.44%	1.32%	3.04%	4.45%	5.33%	5.89%

Table A.5 shows the results of the federal funds futures regression in equation (4.2) for the subsample period 2007 to 2011. The analysis uses synthetic time series with constant maturity of 1 to 6 months. Heteroscedasticity-robust *t*-statistics are depicted in parentheses. \*\*\*, \*\*, \* indicate statistical significance at the 1%, 5%, and 10% level, respectively.

## A5. The impact of cumulative employment and inflation information on the target rate probability

In order to verify the probability estimates and to rule out sample-specific distortions, the actually chosen probability  $p^A$  is regressed on the cumulative number of employment report announcements, CPI announcements, and the number of remaining days until the upcoming FOMC meeting. The panel regression using fixed effects is the following:

$$p_{f,t}^A = \alpha_0 + \alpha_f + \beta_{CPI} \cdot A_{f,t}^{CPI} + \beta_{Empl} \cdot A_{f,t}^{Empl} + \gamma_1 Days_t + \varepsilon_{f,t} \quad (A.5)$$

$p_{f,t}$  is the probability estimate of the actually chosen target rate as of day  $t$  for FOMC meeting  $f$ .  $A_{f,t}$  denotes the cumulative number of employment report announcements or inflation announcements, respectively.  $Days_t$  represents the number of days remaining until the next FOMC meeting takes place. The regression is thus similar to that of Carlson et al. (2005). Likewise, inflation and employment announcements are statistically significant in model (1) and (2). The results in model (3) differ considerably which could be due to the financial crisis and the approach of the zero lower bound. Apparently, the results in the entire sample are driven by the period prior to the financial crisis.

**Table A.6: The impact of cumulative information on option implied probabilities**

	(1) Entire sample	(2) 2003-2006	(3) 2007-2011
Non-farm Payroll & Civilian Unemployment announcements	0.0151* (1.771)	0.0212** (2.202)	-0.0097 (-0.604)
CPI announcements	0.0291*** (3.340)	0.0271*** (2.725)	0.0191 (1.206)
Days until next FOMC	-0.0013*** (-2.994)	-0.0021*** (-3.805)	-0.0009 (-1.295)
Constant	0.8490*** (44.06)	0.8720*** (35.13)	0.8460*** (29.70)
Observations	974	614	360
Adjusted R <sup>2</sup>	14.46%	32.62%	-3.71%
Number of FOMC meetings	45	22	24
FOMC FE	Yes	Yes	Yes

Table A.6 shows the results of the panel regression with fixed effects in equation (A.5). T-statistics are shown in parentheses. Model (1) uses the data of the entire sample, i.e.

2003-2011. For the other two models the sample is split into the periods 2003-2006 (model (2)) and 2007-2011 (model (3)). \*\*\*, \*\*, \* indicate statistical significance at the 1%, 5%, and 10% level, respectively.

## **Declaration of Honor**

I declare upon my word of honor that the doctoral thesis submitted herewith is my own work. All sources and aids used have been listed. All references or quotations in any form and their use have been clearly identified. The dissertation has not been submitted for examination purposes to any institution before.

Ich erkläre hiermit ehrenwörtlich, dass ich die vorliegende Arbeit selbstständig angefertigt habe. Sämtliche aus fremden Quellen direkt und indirekt übernommene Gedanken sind als solche kenntlich gemacht. Die Dissertation wurde bisher keiner anderen Prüfungsbehörde vorgelegt und noch nicht veröffentlicht.

Mainz, den 14.04.2016

.....

Christian Happ