Market-Timing of Capital Structure and Factors Influencing the Leverage Decision of Firms

Inaugural-Dissertation

zur Erlangung des akademischen Grades eines Doctor rerum politicarum (Dr. rer. pol.) der Fakultät für Wirtschaftswissenschaften an der Technischen Universität Chemnitz

vorgelegt
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2011
“The journey of ten thousand miles begins with the first step”

-Lao Tse-
Acknowledgements

During the last two years working on my dissertation, situations emerged where I sometimes felt like Sisyphus, the mythological Greek, who was punished to roll a huge boulder up a steep hill, always rolling back down before he reached the summit. Yet, despite some drawbacks, I have reached my goal due to the support of all of you.

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## Abbreviations

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<tbody>
<tr>
<td>AIC</td>
<td>Akaike Information Criterion</td>
</tr>
<tr>
<td>BIC</td>
<td>Bayesian Information Criterion</td>
</tr>
<tr>
<td>BJ</td>
<td>Bera-Jarque</td>
</tr>
<tr>
<td>CEO</td>
<td>Chief Executive Officer</td>
</tr>
<tr>
<td>CFO</td>
<td>Chief Financial Officer</td>
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<tr>
<td>CLRM</td>
<td>Classical Linear Regression Model</td>
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<tr>
<td>COV</td>
<td>Covariance</td>
</tr>
<tr>
<td>DCF</td>
<td>Discounted Cash Flow</td>
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<tr>
<td>DW</td>
<td>Durbin-Watson</td>
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<tr>
<td>EBIT</td>
<td>Earnings before Interests and Taxes</td>
</tr>
<tr>
<td>EBITDA</td>
<td>Earnings before Interests, Taxes, Depreciation and Amortization</td>
</tr>
<tr>
<td>EPS</td>
<td>Earnings per Share</td>
</tr>
<tr>
<td>GDP</td>
<td>Gross Domestic Product</td>
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<tr>
<td>GLS</td>
<td>Generalized Least Squares</td>
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<tr>
<td>HQC</td>
<td>Hannan-Quinn Information Criterion</td>
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<tr>
<td>IPO</td>
<td>Initial Public Offering</td>
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<tr>
<td>LM</td>
<td>Lagrange Multiplier</td>
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<tr>
<td>MU</td>
<td>Monetary Unit</td>
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<tr>
<td>NPV</td>
<td>Net Present Value</td>
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<tr>
<td>OLS</td>
<td>Ordinary Least Squares</td>
</tr>
<tr>
<td>P/E</td>
<td>Price-Earning</td>
</tr>
<tr>
<td>POM</td>
<td>Plus or Minus</td>
</tr>
<tr>
<td>R&amp;D</td>
<td>Research and Development</td>
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<tr>
<td>SEC</td>
<td>Security and Exchange Commission</td>
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<tr>
<td>SEO</td>
<td>Seasoned Equity Offering</td>
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<td>Description</td>
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<tr>
<td>SIC</td>
<td>Standard Industrial Classification</td>
</tr>
<tr>
<td>S&amp;P</td>
<td>Standard and Poor’s</td>
</tr>
<tr>
<td>UK</td>
<td>United Kingdom</td>
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<td>VAR</td>
<td>Variance</td>
</tr>
<tr>
<td>VIF</td>
<td>Variance Inflation Factors</td>
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<tr>
<td>WACC</td>
<td>Weighted Average Cost of Capital</td>
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**Symbols**

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<tr>
<td>AGE</td>
<td>Natural Logarithm of Years since Foundation</td>
</tr>
<tr>
<td>AR</td>
<td>Accounts Receivables divided by Total Assets</td>
</tr>
<tr>
<td>CAPEX</td>
<td>Capital Expenditures divided by Total Assets</td>
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<tr>
<td>CASH</td>
<td>Cash Flow divided by Total Assets</td>
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<tr>
<td>COLLTRL</td>
<td>Collateral Assets divided by Total Assets</td>
</tr>
<tr>
<td>DIV</td>
<td>Dividend Paying Dummy</td>
</tr>
<tr>
<td>GDP</td>
<td>Growth in Gross Domestic Product</td>
</tr>
<tr>
<td>G_TA</td>
<td>Annual Growth Rate of Total Assets</td>
</tr>
<tr>
<td>G_REV</td>
<td>Annual Growth Rate of Net Revenues</td>
</tr>
<tr>
<td>INDUST_G</td>
<td>Median Industry Growth Rate</td>
</tr>
<tr>
<td>INDUST_LEV</td>
<td>Median Industry Leverage Rate</td>
</tr>
<tr>
<td>INFLATION</td>
<td>Historical Inflation Rate</td>
</tr>
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<td>INTANG</td>
<td>Intangible Assets divided by Total Assets</td>
</tr>
<tr>
<td>INV</td>
<td>Inventory divided by Total Assets</td>
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<tr>
<td>LOSS</td>
<td>Loss Making Dummy</td>
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<td>NBER</td>
<td>NBER Recession Dummy</td>
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<td>NDTLS</td>
<td>Depreciation and Amortization divided by Total Assets</td>
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<td>TA</td>
<td>Natural Logarithm of Total Assets</td>
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<td>-------------</td>
</tr>
<tr>
<td>MB</td>
<td>Market-to-Book Ratio</td>
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<tr>
<td>OPEX</td>
<td>Operating Expenditures divided by Total Assets</td>
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<tr>
<td>PPE</td>
<td>Property, Plant and Equipment divided by Total Assets</td>
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<tr>
<td>PROF</td>
<td>EBITDA divided by Total Assets</td>
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<td>RATING</td>
<td>Investment Grade Rating Dummy</td>
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<td>RISK</td>
<td>Standard Deviation of Growth Rate of Operating Profit</td>
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<tr>
<td>RND</td>
<td>Research and Development divided by Sales</td>
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<tr>
<td>REV</td>
<td>Natural Logarithm of Net Revenues</td>
</tr>
<tr>
<td>SGA</td>
<td>Selling, General and Administrative Expenses divided by Sales</td>
</tr>
<tr>
<td>TAX</td>
<td>Top Tax Rate</td>
</tr>
<tr>
<td>TBILL</td>
<td>Discount Rate</td>
</tr>
<tr>
<td>WC</td>
<td>Working Capital divided by Total Assets</td>
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<tr>
<td>Z_SCORE</td>
<td>Bankruptcy Possibility</td>
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1 Introduction

1.1 Background and Problem Definition

One of the most perennial questions in Corporate Finance is: How do firms finance their investments? This question ultimately influences the capital structure of a firm. In the words of Myers (2001): “The study of capital structure attempts to explain the mix of securities and financing sources used by corporations to finance real investments.” In practice, the choice between debt and equity is an inevitable decision companies need to face. Without doubt the main advantages of debt capital centre on its relative cost. The reason why debt financing might be better than equity derives from the immutable fact that debt capital is usually cheaper than equity, mainly due to three reasons.2

First, the pre-tax rate of interest is consistently lower than the return required by stockholders. This is due to the better legal position of debtholders, who do have a prior claim on the distribution of a company’s income. Thus, it is all about cash priority. It is assumed that the operating cash flows accrue first to high priorities like royalty or revolving credit. Next, expenses and debtholders are paid, while equityholders possess the weakest claim. Furthermore, in the case of bankruptcy, debtholders precede ordinary shareholders in the queue for the settlement of claims. Second, debt interest can be conceived as tax-deductible, thus leading to a tax advantage. Finally, the administrative and issuing costs are usually not as high as for equity financing.

These advantages would imply that firms should solely employ debt financing and restrain from equity. In specific, the question arises why firms do not use debt more intensively, given that the use of leverage is associated with large tax advantages. For instance, Graham (2000) shows that firm value will increase by up to 7.5 percent when firms employ debt up to the point at which the marginal tax bene-

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fit starts to decline. It is confusing why firms in practice fail to engage in massive
gearing. In specific, debt financing can be considered as the *Holy Grail*, highly desira-
ble, but illusory, and difficult to grasp.¹

Until today, a large body of academics have surfaced dealing with the issue how
firms should optimally choose their capital structure.² Studies emerged attempting to
provide a theory that best explains the capital structure puzzle. However, despite the
large number of academic research on this issue, a comprehensible and consistent
capital structure theory fails to exist that accounts for the observed financing pat-
terns in the real world. Furthermore, academics have tried to find out under which
conditions and circumstances firms make use of debt or equity financing. Theoreti-
cally, well-established, larger firms are in the better position to issue debt due to their
consistent stream of revenues and their better credit rating. However, in practice,
one often observes that even small start-up companies over-leverage since they are
not able to raise equity, while larger firms often follow a rather conservative ap-
proach compared with their borrowing capacities.

Thus, combining theoretical knowledge and practical observation, is there a
“correct” and an “optimal” level of debt and equity? There are vast arguments in
favour of and against the extensive use of debt capital and academics have come up
with sophisticated models, analysing the key theoretical relationships between debt
and equity. Despite a vast amount of research in the field of capital structure, Myers’
classic question “How do firms choose their capital structure?” cannot be answered with
certainty.³

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¹ Among others, see Miller (1977), DeAngelo and Masulis (1980), Cordes and Shefrin (1983), Kane et al.
(2009) and Gordon (2010).

² Seminal academic research papers contributing to the convolute of capital structure theories are after
Modigliani and Miller (1958, 1963) in particular Kraus und Litzenberger (1973), Jensen and Meckling
(1976), Myers (1977), Ross (1977), Leland and Pyle (1977), Myers (1984), Myers and Majluf (1984), Jensen

The debate over the optimal capital structure decision of firms has been ignited by the seminal work of Modigliani and Miller in the years 1958 and 1963. Applying arbitrage arguments, the authors illustrate that under restrictive assumptions the capital structure decision of firms fails to have an impact on the value of a firm. In other words, firms do not have to be concerned about the financing mix and rather should put emphasis on the future cash flows that the assets in place generate. Although, their finding only holds in a perfect capital market without market imperfections, the irrelevance theory of Modigliani and Miller (1958) can be considered as the “big bang” in the capital structure debate. Without doubt, the world of finance has changed since the publication of the irrelevance theory. Since then a vast number of competing theories and empirical research worldwide emerged, introducing capital market imperfections in order to prove that the capital structure of firms in reality does matter.

For instance, Kraus and Litzenberger (1973) incorporated two essential capital market frictions that have an immense impact on the financing decision of firms. In specific, the authors show that firms should trade-off the tax saving benefits of leverage against the detrimental bankruptcy costs associated with too much gearing.

Furthermore, Jensen and Meckling (1976) consider the conflict of interest between the different stakeholders of a firm. Specifically, they show that potential agency costs do have an influence on the capital structure decision of firms.

Another classical capital structure theory revolves around asymmetric information. Myers (1984) shows that due to high adverse selection costs, firms should make use of a hierarchical financing decision. In essence, the author claims that firms should prioritize internal financing over external financing. In case internal funds are exhausted, firms should employ debt rather than equity. In other words, equity financing should be conceived as a financing means of “last resort” when all other sources are exhausted. This financing pattern is known as the pecking-order theory of capital structure.

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7 See Kraus and Litzenberger (1973), pp.911.
8 See Jensen and Meckling (1976), pp.308.
9 See Myers (1984), pp.373.
While theories such as the trade-off theory or agency theory attempt to determine an optimal capital structure firms need to pursue, new theories have been introduced in the academic discussion that follow an interdisciplinary approach. In essence, these new theories have in common to link findings of applied economics with pure financing theory over the capital structure of a firm. Recent attention has been given to the notion of the market-timing theory of Baker and Wurgler (2002). In specific, this theory claims that the capital structure decision of firms depends on the timing ability of managers. The authors show that firms decrease their debt level when they are overvalued. In specific the market-timing hypothesis postulates that firms issue equity, when the market prices are (irrationally) overvalued.\textsuperscript{10} In line with the notion of the pecking-order theory, market-timing implies that firms do not follow a target debt level.\textsuperscript{11}

While the various capital structure theories, since the starting-point of Modigliani and Miller in 1958, have provided fundamental ideas in the capital structure research, the main problem of these theories is that they all fail to integrate the different aspects of capital structure into one universal theory. In specific, existing theories so far are mostly tested against a limited number of factors and market frictions. Consequently, we define the first problem in the recent capital structure debate as follows: Academics have developed capital structure theories that are always able to explain certain financing decision of firms. However, these studies mostly investigate single frictions and consider important aspects of capital structure in isolation.

A second problem identified in academic literature so far concerns the stylized facts on the capital structure decision of firms. In essence, a large number of empirical studies have surfaced scrutinizing which factors have an influence on the financing mix of firms. Basically, the majority of studies base their debt determinants on the study of Harris and Raviv (1991). In specific, empirical research has proven that in general, growth and profitability are inversely related to debt financing. In contrast, size, tangibility, industry median debt ratios and expected inflation have a positive

\textsuperscript{10} See Baker and Wurgler (2002), pp.1.
\textsuperscript{11} In contrast, the trade-off theory states that firms adjust their capital structure in case of deviations from the target level.
impact on leverage. The problem of these studies is two-folded: First, these studies all apply a limited set of variables that might have an impact on the capital structure decision of firms.

Second, a main problem of the entire capital structure discussion is the undeniable fact that a link between the stylized facts and the existence of the developed capital structure theories does not exist. No academic paper is prevalent that provides an in-depth study of various debt factors in order to provide results on the issue which capital structure theory is best in explaining observed financing patterns in the real world.

Again, the main problem of the capital structure discussion so far is that no one has tried to combine the different ideas and findings within the last 52 years, since the work of Modigliani and Miller (1958), into one study. In order to fill this void, Chapter 1.2 exposes the main research gaps in capital structure literature and elaborates on the research objectives and contributions of this dissertation.

1.2 Research Gaps and Objectives

As has been mentioned above, over the last five decades, compelling research on the topic of capital structure has emerged. While a convolute of academic work exists, practical and scientific research gaps still have been identified. They form the motivation for this dissertation:

1. Scientific research gap: Existing academic literature studying debt factors that have an impact on the capital structure decision of firms all share one common weakness. These studies only apply a limited set of possible debt determinants and fail to consider other factors that might influence the leverage decision of firms.

12 For instance, see Frank and Goyal (2009) for an overview of debt factors.
A second scientific research gap on the study of stylized facts is the immutable fact that a cross-sectional analysis has yet not been conducted. It would be interesting to find out whether or not certain debt factors are important in some industries, while unimportant in others. However, so far, academic literature has only studied the effect of debt factors on an entire sample. In particular, industries vary according to legal and economic perspectives and henceforth, firms across industry might show different capital structures and a different importance on the various debt factors.

A third research gap revolves around the concern that certain debt factors influencing the capital structure of firms might have different effects over time. In specific, academic research so far has failed to consider whether or not debt factors’ impact on a firm’s financing decision alters throughout different time intervals. Hence, it is necessary not just to study one time frame but rather divide one’s research into different time periods in order to detect possible changes over time.

A fourth research gap deals with the most recent capital structure theory. While the market-timing hypothesis of Baker and Wurgler (2002) also lacks cross-sectional as well as calendar-time results, further research on these aspects is needed. However, the biggest scientific research gap in the market-timing literature is the omission of testing the market-timing effect of debt. While Baker and Wurgler (2002) and subsequent empirical papers focus on the market-timing ability of managers when engaging in equity financing, no consistent study exists that has tried to provide evidence on the market-timing of debt financing.

2. Practical research gap: An essential practical research gap in the capital structure literature is the fact that existing academic studies so far have failed to apply direct measures of financing instruments when testing stylized factors or market-timing existence. These studies have all tested the capital structure determinants and the existence of market-timing of equity on an aggregated amount of leverage (book or market leverage). Concrete studies, empirically proving how stylized factors and the market-timing behaviour of managers influence the equity,
share repurchase, bond and loan decision of firms do not exist to this point of
debate.
A second practical research gap embodies one of the biggest demerits of the
whole capital structure discussion. Since the seminal work of Modigliani and Mil-
er (1958), a large body of capital structure theories have surfaced trying to ac-
count observed financing patterns throughout the world. However, so far no
academic paper has tried to study all existing theories and empirically prove
which theory is the most superior one in explaining the capital structure of
firms. In specific, no concrete elaboration on the connection between stylized
facts and the notion of each capital structure theory exists.

Thus, the purpose of this dissertation is to contribute to the closure of these
aforementioned research gaps. Answering these calls, the following research objectives
are proposed:

1. Understanding the main factors that have an influence on the capital structure
decision of firms.
2. Understanding how the capital structure of firms differs among various indus-
tries and to fathom cross-sectional differences in the importance of debt deter-
minants among industries.
3. Investigating the influence of time on the capital structure decision of firms. In
specific, it must be found out whether certain debt determinants alter their ef-
fect on the capital structure decision of firms over time.
4. Studying the market-timing effect of debt financing. It must be researched how
managers time the debt market when engaging in bond or loan issues.
5. Empirically proving how stylized factors and market-timing behaviour influ-
ences the transaction of equity, bond and loan issues as well as of share repur-
chases.
6. Finally, discussing how far the stylized facts can be explained by existing capital
structure theory in order to crown the theory, whose notion can best account
the observed financing patterns across the world.
Hence, based on the existing practical and scientific research gaps as well as the derived research objectives, the goal of this dissertation is to fill this void in order to bring the capital structure debate up to a new level of quality. Consequently, the intention of this study is to find answers to the following research questions:\footnote{The ranking of the questions are not in line with the research objectives, but rather mirror the hierarchical study of these questions in this dissertation.}

1. Do managers time the market when engaging in equity financing?
2. Which debt factors determine the capital structure of firms?
   i. Are certain debt factors only temporarily important in the leverage decision or do they exhibit a consistent impact over time?
   ii. Are certain debt factors dominant in some industries, yet unimportant elsewhere?
   iii. Which debt factors determine the bond and/or loan decision of firms?
   iv. Which factors influence the equity issue and share repurchase decision of firms?
3. Do managers time the market when engaging in debt financing?
4. Does a universal theory exist that best explains the capital structure decision of firms?

The structure of analysis to answer these central research questions will be detailed in the following chapter.

1.3 Structure of Dissertation

The dissertation is structured in 11 chapters.

\textbf{Chapter 1} provides the introduction to this dissertation. While \textit{Chapter 1.1} investigates the status quo of the research stream and identifies essential research
1.3 Structure of Dissertation

needs, Chapter 1.2 subsequently defines the research objectives and questions of this dissertation. In Chapter 1.3 the structure of this dissertation is laid out.

Chapter 2 illuminates the most relevant classical capital structure theories in academic literature, which are all exposed to empirical evidence and a critical comment of the author. In specific, Chapter 2.1 elaborates on the irrelevance theory, postulated by Modigliani and Miller (1958). Furthermore, this chapter discusses in detail the market imperfections, taxes and bankruptcy costs, that are omitted in the notion of the irrelevance theory and which symbolize the main important inputs for the essence of the trade-off theory. Based on these two imperfections, Chapter 2.2 investigates the contribution of the trade-off theory on the capital structure decision of firms, differentiating between the static and dynamic approach. Chapter 2.3 considers a third market imperfection – agency costs. In particular, this chapter explains the different agency theories between stakeholders and its implications on the capital structure of firms. Chapter 2.4 deals with the capital structure based on asymmetric information. Specifically, different leverage signalling models will be discussed in order to better understand the impact of asymmetric information on the financing decision. Based on this elaboration, the pecking-order theory will be scrutinized, whose existence is a result of the asymmetric information problem. Finally, Chapter 2.5 summarizes the main results on the classical capital structure theories.

Chapter 3 explains the most relevant capital structure theories that differ from the classical ones. Chapter 3.1 examines the impact of market forces on the capital structure decision of firms. In specific, the chapter attempts to detect evidence on a firm’s capital structure based on its competitive strategy, its stakeholders and the market structure a firm competes in. Chapter 3.2 deals with the capital structure of firms based on corporate control. In essence, this chapter studies the effect of takeover threats on the financing decision of firms. Chapter 3.3 introduces the most recent capital structure theory in present days. The market-timing theory will be discussed, focusing on equity- as well as macroeconomic timing behavior of firms. Alternative capital structure theories are briefly discussed in Chapter 3.4, before
Chapter 3.5 concludes the section with an overview of the main implications of each theory on the capital structure of firms.

Chapter 4 deals with the capital structure determinants. In specific, Chapter 4.1 provides an overview of the main determinants of the capital structure decision, differentiating between endogenous and exogenous factors. Chapter 4.2 offers the main study surveys about the determinants of capital structure decision. In specific, these surveys help to fathom whether empirical evidence meets reality. Financing patterns across the world are discussed in Chapter 4.3, focusing on the preference for external or internal financing in countries throughout the world. Finally, a brief conclusion is provided in Chapter 4.4, summarizing the main findings of empirical and survey evidence.

Chapter 5 offers insights on the methodology applied in this dissertation. While, Chapter 5.1 scrutinizes the main assumptions of the regression analysis conducted in the course of the dissertation, Chapter 5.2 deals with the issue of multicollinearity.

Chapter 6 elaborates on the empirical data which are used in testing the theoretical framework and hypotheses. Chapter 6.1 describes the data gathering process, followed by a sample description in Chapter 6.2. In specific, this chapter features summary statistics on different accounting variables, differentiating between sample and industry characteristics.

Chapter 7 conducts an empirical study in order to find out whether firms time the capital market when engaging in equity issues. In specific, this chapter offers sample-, cross-sectional- and calendar-time results. Chapter 7.1 expounds the main hypotheses that will be tested in the course of this chapter. Based on these hypotheses, Chapter 7.2 tackles an empirical study to provide evidence on the short-term effect of market-timing. In contrast, Chapter 7.3 examines the long-term effect on the market-timing of equity. Chapter 7.4 applies direct measures of equity financing, such as the volume amount of equity issues and share repurchases that have been con-
duced by firms during the years 1990-2008. Chapter 7.5 summarizes the main results of this empirical study and its implication on the capital structure of firms.

Chapter 8 empirically determines the main factors influencing the leverage decision of firms. In specific, a convolute of possible debt factors is tested in order to determine which factor exerts a significant impact on the financing decision of firms. While Chapter 8.1 revolves around the developed hypotheses that will be tested, Chapter 8.2 experiences a factor selection process in order to choose only those factors that lead to the best explanatory model of the empirical study. After determining the debt factors that will be included in our empirical analysis, Chapter 8.3 provides empirical results. In specific, this chapter offers sample-, cross-sectional- and calendar-time results. Furthermore, results on alternative leverage measures will also be offered. Specifically, the chosen debt factors will be regressed against direct measures of leverage, such as bonds and loans. Furthermore, it will be empirically proven which factors have an influence on the equity issue and share repurchase decision of firms. Finally, Chapter 8.4 summarizes the main findings of the empirical study and provides an overview of the outcome of the tested hypotheses.

Chapter 9 undergoes an empirical study to find out whether managers do time the market when engaging in debt issues. In specific, Chapter 9.1 inspects the impact of interest rate changes on the timing effect of debt issues. Chapter 9.2 studies the influence of credit rate changes on the timing ability of debt issues. The hypotheses are formulated in the two sub-chapters individually. Chapter 9.3 concludes the section by delivering an overview of the main findings and of the results of the tested hypotheses.

Chapter 10 attempts to find out which existing capital structure theory is able to best explain the results obtained in the previous three chapters. Chapter 10.1 shows how the capital structure theory predicts the implication of certain determinants on the capital structure decision of firms. Based on these predictions, Chapter 10.2 provides a discussion on the validity of each tested capital structure theory.
Chapter 11 concludes this dissertation by summarizing the major findings and recommendations in Chapter 11.1 and by deriving implications for future research in Chapter 11.2.

An overview of the structure of this dissertation is visualized in Figure 1.1.
## Figure 1.1

**Structure of Dissertation**

| 1. Introduction | 1.1 Background and Problem Definition  
| 1.2 Research Objectives and Contribution  
| 1.3 Structure of Dissertation |
| 2. Classical/Kapital Structure Theories | 2.1 Irrelevance Theory  
| 2.2 Trade-Off Theory  
| 2.3 Capital Structure based on Agency Theory  
| 2.4 Capital Structure based on Asymmetric Information  
| 2.5 Conclusion |
| 3.2 Capital Structure based on Corporate Control  
| 3.3 Capital Structure based on Market-Timing  
| 3.4 Alternative Capital Structure Theories  
| 3.5 Conclusion |
| 4. Capital Structure and Determinants | 4.1 Capital Structure Determinants  
| 4.2 Surveys about the Determinants of Capital Structure Decisions  
| 4.3 Financing Patterns across the World |
| 5. Methodology | 5.1 Classical Linear Regression Model  
| 5.2 Multicollinearity |
| 6. Empirical Data | 6.1 Data Gathering  
| 6.2 Sample Description |
| 7. Market-Timing of Equity | 7.1 Development of Hypotheses  
| 7.2 Short-Term Timing Measure  
| 7.3 Long-Term Timing Measure  
| 7.4 Alternative Equity Measures  
| 7.5 Conclusion |
| 8. Determinants of Capital Structure | 8.1 Development of Hypotheses  
| 8.2 Factor Selection  
| 8.3 Empirical Results  
| 8.4 Conclusion |
| 9. Market-Timing of Leverage | 9.1 Interest Rate Changes and the Timing of Debt Issues  
| 9.2 Credit Rate Changes and the Timing of Debt Issues  
| 9.3 Conclusion |
| 10. Discussion of Capital Structure Theories | 10.1 Predictions of Capital Structure Theories  
| 10.2 Discussion |
| 11. Conclusion | 11.1 Final Comments and Recommendations  
| 11.2 Implications for Future Research |
2 Classical Capital Structure Theories

Firms facing investment opportunities are exposed to several types of funding instruments. In financial language, the firm’s chosen set of financing sources is referred to as its capital structure. In order to distinguish between the various financing instruments a firm can select from, it is essential to differentiate between internal and external financing.

Internal financing enables the firm to make use of own saved profits from earlier years. In contrast, external finance can be basically divided into equity and debt financing. In other words, a firm engaging in external financing is apt to issue equity or debt to fund possible investments. While debt financing requires regular interest payments, equity financing is considered as permanent funding, since it is not obliged of any repayments.14 The issuance of ordinary shares is the most relevant financing instrument when equity financing is needed. In contrast, firms can issue debt in several ways.15 The most traditional way of debt issuance is to obtain an ordinary bank loan. While this way of financing used to be most common, firms more frequently make use of the debt capital market. The capital market basically enables firms to issue bonds (so-called corporate bonds), which requires the firm to make regular interest payments and pay back the face value at maturity. Different to bank loans, bonds can be easily bought and sold in the capital market.

The traditional view of the optimal capital structure states that the substitution of “expensive” equity by “cheap” debt will increase firm value up to a certain point. In other words, leverage will cause the weighted average cost of capital (WACC) to

14 While interest payments are mandatory to be paid, dividends are not.
15 For an overview of the different debt sources, see Berk and DeMarzo (2007), pp. 780-789.
drop as borrowing increases.\textsuperscript{16} An optimal capital structure can be found, where the WACC is minimized and firm value maximized. After that point, the disadvantage of too much gearing appears, leading to a sharp rise in the cost of debt as well as the cost of equity. Consequently, the WACC will rise and firm value will decrease. However, when leverage is too low, the firm loses cheap debt on the one hand, but on the other hand, if leverage is too much, financial risk together with WACC rises and subsequently the firm value also declines. In other words, as financial risk rises due to a high level of leverage, shareholders as well as debtholders will demand higher rates of return, leading to an increase in the cost of equity and the cost of debt, respectively. Hence, even though leverage increases the value of a firm up to a certain limit, debt should be used with caution.\textsuperscript{17}

Nonetheless, one of the central issues with the traditional view is the undeniable fact that it remains a purely descriptive theory. The theory does not tell by how much the cost of equity should increase due to financial leverage or by how much the cost of debt should increase due to default risk.

\textbf{Chapter 2} illuminates the main classical capital structure theories. The seminal work of \textit{Modigliani and Miller} (1958) ignited the fruitful debate over the capital structure decision of firms. Based on the assumption of perfect capital markets, the authors theoretically show that the financing mix of a firm seems to be irrelevant and hence can be neglected. \textit{Chapter 2.1} will provide a brief overview of the essence of the irrelevance theorem and its implications on the capital structure decision of firms.

Since then, a conglomeration of academic papers emerged testing the validity of the notion of the irrelevance theory. In essence, these subsequent capital structure theories have in common that they include certain market imperfections, which are considered to be the driving force for firm value enhancement. The trade-off theory incorporates two imperfections, taxes and bankruptcy costs in their theoretical model in order to determine the optimal capital structure decision of firms. The notion of this theory is basically that firms need to weight the benefits of debt taxes with

\textsuperscript{16} See Perridon and Steiner (2004), pp.495.
\textsuperscript{17} For example, see Myers and Majluf (1984), Kester (1986) and Berk and DeMarzo (2007).
the costs of bankruptcy. Chapter 2.2 will deal with the notion of the trade-off theory in more detail.

The agency theory considers the conflict of interest between the various stakeholders as an important element in the determination of optimal capital structure of firms. In specific, this theory incorporates the resulting agency costs in their model. The theory shows which financing instrument to use in order to attenuate the agency conflict. However, as Chapter 2.3 will show, a unified and consistent explanatory contribution to the existing capital structure of firms cannot be provided.

Chapter 2.4 revolves around another market imperfection that influences the capital structure decision of firms. Asymmetric information between managers and stakeholders is prevalent in reality. The pecking-order theory postulates that firms should make use of internal financing first, then debt and finally equity as a last resort in order to mitigate the costs associated with the heterogeneous information between the stakeholders. Chapter 2.5 provides concluding remarks on the different classical capital structure theories under study.

2.1 Irrelevance Theory

Generally, based on pecuniary reasons, a firm should choose the capital structure, which minimizes the cost of capital. The capital structure with the lowest cost of capital will ultimately maximize firm value. In order to fathom why capital structure decisions are important for firms and how they can influence their corporate value, it is of utmost importance to understand first under what conditions the capital structure does not matter.\footnote{See Berk and DeMaso (2007), pp.420.}
2.1 Irrelevance Theory

2.1.1 Assumptions

*Modigliani and Miller’s* (1958) theory, which states that in a perfect capital market under conditions of “atomistic competition” firm value is independent of the degree of debt and equity, is based on the following key assumptions:

- Investors are not able to influence the market prices by their scale of transactions and therefore are considered as price-takers.
- Market participants, firms and investors, can lend and borrow at the same risk-free rate.
- Neither personal nor corporate income taxes exist.
- There are no transaction costs.
- Investors are considered as rational wealth-seekers.
- Firms can be grouped into ‘equivalent risk classes’, such that the market seeks the same return from all member firms in each group.
- Investors’ expectations about future company earnings follow a normal probability distribution.
- Assets of a bankrupt company can be sold at full market value.

2.1.2 Propositions

The first proposition is based on the fact that a firm’s weighted average cost of capital is independent of its debt-equity ratio. Hence, a firm’s WACC equals the cost of capital that a firm would have without leverage. In other words, the appropriate capital structure for a firm is the rate applied by the market to an unlevered firm in the relevant risk category, i.e. that company’s cost of equity. Thus, any difference between the value of a levered firm and an otherwise identical unlevered company could only be a temporary aberration and would be quickly unwound by market...

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forces. Therefore, the first proposition is as follows: “In a perfect capital market, the total value of a firm is equal to the market value of the total cash flows generated by its assets and is not affected by its choice of capital structure.”

Miller (1991) provides an interesting analogy to the irrelevance theory of Modigliani and Miller: “Think of the firm as a gigantic tub of whole milk. The farmer can sell the whole milk as it is. Or he can separate out the cream, and sell it at a considerably higher price than the whole milk would bring. (Selling cream is the analog of a firm selling debt securities, which pay a contractual return.) But, of course, what the farmer would have left would be skim milk, with low butter-fat content, and that would sell for much less than whole milk. (Skim milk corresponds to the levered equity.) The Modigliani-Miller proposition says that if there were no cost of separation (and, of course, no government dairy support program), the cream plus the skim milk would bring the same price as the whole milk.”

The notion of the first proposition can be applied in order to create an explicit relationship between leverage and the equity cost of capital. In specific, the first proposition states that

\[ V_E + V_D = V_U = V_A \]  

(2.1)

where \( V_E \) and \( V_D \) represent the market value of equity and debt if the firm is levered, respectively. \( V_U \) symbolizes the value of an unlevered firm, while \( V_A \) denotes the market value of the firm’s assets. Equation 2.1 illustrates that the value of the firm equals the market value of the total cash flows generated by its assets, whether the firm is unlevered or levered.

Based on Equation 2.1 the following relationship between the returns of levered equity (\( R_L \)), debt (\( R_D \)) and unlevered equity (\( R_U \)) can be derived:

\[ R_L = R_U + \left( \frac{V_D}{V_A} \right) (R_U - R_D) \]

21 Modigliani and Miller provide arbitrage arguments in their proof of the first proposition. For a detailed analysis of the arbitrage proof, see Modigliani and Miller (1958), pp.268.


2.1 Irrelevance Theory

\[
\frac{E}{E+D}R_E + \frac{D}{E+D}R_D = R_U
\]  \hspace{1cm} (2.2)

Solving for \( R_E \) the following equation for the return of levered equity can be retrieved:

\[
R_E = R_U + \frac{D}{E} (R_U - R_D)
\] \hspace{1cm} (2.3)

Equation 2.3 shows how leverage can influence the value of a firm. In specific, the second term of this equation denotes the additional risk due to leverage. Hence, the amount of additional risk a firm carries ultimately depends on the amount of leverage a firm holds, measured by a firm’s debt-equity ratio, (D/E). Equation 2.3 leads to the second proposition of Modigliani and Miller (1958): “The cost of capital of levered equity is equal to the cost of capital of unlevered equity plus a premium that is proportional to the market value debt-equity ratio.”

2.1.3 Critical Comment

Without doubt, the irrelevance theory fails to mirror the capital structure decision of firms in reality. However, the goal of Modigliani and Miller (1958) was not to provide an explanatory contribution to the financing structure of firms per se, but rather to ignite a fruitful debate over significant determinants of capital structure. The authors already recognize the simplification of their theoretical model, which was necessary in order to start a controversial discussion over the capital structure issue. “These and other drastic simplifications have been necessary in order to come to grips with the problem at all. Having served their purpose they can now be relaxed in the direction of greater realism and relevance, a task in which we hope others interested in this area will wish to share.”

\footnote{24 For a proof of the second proposition, see Modigliani and Miller (1958), pp. 271.}
\footnote{25 Berk and DeMarzo (2007), p.438.}
\footnote{26 Modigliani and Miller (1958), p.296.}
The seminal work of Modigliani and Miller (1958) significantly impacted finance research and practice. Perhaps the approach of Modigliani and Miller’s theory plays a more important role than the propositions per se for the development of modern finance. In specific, the first proposition of Modigliani and Miller was one of the first arguments to demonstrate that the “Law of One Price”\(^ {27}\) might have a significant impact on security prices and firm values in capital markets. In essence, it can be argued that the implications of the irrelevance theory herald the beginning of the development of corporate finance theory. The controversy regarding the irrelevance of capital structure ignited a convolute of academic research, testing the validity other than through the arbitrage process\(^ {28}\).

For example, a study of Hirschleifer (1966) provided evidence for the irrelevance theory of capital structure by means of a State-Preference Approach.\(^ {29}\) Furthermore, Sharpe (1964) also validated the notion of the irrelevance theory through the development of the Capital Asset Pricing Model.\(^ {30}\)

The work of Modigliani and Miller ushered into a complete new thinking about the quintessence of financial markets that was first stated by Williams (1938). In essence, the results of the irrelevance theory shows that under perfect capital markets, financial transactions neither increase nor decrease firm value, but instead signifies a repacking of risk. Thus, value enhancement can only be achieved through the exploitation of market imperfections. In specific, if the asset structure of a firm influences firm value, then this reflects the consequences of identified market imperfections. The theorems of Modigliani and Miller therefore embody the norm of comparison for theoretical and empirical analysis in modern finance theory. Hence, the following chapter will scrutinize possible market imperfections and the source of value that are introduced in the firm’s capital structure choice and other financial transactions.

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\(^{27}\) The Law of One Price basically states that in an efficient market, identical goods should have the same price. See Berk and DeMarzo (2007), pp.60-61.

\(^{28}\) Modigliani and Miller (1958) proved their irrelevance theory by means of an arbitrage process (pp.268).

\(^{29}\) See Hirschleifer (1966), pp.252.

2.1.4 Debt and Taxes

2.1.4.1 Corporate Taxes

As has been shown above, Modigliani and Miller (1958) have proven that in perfect capital markets a firm’s choice of capital structure is irrelevant. A number of authors have come up with the same results under different and often more general assumptions.31

However, the irrelevance theory stays in heavy contrast to the observation that many firms invest significant amounts of resources in managing their capital structure.32 Furthermore, academics claim that firms themselves do indeed believe in the relevance of the debt-equity choice. In specific, Graham and Harvey (2001) set up a survey, asking 392 Chief Financial Officers (CFOs) in the U.S. whether or not they consider capital structure decisions as important or irrelevant as suggested by Modigliani and Miller. Their survey actually shows that approximately 81 percent of the questioned CFOs do consider the capital structure decision of critical importance to a firm’s value and future success.33

Hence, the observations in real world and the surveys by academics suggest that capital markets are imperfect in reality, requiring theories of capital structure decisions to focus on market imperfections.34 In other words, if the debt-equity choice does indeed matter, then it must stem from market imperfections.

The following section will deal with such an imperfection – taxes. Ironically, in a paper five years later of their original work in 1958, Modigliani and Miller (1963) corrected for the omission of tax considerations in their theory.35 A vast number of literatures highlight the role that corporate and investor taxes play in affecting corporate policies and firm value. Without doubt, a firm can enhance its value by mak-

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31 For instance, see Hirshleifer (1966), Stiglitz (1969, 1974) and Fama and Miller (1972).
33 Brounen et al. (2006) conducted a similar survey by examining the practice of capital structure in four European countries (the U.K, the Netherlands, Germany and France). In general, they also found that the capital structure decision is a very important decision for the firm’s long-term success and is not considered as irrelevant.
34 See Elbas and Florysiak (2008), p.43.
35 See Modigliani and Miller (1963), pp.433.
ing use of debt to minimize the taxes it and the investors need to pay. If a firm makes use of debt financing it needs to pay interests on the debt, which in turn reduces the amount of corporate taxes it must pay. Hence, this feature of the tax code creates an incentive for companies to use leverage.\textsuperscript{36}

Letting \( V_L \) and \( V_U \) be the value of the firm with and without leverage, respectively, the following change to the first proposition in Equation 2.1 in the presence of taxes needs to be made:

\[
V_L = V_U + PV (\text{Interest Tax Shield}) \quad (2.4)
\]

Equation 2.4 illustrates that the total value of a levered firm exceeds the value of an unlevered firm due to the present value (PV) of the tax savings from debt financing.\textsuperscript{37}

As has been already mentioned above, the seminal paper of Modigliani and Miller (1958) did not consider any net tax advantages when using leverage. Hence, the cost of capital (\( r_C \)), the cost of debt (\( r_D \)) and the cost of equity (\( r_E \)) all equal zero, implying that the capital structure decision is irrelevant. In their “correction paper”, Modigliani and Miller (1963) consider corporate income taxation but continue to assume that \( r_D \) and \( r_E \) equal zero. Furthermore, they believe that interest deductions are as risky as the debt that generates them and therefore should be discounted by factor \( r_D \).\textsuperscript{38} Applying perpetual debt, according to Modigliani and Miller (1963), the value of a firm with leverage is as follows:\textsuperscript{39}

\textsuperscript{36} For a detailed overview of the interest tax deduction, see Berk and DeMarzo (2007), pp.460-467.
\textsuperscript{37} See Berk and DeMarzo (2007), p.462.
\textsuperscript{38} This assumption by Modigliani and Miller is controversial due to the fact that this requires the amount of debt to remain fixed. Instead of having a fixed debt-equity ratio, Miles and Ezzell (1983) rather looked at a target debt equity ratio. Here the interest deductions have equity risk and therefore should be discounted with the return on assets \( r_A \) rather than \( r_D \). Arzac and Glosten (2005) agree with the study of Miles and Ezzell and show in their paper that “in the absence of growth, maintaining constant leverage implies that the value of the tax shield is smaller than \( r_D \), but for the exceptional case of constant debt considered by Miller and Modigliani or in the absence of systematic risk, in which all cash flows are discounted at the riskless rate.”
\textsuperscript{39} See Modigliani and Miller (1963), pp. 434.
2.1 Irrelevance Theory

\[ V_L = V_U + \frac{r_F r_D}{r_D} = V_U + r_C D \]  

(2.5)

where \( r_C D \) denotes the tax advantage of debt.

The discussion about the irrelevance theory was further heightened by the immutable fact that under the assumption that the corporate tax rate is positive and that interest payments are deductible from taxable income, Equation 2.5 implies that an optimal capital structure should consist 100 percent of debt.\(^\text{40}\) Furthermore, this equation implies that if \( r_C \) is constant, the value of the firm increases linearly with \( D \) due to tax benefits.

Figure 2.1 shows the relationship between the corporate value and the amount of leverage outstanding under the assumptions of perfect capital markets with corporate taxes.

\(^{40}\text{Several authors amongst others Miller (1977), Schneller (1980), DeAngelo and Masulis (1980) and MacKie-Mason (1990), examine how taxes affect the proportions of debt and equity used to finance a firm. They show that corporations should not finance with 100 percent debt due to the costs of leverage.}\)
2.1.4.2 Personal Taxes

Equation 2.5 refers to the tax benefits of leverage with regard to the taxes a corporation must pay. It must be noted that for individuals interest payments obtained from debt are taxed as income. Equity investors also need to pay taxes on dividends and capital gains. Hence, personal taxes, just like corporate taxes, diminish the cash flows to investors and therefore reduce the value of the firm. Consequently, the actual interest tax shield is based on the reduction in the total taxes (both corporate and personal) that are paid.

If it is the case that personal taxes on equity income and debt income are the same, then the additional complication does not affect the outcome; personal taxes do not change when equity income is substituted by debt income. However, if these tax rates are different from each other, they may affect capital structure decisions. The relationship between personal taxes and the benefits are quite intuitive. Inves-

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41 See Berk and DeMarzo (2007), p.471
42 This finding was already observed by another path-breaking article by Miller (1977). See also Miller and Scholes (1978).
tors will prefer less income in the form that is taxed more heavily at the personal level. If debt income is taxed higher than equity income at the personal level, investors prefer less debt income.\(^{43}\)

Thus, while debt is beneficial at the corporate level because it reduces the firm’s tax burden, the effect of debt income on personal taxes might increase, reduce or even reverse the benefits of debt financing; it all depends on the personal tax rates on debt and equity income.

Graham (2003) models the tax benefits of debt by referring to the “classical” tax system found in the U.S.\(^{44}\) In Graham’s framework, the after-personal tax value to investors of a firm paying $1 of interest is $1\((1 - r_D)\). However, if that capital were to be invested as equity income, it would be subject to taxation at both the corporate and personal level, and hence, the investor would obtain $1\((1 - r_C)(1 - r_E)\). Thus, the net tax advantage of $1 of leverage payout, relative to $1 of equity payout, is as follows:

$$\begin{align*}
(1 - r_D) - (1 - r_C)(1 - r_E)
\end{align*}$$

(2.6)

As long as Equation 2.6 is positive, debt interest “is the tax-favoured way to return capital to investors, once both corporate and individual taxation are considered.”\(^{45}\) Hence, in order to maximize firm value, a firm has a tax incentive to issue debt instead of equity. It must be noted that Equation 2.6 captures the tax benefits in the current period. If a company holds $D of debt with a firm’s corporate tax rate, \(r_T\), the value of the firm with leverage is as follows:

$$\begin{align*}
V_L = V_U + PV\left( (1 - r_D) - (1 - r_C)(1 - r_E) \right) r_T D
\end{align*}$$

(2.7)

\(^{43}\) See Berk and DeMazza (2007), pp.471-476.

\(^{44}\) Key features of the classical tax system are that “incorporate income is taxed at rate \(r_C\), interest is deductible and so is paid out of income before taxes, and equity payout is not deductible but paid from the residual remaining after corporate taxation.” Graham (2003), p.1079.

where $PV$ represents the present value of all current and future interest deductions.\footnote{Whereas Graham (2003) developed a rather general framework, Goldstein et al. (2001) approached the tax benefits of debt by a dynamic contingent-claim model. The dynamic structure model enables firms to restructure debt. Goldstein et al. (2001) find out that the tax benefits of debt increase significantly over the static capital structure model. See Goldstein et al. (2001), pp.489.}

2.1.4.5 Tax Model of Miller (1977) and DeAngelo and Masulis (1980)

One of the first academics, who discussed the link between taxes and debt was Miller (1977). He argues that the corporate tax advantage of debt is eliminated by the marginal personal tax disadvantage of leverage.\footnote{The point that personal taxes do diminish the tax value of debt was extensively developed by Farrar and Schwyn (1967). They examined different cases with a series of increasingly complex tax structures, analysing their impact on the optimal capital structure of firms. In their last case (fourth) Farrar and Schwyn considered corporate, personal income and capital gain taxes simultaneously on the financing decision of firms. They found out that personal taxes do have an impact on the capital structure decisions of firms.} Without the need for bankruptcy or agency cost, Miller (1977) only considers personal taxes in order to show that the “100 percent debt” implication is unrealistic.\footnote{See Miller (1977), pp.262.}

Due to higher personal taxes on interest income (relative to personal taxes on equity income), investors demand a higher pre-tax return on debt, relative to equity returns. Hence, paying this higher pre-tax return offsets the tax advantage of using debt financing. In essence, two implications can be drawn from Miller’s analysis.\footnote{The figure is based on the elaboration of Miller (1977).} First, due to disadvantage at the personal level, investors demand higher pre-tax returns on debt, which ultimately wipes out the tax advantage of using debt. Second, relative corporate and personal taxes affect the aggregate supply of debt.

Figure 2.2\footnote{See Miller (1977), pp.268-272.} illustrates that high personal taxes on interest income relative to personal taxes on equity income put firms in a situation to restrain from leverage.\footnote{See Miller (1977), pp.268-272.}
Since Miller assumes in his analysis that the benefit of debt for all firms is equal to a constant corporate tax rate, the supply curve of debt follows a horizontal line. In essence, the supply curve shows the expected tax rate and hence the tax benefit of a dollar of interest for the firms that issue debt. In contrast, the demand curve depicts the tax rate and therefore the tax cost of a dollar of interest for the investors that make use of debt financing. The demand curve of debt starts at zero (tax-free investors) and gradually slopes upward. The increase can be explained by the fact that the return on debt must increase in order to allure investors with higher personal income tax rates. Further, by assuming that the tax rate on equity income equals zero, equilibrium is reached as long as the marginal investor with is attracted to make use of debt. In other words, investors with a tax rate less than that of the marginal investor’s appreciate an after-tax return on debt which is greater

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52 In other words, all firms have the same tax rate in every state of nature.
53 denotes the investor-level tax on interest income.
than their reservation return. In this equilibrium, the entire surplus accrues to investors subject to personal tax rates less than $r_p$.

A more general version of Miller’s implication, that does not assume $r_B$ to be zero, can be expressed in terms of Equation 2.8. Hence, when personal taxes are included into the framework, the value of a firm using perpetual debt is as follows:

$$V_L = V_U + [1 - \frac{(1-r_T)(1-r_p)}{1-r_p}D]$$

(2.8)

Comparing Equation 2.8 with Equation 2.5, the two equations are identical if personal taxes do not exist, or if $r_p = r_B$. Equation 2.8 shows that the tax gain from leverage vanishes entirely or even turns negative if the investor-level tax on interest income $r_p$ is large compared to the tax rates on corporate $r_T$ and equity income $r_B$.

Miller’s argument that there is a personal tax discount in the pricing of corporate interest payments which can wipe out the corporate tax benefit of debt was often discussed by academics. Especially his assumption that all firms face the same marginal tax rate is under scrutiny. In reality, the marginal tax rate differs across firms and consequently the value of the tax benefit should vary along the height of corporate tax rates. Myers (1984) rejects Miller’s assumptions by saying that “the extensive trading depreciation tax shields and investment tax credits, through financial leases and other devices, proves that plenty of firms face low marginal rates.”

DeAngelo and Masulis (1980) extend Miller’s analysis by showing that the inclusion of non-debt corporate tax shields (e.g. depreciation and investment tax credits) is sufficient to reject Miller’s leverage irrelevance theorem. In line with the arguments of Myers (1984), DeAngelo and Masulis (1980) argue that the marginal tax rate $r_T$

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55 For detailed evidence on the cross-sectional dispersion of effective marginal tax rates see Cordes and Shefrin (1983) as well as Block (1987).
does not follow a constant horizontal line. Rather it decreases in non-debt tax shields (NDTSs), due to the undeniable fact that NDTWs evaporate the tax benefits of interest payments. This is mainly achieved through the interaction of personal and corporate tax treatment of debt and equity.57

Figure 2.358 shows that the debt supply curve is decreasing since existing interest deductions mitigate the tax benefits of incremental interest.

Hence, the tax incentive to make use of leverage is decreasing with the probability that a firm will experience non-debt tax shields and/or interest deductions from already-existing debt. In contrast to the model of Miller (1977), a corporate advantage of employing debt exists, as measured by the “firm surplus” of issuing debt.

To sum up, DeAngelo and Masulis (1980) argue that large non-debt tax shields tend to negatively affect a firm’s optimal debt level.59 However, an important impli-

58 The figure is based on the elaboration of DeAngelo and Masulis (1980).
cation of this model is that the different levels of non-debt tax shield found in different industries can explain the observed differences in financial leverage across industries.

Bowen et al. (1982) come up with a study that confirms the findings of DeAngelo and Masulis. In their study of cross-industry difference in financial leverage, the authors perform an analysis of variance study of two measures of leverage across nine Standard Industrial Classification (SIC) industry groupings in order to find that non-debt tax shields significantly affect the capital structure decision at the industry level. Furthermore, the study of Bowen et al. (1982) reveals negative rank correlation coefficients between industry average leverage ratios and industry average tax shelter ratios. This finding confirms another hypothesis of DeAngelo and Masulis (1980), namely that “...firms with lower investment related tax shields will employ greater debt in their capital structure.”

Another string of academics however reject the hypothesis of DeAngelo and Masulis (1980). For example, Boquist and Moore (1984) test the findings of DeAngelo and Masulis in a study similar to that of Bowen et al. (1982). Making use of a different methodology, Boquist and Moore (1984) reject the hypothesis of DeAngelo and Masulis by finding that tax shelter ratios and leverage ratios are not inversely related at the firm level.

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55 See DeAngelo and Masulis (1980), pp.3.
56 This observation by Bowen et al. (1982) is also confirmed by Kester (1986), Titman and Wessels (1988), and Long and Malitz (1988).
57 See Bowen et al. (1982), pp.13-20.
59 Academics such as Bradley et al. (1984), Auerbach (1985), Gardner and Trzinka (1992) and Downs (1993) find consistent results against the hypothesis of DeAngelo and Masulis (1980).
60 In their methodology, Boquist and Moore (1984) excluded liabilities, such as accounts payable, accrued wages, and tax pays. Further, they made use of operating income instead of revenues for its measure of standardized non-debt tax shields. Finally, they performed the study using data at the firm level instead of the industry level. See Boquist and Moore (1984), pp.5-10.
2.1.4.6 Empirical Evidence

The previous chapter has demonstrated that the tax shield of debt has ignited decades of debate regarding debt financing and firm value. Modigliani and Miller (1963) were the first to academically prove that the tax benefits of debt lead to an increase in firm value.\textsuperscript{65} Miller (1977) countered that the corporate tax advantage of debt is eliminated by the marginal personal tax disadvantage of leverage. In specific, he claims that due to disadvantages at the personal level, investors demand higher pre-tax returns on debt, which ultimately wipes out the tax advantage of using debt financing. DeAngelo and Masulis (1980) ascertained that firms with large non-debt tax shields tend to engage in less debt financing. A priori, therefore, the valuation of the debt tax shield and implications on the capital structure decision of firms are blurred, thus empirical evidence is necessary.

In essence, empirical research on the estimation of the tax benefits has pursued three primary lines of inquiry.

First, a convolute of empirical studies revolves around the predictions of Modigliani and Miller (1958, 1963) and examines the effect of debt tax shields on the promotion of debt versus equity financing. For instance, studies of Marsh (1982), Bradley \textit{et al.} (1984), Long and Malitz (1985), Titman and Weisels (1988) and Fischer \textit{et al.} (1989) focus their studies on the debt-to-equity ratio and scrutinize whether non-debt tax shields diminish the propensity to apply debt tax shields. In essence, these studies fail to observe significant evidence of debt tax effects.

In contrast, studies by Mackie-Mason (1990), Treynor (1992), as well as Graham (1996, 1999) focus on the option between new debt versus new external equity financing and they find clear evidence that the preference for debt increases with the corporate tax rate. In other words, the higher the corporate tax rate the higher the preference for firms to employ debt. In addition, Givoly \textit{et al.} (1992) and Rajan and Zingales (1995) show that firms increase their level of debt financing following changes in statutory tax rates that raise the debt tax benefits of leverage.

\textsuperscript{65} Note that Modigliani and Miller (1963) ignored personal income taxes in their elaboration.
Recent studies applying cross-sectional regressions typically report larger effects. For instance, *Gordon and Lee* (2001) make use of the variation in statutory tax rates between small and large firms in the USA and they conclude that a 1 percent-point rise in the corporate tax rate increases the debt-asset ratio at the margin by 0.36 percentage-point.66

Several studies explore the sensitivity of taxation on the capital structure decision of multinationals, thereby applying cross-country variation in tax rates.67 These studies yield the prediction that a multinational firm’s incentive to issue debt in a country depends on the weighted average of national tax rates and differences between national and foreign tax rates.68 Specifically, *Collins and Shackelford* (1992), *Froot and Hines* (1995), *Alshuler and Grubert* (2003), *Desai et al.* (2004) as well as *Huizinga et al.* (2008) apply data on foreign affiliates of US multinationals and find that US multinational financial structure and the pattern of intra-firm interest are in line with tax minimization objectives.69 For example, *Alshuler and Grubert* (2003) find that a 1 percentage-point increase in the corporate tax rate raises the debt-asset ratio by 0.4 of a percentage-point.70 *Desai et al.* (2004) find out that a ten percent increase in local tax rates is associated with a 2.8 percent higher debt-asset ratio of firms.71 *Huizinga et al.* (2008) show that a 10 percent increase in the overall corporate tax rate leads to a 1.8 percent rise in the debt/asset ratio of stand-alone domestic firms.72

However, academics such as *Gordon and Malkiel* (1981), *Peterba* (1987) and *Mayer* (1990) find rather non-significant or counterintuitive tax effects of the debt-equity  

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67 Studies applying cross-country data have the advantage that they allow for international variation in tax rates.
68 Parent firms prefer debt financing for subsidiaries located in high-tax countries and equity financing for subsidiaries in low-tax countries.
69 Applying German data, *Ramb and Weichenrieder* (2004) and *Mintz and Weichenrieder* (2005) present a positive impact of taxation on the leverage of German inbound and outbound FDI. *Desai et al.* (2004) show that both the internal as well as the external financing of outward US FDI is sensitive to foreign tax rates. *Mills and Newberry* (2004) analogously conclude that non-US multinationals from countries with relatively low tax rates use relatively intensive debt finance of their foreign controlled corporations in the US. *Wu and Yue* (2009) investigate listed companies in China and find that an increase in the corporate tax rate leads to an increase in leverage by the firm in order to exploit the tax shield advantage.
71 See Desai et al. (2004), pp.2461-2483.
72 See Huizinga et al. (2008), pp.100-102.
2.1 Irrelevance Theory

decisions of firms.73 Meyer (1990) tests several OECD countries in order to find out whether or not a tax incentive for debt does exist. He comes to the conclusion that “there would have to be a remarkable level of mismeasurement for taxation to provide a credible explanation for observed financing proportions.”74 Many more models exist which stay in contrast to the empirical findings of Gordon and Mankiel (1981), Poterba (1987) and Meyer (1990) and which predict that corporate and personal income taxes do indeed affect firm’s financial decision.75

Second, Graham (2000, 2003) applies firm-level financial statement data to determine the debt tax benefit of firms. In specific, he estimates the tax benefit to be in the range of 10 percent of firm value at the time of the capital structure decision.76 Despite the fact that the studies by Graham (2000, 2003) fail to offer direct market evidence of the debt tax shield, he shows that firms obtain significant tax benefits from debt financing.

Third, another string of academics have researched direct market evidence for the debt tax shield by scrutinizing the effect of exchange offers to firm value. For example, Masulis (1980a, 1980b, 1983) has proven that firm value rises when a firm offers to swap debt for equity, and decreases when they offer to exchange equity for debt.77 In specific, he claims that leverage-increasing exchange offers trigger an increase in firm value due to a surge in tax deductions.78 In specific, Masulis (1980a) studies exchange offers during the 1960s and 1970s and finds consistent evidence that leverage-increasing exchange offers have a positive impact on equity value by approximately 7.6 percent, while leverage-decreasing transactions reduce value by 5.4

73 Also, the studies of Marsh (1982), Auerbach (1985), Fischer et al. (1989), Barclay et al. (1995), Gupta and Newberry (1997) and Richardson and Lantis (2007) fail to consistently find a positive relation between tax status and financial leverage.
75 See Graham (2003), p. 1924.
76 This finding can be explained in various ways. This part however, concentrates only on the tax effect of the findings of Masulis.
77 It must be noted that Masulis embraces the idea that firms are underlevered and hence deviate from its optimal debt ratio. For a company at its optimum, an increase or decrease of leverage would ultimately lead to a decrease in firm value.
percent. Further, he finds that exchange offers with the largest increase in tax deductions lead to the largest positive stock price reactions.

Moreover, Masulis (1983) argues that the financial market will experience a more positive effect when firms move toward the industry average debt ratio from below instead of moving away from the industry average. In his sample, he finds a debt coefficient of approximately 0.40, measuring the average benefit of debt net of the costs. Masulis attributes his findings mainly to three effects. It is consistent with (1) the tax-based theories of optimal capital structure, (2) leverage-induced wealth transfers between stockholders and bondholders, and (3) the positive information effect because investors will interpret an increase in debt financing as a positive signal for a firm’s future prospects.

Similarly, Mikkelsen (1981, 1985) finds significant negative abnormal stock returns on the announcement of convertible debt calls that force conversion of debt to common stock.

While Masulis (1980a, 1980b, 1983) and Mikkelsen (1981, 1985) provide empirical evidence that using leverage in lieu of equity raises the value of the firm, Myers (1984) as well as Cornett and Travlos (1989) question the methodology used in these studies. Both studies come to the conclusion that an increase in leverage will not ultimately raise firm value, even if interest reduces tax liabilities.

Most of the literature above makes use of time-series studies in order to identify the impact of taxes on firm value. Goolsbee (2004) criticizes time-series studies, since

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80 Exchanging debt for common stock as well as debt for preferred stocks leads to stock price reactions up to 9.8% and 4.7%, respectively. See Masulis (1980a), pp.307.
81 The average benefit of debt is derived by averaging across firms and averaging over the incremental net benefit of each dollar of debt for a given firm. See Masulis (1983), pp.108.
82 Further, McConnell and Schularbaum (1981) find positive abnormal common stock returns in response to exchange offers involving income bonds for preferred stock. They interpret their results as being in line with the corporate-tax-with-bankruptcy cost models of optimal capital structure. Finnerty (1985) analyses the effect of stock-to-debt swaps and finds significant abnormal returns at the announcement. He concludes that his findings are not consistent with tax or wealth transfer effects. Peavy and Scott (1985) also finds negative abnormal returns at the announcement of stock-to-debt swaps. Consistent with Finnerty (1985), they conclude that their findings are not in line with wealth transfer and information effects.
84 Cornett and Travlos (1989) extend the studies by Masulis (1983) and Mikkelsen (1985) by including proxies for the information effects of capital structure changes. In contrast to Masulis (1983) and Mikkelsen (1985), Cornett and Travlos (1989) find that the stock price reactions to capital structure changes reflect information effects rather than tax and wealth transfer effects.
the variation in tax rates over time is only marginal, making it hard to detect tax effects properly.\textsuperscript{85} One of the first applications of cross-sectional regressions is the study by \textit{Fama and French} (1998), who examine the value of the debt tax shield by regressing total firm value on interest expense, which proxies for debt. In order to account for non-tax effects of debt, the study controls for earnings before interest and taxes, size, growth in assets, research and development costs, and dividends. \textit{Fama and French} (1998) cannot find any significant positive effect for the market value of the tax shield, arguing that the result may stem from inadequate controls for the non-tax attributes of debt.\textsuperscript{86} In specific, the authors observe a negative relationship between leverage and firm value, concluding that “imperfect controls for profitability probably drive the negative relations between debt and value and prevent the regressions from saying anything about the tax benefits of debt”.\textsuperscript{87}

\textit{Kemply and Nissim} (2002) try to avoid the measurement problem of \textit{Fama and French} (1998), by applying reverse nonlinear regressions that enable them to apply market-to-book ratios to facilitate control for firm-level growth opportunities.\textsuperscript{88} In essence, they show that the value of the debt tax shield is approximately 40 percent of firm value\textsuperscript{89}, which is consistent with the implications of \textit{Masulis} (1980a, 1980b, 1983) and \textit{Mikkelsen} (1981, 1985) and implies near-zero average debt costs and a near-zero effect of personal taxes.\textsuperscript{90}

\textit{Jiang} (2003) conducts an almost similar methodology to the study of \textit{Fama and French} (1998) but controls for capitalization rates by dividing the sample into more similar sub-groups based on industry and profitability. \textit{Jiang}'s result confirms the findings of \textit{Kemply and Nissim} (2002) and \textit{Masulis} (1983) by showing that the average

\textsuperscript{85} Goolsbee (2004) apply cross-sectional regressions in order to determine the importance of taxes on organizational form choices. He concludes “that cross-sectional data can be particularly useful in studying the impact of the corporate income tax” (Goolsbee (2004), p.2296).

\textsuperscript{86} See Fama and French (1998), pp.837-840.

\textsuperscript{87} Fama and French (1998), p.839.

\textsuperscript{88} See Kemply and Nissim (2002), p.2050.

\textsuperscript{89} See Kemply and Nissim (2002), pp.2057-2065.

\textsuperscript{90} Green and Hollifield (2003) show that their calculations of the personal tax disadvantage of debt can be reconciled with estimates in Kemply and Nissim (2002). See Green and Hollifield (2003), pp.173.
market value of the debt tax shield equals approximately 40 percent of debt balances.91

So far, the majority of empirical studies have detected a positive impact of tax shield on the leverage decision of firms. Hence, these studies ultimately might lead to the conclusion that firms should make use of excessive debt financing, which clearly contradicts reality. Kemsley and Williams (2007) tackle the issue whether a high coefficient of the market value of the tax shield does indeed imply that leverage dominates equity. Their study shows that a high coefficient of the market value of the debt tax shield implies that debt is tax preferred over the use of equity. However, this does not necessarily mean that debt is tax preferred over the use of internal free cash flows. In specific, Kemsley and Williams (2007) prove that internal free cash flows are preferred over external equity due to personal tax reasons, since the use of internal cash flows avoids imposing a personal tax on distribution. Hence, in contrast to the studies mentioned above, Kemsley and Williams (2007) show that the tax preference for debt versus internal financing is ambiguous.92 In line with this ambiguity, Marab (1982), Titman and Wessels (1988) and Fischer et al. (1989) focus their studies on debt-to-equity ratios and do not find significant evidence of tax effects.

The empirical literature, presented above, has shown that firms are making use of the debt tax shield when engaging in capital structure decisions. “However, tax-based explanations are from an economic perspective a somewhat unsatisfactory capital structure determinant, because taxes are set exogenously by governments, without a clear underlying economic rationale. Moreover, since corporate tax-regimes typically are homogenous for companies located in the

91 While the three lines of inquiry mentioned above have in common that they directly examine the influence of tax shield on the capital structure of firms, another stream of authors provides non-tax explanations for evidence of positive (negative) stock reactions to leverage-increasing (leverage-decreasing) events. For instance, Asquith and Mullins (1986) and Mikkelson and Parch (1986) find in their studies negative stock price reactions in response to straight equity issuance, whereas positive stock price reactions can be found by Pinagar and Lease (1986) in case of preferred-for-common exchanges. In contrast to straight equity issuance, Mikkelson and Parch (1986) as well as Erkko (1986) study the effects of straight debt issuance on stock price reactions. Both find that stock prices are almost unaffected. Other authors conclude that exchange offers convey non-tax information that affects security prices, perhaps due to asymmetric information problems along the lines suggested by Myers and Majluf (1984) or due to signalling (Ross (1977)).

same country at the same time, taxes cannot explain fully the observed systematic capital structure heterogeneity”\textsuperscript{93}

Studies of \textit{Rajan and Zingales} (1995), \textit{Graham} (2000), \textit{Berk and DeMarzo} (2007) and \textit{Elias and Florysiak} (2008) illustrate that the tax-advantage of leverage does not suffice to account for the observed financing patterns. In specific, \textit{Berk and DeMarzo} (2007) compare the interest expenses and Earnings before Interests and Taxes (EBIT) for firms in the S&P500. Their study reveals two important implications. First, firms engage more in leverage in recent years than they did in the 1970s and early 1980s. This trend implies that there is an increase in the effective tax advantage of debt. Second, the firms under study shield only about one-third of their earnings from taxes by making use of leverage.\textsuperscript{94}

\textit{Elias and Florysiak} (2008) do the same for German firms and find similar results. Their sample reveals that most of the firms do not fully exploit the potential tax benefit and are underleveraged.\textsuperscript{95}

\textit{Rajan and Zingales} (1995) test international leverage levels using 1990 data. In line with the studies above, \textit{Rajan and Zingales} (1995) show that the firms worldwide do have similar low proportions of debt financing. Here, firms shield only half of their taxable income using interest payments.\textsuperscript{96}

\textit{Graham} (2000) determines the amount of interest expense a firm could pay before the expected tax benefits of debt begins to shirk. In essence, he finds that approximately 44 percent of firms could more than double their leverage ratio and still enjoy full debt tax advantage.\textsuperscript{97}

These studies all have in common that firms seem to be underleveraged and do not fully exploit the tax advantage of debt financing.

Besides the empirical evidence, history also shows that taxes cannot be the crucial driving force in the use of leverage. Historians have proven that firms made

\textsuperscript{93} Elias and Florysiak (2008), p.42.
\textsuperscript{95} See Elias and Florysiak (2008), pp.48.
\textsuperscript{96} See Rajan and Zingales (1995), pp.1425.
\textsuperscript{97} See Graham (2000), p.1903.
use of leverage long before corporate income taxes existed. Consequently, corporate income tax cannot account for the extensive usage of debt contracts centuries before any such taxes had been implemented.98 For instance, Copeland and Weston (1992) have shown that the capital structure of US companies did not alter much after corporate income tax had been introduced. Further evidence is provided by Rajan and Zingales (1995) by showing that the capital structure of Australian firms, where there is no dual income taxation at all, is almost similar to other economies. Booth et al. (2001) have proven that the tax benefits differ in developing countries and that they play no crucial role in the determination of capital structure decisions.99 Finally, a recent study of Blouin et al. (2010) shows that the tax benefits of debt seem to be overestimated. In specific, they find “that additional debt would provide firms with much smaller tax benefits than previously thought, and that when distress costs of adding debt are also considered, the proportion of firms failing to take advantage of the tax benefits of debt appears relatively small”.100

To conclude, empirical studies as well as history have shown that firms fail to fully exploit the tax advantage of debt. Choosing low levels of leverage suggests that debt financing is associated with certain costs that prevent firms from fully exploiting the interest tax shield. The studies above strongly imply that taxes cannot be the only determinant of optimal leverage.

Based on the rationale mentioned above, the subsequent chapter will deal with the biggest costs of debt financing — financial distress. In essence, the level of debt financing is positively related to the probability of default. Aside from taxes, another essential difference between debt and equity financing is that debt payments must be met in order to circumvent potential bankruptcy, whereas firms are able to restrain from dividend payments or capital gains. In specific, if the probability of distress is considered to be costly for a firm, these costs might offset the tax advantage of debt financing. Thus, Chapter 2.1.5 examines the impact of financial distress on the capital structure decision of firms.

98 See Braudel (1982), pp.397.
99 Evidence on the interaction between taxation and debt choices is provided by Mintz and Weichentrieder (2005) and Paneghini (2009).
100 Blouin et al. (2010), p.195.
2.1.5 Financial Distress

We have shown that the tax shield of debt implies that firms should rely on debt for nearly 100 percent of their financing. However, this implication is at odds with reality, since only few firms gear up to extreme levels. Many authors introduce “the costs of financial distress” as a second market imperfection into the analysis of capital structure decisions, which has also been neglected by Modigliani and Miller (1958, 1963).101 Although Miller (1977) recognizes the impact of bankruptcy costs on the capital structure decision in a subsequent paper, he considers the influence on those costs as rather marginal in comparison to the immense benefit of the tax shield of leverage.102

The fear of bankruptcy due to too much debt financing is a reason why the tax benefit of debt has only a limited usage. A vast number of literatures have emerged studying the impact of bankruptcy risk on the capital structure decision of firms. These studies mainly differ in the choice of variables used to predict bankruptcy and the methodology applied to determine the likelihood of default. For example, Beaver (1966), Altman (1968), Ohlson (1980) and Zmijewski (1984) apply accounting variables in order to estimate the probability of default in a static model.103

Other authors criticize the usage of a static model for predicting bankruptcy due to the immutable fact that it does not take into account that a company could have had unfavourable indicators several periods before going into bankruptcy. For instance, Shumway (2001) proposes a hazard model that makes use of all available information in order to estimate a firm’s bankruptcy probability at each point in time.104

Duffie et al. (2007) show that the likelihood of bankruptcy depends on the horizon one is considering. They determine mean-reverting time series processes for macroeconomic and company-specific predictors of default and merge these with a

102 See Miller (1977), pp.262.
103 Altman’s Z-score and Ohlson’s O-score are fundamentally and widely accepted measures of financial distress.
short-horizon failure model to find the marginal probability of failure at different horizons.\textsuperscript{105} Once the probability of default is predicted, one can determine the impact of such bankruptcy on firm performance. Most literature has found out that stocks with a high risk of failure tend to deliver anomalously low average returns.\textsuperscript{106}

Haugen and Senbet (1978) argue that bankruptcy “…occurs when the fixed obligations to creditors cannot be met. In this case, there is a transfer of ownership and a formal reorganization of the capital structure of the firm. The costs associated with this transfer can be categorized as either direct or indirect. Direct costs include legal, accounting and trustee fees as well as the possible denial of income tax loss carryovers and carrybacks. Indirect costs relate to opportunity costs resulting from disruptions in firm-supplier or firm-customer relationships that are associated with the transfer of ownership or control.”\textsuperscript{107}

According to the quote of Haugen and Senbet (1978), financial bankruptcy has both direct and indirect costs that have an impact on the capital structure decision of firms.\textsuperscript{108} Thus, the subsequent sub-chapters will discuss the implications of direct and indirect bankruptcy costs on the capital structure decision.

2.1.5.1 Direct Bankruptcy Costs

In general, direct costs consist of legal and other administrative fees associated with bankruptcy.\textsuperscript{109} These costs are found to be rather small and consequently do only have a marginal impact on the debt-equity decision of firms.\textsuperscript{110} Warner (1977), Altman (1986) as well as Weiss (1990) determine direct bankruptcy costs on the order of 3 to 6 percent of firm value at the time of distress.\textsuperscript{111}

\textsuperscript{105} See Duffie et al. (2007), pp.644.
\textsuperscript{106} For example, see Diehl et al. (1998), Garlappi et al. (2006), Avramov et al. (2006) and Campbell et al. (2008).
\textsuperscript{107} Haugen and Senbet (1978), p.385.
\textsuperscript{109} An example of direct costs are litigation fees.
\textsuperscript{110} Andrade and Kaplan (1998) and Graham (2000) have shown that the observed size of distress costs is inconsistent with the detected leverage level of firms.
\textsuperscript{111} Warner (1977) studied bankruptcy of eleven railroad firms between 1933 and 1955 and came to the conclusion that direct bankruptcy costs amounted to approximately 5 percent of firm value prior to
study of Andrade and Kaplan (1998) find that the direct costs of bankruptcy are between 10 and 20 percent of firm value.\textsuperscript{112} Bris et al. (2006) examine the differences in US bankruptcy between Chapter 7 liquidations and Chapter 11 reorganizations. They find median direct bankruptcy costs of 2.5 percent (Chapter 7) and 1.9 percent (Chapter 11) of firm value.\textsuperscript{113} Recent study of Molina (2005) and Almeida and Philippon (2007) show that the apparent underleverage suggested by the studies of Rajan and Zingales (1995), Graham (2000), Berk and DeMarzo (2007) and Eljas and FlORSIak (2008) can be explained by substantial high direct distress costs.\textsuperscript{114}

2.1.5.2 Indirect Bankruptcy Costs

Indirect costs, such as loss of market share,\textsuperscript{115} inefficient asset sales\textsuperscript{116} and human costs,\textsuperscript{117} seem to be more relevant in capital structure decision of firms compared to direct bankruptcy costs. However, the main problem of these indirect costs is the indisputable fact that they are hard to quantify.

Cutler and Summers (1988) try to determine the indirect bankruptcy costs for the Pennzoil/Texaco trial and find a decrease in value of approximately 2 billion USD of the two companies.\textsuperscript{118} Opler and Titman (1994) find a strong correlation between highly leveraged firms and loss of substantial market share. They show evidence that ex-ante highly leveraged firms experience lower sales growth in distressed industries compared to firms with lower ex-ante leverage.\textsuperscript{119} A study of Campello (2003) confirms the findings of Opler and Titman (1994), showing that debt financing is inversely default. Altman (1986) examined default on industry firms and found the costs to be 6 percent of firm value. Weiss (1990) studied the bankruptcy of 31 companies between 1980 and 1986 and found the cost to be 3% of value and about 20 percent related to the market value of equity.

\textsuperscript{112} Baxter (1967) also finds relatively high direct bankruptcy costs. He studied the bankruptcy of small partnerships and found the costs to be approximately 20 percent of firm value.

\textsuperscript{113} See Bris et al. (2006), pp.1260.

\textsuperscript{114} In specific, Almeida and Philippon (2007) show that the NPV of distress is 4.5 percent of the firm value before default (pp.2565).

\textsuperscript{115} See Opler and Titman (1994).

\textsuperscript{116} See Shleifer and Vishny (1992).

\textsuperscript{117} See Berk et al. (2010).


related to firms’ sales growth. Despite the fact that a clear quantification of the indirect bankruptcy costs cannot be provided, the study illustrates that these cost do have an immense impact on the capital structure decision of firms.\footnote{Altman (1984) estimates indirect costs of 11 to 17 percent of firm value three years before bankruptcy. Andrade and Kaplan (1998) find similar results by examining financially distressed firms that are still able to sustain positive operating earnings. They quantify the indirect bankruptcy costs on the order of 10 to 23 percent of firm value.\footnote{Regarding Chapter 7 liquidations and Chapter 11 reorganizations, Bris et al. (2006) estimate median indirect bankruptcy costs of approximately 62 percent (Chapter 7) and 13 percent (Chapter 11) by losses in asset values during bankruptcy.\footnote{In a more recent study, Korteweg (2007) determines indirect costs of approximately 5 percent of firm value for observed leverages and up to 31 percent of firm value for bankrupt firms.\footnote{However, among others, Altman (1984), Andrade and Kaplan (1998), Campello (2003) and Korteweg (2007) all agree that a fair quantification of the indirect costs is hardly possible and argue that part of these costs might not be genuine bankruptcy costs. But despite the quantification problem of these indirect costs, empirical evidence has shown that they should not be neglected when dealing with the optimal capital structure decisions of firms.}\footnote{However, the importance of indirect costs on the capital structure decisions of firms is not unchallenged by several authors. Especially Haugen and Senbet (1978) claim that in case of bankruptcy only a small portion of the decrease in firm value applies to indirect bankruptcy costs and that a large fraction of the loss in value is}}}}\footnote{See Campello (2003), pp.372.\footnote{Altman (1984) determines indirect bankruptcy costs as the difference between profit projections and realized profits during distress (pp.1074).\footnote{See Andrade and Kaplan (1998), pp.1447.\footnote{Bris et al. (2006) refer to some measurement problems that could have led to the relatively high indirect costs.\footnote{See Korteweg (2007), pp.15-19.}}}}}
due to expected liquidation costs. Further, they assert that the observed decline in product demand and decreased profitability prior to filing bankruptcy are due to the likelihood of liquidation rather than bankruptcy. In the words of Altman (1999): “The loss in the value of the firm is attributable not only to ex ante liquidation costs but also to the expected value of the costs associated with liquidation at the time of its occurrence. They distinguish between liquidation and bankruptcy costs by defining liquidation costs as a deteriorating profitability that eventually leads to a costly piecemeal liquidation of the firm’s operations and the bankruptcy costs as the direct and indirect cost associated with a transfer of ownership. Furthermore, Haugen and Senbet (1978) argue that there is no conceptually sound basis for inferring or assuming bankruptcy and liquidation costs are related, a position which is in sharp contrast to that of Titman (1984), who suggests a link between financial structure and liquidation”.

A recent study of Reimund et al. (2009) confirms the claim of Haugen and Senbet (1978). They test German distressed firms and find that ex-ante highly leveraged firms do not experience significant sales decreases in economic downturns. Hence, Reimund et al. (2009) argue that indirect bankruptcy costs fail to be an important factor in the capital structure decision of firms.

In general, a vast number of empirical researches, dealing with the impact of bankruptcy costs on capital structure share one common fallacy. They do not clearly distinguish between financial and economic distress, or an interaction of the two, thus overestimating the cost of bankruptcy.

Other authors even argue that financial distress might be beneficial for firms, and hence, bankruptcy costs should be neglected. Wruck (1990) claims that “forced” reorganization could increase operational efficiency in distressed situations. In essence, he shows that bankruptcy risk “triggers a process of organizational change that has

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125 See Haugen and Senbet (1978), pp.385.
127 See Reimund et al. (2009), pp.115.
129 See Wruck (1990), pp.433-436.
the potential to create value for the firm’s claimholders’. Other authors, such as Jensen (1989) and Berk et al. (2010) even claim that a high probability of financial distress might be beneficial for a firm due to the increased bargaining power of management against other stakeholders.

To sum up, Chapter 2.1.5 has dealt with the direct and indirect costs of bankruptcy and their impact on the capital structure decision of firms. While direct costs are characterized by simple calculation and weak importance, indirect costs are associated with difficult quantification and strong importance in the leverage decision of firms. Chapter 2.2 will combine the knowledge of the benefits of debt from the interest tax shield with the cost of financial distress in order to determine an optimal level of debt a firm should issue to maximize firm value. The term trade-off theory is applied by a vast number of authors, describing the costs and benefits of leverage.

2.2 Trade-Off Theory

The following capital structure theory meets the shortcomings of the irrelevance theory by combining the impact of the debt tax shield and the bankruptcy cost in the leverage decision of firms. In specific, according to the trade-off theory the optimal debt-equity ratio can be reached by balancing the corporate tax advantages of debt financing against the costs of financial distress that evolve from bankruptcy risk and agency costs. One needs to discriminate between the classic, so-called “static” trade-off theory (Chapter 2.2.1) and the “dynamic” trade-off theory (Chapter 2.2.2), in which the target leverage varies over time due to time-varying determinants.

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130 Wruck (1990), p.442.
131 Berk et al. (2010) find out that a threat of bankruptcy enables firms to renegotiate labour contracts, which ultimately might be advantageous to shareholders (p.4). Chapter 3.1.2.2 of this dissertation deals with this issue.
133 See Kraus and Litzenberger (1973).
134 See Jensen and Meckling (1976).
135 For a detailed overview of the static trade-off theory, refer to Bradley et al. (1984) and Myers (1984).
As highlighted by Myers (1984), firms should engage in capital structure adjustments in case the optimal level deviates from target level due to temporarily shocks. However, empirical evidence of the trade-off theory is far from conclusive (Chapter 2.3.3). For instance, while Bradley et al. (1984) do not find clear evidence of the existence of the trade-off theory, Trezevant (1992) confirms the validity of the theory.136

2.2.1 Static Trade-Off Theory

Among others, Kraus and Litzenberger (1973) were one of the first to develop a classical theory, predicting that optimal leverage reflects a trade-off between the costs of bankruptcy and the tax benefits of debt.137 The trade-off model can be expressed in the following equation:

\[ V_L = V_U + PV(\text{Interest Tax Shield}) - PV(\text{Bankruptcy Costs}) \]  

(2.9)

Equation 2.9 illustrates that debt financing exhibits costs as well as benefits. According to the equation, the value of a levered firm is equal to the value of an unlevered firm plus the present value of the debt tax shield, minus the present value of bankruptcy costs.138

Frank and Goyal (2008) argue in their paper that “a firm is said to follow the static trade-off theory if the firm’s leverage is determined by a single period trade-off between the tax benefits of debt and the deadweight costs of bankruptcy.”139 Myers (1984) claims that in a static trade-off theory, “the firm is supposed to substitute debt for equity, or equity for debt, until the value of the firm is maximized.”140 In line with the arguments mentioned above, Myers

137 Authors such as Robichek and Myers (1966), Baxter (1967), Scott (1976), Miller (1977), Taggart (1977), Kim (1978), DeAngelo and Masulis (1980), Hirschleifer (1980) and Bradley et al. (1984) had an immense influence on the development of the trade-off theory.
139 Frank and Goyal (2008), p.10.
(1984) also stresses the difficulty to materially determine the true value of the tax shield as well as of the costs of financial distress.141

Among others, Brealey and Myers (2006), Fan et al. (2008) as well as Frank and Goyal (2009) claim that referring to the static trade-off theory, the debt-equity decision should be based on observable firm characteristics such as business risk as well as asset structure.142 Especially firms with large intangible assets (younger firms) often face higher bankruptcy costs than companies with tangible assets, which can be used as collateral.143 Hence, according to the static-trade-off theory, firms with large intangible assets should make use of less leverage.144

However, part of intangible assets, such as reputation, is often considered as “quasi-tangible” assets by debtholders and hence conceived as collateral.145 DeAngelo and Masulis (1980), Ross (1985) and Leland (1994), among others, have proven that profitable firms with tangible assets as well as static and secure cash flows face lower distress costs and hence, should make use of more leverage in order to balance the tax benefits against the distress costs. In other words, the static trade-off theory emphasizes on the existence of an inverse relationship between business risk and leverage.146 Consequently, one could argue that the debt-equity choice varies among firms within different industries, since business risk typically differs among industries.147 Bradley et al. (1984) argue that as long as a firm’s cost of bankruptcy is significant, its optimal debt-equity choice is inversely related to the variability of earnings. Further, they suggest that a strong relationship exists between industry classification and average firm level ratio in order to determine the optimal capital structure under the static trade-off theory.148

142 Bank financing depends upon whether or not the lending can be secured by tangible assets. See Storey (1994) and Berger and Udell (1998).
143 See Bontemp and Golinelli (2001), pp.10.
145 See Balachrishnan and Fox (1992).
146 For further detail refer to Matlay (2005), pp.162. Also for a thorough overview of business risk and capital structure see Frank and Goyal (2009).
147 See Matlay (2005), pp.162.
148 Also see Sileofer and Vishny (1992), pp.1343.
2.2.2 Dynamic Trade-Off Theory

According to *Myers* (1984) a dynamic trade-off theory is characterized by the fact that firms set a debt-equity target and gradually adjust their capital structure to that target when shocks occur.¹⁴⁹ Some of the first dynamic models analysing continuous time models with uncertainty, taxes, bankruptcy costs, and free from transaction costs have been developed by *Kane et al.* (1984) and *Brennan and Schwartz* (1984). In case of adverse shocks, these models enable firms to rebalance their capital structure towards their debt-equity target without considering transaction costs. However, *Fischer et al.* (1989) go one step further and introduce bankruptcy costs in their dynamic trade-off model. Instead of reacting immediately to adverse shocks due to the absence of transaction costs, firms allow its capital structure to drift over a long period of time. Firms wait to rebalance as long as the adjustment costs exceed the value lost due to sub-optimal capital structure. Such behaviour may account for the empirical observation that a negative relation between profitability and leverage exists.¹⁵⁰ For example, *Hossainian et al.* (2001) claim that high profitability is associated with low leverage as well as with a higher likelihood of issuing debt rather than issuing equity.¹⁵¹ *Frank and Goyal* (2008) analyse large panel of data and find that most of the data depicts a drift rather than active rebalancing. This finding can be mainly explained by the existence of transaction costs in the real world.

2.2.3 Empirical Evidence

While the trade-off theory became popular among many academics when dealing with the optimal capital structure, it was also under severe debate. As described above, the notion of the static trade-off theory is based on *Miller’s* (1977) perpetual tax shield formula which states that firms should weight the benefits of debt tax shields against the costs of higher bankruptcy risk.¹⁵² However, empirical literature

¹⁵⁰ Also see *Leland* (1994, 1998).
¹⁵¹ This finding is consistent with dynamic trade-off theories (e.g., *Fischer et al.* (1989) and *Leland* (1994)).
¹⁵² Hence, based on this rationale, firms should set their debt-equity ratio as shown in Figure 2.4.
has emerged whose results stay in contrast to the central idea of the static trade-off theory. For instance, Graham (2000) argues that, \textit{“paradoxically, large, liquid, profitable firms with low expected distress costs use debt conservatively.”}\textsuperscript{153} Furthermore, Myers (1993) posits: \textit{“The most telling evidence against the static trade-off theory is the strong inverse correlation between profitability and financial leverage...Higher profits mean more dollars for debt service and more taxable income to shield. They should mean higher target debt ratios.”}\textsuperscript{154} Baker and Wargler (2002) also refute the notion of the trade-off theory, claiming: \textit{“The trade-off theory predicts that temporary fluctuations in the market to book ratio or any other variable should have temporary effects.”}\textsuperscript{155}

The tree citations show that firms fail to engage in sufficient debt financing in order to reap the benefits of the debt tax shield.

Miller (1977), for example, considers the trade-off theory as one of a horse-and-rabbit stew, consisting of one horse (the tax shield) and one rabbit (the bankruptcy costs). \textit{“The supposed trade-off between tax gains and bankruptcy costs looks suspiciously like the recipe for the fabled horse-and-rabbit stew – one horse, one rabbit.”}\textsuperscript{156}

Later, Hagen and Senbet (1978) show the insignificance of bankruptcy costs to the theory of the optimal capital structure, as has been described above. Hackbartb et al. (2007) argue that most of the existing trade-off models do not provide guidance on the debt structure of a firm, but only analyse the optimal amount of debt a firm should hold. Hart and Moore (1995) are in line with the opinion of Hackbartb et al. (2007) by claiming that the existing trade-off theories \textit{“cannot explain the types of debt claims observed in practice.”}\textsuperscript{157} In other words, trade-off models such as those developed by Brennan and Schwartz\textsuperscript{\textregistered} (1984), Fischer et al. (1989), Kane et al. (1984), Leland (1994), Strebulaev (2004) and Titman and Tsypinsky (2005) fail to address debt structure.\textsuperscript{158}

\textsuperscript{154} Myers (1993), pp.7-8.
\textsuperscript{155} Baker and Wargler (2002), p.3.
\textsuperscript{156} See Miller (1977), p.264.
\textsuperscript{158} A recent study by Sahlwalsky (2010) provides new evidence on the trade-off theory, applying a non-linear structural equation framework. He shows that the notion of the trade-off theory is existent for small and medium-sized firms, but not for large firms (pp.137.)
Hence, the question should be how much market and how much non-market debt, such as bank loans and private placements, a firm should utilize, once the optimal amount of debt has been determined by the trade-off theory.

However some models do exist, which not only consider market debt but also address non-market debt and hence try to optimize the debt structure of a firm.169 Hackbath et al. (2007) go even one step further and analyse the optimal mix of non-market and market debt. They find that small/young firms should exclusively make use of non-market debt, whereas older/mature firms should utilize a mix of bank and market debt.160 This finding is in line with Titman and Wessels (1988), Johnson (1997), Denis and Mihov (2003) and Defang et al. (2008), who find that the percentage of market debt a firm is utilizing increases with firm size and age.

Referring to the relevance of tax shield and bankruptcy costs on the optimal capital structure decision, Welch (2004) claims that the debt-equity decisions “remain largely a mystery.”161 The main source of this mystery is based on the fact that it is almost impossible to identify the first order friction that provides a counterbalance to the tax shield and thus limiting the benefits of leverage.162

2.2.4 Critical Comment

In contrast to the irrelevance theory of Modigliani and Miller (1958), the goal of the trade-off theory is to show that capital structure decisions of firms are indeed relevant. In essence, the trade-off theory incorporates the two market imperfections, tax payments and bankruptcy costs and conveys a relatively simple notion: Firms should choose their capital structure by weighting the benefits of debt taxes with the costs of financial distress. By virtue of its simplicity and comprehensible logic, the

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160 See Hackbath et al. (2007), pp.1396.
162 See Berk et al. (2010), pp.891.
notion of the theory gained a lot of academic advocates in the beginning since the seminal work of Kraus and Litzenberger (1973).\footnote{Supporters of the idea of the trade-off theory used to be in the beginning Scott (1976), Miller (1977), Taggart (1977) and Kim (1978).}

However, a vast number of empirical studies arose, showing that firms fail to follow the basic idea of the trade-off theory.\footnote{Criticism on the trade-off theory were, among others, Masulis (1980), Myers (1984, 1993), Graham (2000) and Baker and Wurgler (2002).} In essence, the trade-off theory postulates that a firm is subject to an optimal target capital structure, where deviations from the target are only temporarily due to later adjustments. However, this rationale is hard to implement in reality. While the estimation of the tax shield seems to be relatively unproblematic, the exact determination of the bankruptcy costs is hardly possible in reality.\footnote{Especially the indirect costs are subject to severe estimation problems. See Chapter 2.2.3.2 for a review.}

Some empirical results contradict the notion of the trade-off theory. First, empirical studies found out that firms facing large growth opportunities and possess large amounts of intangible assets are subject to less debt financing.\footnote{Among others, see Myers (1984, 2001), Kester (1986), Titman and Wessels (1988), Baskin (1989), Rajan and Zingales (1995), De Jong et al. (2008) and Frank and Goyal (2009).} Second, the most fundamental issue against the validity of the trade-off theory is the empirical finding of a negative correlation between the profitability and the debt ratio of a firm. According to the idea of the trade-off theory, a positive relationship between the two factors is anticipated. Profitable firms are characterized by lower bankruptcy costs and can reap the benefits of the tax shield by engaging in massive debt financing. However, empirical studies contradict this rationale.\footnote{Chapter 8.1.6 provides an overview of different empirical studies dealing with the profitability effect on the leverage decision of firms.} In specific, profitable firms tend to have a higher equity ratio compared non-profitable firms.\footnote{For an overview of the different studies, see Table 9.6 in Chapter 9.1.6.} Third, historians have proven that firms made use of leverage long before corporate income taxes existed. Consequently, corporate income tax cannot account for the extensive usage of debt contracts centuries before any such taxes had been implemented.\footnote{See Braudel (1982), pp.397.} For instance, Capeland and Weston (1992) have shown that the capital
structure of US companies did not alter much after corporate income tax had been introduced.

Due to the vast number of empirical studies contradicting the notion of the trade-off theory, academics agree that the capital structure decision of firms fails to be solely determined through the notion of the trade-off theory.

2.3 Capital Structure Based on Agency Theory

While the capital structure theories so far consist of the assumption that managers choose their debt-equity ratio in the interests of shareholders, the following capital structure theory shows that managers’ self-interest can culminate into capital structure decisions that do not maximize shareholder value. An early example on that issue provides Donaldson’s (1969) study of financing choices, showing that some managers take decisions that are in contrast to the interests of shareholders, i.e. pursuing goal of personal success or organizational growth.\(^\text{170}\) While so far the notion of the trade-off theory is based on weighting the tax advantage of debt with direct and indirect bankruptcy costs, in a next step, models of Stulz (1990) and of Morellec (2004), in which agency costs of debt play a crucial role, can also be included in the trade-off model.\(^\text{171}\)

“The directors of such (joint-stock) companies, however, being the managers rather of other people’s money than of their own, it cannot well be expected, that they should watch over it with the same anxious vigilance with which the partners in a private copartnery frequently watch over their own. Like the stewards of a rich man, they are apt to consider attention to small matters as not for their master’s honour, and very easily give themselves a dispensation from having it. Negligence and

\(^{170}\) For example, Jensen (1993) provides a summary of different manager’s financing decision that destroyed shareholder value.

\(^{171}\) Morellec (2004) claims that an optimal capital structure reflects both the tax advantage of leverage less bankruptcy costs and the agency costs of managerial discretion.
profusion, therefore, must always prevail, more or less, in the management of the affairs if such a company.”

In line with the quotation of Adam Smith in the year 1776, Berle and Means (1932) claimed already more than 75 years ago that the modern firm is characterized by a separation of ownership and control. After Berle and Means’ contribution, various aspects of the so-called agency conflict have been examined.

Basically, Jensen and Meckling (1976) were one of the first to initiate the analysis of the agency costs that arise due to the conflict between managers and other stockholders. In their seminal paper, they identify two types of agency costs that occur due to the incomplete alignment of the agent’s and the owner’s interests. On the one hand, agency costs derive from conflicts between equityholders and managers, and on the other hand between equityholders and debtholders. Although managers tend to prefer valuable empires to worthless ones, agency conflicts between the different stakeholders might culminate in overinvestment and consequently agency costs arise.

A vast number of researchers have found that debt finance per se helps to mitigate the agency conflict between managers and shareholders. Reasons for the reduction in agency costs are for instance, monitoring activities by debt holders,

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172 Adam Smith (1776), p.700.
173 For a detailed review of the literature, see Stein (2003) and Morck et al. (2005).
174 Jensen and Meckling (1976) consider an agency relationship “as a contract under which one or more persons (the principal(s)) engage another person (the agent) to perform some service on their behalf which involves delegating some decision making authority to the agent. If both parties […] are utility maximizers, […] the agent will not always act in the best interest of the principal.” Jensen and Meckling (1976), p.308. For an introduction to the principal-agent contracting problem, see Ross (1973), pp.134-138.
175 Their study about agency conflict between different stakeholders has been mainly influenced by a research paper by Fama and Miller (1972).
176 Other theoretical studies differentiating between manager, debtholders and owner objectives, include for instance, John and John (1993), Dewatripont and Tirole (1994), Berkovich and Israel (1996), Douglas (2002) and Childs and Mauer (2008). Research on principal-agent conflicts revolve around normative as well as positive theory of agency. The normative agency theory deals with the optimization of contracts between principal and agent, whereas the positive theory of agency focuses on corporate behaviour associated with agency conflicts. See Jensen and Smith (1985) for a detailed survey on that issue.
178 Among others, see Grossman and Hart (1982), Lasfer (1995), Maloney et al. (1993), Mao (2003), Williams (1987), Wruick (1994). These studies show that high usage of leverage increases firm value by reducing the agency costs due to fact that managers perform more in the interests of the shareholders.
179 See Ang et al. (2000).
fear of bankruptcy which may cause managers to lose reputation, salaries, etc.\textsuperscript{180}, containment of overinvestment\textsuperscript{181} and reduction in the amount of free cash flow available for managers to engage in self-interest activities, e.g. empire building\textsuperscript{182}. This mitigation of the agency conflict between managers and shareholders can be seen as one of the main benefits of leverage.\textsuperscript{183}

However, leverage might aggravate the conflict between equityholders and debtholders. On the one hand, when investing in risky projects, equityholders will reap most of the gain when the investment yields higher return than the face value of debt. In case of failure, bondholders lose more than equityholders, since the latter are protected by their limited liability. On the other hand, if the benefits seized by debtholders diminish the returns to shareholders, an encouragement to restrain from positive NPV projects is apparent. Consequently, the debt contract motivates equityholders to engage in sub-optimal investments. \textit{Myers} (1977) claims that in order to avoid such an underinvestment problem, firms facing growth opportunities should employ less debt financing. \textit{Stulz} (1990) and \textit{Lasfer} (1995) confirm this argument by finding that firms with many investment opportunities as well as firms with no free cash flow problems are more likely to have lower levels of leverage.

The following section will provide a detailed overview of the different agency cost theories, dealing first with agency conflicts among equityholders and managers and second between equityholders and bondholders.

2.3.1 Agency Conflict between Equityholders and Managers

Chapter 2.3.1 deals with the agency conflict between equityholders and managers of a firm. In essence, interests between the two stakeholders often diverge and as

\textsuperscript{180} See Williams (1987).

\textsuperscript{181} See Stulz (1990).

\textsuperscript{182} See Jensen (1986).

\textsuperscript{183} See Lasfer (1993), pp. 268-269 for an overview of the effects of agency costs.
a consequence managers habitually do not act in the welfare of shareholders. Despite the fact that shareholders, through the board of directors, do have the power to fire managers in case of irreconcilable conflict of interests, this option is rarely executed unless firm performance is extraordinarily poor.\textsuperscript{184} The separation of ownership and control enables managers to engage massively in management entrenchment.\textsuperscript{185} This ultimately leads to the situation that managers commit business decisions that fail to be value enhancing for the shareholders per se. The following chapter will provide an overview of possible agency conflicts and shows how the use of debt financing helps to attenuate the conflict of interest between the two stakeholders.

2.3.1.1 Free Cash Flow Hypothesis
The free cash flow hypothesis, introduced by Jensen\textsuperscript{186} (1986) and Stulz\textsuperscript{187} (1990), states that instead of returning free cash to shareholders, managers conduct investments in negative net-present value (NPV) projects in order to let the firm become bigger.\textsuperscript{188} This size effect is often associated with a manager's enhancement of power and reputation\textsuperscript{189} and remuneration\textsuperscript{190}. This is mainly achieved through (i) empire building\textsuperscript{191}, (ii) perk consumption\textsuperscript{192} and (iii) diversification\textsuperscript{193}.

Jensen\textsuperscript{194} (1986, 1993) claims that managers' preference for empire building forces them to spend essentially all available free cash flow on projects. Amihud and Lev\textsuperscript{195} (1981) argue that managers also have a preference for diversification due to the fact that this helps to mitigate the risk of the empire to go bankrupt.\textsuperscript{196}

\textsuperscript{184} See Warner et al. (1988), pp.461.
\textsuperscript{185} Management entrenchment refers to the situation where managers face little threat of being replaced and therefore conduct actions that are often in the interest of the manager.
\textsuperscript{187} See Jensen (1986).
\textsuperscript{188} See Murphy (1985).
\textsuperscript{189} See Baumol (1959), Jensen (1986, 1993) and Shleifer and Vishny (1997).
\textsuperscript{190} See Jensen and Meckling (1976).
\textsuperscript{192} See Amihud and Lev (1981), pp.605.
Referring to Jensen (1986), free cash flow is defined as corporate cash in excess of what is needed to finance all positive net present value projects. In order to determine free cash in a firm it is essential that management knows how many positive net present value projects they have on disposal and how much cash these will require; however this is almost impossible to determine. A quote by Butz (1991) perfectly fits into this paradigm: “Moreover, if simple statistical procedures could accurately measure free cash, then firms could easily remedy agency conflicts by amending managerial contracts to create appropriate incentives to disgorge it. Consequently, empirical tests must take an indirect approach using total cash flow, cash plus marketable securities, etc., as a noisy proxy.”

The costs of the free cash flow problem must solely bear the shareholders, however it may also influence debtholders if the firm faces bankruptcy. In order to mitigate the free cash flow problem Jensen (1986) suggests that firms should increase their debt financing which might address this issue. By issuing debt, it forces management to pay out the excessive cash flow, leading to a decrease in free cash flow which is at manager’s discretion and thus in danger of being sub-optimally invested. Thus, management is obliged to service debt payments with free cash available instead of engaging in “empire building”.

In cases where the agency costs created by the free cash flows are too severe, Jensen (1986) recommends to “overleverage”, implying that firms are unable to avoid bankruptcy except by cutting investments and expansion programs and selling valuable assets. This process “results in a complete rethinking of the organization’s strategy and its structure.”

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195 This type of cost is an example of agency costs, which occur when conflicts of interest between stakeholders emerge.
196 In their seminal paper, Grossman and Hart (1982) already recognized the bonding role of debt when dealing with the free cash flow problem. However, Jensen (1986) popularized this idea and provided anecdotal evidence that leverage mitigates this type of agency conflict.
197 A recent study of Zhang (2009) examines the bonding role of debt financing and incentive compensation in order to disgorge the agency conflict. In essence, he finds out that debt and executive stock options help to attenuate a firm’s free cash flow problem (pp.517).
198 Lang et al. (1995) come to the same conclusion by claiming that a substantial debt overhang is necessary in order to force management not to engage in wasteful expenditures (pp. 5-6). Westphalen (2002) conducts a sensitivity analysis and finds that higher agency costs of free cash flow increases the optimal leverage (pp.11-12).
Besides Jensen (1986), other authors such as Stulz (1990) also find that it is optimal for the owners of the firm to increase debt financing when managers are inclined to follow personal objectives.200 Zwiebel (1996) even creates a model in which managers per se voluntarily make use of leverage in order to constrain their own future empire building. However, he demonstrates that managers actually issue less debt than is optimal in order to restrain them from any wasteful investments.201

Morellec (2004) extends the model of Zwiebel (1996) and creates a continuous-time model of an entrenched manager, who prefers leverage over equity issuance in order to make a hostile takeover unprofitable. He includes a tax advantage of leverage, implying that there exists an optimal debt level even in the absence of agency problems. He concludes that leverage serves as a good tool to constrain wasteful investments.202

However, in practice, a study by Graham and Harvey (2001) finds only weak evidence to Jensen’s argument. Specifically, they find that firms actually do not proactively issue debt in order to discipline managers and prevent them from engaging in wasteful investments.203

The empirical evidence on the importance of free cash flows is rather mixed. While Bhagat et al. (1990) find empirical significance of the free cash flow effects in the oil industry, they discover little evidence of its effects in other industries.204 Lehn and Poulsen (1989) find significant and material evidence on Jensen’s hypothesis that free cash flow poses special agency problems.205 Furthermore, Buiz (1991) claims in his paper that excess cash flow is essential mainly in conjunction with pre-existing

200 Also refer to Masulis et al. (2009), who examine the impact of agency costs at dual-class companies.
201 In his model manager is able to choose between a good and a bad project. On the one hand, the bad project offers the manager private benefits, but on the other hand it also bears the risk that all the benefits will evaporate in case of a takeover. In order to minimize the threat of a takeover, the manager commits himself not choosing the bad project by issuing debt (pp.1697).
204 See Bhagat et al. (1990), pp.53-54.
205 In specific, Lehn and Poulsen (1989) examine the source of stockholder gains in going private transactions. Testing 263 transactions from 1980-1987 the authors find a significant relationship between cash proceeds and a firm’s decision to go private (pp.776-783).
agency conflicts and that excess cash flows are a result of agency conflicts rather than a cause.\textsuperscript{206}

Another string of academics provide evidence in support of the free cash flow hypothesis and its impact on the capital structure decision of firms. Berger et al. (1997) for instance, find an inverse relationship between the degree of leverage and various measures of managerial entrenchment.\textsuperscript{207}

Jung et al. (1996) explain why some typical debt-issuing firms\textsuperscript{208} make use of equity although the announcement of a new equity issue triggers a decline in the stock price. Basically, managers are aware of the fact that the stock price will drop by issuing equity. However, they are still willing to make use of equity in order to avoid the disciplinary effects of leverage.\textsuperscript{209} Among others, empirical studies of Novas and Zingales (1995), Jung et al. (1996), Berkowitz et al. (2000), De Jong and Veld (2001), Kayhan (2003), Brown et al. (2006), Dittmar and Mahrt-Smith (2007), Harford et al. (2008), Zhang (2009) and D’Mello and Miranda (2010) all provide empirical support for the relevance of the free cash flow hypothesis, showing that cash proceeds trigger self-interest investments by managers and that these effects are indeed related to a firm’s capital structure choice.

2.3.1.2 Over- and Underinvestment

Due to the fact that prior research has found a significant linkage between investment expenditure of a firm and its cash flow\textsuperscript{210}, a detailed explanation of this positive relationship will be provided. Investment expenditure mainly derives from the use of retained capital, which is generally unconstrained.\textsuperscript{211} Hence, Stulz (1990) and Lang et al. (1995) have examined that self-interested managers will tend to retain


\textsuperscript{207} Berger et al. (1997) basically test three different hypotheses. They tested whether managers (i) choose to underlever due to risk aversion, (ii) try to overlever to increase voting power of their equity stakes and minimize takeover threats or (iii) overlever to signal restructurings in order to decrease the likelihood of hostile takeovers. Strongest support has been found for the first hypothesis (pp.1419-1436).

\textsuperscript{208} Here, typical debt-issuing firms are characterized by low leverage and high tax payments.

\textsuperscript{209} See Jung et al. (1996), pp.169.


\textsuperscript{211} See Bates (2005), p.109.
sale proceeds. These proceeds can be used by managers in order (i) to maintain firm size, (ii) to invest in manager-specific projects or (iii) to diversify the firm's operations and minimize the risk of their undiversifiable human capital, leading ultimately to an overinvestment of free cash flow. The linkage between free cash flow and overinvestment can be mainly accounted by the existing agency problems, where managers spend the free cash flow not in the interest of the shareholders. "When managers' objectives differ from those of shareholders, the presence of internally generated cash flow in excess of that required to maintain existing assets in place and finance new positive NPV projects creates the potential for those funds to be squandered." 

Empirical evidence supports the quote by Richardson (2006). For example, Harford (1999) as well as Opler et al. (1999) both empirically prove that benefits associated with free cash proceeds particularly accrue to the provision of internal capital for successive investments. In specific, Harford (1999) provides evidence that cash rich firms are more apt to engage in acquisitions rather than distributing it to shareholders. These firms are characterized by greater agency-conflicts between owners and managers. Specifically, Harford (1999) tests 487 takeover bids and finds a consistent pattern in which cash rich firms engage more in large acquisitions that destroy value, relative to the acquisitions made by firms with normal level of cash. 

Opler et al. (1999) also find that firms with higher cash flows do indeed engage in higher capital expenditures and spend more on acquisitions, independent of the value of the firm's growth opportunities.

Analysing the allocation of cash proceeds on a sample of 400 subsidiary sales from 1990 to 1998, Bates (2005) finds that firms with large retained earnings systematically overinvest, relative to industry benchmark. Richardson (2006) uses an accounting-based framework to determine overinvestment and cash flow and finds that firms with the highest levels of free cash flow do engage more heavily in overin-

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216 See Opler et al. (1999), pp.32.
217 See Bates (2005), pp. 111.
vestments. Specifically, he found that during the period 1988-2002, “the average firm over-invested 20 percent of its available free cash flow.”218

An additional proof of the overinvestment of free cash flow is the analysis by Blanchard et al. (1994) and Harford and Hanshalter (2003). Blanchard et al. (1994) examines eleven firms that obtained large cash litigation awards. They find that retaining firms utilized the cash proceeds in order to conduct diversifying acquisitions as well as frequently increasing managerial remuneration.219 Harford and Hanshalter (2003) find a positive correlation between overinvestment and free cash flow by testing 34 firms in the oil and gas industry during the Persian Gulf Crisis. They show that a sudden increase in cash flow triggers a considerable rise in investment activity for firms in this industry.220

The empirical evidence mentioned above all share the same intuition of management’s behaviour in regard to excess free cash flow. When cash flow is abundant, managers are inclined to invest in negative NPV projects due to self-interest reasons, instead of paying it out to the shareholders. Consequently, cash that is left over after all positive NPV projects have been exhausted, ultimately leads to overinvestment. As mentioned above, Myers (1977), Jensen (1986) and Stulz (1990), among others, claim that a potential solution to the overinvestment problem is the excessive use of debt financing.221

A recent study of D’Mello and Miranda (2010) provide a direct test of the overinvestment hypothesis by analysing the pattern of abnormal investments around a new debt offering by unlevered companies. Examining 366 debt offers by unlevered firms between the years 1968 and 2001, they find empirical support that issuing debt does indeed attenuate managers’ propensity to engage in overinvestment activities.222 More specifically, their results can be summarized as follows: First, they show that managers of unlevered firms maintain a relatively high level of cash, compared to

219 See Blanchard et al. (1994, pp. 347.
221 In a recent study by Florackis and Ozkan (2009), they analyze the impact of managerial entrenchment on agency costs using UK panel data. In essence, the authors find out that debt, in specific short-term debt, and dividend payments serve as perfect tools to attenuate the agency conflict (pp.507).
firms with high level of leverage. Second, leverage increase leads to a reduction in overinvestment and as well as to a reduction in the cash ratio. Third, the decline in overinvestment is mainly driven by debt service obligations. Fourth, for firms that are exposed to overinvestment issues, introducing debt does not entirely eliminate excess capital expenditures, but alleviates it. Fifth, a mitigation of the overinvestment problem leads ultimately to an increase in equity market values. Taken together, D’Mello and Miranda (2010) have empirically proven that leverage does indeed execute a critical disciplinary effect on managers’ business behaviour.223

Another reason why managers might engage in aggressive overinvestment is that they are doomed to be overconfident.224 Even if managers act in the interests of shareholders, managers might commit mistakes due to their optimistic attitude. In specific, managers are blinded from reality and are overconfident about a firm’s growth opportunity which in the end is worse than anticipated. Furthermore, overconfident managers might continue to invest in projects that should be terminated due to bad performance.225

While the previous academic studies covered the overinvestment problem, Stulz (1990) shows in his model that the agency conflict between managers and owners in the firm not only leads to overinvestment of free cash flow, but also sometimes to underinvestment.226 Specifically, when free cash flow is not sufficient in order to take advantage of all NPV projects, the informational asymmetry between managers and shareholders ultimately lead to sub-optimal investments. The cost of the under-investment is equal to the net present value of the profitable investments that have not been undertaken by management.227 Due to the fact that the owners are unable to fairly value the different investment opportunities, “shareholders never believe management’s assertion that cash flow is too low, because management always benefits from increasing

223 See D’Mello and Miranda (2010), pp.324.
224 Chapter 3.4.2.1 of this dissertation deals with the issue of overconfidence on the capital structure decision of firms in depth.
226 See Stulz (1990), p. 3.
Consequently, management is not able to optimally invest in all the different valuable projects, implying that the firm underinvests. The paper of Stulz (1990) perfectly illustrates that managerial discretion comes at two costs. An overinvestment cost that occurs due to the circumstance that management often engage in self-interesting investments and an underinvestment cost derived from management’s lack of credibility when arguing that it is unable to fund positive NPV with the available internal funds.

According to Stulz (1990) the issue of over- as well as underinvestment of the free cash flow leads to lower firm value, which is especially large for firms with volatile cash flows. Referring to the over- and underinvestment issue, shareholders face a dilemma. On the one hand, overinvestment costs might be mitigated when the firm makes use of leverage. Here, managers are forced to pay out all the accrued cash flows to service the debt payment, hindering managers to overinvest the free cash flow. On the other hand, a debt issue might even exacerbate the underinvestment costs, since managers do not have sufficient funds to invest in valuable projects. In contrast, an equity issue would ultimately reduce the underinvestment costs due to the sufficient funds managers have, but worsens the overinvestment cost. Stulz (1990) proposes an optimal capital structure by claiming that a firm needs to trade-off the benefits of debt financing (decrease of overinvestment costs) against the costs of leverage (increase in underinvestment costs).

To sum up, ignoring the underinvestment issue, leverage should be used in order to mitigate the overinvestment problem. However, it should be noted that not all forms of debt are equally likely to curtail overinvestment. For example, in case of short-term debt, management needs to frequently face the scrutiny of the capital markets in order to refinance principal. However, this type of debt enables managers to positively signal firm quality by increasing the information exchange between

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228 Stulz (1990), p. 4.
229 See Stulz (1990), pp. 21-23.
230 Two recent studies of Lyandres and Zhdanov (2006) as well as of Sarkar (2007) have shown that part of the agency costs deriving from under- and overinvestment can be curtailed if part of the investment is financed through new debt issue upon investment.
232 See Harvey et al. (2004), pp. 5-6.
management and external capital markets.\textsuperscript{233} Conversely, in less-developed capital markets, short-term debt is less likely to dampen overinvestment due to the fact that in these emerging markets family groups often have control over banks and use them for their own purposes.\textsuperscript{234}

2.3.1.3 Managerial Consumption

In their seminal paper, \textit{Jensen and Meckling} (1976) examine the nature of the agency costs incurred by the existence of debt and outside equity. The quote of Adam Smith in the beginning of Chapter 2.3 perfectly shows that the origin of any agency conflict derives from the separation of ownership and control. The quote illustrates that the interests of well-informed managers and poor informed shareholders diverge and hence manages try to act in their interest in order to maximize their personal wealth, leading to a decrease in equity value. This egoistic behaviour triggers agency costs of outside equity.

\textit{Jensen and Meckling} (1976) examine the impact of equity on agency costs by comparing the behaviour of a manager being the sole owner to his behaviour when he sells equity claim on the firm to outsiders. In the case that the manager owns 100 percent of the firm, the manager will conduct business in a way that will maximize firm value.\textsuperscript{235} By doing so the manager strives to generate utility from pecuniary as well as non-pecuniary aspects. The optimum balance between the diverse pecuniary and non-pecuniary benefits will be obtained when “the marginal utility derived from an additional dollar of expenditure (measured net of any productive effects) is equal for each non-pecuniary item and equal to the marginal utility derived from an additional dollar of after tax purchasing power (wealth).”\textsuperscript{236}


\textsuperscript{234} See La Porta et al. (2002).

\textsuperscript{235} "If a wholly owned firm is managed by the owner, he will make operating decisions which maximizes his utility." (Jensen and Meckling (1976), p. 312).

\textsuperscript{236} Jensen and Meckling (1976), p.312.
However, when selling equity claim to outside shareholders, agency costs occur by the divergence between the interest of the manager and the shareholder, due to the fact that the manager will then only bear a small amount of the costs of any non-pecuniary benefits that he will reap in order to maximize his own utility. Consequently, it is assumed that managers will make use of the limited resources of the firm in order to engage in “perk consumption”. If the manager owns only 95 percent of the stock, he will expend resources to the point where the marginal utility derived from a dollar’s expenditure of the firm’s resources on such items equals the marginal utility of an additional 95 cents in general purchasing power (i.e., his share of the wealth reduction) and not one dollar.

In order to curtail such egoistic behaviour, shareholders impose controlling as well as monitoring activities, whose costs will increase linearly with a decrease in the manager’s ownership claim of the firm. Prospective shareholders anticipate the potential interest divergence between managers and themselves and thus will incorporate the costs of these divergence as well as the costs of the necessary disciplinary mechanisms, such as monitoring, in the price of the stock they are willing to pay.

Though, the threat for shareholders that managers will expropriate firm’s resources in order to engage in perquisite consumption is only half the story that has a detrimental impact on shareholder value. Jensen and Meckling (1976) point to another important conflict that might arise when manager’s ownership claim decreases. Basically, manager’s effort and devotion to the company’s prosperity falls in line with a decrease in manager’s ownership claim. Instead of finding new profitable ventures for the company, managers might be discouraged to engage in work-intensive projects, which might be beneficial for the firm as a whole. Avoidance of such effort and devotion to the job per se can culminate in a substantially lower firm value than it otherwise could be. Hence, the consumption thesis by Jensen and Meckling (1976) ultimately leads to the conclusion that management needs to hold a significant proportion on the firm in order to reduce the prevalent agency costs. Thus, the value of

237 For instance, corporate jets and huge offices with expensive art.
239 See Jensen and Meckling (1976), p.313.
240 For a detailed examination on equity issues and the agency costs of free cash flow, see Mann and Siegharman (1991).
241 See Jensen and Meckling (1976), pp.352.
a firm is based on the fraction of shares owned by managers. The greater the manager’s ownership claim, the greater the value of the corporation.

The issue of prerequisite consumption is and remains a controversial as well as an important topic in academic discourse. Because of the relevance of this issue, the Securities and Exchange Commission (SEC) even altered the rule in 2006 in order to lower the threshold of perk disclosure to improve the transparency of prerequisite consumption. Consequently, a larger amount of perk consumption has been disclosed after the rule has been changed by the SEC.

Recent studies of Yermack (2006) and Rajan and Wulf (2006) study the impact of any perk announcement on the stock market and finds that an announcement of a manager's first prerequisite consumption triggers a negative stock market reaction. These results show that the market conceives the announcement of perk consumption as a revelation of agency problems. However, the author fails to find a link between prerequisite consumption and agency problems.

Chen et al. (2009) fill the gap of Yermack (2006) and Rajan and Wulf (2006) by showing that perk consumption is more apparent when agency problems are severe. Specifically, they find that the stock price will drop by approximately 2.1 percent around the announcement of a descendent Chief Executive Officer's (CEO’s) initial prerequisite consumption.

2.3.2 Agency Conflict between Equityholders and Debtholders

Due to the fact that equityholders only hold a residual claim to the firm’s earnings, they take on an agent role vis-à-vis the debtholders. Accordingly, shareholders

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242 Before the year 2006, managers were obliged to disclose any perk consumption if the costs exceed 10 percent of the manager’s salary plus bonus or $50,000. After 2006, the threshold has been lowered to $10,000.
243 See Grinstein et al. (2008) for an overview of different perk disclosures since 2006.
244 Rajan and Wulf (2006) find that prerequisite consumption is encouraged in order to improve managerial productivity by corporations, which are headquartered in countries with low population and/or poor infrastructure. As in the study by Yermack (2006), they do not find any association with perk consumption to the different measures of agency problems.
245 See Chen et al. (2009), pp. 12.
might act detrimental to the debtholders, either leading to a problem of asset substitution/risk-shifting\textsuperscript{246}, underinvestment\textsuperscript{247} and/or reputational concerns\textsuperscript{248}.

2.3.2.1 Asset Substitution/Risk-Shifting

In case of asset substitution, shareholders extract value from debtholders by shifting risk from equityholders to debtholders for which the latter have not been compensated in advance.\textsuperscript{249}

The asset substitution issue can be easily explained by an options framework developed by Black and Scholes (1973). According to Jensen and Meckling (1976), equity can be conceived as a call option on the firm, whose value ultimately increases with the volatility of the underlying asset. Consequently, equityholders have the incentive to shift the firm’s investments into high risk projects, implying higher volatility and hence, higher value. In their seminal paper, Jensen and Meckling (1976) explain the asset substitution problem by providing an example of an unlevered firm, which faces two mutually exclusive investment opportunities, I\textsubscript{1} and I\textsubscript{2}. The two investments are both exposed to the same initial costs and yield random payoff streams with the same expected market values. All else being equal, the investments differ only in the variances of the payoff streams, \(\sigma_{I_1}^2 < \sigma_{I_2}^2\). If the manager of the unlevered firm first decides to issue debt in order to finance one of the investments and then decides which investment opportunity to take, the opportunity to extract value from the debtholders is apparent. Applying the Black and Scholes formula, the value of debt and equity can be easily determined since the total value of the firm is independent of the investment choice.\textsuperscript{250} Here, the levered equity can be regarded as a European call option, whose value increases with the variance of the payoff streams. Due to the fact that \(\sigma_{I_1}^2\) is lower than \(\sigma_{I_2}^2\), an investment in the low-risk project I\textsubscript{1} would ultimately lead to a lower equity value and higher debt value than investing in I\textsubscript{2}. Consequently, the manager could extract value from the debtholders.

\begin{footnotesize}
\textsuperscript{246} See Jensen and Meckling (1976).
\textsuperscript{247} See Myer (1977).
\textsuperscript{248} See Diamond (1989).
\textsuperscript{249} See Jensen and Meckling (1976), p.335.
\textsuperscript{250} See Jensen and Meckling (1976), p.335.
\end{footnotesize}
by pretending to invest in project $I_1$, sell the debt at a higher value, and subsequently invest in project $I_2$.251

The theory of Jensen and Meckling (1976) assumes that agency cost of debt rises monotonically with the level of leverage. In contrast to their theory, Gavish and Kalay (1983) also examine the relationship between debt and the asset substitution problem and find that the equityholders’ risk shifting incentive does not necessarily rise with an increase in leverage.252

However, Green and Talmon (1986) reconsider the problem of Gavish and Kalay (1983) and find evidence in support of Jensen and Meckling (1976). Basically, their study claims that the results of Gavish and Kalay (1983) are a misinterpretation and that a rise in leverage indeed aggravates equityholders’ incentive to shift risk.253

In order to counterattack such behaviour, debtholders demand a higher coupon rate. Leland and Toft (1996) for instance demonstrate that short-term debt diminishes the incentives for equityholders to raise firm risk. Hence, introducing short-term debt may reduce or even eliminate the agency costs of asset substitution.254 In practice, however, Graham and Harvey (2001) find only weak evidence that managers explicitly issue short-term debt in order to alleviate the asset substitution problem.255

Green (1984) finds another way to prevent equityholders from engaging in asset substitution by making use of convertible debt.256 However, as the study of Hennessy and Tserukевич (2008) has shown, convertible debt fails to eliminate the cost of asset substitution due to the undeniable fact that equity is risk-seeking when bankruptcy is apparent.257 Furthermore, the study survey of Graham and Harvey (2001) also lacks evidence that firms make use of convertible debt in order to reduce the asset substi-

252 In specific, Gavish and Kalay (1983) postulate: “Thus, we conclude that stockholders’ incentive to increase the investment’s risk is not an increasing function of the leverage ratio. Thus, stockholders who control firms with a high leverage ratio are less likely to choose high risk projects with negative net present value” (p.12) and, “Thus, for a given investment set, at least this part of the agency costs of debt, suggested by Jensen and Meckling, is not increasing monotonically with the leverage ratio.” (p.29).
254 Also see Barnea et al. (1980) and Barday and Smith (1995)
ution problem. A recent study by Vanden (2009), however, fills this void by providing evidence that structured finance serves perfectly to attenuate the asset substitution problem. "Structuring induces the firm’s owner to optimally choose the first best operating strategy even though the owner’s value function might be locally convex (concave), which would ordinarily lead to overinvestment (underinvestment) in risky projects."

2.3.2.2 Underinvestment

Although limited liability contains a number of economic benefits, it also comes at a detrimental cost. "By creating an asymmetry between the costs and benefits of risky activities, limited liability causes bondholders and shareholders to have incompatible incentives whenever the corporation’s debt is subject to the risk of bankruptcy." The quote of Garven and MacMinn (1993) perfectly paraphrases the quintessence of the underinvestment problem, which has been first discussed by Myers (1977). Generally, shareholders might be willing to forgo certain positive NPV investments when the firm is highly indebted. This behaviour can be explained by the fact that equityholders need to bear the full costs of any project, but capture only part of the net benefits. Hence, underinvestment in positive NPV projects arises. Myers (1977) regards the presence of "risky" leverage, characterized by a lower market value than the nominal value, as the core reason why managers often engage in inefficient investment strategies.

Myers’ (1977) concept is based on the premise of a “going-concern” business. In other words, the author describes a firm which has the ability to continue functioning as a business entity and whose firm value is derived from existing assets and future assets (growth opportunities). The value of the growth opportunities is based

258 See Graham and Harvey (2001), p. 221.
263 Myers (1977) shows that when the market value of debt equals its nominal value (safe debt) underinvestment problems do not exist, since managers would not find it beneficial to adopt underinvestment strategies, which are favoured by the shareholders.
on the expected cash flow and especially on the manager’s discretion to take advantage of them. The way the existing assets are financed, (i.e. how firm’s capital structure is chosen) has an immense impact on the ability to create and conduct growth opportunities.

As a general rule, managers should take advantage of all investment options as long as they have a positive NPV in order to increase firm value. However, Myers (1977) shows that in the presence of “risky” debt, managers, acting in the interest of the equityholders, often do not abide to this general rule mentioned above. Due to the limited liability of bondholders, shareholders are discouraged to finance projects, hence incurring the costs that would mostly be beneficial for the bondholders. The benefits for the debtholders occur through the rise of the debt’s market value up to the corresponding nominal value, given that the NPV of the project is positive. The shareholders do not reap any benefits from that, but rather bear the full costs of the risky project. Consequently, corporations with large leverage are discouraged to finance positive NPV investment projects, thus losing growth opportunities and, in the long run, firm value. In other words, when the firm increases its level of leverage, equityholders have the incentive to underinvest in positive NPV investments. Myers (1977) suggests that firms should limit leverage, or use short-term debt, in order to mitigate the underinvestment costs.

2.3.2.3 Interaction of Asset Substitution and Underinvestment

The following chapter provides a unified analysis accounting for both the asset substitution and underinvestment debt agency problem. As has been discussed above, the higher the amount of leverage, the more severe the asset substitution problem and underinvestment issue becomes. Rational bondholders are aware of

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264 Myers (1977) compares the growth opportunities with call options, implying that the value of the firm is partially derived from the company’s investment choices.

265 For example, if the firm has used too much leverage in order to finance its assets in place, managers could now be unwilling to invest in positive NPV projects, since they will not be better off when doing so.

266 See Myers (1977), pp.130.

267 Bodie and Taggart (1978) find that manager’s willingness to forego positive NPV projects increases with the amount of leverage as well as the probability of financial default.
equityholder’s behaviour and hence demand a higher rate of return. Thus, the costs of debt agency problems entirely accrue to the equityholders through increased cost of debt financing. The consequence that more leverage exacerbates the debt agency problem mainly derives from the fact that both the risk-shifting as well as the underinvestment problem are analysed in isolation.

The impact of a potential interaction between the asset substitution and underinvestment problem on the firm’s capital structure has already been noticed by Myers (1977). He suggests that the underinvestment problem might be alleviated by equityholder’s willingness to engage in asset substitution, if investment raises the variance of project return. “The impact of risky debt on the market value of the firm is less for firms holding investment options on assets that are risky relative to the firm’s present assets. In this sense we may observe risky firms borrowing more than safe ones.”

The quote suggests that the optimal level of leverage is positively related to the business risk a firm faces. While Long and Malitz (1985) find evidence for Myers’ argument, others, such as Bradley et al. (1984) and Titman and Wessels (1988) find the opposite to be true. They claim that the optimal debt level is negatively related to the business risk.

Mao (2003) also examines the interaction of debt agency problems and claims that all previous studies (e.g. Myers, 1977; Long and Malitz, 1985; Bradley et al., 1984; Titman and Wessels, 1988) have one common mistake in their analysis and therefore do not find significant evidence for the interaction between risk-shifting and underinvestment problems. Not the volatility per se, but the marginal volatility of investments mitigates the agency problem of underinvestment. “Although risk-shifting firms may have high volatility in project cash flows, firms with high volatility need not have a high risk-shifting incentive.” Specifically, Mao (2003) finds that for high growth firms the optimal debt level rises with the magnitude of the marginal volatility of investment and vice versa. For firms with little growth opportunities, the optimal level of debt falls with the magnitude of the marginal volatility of investment.

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270 See Mao (2003), pp. 403.
The study of Mao (2003) has demonstrated that risk-shifting by equityholders will ultimately diminish the underinvestment problem, given that high business risk is prevalent. However, when considering the risk-shifting and underinvestment issue in isolation, the agency costs exacerbate with an increase in leverage. However, the interaction of these debt agency problems has shown that this argument is not true anymore. Rather, the total agency costs of debt do not uniformly rise with leverage.

The discussion above has shown that asset substitution and underinvestment are two important agency problems in theory. In reality however, managers do not pay much attention to this issue. A survey by Graham and Harvey (2001) shows that managers do not really consider the asset substitution as well as the underinvestment problem when making investment and financing decisions. Specifically, they find only little evidence that managers try to proactively impose mechanisms in order to minimize the problem of asset substitution and underinvestment.

2.3.2.4 Reputation

A factor that might mitigate the debt agency costs is the reputation of the corporation, as well as the personal reputation of the managers. According to Wiedmann and Baez (2005) good corporate reputation enables firms to hire good employees, attract consumers, build up loyalty and have better access to the capital market. Dealing with corporate reputation, Diamond (1989) claims that firms try to maintain or establish a good reputation by choosing secure projects with low business risk, thereby mitigating the agency costs of leverage derived from decisions on overinvestment. Further, a good reputation entails better access to the debt mar-

272 Ju and Ou-Yang (2006a) also find only little evidence that executives pay much attention to the debt agency problems when determining its capital structure.
273 John and Nachman (1985), Diamond (1989) and Hirshleifer and Thakor (1992), among others, deal with the reputation effects on a firm’s capital structure decision.
274 For a detailed analysis of the importance of corporate reputation, see Argenti and Druckenmiller (2004) and Wiedmann and Baez (2005).
ket.\textsuperscript{275} In a dynamic setting, he shows that firms will prefer low risk projects instead of risky ones in order to establish a reputation and diminish the agency costs of debt.

In essence, borrowers characterized by an excellent reputation are able to circumvent the adverse selection problem of being pooled with other (riskier) borrowers, leading to lower debt financing costs. Due to lower debt costs, firms attempt to maintain or establish a good reputation. Johnson (1998) shows that a good reputation indeed alleviates adverse selection and moral hazard problems, making costly monitoring irrelevant. Furthermore, the author claims that firms should restrain from increasing their debt ratio, since too much debt might negatively impact their reputation.\textsuperscript{276}

While the study of Johnson (1998) deals with the corporate reputation, Hirschleifer and Thakor (1992) focus on the manager’s personal reputation. In specific, they examine how the success or failure of an investment might influence the reputation of the manager. Thus, in order to avoid investments that might negatively influence manager’s reputation, in case of failure or unsuccessfulness, managers tend to have a bias towards safer investments.\textsuperscript{277} This “safety bias” diminishes in turn the agency cost of debt. Thus, higher management reputation implicates for the firm to tackle safer investments and hence face lower agency costs. The model of Hirschleifer and Thakor (1992) proclaims that managers concerned with their personal reputational effects tend to employ a higher debt-equity ratio.\textsuperscript{278} In the words of the two authors: ‘We show that the incentive for managers to build their reputations distorts firms’ investment policies in favour of relatively safe projects, thereby aligning managers’ interests with those of bondholders, even though managers are hired and fired by shareholders. This effect opposes the familiar agency problem of risky debt that is imperfectly covenant-protected, wherein shareholders are tempted to favour excessively risky projects in order to expropriate bondholders. Consequently, when manage-

\textsuperscript{275} See Diamond (1989), pp.828.
\textsuperscript{276} See Johnson (1998), pp.51.
\textsuperscript{277} A conflict of interest between managers and shareholders exist due to the fact that only managers risk their reputation. The shareholders demand a maximization of the shareholder value and therefore often favor risky investments, which in turn are associated with higher expected returns. However, since shareholders do not risk their reputation, managers rather favor safer investments to protect their personal reputation, which is an important feature of the manager.
\textsuperscript{278} See Hirschleifer and Thakor (1992), pp.457.
rial concern for reputation results in conservatism, it can actually make shareholders better off ex ante by allowing the firm to issue more debt.“279

Dodonova and Khoroshilov (2006) develop a model similar to Hirshleifer and Thakor (1992) in order to find that manager’s reputational concern does have an influence on the investment decision of firms. Specifically, they find that managers prefer safer projects in order to avoid failure and hence to maintain their reputation. This ultimately leads to the fact that managers with reputational concerns, do engage in more leverage, as has been shown by Hirshleifer and Thakor (1992).280

The study of Diamond (1989) and Hirshleifer and Thakor (1992) have shown that reputational concerns do have an impact on the investment and capital structure decisions. Scharfstein and Stein (1990) for instance find evidence that managers often imitate the decisions of other managers in their financing decisions due to their reputational concerns.281 Furthermore, Gibbons and Murphy (1992) provide evidence that especially young managers are concerned with their reputation and hence it can be argued that firms with younger managers do engage more often in safer projects than those with mature managers.282 Finally, Hirshleifer (1993) shows that managers use investment choices as a tool for creating their personal reputations or the reputation of their companies. Specifically, he shows that reputation-building can force management to behave more in the interest of creditors, instead of just equityholders. This might ultimately lead to a decrease in the investment inefficiencies associated with asset substitution.283

2.3.3 Agency Costs and the Trade-Off Theory

Referring to the benefits of debt, one can conclude that firms are supposed to make use of leverage in order to gain from the tax shield as well as to mitigate the

281 Also see Ottaviani and Sorensen (2000).
282 See Gibbons and Murphy (1992), pp.468.
agency conflicts between equityholders and managers and to enhance performance by inducing increased monitoring from lenders.\footnote{See Gul and Tsui (2001), pp.71.} These benefits of leverage are interwoven and enable firms to minimise other costs. For instance, when leverage triggers favourable incentive effects, as mentioned above, it may be redundant to discipline managers by forcing them to carry larger stakes in the company. Agrawal and Nagarajan (1990) provide evidence for this argument by showing that all-equity firms exhibit greater level of managerial equity holding than similar levered firms. This finding is consistent with the view that large equity stake provides sufficient incentive for the managers, implying that an increase in the debt level becomes unnecessary.\footnote{Besides that, Agrawal and Nagarajan (1990) also find that “there is significantly greater family involvement in the corporate operations of all-equity firms than in levered firms, managerial ownership in all-equity firms is positively related to the extent of family involvement and all-equity firms are characterized by greater liquidity positions than levered firms” (p.1330).} The usage of managerial equity stake as an incentive device may ultimately culminate in entrenchment problems, since voting and takeover mechanism are doomed to failure when managers own the controlling interest in the firm.\footnote{See Lasfer (1995), p.270.}

It should be noted that firms are likely to implement all the mechanisms, mentioned above, optimally and not exclusively. For instance, managers are trying to positively signal to the capital market their quality by raising their leverage, while maintaining their equity holdings in their firms. In this case, Agrawal and Madelker (1987) show that a positive correlation between the company’s leverage and managerial equity ownership exists. Moreover, firms are not expected to base their capital structure solely on leverage, since it also entails massive costs. Too much leverage may become suboptimal for the firm, since it may lead to a substantial rise in the firm’s default risk and it may impair agency problems such as asset substitution, risk shifting and underinvestment. Due to the benefits as well as costs of leverage, managers must choose the optimal debt-equity ratio in order to maximise tax shields, and at the same time reduce the bankruptcy costs as well as the total agency costs in the firm. Consequently, Equation 2.9 in Chapter 2.2.1 can now be adjusted in order to incorporate the agency costs and agency benefits of debt financing.
\( V_L = V_0 + PV(\text{Interest Tax Shield}) - PV(\text{Bankruptcy Cost}) - PV(\text{Agency Cost of Debt}) + PV(\text{Agency Benefit of Debt}) \)  
(2.10)

2.3.4 Ways to Eliminate Agency Conflicts

The previous chapters have well documented, that agency conflicts between different stakeholders are prevalent in many situations. In order to mitigate these detrimental conflicts, internal as well as external measures can be utilized. The most internal approach for restricting managerial discretion is the usage of leverage. Instead of wasting the free cash flow, managers are obliged to meet interest payments and debt amortisation, thereby mitigating managerial discretion. Here, agency problems of leverage financing can be curtailed by the use of debt covenants, mezzanine instruments and collaterals.

Another internal disciplining effect can be achieved through the usage of dividend payouts, emphasized by Easterbrook (1984). He explains why firms simultaneously pay out dividends and approach the capital market to raise new liquidity. “...dividends may keep firms in the capital market, where monitoring of managers is available at a lower cost, and may be useful in adjusting the level of risk taken by managers and the different classes of investors.” This process, in turn, forces the firm to reliably signal the profitability of the projects.

While debt obligations entail far-reaching implications in comparison to dividend payments, leverage has a stronger disciplinary effect than dividends. In case management fails to meet debt obligations, the firm faces bankruptcy. In contrast, failing to pay out the required dividends does not lead to insolvency, thus having a less disciplinary effect.

290 See Bester (1987), pp.892.
291 See also Rozell (1982), pp.250-252. For a recent study on the agency cost of dividends, see Cohen and Yaglil (2006), pp.180-182.
A third internal instrument to curtail managerial discretion is the implementation of covenants. Costs suffered by the introduction of covenants into financing contracts are regarded as monitoring cost. A case study by DeAngelo et al. (2002) illustrates that covenants do have a strong disciplinary effect on management’s and equityholders’ behaviour.

External measures try to alleviate agency conflicts without directly curbing management’s discretion. Going back to Adam Smith, economists have long disputed that managerial entrenchment applies mostly to firms in non-competitive industries. The famous British economist Sir John Hicks has already claimed in the year 1935 that managers of such firms are inclined to pursue the “quiet life”. Since the notion of the “quiet life” hypothesis, a large number of empirical studies emerged testing the effect of competition on managerial slack.

For example, Fama (1980) shows how efficient labour markets may have a disciplinary effect on management behaviour. Competition from other firms forces managers to avoid wasteful consumption and increase firm value. The threat of insolvency and hence the loss of their job makes managers willingly avoid managerial discretion. Hart (1983) shows that competition in the product market reduces managerial slack in the overall economy. However, a study of Scharfstein (1988) contradicts the results of Hart (1983) and shows that competition per se does not ultimately lead to a reduction in managerial entrenchment; it rather exacerbates the managerial discretion issue. While other studies found ambiguous results about

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293 One of the first to analyse covenants in detail was Smith and Warner (1979). Also see Barclay and Smith (1995), Rajan and Winton (1995) and Gilson and Warner (1998).
295 In specific, DeAngelo et al. (2002) conduct a case study of L.A. Gears in the US and show that debt covenants are perfect instruments to curtail managerial slack. The authors also show that this instrument serves even better than the pressure to meet cash interest obligations as suggested by Jensen (1986).
296 “The best of all monopoly profits is a quiet life”. See Hicks (1935), p.8. In a similar vein, Smith (1776, p.91) argued: “Monopoly, besides, is a great enemy to good management.”
297 See Chapter 3.1 of this dissertation for further information.
299 Specifically Hart (1983) demonstrates that competition will mitigate managerial discretion when firm’s environments are correlated, but not if they are independent. See Hart (1983), p. 376-378.
300 The divergence in outcome of the two studies results in the different assumptions made by Scharfstein (1986). In specific, in his study the compensation scheme plays a significant role in the outcome of his study. See Scharfstein (1988), pp.149-151.
the impact of competition on managerial slack\textsuperscript{301}, Holmström and Tirole (1989) conclude: “...apparently, the simple idea that product market competition reduces slack is not as easy to formalize as one might think.”\textsuperscript{302}

The same applies to the threat of takeovers, which might have the same consequences for the existing management as bankruptcy.\textsuperscript{303} Jensen and Ruback (1983), Kini et al. (2004) and Scholten (2005) provide empirical evidence that corporate takeovers act perfectly as a disciplinary measure.\textsuperscript{304} Recent studies by Bertrand and Mullainathan (2003), Qiu and Yu (2009) and Giroud and Mueller (2010) have found that an active takeover market alleviates the managerial entrenchment problem and raises managerial career concern.\textsuperscript{305} In case disciplinary takeovers decline, alternative monitoring mechanisms such as active boards can act as disciplinary mechanisms in order to replace poorly performing managers.\textsuperscript{306} Kaplan (1994) as well as Kang and Shirasaki (1997) analyse the Japanese market and find strong evidence in favour of such a substitution. Further, they find that especially large blockholders, as well as banks monitor management in order to eliminate managerial discretion.

Both direct and indirect measures have shown that the agency conflict between the different stakeholders can be mitigated. However, all the instruments, with the exception of the disciplinary hypothesis of Jensen (1986) and Zweibel (1996), fail to determine an optimal capital structure.

\textsuperscript{301} See Hermelin (1992) and Schmidt (1997).
\textsuperscript{302} Holmström and Tirole (1989), p. 76.
\textsuperscript{303} Chapter 3.2 deals in depth with the impact of corporate control on capital structure decisions of firms.
\textsuperscript{304} The impact of anti-takeover mechanisms on capital structure decision and managerial behaviour can be found in Garvey and Hanka (1999). They find that unprotected firms make use of extensive leverage in order to avoid a hostile takeover, as suggested by Novaes and Zingales (1995) and Zweibel (1996). However, if companies are protected by anti-takeover laws, firms make use of less leverage. See Garvey and Hanka (1999), pp. 522.
\textsuperscript{305} In specific, Giroud and Mueller (2010) tested 30 business combination laws passed between the years 1985 and 1991 on a state-by-state basis. In essence, they found out that the threat of a hostile takeover indeed led to the finding that managerial entrenchment was reduced (pp.314-328).
\textsuperscript{306} Fama and Jensen (1983) deal with monitoring by the board of directors in general and show that they do have a strong disciplinary effect on management. (pp.313-315). Also see Denis and Kruse (2000).
2.3 Capital Structure Based on Agency Theory

2.3.5 Empirical Evidence

Referring to the agency conflict between shareholders and debtholders, the results whether agency costs have an impact on the capital structure has been rather mixed.

On the one hand, Leland (1998) and Parrino and Weisbach (1999) have empirically shown that the agency costs deriving from the conflict between shareholders and debtholders only have a marginal impact on the corporate leverage decision. Furthermore, in comparison to the agency costs resulting from the conflict between managers and shareholders, Childs and Mauer (2008) show that the stockholder-bondholder conflict is negligible when dealing with the capital structure decision.307

On the other hand, Ericsson (2000) and Childs et al. (2005) as well as suggest that the shareholder-debtholder conflict may have an economically as well as materially important impact on the corporation’s joint decision of leverage and debt maturity structure.308

Next, the economic significance of the shareholder-owner conflict on the capital structure decision will be investigated. Morellec (2004) creates a model in which the manager possesses control rights over investment as well as financing decisions. Basically, the manager obtains utility from engaging in investments (i.e., empire building). As has been suggested above, leverage could be utilized in order to mitigate wasteful investments (overinvestments), but Morellec (2004) finds that manager-controlled corporations make use of less leverage than would be selected under equity value maximization.309

Parrino et al. (2005) study the effects of managerial-risk aversion on the capital structure decision. They find that risk-averse managers will in fact be biased against risky projects, despite the fact that the manager could reap benefits from higher

308 In specific, Childs et al. (2005) empirically prove that the use of short-term debt serves as a good instrument to resolve agency conflicts. However, their result does not ultimately imply that firms should choose a higher initial debt level (pp.677).
309 In specific, Morellec (2004) provides comparative statistics showing that high growth firms tend to employ less debt financing. Furthermore, the author shows that the agency conflict accounts for the low level of debt observed in practice (pp.266).
project risk. Hence, they conclude that investment decisions based on managerial risk aversion are economically and materially more relevant than those culminating from shareholder-debtholder conflicts.\footnote{See Parrino et al. (2005), pp.29.}

\textit{Childs and Maurer (2008)} complement the study of Morellec (2004) and Parrino et al. (2005) by investigating managerial investment choices in a setting where management is able to dynamically control investment risk. In line with the findings of Parrino et al. (2005), Childs and Maurer (2008) agree that the agency costs resulting from manager-shareholder conflict have a bigger impact on the capital structure decisions than those resulting from shareholder-bondholder conflict. Like Morellec (2004), they also find that the investment distortions ultimately lead to a decrease in optimal leverage.\footnote{See Childs and Maurer (2008), pp.20.}

A more recent study of Margaritis and Psillaki (2007, 2010) also find that high agency costs are associated with higher leverage, which ultimately leads to an increase in firm efficiency and performance and thus in corporate value.\footnote{See Margaritis and Psillaki (2010), pp.622-623. A recent study of Thakor (2009) shows that agency costs seem to be irrelevant in the optimal capital structure decision of firms (pp.8).}

Theoretical arguments have shown that managerial entrenchment may have a material impact on firm’s capital structure. Jiraporn and Gloason (2007) as well as John and Littw (2009) provide recent evidence that firms with a higher degree of managerial entrenchment do carry significantly more leverage than equity. Lundstrom (2009) also shows that entrenched managers are not more likely to issue equity and often make use of leverage in order to restrain self-acting behaviour.\footnote{See Lundstrom (2009), pp.163.} However, these arguments fail to determine whether entrenched managers tend to take on too little or too much debt.\footnote{See Jiraporn and Liu (2008) for an overview of this issue.}
2.3.6 Critical Comment

While the other classical capital structure theories so far have focused on the interests of shareholders when engaging in financing decisions, the agency theory fundamentally contributed to the development and progress of the capital structure debate due to the fact that the notion of the agency theory accounts for diverging interests of stakeholders that might impair shareholder value. In contrast to the irrelevance theory of Modigliani and Miller (1958), the agency theory postulates that the capital structure decision of firms is indeed relevant, since conflicts of interest might have detrimental effects on firm value. Thus, firms must carefully decide which capital structure to choose in order to mitigate such agency costs.

The biggest advantage of the agency theory over the other classical capital structure theories is in particular, that it delivers an explanatory contribution to the large number of institutional policies existing in practice. The main purpose of those policies, such as controlling and voting rights or covenants\textsuperscript{315}, is to ameliorate common agency problems between the different market participants.\textsuperscript{316} However, a weakness of the agency theory is that many of the approaches focus on different fractional subjects, leading partially to controversial results, which fails to offer an extensive and complete explanatory contribution to the capital structure decision. In the end, the agency approaches lack to offer marketable capital structure recommendations in practice.

The majority of agency approaches are based on the fact that the shareholders take benefits from their limited liability and exert influence on managements’ behaviour. The creditors, however, bear the default risk and do not participate on the financial success when conducting risky and profitable projects. Since these conflicts of interests between shareholders and bondholders cannot be attenuated without costs, firm value decreases.

\textsuperscript{315} Covenants are binding agreements with lender and creditor to engage or to refrain from specified actions. If such actions are violated by the lender, default on the loan, penalties being applied, or the loan being called might be possible consequences.

\textsuperscript{316} See Douglas (2009) who scrutinizes the interaction between different corporate conflicts (pp.151).
According to the characteristic and effect of the agency conflicts, different and partially controversial assumptions are made. For instance, the conflict of interest between managers and shareholders can be reduced by means of performance-related payment; however, a consistent and valid determination of the performance of managers seems to be vague.\textsuperscript{317} Furthermore, another way to eliminate the egoistic managerial behaviour is the implementation of controlling and disciplinary mechanisms; however, these are costly and a complete control of manager’s behaviour is impossible. Actually, the most disciplinary mechanism to alleviate managerial discretion is the use of debt; however, the detrimental costs of a large debt level seem to differ along the various agency approaches.\textsuperscript{318}

The conflict of interest between shareholders and bondholder results through the limited liability of shareholders on the one hand and the default risk of bondholders on the other hand. While the trade-off theory only examines bankruptcy costs as the most detrimental cost of debt financing, the agency theory goes one step further and tries to find out which repercussions a potential default has on the investment decision of shareholders and management behaviour.\textsuperscript{319} The fear of wealth expropriation that goes hand in hand with the financial impairment of bondholders seems to be a relevant issue in practice that has been empirically proven.\textsuperscript{320} In order to mitigate these agency costs diverse collaterals and covenants, for instance, have been introduced.\textsuperscript{321}

To conclude, the large body of agency approaches have definitively contributed to the capital structure debate. However, this theory still fails to provide a consistent explanatory recommendation on the capital structure decision of firms. In other words, while some approaches postulate that debt financing is a good instrument to eliminate agency conflicts, others show that debt also carries costs.

\textsuperscript{317} See Myers (2001), pp.96.
\textsuperscript{319} See Myers (2001), pp.97.
\textsuperscript{320} For instance, a study of Asquith and Mullins (1986) has shown that bonds without covenants, in which leveraged-buy-outs (LBOs) might lead to a possible wealth transfer, register a drop in value of approximately 5.2 percent compared to bonds with covenants that even increase in value (pp.61). Also see Alexander et al. (2000) on that issue.
\textsuperscript{321} Smith and Warner (1979) provide a detailed analysis how covenants must be included in credit contracts in order to reduce potential agency conflicts (pp.117).
2.4 Capital Structure Based on Asymmetric Information

Thus, so far, firms need to trade-off the debt tax advantage and debt agency advantage with the bankruptcy costs and debt agency costs in order to find an optimal capital structure. In essence, the biggest weakness of the agency theory is the same as for the irrelevance or trade-off theory. These theories so far explain how firms should set their capital structure to maximize shareholder value; however, these results often do not coincide with what firms actually do in practice.

2.4 Capital Structure Based on Asymmetric Information

Throughout this dissertation, we have generally assumed that neither of the different stakeholders do have any informational advantage over the other. However, in practice the notion of symmetric information is at odds. In reality, manager’s information about the future prospect of the firm is likely to be superior to that of outside stakeholders. Hence, asymmetric information between the stakeholders exists. Based on the rationale mentioned above, Chapter 2.4 will provide insights how asymmetric information might encourage managers to alter a firm’s capital structure.322

In frictionless capital markets, companies are always capable of funding positive NPV projects. However, asymmetric information is often considered as a core reason why economic outcomes such as investment decisions could be inefficient and ineffective.323 Even if an agency conflict does not exist, information asymmetry between managers and outsiders enables leverage to increase value, since managers

322 According to Stiglitz (1987, 2000) early contributions to the information issue comprise work of Adam Smith (1776), Simonde de Sismondi (1814), John Stuart Mill (1848), Alfred Marshall (1890) and Max Weber (1925). Berle and Means (1932) were one of the first to specify the asymmetric information as a problem for firm management. However, the core academic work dealing with asymmetric information is Akerlof’s (1970) study of the market for lemons. Based on this seminal work, Spence (1973) and Stiglitz and Rothschild (1976) also came up with important papers dealing with the asymmetric information issue. Due to work on the economic implications of asymmetric information, Akerlof, Spence and Stiglitz were honored with the Nobel Prize in the year 2001.

are able to signal its willingness to pay out cash flows and/or be monitored by lenders.\textsuperscript{324}

2.4.1 Leverage Signalling Models

One way to diminish the negative consequences of asymmetric information deals with financial signalling.\textsuperscript{325} Starting point for each different signalling theory is the assumption that managers and outside investors are characterized by asymmetric information. In comparison to investors, managers possess superior information about the future prospect of the firm. Due to the informational disadvantage, outside investors attempt to draw conclusions about the true quality of a firm from observing changes in the capital structure. From another point of view, managers can credibly convey the quality of a firm to the investor by conducting actions that investors can easily observe and analyse. Due to the immutable fact that penalties for deceiving investors are large\textsuperscript{326}, outside investors will generally trust such actions. One strategy to communicate the quality of a firm to outside investors is to engage in credible signalling actions.\textsuperscript{327} The use of financial instruments, in particular leverage, as a way to signal good quality to investors is known as the signalling theory of debt. The essence behind debt signalling is quite straightforward. By issuing leverage, the firm commits to meet certain interest payments in the future. Breaking this commitment ultimately leads to higher distress costs and bankruptcy risk. Consequently, firms only engage in such a policy unless they can ensure interest payments.

The signalling models of Ross (1977) and Leland and Pyle (1977) have been the first to directly test the impact of debt signalling on the optimal capital structure decision of firms. Thus, the following sections will provide the essentials on the different signalling models that enjoy the most influential impact on the capital structure debate.

\textsuperscript{324} See Flannery (1986), Harvey et al. (2004), Leland and Pyle (1977) and Ross (1977).
\textsuperscript{325} The concept of signalling was first analysed by Akerlof (1970) in the context of product markets.
\textsuperscript{326} The Sarbanes-Oxley Act of the year 2002 has aggravated penalties for fraud on investors with up to ten years of imprisonment.
\textsuperscript{327} It is important to note that signals need to be credible and costly in order to meet the intention of the firm.
2.4.1.1 Ross’ Signalling Model

In Ross’ (1977) model, information asymmetry over the quality of the firm as well as over the true distribution of firm returns exists between managers and outside investors. Due to a lack of information outside investors are unable to distinguish between good quality firms (implying higher expected cash flows) and bad quality firms with relatively low expected cash flows. Only the managers perceive whether or not his firm is good or bad. The consequences of not being able to convey the true quality of the firm is that good firms are undervalued and bad firms are overvalued by the market. In order to avoid this dilemma, managers have an incentive to signal their private information regarding the good quality to the market through the issuance of high amounts of leverage. In contrast, bad firms would favour to conceal their quality amidst the uncertainty.

In general, investors consider high degree of debt levels as a positive signal on the quality of the firm. Due to the fact that firms with lower expected cash flows (bad firms) incur higher marginal expected bankruptcy costs for any debt level, managers of bad firms are not able to imitate the strategy by the good firm by issuing more debt. In other words, managers can signal the good quality of their firm by issuing a sufficiently high amount of leverage.

An important condition of the signalling model of Ross (1977) is that manager’s benefit depends positively solely on the value of the firm’s securities and turns negative if the firm faces bankruptcy. Therefore, managers need to be sensitive when issuing debt in order to signal the market the good quality of the firm. In the case, that a firm goes bankrupt due to an immense degree of debt issue, the manager would monetarily be penalized. The main empirical result is that firm value, debt level and the bankruptcy probability are all positively related.

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328 Firm return distributions follow first order stochastic dominance.
329 See Ross (1977), pp.28.
330 The premise of Ross’ model is that the signalling to outside investors over the quality of a firm can solely be achieved through debt issue. See Ross (1977), pp.31.
331 See Ross (1977), pp.30.
332 While many other authors also confirm a positive relationship between profitability and the degree of leverage (as will be shown below), Chang (1987), applying an agency model, refutes these results.
Regarding the capital structure of a firm, Ross’ model has the following implication: A high degree of leverage conveys a positive signal of the quality of the firm to the market, since investors realize that managers use leverage only if the probability of bankruptcy is low. One criticism of Ross’ model is the fact that it rests on the assumption that management faces a compensation penalty in case of bankruptcy. This feature restricts the generation of many compelling propositions. \(^{333}\)

2.4.1.2 Leland and Pyle’s Signalling Model

_Leland and Pyle (1977)_ also come up with a model in order to test the signalling functioning of a firm, in which the level of insider ownership (and not the degree of leverage as in _Ross_ (1977)) provides the signal of firm quality. In other words, the higher the equity stake of managers in the firm the more investors believe that the firm is in good quality. It is believed that managers who have a large stake in the firm commit themselves to the firm and bear the risk of the firm. If management holds a large stake in the company and even is willing to increase its ownership stake, a positive signal about the quality of the firm’s cash flow and corporate health is provided to the financial market. \(^{334}\) In contrast, if managers only hold a minor equity stake in the company and are even not inclined to increase it, outside investors believe that the firm is facing difficult times and hence a negative signal is send to the market.

In essence, the following linkage to the capital structure decision can be made: The higher the ownership stake of a manager, the more credible and authentic is the positive signal to outside investors. This ultimately leads to the fact that firms with large inside ownership also have a larger degree of leverage. \(^{335}\) In line with the study of _Ross_ (1977), the model by Leland and Pyle also provides a positive relationship between leverage and firm quality (value).

\(^{333}\) See Ross (1977), p.28.
\(^{334}\) See Leland and Pyle (1977), pp.375.
\(^{335}\) See Leland and Pyle (1977), pp.383. Denis et al. (1997) observe that higher ownership of managers in the firm might lead to higher managerial entrenchment. In order to curtail managerial discretion, firms are supposed to issue more debt, as has been discussed in Chapter 2.4.1.
2.4 Capital Structure Based on Asymmetric Information

2.4.1.3 Other Leverage Signalling Models

Another model that applies debt as a credible signalling tool is that of Heinkel (1982), which also finds a positive correlation between the intrinsic value of a firm and the degree of leverage. However, in comparison to Ross’ model, Heinkel’s model does not assume that firm returns follow a first order stochastic dominance and that managers face a bankruptcy penalty. The premise of the model is that information asymmetry revolves around the mean as well as the variance of firm returns.356

The main assumption of the model is basically that more valuable firms are also exposed to more risk, which is also consistent with Ross’ model, implying that good quality firms with higher value face higher likelihood of bankruptcy due to their high degree of leverage. Given this assumption by Heinkel, a costless signalling equilibrium in which a positive relationship between the value of the firm and the degree of leverage exists.357 In a pooling equilibrium, lower value firms (higher quality firms in Heinkel’s model) find their equity overvalued and their debt undervalued and vice versa. Consequently, higher quality firms are inclined to issue more equity, whereas the low quality firms are more attracted to the debt market. To mimic a high value firm, a lower value firm is forced to issue more underpriced leverage and reduce the amount of overpriced equity. The opposite applies when a high value firm wants to imitate a low value firm. Due to the fact that high quality companies also do have higher total value, the result that these firms are inclined to issue more debt is in line with Ross’ model.358

357 Franke (1987) develops a similar model which also ensures costless signalling to the financial markets. Franke (1987) however claims that the conditions under Heinkel (1982) developed his costless-signalling equilibrium are too hard to understand and in reality not very plausible. In Franke’s model, basically two conditions are scrutinized. Under the outsider-rationality condition the price that outsiders are willing to pay for a security is inversely related to the supply of this financial instrument. Here, the outside investors consider the supply as a quality signal. As a consequence, a larger supply of a security is perceived as a lower quality, implying that outsiders reduce their offered price for the security. The opposite applies when low supply for a security exists. Under the no-arbitrage condition the marginal exchange rates for two securities must be identical in both the primary and secondary markets. These conditions limit the firm’s financing decisions and create a costless signalling equilibrium.
358 John (1987) develops a similar signalling model and derives the same results like Heinkel (1982).
Whereas the information asymmetry in Heinkel’s model is about the mean as well as the variance of firm distributions, the signalling equilibrium by Blazenko (1987) as well as Ravid and Sarig (1991) concerns only the mean return. The model by Blazenko also studies how firms can increase their firm value by signalling to the financial market what managers do know about the intrinsic value of the firm. However, the model differs from Ross’ theory in the managerial motivation for signalling. Specifically, Blazenko shows that manager’s motivation for signalling is mainly driven by their future wealth which is ultimately affected by the capital structure decision. In essence, Blazenko proves that managers, who are risk averse in wealth and know more about asset quality than the outside investor, signal the high value of the firm by issuing debt. In turn, low-value firms issue equity in order to evade the additional risk imposed on the equity claim when leverage exists.

Ravid and Sarig (1991) develop a model in which firms signal its quality by committing itself to cash outflows. This can be achieved either through dividend payments or debt-service obligations, which are informational equivalent since it both commits the firm to a steady cash outflow. Hence, announcements of debt issue or dividend payment should lead to an increase in a firm’s corporate value.

In essence, the models of Heinkel (1982), Blazenko (1987) and Ravid and Sarig (1991) all find a positive relation between financial leverage and firm value, as shown by Ross (1977).

Myers and Majluf (1984) create a signalling model of equity. Similar to the other models mentioned above, they assume that inside managers do have an information-

338 See Blazenko (1987), p.841. Ross (1977, 1978) already notes that managerial wealth is influenced by the financing decision, but does not include it in his signalling model.

339 John and Williams (1985) developed a signalling model in which only dividend payouts are used as a signal. They show that high quality firms signal their quality through the issuance of high dividend payments.

340 Masulis (1980b) confirms this finding by showing that firm value increases by an announcement of an increase in leverage or dividend payout. Ambachts et al. (1987) allow in their signalling model dividends as an additional signal prior to the new issue. See also related study of Miller and Rock (1985) and John and Williams (1985).

341 A more recent study of Wennekenhied (2002) also confirms the importance of debt as a credible signaling tool. See Wennekenhied (2002), pp.6.
al advantage over outside investors. In particular, managers obtain good or bad news about the future prospect of the company in advance of outside investors. In the absence of a signal, investors believe that bad and good news about a firm occurs at an equal probability. Consequently, they would price the company at an average value. In case management is aware of the fact that the company will face good news, it avoids issuing undervalued equity.\(^{344}\) However, if a firm anticipates bad news, overvalued equity will be issued. As a consequence, by issuing equity, investors will fathom that the firm has received bad news, thus leading to a drop in share price.\(^{345}\)

### 2.4.1.4 Empirical Evidence

Empirical evidence on the impact of information asymmetry is rather rare due to the fact that appropriate proxies for the degree of asymmetric information are hard to determine.\(^{346}\)

The capital structure signalling models predict that more profitable firms are willing to have a higher degree of debt financing in order to signal their intrinsic value to the financial market. Cross-sectional analyses, as well as a vast number of event study literature, have come up in order to test whether or not these predictions can be empirically verified. Cross-sectional studies by Rajan and Zingales (1995) and Frank and Goyal (2000) do not support the outcome of the signalling models. Both studies rather find an inverse relationship between the profitability of a firm and the degree of leverage. In other words, more profitable firms do not have the incentive to maintain a high degree of debt. One main explanation for this odd finding provided by Rajan and Zingales themselves considers the fact that many firms time the market when issuing equity, i.e. when the market-to-book ratio is high.\(^{347}\)

\(^{344}\) Issuing undervalued stock would ultimately lead to a dilution of equity stake.

\(^{345}\) See Myers and Majluf (1984), pp.203-207. Due to the high costs of equity, Myers and Majluf have come up with a pecking order of financing, see Chapter 2.4.2.

\(^{346}\) Bharath et al. (2009) provide a list of relevant proxies for information asymmetry.

However, the potential limitation of cross-sectional studies is their incapability of addressing temporal as well as causal relationships. Specifically, it might be the case that managers validly signal the quality of their firm to the market, given the fact that actually other factors account for the capital structure differences across firms. Due to the fact that the signal might be lost amidst the variation in other factors that might influence the capital structure, stronger evidence can be found in the stream of event studies. In general, event studies have come up with evidence for the predictions of the theoretical signalling models. To be specific, these studies have proven that higher-value firms will make use of more leverage, since a higher degree of leverage conveys a positive signal to outside investors. Consequently, leverage increasing transactions ultimately lead to a rise in the stock price of the firm and hence to the corporate value.\footnote{Event studies finding evidence for that issue are for instance Masulis (1980a, 1983, 1988), Vermaelen (1981), Asquith and Mullins (1986), Masulis and Korwar (1986), Mikkelsen and Partch (1986), Pinegar and Lease (1986), Kalay and Shimrat (1987) and Israel et al. (1989).}

The result of the empirical studies of leverage changing transactions, such as exchange offers, share repurchases and seasoned equity offers (SEOs) is in line with the spirit of the theoretical signalling models, whereby announcements of leverage-increasing capital structure result in an increase in share price.\footnote{For empirical studies of exchange offers, see Born and McWilliams (1997), Copeland and Lee (1991), Shah (1994). For studies of repurchases, see Bagwell and Shoven (1989), Constantinides and Grundy (1989), Comment and Jarrell (1991), Ikenberry et al. (1995), Ikenberry and Vermaelen (1996), Lakonishok and Vermaelen (1990), Lasfer (2002), Masulis (1980a) and Peyer and Vermaelen (2005). For studies on SEOS, see Broux (1992), Clarke et al. (2001), Daniel and Tanman (2006) Loughran and Ritter (1995, 1997), McLean et al. (2009) as well as Pontiff and Woodgate (2008).}

Regarding the debt announcement effect of stock price, the results of the empirical event studies fail to provide support for the signalling theories. Among others, Barclay and Litzenberger (1988), Dann and Mikkelsen (1984), Eckbo (1986), Jung et al. (1996), Mikkelsen and Partch (1986), Silyam-Snuder (1991), Tzeng and Singer (1993) and Ritter (2005) investigate stock price movements associated with straight debt issues. In essence, they all find that the stock price response to announcements of debt issues is insignificant. None of the studies are able to detect factors that are relevant in explaining cross-sectional share price changes of straight debt issues.
Smith (1986) and Chaplinsky and Hansen (1993) argue that this finding can be best explained by the predictability of debt offerings. In other words, debt issue is more predictable than equity issue due to the fact that principal repayments are more predictable than earnings.\footnote{Hansen and Crtcheley (1990) find that earnings fall before the issuance of debt. Hence, the insignificant stock price effects can be partially explained by the fact that the market often anticipates debt issues.} However, some event studies do indeed find a significant stock price change in case of straight debt issues. For instance, Johnson (1995) reports that debt issues elicit a significant positive stock price reaction for low-dividend payout firms. Some evidence in Howton et al. (1998) and Akhigbe et al. (1997) find that straight debt issues is related to significant negative stock price reactions.\footnote{To sum up, the majority of empirical studies have provided evidence for the prediction of the signalling models. Thus, it can be concluded that, in general, firms tend to issue debt in order to reduce the asymmetric information costs between managers and outside investors.\footnote{Based on the notion of the asymmetric information theory, Myers and Majluf (1984) developed a capital structure theory that incorporates the features of the asymmetric information theory, known as the pecking-order theory.} Based on the notion of the asymmetric information theory, Myers and Majluf (1984) developed a capital structure theory that incorporates the features of the asymmetric information theory, known as the pecking-order theory.}

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2.4.2 Pecking-Order Theory

The pecking-order theory\footnote{The pecking-order by Myers and Majluf is also a signalling model. See Daniel and Titman (1995). In contrast to the other signalling models, described above, Myers and Majluf’s model focuses solely on new issues as a signal to the financial market.} by Myers (1984) and Myers and Majluf (1984) and its extensions by Lucas and McDonald (1990) are derived from the imbalance of infor-
mation (asymmetric information) between the different stakeholders. In general, managers possess more information about the true value of the company and its riskiness in comparison to less informed outside investors. This imbalance of information might ultimately lead to a mispricing of equity by the market. In the case where companies are obliged to finance new investments with equity issuance, the underpricing of the equity may be so immense that new shareholders gain more than the NPV of the new project, culminating in a net loss to existing shareholders. This scenario, however, consequently leads to the decision to forego the project, even if its NPV is positive, resulting to an underinvestment problem (as has been discussed in Chapter 2.3.2.2). In order to circumvent such an underinvestment problem, firms prefer internal funds and/or riskless debt, since these financial instruments do not face any undervaluation by the market.

A firm following the pecking-order theory prefers internal to external financing and debt to equity if external financing is used. The underlying rationale behind that is mainly driven by problems of asymmetric information among firm’s stakeholders, i.e. issues of adverse selection or moral hazard. Hence, a company’s capital structure decision is not driven by the trade-off theory, but rather simply based upon the firm’s willingness to curtail information asymmetry. In contrast to the trade-off theory, the pecking-order suggests that firms do not have a target debt ratio because the ordering determines their preference regarding the issuance of new capital.

Basically the pecking-order theory stems from Myers (1984), but the idea that managers prefer internal financing over external financing is hardly new. Myers’ theory has been mainly influenced by Donaldson (1961), who observed that “manag-

354 An overview of the pecking order theory per se and the contributions of Myers to the theory of corporate finance in general can be found in Allen et al. (2008).
355 A main assumption by Myers and Majluf (1984) is that managers only invest in projects with positive NPVs, ruling out any possibility of overinvestment in their model’s prediction.
356 In order to mitigate the problem associated with asymmetric information, even risky debt is often utilized by firms rather than equity. See Harris and Raviv (1991), p.306.
360 See Butters (1949) and Donaldson (1961).
ment strongly favoured internal generation as a source of new funds even to the exclusion of external funds except for occasional unavoidable ‘bumps’ in the need for funds.” In line with this observation Myers also claims that firms prefer internal finance and “if external finance is required, firms issue the safest security first. That is, they start with debt, then possibly hybrid securities such as convertible bonds, then perhaps equity as a last resort.” This ranking of finance can be mainly attributed to the Myers and Majluf (1984) adverse selection model. The ordering, however, derives from a bunch of sources including agency conflicts and taxes.

In general, the higher the asymmetric information between managers and investors, the higher the usage of leverage in order mitigate these imperfect information imbalances. Specifically, short-term debt should make up a higher proportion of the debt financing due to the fact that short-term debt is rather insensitive to the information asymmetry problem.

Myers and Majluf’s theory can be best understood when thinking of a firm with assets-in-place that faces an investment opportunity. When the firm accepts the project it is required to issue equity to new shareholders in order to finance the investment. Only the managers do know the fair value of the existing assets in place and the investment opportunity. Hence, the outside investors lack information and are unable to correctly value the equity issue. If the investment opportunity has a positive NPV, the announcement of the new shares is positively related to the stock price reaction. However, issuing overvalued shares is detrimental for the investors. In case the firm issues undervalued shares, wealth expropriation from existing shareholders to new investors can be the result. If managers act in the interest of existing shareholders, undervalued stocks will not be issued unless the value transfer is compensated by the growth opportunity’s NPV.

Consider the following candidate equilibrium by Myers and Majluf (1984). Share prices decrease at the announcement date due to information inferred from the choice to issue. In general, good news about potential positive NPV investment

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363 Excessive managerial optimism might also be a source of the pecking-order theory, all else being equal. See Baker et al. (2007) for this interesting observation.
364 See Flannery (1986), pp.22.
opportunities are always dwarfed by bad news about the value of existing assets in place.\textsuperscript{363} Hence, some good firms characterized by undervalued assets in place tend to restrain from issuing equity even if it means abdicating a positive NPV project. \textit{Asquith and Mullins} (1986) and \textit{Masulis and Korwar} (1986) confirm that the announcement of a stock issue leads to a decrease in the stock price of approximately 3 percent.

In contrast, if a company would issue debt instead of equity in order to finance its project, the stock price drop would be less severe.\textsuperscript{366} Furthermore, for investment grade issues, the fall in the stock price is only marginal.\textsuperscript{367} The core reason why debt issuance only has a relatively negligible impact on stock price performance is that leverage minimizes manager’s information advantage. Managers believing that their shares are undervalued will issue debt rather than equity. In the case where equity is issued, investors are aware of the fact that the equity might be overvalued, given that debt is an open alternative. Consequently, if debt is available on a fair market price, equity issues will be avoided and in equilibrium only leverage will be issued. Only when massive gearing will trigger high costs of financial distress equity issues might be a possible alternative.\textsuperscript{368}

\textit{Dierker} (1991) as well as \textit{D’Mello and Ferris} (2000) show in their analysis that the price drop at announcement is greater the bigger the information asymmetry between manager and outside investors. \textit{Kraus} (1986) extends the idea of Myers and Majluf and also finds that the stock price fall is more severe the larger the stock issue, given a huge information asymmetry.

\textsuperscript{363} This depends on Myers and Majluf’s assumption that managers only invest in positive NPV projects. See Cooney and Kalay (1993).
\textsuperscript{366} Piotr (1992) finds a stock price drop when issuing risky debt, however the price decrease is much smaller in comparison to any equity issue. Further, in case of convertible debt, the price drop is approximately 2.3 percent. See Dann and Mikkelsen (1984).
\textsuperscript{367} See Eckbo (1986) and Shyam-Sunder (1993).
\textsuperscript{368} The choice to make use of equity financing as a last resort can be displayed precisely as in Myers and Majluf (1984). According to their study, the “growth opportunity” fails to be a real investment, but an injection of equity to diminish the likelihood of bankruptcy. NPV is the decrease in the present value of the bankruptcy costs. This forces the firm to balance this NPV against the costs if issuing undervalued equity. The decision to issue shares maintains a bad-news signal to outside investors.
Based on the rationale mentioned above, the pecking-order theory influences the capital structure decision in the following way:369

1) Firms prefer internal to external financing.370
2) Dividends are considered to remain constant and hence dividend cuts are not used to finance capital expenditure.
3) If firms are required to make use of external financing, debt is chosen before it issues equity. This is mainly done in order to avoid the underinvestment problem.
4) Equity is issued only as a last resort. The firm will first issue safe to riskier debt and in case debt is too costly for the firm, equity will be finally issued.

The pecking-order theory perfectly explains why the majority of external financing comes from leverage and not from equity issuance. Furthermore, the theory is able to account for the interesting phenomena that the degree of leverage depends on the profitability of a firm. Hence, the more profitable a firm the less debt it uses. This can be attributed to the fact that profitable firms do have more internal financing available, leading to a better opportunity to spend their money on positive NPV projects. In contrast, less profitable companies are obliged to make use of more external financing, and as a result accumulate more debt.371

So far the pecking-order theory has been explained from the perspective of asymmetric information only. However, the existence of transaction costs associated with external financing also plays a crucial role in the capital structure decision of firms. Due to the immutable fact that debt issue incurs lower costs than equity issue, managers are often inclined to prefer debt financing.372 Baskin (1989) has analysed the US market and found that the costs for issuing debt might be approximately 1 percent of the amounts of funds raised, whereas the costs for equity range between 4

370 Here, information asymmetry is only relevant for external financing.
371 In our empirical study, we also test the influence of profitability on the leverage decision of firms. For empirical results see Chapter 8.3.
and 15 percent.373 Hence, the relatively high transaction costs of equity lead to the pecking-order where first internal funds, followed by external debt, and finally external equity will be used. Gilson (1997) has analysed financially distressed firms and found that due to the high transaction costs of equity, firms still prefer a relatively high leverage ratio. Further, cutting the high debt ratio also incurs high costs and consequently leverage ratios remain quite high.374

To sum up, both asymmetric information and the transaction costs of the financing instrument influence the managers, such that internal finance is preferred to external finance. However, the preference for internal finance can also be accounted by manager’s desire to avoid the disciplinary effect of external financing. The issue of external financing is often associated with a loss of control for the manager of the firm and especially entrenched managers try to avoid these circumstances.375 Hence, managers will try to circumvent monitoring through new shareholders or debt claimants by making use of internal financing instead of external financing. In the instance where retained earnings are not sufficient, managers will choose the financing source without control restrictions, implying that short-term debt is preferred over long-term debt and finally equity issues.

Due to the fact that the seminal work of Myers and Majluf (1984) fundamentally shaped the essence of the pecking-order theory, their econometric model will be briefly discussed.

2.4.3 Empirical Evidence

Without doubt the most cited and most accepted theories in explaining the capital structure of firms are the trade-off as well as the pecking-order theory. The enduring popularity of the theories mainly derives from its comprehensive assumptions and consequences.

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373 See Baskin (1989), pp.32-33.
The trade-off theory determines for each corporation an optimal target capital structure subject to the advantage (tax shield) and disadvantage (bankruptcy cost) of debt financing. In case a company’s capital structure deviates from its target debt ratio due to random events, management tries to adjust its debt structure in order to retain its optimal target capital structure.\footnote{See Myers (2001), p.92.}

As has been shown in Chapter 2.5.1, the announcement of equity issue conveys a negative signal to the financial market, leading to the empirical prediction that the stock price reacts negatively at the announcement of equity issues. In contrast, debt issue is perceived as a less negative signal to the market, leading to a less negative stock price drop. Hence, debt is a more favourable signal than equity. The following sub-chapters will provide an overview of the different empirical evidences on the notion of the pecking-order theory.

2.4.3.1 Positive Results

Shyam-Sunder and Myers\footnote{Refer to Chirinko and Singha (2000) for a critical review of Shyam-Sunder and Myers’ (1999) result.} (1999) provide empirical evidence of the validity of the pecking-order hypothesis. By analysing US firms during the period 1971-1989 they conclude that firms with higher financial deficits, i.e. firms that raise more external capital, try to increase their leverage ratio.\footnote{Tong and Green (2005) analyse 47 listed Chinese companies and find that these firms do follow a pecking-order.} Kagan and Titman\footnote{See Bharat et al. (2009), pp.324.} (2007) also find out that higher financial deficit of a firm is ultimately associated with an increase in leverage. Hence their result supports the essence of the pecking-order theory.\footnote{Bharat et al. (2009) empirically prove that the asymmetric information issue is an important determinant of the capital structure decisions of firms, as suggested by the pecking-order theory.} A recent study of Bharat et al. (2009) empirically prove that the asymmetric information issue is an important determinant of the capital structure decisions of firms, as suggested by the pecking-order theory.\footnote{McDaniel et al. (1994) have shown that firms which need new capital in order to finance their projects make use of internal capital. Only 20 percent...}
of the financing is derived from external capital, where leverage financing plays the dominant role in comparison to equity issue.\textsuperscript{380}

2.4.3.2 Negative Results

However, in reality, equity still plays a dominant role when firms make use of external financing. Fama and French (2005) analyse the financing decisions of firms during the period 1983-2002 and find that in particular small firms, facing the most severe asymmetric information problems, referred to equity as the primary external financing source, even though these firms still had unexploited debt capacity.\textsuperscript{381} According to the notion of the pecking-order theory, especially small and high growth companies face the most severe asymmetric information problems and therefore should employ large degree of leverage. Barclay et al. (2006) show that high growth firms consistently make use of less debt financing, which stays in contrast to the notion of the pecking-order theory.\textsuperscript{382} Seifert and Gonenc (2008) test the validity of the pecking-order theory of firms in the US, the UK, Germany and Japan. They show that in all four countries, equity seems to be the main external financing source, a result which clearly contradicts the essence of the pecking order hypothesis.\textsuperscript{383}

A more recent study of Autore and Kovacs (2010) proves that when information asymmetry for a particular company is low compared to the recent past, the firm is more apt to engage in equity issuance as opposed to debt. Essentially, this relation is only valid for firms that are exposed to high levels of information asymmetry. These companies are more prone to adverse selection costs and consequently they will more than benefit when issuing equity.\textsuperscript{384}

\textsuperscript{380} Other studies that also find evidence for the pecking order are for instance, Amihud et al. (1990), Baskin (1989), Chaplinsky (1993), D’Mello and Ferris (2000) and Chen and Zhao (2004).
\textsuperscript{381} See also Heiberg and Liang (1996).
\textsuperscript{382} See Barclay et al. (2006), pp.37.
\textsuperscript{383} See Seifert and Gonenc (2008), pp.252-259.
\textsuperscript{384} See Autore and Kovacs (2010), pp.15-18.
2.4.3.3 Mixed Results

Frank and Goyal (2003) apply a similar methodology to Shyam-Sunder and Myers (1999) and also observe a strong relationship between financial deficits and the debt ratio. However, the positive effect has been detected by rather older and larger firms, which by definition do not face severe asymmetric information problems in comparison to smaller firms. Consequently, their findings offer only little support for the pecking-order theory.385 However, Chen and Zhao (2004) claim that the results of Frank and Goyal are mainly biased by their large debt-reduction firms. In specific, they come to the conclusion that the firms under study prefer debt over equity. Additionally, they observe that the pecking-order theory gains importance from low-to-medium bankruptcy risk firms.386

Jung et al. (1996) also provide mixed evidence on the pecking-order theory. In line with the notion of the pecking-order, they find that announcement returns are negative and significant for stocks and insignificant for bonds. However, they also observe that firms with large asymmetric information problems make use of equity financing instead of leverage. Contrary to the pecking-order theory, they find that firms with large total assets are less likely to issue equity.387 Jung et al. explain this result by referring to agency considerations whereby manager’s discretion is mitigated by the issuance of equity.388

Lehmann and Zender (2004) analyse the impact of debt capacity considerations on the capital structure decisions in the pecking-order theory. They show that the pecking-order offers a good fit to the data once debt capacity is augmented into the model. However, Frank and Goyal (2008) doubt this finding by claiming that the firms under study in Lehmann and Zender’s model that do not have any debt ratings

385 The difference in results between Shyam-Sunder and Myers (1999) and Frank and Goyal (2003) can be explained by the different sample period they have applied to their model. Data prior to 1990 better supports the pecking order hypothesis than data after 1990 when many small companies became publicly traded.
386 See Chen and Zhao (2004), pp.1.
387 Firms with large total assets are considered as firms that are closely followed by analysts and therefore face lower asymmetric information problems. Hence, these firms should make use of less leverage and more equity.
are in fact small high growth firms, which are often juristically constrained to make use of equity issuance.

While the previous studies have focused on the US market, the following studies try to analyse the validity of the pecking-order theory in international countries. Rajan and Zingales (1995) study the cross-sectional relation of firm factors with debt for international countries. According to the pecking-order theory, firms with few-tangible assets should engage in more debt financing since they face a larger degree of asymmetric information problems between the stakeholders. However, Rajan and Zingales (1995) find the opposite to be true. In their model, firms with few tangible assets actually issue more equity instead of leverage.\(^{389}\)

Gaud et al. (2007) investigate the capital structure decisions of more than 5000 European firms during 1988-2000. They find that in general firms do not follow the pecking-order when making financing decisions. Using a sample of 407 Chinese firms, Ni and Yu (2008) offers mixed evidence for the pecking-order theory. Furthermore, they have to refute the findings of Myers (1984), who states that firms with a relatively low degree of leverage will be most suitable for following the pecking order hypothesis. Specifically, they find that relatively large companies rather follow a pecking-order while small firms do not.\(^{390}\)

To sum up, the empirical evidence on the validity of the pecking-order theory is rather mixed. Table 2.5 provides an overview of the different empirical studies with the corresponding result on the notion of the pecking-order theory. The studies that found negative results prove that equity issue is clearly not a last resort and “the pecking order theory works well when it should not and not so well when it should.”\(^{391}\) As has been shown, the rational of the pecking-order theory is derived from problems of


\(^{391}\) Heider (2003), pp.3.
asymmetric information among the different market participants, i.e. problems of adverse selection or moral hazard.\textsuperscript{392}

\begin{table}[h]
\centering
\caption{Research Overview - Testing the Pecking-Order Theory}
\begin{tabular}{|l|c|c|c|c|}
\hline
Author & Year & Positive Result & Negative Result & Mixed Result \\
\hline
Autore and Kovačec & 2010 & - & x & - \\
Sakai & 2010 & x & - & - \\
Eldomiaty and Ismail & 2009 & x & - & - \\
Yashon and Daskalakis & 2009 & - & x & - \\
López-Gracia and Segovia-Mira & 2008 & - & x & - \\
Ni and Yu & 2008 & - & - & x \\
Seifert and Gencay & 2008 & - & x & - \\
Delcoure & 2007 & - & - & x \\
Gaud et al. & 2007 & - & x & - \\
Kayhan and Titman & 2007 & x & - & - \\
Mitton & 2007 & - & - & x \\
Barclay et al. & 2006 & - & x & - \\
Drobetz and Fix & 2005 & - & - & x \\
Fama and French & 2005 & - & x & - \\
Nivoroukhin & 2005 & - & - & x \\
Tong and Green & 2005 & x & - & - \\
Chen & 2004 & x & - & - \\
Chen and Zhao & 2004 & x & - & - \\
De Medeiros and Daher & 2004 & x & - & - \\
Deesomsak et al. & 2004 & - & - & x \\
Lemmon and Zender & 2004 & - & - & x \\
Frank and Goyal & 2003 & - & - & x \\
Bontempi & 2002 & - & - & x \\
Adedeji & 2001 & - & - & x \\
Bhoth et al. & 2001 & x & - & - \\
De Miguel and Pindado & 2001 & x & - & - \\
D'Mello and Ferris & 2000 & x & - & - \\
Orkan & 2001 & - & - & x \\
Shyam-Sunder and Myers & 1999 & x & - & - \\
Jung et al. & 1996 & - & - & x \\
Rajan and Zingales & 1995 & - & - & x \\
McDaniel et al. (1994) & 1994 & x & - & - \\
Allen & 1993 & x & - & - \\
Chaplinsky & 1993 & x & - & - \\
Ambud et al. & 1990 & x & - & - \\
Baskin & 1989 & x & - & - \\
\hline
\end{tabular}
\end{table}

\textsuperscript{392} See Frank and Goyal (2008) and Neus and Walter (2008).
2.4.3 Critical Comment

Agency conflicts between stakeholders emerge due to the given capital structure of a firm. In order to mitigate these agency costs, the agency theory tries to find a mixture between debt and equity financing. In contrast, the rationale of the pecking-order theory does not stem from a given capital structure, but rather from asymmetric information between managers and outside investors.

An improvement of the pecking-order theory to the trade-off theory is that it discards the notion of the optimal capital structure and the target-adjustment model. While the trade-off model infers a static approach to financing decisions based upon a target-adjustment model, the pecking-order theory implies a dynamic approach in which the firm can set its capital structure at any particular point in time. In specific, the capital structure is the result of a firm’s cumulative requirements for external financing.\textsuperscript{393} In other words, the combination of financial slack (cash and marketable securities) and the number of positive NPV investment opportunities dictate the capital structure of a firm following the notion of the pecking-order theory. Consequently, a profitable firm characterized by few investment opportunities has no incentive to issue debt and therefore will feature a low debt-equity ratio. The more profitable a firm, the more financial slack it can generate, the more investments it can finance internally and consequently the lower the debt-equity ratio. By avoiding equity issues the firm evades both the flotation costs and the monitoring and market discipline that incur when assessing the capital market. Due to the limited use of external financing a firm following the hierarchical financing pattern is able to maintain financial flexibility, which according to a study of Graham and Harvey (2002) is one of the most important capital structure determinants for firms.\textsuperscript{394}

The pecking-order theory can perfectly explain how asymmetric information influences the capital structure decisions of firms. For example, the notion of the theory serves as a good explanation why equity issues per se are still infrequently used by listed companies. A large body of empirical studies have documented the firm’s preference for internal capital and the limited use of equity as an external

\textsuperscript{393} See Myer (2001), p.93.
\textsuperscript{394} For a detailed overview of the study by Graham and Harvey (2002), see Chapter 4.2.1 in this dissertation.
financing instrument.395 Additionally, the pecking-order theory can best explain why stocks experience a price drop when equity issues are announced.396

However, while the pecking-order theory seems to be popular in explaining certain financing patterns of firms, it is not without weakness.

First, the notion of the pecking-order theory is based on the premise that managers act in the interest of existing shareholders. Myers and Majluf (1984) fail to demonstrate why managers do not thrive for the maximization of the entire firm, including existing as well as new shareholders. This policy would facilitate optimal capital investment decisions and existing shareholders would reap greater financial gains ex-ante.397 Furthermore, another assumption is that information costs induce firms to pursue the pecking-order theory. However, academics such as Baksin (1989), Allen (1993) and Adeojeji (1998) prove that transaction and information costs are not the only determinants that negatively influence the use of external financing. In specific, they show that firms concerned of control and disciplinary mechanism, such as monitoring, do restrain from debt and equity financing.

Second, another weakness of the theory is simply its lack of adaptation, i.e. adapting to the rules of the game and hence trying to come up with mechanisms in order to circumvent it. Specifically, in order to avoid the negative consequences of the information imbalance between manager and outside investors, specific financing tactics could be developed. However, the theory fails to even think of possible

395 For instance, a study by McDaniel et al. (1994) show that nearly 80 percent of US firms do not or only did once issue equity. The majority of financing need derives from internal capital, only 20 percent accrue to external financing, where debt is preferred over equity. Furthermore, a statistical survey by Myers (2001) shows that in the year 1999, 85 percent of aggregate investments ($944 billion) were generated by means of internal cashflows ($805 billion). External financing amounted to only $139 billion, which was composed of $283 billion debt financing and of negative $144 billion net equity issues. Thus, the volume of share repurchases exceeded the amount of equity issues. Also see Berk and DeMarzo (2007), p.519 on the aggregate sources of funding for capital expenditures.

396 On that issue see Chapter 2.5.1 in this dissertation.

397 Dybvig and Zender (1991) build on that weakness and claim that optimal managerial compensation must be chosen in order to force managers to maximize the wealth of new as well as old shareholders. As a consequence, agency conflicts disappear and the Myers and Majluf underinvestment problem will be alleviated.
ways to defer manager’s superior information.  

Fama and French (2005) argue that firms can evade information costs by issuing equity which are less prone to information asymmetry. In specific, they show that equity issues to employees in their compensation plan or to existing shareholders are possible alternatives in order to maintain the ownership structure and the existent balance of control, hence diminishing information costs.  

Third, another criticism of the theory is its simplicity. Myers and Majluf only consider the possibility that a firm can choose between equity and debt when financing is needed. Among others, Brennan and Kraus (1987), Noe (1988) and Constantinides and Grundy (1989) cast doubt on the pecking-order theory by developing more complicating settings in which they test the pecking-order theory. It can be argued that the theory does not necessarily hold in more sophisticated adverse selection models, for example when the company also chooses between straight and convertible debt. By enriching the set of financing decisions, Brennan and Kraus (1987), Constantinides and Grundy (1989) as well as Noe (1988) have shown that Myers and Majluf’s (1984) results can be easily refuted in some respect.  

Finally, empirical studies have shown that a clear validity of the pecking-order theory in practice is hard to detect. Studies finding a negative relationship between profitability and leverage claim that the pecking-order theory is the most relevant capital structure theory explaining the differences in financing pattern across the world. However, other studies have emerged that found only weak evidence of the theory. For instance, Fama and French (2002) shows that young start-up firms tend to prefer equity over debt, which stays in contrast to the notion of the pecking-order theory.  

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398 For example, a firm could issue “deferred equity” which do not convey any adverse signals to investors. The question however remains why this is not widespread.  

399 See Fama and French (2005), pp.560.  

400 Ibrahimo and Barros (2009) detect this weakness and therefore developed a model of financial market in which „equity“ serves as a financial arrangement. For further details, see Ibrahimo and Barros (2009), p.473.  

401 See Fama and French (2002), pp.15.
A citation of Fama and French (2005) perfectly fits into the different results of the pecking-order theory: “Thus it is probably time to stop running empirical horse races between them as stand-alone stories for capital structure. Perhaps it is best to regard the two models as stable mates with each having elements of truth that help explain some aspects of financing decisions.”402

2.5 Conclusion

The classical theory of capital structure derives from the seminal paper of Modigliani and Miller (1958). Assuming a perfect arbitrage free capital market, Modigliani and Miller argue that the value of a firm is independent of the debt-equity choice. In other words, the capital structure of a firm is irrelevant. However, in reality, real life market imperfections such as taxes, bankruptcy costs, agency costs and asymmetric information do exist and are relevant in the capital structure decision of firms.403

Incorporating market imperfections in the capital structure models, Myers (1984) concludes that corporate value is dependent on the debt ratio. Hence, the capital structure of a firm is not irrelevant. In particular, taxes and bankruptcy costs are two important elements that need to be considered when dealing with the capital structure decisions. This aspect of the capital structure is known as the trade-off theory, where firms need to balance their debt ratio against the advantage of tax savings with the increased possibility of bankruptcy. According to the trade-off theory a firm reaches its optimal capital structure when it raises its debt ratio as long as the marginal tax advantage equals the marginal cost of bankruptcy.404 Of all different market imperfections, the most significant imperfection influencing the capital structure decision of firms seems to be taxes. In comparison, bankruptcy costs exert a weaker

403 See Modigliani and Miller (1963), Baxter (1967), Miller (1977), Warner (1977) and DeAngelo and Masulis (1980)
impact on a firm’s financing decision.49 While taxes tend to feature the most relevant
imperfection in determining a firm’s capital structure, a 100 percent debt structure of
firms still cannot be empirically proven and is at odds with reality. In other words, if
debt financing is too high, bankruptcy risk surges as firms face difficulty of meeting
debt obligations. While the risk of default is not a problem per se, financial distress
might trigger other detrimental consequences that ultimately lead to a decrease in
firm value. Thus, firms must balance the benefits of debt tax shields against the costs
of bankruptcy.

One of the biggest demerits of the trade-off theory is the undeniable fact that a
large body of empirical studies have found an inverse relationship between the prof-
itability of a firm and its debt level. This finding stays in stark contrast to the notion
of the trade-off theory that profitable firms tend to employ larger amounts of lever-
age in order to reap the benefits of the debt tax shield.

Conflict of interest between the various stakeholders is a further market imper-
fection that exhibits an influence on the capital structure decision of firms. On the
one hand, massive gearing can encourage managers and equityholders to tackle risky
projects and/or engage in underinvestment. On the other hand, a low level of debt
financing might exacerbate the free cash flow problem postulated by Jensen (1986)
and as a result motivates managers to participate in wasteful spending. In essence, it
can be argued that short-term debt serves as the best external financing instrument
when firms face significant agency costs.

While the different agency cost approaches all have in common to provide an
explanation to single agency conflicts, these approaches fail to offer a consistent and
universal explanatory contribution to the optimal capital structure of a firm.

The existence of information asymmetry between managers and its stakeholders
is another important market imperfection that impacts the capital structure decision
of firms. Thus, firms choosing their optimal capital structure should consider the

49 See Baxter (1967), Miller (1977), Warner (1977) and DeAngelo and Masulis (1980), among others.
potential signalling and adverse selection consequences of their financing decision. Due to the fact that bankruptcy exhibits detrimental costs on firm value, an increase in the firm’s level of debt might signal its positive future prospect to meet its required debt obligations. For instance, managers might benefit existing shareholders by issuing overvalued equity. However, investors will respond to this financing pattern by reducing the price they are willing to pay for these overvalued securities. As a result, this ultimately leads to a drop in share price when firms announce equity issue. Thus, in order to avoid such financial consequences, firms should rely first on retained earnings, then debt, and finally equity. In specific, managers exposed to a larger information advantage of the true value of its firm, should heavily rely on the notion of such a pecking-order of financing alternatives. Another important market imperfection influencing the financing decision of firms is the existence of transaction costs associated with changes in a firm’s capital structure. Thus, firms deviating from its target capital structure often do not actively alter their financing mix to the target level. Thus, most changes in a firm’s capital structure occur passively.

Finally, all classical capital structure theories have in common that they create simple models to abstract the capital structure decision of firms theoretically under a body of simplifying assumptions. However, these implications often fail to mirror what can be observed in reality. Thus, these theories all follow a deductive approach. In contrast, the so called “new theories of capital structure” are characterized by a dynamic capital structure model which is based on an inductive approach. Chapter 3 will discuss the different implications of these new theories on the capital structure decision of firms.
3 New Theories of Capital Structure

Chapter 3 will discuss new theories of capital structure that have predominantly emerged since the 1980s, provoking a lot of discussion among academics.406 By virtue of the limited explanatory power of the classical theories, a branch of research emerged since the 1980s following an interdisciplinary approach. In essence, these new theories have in common to link findings of applied economics with pure financing theory and discussion over the capital structure of a firm. For example, the theory of product/market interaction examines the impact of capital structure on the competitive and strategic behaviour of competing firms in product markets. Chapter 3.1 will provide three branches of literature that scrutinize the connection between product markets and capital structure.407

Another capital structure theory gained much attention since the mid-1980s as the American market experienced a strong increase in merger & acquisition (M&A) activities, examining the relationship between “corporate control” and capital structure of a firm.408 Theoretical models in this approach focus on the voting rights attached to shares. Chapter 3.2 provides models dealing with corporate control trying to provide an answer to the question of how the distribution of gains in takeovers can be influenced and how the likelihood of a takeover can be biased by different capital structure decision of firms.409

The theory based on dynamic, windows-of-opportunity and market-timing models are the most recent one that academics have developed (Chapter 3.3). In essence, this theory signifies a significant progress in comparison to the other classical theories due to its realistic assumptions. On the one hand, these approaches show that the observed capital structure does not comply with optimal capital struc-

406 The main reason why we consider these theories as “new” is only based on the fact that these theories have been mainly studied since the 1980s.
407 Brander and Lewis (1986) and Maksimovic (1988) pioneered the research on product market interactions with firm’s capital structure.
tures and that firms might deviate from its desired target level. Additionally, the notion of this theory is not based on a static approach on capital structure, but rather focuses on the dynamics in the capital market. The classical theories develop simple models to abstract the capital structure decision of firms theoretically under a string of assumptions, while in practice these implications often fail to mirror reality. Hence, these theories follow a deductive method. In contrast, the new theories and in particular the dynamic, market-timing theory is based on an inductive approach. Chapter 3.4 will offer concluding remarks on the different capital structure theories under study.

3.1 Capital Structure Based on Product/Market Interactions

A line of research that has become relatively popular since the 1980s, is the study of corporate behaviour and the functioning of markets in lieu of various industries. A vast number of models incorporating features of the theory of industrial organization have emerged in the neo-institutional finance literature. In particular, the theory of industrial organization stresses that a firm’s capital structure has an impact on its aggressiveness in the product market as well as on the conduct of other market participants, thereby biasing competitive outcomes.

Research in this field of study was mainly ignited by the article of Brander and Lewis (1986), studying the interaction of financial and product markets in a Cournot oligopoly setting. The following section will analyse the interaction of a firm’s capital structure with its market competition and its product characteristics.

410 For a detailed review on this issue, see Istatteh and Rodriguez-Fernández (2006).
412 Cournot competition is based on the premise that companies compete on the amount of amount they will produce. The decision of the output occurs independently of each firm and at the same time.
3.1.1 Capital Structure and Firm’s Competitive Strategy

The following section will provide an overview of the different streams of literature, dealing with the interaction between product market competition and financial structure of companies.\textsuperscript{413}

3.1.1.1 The Limited Liability Effect

Due to the notion of the limited liability effect, a rise in the debt ratio ultimately increases a firm’s incentive to conduct riskier output strategies, which lead to higher returns in good states and lower returns in bankrupt states. This risk-taking attitude stems from the immutable fact that shareholders fail to consider the potential decrease in firms’ returns in bankrupt states, since debtholders become the residual claimants.\textsuperscript{414} Debt level alters the returns to shareholders over the different states, which ultimately influences the output strategy preferred by shareholders. Furthermore, firms can set their capital structure in a way in order to drive their rivals into bankruptcy. In essence, models characterized by the notion that the choice of leverage in the first stage of the game impacts the output strategies in the second stage, in which product market competition is apparent, have conventionally been created in a Cournot-type quantity scenario. Models incorporating the Cournot duopoly framework have been developed for instance by \textit{Brander and Lewis} (1986), \textit{Maksimovic} (1988) and \textit{Glazer} (1994).

Starting with the model of \textit{Brander and Lewis} (1986), they show that the capital structure of firms influences its own product decision as well as that of competitors. Their model follows the idea of \textit{Jensen and Meckling} (1976), in which an increase in debt financing encourages equityholders to follow riskier strategies. In other words, firms commit themselves to more risky actions by pursuing a more aggressive output strategy, which is achieved through a positive debt level.\textsuperscript{415}

\textsuperscript{413} See Maksimovic (1995) and Erbemjams et al. (2010) for an overview on this issue.
\textsuperscript{414} See Brander and Lewis (1986), p.956.
\textsuperscript{415} See Brander and Lewis (1986), pp.968.
In essence, the model is based on a Cournot duopoly framework, in which two competing firms exist in a market for a homogenous product. The two firms (i = 1, 2) must simultaneously choose their debt level $D_i$, then simultaneously deciding the quantity, $q_i$, to produce. The profit to firm $i$ is determined by $R_i(q_i, q_j, z_i)$, based on the two quantities chosen and by a firm specific random variable $z_i$, reflecting the effects of an uncertain environment.\(^{416}\) It is believed that a firm $i$’s profits are inversely related to the other firm’s output and positively related to $z_i$. Hence, the random shock $z_i$ plays an important role on the marginal profits of the two firms. Also, it is assumed that a firm $i$’s marginal profit ($\frac{\partial R_i}{\partial q_i}$) is positively related to the variable $z_i$ and negatively related to other firm’s output. Thus, the marginal profits of a firm are higher in better states of the world (when $z$ is large). If the marginal profit of output is high, the firm is eager to choose higher output levels than if is low.\(^{417}\) However, in this model the output level has to be made before its marginal profit is actually known. Since equityholders are protected by the notion of the limited liability effect, they disregard the likelihood that the marginal product of output is low. Hence, on behalf of equityholders, management maximizes the return on equity by choosing higher output levels as leverage increases. In other words, debt financing creates an incentive to raise output.\(^{418}\)

Furthermore, in the Cournot game, firms are induced to increase output since this ultimately forces their competitors to decrease their quantity. Hence, in order to avoid such a scenario, both firms will try to choose a positive debt level. As a consequence, the output equilibrium will be characterized by a higher aggregate output in comparison to the situation in which the commitment device of debt is not available. Thus, both firms will be worse off, since they produce more than the Cournot output.\(^{419}\)

\(^{416}\) It is assumed that $z_1$ and $z_2$ are independent and identically distributed shocks to the firm’s profits. See Brander and Lewis, p. 958.


\(^{418}\) See Brander and Lewis (1986), pp.966-968.

\(^{419}\) For a detailed review of Brander and Lewis’ model, see Harris and Raviv (1991), pp.316-317. To grasp the original thoughts on the model refer to Brander and Lewis (1986).
The model shows that a firm employs debt to commit itself to an aggressive output level and thereby induces an output reduction of its competitors. In the words of Brander and Lewis (1984): “the limited liability provisions of debt financing imply that changes in financial structure alter the distribution of returns between debt and equityholders, and therefore change the output strategy favoured by equityholders.” Hence, this model has demonstrated that oligopolistic companies tend to carry more leverage than firms in competitive industries.

Maksimovic (1988) extends the idea of Brander and Lewis by showing that the capital structure of a firm has an impact on equityholders’ incentive to collude in the product market. Specifically, his model shows that as soon as firms increase their debt financing they tend to deviate from the implicit agreement with their rivals, implying that they will increase their output more than in a Cournot equilibrium output without leverage. Hence, Maksimovic proves that the capital structure of a firm influences the sustainability of tacit agreements with rivals. The main difference to the model of Brander and Lewis (1986) is that Maksimovic “analyses how capital structure endogenously determines the type of equilibrium (“collusive” or Cournot) in the product market, whereas the earlier contributions (Brander and Lewis, 1986) examined the effect of capital structure on firm values, while taking the type of equilibrium as given.” In essence, Maksimovic shows that the level of debt determines the willingness of managers to agree on collusive actions in repeated oligopolies.

Glaeser (1994) shows that the idea of Brander and Lewis, which states that output increases when firms have positive debt levels, does not hold anymore when firms issue long-term debt. In particular, if firms issue long-term debt, they do not pursue an aggressive output strategy due to the immutable fact that the maturity of debt seems to be far away. In contrast, if the firm finances their fixed production costs

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421 It is assumed that in an oligopolistic market, firms reach implicit agreements with their rivals in order to reduce competition.
with short-term debt, they follow a more aggressive output strategy, as hypothesized by Brander and Lewis (1986).424

A recent study of Clayton (2009) extends the model of Brander and Lewis by introducing a third choice variable in the model. Instead of analysing the relationship between capital structure and product market competition solely, Clayton also wants to analyse the interrelationship with a third variable – investment. Hence, his extended model follows a three stage process. The firm chooses its financial structure in the first stage and makes its investment decision in the second stage. In the last stage, firms are enabled to choose their quantity decision. Under this configuration, the financing decision of a firm not only has an impact on the product market competition (as in Brander and Lewis) but also on the investment of a firm. In essence, Clayton’s findings are in line with Brander and Lewis by showing that debt commits the firm to pursue an aggressive output strategy, leading to an increase in its own output quantity and a decrease in the rivals’ output. Regarding the investment decision, leverage imposes two effects.425 First, debt increases the output quantity of a firm, raising the benefit of reducing marginal cost, and hence, makes investments more attractive to the firm. Second, due to the fact that leverage commits the firm to higher outputs, the value of investment decreases as a commitment to high outputs in the product market. Thus, Clayton shows that when companies also face an investment decision, leverage might lead to weaker product market competition in a limited liability model.426

As has been shown above, in the framework of Cournot competition, debt and in particular short-term debt financing commit the firm to a more aggressive output strategy in the sense of a higher quantity output. Alternative frameworks of oligopo-

425 For a detailed examination of the model refer to Clayton (2009), pp.695-700.
listic competition are for instance Bertrand-type price competition\textsuperscript{427} as well as capacity-price competition\textsuperscript{428}.

Showalter (1995) shows that in the case of Bertrand competition\textsuperscript{429}, the optimal level of debt depends on the type of uncertainty that is apparent in the output market. In particular, Bertrand competitors that face uncertain costs do not intend to make use of debt financing, since leverage triggers industry prices and expected firm profit to decline. In contrast to Cournot competition, strategic debt is only used by firms when demand conditions are uncertain. Here, positive debt levels induce an increase in industry prices as well as a rise in the expected profit of a firm.\textsuperscript{430}

Under Cournot competition, the analysis above has shown that firms under either type of uncertainty (demand and cost uncertainty) make use of debt financing in order to commit themselves to an aggressive output strategy. "The contrasting results between the types of competition suggest that a firm’s choice of debt holdings depends not only on whether output-market choice variables are strategic complements or substitutes, but also on the type of uncertainty that exists in the output market."\textsuperscript{431}

Schumacher (2002), however, provides results that are not in line with the Cournot outcomes of Brander and Lewis and the Bertrand results of Showalter. In essence, under capacity-price competition, Schumacher shows that firms make use of no leverage despite the fact that demand conditions are uncertain, which stays in contrast to the results of Cournot firms and Bertrand firms. Capacity-price competitors exposed to uncertain demand conditions find that positive debt levels cause industry prices and expected profits to shrink. However, if costs are uncertain, firms do indeed make use of leverage.\textsuperscript{432}

\textsuperscript{427} See Showalter (1995).
\textsuperscript{428} See Schumacher (2002).
\textsuperscript{429} Bertrand competition basically states that two or more companies compete by simultaneously setting prices and in which each company is obliged to deliver customers with the quantity of the firm’s product they demand given these chosen prices.
\textsuperscript{432} See Schumacher (2002), pp.5.
3.1 Capital Structure Based on Product/Market Interactions

Lyandres (2006) creates a model which is a generalization of the different limited liability models mentioned above, showing a positive relation between a firm’s optimal debt level and the extent of competitive interaction. Unlike the other models, Lyandres’ model analyses the interaction between capital structure and output decision regardless of the type of product market competition (e.g. Cournot competition or Bertrand competition). “The model demonstrates that, regardless of the type of competition in output markets, the extent of competitive interaction among firms positively affects their optimal leverage whenever debt carries a strategic advantage.”

3.1.1.2 Predatory Theory of Entry and Exit

Models of limited liability (as explained above) and predatory models are similar in the sense that the financing decision of a firm has an impact on the competition between firms. However, while in the models of limited liability, the leveraged firm increases its quantity, predatory models show that the unlevered company raises its quantity level in response to the competitor’s increase in leverage in order to force the leveraged firm out of the market.534 The subsequent chapters will differentiate between different categories of predatory theories of capital structure.

The notion that capital market imperfections can influence the structure of the product market is mainly derived from the “deep pocket” argument by Telser (1966). He claims that firms entering a market face more financial severity and hence are financially vulnerable to the incumbent firm. Consequently, the incumbent firm having a “deep pocket”, i.e. access to capital, is able to drive the entrant, which is highly-levered, out of the market by applying predatory practices.535 However, this theory is based on the assumption that capital markets are imperfect and the levered entrants are unable to reduce its leverage.536

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435 Firms with a deep pocket are those that have access to the capital market and do not lack funds. Also called “long pursue” firms. See Telser (1966), pp.259.
436 Predatory practices comprise for instance price dumping or output increase that could weaken the entrant financially in a way that the entrant needs to leave the market.
437 With perfect financial markets this strategy cannot work out since the entrant can always secure financing as long as his entry is profitable. See McGee (1988), pp.137.
After the seminal contribution of Telser (1966), a body of research emerged scrutinizing diverse forms of predatory behaviour, where the incumbent (predator) “jams” information to exhaust the entrant (prey) financially\textsuperscript{438} or to enhance their relative performance\textsuperscript{439,440}.

In Fudenberg and Tirole (1986), debt financing offers a way for rival firms to exploit the situation that highly indebted firms must meet their refinancing need by making the firm look unprofitable, hence encouraging its investors to cease refinancing. In their model the predator’s actions are not directly observable, while the entrant is uncertain of his own future profitability and therefore infers future profitability from their current profit. The incumbent exploits this inference, conducts predatory actions and as a result raises the probability that the entrant will leave the market.\textsuperscript{441} Thus, predatory actions pay off since it might discourage market entry.\textsuperscript{442}

Poitevin (1989) shows that the use of debt financing makes a potential entrant financially vulnerable since competitors might exploit the increased bankruptcy risk of the entrant. In contrast to Brandt and Lewis (1986), Poitevin (1989) develops a model which is not based on the idea of Jensen and Meckling (1976), but rather follows the tradition of the signalling approach, represented by Ras (1977). Here, Poitevin analyses the interaction of financial and product markets on the basis of predatory practices. Specifically, firms engage in predatory practices through temporarily setting low prices in order to drive competitors out of the market or to avoid the market penetration of other firms.\textsuperscript{443}

\textsuperscript{438} Firms putting financial constraints on the entrant through predatory actions have been studied by Fudenberg and Tirole (1986), Poitevin (1989), Bolton and Scharfstein (1990) and Fernandez-Ruiz (2004).
\textsuperscript{439} Firms engaging in predatory actions in order to improve their relative performance have been studied by Rotemberg and Scharfstein (1990).
\textsuperscript{440} For example, Mauer (1999) shows that the pattern of strategic interaction between firms influences incumbent’s predatory actions against the entrant. Lambrecht (2001) examines the interaction between market entry, company foreclosure and capital structure in a duopoly framework. Kanatas and Qui (2001) argue that the predatory threat of incumbents can be attenuated by the maturity and source of debt.
\textsuperscript{441} See Fudenberg and Tirole (1986), p.366.
\textsuperscript{442} For a detailed analysis on the signal-jamming model, see Fudenberg and Tirole (1986), pp.367.
\textsuperscript{443} See Poitevin (1989), pp.30.
In his model we need to distinguish between an incumbent firm and one potential entrant company. Basically, the model has two stages. In the first stage (financial stage), each company needs to finance their fixed production cost. In a second stage (output stage), the incumbent as well as the entrant company compete in a Cournot market for a homogenous product. Due to the fact that both firms can make use of extensive leverage in order to finance their production costs, the likelihood of bankruptcy increases. In the case where a firm defaults on its debt payments, the other firm obtains an exogenous benefit, which is characterized by the monopolistic position of the firm in future periods. In other words, a firm benefits from the bankruptcy of its competitor and therefore the financial policy of the competitor at the first stage (financial stage) is taken into account by the other firm when deciding on its output quantity (output stage).  

Referring to predatory practices, a potential entrant prefers equity financing over leverage in the financial stage in order to avoid price dumping and other predatory practices in the output stage by its competitor. Where leverage is favoured over equity, the potential entrant would struggle to counterattack against the low prices set by its incumbent competitor and could face default on its debt payments. It must be noted however, that the production costs of the potential entrant cannot be fairly estimated and consequently, its securities fail to be fairly priced on its true costs. Thus, in order to obtain an appropriate pricing of its securities, a low-cost entrant is able to convey its type by making use of at least some debt financing. This increase in leverage ultimately exposes the entrant to risk of bankruptcy in the output stage and the incumbent firm may be successful to drive the competitor out of the market due to predatory practices. This behaviour raises the incumbent’s expected

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445 Since debt is more costly to high-cost companies than to low-cost firms, the use of leverage signals the type of firm to the financial market.
446 Fulghieri and Nagarajan (1996) develop a model similar to that of Poitevin (1989) in the sense that the incumbent firm also tries to engage in predatory practices in order to avoid the successful entrance of the competitor into the market. They show that a highly leveraged entrant can be forced out of the market by an incumbent monopolist (pp.6).
return. Hence, the model of Poitevin (1989) shows that predatory incentives are positively related to the entrant’s debt level.447

The model of Bolton and Scharfstein (1990) shows how agency conflicts in financial contracts might generate rational predatory behaviour. Based on the assumption that refinancing decisions are based on firm’s future prospect solves incentive problems between the firm and its investors. However, this simultaneously ignites the willingness of the rival firm to commit predatory actions to ensure that firm’s future prospect is indeed poor. This in turn leads to the fact that investors would cede funding, accelerating the market exit of the firm.448

Bolton and Scharfstein create a two-period model in which a “deep pocket” firm competes against a firm that has a “shallow pocket”449, which is forced to refinance its investment needs in each period via the capital market. However, in order to be granted for additional financing, the investor requires repayment of the initial loan out of its operating earnings. Being aware of this procedure, the incumbent firm with the deep pocket is inclined to engage in predatory behaviour to lower the operating profit of the rival. Thus, the rival firm would lack additional funds and as a result is forced to leave the market.450 Furthermore, the credible threat of predatory actions might discourage market entrance in the first place.451

Maurer (1999) extends the idea of Bolton and Scharfstein (1990) and examines the interaction between product market competition and innovation. He creates a two-period model in which one firm (the incumbent) generates funds internally whereas the other (the entrant) is obliged to make use of outside debt. His model proves that

447 Also see Fudenberg and Tirole (1986), Bolton and Scharfstein (1990) and Maurer (1999) for predatory practices when firms are highly leveraged.
448 See Bolton and Scharfstein (1990), p.93.
449 Bolton and Scharfstein (1990) apply this term to characterize firms that do not have funds available to meet all financing requirements. Hence, these firms need to refinance itself in each period (p.95).
450 See Bolton and Scharfstein (1990), pp.101-104.
451 Bolton et al. (2000) follow the idea of Bolton and Scharfstein (2000) and apply their framework to a case of new entry into a market of television service. Furthermore, in contrast to Bolton and Scharfstein (1990) whose model is concerned about the ex-post performance of a firm, Fernández-Ruiz (2004) examines the consequences on predation of entrants having trouble determining ex-ante prospects of a project. To attenuate the ex-ante information asymmetry, entrants might optimally condition on future assessments made by financial markets. However, incumbents might conduct predatory behaviour in order to distort these assessments and hence drive the rival out of the market (pp.718).
the pattern of strategic interaction between competing firms fundamentally impacts investments in innovation and output market behaviour deriving from financial constraints.432

To sum up, it has been shown that models under the limited liability effect come to the conclusion that debt boosts firm’s product market performance, whereas models based on predatory behaviour find the opposite to be valid.

3.1.2 Capital Structure and Stakeholder Theory

One important aspect of the relationship between capital structure and the product market is the connection to the stakeholders of a firm. It is argued that the optimal capital structure of a firm might be driven by a firm’s non-financial stakeholders, such as employees, suppliers and customers, due to the fact that they face immense costs in case of bankruptcy of the firm.433 In the following abstract we will show how specific investments and the bargaining power of leverage influence the capital structure of a firm.

3.1.2.1 Capital Structure and Specific Investments

One of the first to deal with the interplay between specific investments and capital structure was the work of Titman (1984) and Titman and Wessels (1988), claiming that customers must bear high switching costs if the firm is liquidated. These costs are even aggravated in the event that the company has committed itself to the production of unique products. The same applies to other stakeholders, such as employees, who in the event of bankruptcy not only lose their job but also need to bear the costs of not being able to find a new job due to the high specialization of the firm. In both cases, the authors argue that a highly leveraged firm would face lower demand (on the customer side) and probably would increase wages of the

432 See Maurer (1999), pp.457.
433 See Grinblatt and Titman (2002)
employees to compensate them for the risk of bankruptcy.\textsuperscript{454} Hence, these costs that accrue to the different stakeholders of a firm in the event of bankruptcy have a significant effect on the firm’s optimal capital structure.\textsuperscript{455}

In general, the starting point for many academics dealing with the stakeholder theory of capital structure was the study of Titman (1984), analysing the effects of indirect bankruptcy costs imposed on non-financial stakeholders. Specifically, he demonstrates that for firms producing unique products, the costs incurred by non-financial stakeholders are higher than for firms producing non-durable products. Hence, these firms commit themselves to a financing policy that is favourable to them – choosing a lower debt ratio.\textsuperscript{456}

Titman and Wessels (1988) provide empirical evidence on the theoretical elaboration mentioned above by showing that firms producing unique products do indeed carry less leverage.\textsuperscript{457} This result is in line with the implications of Titman (1984) that firms imposing high costs on their stakeholders in case of bankruptcy tend to employ less leverage.

Maksimovic and Titman (1991) develop the idea further by showing that leveraged firms are inclined to invest less into reputation and product quality and as a consequence, the firm will lose customers. In contrast to the study of Titman (1984) and Titman and Wessels (1988), they show that customers might avoid doing business with a highly levered firm, even if they will suffer no costs in the event of bankruptcy. This is mainly due to the fact that customers are concerned that highly levered firms, facing bankruptcy, will cut their investments into product quality in order to mitigate short-term cash flow problems. In other words, a fear of product quality deterioration due to insufficient funds leads customers to restrain themselves from doing business with such firms.\textsuperscript{458}

\textsuperscript{454} See Titman (1984), pp.137.
\textsuperscript{455} Also see Grimaldi and Titman (2002).
\textsuperscript{456} See Titman (1984), pp. 143-149.
\textsuperscript{458} See Maksimovic and Titman (1991), pp.191-193. Balakrishnan and Fox (1993) study 295 firms across 30 industrial sectors and confirm the findings of Maksimovic and Titman (1991) by proving that highly levered firms will cut their costs in order to alleviate cash flow problems (pp.3).
Two recent studies, based on the work of Titman (1984) and Makšimović and Titman (1991), empirically prove that specific investments play a crucial role in the choice of optimal capital structure. First, Kale and Shahrur (2007) show that firms carry less leverage when their suppliers/customers undertake relationship specific investments. Specifically, the study proves that firms with higher R&D investments in supplier/customer industries possess lower debt ratios. Second, Banerjee et al. (2008) provide evidence that firms in durable industries with specific investments have a lower debt ratio compared to firms in non-durable industries. In other words, customers in durable sectors prefer to have a rather conservative capital structure in order to encourage their suppliers to undertake more relationship specific investments.

3.1.2.2 Capital Structure and the Bargaining Power of Leverage

Next, the relationship between debt financing and bargaining power vis-à-vis its stakeholders will be examined. Generally, labour unions attempt to impose high salaries and other costs on employers. In order to alleviate the impact of bargaining on profits, employers might engage in massive gearing. This increase in leverage ultimately leads to a decrease in financial flexibility and aggravates the salary negotiations with labour unions.

Bronars and Deere (1991) analyse the use of leverage as a negotiating tool in order to secure the wealth of shareholders from the threat of union formation. By issuing debt a firm reduces its funds available (through interest and principal payments), which otherwise would be obtainable for an increase in wages. They empirically show that firms make use of debt financing when the threat of unionisation is high. Hence, an inverse relationship between the union wage and leverage exists.

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460 See Banerjee et al. (2008), pp. 2523.
461 See Lewis (1986).
462 Hanla (1998) conducts a similar empirical study and shows that firms with higher level of debt are able to impose lower wages and more frequent employment reductions. These results infer that debt serves as a good instrument to reduce labor costs (pp. 246).
higher the level of leverage, the lower the union’s optimal wage. This is due to the fact that an increase in leverage also raises the likelihood of bankruptcy. In order to reduce the possibility of default, unions will demand lower wages. Consequently, debt financing ultimately triggers an increase in firm value when facing a threat of unions.  

Dasgupta and Sengupta (1993), Subramanian (1996) and Cavanagh and Garen (1997) also show that firms make use of more debt financing in order to reduce the bargaining power of workers that arise from union formation.  

Kale and Shahrur (2007) also find support for the theory suggested by Bronars and Deere (1991), showing that firms make use of more leverage when supplier and/or customer industries are concentrated. If such concentration exists, firms per se are at a bargaining disadvantage vis-à-vis their stakeholders. Hence, in order to offset the bargaining disadvantage, firms take on greater debt levels.  

A recent study of Hennessy and Livdan (2009) and Matsa (2010) also examine the strategic employment of leverage to enhance a firm’s bargaining power vis-à-vis organized labour unions. In essence, they also find that leverage is often employed as an instrument to counter the bargaining power of unions. Matsa (2010) claims: ‘Corporate financing decisions are not made in vacuum. In addition to considering tax, distress, and other (direct) financial impacts of debt financing, a firm setting its optimal capital structure may also attempt to influence its competitive position in product and input markets. In this sense, debt financing can be thought of as a strategic variable in product and market competition.’  

Finally, a study of Sarig (1998) stays in contrast to the findings of the previous studies, claiming that the level of debt rises in respect to the bargaining power of stakeholders. In essence, Sarig ascertains that in general skilled employees of highly

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464 Not considering the likelihood of bankruptcy, Sarig (1998) shows that employees of highly levered firms are in a better position to negotiate better contract terms than can employees of identical but less levered firms. It is argued that levered firms are more susceptible to employee’s threats of leaving the company. Hence, firms will rather have low debt ratios in order to mitigate the negotiation power of employees.
465 Also see Brown et al. (2009).
leveled firms are in a superior position to negotiate better contracts than employees of less leveraged firms. This mainly derives from the fact that these skilled employees threaten the firm to seek alternative employment due to the fear of bankruptcy. Hence, ignoring other market imperfections, leverage decreases firm value. Consequently, firms possessing highly specialized employees might employ lower levels of leverage in order to protect themselves against employees’ negotiation power.468

To sum up, the empirical findings mentioned above show that the bargaining power of stakeholders play an important role in the capital structure decision of firms. Generally, leverage increases with the bargaining power of stakeholders.

3.1.3 Capital Structure and Market Structure

In the following section the relationship between market structure and capital structure of a firm will be examined. This relationship can be best described either through the effect that a high debt level has on market structure during industry downturns or through the effect that a drastic rise in debt level has on market structure by changing the incentives of the competing firms.

Opler and Titman (1994) empirically prove that highly leveraged firms suffer a loss of market share and face a decrease in profits compared to less leveraged firms in industry downturns.469 In specific, firms in the top leverage decile experience a sales decrease of 26 percent more than do firms in the bottom leverage decile.470 Furthermore, the authors find out that in particular firms that engage in heavy research and development (R&D) activities suffer the most in downturns.471 The au-

470 The same pattern can be observed for the market value of equity. See Opler and Titman (1994), pp.1015.
471 This finding is in line with studies dealing with special investments and capital structure. While those studies postulate that specific investments make indebted firms especially vulnerable to financial distress, the same reasoning can be applied for firms engaging in R&D.
thors provide three probable explanations for this finding. First, customers might stop doing business with highly leveraged firms during industry downturns. Second, “deep pocket” firms may engage in predatory behaviour in order to exploit this financially distressed situation and attempt to drive the weak rival out of the market. Third, leveraged firms are inclined to efficiently downsize in response to a downturn.

The findings of Opler and Titman (1994) show that in particular highly indebted firms tend to face severe consequences in a financially distressed environment. This is mainly due to fact that unleveraged rivals try to force the firm out of the market by conducting predatory actions, such as through aggressive advertisement or price dumping activities. In essence, the incentive of the rival to take advantage of the bad situation of the leveraged firm is especially high in concentrated markets. As a result, firms operating in concentrated industries tend to feature lower levels of debt in order to mitigate the risk of predatory behaviour of rival firms.

While the previous study analysed the effect that high leverage has on market structure, the subsequent studies examine the effect that a rise in debt levels has on market structure. Chevalier (1995a, 1995b) shows that firms that increase their debt level through a leveraged-buy-out (LBO) engage in less aggressive actions due to its financial vulnerability, leading to a smoother product market competition. Due to the high level of leverage these firms are exposed to severe predatory behaviour, encouraging local entry and rivals’ expansion. Hence, this trend suggests a decline in the market structure concentration.

However, a number of academics deviate from the argument that high debt levels lead to a decline in market structure concentration. First, Myers (1977) postulates that highly leveraged firms tend to be unable to finance investment opportuni-

472 As mentioned above, reasons for action can be the fear that leveraged firms stop investing sufficient funds in product quality or reputation.
475 Also see Koehnner (1996).
ties, making firm survival hard to achieve.\footnote{See Myer (1977), pp.147.} In a similar vein, Phillips (1995) argues that indebted firms face difficulty in financing investment opportunities, since investors do not provide new funding due to the increased probability of default. In the worst case the high level of leverage might cause bankruptcy, which in turn leads to a more concentrated market structure.\footnote{See Phillips (1995), pp.189.} Second, Poiterin (1989) has shown that financially distressed firms are prone to predatory behaviour by rivals trying to drive them out of the market.\footnote{For an overview of predatory actions and capital structure, refer to Chapter 3.1.1.2 in this dissertation.} Third, academic work of Harris and Ravin (1990) and Stulz (1990) demonstrate that a high initial level of leverage might be detrimental for survival, thus leading to a more concentrated market structure.

So far, the empirical studies above have provided evidence that the capital structure of a firm might impact product market structure. However, other studies exist that attempt to show how the product market structure influences the capital structure of a firm. For instance, Istatheh and Rodriguez (2002) provide empirical evidence that, on the one hand, firms competing in concentrated industries are prone to have high levels of debt and, on the other hand, highly indebted firms tend to raise market concentration. The market structure’s effect on a firm’s capital structure is based upon the fact that firms in concentrated industries generally apply lower levels of debt financing, because firms with low levels of debt are in a better position to engage in predatory actions and to drive the indebted firm out of the market. Consequently, it is expected that firms trying to evade predatory actions of its rivals choose lower levels of debt in order to signal their good firm’s quality.

The notion that firms in concentrated industries tend to have lower levels of debt is in line with studies based on agency theory. For example, firms in a concentrated environment face severe competition, which might act as a disciplinary mechanism. Hence, debt might become irrelevant as a disciplinary instrument.\footnote{On the issue that debt might serve as a perfect instrument to mitigate agency conflict, see Chapter 2.4.1.1 in this dissertation.} To sum
up, firms need to trade-off the degree of competition with the appropriate amount of debt level.\textsuperscript{481}

3.1.4 Critical Comment

Chapter 3.1 has examined the relationship between factor-product markets and the capital structure of a firm.
First, the firm's competitive strategy was linked to the capital structure, all leading to one of the following results. Either a high debt level triggers aggressive firm behaviour, increasing firm competition; or a high leverage level results in less aggressive predatory behaviour, decreasing firm competition. The most well-known theoretical product market model is derived from \textit{Brander and Lewis (1986)}, who show that a low level of leverage facilitates cooperative action between competing firms. A large body of empirical studies have emerged examining the interaction between product markets and financial structure.\textsuperscript{482} However, no empirical evidence exists that is able to empirically prove their hypothesis that an increase in leverage ultimately leads to more competitive action among firms. Far from it; some empirical studies emerged showing that a high debt level tends to result in a decrease in market share and hence to less competition. However, a firm’s strategic action might also influence its capital structure. This would be the case when firms are able to anticipate the strategic behaviour consequences of financial decisions. Hence, a two-direction effect exists.

Second, a link between the stakeholder theory and the capital structure decision of a firm has also been discussed. Non-financial stakeholders, such as employees, suppliers or customers play a significant role in determining a firm’s capital structure. Firms facing bankruptcy impose costs not only to financial stakeholders, such as bondholders or shareholders, but also to its non-financial stakeholders. Thus, non-

\textsuperscript{481} See Nickel (1996) and Nickel et al. (1997).

\textsuperscript{482} For a detailed overview of the different empirical studies dealing with the impact of product markets on capital structure, see the work of Franck and Huygebaert (2004), pp.781.
financial stakeholders might transfer these costs to the shareholders. As a result, firms trying to avoid such a situation are characterized by low levels of debt.

In addition, another body of academic studies dealt with the bargaining power of specialized employees. In essence, it was argued, that specialized employees in highly leveraged firms are in a superior position to negotiate better contracts compared to employees of identical, but less leveraged firms. This is mainly due to the fact that indebted firms are highly exposed to the threat of its skilled employees to leave the firm and encounter alternative employment. Hence, firms trying to mitigate the threat tend to have lower debt levels.

However, these results can be easily reversed if bankruptcy costs and the bargaining power of unions are considered. Basically, there is a conflict of interest between unions and employers. While unions try their best to increase labour wages, firms always attempt to avoid or minimise any wage increases. In order to evade from union’s bargaining power, firms tend to increase their debt levels so that available cash must be used for interest and principal payments. In other words, highly indebted firms are forced to meet interest payments and therefore lack any financial capacity to increase labour wages, which would ultimately deter their financial prospect and ultimately increase the likelihood of bankruptcy. Thus, firms trying to avoid wage increases have generally higher levels of debt.

Third, Chapter 3.1 has discussed the linkage between capital structure and market structure. On the one hand, studies emerged showing that the capital structure of a firm might influence market structure, leading to more or less industry concentration. A study of Opler and Titman (1994) proves that highly indebted firms are prone to lose market shares in distressed situations. Chevalier (1995a, 1995b) confirm previous finding by showing that an increase in the debt level leads to a rise in product prices and subsequently to a decrease in market share. Phillips (1995) studying the capital structure behaviour in LBOs also finds that firms with a relatively high debt ratio due to the LBO transaction lose market share in the future.

On the other hand, foresighted firms will consider the market structure when choosing their optimal capital structure. Thus, the market structure will have an impact on the capital structure. Thus, again a two-direction effect exists.
While in the relationship between capital structure and market structure as well as capital structure and competitive strategy a two-direction effect has been found, an interesting future research could be to examine a two-direction effect in which debt levels influence and are influenced by non-financial stakeholders.

To conclude, it has been shown that the optimal capital structure of a firm is not only dependent on the pure finance function but also on product market interactions. However, the limited number of empirical literature has examined different aspects of product market interactions and unfortunately a clear consensus on a firm’s optimal capital structure is still missing.

3.2 Capital Structure Based on Corporate Control

Starting with the influential paper of Manne (1965), the question whether or not hostile takeovers are beneficial or detrimental to firm value remains a controversial debate. On the one hand, the threat of a takeover helps to mitigate the agency conflict between managers and stakeholders. Due to the threat of being replaced, incumbent managers try to work hard and avoid wasteful investments in order to maintain their job. Hence, an active takeover market could help to discipline managers and reduce managerial slack.483

On the other hand, the threat of hostile takeovers might be detrimental in case of expropriation of employees’ or other stakeholders’ wealth. For instance, managers might counterattack the threat of a takeover by increasing leverage or paying out liquid assets.484 For instance, Warga and Welch (1993) show that bondholders on average incur losses of six to seven percent around announcements of leveraged buyouts.485

483 See Jensen and Ruback (1983) and Qiu and Yu (2009).
484 For instance, Klock et al. (2005), Cremers et al. (2007) and Chava et al. (2009) empirically prove that a threat of a takeover is detrimental to bondholders’ wealth.
3.2 Capital Structure Based on Corporate Control

3.2.1 Capital Structure and the Threat of a Takeover

During the 1980s the number and size of transactions in the market for corporate control increased significantly, while many companies raised their debt financing noticeably. The following section will deal with three contributions that try to connect the two seemingly unrelated issues.

Theoretical models in this approach are mainly based on the voting rights attached to securities. Models dealing with corporate control attempt to answer the question of how the distribution of gains in a takeover can be influenced, or how the likelihood of a takeover can be biased by different capital structure decisions. These models exploit the fact that equity follows the principle of the “one share - one vote” rule, while debt does not. While these models predict an inverse relationship between leverage and the likelihood of a tender offer and of its success, these theoretical models have been created from distinctly different perspectives.

First, Harris and Raviv (1988) and Stulz (1988) basically claim that the fraction of the voting rights controlled by management plays a crucial role in the capital structure decision of firms. Specifically, both suggest that when facing a takeover threat, management tends to raise its leverage ratio mainly due to two reasons. First, an increase in leverage might impede a tender offer and second, if a takeover is inevitable, an increase in leverage helps to extract a higher premium for the managers and other shareholders due to the raise in firm value. In other words, the models of Harris and Raviv as well as of Stulz share the principle that management is inclined to boost the leverage ratio up to a high level in order to prevent the takeover from

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486 For a survey of the theoretical and empirical research on the mechanisms of corporate control, see Becht et al. (2003).
487 See Jarrell et al. (1988) for the development of the market for corporate control in general. Refer to Schwert (2000) for detailed information about the trend of hostile takeovers in the USA.
490 For a comprehensive study of the one share-one vote issue, see Burkart and Lee (2007) for a comprehensive study of the one share-one vote issue.
491 For a detailed overview of the impact of takeover defences on the value as well as on the profitability of a firm, see Bebchuk and Cohen (2005), Cremers and Nair (2003) and Masulis et al. (2007).
taking place and hence to maintain control.\textsuperscript{492} Empirical support can be found by studies of Novaes and Zingales (1995) and Zwickel (1996), showing that managers employ large levels of debt not only to benefit shareholders but also to mitigate the threat of a takeover.

Second, Israel (1991) creates a model of an optimal capital structure, in which leverage impacts the likelihood and success of a takeover through its effect on the distribution of cash flows to the stakeholders involved in the tender offer. Specifically, he claims that as leverage rises in the target company, the value gain applicable to the bidder decreases, thereby diminishing the success of a tender offer.\textsuperscript{493} In a similar vein, the gain accruing to the shareholders of the target increases. Consequently, in order to reap the highest possible benefit for a target firm’s shareholders, management is inclined to increase leverage during strong corporate control phases. In essence, the theory of Israel has the following empirical implications:

“(i) the probability of firms becoming acquisition targets decreases with leverage, (ii) when acquisition is initiated, target firms’ stock price, target firms’ debt value, and acquirers’ firm value increases, (iii) acquirers’ share of the total gain increases with target firms’ degree of leverage, and (iv) during the acquisition, there are additional price changes in which the expected change is zero and the variance decreases with target firm’s leverage".\textsuperscript{494}

Israel (1992) extends his model by considering ownership distribution as a way to affect the success of a takeover threat. Hence, his model considers both, capital structure as well as ownership structure to influence the outcome of tender offers.\textsuperscript{495}

To sum up, in Harris and Raviv (1988) and Stulz (1988), the financing decision of firms influences the success of takeovers through its effect on the distribution of votes, especially the fraction of voting rights controlled by management. In Israel (1991, 1992), the choice of the optimal debt level influences the success of control

\textsuperscript{493} See Israel (1991), pp.1394.
\textsuperscript{494} Israel (1991), p.1404.
\textsuperscript{495} In essence, he shows that (i) efficient managers make use of less debt, (ii) firms facing better rivals increase their debt level and (iii) firms with supermajority rules make use of less debt (pp.193-195).
contests through its effect on the distribution of cash flows between voting equity and nonvoting debt.

Third, Raad and Ryan (1995) investigate the capital and ownership structure of corporations facing tender offers and try to test these predictions of the models by examining tender offers during the years 1984-1991. Their study provides results which are in line with the predictions of the models of Harris and Raviv (1988), Stulz (1988) as well as Israel (1991, 1992). First, target firms raise their debt ratio when facing severe takeover threats.496 Second, in hostile takeovers, the increase in leverage is larger than for firms facing tender offers.497 Third, the raise in leverage is larger in unsuccessful than in successful tender offers.498

Due to the immutable fact that the corporate control model of Harris and Raviv (1988) was one of the most influential contributions to the debate of capital structure and corporate control, this model will be analysed briefly in the subsequent chapter.

3.2.2 Corporate Control Model of Harris and Raviv (1988)

The theoretical model of Harris and Raviv (1988) provides implications for capital structure changes related to takeover activity. In essence, their model proves that management is able to actively influence the outcome of a takeover by altering the capital structure of the target firm.499

The model consists of three types of investors, which are all considered as risk-neutral: the incumbent management of the firm, I, the rival management, R, and a number of small, passive investors, P.500 The target firm, which should be taken over, is fully equity financed. The incumbent management has invested its wealth in the firm, while the remaining equity is held by the passive investors. The goal of the

496 Studies by Dann and DeAngelo (1998) and Denis (1999) report similar results.
497 Also see Berger et al. (1997), pp.1411.
500 See Harris and Raviv (1988), pp.89.
incumbent firm is to choose its equity stake in the firm, $\alpha$, to maximize the pay-off, $V(\alpha)$, which is based on the personal benefits of control and the value of shares.\footnote{See Harris and Raviv (1988), pp.61.}

Further, it is assumed that two possible scenarios can occur in which the cash flows $Y_1$ and $Y_2$ differ, where $Y_1 > Y_2$. The incumbent firm is able to generate cash flows $Y_1$ or $Y_2$ with probabilities of $p$ and $(1 - p)$, respectively. Assuming that the incumbent firm will be in control, the value of the cash flows is defined as follows:\footnote{See Harris and Raviv (1988), p.64.}

$$Y_t = pY_1 + (1 - p)Y_2$$ (3.1)

In contrast, the rival management is able to generate cash flows $Y_1$ or $Y_2$ with probabilities of $(1 - p)$ and $p$, respectively. Assuming that the rival management will be in control, the value of the cash flows would be as follows:\footnote{See Harris and Raviv (1988), pp.65-66.}

$$Y_R = (1 - p)Y_1 + pY_2$$ (3.2)

In case of a takeover threat initiated by the rival management, it is assumed that the incumbent management will change its equity stake for a short period. The rival firm attempts to acquire shares from the passive investors. Subject to the equity stake, $\alpha$, of incumbent management and the acquired equity stakes of the rival firm via passive investors, Harris and Raviv differentiate between three scenarios.

First, a successful tender offer is defined as one in which the rival management acquires a sufficient fraction of shares in order to take control over the firm even if he is the inferior candidate. Hence, the pay-off, $V(\alpha)$, consists of the future generated cash flows of the rival management that has taken over the firm of the incumbent management. The pay-off will be as follows:\footnote{See Harris and Raviv (1988), p.70.}

$$V(\alpha) = \alpha \text{CF}_R$$ (3.3)
Second, an unsuccessful tender offer is defined as one in which the incumbent management retains a sufficient fraction of equity in order to guarantee that the rival firm is unable to take over the firm even if he is the superior candidate. Thus the pay-off for the incumbent management consists of future cash flows and the expected present value of personal benefits of control, \( PB \).\(^{505}\)

\[
V(a) = a_0 CF_{1t} + PB
\]  
\((3.4)\)

Third, a proxy fight is defined as one in which neither candidates are able to obtain sufficient fractions to win for sure. In this case the incumbent’s or rival’s success depends on its higher ability. Hence, the pay-off for the incumbent management consists of its fraction of future cash flows \( Y_t \) and the probability \( p \) of personal benefits of control.\(^{506}\)

\[
V(a) = a_0 Y_t + pPV
\]  
\((3.5)\)

The message of the model is straightforward: If the incumbent management wants to maintain control they have to acquire a sufficient fraction of equity. The optimal equity stake is derived from the maximization of the pay-off \( V(a) \). Thus, if the incumbent management increases its equity stake, the probability that a takeover will be thwarted, increases. However, if the incumbent firm acquires an excessive fraction of shares, firm value might decrease. This is mainly due to the fact that the financing need for the acquisitions is met via debt financing. In other words, share repurchases are mainly financed by debt, which in turn increase bankruptcy costs and hence decreases firm value.\(^{507}\)

Based on the premise that the only reason to make use of debt financing is to counterattack any takeover threats, the following implications from the model can be retrieved: First, targets of takeovers generally possess larger levels of debt com-

\(^{505}\) See Harris and Raviv (1988), pp.67-68.

\(^{506}\) See Harris and Raviv (1988), pp.68-70.

\(^{507}\) See Harris and Raviv (1988), pp.74.
pared to firms that are no targets. Second, the amount of debt financing needed depends on the feasibility of diverse takeover methods and their outcomes. If the incumbent management wants to maintain control over the firm, a higher level of debt will be chosen. Third, if the incumbent firm is characterized by higher ability, less debt financing will be necessary, since it obtains more of the passive votes.\footnote{The passive investors will vote for the firm that has the highest ability to manage the firm and maximize shareholder value.} Finally, among firms that face proxy fights, the debt level is smaller, on average, when the rival is unsuccessful in obtaining control than when the rival is successful.\footnote{See Harris and Raviv (1988), pp.74-75.}

To sum up, the model of \textit{Harris and Raviv} (1988) shows that firms facing takeover threats do increase their debt levels. The amount of debt issued depends solely on the maximization function of the firms’ pay-off $V(a)$.

\subsection{3.2.3 Critical Comment}

Due to the intense takeover activities in the 1980s the reciprocity between capital structure and takeover defences has been analysed. The different theoretical models dealing with this issue are all based on the premise that the firm chooses its capital structure \textit{solely for} takeover defence purposes. Changes in the capital structure experience a rather \textit{short-term} adaptation. In essence, all models have in common to postulate that potential takeover targets tend to increase their debt level, which ultimately leads to a decline in takeover threat.\footnote{See Harris and Raviv (1988), pp.55, Stulz (1988), pp.25 and Israel (1991, 1992).}

However, these models fail to provide an explanatory contribution to the \textit{long-term} changes in the capital structure of firms. In specific, these models have three significant weaknesses in common. First, the notion of the corporate control theory fails to consider potential information asymmetry between managers and stakeholders.\footnote{The theory assumes perfect symmetric information between the stakeholders.}
Second, the theory also neglects the incentive effect of large equity shares postulated by Jensen and Meckling (1976). Finally, the models only consider changes in the capital structure as the ultimate takeover defence and fail to deliver alternatives.

To conclude, due to the stringent model assumptions, the models based on the notion of the corporate control theory serve only to explain short-term capital structure. Unfortunately, a contribution to the explanation of long-term capital structure of firms cannot be provided by the corporate control theory.

3.3 Capital Structure Based on Market-Timing

The seminal work of Baker and Wurgler (2002) introduced a new capital structure theory that since then deserves much attention in the academic as well as economic world. Their study was the first to combine the timing ability of firms that has been already recognized by Ritter (1991) into a capital structure model that is able to explain capital structure decision of firms. In specific, the notion of the market-timing hypothesis à la Baker and Wurgler (2002) is that firms issue equity when the market is overvalued and conduct share repurchases when the market is undervalued.

Next to the market-timing of equity, Kogan and Levy (2003) studied the effect of macroeconomic factors on the capital structure decision of firms. In essence, the authors show that firms engage in capital structure changes when the macroeconomic environment seems favourable.

3.3.1 Windows-of-Opportunity

3.3.1.1 IPOs and Performance

Ritter (1991) was one of the first studying the long-term performance of initial public offerings (IPOs), documenting significant underperformance of IPOs. In

512 See Jensen and Meckling (1976), pp.305.
essence, Ritter (1991) shows that the initial underpricing of IPOs seems to be a rather short-run phenomena.\textsuperscript{513} Studying 1,526 IPOs and their subsequent performance during 1975-1984, Ritter shows that the average holding period return of the IPOs under study in the three years after going public amounts to approximately 34.47 percent.\textsuperscript{514} However, a simultaneous investment into 1,526 listed stocks, which are similar in industry and market value, provide an average holding return of roughly 61.86 percent over the same 3 years holding period.\textsuperscript{515} “Every dollar invested in a portfolio of IPOs purchased at the closing market price on the first day of trading results in a terminal wealth of $1.3447, while every dollar invested in the matching firms results in $1.6186, a ratio of only 0.831. In the long run, IPOs underperformed.”\textsuperscript{516}

Ritter provides three possible explanations for the long-run underperformance phenomena of IPOs. The results can be mainly due to bad luck, a systematic overestimation of the market or companies try to time the market in order to go public. The last explanation is known as the “windows-of-opportunity hypothesis”, stating that issuing firms go public when they believe the market overvalues the firm.\textsuperscript{517} Hence, firms can exploit the errors of mispricing by the market by going public whenever they detect overvaluation. In other words, firms attempt to time the market whenever it seems beneficial for the company to go public.\textsuperscript{518}

In essence, the study of Ritter (1991) has shown that companies try to go public whenever they detect an overvaluation of the market.\textsuperscript{519} This overvaluation will be reversed in the subsequent years, leading to a long-term underperformance of IPOs.

\textsuperscript{517} A recent study of Engelen and van Essen (2010) provide firm- and country-specific characteristics to account for the underpricing phenomenon of IPOs. For further detail, see Engelen and van Essen (2010), pp.1958.
\textsuperscript{514} The holding period return is determined from the closing market price on the day of going public to the closing market price 3 years later. See Ritter (1991), p.4.
\textsuperscript{516} Ritter (1991), p.4.
\textsuperscript{518} While Chapter 3.3.2 and Chapter 7 will deal with the market-timing hypothesis in depth, authors already have detected the relationship between equity issue and high market valuations. See for instance, Taggart (1977), Jung et al. (1996) and Pagano et al. (1998).
\textsuperscript{519} Pagano et al. (1998) also provide empirical evidence that IPOs tend to coincide with high firm valuation.
Table 3.1 provides an overview of other studies dealing with the same issue, all leading to the same conclusion: In the long run, IPOs underperform.

### Table 3.1
Research Overview - IPO Long-Term Performance

<table>
<thead>
<tr>
<th>Author</th>
<th>Year</th>
<th>Geographical Focus</th>
<th>Period</th>
<th>CAR*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gompers and Lerner</td>
<td>2003</td>
<td>USA</td>
<td>1935-1972</td>
<td>-19.90%</td>
</tr>
<tr>
<td>Ritter and Welch</td>
<td>2002</td>
<td>USA</td>
<td>1980-2001</td>
<td>-23.40%</td>
</tr>
<tr>
<td>Stehle and Erhardt</td>
<td>1999</td>
<td>Germany</td>
<td>1960-1992</td>
<td>-5.00%</td>
</tr>
<tr>
<td>Carter et al.</td>
<td>1998</td>
<td>USA</td>
<td>1979-1984</td>
<td>-19.90%</td>
</tr>
<tr>
<td>Affleck-Graves et al.</td>
<td>1996</td>
<td>USA</td>
<td>1975-1991</td>
<td>-7.66%</td>
</tr>
<tr>
<td>Longran and Ritter</td>
<td>1995</td>
<td>USA</td>
<td>1970-1990</td>
<td>-26.70%</td>
</tr>
<tr>
<td>Schuler</td>
<td>1995</td>
<td>Germany</td>
<td>1978-1991</td>
<td>-28.00%</td>
</tr>
<tr>
<td>Ritter</td>
<td>1991</td>
<td>USA</td>
<td>1975-1984</td>
<td>-29.10%</td>
</tr>
</tbody>
</table>

* CAR = Cumulative Abnormal Return

### 3.3.1.2 SEOs and Performance
Some empirical studies during the 1980s have already documented the phenomena that companies generally engage in capital increases when the stock value has increased before.\(^{520}\) In particular, Asquith and Mullins (1986) study 265 stock offerings during the years 1963-1981. In essence, the authors show that firms under study experienced an outperformance of the market by approximately 33 percent two years prior to seasoned equity offerings (SEO). In the two years following the SEO, the firms on average underperformed the market by nearly 6 percent.\(^{521}\) In other words, the study of Asquith and Mullins (1986) demonstrates that firms issue equity when the stock market seems to be overvalued.\(^{522}\)

\(^{520}\) Among others, also see Taggart (1977), Marsh (1982), Asquith and Mullins (1986), Korajczyk et al. (1991), Jung et al. (1996) and Hovakimian et al. (2001).

\(^{521}\) See Asquith and Mullins (1986), p.86.

Other empirical studies show that after SEOs, companies experience a long-term underperformance, which is similar to the findings of Ritter’s (1991) IPO long-term underperformance. Loughran and Ritter (1995) analyse SEOs during 1970-1990 and find that investors obtain only 7 percent per year during the five years after the SEOs. In comparison, an investment in listed companies that do not undergo any SEOs would have given a return of approximately 15 percent per annum. The authors claim that “the poor performance of firms conducting SEOs is not a manifestation of long-term return reversals, nor is it attributed to differences in betas. . . our evidence is consistent with a market where firms take advantage of transitory windows of opportunity by issuing equity when, on average, they are substantially overvalued”.

These findings have been confirmed by Spiess and Affleck-Graves (1995). Analysing 1,247 companies during the period 1975-1989, they demonstrate that the average annualized buy-and hold abnormal return is approximately negative 6.1 percent during the five years after the SEO. Besides the study of Spiess and Affleck-Grave (1995) a large body of empirical studies have emerged confirming the findings of Loughran and Ritter (1995).

To sum up, it has been shown that the long-run performance of firms after an IPO or an SEO is worse than the performance of firms not making capital increases. The empirical evidence suggests that the perception of mispricing plays an important role for the market-timing behaviour of equity issuance. Hence, we will next deal with the market-timing hypothesis and its consequences of the capital structure of a firm.

527 Also see Jenter (2005).
3.3.2 Market-Timing Theory

Based on the empirical findings of the “windows-of-opportunity” hypothesis, Baker and Wurgler (2002) were the first to theoretically and empirically find a relationship between the capital structure of a firm and the market-timing effect of equity. According to them, “capital structure evolves as the cumulative outcome of a firm’s past attempts to time the equity market.” The importance of their empirical study as another theory of capital structure has been increased by the survey of Graham and Harvey (2001, 2002). Asking CFOs in US firms about the importance of the different capital structure theories, they find that the CFOs do not put a lot of emphasis on the trade-off theory and pecking-order theory. However, the survey shows that the CFOs actively engage in market-timing practices when deciding on the firm’s capital structure.

Baker and Wurgler (2002) were the first to study how market-timing influences a firm’s capital structure by applying the market-to-book ratio as a proxy for firm valuation. In essence, the market-timing theory is based on the existence of irrational investors, which ultimately leads to a mispricing of stocks. Equity market-timing in the sense of Baker and Wurgler basically implies that equity is issued when the stock price is rather overvalued and shares are repurchased if stock price is undervalued. Hence, the market-timing theory postulates that companies always tend to prefer equity rather than debt issues when their own market value, relative to the book value, is high and hence an overvaluation exists. Such a mispricing occurs when investors are too optimistic about the expected returns of the company. In contrast, undervaluation of stock prices occurs when investors possess pessimistic beliefs about future returns of the company. Baker and Wurgler (2002) claim that companies try to detect such mispricing in order to time the market and consequently, issue equity. Hence, leverage is inversely related to the market value of equity.

529 However, CFOs of listed companies in Germany, Switzerland and Austria do not seem to put much attention to the market-timing when dealing with the financing decision. See Drobele et al. (2006).
531 The market-timing theory is based on the notion of behavioural finance theory, discussed in Chapter 3.4.2 in this dissertation.
In contrast to the trade-off theory, the market-timing theory is not based on a target capital structure and inhibits any adjustment to the debt-equity mix. In other words, the market-timing theory can have a significant and enduring influence on the leverage ratio of a firm. In particular, according to Baker and Wurgler (2002), temporarily fluctuations in market values lead to permanent changes in the capital structure of firms, which might last at least for ten years.

3.3.2.1 Empirical Evidence

After Baker and Wurgler (2002) developed a relationship between equity market-timing and the capital structure of firms, many other authors supported their idea. For instance, Talberg et al. (2008) confirm the importance of market-timing in the capital structure decision of firms by saying: “Every company would like a capital structure which is best fitted to their current situation that minimizes the cost of capital.” Von Nitzsch and Ronette (2006) claim that the capital structure of a firm should depend on the market environment. Specifically, they argue that firms should issue equity when it is cheap compared to debt, and vice versa.

While these authors all confirm the importance of market-timing, other authors try to empirically test the persistence and longevity of market-timing’s impact on the capital structure decision of firms. The first strand of literature questions the longevity and persistence of the market-timing hypothesis as has been suggested by Baker and Wurgler (2002). Studies of Leary and Roberts (2005), Alti (2006), Flannery and Rangan (2006), Kayhan and Titman (2007), Antoniou et al. (2008b), Lammon et al. (2008) and Huang and Ritter (2009) dedicate their research to the question of whether market-timing exhibits a persistent change in the capital structure of firms. Frank and

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536 Among others, authors dealing with the issue of market timing and capital structure are Jenter (2005), Alti (2006), Hovakimian (2006), Chazi and Tripathy (2007), Elliot et al. (2007), Elliot et al. (2008), Mab-ajan and Tarturoglu (2008) and Saumner and Spranger (2009).
537 Section X deals in depth with the issue whether or not firms have a target debt ratio.
Goyal (2008) refer to this issue in their survey article by saying: “Corporate leverage is mean reverting at the firm level. The speed at which this happens is not a settled issue.”

In particular, Altı (2006) claims that companies engaging in market-timing practices in “hot markets”, issue significantly more equity than companies that go public in “cold markets”. Consequently, in the short-run, market-timing exhibits a crucial determinant of financing decision of firms. However, his study also shows that the market-timing effect on capital structure vanishes as time goes by. “Immediately following their IPOs, hot-market firms start issuing significantly more debt and less equity than cold-market firms do. As a result of this active reversal policy, the leverage ratios of hot-market firms increase significantly in the 2 years following the IPO. In contrast, cold-market firms appear to be content with the leverage ratios they attain at the IPO. By the end of the second year, the hot-market effect on leverage completely vanishes.” The study of Altı (2006) has shown that market-timing per se seems to be an important factor in the capital structure decisions in the short-run. However, in the long-run, this effect is not persistent and vanishes. In the long-run, the market-timing of equity is rather consistent with the trade-off theory, i.e. companies follow a leverage target.

Flannery and Rangan (2006) confirm the non-persistent effect of market-timing on the capital structure. In line with Altı (2006), they claim that a firm’s leverage ratio quickly adjusts to their target leverage ratios when shocks have temporarily influenced the debt-equity ratio. Lemon et al. (2008) determine a relatively fast speed of adjustment of approximately 25 percent per annum for book leverage. Mahajan and Tartakovsky (2008) investigate the market-timing issue in G-7 countries. Essentially, they find that all G-7 countries except Japan undo the effect of equity issue and that the persistence of market-timing on leverage is only marginal. Specifi-

538 Frank and Goyal (2008), p.185.
540 Leary and Robers (2005) also find that the market timing effect vanishes within two to four years, implying a quick speed of capital structure adjustment.
543 Kayhan and Timman (2007) also come to the conclusion that the impact of market timing on leverage is short lived.
cally, they find that within five years the market-timing effect is neutralized. In a similar vein, De Bie and De Haan (2007) also fail to find persistent effects of market-timing behaviour on the capital structure of Dutch firms.

The analyses all show that market-timing fails to exhibit a persistent and long-lasting effect on the firm’s capital structure, as claimed by Baker and Wurgler (2002). It rather seems that firms tend to follow the notion of the trade-off theory by following a target debt level.

However, in contrast to the four studies questioning the longevity of market-timing, Huang and Ritter (2009) find empirical evidence of a longer lasting market-timing effect on capital structure. They show that companies make use of equity issue when the cost of equity is low and in periods when the cost of equity is high, companies follow the pecking-order theory by issuing leverage when making use of external financing. Huang and Ritter (2009) also come to the conclusion that firms move toward a capital structure target, but at a much more moderate pace.

A second strand of literature claims that the inverse relationship between market-to-book ratio and leverage is not necessarily subject to market-timing behaviour. Horakimian (2006) also cannot find any significant and permanent effect of the market-to-book ratio on the capital structure of US firms. However, more important in his study is the following finding. Horakimian (2006) claims that the negative relationship between market-to-book ratio and leverage is mainly due to growth opportunities (implying that firms facing large growth opportunities issue more equity). Chazi and Tripathy (2007) apply insider selling as an alternative to the market-to-book ratio.

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544 See Mahajan and Tartaglou (2008), pp.762-763. Leary and Roberts (2005) find similar results by showing that US firms rebalance their capital structure in three to five years following equity issuance. See Leary and Roberts (2005), p. 2600-2603.
545 See De Bie and De Haan (2007), pp. 183.
547 See Huang and Ritter (2009), pp. 258.
They do not find any evidence for a market-timing theory of capital structure, which is based on real mispricing.\textsuperscript{550}

A third body of literature deals with the basic question of whether or not the market-timing hypothesis per se can be verified and empirically proven. Huang and Ritter (2005, 2009) support the market-timing hypothesis, showing that firms engage in more equity issues when market valuation seems high and adjust slowly toward target leverage. Testing the empirical significance of market-timing for US firms, Elliot et al. (2008) also find that firms issue more equity when their equity is overvalued. In essence, they provide empirical evidence that mispricing of equity plays a major role in the capital structure decision of firms. However, in line with Hovakimian (2006), they doubt whether the negative relationship of market-to-book and leverage is only indicative of market-timing.\textsuperscript{551}

Hermanns (2006) studies the impact of market-timing on the capital structure decision of German firms. She shows that the market-timing of equity is not irrelevant in the financing decision; however, it plays a much minor role in comparison to US firms.\textsuperscript{552} Sautner and Springer (2009) provide only weak support for the strength of market-timing behaviour for companies listed in the DAX and Euro Stoxx 50. They show that firms rather follow the principles of the pecking-order theory.\textsuperscript{553} A recent study of Xu (2009) also challenges the generality of the market-timing hypothesis by analysing Canadian firms. In essence, he finds that the effect of past equity issues on Canadian firms’ capital structure is rather transitory.\textsuperscript{554}

A modification of the market-timing theory is the “pseudo market-timing theory”, which has been focused on by Schultz (2003). He argues that the predictions of the market-timing theory do not necessarily imply inefficient markets. Schultz de-

\textsuperscript{550} See Chzai and Tripathy (2007), pp. 75-77. Liu (2005) also makes use of insider activity instead of market-to-book ratio and also fails to find empirical support of the negative relationship between market-timing and leverage.

\textsuperscript{551} See Elliot et al. (2008), p.195.

\textsuperscript{552} See Hermanns (2006), pp.252-261.

\textsuperscript{553} See Sautner and Springer (2009), p.274.

\textsuperscript{554} See Xu (2009), pp.12-17.
fines pseudo market-timing as follows: “The promise of pseudo market timing explanation for underperformance is that more firms go public when they can receive a higher price for their 
shams. As a result, ex-post there are more offerings at peak valuations than at lower prices.”555

However, studies of Baker et al. (2006) and Dahlquist and de Jong (2008) show that the pseudo market-timing fails to nullify the predictions of the market-timing hypo-
thesis.

To sum up, the market-timing à la Baker and Wurgler (2002) plays an important role in the financing decision of firms, however, this applies only to US firms. In Europe, market-timing is not such an important determinant for the capital structure of firms, which is also in line with the interview survey of Drobotz et al. (2006).556 Furthermore, it has been proven that the persistency as well as longevity of market-
timing on leverage is rather small. Hence, after an IPO or SEO, firms adjust their target debt ratio, which stays in contrast to the findings of Baker and Wurgler (2002).

3.3.3 Market-Timing and Macroeconomic Factors

An empirical study of Korajczyk and Levy (2003) also link the capital structure decision to the market-timing behaviour of firms. While in the previous literature the models examined the market-timing effect through the detection of share mispric-
ing, the following study relates the market-timing of capital structure to macroeco-

556 A detailed overview of the survey of Drobotz et al. (2006) will be provided in Chapter 4.2.2.2 in this dissertation.
557 See Korajczyk and Levy (2003), p.75.
nities. Specific criteria for such firms are that they are constrained to pay out dividends and to have a net repurchase of debt or equity. Furthermore, financially constrained firms are characterized of having a Tobin’s q\textsuperscript{558} of greater than one at the end of the event quarter. In total, their sample consists of 565 financially constrained firms and 5,059 financially unconstrained firms, whose financing structure is examined through the years 1984-1998.\textsuperscript{559}

In line with the findings of Baker and Wurgler (2002), the model of Korajczyk and Levy (2003) pursues the same assumption that the dependent variable resembles the aggregated market- and book leverage of the firm. While the model apples firm-specific as well as macroeconomic data in their analysis, their focus, however, lies in the influence of macroeconomic factors on the timing ability of firms. The basic relationship can be expressed as follows:\textsuperscript{560}

\textit{Leverage Ratio} = f(\textit{macroeconomic and firm – specific factors}) \hspace{1cm} (3.6)

The macroeconomic determinants of the leverage ratio serve as proxies for frictions that impact issue choice. In essence, their choice of variables is based on theories that link the capital structure decision to variations in adverse selection and distress costs. In specific, three macroeconomic determinants are specified, measuring the two-year aggregate domestic nonfinancial corporate profit growth, the two-year equity market return and the annualized rate on three-month commercial paper over the rate on the three-month Treasury bill.\textsuperscript{561} Firm-specific determinants of the capital structure decision of firms comprise profitability, asset tangibility, tax-shields and size.\textsuperscript{562}

By means of an econometric model, the authors attempt to analyse, how the capital structure decision of firms can be explained by the defined firm-specific and macroeconomic variables. The results show that the leverage ratio of financially

\textsuperscript{558} The Tobin’s q is defined as the sum of the market value of equity and the book value of debt, divided by the book value of assets. In essence, high Tobin’s q values stimulate firms to invest more in capital because they are "worth" more than they actually paid for them. See Tobin (1969), pp.15.
\textsuperscript{559} See Korajczyk and Levy (2003), p.82.
\textsuperscript{560} See Korajczyk and Levy (2003), pp.84.
\textsuperscript{561} For a detailed definition of these variables, see Korajczyk and Levy (2003), p.86.
\textsuperscript{562} See Korajczyk and Levy (2003), p.85.
unconstrained firms varies generally counter-cyclically with macroeconomic factors. In specific, the authors argue that the macroeconomic determinants explain 12-51 percent of the time-series variation in these firms’ leverage.563 In essence, Levy and Hennessy (2007) confirm these findings by showing that less constrained firms issue more debt during contractions and less debt during economic expansions.564

In contrast, financially constrained firms follow a pro-cyclical development, in which macroeconomic factors are able to account for 4-41 percent of time-series variation in firm’s debt ratio.565 These findings can also be confirmed by Levy and Hennessy (2007), showing that financially constrained firms engage in more debt financing during expansions and less debt financing during contractions.566

To sum up, the econometric model of Kornijczyk and Levy (2003) indicates that macroeconomic factors play an important role in the timing behaviour of firms. Thus, it can be concluded that the capital structure decision of firms not only reflects market overvaluation as postulated by Baker and Wurgler (2002), but also the state of the economy in the sense of Kornijczyk and Levy (2003).

3.3.4 Critical Comment

Since the seminal study of Baker and Wurgler (2002) the market-timing theory established itself as one of the most influential capital structure theories nowadays. The notion of the theory revolves around the assumption that firms issue equity when they are overvalued and conduct share repurchases when they are undervalued. While a convolute of academic studies found a significant market-timing effect for US firms, other studies fail to validate the essence of the market-timing theory for capital markets other than those of the USA. This can be accounted by the fact that the institutional structure differs among countries. Thus, the market-timing

behaviour fails to provide a universal explanatory contribution to the capital structure of firms around the world.\footnote{567}

A further weakness of the empirical studies testing the market-timing hypothesis is that they mainly apply an aggregated amount of leverage, instead of testing how the market-to-book ratio directly influences equity issues, share repurchases, bond and loan issues.

The study of Baker and Wurgler (2002) and the subsequent empirical studies all focus in particular on equity issues when dealing with market-timing. In other words, these studies all fail to consider the relationship between market-timing and leverage.

Our empirical study will fill this void by testing the market-timing of equity as well as the market-timing of leverage in order to scrutinize any possible explanations of the capital structure decision of firms. Furthermore, next to the aggregated leverage ratio, our study will directly test the market-timing of equity on the dependent variables equity issues and share repurchases and market-timing of debt on the dependent variables bond and loan issues.\footnote{568}

3.4 Alternative Capital Structure Theories

The following chapter provides three alternative capital structure theories that gained less attention in the academic world but should not be neglected in the capital structure decision of firms.\footnote{569} The first capital structure theory deals with the interaction between a firm’s competitive strategy and its financing decision. Barton and Gros-

\footnote{567} This applies to the market-timing hypothesis of equity. Korajczyk and Levy (2003) show that macroeconomic factors do have an impact on the capital structure of firms. However, studies testing such a relationship fail to provide a universal explanation which macroeconomic factors in particular induce firms to time the market. Hence, the usefulness of this theory is limited.

\footnote{568} Chapter 7 deals with the market-timing of equity, while Chapter 9 covers the market-timing of leverage.

\footnote{569} The author is aware of the immutable fact that more capital structure theories exist. However, due to limited space, this dissertation will focus only on the most relevant and empirically studied capital structure theories.
don (1987, 1988) contributed immensely to the development of this theory by showing that strategic aspects often do have a significant impact on the capital structure decision of firms. The second capital structure theory nullifies the assumption of the neo-classical theories that financing decisions are based on the premise of efficient markets and rational investors. The theory of behavioural finance in particular attempts to find a relation between cognitive behaviour and financing decision of firms. In specific the theory shows that overconfident managers tend to engage in massive gearing and that firms often mimic the capital structure of the herd or of the leading firm in an industry. The third capital structure shows how the maturity structure of leverage might influence a firm’s capital structure.

3.4.1 Capital Structure and Strategic Aspects

Since the publication of Barton and Gordon (1987) a significant number of researches surfaced studying the relationship between capital structure and corporate strategy of a firm.\textsuperscript{570} Furthermore, the paper urged researchers to tackle the issue of strategy and capital structure, a call that later has been fostered by Harris and Raviv (1991). In a subsequent empirical study of Barton and Gordon (1988) the authors proved that firms pursuing different strategies tend to exhibit different debt ratios. Additionally, their study reveals that the relationship between a firm’s capital structure and its traditional financial variables might be influenced by the corporate strategy.\textsuperscript{571} A study of Lowe et al. (1994) confirms these results by testing 176 Australian firms during the years 1984 - 1988. In specific, they show that firms following a diversification strategy are associated with a different capital structure relative to firms with less diversified portfolios. In specific, more diversified firms tend to have larger levels of debt financing compared to non-diversified firms.\textsuperscript{572} Taylor and Lowe

\textsuperscript{570} The idea that strategic decisions and capital structure might be related was first directly expressed by Jensen and Meckling’s (1976) study on agency costs. In essence, they showed that a firm issues debt and subsequently chooses which investment to take. An increase in debt levels is associated with more risky strategies a firm chooses.

\textsuperscript{571} See Barton and Gordon (1988), pp.623.

\textsuperscript{572} See Lowe et al. (1994), pp.250-252.
(1995) and Kochan and Hitt (1998) also find out that industrially diversified firms are
associates with larger debt levels due to risk reduction. In a recent study of La Rocca
et al. (2009), testing publicly-listed Italian firms, they show that unrelated diversifica-
tion strategies are positively related to the level of debt financing. However, they also
show that related diversification strategies follow a rather opposite direction. In
specific, they show that firms pursuing related diversifications tend to experience a
decrease in leverage.573

Jordan et al. (1998) try to link the capital structure of a firm to Porter’s (1980)
generic strategy typology and find out that firms following a strategy contingent
upon innovation have the lowest level of debt, while firms following a cost-
leadership strategy experience the highest debt ratio.574 A more recent study of
O’Brien (2003), studying 16,258 firms during the years 1980-1999, come to the same
conclusion that a firm’s emphasis on strategy of innovation is associated with a
lower leverage ratio.575 In a similar vein, a study of Vincente-Lorente (2001) reveals that
firms spending large amounts of R&D in order to boost their innovative capacity,
experience lower levels of debt, compared to firms with low exposure to R&D
costs.576

To sum up, the empirical studies above show that a firm’s capital structure is
often also impacted by the corporate strategy a firm pursues. However, it must be
noted that different strategies lead to different capital structures. Hence, a consistent
and unified explanatory contribution to an optimal capital structure cannot be pro-
vided.

573 See La Rocca et al. (2009), pp.816.
574 See Jordan et al. (1998), pp.8.
3.4.2 Capital Structure and Behavioral Finance

The majority of capital structure theories, such as in particular the classical theories, are based on the notion that investors and managers behave rationally in a sense of maximizing their individual utility in an efficient capital market. Each theory is subject to contradictory empirical evidence and consequently fails to prevail in practice. Within the last several years researchers have emerged trying to study in particular the impact of the human factor on the capital structure decision of firms. In specific, the behavioural finance approach of capital structure surfaced examining the psychological factors in financing decisions. Ohlson (1998) defines behavioural finance as follows: “Behavioral finance is part of science, in that it starts from fundamental axioms and asks whether a theory built on the axioms can explain behaviour in the financial marketplace.”

In essence, the notion of common rationality of individuals and market efficiency has been questioned by researchers basically due to two reasons. First, a convolute of experimental studies emerged claiming that the motives for individual’s behaviour might deviate from the notion traditional theories have postulated. Kahneman and Tversky (1979) provide one of the most influential cognitive psychological studies examining pervasive behavioural biases that actually lead to the observed deviation from rationality. In essence, the authors empirically prove that individuals generally undervalue outcomes that are merely probable compared to results received with certainty.

Second, next to the experimental studies, a large body of empirical studies surfaced testing the validity of market efficiency claimed by Fama (1970). Essentially, these studies refute the tenets of the paradigm by unfolding various anomalies on capital markets. These anomalies basically revolve around market over- and under

577 See Neus and Walter (2008) and Vasilou and Daskalakis (2009) on that issue.
580 For further detail, see Kahneman and Tversky (1979), pp.263.
action of stock prices. Empirical evidence of market overreaction is prevalent for studies of IPOs, SEOs, merger announcements and dividend omissions. Ample evidence for the existence of market underreaction are provided by studies subject to dividend initiations, earnings announcements and share repurchases.

Two essential strings of research dealing with cognitive decision of capital structure are the notion of overconfidence and herd behaviour.

3.4.2.1 Overconfidence

Within the last 20 years many academics have shown that overconfidence of management plays a crucial role in determining manager’s financing and investment decision. Theoretically, managers exposed to overconfidence tend to underestimate the riskiness of future cash flows and as a consequence are prone to employ higher levels of debt. This confidence bias is perceived as an important capital structure determinant.

Hackl and Hackl (2008) examines the implications of managerial overconfidence on their financing behaviour. He shows that overconfident and optimistic managers are susceptible to larger gearing and to more debt issuance compared to less confident

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581 Refer to Chapter 3.3.1.1.
582 Refer to Chapter 3.3.1.2.
584 Among others, see Michaely et al. (1995), Van Eaton (1999), Koch and Sun (2004), Lie (2005) and Bulan et al. (2007).
586 See Bernard and Thomas (1990), Cready and Gurun (2010) and Gift et al. (2010).
managers.\textsuperscript{590} Malmendier and Tate (2005a, 2005b) empirically prove that managers exposed to high levels of overconfidence tend to prefer internal financing over external financing. Further, they show that debt is preferred over equity when external financing is needed.\textsuperscript{591} A positive relation between leverage and overconfidence has also been found by Ben-David et al. (2007), Fairchild (2007, 2009), Kasch (2008) and Oliver and Mejteh (2010), among others.\textsuperscript{592}

3.4.2.2 Herd Behavior and Following the Leader

One of the first empirical studies dealing with “herd behaviour” in capital structure decisions was delivered by Patel et al. (1991). Basically, herd behaviour describes how individuals might mimic the action of a group or herd without planned direction.\textsuperscript{593} Studying 182 firms within ten industries, the authors find out that in seven out of ten industries, 15 percent of the firms pursued the same capital structure as the herd.\textsuperscript{594} In specific, the authors proclaim that herd behaviour in capital structure decisions is associated with following the average debt-equity ratio of the industry. A study of Filbeck et al. (1996) analyses 120 firms during the years 1981-1990 in order to test the validity of the herd behaviour hypothesis postulated by Patel et al. (1991). However, the study fails to deliver any significant evidence in support of the herd behaviour in capital structure decisions.\textsuperscript{595}

Another psychological research issue concerns the fact that some firms’ decisions are based on successful leader firms in the industry, known as “Following the Leader”.\textsuperscript{596} Thus, the hypothesis posits that firms exist that attempt to choose their capital structure in a similar vein to that of the leader firm. So far only two empirical studies exist that explicitly study the impact of industry leaders on the capital struc-

\textsuperscript{590} See Hack Barth (2008), pp.848.
\textsuperscript{591} See Malmendier and Tate (2005a), pp.653-655 and Malmendier and Tate (2005b), pp.2668.
\textsuperscript{592} For a detailed overview of overconfidence and capital structure, refer to the dissertation of Kasch (2008).
\textsuperscript{593} See Patel et al. (1991), pp.232.
\textsuperscript{594} See Patel et al. (1991), pp.232.
\textsuperscript{595} See Filbeck et al. (1996), pp.57.
\textsuperscript{596} See Statman and Caldwell (1987), pp.7.
ture of the individual firm. While, Filbeck et al. (1996) provide only weak evidence in favour of this hypothesis, a recent study of Leary and Roberts (2009) empirically prove that firms indeed respond strongly to capital structure changes of industry leaders. In specific, they show that in particular poor performing firms and new entrants tend to mimic the financing decision of leader firms.397

To sum up, the new strand of research, called behavioural finance, provides a fruitful contribution to the capital structure discussion per se. While a large number of theories exists that tries to explain the capital structure behaviour of firms, unfortunately only a few empirical work exist that provide empirical evidence for these hypotheses. Thus, future research is needed in order to examine more closely the effects of irrational behaviour on the capital structure decision of firms.

3.4.3 Capital Structure and Debt Maturity Structure

The following theory tries to show how the maturity of debt and in particular the factors influencing it, might impact a firm’s capital structure.398 In essence, the most important models determining the maturity structure of debt are the signalling model, the tax model and the maturity-matching model; they will be briefly discussed consecutively.

The signalling model is based on the notion of asymmetric information and assumes that outside investors are able to extract information about the financial prospect of a firm through the maturity structure of debt.399 In particular, Flannery (1986) provides a signalling model in which the maturity of a firm’s debt might be a signal about its credit quality. In case investors are unable to differentiate between good and bad firms, good ones will consider their long-term debt to be undervalued

397 See Leary and Roberts (2009), p.25.
398 Studies dealing with debt maturity and capital structure include Barclay and Smith (1995), Ju and Ou-Yang (2006b) and Fan et al. (2008).
and consequently issue short-term debt. In contrast, bad firms will issue overvalued long-term debt.\footnote{See Flannery (1986), p.35.}

The tax model posits that firms choose the maturity of debt with regard to the optimal corporate tax rate.\footnote{Studies dealing with that issue include Brick and Ravid (1985, 1991), Emery et al. (1988), Brick and Palmon (1992), Mauer and Lewellen (1987) and Nam and Radulescu (2010).} \textit{Brick and Ravid} (1985) create a theoretical model in order to show that taxes play a significant role for the debt maturity structure a firm chooses. In essence, they show in their tax model that when interest rates pursue an upward trend, firms tend to prefer long-term debt due to its larger interest tax shield.\footnote{See Brick and Ravid (1985), pp.1423.} In a similar vein, \textit{Guedes and Opler} (1996) claim: \textit{“With a convex corporate tax function, an increase in interest rate volatility reduces the present value of the debt tax shields from short-term financing, while the present value of tax shields from long-term financing remain unchanged. Thus long-term debt is attractive when interest rates are volatile and the firm expects a stream of taxable earnings.”}\footnote{Guedes and Opler (1996), p.1813.}

\textit{Brick and Ravid} (1991) extend their theoretical tax model from 1985 by incorporating stochastic and thus uncertain interest rates. Their study reveals that firms facing interest rate uncertainty tend to engage in more long-term debt rather than short-term debt.\footnote{See Brick and Ravid (1991), pp.63.}

The essence of the maturity-matching model, also called contracting-cost model is that firms may hedge their exposure to interest rate risks by matching the duration of assets to the debt employed in order to finance these assets. \textit{Myers} (1977), \textit{Barnea et al.} (1980), \textit{Fama} (1990), \textit{Harris and Raviv} (1990), \textit{Stulz} (1990) and \textit{Jen and Jen} (2005) claim that a firm’s debt maturity structure is subject to the contracting costs arising from agency problems. In essence, these studies show that short-term debt will be preferred when firms face growth opportunities in order to attenuate the underinvestment problem, as discussed in Chapter 2.4.2.2. Furthermore, short-term debt will be used when the fear of asset substitution is rather high, since the value of
short-term debt behaves more insensitive to the level of asset risk compared to long-term debt. Finally, short-term debt will be preferred over long-term debt when the need for monitoring is high.\textsuperscript{605} Jun and Jen (2005) empirically prove the maturity-matching principle and show that firms engaged in higher degree of maturity matching are associated with lower stock return volatilities.\textsuperscript{606} In addition, empirical studies of Easterwood and Kadapakkam (1994), Barclay and Smith (1995, 1996) and Guedes and Opler (1996) confirm the validity of the maturity-matching theory. In specific, they prove that firms facing larger growth options and more agency problems tend to prefer short-term debt over long-term debt financing.

3.5 Conclusion

The capital structure theories discussed in Chapter 3 have all in common that they follow an inductive and interdisciplinary approach, linking findings of applied economics to the capital structure decision of firms. In contrast to the classical, static and deductive capital structure theories mentioned in Chapter 2, the new dynamic theories attempt to find out how specific business-related aspects influence the financing mix of firms. Without doubt, such interdisciplinary approaches have significantly contributed to an enhanced understanding of the observed capital structure in reality. However, one of the biggest demerits of these studies is the difficulty to provide valid and statistical measurability of these business-related aspects. Furthermore, most of the new theories lack statistical significant empirical evidence and hence further research is necessary in the future.

One of the first capital structure theory combining dynamic aspects in the financing decision of firms has been immensely influenced by the work of Brander and Lewis (1986). This theory attempts to examine the relationship between factor-

\textsuperscript{605} See Myer (1977), pp.170.
\textsuperscript{606} See Jun and Jen (2005), pp.313.
product markets and the capital structure of a firm. First, the firm’s competitive strategy was linked to the capital structure. In essence, Brander and Lewis (1986) hypothesize that low levels of debt do motivate firms to engage in cooperative actions. However, no empirical evidence so far exists that is able to empirically prove the hypothesis that an increase in leverage ultimately leads to more competitive action among firms. Second, a link between the stakeholder theory and the capital structure theory decision of a firm has been discussed. In general, it has been shown that firms trying to mitigate the bargaining power of stakeholders tend to have lower levels of debt. Third, a linkage between the capital structure and market structure has been provided. Studies of Opler and Titman (1994) and Cheronier (1995a, 1995b) have shown that highly indebted firms are associated with a lower market share. In other words, an increase in debt leads to a rise in product prices and consequently to a decrease in market shares.

The second capital structure theory mainly emerged due to the intense takeover activities in the 1980s, testing how corporate control in general, and takeover threat in specific, might influence the capital structure decision of firms. In essence, the capital structure theories based on the notion of corporate control, all come to the conclusion that firms generally engage in massive gearing when a takeover threat is apparent. In specific, debt financing serves as a perfect tool to diminish the probability of a successful takeover. While these approaches are able to account for the short-term fluctuations in the capital structure of firms, they all fail to provide an explanatory contribution to the long-term capital structure of firms. Thus, the capital structure theory based on corporate control is only of limited benefit.

The third capital structure theory established itself as one of the most influential theories in explaining capital structure decision of firms. The study of Baker and Wurgler (2002) and Korajczyk and Levy (2003) have shown that capital structures per se are not static and rather follow a dynamic trend, deviating from the target debt level. This deviation mainly occurs through the market-timing behaviour of firms. While Baker and Wurgler (2002) has shown that in specific the capital market has an influence on the financing mix of firms, Korajczyk and Levy (2003) have proven that mac-
roeconomic variables might account for irrational behaviour of firms. These studies show in particular that firms generally pursue a target capital structure in the sense of the trade-off theory and deviate from this target due to market-timing opportunities.

While a large body of empirical studies find evidence in favour of the market-timing effect of equity in the USA, other studies fail to validate the essence of the market-timing theory for firms other than those of the USA. In specific, a long-lasting effect of market-timing can hardly be found.

While Modigliani and Miller’s (1958) irrelevance theory attempted to ignite a vital discussion on the capital structure of firms in general, the seminal paper of Baker and Wurgler (2002) introduced a fruitful debate over the market-timing effect in the capital structure decision of firms in specific. This dissertation will also contribute to this issue by extending the idea of Baker and Wurgler (2002), examining how the market-timing of leverage might influence the financing decision of firms. Furthermore, we will apply direct equity and debt measures in order to provide a reliable analysis on the market-timing behaviour of equity and debt financing.

While the other studies, dealing with strategic aspects, behavioural finance and the maturity of debt, also play an important aspect in the capital structure decision of firms, no theory exists that is able to provide a universal explanation to the observed financing mix of firms. The capital structure theories so far all attempt to test one single aspect and try to validate or refute their hypothesis. No theory exists that is able to study a convolute of different aspects that influences the financing decision of firms.

Due to the undeniable fact that no universal capital structure theory exists that can explain all observed financing pattern, it is of utmost importance to find out which debt factors have an immense influence on the leverage decision of firms. Based on a large number of capital structure determinants one is able to find out which capital structure theory is best to explain the capital structure decision of firms in reality. Thus, the subsequent chapter will offer a brief overview of some of the most relevant debt factors, while Chapter 8 provides an empirical study of the importance of the most important debt determinants. Based on these findings Chapter 10 is able to show which capital structure theory survives in accounting best the observed financing pattern.
4 Capital Structure and Determinants

Chapter 4 will provide an overview of the factors that have an influence on the capital structure decision of firms. Guided by the existing empirical literature we will briefly discuss the most relevant factors that proved to have a significant impact on the leverage decision of firms. Please note that Chapter 8 in this dissertation offers an in-depth empirical analysis on the various capital structure determinants. While Chapter 4.1 discusses endogenous as well as exogenous debt factors, Chapter 4.2 provides an overview of the surveys about the determinants of capital structure decisions. Chapter 4.3 discusses the financing pattern across the world, before Chapter 4.4 delivers concluding remarks on the content formulated in this chapter.

4.1 Capital Structure Determinants

4.1.1 Endogenous Determinants

The following section provides a brief overview of the key debt factors and their predicted effect on the capital structure decision of firms.

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608 While Chapter 2 and Chapter 3 serve as a theoretical introduction to the empirical work in Chapter 7 and Chapter 9, Chapter 4 provides the theoretical fundament for the empirical study in Chapter 8.

609 Key debt factors are those that have been frequently studied by academics, showing a significant impact on the leverage decision of firms. Again, Chapter 4.1 offers only a limited number of factors due to the fact that an in-depth examination will be delivered in Chapter 8.

610 The factors will be discussed with regard to the prediction of the trade-off and pecking-order theory. This elaboration in this chapter seems limited, due to the fact that a detailed study of the predictions of various capital structure theories will be given in Chapter 10 in this dissertation.
4.1.1.1 Growth

Growth opportunities are mainly measured by Tobin’s Q. In essence, an inverse relationship exists between leverage and the growth opportunities of a firm. In other words, the more growth opportunities a firm has, the less leverage it applies. This negative relationship has also been confirmed by Steyn-Sunder and Myers (1999) as well as by Barclay et al. (2006). On the one hand, this empirical finding seems to be in line with the prediction of the trade-off theory, stating that large growth opportunities might raise the costs of financial distress, leading to lower leverage. However on the other hand, the negative relationship between growth and leverage stays in contrast to the notion of the pecking-order theory. The pecking-order theory actually theorizes that growth opportunities should be financed with leverage and not equity, leading to an increase in leverage.611

4.1.1.2 Size

Typically, the size of a firm is determined through the logarithm of assets or the age of the firm. In most studies, size and leverage exhibit a positive relationship. Hence, the bigger/older a firm, the more leverage it employs. This empirical finding is in line with the trade-off theory, since larger/older firms are exposed to less default risk than smaller/younger start-up firms. Furthermore, larger/older firms have already established a certain track record of success and therefore might enjoy better attention from financial analysts and credit ratings. Hence, a firm is able to make use of more debt financing.

A recent study of Beek et al. (2008) shows that firm size plays a significant role in the capital structure decisions of companies. Applying a firm-level survey database in 48 countries, the authors proof that small firms make use of less external financing and in particular, small firms engage in less debt financing.612

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611 An in-depth discussion on the validity of each capital structure theory based on the given debt factors will be provided in Chapter 10 in this dissertation.
612 See Beek et al. (2008), 476-484.
4.1.1.3 Tangibility
The ratio of fixed assets to total assets is a perfect measure in order to determine the tangibility of assets of a firm. Most studies have detected a positive relationship between the tangibility of assets and the degree of leverage of a firm. Thus, the more tangible assets a firm possesses, the more incentive the firm has to increase its leverage. This is also in line with the essence of the trade-off theory, since tangible assets often serve as collateral for debt financing, leading to a decrease in the costs of financial distress and consequently raising the debt capacity of firms. This is also consistent with the pecking-order theory, in which the collateral is used in order to diminish the relevance of asymmetric information.

4.1.1.4 Value
Empirical studies have shown that firm valuation does have a significant impact on the leverage decision of firms. The market-to-book ratio is mostly applied in order to capture the value effect on leverage. It is expected that the market-to-book ratio is negatively related to the level of debt. This prediction is in line with the notion of the market-timing theory, discussed in Chapter 3.3.2. Thus, firms will issue equity when they think that the current value is overvalued and vice versa.

4.1.1.5 Liquidity
The impact of asset liquidity on the capital structure decision of firms has been a source of debate for many years. While some academics claim a positive relationship between liquid assets and leverage, others detect a rather curvilinear relationship. The rationale of a positive effect stems from the notion that less liquid assets are associated with higher liquidation costs, which ultimately leads to higher distress costs. Hence, in order to mitigate the higher distress costs, firms need to lower their debt level. In other words, firms with liquid assets possess higher financial flexibility,

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613 Among others, see Baker and Wurgler (2002), Elliott et al. (2008) and Frank and Goyal (2009).
which is positively conceived by the market and therefore makes debt financing less expensive. However, academics finding a negative effect claim that less liquid assets makes it more costly for the firm to expropriate value from bondholders. Consequently, less liquid assets lowers the costs of debt financing, leading to an increase in leverage.616

4.1.1.6 Profitability
Generally, the more profitable a firm, the less leverage it employs. Hence, a negative relationship between profitability and leverage can be anticipated.617 This finding is in line with the essence of the pecking-order theory, since profitable firms are associated with larger internal funds and hence can restrain from external financing. However, according to the notion of the trade-off theory a positive relationship between profitability and leverage is predicted. Due to the fact that more profitable firms face lower bankruptcy costs, these firms should exploit the debt tax shield benefit by increasing their debt level.

4.1.1.7 Industry Median Debt Ratios
Empirical studies have proven that firms competing in industries in which the median firm has high leverage tend to have larger amounts of debt financing.618 This result is in line with the notion of the capital structure theory based on “herd behaviour” and “follow the leader”, discussed in Chapter 3.4.2.2 in this dissertation.

616 Morellec (2001) argues that the impact of asset liquidity on capital structure decision of firms depends whether restrictions on asset disposition are prevalent. Myers and Rajan (1998) in particular show that less liquid assets restrain managers from expropriating value from investors.
618 For example, see Dittmar (2004), Elliott et al. (2008) and Frank and Goyal (2009).
4.1.2 Exogenous Factors

The following sub-chapter will offer some exogenous determinants that might have an influence on the capital structure of a firm. The focus lies not on the stylized facts but rather on factors that are often neglected in empirical studies.

4.1.2.1 Deregulation

A recent study of Ovechinnikov (2010) explicitly deals with the evolution of capital structure in response to industry deregulation. Due to the immutable fact that a deregulation is associated with a transformation of the operating environment, the author assumes that such an economic shock must have an influence on the capital structure of firms. He claims that debt factors, such as profitability, size and asset tangibility deter the financing structure of a firm in a non-trivial way, when economic deregulation occurs. In specific, his study shows that firms exposed to industry deregulation are characterized by a significant decrease in profitability, asset tangibility and an increase in growth options. Due to this development firms, in general, attempt to diminish their debt level. Furthermore, the study demonstrates that leverage is less inversely correlated with profitability and market-to-book and more positively related to firm size following deregulation.

4.1.2.2 Bank Concentration and Institutions

González and González (2008) have studied the effect of bank market concentration and institutions on the capital structure decision of firms. They studied 12,049 firms within 39 countries during the years 1995-2004. In essence, their study shows that firms, exposed to greater bank concentration and stronger creditor rights protection, tend to have larger debt levels. In contrast, firms facing strong protection of property rights tend to have lower levels of debt. Furthermore, they show that greater bank concentration substitutes for creditor protection and asset tangibility to

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620 See Ovechinnikov (2010), pp.262.
621 See González and González (2008), pp.369-373.
mitigate agency costs between shareholders and bondholders, as discussed in Chapter 2.4.2. In case of weak protection rights, firms tend to follow the notion of the pecking-order theory due to higher agency costs of external financing. Their results indicate that in particular bank concentration and the protection of credit rights facilitate the access to debt financing.

4.1.2.3 Access to Capital Markets

Brav (2009) tries to examine how the access to capital might influence the capital structure of a firm. While the most empirical studies in the academic debate scrutinize publicly traded firms that have access to the capital market, only a limited number of academic papers exists studying private firm’s capital structure. Studying firms in the UK during the years 1997-2003, the author empirically proves that access to the capital market entails two implications for the capital structure decision of firms. The first is a level effect, which implies that private firms employ more leverage compared to public firms. The second is a sensitivity effect which occurs through their avoidance of capital markets, leading to greater sensitivity of their capital structure to fluctuations in performance. This pattern is more severe for private firms than public firms due to the higher costs associated with private equity.

4.2 Surveys about the Determinants of Capital Structure Decisions

As has been shown a vast number of different capital structure theories exist all trying to explain the debt-equity choice of companies. The question that remains is what factors do have an influence on the capital structure decisions of publicly traded companies. While the trade-off theory is based on traditional factors such as the
tax advantage and the bankruptcy costs of leverage, others apply the asymmetric information framework where leverage or equity is used as a signalling mechanism or a strategic tool. Despite extensive empirical research on the different capital structure theories, only little consensus about the diverse capital structure determinants exists. Chapter 4.2 will provide four studies that conducted a questionnaire survey in order to test which debt factors really matter in practice.

4.2.1 Study of Graham and Harvey (2001, 2002)

Graham and Harvey (2001, 2002) are one of the first to find out which factors are reliably important in the financing mix by providing a comprehensive interview survey to chief financial executives (CFOs) in U.S. companies. Since then, other academics emerged in order to determine the factors of the capital structure decision of firms.\textsuperscript{625}

Graham and Harvey create a questionnaire of more than 100 questions in order to find out which factors determine the capital structure decisions of U.S. companies. The survey samples a large cross-section of U.S. companies, obtaining a response of 392 CFOs.\textsuperscript{626} The respondents have been separately asked which factors they consider as important for their leverage decision as well as equity issuance decision. Figure 4.1 shows the different factors that CFOs consider as very or less important when dealing with the decision how much debt a firm should issue. As can be seen in Figure 4.1, financial flexibility\textsuperscript{627} appears to be the most important fac-

\textsuperscript{625} For example, Bancil and Mittoo (2004) conduct a survey of companies in 16 European countries, in order to combine theory and practice of capital structure across different European countries. Brunder et al. (2004, 2006) survey among 313 CFOs in the U.K, Germany, France and the Netherlands and compare these results to the findings of Graham and Harvey in their U.S sample. Dimberg et al. (2006a) apply a similar questionnaire like Graham and Harvey to test the factors that determine the debt/equity choice in German, Swiss and Austrian companies.

\textsuperscript{626} The survey was send to each CFO in the 1998 Fortune 500 list and to 4400 publicly traded US companies which are members of the “Financial Executive Institute” (FEI). Having a response rate of nearly 9 percent, Graham and Harvey were able to survey 392 CFOs about the capital structure decision of their firms.

\textsuperscript{627} Figure is based on Graham and Harvey (2001), pp.209-211. Own illustration.

\textsuperscript{628} Refer to Gamba and Triantis (2008) for a detailed study of the value of financial flexibility.
tor in the corporate debt decision process. Nearly 59 percent of the respondents claim that flexibility seems to be an important or very important factor.  

\[\text{Figure 4.1: Survey - Determinants of Debt Choice}\]

The notion of financial flexibility diverges with the essence of the trade-off and pecking-order theory by means of inter-temporal dependencies in financing activity. In essence, the opportunity cost of using leverage in the current period materializes in the prospective incapability of borrowing in future periods. In other words, \textit{ex-ante} optimal debt policies will diminish a firm’s ability to obtain external financing \textit{ex-post} in the case of unexpected events. Hence, in order to ensure a certain degree of financial flexibility, companies base their debt decision on the question whether or not too much debt \textit{ex-ante} constrains the firm’s access to the capital market \textit{ex-post}.

\[\text{\cite{DeAngelo_2007, Denis_2009}}\] Recently, DeAngelo and DeAngelo (2007) and Denis and McKeon (2009) empirically confirm that financial flexibility seems to be a very crucial debt policy factor.
Almost equally important for CFOs are the concerns of their credit rating. Approximately 57 percent of the respondents consider the fear of distress and the ultimate consequences on their credit rating important or very important when determining the appropriate amount of leverage. The importance of credit rating is positively related to the size of a company. In particular, companies enjoying an investment-grade rating are even more worried about possible downgrading because of the potential distress costs of leverage.\textsuperscript{630} Kissen (2006) empirically shows how credit rating concerns lead to real economic decision making consequences. Basically, he finds that a company close to a rating change issues approximately 1 percent less net debt relative to net equity per annum as a percentage of total assets in comparison to firms not near a rating change.\textsuperscript{631}

\textit{Earnings volatility} is the third most important factor when making leverage decisions. According to the trade-off theory, firms that are exposed to low volatile earnings are often characterized by a higher leverage ratio due to its lower bankruptcy probability.

47 percent of the CFOs respond that insufficient internal funds are an important or very important cause for the issuance of debt. Furthermore, the survey shows that especially smaller firms are inclined to use leverage when facing internal funds deficit. This finding is in line with the notion of the pecking-order theory, suggesting that smaller firms are exposed to larger asymmetric information, leading to the decision that internal funds is the prior source of financing.

The \textit{level of interest rates} consider 46 percent of the respondents as an important or very important debt factor. Hence, firms often try to time the market by issuing

\textsuperscript{630} Chapter 9.2 in this dissertation empirically examines the effect of credit rating changes on the capital structure decision of firms.

\textsuperscript{631} See Kissen (2006), pp.1043.
debt when market interest rates are particularly low.532 The concern of the level of interest rates is particularly relevant for larger companies.533

According to the trade-off theory, the corporate tax advantage plays a crucial role for firms. However, the survey shows that this factor is not considered as one of the utmost important debt factor when dealing with the decision how much leverage to employ. Approximately 45 percent of the respondents agree upon that the tax shield of debt has an important or very important influence on the capital structure choice. Particularly, the corporate tax shield is most essential for large, regulated, and dividend-paying companies.534 Interestingly, personal taxes appear to be a non-relevant debt factor. Only 5 percent of the CFOs consider this debt factor as important or very important.

While Titman and Wessels (1988) as well as Fisher et al. (1989) highlight the importance of transaction costs on the optimal debt level, the survey of Graham and Harvey (2002) shows only moderate evidence. Approximately 33 percent argue that they consider the transaction costs of debt issue as an important or very important factor. Interestingly, when asked whether or not firms delay or retire debt issues due to transaction costs, only 10 percent of the respondents agree to follow such timing.

However, certain debt factors, which seem to be relevant in theory, appear to be rather negligible in the capital structure decision of firms. While the financial distress costs are a key input in the trade-off theory, only 21 percent of the respondents consider these as important or very important. In a similar vein, only 23 percent of the CFOs claim that the peers’ debt ratio plays an important role in their debt decision making. While Opler and Titman (1998) show that the accumulation of profits is positively related to the level of leverage, the survey shows that only 1 percent of the respondents identify this debt factor as important or very important. Furthermore, while

532 Chapter 9.1 deals with the issue how companies time the market when issuing leverage, focusing on the attempt to time interest rates.
Brander and Lewis (1986) proof that the production threat of rivals influences the debt policy of companies, the executives do not consider this as an important debt factor.

Capital structure theories, which have been discussed in Chapter 2 and Chapter 3, fail to exhibit significant importance in the capital structure decision of firms. For instance, only 12 percent of the CFOs provide support for the underinvestment hypothesis by considering it as an important or very important debt factor. While Myers (1977) shows that firms reduce the amount of leverage, or rather employ short-term debt in order to diminish underinvestment costs, Graham and Harvey do not find clear evidence. The same applies to the asset substitution hypothesis. Here, the survey provides only little support that firms issue short-term debt to reduce asset substitution problems. Also interesting to note is the fact that less than 2 percent of the respondents consider the free cash flow hypothesis by Jensen (1976) as an important factor when dealing with the debt-equity decision. Hence, potential negative consequences due to too much cash flow are not really fathomed by executives. Furthermore, the signalling hypothesis and the corporate control theory do not find a lot of acceptance and recognition by CFOs when dealing with the optimal capital structure decision.635

Additional to the questioning over the importance of certain debt policy factors, the executives have also been surveyed about the question which factors reliably influence the equity decision the most. Figure 4.26 provides a detailed overview of the most important common stock factors.

The most important factor in issuing equity is the concern that additional shares exercise a negative impact on earnings per share (EPS). Almost 68 percent of the respondents regard earnings dilution as the single most important equity factor. This result seems quite delusive when recalling the fact that since decades corporate finance literature has shown that earnings dilutions should be negligible in firm valua-

636 Figure is based on Graham and Harvey (2001), pp.229-231. Own illustration.
4.2 Surveys about the Determinants of Capital Structure Decisions

To quote Graham and Harvey (2001): “The popularity of this response is intriguing, It either indicates that executives focus more than they should on earnings dilution (if the standard textbook view is correct), or that the standard textbook treatment misses an important aspect of earnings dilution.” The concern for earnings dilution is even more severe for large and dividend-paying companies.

Figure 4.2: Survey - Determinants of Equity Choice

More recently, Huang et al. (2009) investigated this apparent paradox and come up with some interesting explanations for this paradigm. In essence, they find evidence that managers always obviate EPS dilution when their bonus compensation...
depends upon EPS performance. Further, they show that companies prefer debt over equity when managers’ compensation is mainly based on EPS performance.641

The second most important equity factor revolves around the potential over- and undervaluation of common stock. Approximately 66 percent of the CFOs answer that they avoid issuing equity when it is undervalued. Instead of issuing undervalued common stock companies often prefer to make use of convertible debt.642 Hence, companies try to time the market when issuing equity.

Consistent with this finding is the third most important equity factor. Nearly 62 percent agree that they issue equity during windows-of-opportunity643. Hence, shares will be issued after a rise in the stock price has been experienced. This notion seems consistent with the relevance of EPS dilution due to the immutable fact that issuing equity after a stock price increase is likely to mitigate the risk of EPS dilution.644

Almost 53 percent of the respondents agree that due to the employee bonus plans, firms often issue equity in order to provide shares to their employees.

Maintaining a target debt-equity ratio also seems a quite relevant factor for potential equity issues. 52 percent of the CFOs consent upon that they issue equity to sustain a target debt-equity ratio. Graham and Harvey directly asked in their survey whether or not they have an optimal or target debt-equity ratio. As can be seen in Figure 4.3445, only 10 percent of the respondents do have a strict target debt ratio, while 34 percent follow a rather tight debt-equity range. Another 37 percent have a flexible target and almost 19 percent agree not to follow a target debt ratio or target range. Differentiating between the size of a firm, the survey also reveals that larger companies do follow a rather stricter target debt-equity ratio (55 percent) compared to smaller firms (36 percent).

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641 For detailed information, see Huang et al. (2009), pp.10.
642 Further, the survey reveals that approximately two-thirds of CFOs perceive their equity as undervalued.
643 The notion of “windows-of-opportunity” has been discussed in Chapter 3.3.1.
644 Alternatively, it is also consistent with the characteristics of financial flexibility supported in issuing debt.
645 Figure is based on Graham and Harvey (2001), p.218. Own illustration.
While the concern of diluting holdings of certain shareholders also plays a certain importance in the decision whether or not to issue equity (49 percent), other factors are less relevant in the CFOs’ equity decision.

For example, a modest number of respondents (30 percent) agree that they make use of equity due to its positive risk characteristic. The idea that equity is the cheapest source of funds is almost irrelevant in the equity decision process (15 percent). Consistent with the notion of the pecking-order theory are the following two equity factors, which apparently play a minor role in practice. 29 percent state that they issue equity when retained earnings are too low to finance upcoming projects and 17 percent claim that they issue equity due to a lack of other financing sources. Hence, these results show that some firms do indeed follow the pecking-order theory by financing projects first through internal funds, followed by debt and finally equity.

To sum up, the results shown by the survey are quite puzzling and surprising in regard to the notion of the capital structure theories. Especially informal characteristics such as financial flexibility and credit ratings need to be considered as the most
important debt factors in practice. Especially factors such as bankruptcy costs or the
corporate tax advantage, which play a crucial role in the theoretical capital structure
literature, exhibit a rather minor importance in the debt decision of firms. In con-
trast, financial flexibility, which has been almost completely neglected in capital
structure theories, seems to be the most important debt factor. Other informal fac-
tors such as EPS dilution as well as stock price undervaluation/overvaluation are the
two most important factors in how much equity a firm should issue. Executives state
that they are willing to issue equity when their stock is overvalued or when the stock
price has recently increased due to the mitigating effect of EPS dilution. Hence, in
practice, firms are prone to time the market when deciding to issue a certain amount
of common stocks. Furthermore, the survey provides only moderate evidence that
companies stick to the trade-off theory and follow a target debt ratio. In contrast,
the characteristics of financial flexibility as well as equity undervaluation are con-
sistent with the notion of the pecking-order theory. Also interesting to note is the
fact that the underinvestment hypothesis, the cash flow hypothesis as well as the
information asymmetry and the signalling effect are only of subordinated im-
portance.\textsuperscript{646}

4.2.2 Other Surveys

4.2.2.1 Survey of Bancel and Mittoo (2004)

\textit{Bancel and Mittoo} (2004) conduct a survey similar to that of \textit{Graham and Harvey}
(2001, 2002), however their focus lays on the important capital structure factors for
European companies. Their survey was mailed to CFOs in 16 different European
countries and a total of 87 responses were obtained.\textsuperscript{647} The results appear to be
relatively similar to those of the study by Graham and Harvey. Concerning the debt

\textsuperscript{646} See Graham and Harvey (2001), pp.233-236.
\textsuperscript{647} The population firms by country of origin are Austria, Belgium, Denmark, Finland, France, Germany,
Greece, Ireland, Italy, Norway, Portugal, Spain, Sweden, Switzerland, the Netherlands, and the United Kingdom.
policy, the two most important factors of debt issuance are financial flexibility and credit rating concerns.

Figure 4.4 shows a selection of the 15 most important debt factors comparing the ranking of US managers with that of European executives. As can be seen in Figure 4.4, the relative ranking of the most important debt factors are largely similar, the response rate is quite different between the European survey of Bancel and Mittoo and the US study by Graham and Harvey. For instance, almost 91 percent of the European CFOs state that financial flexibility is considered as an important or very important debt factor, compared to only 59 percent of US executives. In a similar vein, credit rating concerns are recognized as important or very important by almost 73 percent of the European managers, compared to approximately 57 percent of the US managers.

Furthermore, the European survey perfectly shows that countries with different legal systems also exhibit different focus on the importance of debt factors. For example, credit rating concerns play a higher importance in the debt decision process for German and Scandinavian countries in comparison to English or French Law firms. However, the corporate tax advantage is ranked much higher in English or French law countries than in German or Scandinavian countries.

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448 Figure is based on Graham and Harvey (2002) and Bancel and Mittoo (2004); Own illustration.
449 This evidence is in line with the argument that external financing is influenced by a country’s legal and financial environment. See La Porta et al. (1997, 1998), Demirgüç-Kunt and Maksimovic (1998) and Rajan and Zingales (1998) and Carlín and Mayer (2003).
Figure 4.4: Cross-Country Determinants of Debt Choice

Figure 4.5 depicts that the responses of the European and the US executives converge on most of the equity factors. For instance, EPS dilution is also considered as the most important factor influencing the firm how much equity to issue. Approximately 68 percent of US executives recognize EPS dilution as important or very important, compared to 66 percent of European managers. Equity determinants relating to stock price reaction and the amount of stock under- or overvaluation are also recognized as important equity factors by both European and US executives.

Interesting to note is the fact that maintaining a target debt-equity ratio appears to be the second most important equity determinant for European CFOs. 59 percent of the respondents consider this factor as important or very important, compared to 52 percent of the US executives, where it ranks only fifth place. Also interesting seems that the dilution of certain shareholders plays a much minor role in the equity decision for European managers than for US firms. While 49 percent of the US

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650 Figure is based on Graham and Harvey (2002) and Baele and Mittoo (2004). Own illustration.
CFOs recognize this factor as important or very important, only 30 percent of the European managers have the same consideration on the importance of this equity determinant.

To sum up, Bancel and Mittoo (2004) surveyed managers of companies in 16 European countries and found out that the major determinants of the capital structure choice appear to be quite similar across European and US executives. However, the survey also shows that countries with different legal systems sometimes exhibit diverse importance on the major capital structure factors.\(^{651}\) It should be noted, however, that Graham and Harvey (2001, 2002) sampled public and privately held firms, while Bancel and Mittoo (2004) analysed exclusively public companies.\(^{652}\)

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\(^{651}\) See Bancel and Mittoo (2004), pp.124-130.

\(^{652}\) Brounen et al.(2006) overcome the weakness of Bancel and Mittoo’s sample by analysing 313 European firms, public as well as private ones. See Chapter 4.2.2.3
4.2.2.2 Survey of Drobetz, Pensa and Wöhle (2006)

In collaboration with the German stock exchange, the Vienna stock exchange as well as the Swiss stock exchange, Drobetz et al. (2006) conduct a survey sampling 80 companies, thereof 48 from Germany, 28 from Switzerland and 4 from Austria. The results are to a large extent in line with the findings of the two other surveys mentioned above.

Referring to the major determinants of the debt choice, financial flexibility as well as credit rating concerns are the two most relevant debt factors. In line with the findings of Harvey and Graham (2001, 2002) as well as Bancel and Mittoo (2004), bigger companies owning an investment-grade rating are much more concerned about possible credit rating changes. Earnings and cash flow volatility are also considered as important debt factors, supporting the notion of the trade-off theory, since a higher volatility translates into higher probability of default and hence ultimately to higher bankruptcy costs.

In contrast to the two other surveys mentioned above, 46 percent of the respondents consider potential bankruptcy costs as a relatively important issue when dealing how much debt to employ.

Concerning the issue of common shares, the most important determinant differs from the findings of the other surveys. Nearly 66 percent of the respondents regard the maintenance of a target debt-equity ratio as the most crucial equity factor. In addition, concerns of negative stock price reaction as well as of EPS dilution are further important equity factors. Quite puzzling is the finding that equity under-/overvaluation plays only a minor role in the equity choice. Less than 25 percent of the responding executives consider this factor as important or very im-

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653 In total 931 questionnaires have been send to various companies in Germany, Switzerland and Austria, obtaining a response rate of approximately 8.6%.
654 See Drobetz et al. (2006), pp.259-265.
656 Especially companies facing high financial leverage, dividend-paying companies as well as large companies per se put even more emphasis on maintaining a target debt-equity ratio. See Drobetz et al. (2006), pp.259.
4.2 Surveys about the Determinants of Capital Structure Decisions

important, ranking ninth place.\textsuperscript{657} This finding shows that the relevance of market-timing is almost negligible for German, Swiss and Austrian CFOs, being in stark contrast to the results of Graham and Harvey (2001, 2002).\textsuperscript{658}

4.2.2.3 Survey of Brounen, DeJong and Koedijk (2006)

Brounen et al. (2006) conduct a survey, interviewing 313 CFOs on the issue of the capital structure policy in the UK, the Netherlands, Germany, and France.\textsuperscript{659} More specific, the authors obtained 68 responses from the UK, 52 from the Netherlands, 132 from Germany and 61 from France, comparing their country-specific findings with the results of Graham and Harvey (2001, 2002) for US firms and Bancel and Mittoo (2004) for large pan-European companies.\textsuperscript{660} Their survey tries to analyse differences in the capital structure choice among the 4 different European countries and find that financial markets do have an essential impact on the capital structure decision of firms. While financial flexibility maintains the most important debt factor for the respondents in all countries it is also interesting to note some divergence in their relative ranking of the debt determinants.

For example, while 39 percent of the German executives agree that credit rating concerns are the most second important debt factor, only 27 percent of the British managers consider it as important or very important, ranking only sixth position. In contrast 34 percent of the British and 32 percent of the French CFOs state that the comfort of suppliers and customers seems to be an important or very important factor in how much debt to issue, compared to a response rate of 8 percent in the Netherlands and 15 percent in Germany.\textsuperscript{661} Furthermore, the potential costs of bankruptcy play a modest importance in the debt decision. However, in Germany with a response rate of only 7 percent this debt determinant is one of the most un-

\textsuperscript{657} Recall, that concerns of equity undervaluation/overvaluation has ranked second in the survey of Graham and Harvey (2002) and fourth in the study by Bancel and Mittoo (2004).

\textsuperscript{658} This result is also in line with the empirical studies testing the market-timing effect in countries other than the USA. See Chapter 3.3.2 in this dissertation for further information.

\textsuperscript{659} The authors employ exactly the same questions like in the survey of Graham and Harvey (2001, 2002).

\textsuperscript{660} The overall response rate amounts to 5%.

\textsuperscript{661} 19 per cent of US managers in the study of Graham and Harvey and only 5 per cent of European managers in the survey by Bancel and Mittoo consider this debt factor as important or very important.
important one, compared to 30 percent in the UK, 27 percent in the Netherlands and 24 percent in France.\footnote{See Brounen et al. (2006), pp.1409.}

Same puzzling results can also be found when examining the factors that affect a firm’s decision to issue common stock. While EPS dilution is recognized to be of utmost importance in the US, UK, and in the Netherlands, not a single company in Germany and France considers this equity factor as important or very important. According to French managers, maintaining a target debt ratio seems to be the most important equity factor (60 percent), while just 8 percent of the German firms consider it as an important or very important equity determinant. Table 4.1\footnote{Table is based on Graham and Harvey (2002), Bancel and Mittoo (2004) and Brounen et al. (2006). Own illustration.} and Table 4.2\footnote{Table is based on Graham and Harvey (2002), Bancel and Mittoo (2004) and Brounen et al. (2006). Own illustration.} summarize the different debt and equity factors relative to the importance of the countries. The results confirm the argument of La Porta et al. (1997, 1998) and Rajan and Zingales (2003), claiming that different countries are exposed to different financial markets, leading ultimately to diffuse capital structure decisions.
### Table 4.1  
Survey Results - Debt Determinants

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<td>59.26%</td>
<td>Magnitude of equity undervaluation/overvaluation</td>
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<td>Maintaining target debt-equity ratio</td>
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<td>If recent stock price increases, selling price &quot;high&quot;</td>
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<td><strong>Providing shares to employee bonus/option plans</strong></td>
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<td><strong>Sufficiency of recent profits to fund activities</strong></td>
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<td>Stock is our &quot;least risky&quot; source of funds</td>
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<td>Sufficiency of recent profits to fund activities</td>
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<td>Magnitude of equity undervaluation/overvaluation</td>
<td>41.67%</td>
<td>Stock is cheapest financing alternative</td>
<td>50.00%</td>
<td></td>
</tr>
<tr>
<td><strong>No other sources of funds available</strong></td>
<td>46.67%</td>
<td>Providing shares to employee bonus/option plans</td>
<td>41.67%</td>
<td>If recent stock price increases, selling price &quot;high&quot;</td>
<td>40.00%</td>
<td></td>
</tr>
<tr>
<td><strong>If recent stock price increases, selling price &quot;high&quot;</strong></td>
<td>46.15%</td>
<td>If recent stock price increases, selling price &quot;high&quot;</td>
<td>33.33%</td>
<td>Stock is our &quot;least risky&quot; source of funds</td>
<td>40.00%</td>
<td></td>
</tr>
<tr>
<td><strong>Providing shares to employee bonus/option plans</strong></td>
<td>46.15%</td>
<td>Stock is our &quot;least risky&quot; source of funds</td>
<td>25.00%</td>
<td>Sufficiency of recent profits to fund activities</td>
<td>40.00%</td>
<td></td>
</tr>
<tr>
<td><strong>Magnitude of equity undervaluation/overvaluation</strong></td>
<td>38.46%</td>
<td>Favorable investor impression vs. issuing debt</td>
<td>16.67%</td>
<td>Magnitude of equity undervaluation/overvaluation</td>
<td>33.33%</td>
<td></td>
</tr>
<tr>
<td><strong>Diluting holdings of certain shareholders</strong></td>
<td>38.46%</td>
<td>Stock is cheapest financing alternative</td>
<td>16.61%</td>
<td>Diluting holdings of certain shareholders</td>
<td>33.33%</td>
<td></td>
</tr>
<tr>
<td><strong>Sufficiency of recent profits to fund activities</strong></td>
<td>35.71%</td>
<td>Maintaining target debt-equity ratio</td>
<td>8.33%</td>
<td>Investor taxes on equity income</td>
<td>33.33%</td>
<td></td>
</tr>
<tr>
<td><strong>Stock is our &quot;least risky&quot; source of funds</strong></td>
<td>30.77%</td>
<td>Similar amount of equity as same-industry firms</td>
<td>8.33%</td>
<td>Similar amount of equity as same-industry firms</td>
<td>20.00%</td>
<td></td>
</tr>
<tr>
<td><strong>Similar amount of equity as same-industry firms</strong></td>
<td>13.38%</td>
<td>Earnings per share dilution</td>
<td>8.33%</td>
<td>Earnings per share dilution</td>
<td>0.00%</td>
<td></td>
</tr>
<tr>
<td><strong>Investor taxes on equity income</strong></td>
<td>14.29%</td>
<td>Earnings per share dilution</td>
<td>8.33%</td>
<td>Earnings per share dilution</td>
<td>0.00%</td>
<td></td>
</tr>
<tr>
<td><strong>Favorable investor impression vs. issuing debt</strong></td>
<td>15.38%</td>
<td>Investor taxes on equity income</td>
<td>8.33%</td>
<td>Providing shares to employee bonus/option plans</td>
<td>0.00%</td>
<td></td>
</tr>
<tr>
<td><strong>Stock is cheapest financing alternative</strong></td>
<td>0.00%</td>
<td>No other sources of funds available</td>
<td>0.00%</td>
<td>No other sources of funds available</td>
<td>0.00%</td>
<td></td>
</tr>
</tbody>
</table>
4.3 Financing Patterns across the World

While Chapter 4.2 provided an overview of different capital structure surveys, crystallizing the core determinants of debt and equity in practice, the following chapter deals with the financing patterns around the world. Basically, this chapter offers a brief investigation on how institutional as well as legal and financial differences across countries shape the financing decision of firms.\footnote{665}

In essence, the academic studies all come to the conclusion that in countries characterized by weak legal and financial systems firms make use of less external financing. Furthermore, the implication of these studies is that in countries with underdeveloped institutions, firms face different financing opportunities.

Referring to the analysis of \textit{Beck et al.} (2008), Figure 4.6\footnote{666} shows the different financing patterns around the world. As can be seen, the ratio of external financing and internal financing varies dramatically across countries. In specific, in most countries including developed ones, internal financing is largely employed by firms to meet investment needs. However, the figure also provides some puzzling results. On the one hand it is not surprising that in developing countries such as Armenia, Moldova and Belarus firms are not prone to make use of large external financing. On the other hand, firms in the USA, in which financial and legal environment is supposed to be one of the highest, make use of less external financing, compared to firms in Columbia, Malaysia or Poland.\footnote{667}

To sum up, a convolute of characteristics influence the financing patterns of firms in various countries. While the development of institutional as well as legal and


\footnote{666} Figure is based on \textit{Beck et al.} (2008), p. 472. Own illustration.

\footnote{667} It is out of scope of this dissertation to explicitly analyze reasons for this aforementioned financing phenomenon. However, if interested, refer to \textit{Beck et al.} (2008).
financial environment plays a crucial role in the financing decision of firms, firm-characteristics also have a large impact on the financing patterns across countries.
4.4 Conclusion

Chapter 4 has provided the main factors that might have an impact on the capital financing mix. Certain debt determinants such as the influence of growth opportunities, size, tangibility, value, liquidity, profitability and industry peers might entail consequences on the capital structure of firms. The goal of this chapter is not to offer an in-depth empirical analysis on the debt determinants under study. This will be done in Chapter 8 in this dissertation. Furthermore, the chapter has shown that exogenous factors also impact the financing decision. In specific, firms exposed to industry deregulation are characterized by a significant decrease in profitability, asset tangibility and in an increase in growth options, prompting firms to diminish their debt level. Furthermore, firms facing greater bank concentration and stronger creditor rights tend to possess larger debt levels. Finally, the chapter has shown that private firms tend to have larger levels of leverage compared to public firms.

The second part of this chapter scrutinized different surveys in order to see whether empirical and theoretical results are in line with what firms do in practice. In specific, it has been shown that financial flexibility, credit rating concerns as well as earnings volatility are the three most mentioned debt determinants. Hence, the market imperfections mentioned in Chapter 2 exert only little importance in real life practice. The three most important equity determinants are EPS dilution, stock over- and undervaluation and chances of windows-of-opportunities. It has also been shown that the importance of certain capital structure determinants vary among countries.

The third part of this chapter illuminated the financing patterns across the world. In specific, it has been shown that countries characterized by weak legal and financial systems tend to make use of less external financing.
5 Methodology

Chapter 5 provides a brief description of the methodology applied in this dissertation. In specific, Chapter 5.1 deals with the main assumptions of the regression analysis that need to be met in order to obtain reliable results. Chapter 5.2 covers the issue of multicollinearity, which might occur in a regression analysis. In specific, the implications of possible multicollinearity on the data output and ways to eliminate such a problem will be discussed.

5.1 Classical Linear Regression Model

To test the various hypotheses in Chapter 7, Chapter 8 and Chapter 9, a classical linear regression model (CLRM), also called ordinary least squares (OLS), will be applied. In general, a regression deals with determining a relationship between a given variable and one or more other variables. More specifically, a regression is concerned with accounting movements in a variable by means of movements in one or more other variables. The regressions conducted in the subsequent analysis are as follows:

\[ y_t = \alpha + \beta x_t + \varepsilon_t \]  

(5.1)

5.1.1 Assumptions of CLRM

In general, five assumptions regarding the OLS are required in order to ensure reliable and valid results from the CLRM. Specifically, it is assumed that:
1. \( E(\varepsilon_t) = 0 \)
2. \( \text{var}(\varepsilon_t) = \sigma^2 < \infty \)
3. \( \text{cov}(\varepsilon_t, \varepsilon_i) = 0 \)
4. \( \text{cov}(\varepsilon_t, x_t) = 0 \)
5. \( \varepsilon_t \sim N(0, \sigma^2) \)

We will briefly describe the different assumptions in more detail and show consequences of possible violations of not meeting these requirements.

5.1.1.1 Assumption 1: \( E(\varepsilon_t) = 0 \)

The first assumption to adhere to is that the average value of the error terms, denoted \( \varepsilon_t \), equals zero. In fact, this prerequisite can be achieved by including a constant term in the regression equation. However, in case no intercept will be included in the regression, severe consequences can follow, having a stark impact on the reliability of the results. First, \( R^2 \) might become negative, suggesting that the sample average, \( \bar{y} \), accounts more of the variation in \( y \) than the independent factors. Second, a regression equation without any intercept might exhibit severe biases in the slope coefficient estimates.\(^{668}\)

5.1.1.2 Assumption 2: \( \text{var}(\varepsilon_t) = \sigma^2 < \infty \)

The second assumption relating to the CLRM is concerned with the variance of the errors. In essence, it is assumed, that the variance of the error terms follow a constant pattern, implying that they are homoscedastic. In contrast, in case the errors fail to appeal to a constant variance, they are said to be heteroscedastic. A number of formal statistical tests can be applied in order to test for possible heterosce-

\(^{668}\) For further detail, see Brooks (2002), pp.146-147.
dasticity. One popular test is for instance White’s (1980) general test for heteroscedasticity.\textsuperscript{669}

Four essential steps need to be carried out in order to obtain reliable results of White’s test. First, we assume that the regression model is as follows:

\[ y_t = \beta_1 + \beta_2 x_{2t} + \beta_3 x_{3t} + \varepsilon_t \]  \hspace{1cm} (5.2)

Applying this regression, the residuals, \( \hat{\varepsilon}_t \), need to be calculated. Second, after obtaining the residuals, an auxiliary regression will be run following Equation 5.3.

\[ \hat{\varepsilon}_t^2 = a_1 + a_2 x_{2t} + a_3 x_{3t} + a_4 x_{2t}^2 + a_5 x_{3t}^2 + a_6 x_{2t} x_{3t} + v_t \]  \hspace{1cm} (5.3)

Where \( v_t \) is an error term independent of \( \varepsilon_t \). As can be seen in Equation 5.3, the calculated residuals are squared and then regressed over the independent variables, the squares of the independent variables and their cross-products. This enables us to see whether or not the variance of the residuals alters systematically with any known explanatory variables. Third, given the auxiliary regression, \( R^2 \) will be obtained from Equation 5.3 and multiplied by the number of observations, \( T \). This method is recognized as a Lagrange Multiplier (LM) test, which is based on the value of \( R^2 \) for the auxiliary regression. It can be shown that

\[ TR^2 \sim \chi^2(m) \]  \hspace{1cm} (5.4)

where \( m \) stands for the number of regressors in Equation 5.3. Finally, it needs to be determined whether or not \( \chi^2 \)-test statistic exceeds the corresponding value from the statistical table. In case \( \chi^2 \) is greater, the joint null hypothesis that \( a_2 = 0, a_3 = 0, a_4 = 0, a_5 = 0 \) and \( a_6 = 0 \) can be rejected.

\textsuperscript{669} Often, graphical illustration will be applied in order to obtain first impression over possible heteroscedasticity. Here the residuals, \( \delta_t \), are determined and plotted against one of the independent variables, \( x_t \). Scatter plots are not used in our test for heteroscedasticity, since they are only considered as an approximation.
The consequences of applying OLS in the presence of heteroscedasticity are two-folded. On the one hand, the OLS still serves unbiased estimates of coefficients. But on the other hand, ignoring heteroscedasticity ultimately might lead to wrong standard errors, implying that any inferences could be misleading.

One way to deal with the presence of heteroscedasticity is the application of an alternative estimation method, the generalized least squares (GLS). Suppose that the error variance was related to $z_t$ by the expression

$$ var(\varepsilon_t) = \sigma^2 z_t^2 $$

(5.4)

In order to transform the OLS into homoscedastic error terms, one need to divide the regression equation by $z_t$.

$$ \frac{y_t}{z_t} = \beta_1 \frac{1}{z_t} + \beta_2 \frac{y_{2t}}{z_t} + \beta_3 \frac{y_{3t}}{z_t} + \nu_t $$

(5.5)

Where $\nu_t$ is an error term, defined as $\frac{\nu_t}{z_t}$

Another way to obviate the possible consequences of heteroscedasticity is to transform the variables into logarithms. However, it must be kept in mind that this transformation can only be done if the variables do not take negative values or zero.\(^{670}\)

5.1.1.3 Assumption 3: $\text{cov}(\varepsilon_t, \varepsilon_j) = 0$

The third assumption revolves around testing whether or not the CLRM’s error terms are correlated with one another. To obtain reliable results of the regression equation it is necessary that the disturbance terms exhibit uncorrelated patterns with the others. A first step in testing for possible autocorrelation is to plot $\hat{\varepsilon}_t$ over time. A more formal statistical test is the Durbin Watson (DW) test for first order auto-

\(^{670}\) For further information on heteroscedasticity, see Brooks (2002), pp.147-155.
correlation.\footnote{See Durbin and Watson (1951).} In order for the DW test to be valid three conditions need to be met. First, a constant term needs to be included in the regression equation. Second, the independent variables need to be non-stochastic (assumption 4). Finally, no lags of the dependent variable need apparent. Fulfilling these requirements, the DW test can be conducted.

\[
DW = \frac{\sum_{t=2}^{T}(e_t - \hat{e}_{t-1})^2}{\sum_{t=2}^{T} \hat{e}_t^2} \tag{5.6}
\]

The numerator compares the errors at time \(t - 1\) and \(t\), which are independent of one another. The DW test statistic can reach values from zero to four. A value near two implies non-autocorrelation. A value approaching zero indicates positive autocorrelation and a value getting closer to four suggests negative autocorrelation.\footnote{For more detailed information, see Brooks (2002), pp.155-178.}

5.1.1.4 Assumption 4: \(\text{cov}(\varepsilon_t, x_t) = 0\)

The fourth assumption states that the independent variables, \(x_t\), are non-stochastic, implying that there is no sampling variation in \(x_t\).

5.1.1.5 Assumption 5: \(\varepsilon_t \sim N(0, \sigma^2)\)

The last assumption is essential for conducting joint hypothesis tests. Here it is assumed that the regression model follows a normal distribution. One of the most common used tests for normality is the Bera-Jarque (BJ) test. Since the BJ test is based on the immutable fact that the entire distribution is characterized only by the first two moments (the mean and the variance), the third (skewness) and fourth (kurtosis) moments of a distribution are considered to be non-existing. In other words, it is assumed that a normal distribution does not exhibit any skewness as well as having a kurtosis of three. In specific, Bera and Jarque (1981) test whether the coef-
ficients of skewness as well as of excess kurtosis are jointly zero by the following two equations. The coefficient of skewness and kurtosis is determined respectively as follows:

\[ b_1 = \frac{E[u^3]}{(\sigma^2)^{3/2}} \]  

(5.7)

and

\[ b_2 = \frac{E[u^4]}{(\sigma^2)^2} \]  

(5.8)

where, \( u \) and \( \sigma^2 \) denote the errors and their variance, respectively. Consequently, the BJ test can be determined as follows:

\[ W = T \left( \frac{b_1^2}{b_2} + \frac{(b_2-3)^2}{24} \right) \]  

(5.9)

These five assumptions needs to be meet in the OLS regression analysis in order to deliver reliable and valid information about the hypotheses under study.

5.2 Multicollinearity

An implicit assumption that is made when applying the OLS method is that the independent variables do not exhibit strong correlations with one another. To be more specific, if the variables are uncorrelated to one another they are said to be orthogonal, implying that adding or removing a variable from a regression equation does not lead to changes in the coefficients of the other explanatory variables. However, if explanatory factors are correlated, multicollinearity is apparent.\(^{673}\) Besides a

\(^{673}\) Detailed information on detecting and removing multicollinearity, see Altheety and Gere (2009), pp. 62.
common correlation matrix, the calculation of the Variance Inflation Factors (VIF) can be applied in order to determine multicollinearity among the factors. Consider a regression model relating a dependent variable $y$ to a group of explanatory variables $x_j$. In essence, the VIF for every single independent variable is denoted $VIF_j$ and defined by the equation:

$$VIF_j = \frac{1}{1-R_j^2} \quad (5.10)$$

Generally, if $R_j^2$ equals zero, implying that the variable $x_j$ is not related to the other explanatory variables, $VIF_j$ equals one. However, as soon as $R_j^2$ exceeds zero, insinuating that the variable does exhibit a relationship to the other independent variables, $VIF_j$ becomes greater than one. Both, the largest variance inflation factor among the explanatory variables as well as the mean $\overline{VIF}$ do play a significant role in determining the severity of multicollinearity. Usually, the multicollinearity between independent factors might be severe when the following two criteria are met.$^74$

1. The largest variance inflation factor exceeds ten, meaning that $R^2$ is greater than 0.9.
2. The mean $\overline{VIF}$ of the variance inflation factors for the independent variables is substantially greater than one.

The biggest demerit of multicollinearity is that it can crucially limit our ability to apply the t-statistics and related p-values to appraise the importance of the explanatory variables. To be more specific, due to the immutable fact that two or more correlated variables ultimately supply redundant information, multicollinearity habitually prompts the t-statistics of the variables to be smaller, compared to the t-values that would be obtained if separate regression analysis were run.$^75$ Consequently, multicollinearity can precipitate some of the independent variables to seem less

$^74$ See Brooks (2002), pp.185.
important - in terms of having lower t-values and larger p-values - than they really are.

Brooks (2002) deals with multicollinearity and provides some solutions to the problem at hand. One possible way of dealing with near multicollinearity is to ignore it. He argues that if the model is adequate, i.e. statistically and in terms of each coefficient being of a plausible magnitude and having an appropriate sign, multicollinearity can be neglected.\footnote{See Brooks (2002), p.192} A second way of dealing with the issue is to drop some of the collinear variables, so that the problem disappears. However, this may be unacceptable if there were strong a priori theoretical reasons for including both variables in the model. Further, due to dropping of some variables, an omitted variable bias would result.
6  Empirical Data

Chapter 6 provides an overview of the empirical data and of the research approach applied in the course of this dissertation. While the data selection process will be discussed in Chapter 6.1, Chapter 6.2 deals with the overall sample and provides an in-depth sample description.

6.1  Data Gathering

The sample under study consists of non-financial U.S. companies over the years 1990-2008. The required financial statements have been extracted from the financial database Thomson ONE Banker\(^{677}\) as well as from Compustat\(^{678}\). The stock returns and tax level data have been retrieved from Thomson Financial Datastream\(^{679}\). Furthermore, in order to ensure the correct dates of capital structure changes, the media database Factiva\(^{680}\) has also been applied.

To be included in the sample, capital structure transactions had to meet the following criteria:

1) The transaction has taken place between the years 1990 and 2008.

Compared to other empirical studies this time frame must be consid-

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\(^{677}\) Thomson ONE Banker is a research tool, providing financial data on firms throughout the world.

\(^{678}\) Compustat offers financial, statistical and market information on active and inactive firms throughout the world.

\(^{679}\) Thomson Financial Datastream is a research database, offering historical financial data on various financial instruments.

\(^{680}\) Factiva provides business and research information by an access of more than 14,000 sources.
ered as rather long. Transactions before the year 1990 have been neglected due to lack of available information.

2) **Firms have to be listed in the Standard and Poor’s (S&P) 500 index.** 500 leading companies are included in the index from various industries of the U.S. economy, capturing almost 75 percent of U.S. equities. Hence, it can be assured that only companies with high market capitalizations are included in this study.

3) **Firms have to be non-financial corporations.** Due to the immutable fact that financial firms need to comply with certain financial standards, these companies would bias the results. Thus, financial corporations, such as banks, are excluded in our sample.

4) **The capital structure transaction volume exceeds USD 10 million.** The floor of USD 10 million seems plausible, since a lower transaction volume might not convey any significant impact on the capital market.

5) **The capital structure transaction is completed.**

6) **Firms need to possess financial information for at least three years.** Thus, companies with less than three years of financial information are omitted.

6.2 Sample Description

As mentioned above only non-financial companies of the S&P 500 index have been included in our study, totalling a sample of 421 firms. Out of the 421 firms, 11 (2.61 percent) companies are from the telecommunication sector, 59 (14.01 percent)
are categorized as industrial firms, 52 (12.35 percent) are from the health sector, 79 (18.76 percent) of the firms are consumer discretionary, 42 (9.98 percent) are consumer staples, 75 (17.81 percent) are information technology firms, 33 (7.84 percent) are from the utility sector, 30 (7.13 percent) from the materials sector and 40 (9.50 percent) firms are from the energy industry (Figure 6.1). Thus, the largest number of firms under study is retrieved from the information technology and consumer discretionary industry.

![Figure 6.1: Industry Breakdown](image)

Table 6.1 in Appendix A provides a detailed overview of the different companies included in the study.

Figure 6.2 depicts the total value of capital issue proceeds during the years 1990-2008. Panel A shows the development of equity issues and share repurchases of the sample under study. The following interesting findings can be drawn from this graph. First, the total proceeds of share repurchases are much larger than the proceeds of equity issues. In other words, the volume of share repurchases exceeds the volume of equity issues. Second, equity issues experienced a modest development
during the years 1990-1998, while the years 1998-2001 are characterized by a drastic increase in volume, culminating in a peak in the year 2001 with a total equity issue value of approximately USD 57,178.16 million. However, the time period 2002-2005 is associated with a decreasing equity issue development. Third, share repurchases followed a very static trend until the year 2003. Since then the proceeds of share repurchases surged, leading to a peak in the year 2007 with a total value of roughly USD 385,599.94 million. Hence, it can be argued that the firms under study engaged in massive share repurchase transactions since the year 2003, while equity issues experienced a rather declining trend.

Panel B in Figure 6.2 shows the issue proceeds of bonds and loans. In specific, during the years 1990-2003 bond issues were mostly characterized by a higher transaction volume compared to loan issues. However, the years 2004-2008 can be regarded as a diminishing transaction volume of corporate bonds, while loans gained momentum and reached its peak in the year 2007 with a total of approximately USD 376,763.59 million. In comparison, bond issues reached a volume of only USD 187,881.38 million in the same year. Thus, firms in need of debt financing prefer in general to issue larger amounts of loans instead of bonds.

Panel A and Panel B of Figure 6.2 show that equity issues and bond issues follow a decreasing trend since the years 2003, while share repurchases and loan issues face an immense increase in volume. Chapter 7 and Chapter 9 attempts to find out whether the observed financing development can be accounted by market-timing behaviour of firms.681

681 Chapter 7 will empirically test the market-timing of equity, while Chapter 9 empirically studies the market-timing behaviour of debt financing.
Figure 6.2  
Total Value of Issue Proceeds

The following figure shows issuance proceeds of different capital instruments. The data accrue to the sample and cover the time frame from 1990-2008. Panel A shows the amount of equity issues and share repurchases. In contrast, Panel B depicts the issuance proceeds of bonds and loans.

Panel A: Total Value of Equity Issues and Share Repurchases

Panel B: Total Value of Bond Issues and Loan Issues
6.2 Sample Description

6.2.1 Summary Statistics

6.2.1.1 Capital Structure and Financing

The following chapter deals with the capital structure of the sample. Panel A of Table 6.2 provides an overview of leverage and financing for the sample under study, differentiating between certain time periods. The main reason to divide the study into different time intervals is basically to detect possible diverging results within the given time frame.

Book leverage is defined as book debt to total assets, where book debt is determined by subtracting book equity from total assets. Book equity equals total assets minus total liabilities and preferred stock plus deferred taxes.\textsuperscript{602} Firm-year observations will be dropped in case the resulting book leverage is greater than one.\textsuperscript{603} Market leverage is considered to be the ratio of book debt to the result of total assets less book equity plus market equity.\textsuperscript{604} Net equity issues ($e/A$) equal the change in book value of equity minus the change in retained earnings divided by total assets. Newly retained earnings ($\Delta RE/A$) equals the change in retained earnings over total assets. Net debt issues ($d/A$) are defined as the residual change in assets divided by total assets.\textsuperscript{605}

\textsuperscript{602} In contrast to the work of Baker and Wurgler (2002) and Kayhan and Tirman (2007), convertible debt is not included in the determination of book equity. Due to the immutable fact that convertible debt per se is regarded as debt and not equity, this variable will be omitted in the calculation of book equity. This is consistent with the studies of Rajan and Zingales (1995), Hovakimian et al. (2001) and Fama and French (2002).

\textsuperscript{603} Since market value cannot plunge under zero, market leverage per se never exceeds one, implying that this limit extracts no effect on the market leverage samples.

\textsuperscript{604} This determination follows the study of Fama and French (2000).

\textsuperscript{605} These variables can also be determined by using cash flow statement data (Frank and Goyal (2003) and Shyam-Sunder and Myers (1999)). In essence, net equity issues are defined as the sale of common and preferred stock less the purchase of common and preferred stock, and net debt issues is the difference between long-term debt issuance and long-term debt reduction. Due to the fact that cash flow statement data are not always available, resulting in fewer observations available for the study, balance sheet measures are used.
Table 6.2
Summary Statistics of Capital Structure and Financing

The table depicts means, medians and standard deviations of leverage and components of the change in assets. *Book leverage* is defined as book debt to total assets. In this and following tables, firm-year observations where book leverage is larger than one will be excluded. *Market leverage* is book debt divided by the result of total assets minus book equity plus market equity. *Net equity issues (e/A)* are the result of the change in book equity, minus the change in retained earnings, divided by total assets. *Net retained earnings (Are/A)* are the change in retained earnings divided by assets. *Net debt issues (d/A)* are defined as the residual change in assets divided by assets. Panel A shows data in calendar time for all firms in the sample. Panel B provides statistics for sub-samples in different industries. All values are expressed in percentage terms. N represents the number of observations.

<table>
<thead>
<tr>
<th>Year</th>
<th>Year Name</th>
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<th>N Mean</th>
<th>N Median</th>
<th>N S.D.</th>
<th>N Mean</th>
<th>N Median</th>
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<th>N Mean</th>
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<tr>
<td></td>
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<td>Book Leverage D/A %</td>
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<td>Market Leverage D/A %</td>
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<td>e/A %</td>
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<td>Are/A %</td>
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<td>Mean</td>
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<td>Panel A</td>
<td>Calendar Time, All Firms</td>
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<td>1990-1995</td>
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Referring to the calculated numbers in Panel A it is interesting to note that book leverage follows a rather steady pattern throughout the whole calendar-time. Only marginal increases can be detected between 2007 and 2008, implying that leverage increased during the credit crisis. In contrast, the market leverage of the firms is exposed to slight changes throughout the time of observations. Especially, during times of high market valuations, which occurred in the late 1990s, market leverage experienced a marginal decrease. Specifically, market leverage dropped from approximately 38.44 percent (1990-1995) to 32.45 percent (1996-2001).

The numbers also illustrate that the annual change in assets of the firm is mainly driven by net debt issues (roughly 50 percent) between 1990 and 2008. In general, it can be concluded that net debt issues always represent a higher percentage of the annual asset change compared to net equity issues. While net equity issues played a material significant role in the 1990s, its importance dropped dramatically after the internet bubble crisis (2002-2008), representing only 3 percent of the annual change in assets.

Panel B in Table 6.2 compares the capital structure and financing decision among the different industries. As can be seen, companies in the information technology sector as well as in the health care sector do have the lowest level of book and market leverage. Figure 6.3 depicts the significant differences among the industries. In contrast to the information technology and health care sector, utility firms exhibit by far the highest amount of book and market leverage. For comparison, while companies in the utility sector on average have a book leverage of nearly 72 percent (highest result), firms in the information technology industry have only 41 percent of book leverage (lowest result).

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686 This finding is also in line with the study of Baker and Wurgler (2002) as well as Sautner and Spranger (2009).
While almost all industries follow the trend that net debt issues are the most relevant driver for annual asset changes, companies in the information technology sector are engaged in more net equity issues than in net debt issues (Figure 6.4). In essence, annual changes in assets are driven approximately by 47 percent of net equity issues, 36 percent of net debt issues and by 17 percent of newly retained earnings. Furthermore, while net debt issues are exposed to only marginal differences between the industries, net equity issues follow a material significant different path throughout the different industries. While the telecommunication sector as well as the information technology sector exhibit high levels of net equity issues (approximately 8 percent), utilities (1.77 percent), industrials (0.88 percent), consumer discretionary (1.34 percent), materials (0.38 percent) and consumer staples (-0.44 percent) do pursue a different pattern of capital structure and financing decisions.\footnote{It should be noted that the number of observations in the telecommunication sector is pretty low and consequently the results should be taken cautiously.} In those industries, annual changes in assets are mainly driven by net debt issues as well as by newly retained earnings. More specifically, annual changes in assets in the consumer discretionary sector are driven by 54 percent of net debt issues, 35 percent of newly

\footnote{It should be noted that the number of observations in the telecommunication sector is pretty low and consequently the results should be taken cautiously.}
retained earnings and only by 11 of percent of net equity issues. Industrials, consumer staples, utilities as well as materials follow a similar financing pattern. In contrast, changes in assets in the health care sector are derived roughly by 43 percent of net debt issues, by 29 percent of newly retained earnings and by 28 percent of new equity issues.\textsuperscript{698}

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{capital_structure_financing_part_ii.png}
\caption{Capital Structure and Financing-Part II}
\end{figure}

6.2.1.2 Development of Capital Structure

Table 6.3 provides an overview of the different accounting variables for the entire sample between the years 1990 and 2008. The numbers show that the debt-equity ratio of the companies under study follows a rather steady stream, without large outliers. In other words, between 1990 and 2008 the capital structure of the companies varied by no more than 5 percent. More specifically, the equity ratio varies only between 41 and 45 percent throughout the whole time period.

\textsuperscript{698} It should be kept in mind, that the mean values in Table 6.2 might misrepresent the true outcome of the variables. Henceforth, the median should be considered in order to diminish the impact of possible outliers. The trimmed mean has not been listed since the results are not materially different than that of the median.
Hence, it can be concluded that the firms follow the notion of the trade-off theory and choose a target debt level.\textsuperscript{689} Further, it can be observed that the tendency exists, that companies are exposed to more leverage within the last years. Figure 6.5\textsuperscript{690} depicts the development of the debt-equity ratio of the sample under study. The figure perfectly illustrates that firms seem to stick to a certain capital structure. While the debt ratio experienced a marginal increase during the time period under study, the equity ratio dropped especially since the credit crisis in the year 2007.

Figure 6.5: Debt-Equity Ratio

Despite certain economic events, such as the stock boom during the late 1990s, the internet bubble in the beginning of the 21\textsuperscript{th} century as well as the credit crisis in 2007, the capital structure of the firms seems to vary only marginal and rather seems to follow a target ratio, as postulated by the trade-off theory.

\textsuperscript{689} For a detailed overview of the essence of the trade-off theory refer to Chapter 2.3 in this dissertation.

\textsuperscript{690} The figure is based on median values. For mean values refer to Table 6.3.
Referring to cash as another accounting variable it also seems quite striking that companies are holding much more cash than they used to do in former years (Figure 6.6).\textsuperscript{601}

![Figure 6.6: Cash Holdings](image)

While in the year 1990 the average cash holdings amounted to almost 9 percent (median = 4.17 percent), in 2008 the value increased to more than 13 percent (median = 7.26 percent). This finding is in line with recent studies of Bates et al. (2009) and Duchin (2010), analyzing the cash pattern of U.S. industrial firms. Bates et al. (2009) show that the average cash-to-asset ratio more than doubled during the years 1980-2006.\textsuperscript{602} Duchin (2010) in particular differentiates between liquidity and diversification. He finds that diversified firms held approximately 12 percent of their assets in cash, while stand-alone firms reach a ratio of about 21 percent.\textsuperscript{603} The results could be in line with the notion of the free cash flow hypothesis by Jensen (1986) that some

\textsuperscript{601} Due to missing data, the accounting variable “cash and short-term investments” has been used in order to analyze the cash patterns of firms.


\textsuperscript{603} Duchin (2010), p.985.
companies hold larger cash reserves due to agency problems. However, the study of Bates et al. (2009) fails to deliver clear evidence that cash ratios grow more for companies with more entrenched management.604

Referring to liabilities in Table 6.3, companies engage in higher volume of long-term debt than in short-term debt. Figure 6.7 depicts the development of short-term and long-term debt.

![Figure 6.7: Liability Variables](image)

The figure shows that firms do not exploit short-term debt in order to mitigate possible agency- and asymmetric information costs, as discussed in Chapter 2. The ratio of the two variables seems to be relatively constant, detecting a slight decrease in short-term debt for an increase in long-term debt. The result stays in contrast to

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604 For a detailed overview of the free cash flow hypothesis and its implications of a firm’s capital structure, see Chapter 2.4.1.1.
the general notion that a substitution of short-term debt for long-term debt increases the expected returns of common stocks.\footnote{This is mainly due to the fact that a substitution might transfer risk from long-term debtholders to shareholders. See Choe (1994).}

As has been already mentioned above, the equity ratio stays relatively constant throughout the time period, varying between 41 and 45 percent.\footnote{The median value of the equity ratio amounts to 44 percent during 1990-2008.} Figure 6.8\footnote{The figure is based on median values. For mean values refer to Table 6.3.} depicts the development of three different equity variables, capital surplus, retained earnings and common stock.

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{Figure6_8.png}
\caption{Equity Variables}
\end{figure}

In essence, retained earnings are the highest equity position of the three variables in the sample, having a median value of 26.54 percent during the years 1990-2008. In comparison, capital surplus and common stock reach a median value of 15.04 and only 0.74 percent, respectively. However, it can be observed that the values of retained earnings and capital surplus narrow, implying that capital surplus
becomes a much larger stake in a firm’s balance sheet. More specifically, between 1990 and 2008 the value of capital surplus experienced a drastic increase, more than doubling within the last 18 years.

Figure 6.9 provides an overview of the different accounting variables, showing their median values for the time interval 1990-2008. Hence, it can be shown that the capital structure of the firms exhibits more leverage (56.03 percent), compared to equity (43.97 percent). Furthermore, regarding borrowing, short-term debt plays a rather minor role (2.22 percent), compared to long-term debt (18.22 percent). Also interesting to note is the finding that non-convertible debt (15.87 percent) is almost exclusively used, relative to convertible debt. Finally, Figure 6.10 shows that common equity (40.70 percent) is a major stake in a company’s balance sheet, followed by retained earnings (26.54 percent) and capital surplus (15.04 percent). However, as has been mentioned above, capital surplus gained momentum within the last years, while retained earnings remain relatively constant.

\[\text{注: 由于可转换债务的值非常小且几乎可以忽略不计，因此未在统计中公布。}\]
While Table 6.3 and the following figures have only provided an overview of the entire sample, the next step is to conduct a cross-industrial study for the different accounting variables. Appendix B provides a detailed overview of the different accounting variables for each of the nine industries.

However, it is interesting to graphically analyze the accounting variables for each of the single industries. Figure 6.10 shows the median value of the cash holdings of the different industries. While almost all industries follow the same pattern regarding their cash holdings, health care companies and especially information technology firms exhibit a totally different behaviour. While the overall tendency towards higher cash holdings in all industries can be observed, information technology companies do have cash holdings far away from the overall median of 5.17 percent. The minimum median value equals 18.20 percent in the year 1990, while in 2004 the maximum value of roughly 34 percent has been reached, being an increase of approximately 87 percent. Not only the increase per se seems
astonishing, but rather the high level of the cash holdings itself. The health care as well as the consumer discretionary sector also exhibit relatively larger cash holdings than the average of the sample as a whole.

![Cash & Short-Term Investment](image)

While cash holdings experienced a steady increase in all industries, the next accounting variable *accounts payable* exhibit an opposite pattern. Figure 6.11 depicts the negative trend of accounts payable in the firm’s balance sheet. In all industries between 1990 and 2008, the value of accounts payable declined marginally. The median of the whole sample between the time interval under study accounts to less than 7 percent.
The next two variables are quite interesting to scrutinize in order to detect possible differences in the usage of short-term debt and long-term debt between the different industries. As has been already discussed above, short-term debt per se is generally associated with a positive impact on equity prices. Hence, it could be expected to observe a trend for a substitution of short-term debt for long-term debt.

Figure 6.12 shows the development of short-term debt in general. While the overall median of short-term debt is rather low (2.22 percent), it is still noteworthy to note that especially firms in the utility as well as in the consumer staple sector possess a much larger fraction of short-term debt, compared to the other industries. It is also striking that especially in the years 1998 to 2002 companies in all industries made use of more short-term debt, while within the last couple of years the usage of short-term debt experienced a rather negative trend. Consequently, an increase in the usage of short-term debt and a substitution for long-term debt cannot be found.
Figure 6.12: Short-Term Debt

Figure 6.13 provides a clear picture of the development of long-term debt as a financing option for firms. As can be seen, the median of approximately 18.22 percent is much higher, compared to short-term debt. Interesting however is the immutable fact that companies in the information technology sector engage in only modest long-term debt transactions. Throughout the time period the median value seems to remain at a relatively low level, experiencing a slight increase since 2005. However, this finding is also in line with the median value of short-term debt in Figure 6.12. The values are nearly zero, suggesting that information technology companies engage in less short-term and long-term debt, but do have a substantial chunk of their company value tight up in cash and short-term investments. Companies in the health care sector also exhibit relatively short-term as well as long-term median values. In contrast to the low values of the information technology as well as of the health care sector, firms in the utility sector do conduct relatively high amounts of long-term debt. Between 1990 and 2008 these firms reached a minimum median value of 28.32 percent in 2007 and a maximum value of 35.17 percent in the year 2003.
However, it can be argued that almost all companies within the different industries experience a rather increase in long-term debt when engaging in leverage financing.

![Figure 6.13: Long-Term Debt](image)

Having scrutinized the debt positions of the different industries under study, the next step is to examine the equity side. Figure 6.14 shows the median values of the common equity positions for the different industries. Again, it is interesting to note that the information technology sector exhibits a stark difference in their financing decision, compared to the other industries. While the median value displays roughly 40.7 percent of equity, the telecommunication industry possesses by far the highest ratio. Reaching their peak in 2000 with a median value of approximately 65.55 percent of total equity, since then, it followed a declining drift with a value of 53.08 percent in 2008. Despite the negative downward trend, the median value of common equity is still exorbitantly high in the information technology industry. Firms in the health care as well as the energy sector also display a rather high equity value. The other extreme accrues to companies in the utility industry, showing a median value of less than 30 percent since 1998.
The next variable under study is *capital surplus* (Figure 6.15). While the value of common equity followed rather an invariant, non-volatile development, the cross-sectional sample description reveals that capital surplus surged significantly throughout the various industries. Without doubt, all industries, except the energy sector, experience an increasing movement of their capital surplus since the year 1990. While for most industries the median value of capital surplus did not exceed 15 percent of equity in 1990, in 2008 the equity position altered extremely. In 2008 most of the industries do have capital surplus of more than 20 percent of equity. Again, the information technology sector displays a relatively outstanding and astonishing picture. While in 1990, the information technology revealed values of almost 20 percent, the value more than doubled in 2008 with a median value of more than 40 percent. Furthermore, the development of capital surplus positions in the health care industry experience also an interesting pattern. Specifically, in 1990 the industry had less than 5 percent of equity tied up in capital surplus. However, since then the median value rose incredibly, leading to more than 25 percent of equity tied up in capital surplus in the year 2008. Thus, it can be argued that within the last 18 years,
the U.S. industries experienced a stark increase in capital surplus positions and that some industries grew larger than others in respect to capital surplus.

Figure 6.15: Capital Surplus

The last variable under study is *retained earnings* in Figure 6.16. In contrast to the capital surplus position, a definite trend cannot be observed. This variable seems to follow a rather volatile trend, going up and down throughout the time interval. While the median value reaches 26.54 percent for the whole sample, the utility sector exhibits a relatively low position, having less than 10 percent of equity tied up in retained earnings within the last couple of years. The energy industry experienced an astonishing increase, from 13.92 percent in 2002 to 32.52 percent in 2008. All other industries follow a rather consistent pattern, having values between 25 percent and 35 percent.
Figure 6.16: Retained Earnings

Finally, Figure 6.17 and Figure 6.18 show the total debt and total equity values for the different industries. Unsurprisingly, the information technology as well as the health care sector do exhibit the highest equity ratio, while the utility industry does have the lowest ratio.
Figure 6.17: Total Debt

Figure 6.18: Total Equity
6.2.1.3 Equity Ratio Quintile

Table 6.4\textsuperscript{609} provides an overview of the different equity ratios firms’ exhibit, including the sample and the different industries. Referring to the sample results, a predominant number of companies (60 percent) feature an average equity ratio ranging between 20 and 50 percent. Observing the frequency distribution, an equity ratio between 20 and 30 percent (23.23 percent) as well as between 30 and 40 percent (22.74 percent) seems to be most common. However, extreme equity ratios of more than 60 percent or less than 20 percent are not very common in the sample. Furthermore, three companies exhibit average equity ratios of less than zero percent, implying that these companies suffered severe losses during the time under study.\textsuperscript{700}

Next, it is of utmost importance to ascertain the frequency distribution of the different equity quintiles for the different industries. The following can be observed in Table 6.4: First, more than 50 percent of the firms in the telecommunication sector exhibit an equity ratio ranging between 30 and 50 percent. Second, the majority of companies in the industrial sector possess equity ratios between 20 and 50 percent, similar to that of the total sample. Third, the health care industry exhibits larger equity ratios. Approximately 64 percent of the companies in the health care sector do have equity ratios between 40 and 70 percent. No firm does exhibit a ratio of less than 10 percent. Fourth, firms in the consumer discretionary as well as consumer staples industry reveal equity ratios, which are similar to that of the overall sample. Most of the companies bear equity ratios between 20 and 50 percent. Fifth, companies in the information technology sector do possess the largest amount of equity ratio. Only 11 percent of the technological companies do exhibit an equity ratio of less than 40 percent. On the other extreme, approximately 24 percent of the firms do have equity ratios larger than 70 percent. Sixth, the opposite of capital structure can be observed in the utility industry. Here, almost 90 percent of the companies do have an equity ratio ranging between 20 and 40 percent. None of the firms do have equity ratios larger than 50 percent. Finally, firms in the material as

\textsuperscript{609} Due to missing data on equity values, 409 firms are included in the sample description of equity ratios.

\textsuperscript{700} Dun & Bradstreet (industrial), Amazon Corp. (information technology) and Kroger Company (consumer staples) exhibit average negative equity ratios for the time under study.
well as in the energy sector follow to a greater extent the pattern of the sample, exhibiting an equity ratio between 20 and 50 percent.

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6.2.1.4 Testing the Trade-off Theory

According to the essence of the trade-off theory, companies follow a debt-equity target and gradually adjust their capital structure to that target when shocks occur.501 In order to find out whether or not the companies under study do follow a target debt ratio, the variance of the debt-equity ratio has been determined and compared between the years 1990 and 2008.

---

501 For a detailed description of the trade-off theory, refer to Chapter 2.3.
Companies exhibiting a relatively fixed capital structure should have a moderately low variance in the equity ratio. Table 6.5 shows the change in equity ratio for the whole sample as well as for the various industries, differentiating between different time frames.

Examining the time between 1990 and 2008 it is striking that the majority of the firms were exposed to an equity change of at least 30 percent. The same applies when analysing the different industries, except for the utility sector. Here, the biggest part of the firms does feature equity changes between 10 and 20 percent. The observation of such large equity changes of the sample must be fathomed under the circumstances that the time has been characterized by many different economic events. Furthermore, companies being founded in the 1990s exhibit larger debt positions before substituting equity for leverage.

Applying shorter time intervals, companies indeed do not change their equity ratio in such a large amount. According to the notion of the trade-off theory, companies pursue a target debt ratio. In order to test this, a time interval of 2002 and 2008 has been chosen to detect certain implications. Referring to the sample it is interesting to note that most of the companies (55.5 percent) conduct equity changes ranging between 5 percent and 20 percent. Analyzing the industries, it can be found, that especially the health care as well as the information technology sectors do have the largest equity ratio changes.

\[\text{Refer to Chapter 2.3 for a study of the trade-off theory.}\]
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Change in Equity Ratio
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Change in Equity Ratio

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Approximately 33 percent of the utility companies do show ratio changes of no more than 5 percent, implying that these firms do follow a rather strict target capital structure. The other industries ratios are in between 5 percent and 20 percent. Figure 6.19 graphically depicts the findings of the equity ratio changes for the sample between the time frame 2002 and 2008, testing whether companies follow a fixed or rather a flexible target capital structure.703

![Figure 6.19: Target Structure](image)

The numbers perfectly show that almost 46 percent of the companies under study do follow a very strict or somewhat tight target capital structure. Approximately 38 percent of the companies do have equity ratio changes of more than 20 percent.

703 The following assumptions have been made. Companies exhibiting an equity change of up to 5 percent are regarded to follow a fixed target capital structure. Firms, having a ratio variance between 5 and 15 percent, do have a somewhat tight capital structure. Firms possessing an equity ratio variation between 15 and 20 percent do have a flexible target structure. Finally, companies exhibiting an equity ratio change of more than 20 percent do not have any target capital structure. The definition has been retrieved from Graham and Harvey (2002).
cent, implying that these companies are considered of not having a target capital structure. However, it must be noted that companies might have set a target capital structure, but due to severe monetary losses they were forced to resort to their equity positions. Thus, the notion of the trade-off theory is pursued by at least 46 percent of the sample.

While Chapter 6 has provided an overview of the empirical data, the following three chapters offer empirical results on the aforementioned research questions under study.

---

704 Data analyses has shown that some companies with larger amounts of equity changes and hence characterized those companies not following a target capital structure are exposed to larger losses in some of the years between 2002 and 2008.

705 Refer to the study of Graham and Harvey (2002) in Chapter 4.2.1.
7 Market-Timing of Equity

Chapter 7 deals with the timing ability of firms when engaging in equity financing. Since the seminal work of Baker and Wurgler (2002), the concern of the market-timing of equity gained importance in the capital structure literature. A vast number of empirical research papers emerged testing the market-timing effect of equity.\(^{706}\) So far, these empirical studies have all in common that their study is limited to the application of a single aggregated dependent variable.\(^{707}\) Furthermore, these studies fail to scrutinize the market-timing effect over time and on a broader, diffuse sample.

Chapter 7 fills this void by applying direct measures of equity financing. In particular, next to an aggregated amount of equity, our study attempts to find out how firms time their seasoned equity offerings (SEO) and share repurchase activities. Additionally, this chapter contributes to the capital structure literature by providing cross-sectional as well as calendar-time results. In other words, our study will analyse how the market-timing effect of equity behaves in different business industries. Furthermore, we will examine whether the market-timing effect of equity alters over time. Based on the rationale mentioned above, the goal of Chapter 7 is to provide an answer to the following core research question:

*Do managers time the market when engaging in equity financing?*

The outline of this chapter is as follows: While Chapter 7.1 deals with the development of the hypotheses, Chapter 7.2 provides regression results for the short-term

---

\(^{706}\) Refer to Chapter 3.3.2 for an overview of the empirical evidence on the market-timing hypothesis.

\(^{707}\) The large number of existing academic papers makes use of book leverage or market leverage when testing the market-timing hypothesis of equity financing. These studies fail to study the direct effects of market-timing on seasoned equity offerings (SEO) and share repurchase activities.
measures of equity market-timing. Here, sample-, cross-sectional-, and calendar-time results will be offered. While Chapter 7.2 is concerned about the short-term effect of market-timing, Chapter 7.3 examines the long-lasting effect of equity market-timing. Chapter 7.4 applies direct measures of equity and provides results for the timing effect on SEOs and share repurchases. Finally, Chapter 7.5 presents concluding remarks on the equity market-timing issue and provides an overview of the tested hypotheses.

7.1 Development of Hypotheses

Ordinary least squares (OLS) regression analysis will be conducted in order to detect if the market-to-book (MB) ratio does have any significant short-run as well as long-run impact on the annual change in leverage.

Market-to-book (MB) is defined as total assets minus book equity plus market equity all divided by total assets. According to the quote of Baker and Wurgler (2002) it is assumed that firms with a relatively high market valuation tend to decrease their leverage due to larger equity issuance. ‘In Corporate Finance, equity market timing refers to the practice of issuing shares at high prices and repurchasing at low prices. The intention is to exploit temporary fluctuations in the cost of equity relative to the cost of other forms of capital.’

Hence, the following hypotheses will be tested:

**Hypothesis 1 (\( \beta(\xi_1) \)):** Firms with a high market-to-book ratio are associated with a decrease in leverage compared to those with a low market-to-book ratio.

The regression includes certain control variables such as asset tangibility, profitability, as well as firm size, which are all considered to be major determinants of firm

\( ^{108} \text{Baker and Wurgler (2002), p.1.} \)
leverage.\textsuperscript{706} Tangible assets may be employed as collateral and consequently may lead to more debt financing. It is defined as property, plant, and equipment divided by total assets ($PPE/A$).

Profitability serves as a perfect proxy for the availability of internal funds and is associated with less leverage under the pecking-order theory. This ultimately stems from the asymmetric information hypothesis of Myers (1977) and Myers and Majluf (1984), in which firms make use of internal generated funds due to the fact that external funds are characterized by higher agency costs.\textsuperscript{707} This implies a negative relationship between leverage and profitability.\textsuperscript{711}

In contrast, the tax shield hypothesis of Modigliani and Miller (1963) suggests a positive relationship between capital structure and profitability.\textsuperscript{712} Furthermore, Jensen (1986) claims that debt may serve as a disciplining mechanism, implying that managers pay out cash to meet interest payments, rather than engaging in personal shirking.\textsuperscript{713} Profitability is determined as earnings before interest, taxes, depreciation and amortization divided by total assets ($EBITDA/A$).

Firm size is associated with an increase in leverage, since larger firms are less likely to incur financial distress. It is measured as the natural logarithm of net sales.\textsuperscript{714} Consequently, the following three hypotheses are derived:

Hypothesis 2 ($= \beta(\xi_2)$): Asset tangibility has a positive impact on leverage.

Hypothesis 3 ($= \beta(\xi_3)$): Profitable firms tend to have lower leverage compared to non-profitable firms.


\textsuperscript{707} See Chapter 2.5 for a detailed discussion on this notion.

\textsuperscript{711} Detailed overview of the relationship between leverage and profitability will be provided in Chapter 8.1.6. For a research overview on this issue, refer to Table 8.6.

\textsuperscript{712} Refer to empirical results of Givoly et al. (1992), Delcoure (2007) and Elliot et al. (2008).

\textsuperscript{713} Refer to Chapter 2.4.1 for a detailed discussion on that issue.

\textsuperscript{714} In case variables are exposed to long tails and some skewness, a natural logarithm ensures that the actual variable does not give too much statistical noise to the regression.
Hypothesis 4 ($\beta(\xi_4)$): The bigger a firm, the more leverage it tends to employ compared to smaller firms.

Once we have determined whether or not market-timing behaviour of firms exists in leverage decisions, it is interesting to find out if the value effect is consistent across various business industries. As has been shown in Chapter 6.2.1, industries differ in their capital structure. This implies that the market-timing effect might fail to be relevant in every business industry. Based on the rationale mentioned above the following hypothesis is derived:

Hypothesis 5 ($\beta(\xi_5)$): Market-timing behaviour fails to be consistent across various business industries.

While it is predicted that a high market-to-book ratio is negatively related to leverage, the question remains how the change in leverage is reached. In order to test this, the change in leverage will be decomposed into equity issues, retained earnings and the residual change in leverage. Each of the three components will be regressed on the market-to-book ratio to examine whether or not the net effect comes through net equity issues as market-timing implies. Hence, the following three hypotheses have been developed:

Hypothesis 6 ($\beta(\xi_6)$): Firms with a high market-to-book ratio tend to have larger net equity issues.

Hypothesis 7 ($\beta(\xi_7)$): Firms with a high market-to-book ratio tend to retain fewer earnings as they invest more.

---

113 The residual change in leverage depends on the total growth of assets from the combination of equity issues, debt issues and newly retained earnings.

Hypothesis 8 ($\beta(\xi_8)$): Firms with a high market-to-book ratio tend to have larger asset growth compared to firms with lower market-to-book ratios.

Our study also tries to find out whether the market-timing effect is consistent throughout the different time periods under study. Consequently, the following two hypotheses have been developed:

Hypothesis 9 ($\beta(\xi_9)$): The effect that a high market-to-book ratio leads to a decrease in leverage is consistent over time.

Hypothesis 10 ($\beta(\xi_{10})$): The effect that an increase in the market-to-book ratio leads to a rise in net equity issues is consistent over time.

While the previous hypotheses all deal with short-term effects of the market-to-book ratio it is of utmost importance to scrutinize whether a persistent long-term market-timing effect exists in the leverage decision of firms.

Hypothesis 11 ($\beta(\xi_{11})$): The market-timing behaviour of firms has a long lasting effect on leverage.

The last two hypotheses revolve around direct measures of equity changes in a firm. Instead of using book or market leverage as the dependent variable in our regression model, we will find out whether more seasoned equity offerings have been issued and less share repurchases have been conducted when the market-to-book ratio has been relatively high. Hence the subsequent hypotheses are as follows:

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717 Our study differentiates between three time periods. The first time frame lasts from 1990-1995, the second from 1996-2001, and the last covers the period 2002-2008.

718 In order to determine the possible persistent effect of market-timing behavior, an “external finance weighted-average” market-to-book ratio has been created on the basis of the analysis by Baker and Wurgler (2002). See Baker and Wurgler (2002), pp.11.
Hypothesis 12 ($= \beta(\xi_{12})$): Firms with high a market-to-book ratio tend to issue more seasoned equity offerings.

Hypothesis 13 ($= \beta(\xi_{13})$): Firms with high a market-to-book ratio tend to engage in less share repurchase activities.

Table 7.1 provides an overview of the 13 hypotheses that will be tested in Chapter 7.

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1</td>
<td>Firms with a high market-to-book ratio are associated with a decrease in leverage compared to those with a low market-to-book ratio.</td>
</tr>
<tr>
<td>H2</td>
<td>Asset tangibility has a positive impact on leverage.</td>
</tr>
<tr>
<td>H3</td>
<td>Profitable firms tend to have more leverage compared to non-profitable firms.</td>
</tr>
<tr>
<td>H4</td>
<td>The bigger a firm the more leverage it tends to employ compared to smaller firms.</td>
</tr>
<tr>
<td>H5</td>
<td>Market-timing behavior fails to be consistent across various business industries.</td>
</tr>
<tr>
<td>H6</td>
<td>Firms with a high market-to-book ratio tend to have larger net equity issues.</td>
</tr>
<tr>
<td>H7</td>
<td>Firms with a high market-to-book ratio tend to retain fewer earnings as they invest more.</td>
</tr>
<tr>
<td>H8</td>
<td>Firms with a high market-to-book ratio tend to have larger asset growth compared to firms with lower market-to-book ratio.</td>
</tr>
<tr>
<td>H9</td>
<td>The effect that a high market-to-book ratio leads to a decrease in leverage is consistent throughout the various time periods.</td>
</tr>
<tr>
<td>H10</td>
<td>The effect that an increase in the market-to-book ratio leads to a rise in net equity issues is consistent throughout the various time periods.</td>
</tr>
<tr>
<td>H11</td>
<td>The market-timing behavior of firms has a long lasting effect on leverage.</td>
</tr>
<tr>
<td>H12</td>
<td>Firms with a high market-to-book ratio tend to issue more seasoned equity offerings.</td>
</tr>
<tr>
<td>H13</td>
<td>Firms with a high market-to-book ratio tend to engage in less share repurchase activities.</td>
</tr>
</tbody>
</table>
7.2 Short-Term Timing Measure

Chapter 7.2 provides OLS regression results on the market-timing effect of equity financing. In particular, this chapter is concerned about the short-run impact of equity market-timing on a firm’s capital structure.\(^{719}\)

7.2.1 Sample- and Cross-Section Results

A regression analysis will be conducted for the sample and for each industry separately, in order to desery whether capital structure changes are driven by net equity issues when firms are overvalued. The OLS method is applied, which is considered to be a favourable linear regression model in this context.\(^{720}\)

\[
\left( \frac{D}{A} \right)_t - \left( \frac{D}{A} \right)_{t-1} = a + b \left( \frac{M}{B} \right)_{t-1} + c \left( \frac{PPE}{A} \right)_{t-1} + d \left( \frac{EBITDA}{A} \right)_{t-1} + elog(S)_{t-1} + f \left( \frac{B}{A} \right)_{t-1} + \epsilon_{t-1}
\]

(7.1)

Since leverage can only have values between 0 and 1 for solvent firms, it can, independent from the other variables, only alter in one direction if close to the boundaries. Specifically, if the value approaches 0, leverage will increase and if it is close to 1, leverage will fall. Hence, in order to obviate any bias, lagged leverage is included to control for this specific level effect.\(^{721}\) The reason to apply a lag of -1 is to detect how the current change in leverage has been derived by means of several variables t-1 years ago. This way of mathematical conduct is academically accepted.\(^{722}\)

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\(^{719}\) Chapter 7.3 deals with the long-run effect of equity market-timing.

\(^{720}\) Where: \(D = \) Debt; \(A = \) Assets; \(M/B = \) Market-to-book; \(PPE = \) Property, plant and equipment, \(EBITDA = \) Earnings before interest, taxes, depreciation and amortization; \(S = \) Sales

\(^{721}\) In a similar vein, see Baker and Wurgler (2002), pp.6.

\(^{722}\) Academics such as Baker and Wurgler (2002), Fan et al. (2008) and Sautner and Sprunger (2009) also apply a lag of -1.
7.2.1.1 Influence of MB Ratio on Leverage and Firm Characteristics

Table 7.2 reports the results from regressing the annual changes in leverage on the variables under study. Referring to the whole sample first, the results indeed suggest that high market-to-book ratios are associated with a decrease in leverage. In particular, a one standard deviation increase in market-to-book is associated with a 0.0046 percentage point decrease in leverage. This finding is consistent with the notion of Hypothesis 1, claiming that firms with a high market-to-book ratio tend to have less leverage compared to those with a low market-to-book ratio. Hence, Hypothesis 1 can be confirmed. In comparison to the study of Baker and Wurgler (2002), the result does exhibit the expected negative sign and is statistically significant at the 5 percent confidence level.\(^2\)

Also in line with Baker and Wurgler are the results of the other columns in Table 7.2. As expected, asset tangibility tends to have a positive impact on leverage (by 0.0032 percentage points per standard deviation increase), profitability tends to decrease leverage (by 0.0058 percentage points per standard deviation increase), and firm size is inclined to increase leverage (by 0.0098 percentage points per standard deviation increase).\(^3\) These results all exhibit strong statistical significance.\(^4\) According to the results in Table 7.2, Hypothesis 2 and Hypothesis 4 can be confirmed. In contrast, Hypothesis 3 must be rejected. Our study approves that asset tangibility as well as firm size exhibit a positive impact on the leverage decision of firms, while profitability exerts an inverse relationship.\(^5\)

\(^2\) Table 8.3 in Chapter 8.1.2 provides a research overview on the impact of market-to-book ratios on leverage.

\(^3\) The numbers are calculated with the coefficients in the sample row in Panel A of Table 8.2 and the sample standard deviations of the variables under study. Hence, the calculations are as follows: - 0.0033*1.40 = -0.0046, where 1.40 is the standard deviation of lagged market-to-book. The same calculations are applied for the other independent variables. Here the standard deviation for lagged asset tangibility equals 0.27, for lagged profitability 0.1 and for lagged log sales 0.67.

\(^4\) The material insignificance of the results is in line with the study of Högfeldt and Oborenko (2008) and partly Baker and Wurgler (2002) for US sample. For European sample, the results of Sautner and Spranger (2009) are statistically as well as materially insignificant. Hermanns’ (2007) study of German firms also lacks any significance. Also see Fan et al. (2008).

\(^5\) Chapter 8 provides an in-depth analysis of the different determinants of the capital structure decisions of firms. The focus in this chapter lies mainly on the market-timing behavior of firms.
While the aforementioned results accrue to the whole sample, Equation 7.1 has also been applied to every single business industry separately. Concerning the market-to-book ratio it is interesting that in all industries, except in the telecommunication service sector, the coefficients exhibit a negative sign, as suggested by the market-timing hypothesis.\(^{72}\) In these industries it can be observed that firms do decrease their leverage when firm valuation is high.

The signs of the coefficients for asset tangibility alternate and do not behave consistently. Only the telecommunication, materials as well as energy sector do exhibit the same coefficient sign as the sample, suggesting that fixed assets are positively related to leverage. However, this finding is only statistically significant in the energy sector. All other industries follow a different pattern, in which the coefficient sign is negative, implying that fixed assets lead to a decrease in leverage. This finding is strongest in the utility sector and statistically significant at the 5 percent confidence level.

It has been shown that profitability has a negative impact on leverage, as the results of the sample in Table 7.2 suggest. The telecommunication, health care, consumer discretionary, information technology and energy sector also exhibit a negative sign. Here, the results in the telecommunication, consumer discretionary as well as energy industry are considered to be statistically significant at the 5 percent level. Especially, firms in the telecommunication sector exhibit the strongest material effect. More specifically, a one standard deviation increase in profitability leads to a 0.3232 percentage point decrease in leverage.\(^{728}\)

\(^{72}\) Results for the health care, consumer discretionary, consumer staples, information technology and materials industry exhibit strong statistical significance.

\(^{728}\) \(0.3232 = -0.0506 * 0.38\), where 0.38 is the standard deviation of lagged profitability for the telecommunication sample.


### Table 7.2

Determinants of Annual Changes in Leverage and Components (1990-2008)

OLS regression of changes in book leverage and its components on the market-to-book ratio, fixed assets, profitability, firm size, and lagged leverage.

Book leverage is defined as book debt to total assets. The M/B ratio is total assets minus book equity plus market equity divided by total assets. Firm-year observations with an excessive market-to-book (larger than ten) are excluded. Fixed assets intensity (PPE/A) is defined as net property, plant, and equipment over total assets. Profitability (EBITDA/A) equals operating income before depreciation divided by total assets. Firm size is defined as the natural log of net sales. The total change in leverage is depicted in Panel A. The net equity issues are in Panel B, while newly retained earnings are in Panel C. Panel D represents the growth in the assets components. Robust t-statistics are also presented.

<table>
<thead>
<tr>
<th>Industry</th>
<th>N</th>
<th>M/B-1 %</th>
<th>PPE/A-1 %</th>
<th>EBITDA/A-1 %</th>
<th>log(S)-1</th>
<th>D/A-1 %</th>
<th>R²</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>b</td>
<td>t(b)</td>
<td>e</td>
<td>t(e)</td>
<td>d</td>
<td>t(d)</td>
</tr>
<tr>
<td>Sample</td>
<td>6273</td>
<td>-0.0033</td>
<td>-2.94</td>
<td>0.0117</td>
<td>2.16</td>
<td>-0.0579</td>
<td>-3.61</td>
</tr>
<tr>
<td>Industry</td>
<td>981</td>
<td>-0.0045</td>
<td>-1.48</td>
<td>-0.0047</td>
<td>-0.48</td>
<td>0.0771</td>
<td>1.66</td>
</tr>
<tr>
<td>Health Care</td>
<td>688</td>
<td>-0.0003</td>
<td>-2.07</td>
<td>-0.0133</td>
<td>-0.22</td>
<td>-0.0778</td>
<td>-1.30</td>
</tr>
<tr>
<td>Consumer Disc</td>
<td>1299</td>
<td>-0.0002</td>
<td>-2.10</td>
<td>-0.0143</td>
<td>-1.04</td>
<td>-0.0985</td>
<td>-2.55</td>
</tr>
<tr>
<td>Consumer Staples</td>
<td>644</td>
<td>-0.0116</td>
<td>-3.24</td>
<td>-0.0032</td>
<td>-0.17</td>
<td>0.3483</td>
<td>5.14</td>
</tr>
<tr>
<td>Information Tech</td>
<td>1087</td>
<td>-0.0060</td>
<td>-2.24</td>
<td>-0.0252</td>
<td>-0.82</td>
<td>-0.0477</td>
<td>-1.18</td>
</tr>
<tr>
<td>Utilities</td>
<td>563</td>
<td>-0.0103</td>
<td>-1.02</td>
<td>-0.0569</td>
<td>-3.19</td>
<td>0.0018</td>
<td>0.36</td>
</tr>
<tr>
<td>Materials</td>
<td>464</td>
<td>-0.0155</td>
<td>-2.20</td>
<td>0.00332</td>
<td>1.36</td>
<td>0.0067</td>
<td>1.01</td>
</tr>
<tr>
<td>Energy</td>
<td>612</td>
<td>-0.0121</td>
<td>-1.61</td>
<td>0.00472</td>
<td>2.05</td>
<td>-0.0205</td>
<td>-3.94</td>
</tr>
</tbody>
</table>

Panel A: Change in book leverage (d(D/A-1) %)

Panel B: Change in book leverage due to net equity issues (-d(e/A-1) %)

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7.2 Short-Term Timing Measure
### Determinants of Annual Changes in Leverage and Components (1990-2008)

#### Panel C: Change in book leverage due to newly retained earnings (-(DRE/AA) %)

<table>
<thead>
<tr>
<th>Industry</th>
<th>N</th>
<th>M/Br-1 %</th>
<th>PPE/At-1 %</th>
<th>EBITDA/At-1 %</th>
<th>log(S)At-1</th>
<th>DAt-1 %</th>
<th>R²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample</td>
<td>6273</td>
<td>0.0043</td>
<td>2.84</td>
<td>0.0481</td>
<td>-0.5181</td>
<td>-24.04</td>
<td>-0.0002</td>
</tr>
<tr>
<td>Telecom Svc</td>
<td>65</td>
<td>-0.0501</td>
<td>-0.87</td>
<td>0.1350</td>
<td>-0.3932</td>
<td>-0.55</td>
<td>0.0310</td>
</tr>
<tr>
<td>Industry</td>
<td>941</td>
<td>-0.0190</td>
<td>-5.75</td>
<td>0.0058</td>
<td>-0.1601</td>
<td>-3.17</td>
<td>0.0060</td>
</tr>
<tr>
<td>Health Care</td>
<td>688</td>
<td>0.0123</td>
<td>6.04</td>
<td>0.2841</td>
<td>-0.0898</td>
<td>-28.03</td>
<td>0.0040</td>
</tr>
<tr>
<td>Consumer Disc</td>
<td>1209</td>
<td>-0.0038</td>
<td>-2.18</td>
<td>-0.0404</td>
<td>-0.3554</td>
<td>-8.28</td>
<td>0.0015</td>
</tr>
<tr>
<td>Consumer Staples</td>
<td>644</td>
<td>-0.0162</td>
<td>-3.87</td>
<td>0.0038</td>
<td>0.0273</td>
<td>0.35</td>
<td>-0.0032</td>
</tr>
<tr>
<td>Information Tech</td>
<td>1087</td>
<td>0.0008</td>
<td>0.14</td>
<td>-0.0635</td>
<td>-0.6927</td>
<td>-8.36</td>
<td>0.0098</td>
</tr>
<tr>
<td>Utilities</td>
<td>563</td>
<td>-0.0221</td>
<td>-3.71</td>
<td>0.0159</td>
<td>-0.1656</td>
<td>-3.76</td>
<td>0.0104</td>
</tr>
<tr>
<td>Materials</td>
<td>464</td>
<td>-0.0260</td>
<td>-4.60</td>
<td>0.0512</td>
<td>-0.1322</td>
<td>-2.46</td>
<td>0.0059</td>
</tr>
<tr>
<td>Energy</td>
<td>612</td>
<td>-0.0228</td>
<td>-3.33</td>
<td>0.0154</td>
<td>-0.3011</td>
<td>-6.30</td>
<td>-0.0082</td>
</tr>
</tbody>
</table>

#### Panel D: Change in book leverage due to growth in assets (-E(A) (1/At - 1/At-1) %)

<table>
<thead>
<tr>
<th>Industry</th>
<th>N</th>
<th>M/Br-1 %</th>
<th>PPE/At-1 %</th>
<th>EBITDA/At-1 %</th>
<th>log(S)At-1</th>
<th>DAt-1 %</th>
<th>R²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample</td>
<td>6273</td>
<td>0.0052</td>
<td>-3.92</td>
<td>-0.0021</td>
<td>-0.1957</td>
<td>-10.24</td>
<td>0.0331</td>
</tr>
<tr>
<td>Telecom Svc</td>
<td>65</td>
<td>-0.0457</td>
<td>-1.01</td>
<td>0.1813</td>
<td>-0.6634</td>
<td>-1.16</td>
<td>0.1129</td>
</tr>
<tr>
<td>Industry</td>
<td>941</td>
<td>-0.0176</td>
<td>-5.13</td>
<td>-0.0173</td>
<td>0.0727</td>
<td>1.39</td>
<td>0.0335</td>
</tr>
<tr>
<td>Health Care</td>
<td>688</td>
<td>-0.0075</td>
<td>-2.14</td>
<td>0.0032</td>
<td>-0.3332</td>
<td>-6.66</td>
<td>0.0039</td>
</tr>
<tr>
<td>Consumer Disc</td>
<td>1209</td>
<td>-0.0038</td>
<td>-2.18</td>
<td>-0.0404</td>
<td>-0.3354</td>
<td>-8.28</td>
<td>0.0185</td>
</tr>
<tr>
<td>Consumer Staples</td>
<td>644</td>
<td>-0.0061</td>
<td>-1.96</td>
<td>-0.0231</td>
<td>0.0082</td>
<td>1.49</td>
<td>0.0157</td>
</tr>
<tr>
<td>Information Tech</td>
<td>1087</td>
<td>-0.0016</td>
<td>-0.38</td>
<td>0.0113</td>
<td>-0.4050</td>
<td>-6.13</td>
<td>0.0570</td>
</tr>
<tr>
<td>Utilities</td>
<td>563</td>
<td>0.0359</td>
<td>-4.75</td>
<td>0.0359</td>
<td>-0.0511</td>
<td>-0.83</td>
<td>0.0119</td>
</tr>
<tr>
<td>Materials</td>
<td>464</td>
<td>-0.0072</td>
<td>-1.31</td>
<td>0.0499</td>
<td>-0.1803</td>
<td>-3.45</td>
<td>0.0043</td>
</tr>
<tr>
<td>Energy</td>
<td>612</td>
<td>-0.0010</td>
<td>-0.36</td>
<td>-0.0143</td>
<td>-0.0611</td>
<td>-1.36</td>
<td>0.0192</td>
</tr>
</tbody>
</table>
Companies in the industrial, consumer staples, utilities and materials sector are characterized by different capital structure patterns. For instance, a one standard deviation increase in profitability for companies in the consumer staple industry is associated with a 0.0210 percentage point increase in leverage.\textsuperscript{729} The finding that a clear and consistent picture of the impact of profitability on capital structure is missing meets academic as well as empirical theory and results. On the one hand, profitability might be translated into an increase in leverage due to lower financial distress costs, but on the other hand it might decrease leverage due to the tax advantage hypothesis as well as Jensen's cash flow notion.\textsuperscript{730}

Firm size does feature a positive impact on leverage, as suggested by theory, in every business industry. Statistical significance at the 5 percent confidence level are reached in the telecommunication service, consumer discretionary, and information technology sector, while the results in the health care and materials industry are significant at the 10 percent confidence level. It can be shown that firm size and leverage do have a positive relationship.\textsuperscript{731}

To sum up, the main goal of conducting a regression analysis based on Equation 7.1 was to find out whether or not a firm overvaluation (proxied by market-to-book ratio) is associated with a decrease in leverage. The results in Panel A of Table 7.2 all provide a consistent financing pattern across the different industries. In specific, firms do decrease their level of leverage when firm valuation seems high. This finding is prevalent for all industries, except the telecommunication business. Hence, Hypothesis 5 must be rejected, since our results have shown that market-timing behaviour is imminent in the majority of the business industries under study. In other words, firms in almost all industries do time the market when engaging in leverage decisions.

\textsuperscript{729} 0.0210 = 0.3483 * 0.06, where 0.06 is the standard deviation of lagged profitability in the consumer staples industry.
\textsuperscript{730} Refer to Chapter 2.4.1 for further information on that issue. Also refer to Chapter 8.1.6 for an overview of empirical studies on profitability.
\textsuperscript{731} Unsurprisingly, the coefficients of lagged leverage are all negative and significant at the 5 percent level in every business industry.
Next to the market-to-book ratio, the other three explanatory variables also exert interesting findings. In essence, it can be found, that cross-section differences among industries do not seem very high. For instance, while firm size is positively related to the sample, the same positive impact accrues also to every single industry. In other words, the bigger a firm the more leverage it tends to employ. Almost a consistent financing pattern can also be found for the tangibility as well as profitability effect. Here, only some cross-sectional differences can be detected.\footnote{A detailed research analysis on the capital structure determinants is provided in Chapter 8. Therefore, it is out of the scope of Chapter 7 to offer an in-depth interpretation of the results mentioned above.}

7.2.1.2 Influence of MB Ratio on Decomposition of Leverage

While the previous results all revolved around changes in leverage in particular, the following findings shed further light on how these leverage changes are reached. In specific, Panels B, C, and D in Table 7.2 all show the results how each of the three components alter the annual leverage of the companies under study. Equation 7.2 shows that the decomposition of the change in leverage is reached through net equity issues ($e/A$), newly retained earnings ($\Delta RE/A$), and residual change in leverage, which derives from total growth in assets from the combination of equity issues, debt issues, and newly retained earnings. This decomposition enables us to find out whether the market-to-book ratio influences leverage through means of net equity issues, as market-timing suggests.\footnote{See Baker and Wurgler (2002), p.9.}

\[
\frac{(\frac{D}{A})_t}{(\frac{D}{A})_{t-1}} = \left[\frac{(E}{A})_t - \frac{(E}{A})_{t-1}\right] = - \left(\frac{e}{A_t}\right) - \left(\frac{\Delta RE}{A_t}\right)_t - \left[E_{t-1} - \left(\frac{1}{A_{t-1}} - \frac{1}{A_{t-1}}\right)\right]
\]

(7.2)

Referring to the sample results first, Panel B reveals that $MB$ does indeed have an effect on leverage through net equity issues. In other words, a high market-to-book ratio is associated with larger net equity issues. This result is statistically strong significant at the 1 percent confidence level. Panel C shows that $MB$ exhibits a statistically significant and positive effect on leverage by means of retained earnings.
When the market-to-book ratio is high, firms in the sample tend to retain less as they invest more.\textsuperscript{734} Panel D suggests that the market-to-book ratio is negatively related to growth in assets, which results into a decrease in leverage.\textsuperscript{735}

The results in Panel B, C and D in Table 7.2 confirm Hypothesis 6, Hypothesis 7 and Hypothesis 8. In essence, it has been shown that the market-to-book ratio negatively influences leverage mainly by means of net equity issues.\textsuperscript{736} Further, a high market-to-book ratio influences leverage through a decrease in retained earnings. Finally, it has been shown that firms with a high market-to-book ratio tend to have larger asset growth compared to those with a low firm valuation.

The other columns of Table 7.2 show the results for asset tangibility, profitability, and firm size. Regarding asset tangibility, it can be noted, that fixed assets do exhibit a very pronounced effect on changes in leverage through means of newly retained earnings. More specifically, a one standard deviation increase in asset tangibility leads to a 0.010 percentage point increase in equity issues, while a one standard deviation increase in asset tangibility is associated with a 0.013 percentage point decrease in leverage due to newly retained earnings.\textsuperscript{737} These values are all very strong statistically significant.

Referring to profitability as well as firm size, two further interesting patterns can be observed. First, similar to the findings of asset tangibility, retained earnings are the major driver of leverage changes. In particular, profitable firms engage in less equity issuance, but in higher retained earnings transactions. In other words, capital structure changes for profitable firms are not affected by equity issuance, but rather through internal capital, i.e. the use of retained earnings. Again, the statistical power of profitability is very strong. Second, firm size offers an important role for changes in leverage through equity issuance and asset growth. As can be observed in Panel B, larger firms issue less equity and are characterized by changes in leverage due to less


\textsuperscript{735} However, in comparison to the results in Panel B, the variable in Panel D exhibits relatively less material significance.

\textsuperscript{736} This result is also in line with the findings of Baker and Wurgler (2002).

\textsuperscript{737} The standard deviation of asset tangibility equals 0.27, which is multiplied with the corresponding coefficient of net equity issues and newly retained earnings in order to obtain the values mentioned above.
growth in assets. The net effect culminates in the consequence that firm size leads ultimately to an increase in leverage. These variables are also statistically strong significant.\textsuperscript{738}

Referring to cross-sectional results, the following interesting findings can be drawn. First, the phenomenon that a high market-to-book ratio leads to more equity issues can be observed in the industrial, health care, consumer discretionary, consumer staples, information technology and utility sector. These results are mostly statistically significant.

Second, a high market-to-book ratio also leads to an increase in retained earnings in industries, such as consumer discretionary, consumer staples, utilities, materials, and energy sector, all displaying strong statistical power. These results stay in contrast to the findings of the overall sample, where an increase in the market-to-book ratio is associated with a decrease in retained earnings. Here, only firms in the health care sector do follow the same pattern, implying that a one standard deviation increase in market-to-book leads to a 0.0248 percentage point decrease in retained earnings.\textsuperscript{739} In Panel D, for all industries, market-to-book is negatively related to growth in assets, culminating into a decrease in leverage. Here, we find only statistical significance for the industrial, health care, consumer discretionary, consumer staples and utility sector.

Third, asset tangibility is negatively related to equity issue for the telecommunication, information technology and energy sector, the latter not being of any statistical power.

Fourth, strong statistical significance can be observed in Panel B for the column profitability. All industries, except the telecommunication sector, have in common that profitable firms tend to issue less equity. However, for telecommunication service companies, a one standard deviation increase in profitability is translated into a 0.4234 percentage point increase in equity. In other words, only telecommunication companies issue more equity when their profitability increases.

\textsuperscript{738} Baker and Wurgler (2002) find similar results, but most of their coefficients exhibit much lower statistical power. Also see Högfeldt and Oborenko (2005).

\textsuperscript{739} This result exhibits also strong statistical power.
Fifth, the decrease in equity issue for profitable firms is more than offset by higher retained earnings. The strongest effect can be observed in the health care sector. Seven out of nine industries exhibit very strong statistical significance.

Sixth, in all industries, size is inversely related to equity issue. In other words, the larger a firm becomes, the less it tends to engage in equity issue. Again, strong statistical significance can be observed in the telecommunication, industrial, health care, consumer discretionary, consumer staples, information technology, utilities, and energy sector. The effect of size on newly retained earnings is rather contrarian to the results of the sample. Only firms in the consumer staples and energy business do have a negative coefficient.

To sum up, regression results have shown that the market-to-book ratio is associated with a decrease in leverage due to net equity issues. These results are significant for the sample and mostly for the different industries. Further, regarding the sample, fixed assets are associated with an increase in equity, while profitability and firm size is negatively related to equity issues. Within the different business segments, exceptions and different patterns can be observed.

7.2.2 Calendar-Time Results

The following abstract deals with the issue whether the market-timing effect alters over time. The following calendar-time analysis has been divided into three different time periods in order to detect possible changes over time. The first time period lasts from 1990-1995, the second from 1996-2001, and the last covers the period 2002-2008. Table 7.3, Table 7.4 and Table 7.5 in Appendix C provides a detailed overview of the different calendar-time results. Due to the fact that our centre of attention lies on the question whether or not market-timing behaviour exists, our focus is mainly based on the market-to-book ratio. Figure 7.1 depicts the development of the change in book leverage, net equity issues, newly retained earnings, and asset growth in relation to the market-to-book ratio.
The results in Table 7.3, Table 7.4 and Table 7.5 in Appendix C and in Figure 7.1 confirm our previous findings that a high market-to-book ratio of firms ultimately leads to a decrease in book leverage. This finding is consistent in all three time periods. Despite the fact that the material effect of a high firm value on leverage change diminished slightly in the years 1996-2001, results confirm that market-timing behaviour is prevalent in all time periods.\footnote{The result for the period 1996-2001 lacks statistical significance.} Furthermore, Figure 7.1 shows that leverage changes occurred mainly due to net equity issues. During the three time periods, an increase in market-to-book ratio had a positive impact on net equity issue. These results are all statistically significant.

Based on the results mentioned above, Hypothesis 9 and Hypothesis 10 can be confirmed. Our study fails to detect any changes in market-timing behaviour over time. In essence, a high market-to-book ratio is associated with a decrease in leverage and a rise in net equity issues. It has been shown that these effects are consistent throughout the various time periods.

While the calendar-time regression model has been primarily conducted to prove Hypotheses 9 and 10, other interesting findings can be retrieved from our regression analysis. Whereas previous results in Table 7.2 have shown that a high market-to-book ratio is associated with an increase in newly retained earnings, the results in the calendar-time regression provide an opposite finding for the time frame 1996-2001. Here, a high \( MB \) ratio leads to a decrease in retained earnings financing. Comparing the two graphs (Net Equity Issue and Newly Retained Earnings) in Figure 7.1, it is striking that the decrease in retained earnings financing is offset through an increase in equity issue. Consequently, it can be concluded that during 1996-2001 firms made use of more equity issue than complying with internal financing in the form of retained earnings. Finally, the results regarding leverage changes due to growth in assets follow a consistent pattern over the different time periods.
Concerning cross-section results it can be concluded that statistically significant results for changes in the impact of the market-to-book ratio on leverage does not exist. In other words, the notion of the market-timing hypothesis is followed in mainly all different industries throughout the three different time periods.
7.2.3 Summary

The main goal of Chapter 7.2 is to provide results for the short-run equity market-timing effect. In specific, this chapter offered sample-, cross-sectional- and calendar-time results. Furthermore, firm-characteristic results have also been provided. The findings of Chapter 7.2 are as follows:

- Firms with a high market-to-book ratio tend to have lower leverage compared to those with a low market-to-book ratio.
- The decrease in leverage due to firm overvaluation is mainly achieved through net equity issues. Furthermore, firms with a high market-to-book ratio tend to have less retained earnings and larger asset growth.
- The short-run market-timing effect on equity financing is consistent over time.
- Firm-characteristics also have an influence on the capital structure decision of firms. In essence, the bigger a firm the more leverage it tends to employ and the less equity it issues. Furthermore, the more tangible assets a firm holds the more leverage it tends to hold. Profitable firms tend to have less leverage compared to non-profitable ones. Furthermore, profitable firms tend to engage in less equity issuance, but in higher retained earnings transactions, implying that profitable firms tend to pursue the notion of the pecking-order theory.

7.3 Long-Term Timing Measure

We have shown that market-to-book exhibits a short-run impact on leverage by means of net equity issues. However, in a next step, we need to determine whether the market-timing of equity exhibits a long-term effect on the capital structure decision of firms. “Market timing could just be a local opportunism whose effect is quickly rebalanced
away. Alternatively, if managers do not rebalance to some target leverage ratio, market timing may have persistent effects, and historical valuations will help to explain why leverage ratios differ.”

In order to test for a persistent effect, a long-term timing measure needs to be created to test whether managers act as though their costs of equity financing is negatively related to MB ratios, implying that firms would finance their financial deficit with means of equity rather than debt if their market-to-book ratio is high. Baker and Wurgler (2002) include an “external finance weighted-average” market-to-book ratio in order to capture persistency. For a given firm-year, it is defined as follows:

\[
\left( \frac{M}{B} \right)_{\text{efwa},t-1} = \sum_{s=0}^{t-1} \frac{e_s + d_s}{e_t + d_t} \times \left( \frac{M}{B} \right)_s
\]

(7.3)

where e and d represent net equity and net debt issues, respectively.

In particular, the variable denotes higher values for those companies that either issued debt or equity when the market-to-book ratio was high, and vice versa. “The intuitive motivation for this weighting scheme is that external financing events represent practical opportunities to change leverage. It therefore gives more weight to valuations that prevailed when significant external financing decisions were being made, whether those decisions ultimately went toward debt or equity. The weighted average is better than a set of lagged market-to-book ratios because it picks out, for each firm, precisely which lags are likely to be the most relevant.”

A multivariate regression of book and market leverage on the weighted average MB and the previous control variables has been conducted. The results in Table 7.6 are based on the following regression equation:

---

42 In case of negative weights, the weights are set to zero.
\[
\left( \frac{D}{A} \right)_t = a + b \left( \frac{M}{B} \right)_{efwa,t-1} + c \left( \frac{M}{B} \right)_{t-1} + d \left( \frac{PPE}{A} \right)_{t-1} + e \left( \frac{EBITDA}{A} \right)_{t-1} + f \log(S)_{t-1} + \varepsilon_t
\]  

(7.4)

Again, the \( MB_{efwa} \) variable serves as an explanation for the effect of current cross-sectional variation in market-to-book, while the weighted variable \( MB_{efwa} \) captures the influence of past variation in the market-to-book ratio.

The results in Table 7.6 show that a persistent market-timing effect on leverage cannot be found for our sample. Hence, Hypothesis 11 must be rejected. Referring to the sample, a positive relationship between past within-firm variation in market-to-book and book leverage exists, being significant at the 10 percent level. Also a positive sign for market leverage is apparent, however being statistically insignificant. Furthermore, current cross-sectional variation in market-to-book exhibits again a negative trend for book as well as for market leverage. This is in line with the previous analysis and with the results of Baker and Wurgler (2002). However, the results for \( MB_{efwa} \) stand in contrast to the results of Baker and Wurgler, in which the weighted variable is more important in explaining the cross section of leverage than the lagged \( MB \) variable. As expected, lagged \( MB \) and profitability both reduce leverage, while asset tangibility and firm size increases leverage.\(^{74}\) The results are all statistically significant at the 1 percent confidence level.

Referring to the results of the different business segments it can be shown that historical variation in market-to-book fails to be a good cross-sectional predictor of firm leverage. In particular, companies in the industrial, consumer discretionary, information technology, utilities, materials and energy sector all exhibit a positive relationship to leverage, implying that the market-timing effect is quickly rebalanced away.\(^{75}\) Only the telecommunication sector exhibits a statistically significant relationship between past market-to-book variation and leverage.

---

\(^{74}\) While firm size exhibits a positive relationship with book leverage, it simultaneously has an inverse relationship with market leverage.

\(^{75}\) The fact that the sign of the weighted MB is negative is not surprising. Since the negative relationship between current MB and leverage is materially very weak, a change in sign is not uncommon in case of different regressions.
The results for the current $MB$ are in line with previous results, exhibiting a negative relation to leverage. However, it is interesting to note that firms in the health care as well as consumer discretionary sector are not exposed to current mispricing. Specifically, both industries exhibit a positive trend to leverage, being statistically significant at the 1 percent level.

Overall, the results in Table 7.6 challenge the generality of Baker and Wurgler’s market-timing theory as market-timing has no persistent long-run effect on capital structure. Only short-term mispricing has been detected, implying that firms engage in equity issue when market-to-book is high. However, this trend fails to have a long-lasting effect on firm’s capital structure. Particularly, profitability serves as the best explanatory variable for leverage. Combining the negative relationship of short-term $MB$ and profitability with the non-existing persistent effect of $MB$ it can be concluded that firms might follow the essence of the enhanced pecking-order theory. In other words, firms in need of capital make use first of internal capital (which is imminent for profitable firms) and as a last resort of external capital.

To sum up, two main results can be drawn from our analysis. First, high market valuations are associated with a decrease in leverage in the short-run. Second, historically high market valuations do not ultimately reduce leverage. Combining the two results, it can be concluded that the market-timing effect of firms fails to exhibit a persistent long-run effect and is rather short-term oriented.\(^\text{746}\)

\(^{746}\) Non-persistent effect of market-timing has also been detected by Hägfeldt and Ohorenko (2005), Hermanns (2007) and Saumner and Sprunger (2009).
Table 7.6
Leverage and Long-Term Timing (1990-2008)

OLS regressions of book and market leverage on the market-to-book ratio, fixed assets, profitability and firm size.

\[
\left( \frac{D}{A} \right)_{t-1} = a + b \left( \frac{M}{B} \right)_{q_{B,t-1}} + c \left( \frac{M}{B} \right)_{t-1} + d \left( \frac{PPE}{A} \right)_{t-1} + e \left( \frac{EBITDA}{A} \right)_{t-1} + f \log(S)_{t-1} + \epsilon_t
\]

Book leverage is defined as book debt to total assets, whereas market leverage is book debt over total assets minus book equity plus market equity. MB League is a weighted average MB. The weights are determined through the amount of external finance raised in each year during the period ending at t-1. External finance is the sum of net equity issues and net debt issues. In case the value becomes negative, the weight is set to zero. The MB ratio is total assets minus book equity plus market equity divided by total assets. Firm-year observations with an excessive market-to-book (larger than ten) are excluded. Fixed assets intensity (PPE/A) is defined as net property, plant, and equipment over total assets. Profitability (EBITDA/A) equals operating income before depreciation divided by total assets. Firm size is defined as the natural log of net sales. Results for book leverage are depicted in Panel A, while Panel B presents results for market leverage. Robust t-statistics are also presented.

<table>
<thead>
<tr>
<th>Industry</th>
<th>N</th>
<th>M/B (q_{B,t-1})</th>
<th>M/B-1</th>
<th>PPE/A-1 %</th>
<th>EBITDA/A-1 %</th>
<th>log(S)-1</th>
<th>R²</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>b</td>
<td>c</td>
<td>d</td>
<td>e</td>
<td>f</td>
<td>t(f)</td>
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<td>Panel A: Book Leverage %</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
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<td>-4.32</td>
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<td>1.13</td>
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<td>0.0305</td>
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<tr>
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<td>611</td>
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<td>0.0042</td>
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<td>0.0076</td>
<td>0.44</td>
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<td>Panel B: Market Leverage %</td>
<td></td>
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<tr>
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<td>0.0431</td>
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<td>-11.98</td>
<td>0.0051</td>
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<td>0.8288</td>
<td>3.28</td>
<td>4.3344</td>
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<td>0.1014</td>
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</table>
7.4 Alternative Equity Measures

The following study will make use of direct measures of equity changes in a firm in order to detect market-timing behavior. Instead of using book or market leverage as the dependent variable in our regression model, two direct measures of capital changes are applied. First, the explanatory variables will be regressed against the variable $E/A$, which is defined as equity issue over total assets. Second, the pendant to the equity issue of firms is the action of share repurchases, denoted $/A$. It must be noted that research on share repurchases is limited due to a lack of available data on share repurchases transactions in the US. Hence, our study is one of a few that have collected a sufficient large number of share repurchase transactions in order to investigate the timing of share repurchase. Ginglinger and Hamon (2007) argue that “research on the impact of open market share repurchases has been hindered by the lack of data available on actual share repurchases in many countries, including the US.”

Before delving into the OLS regression analysis, Figure 7.2 provides a graphical overview of the transaction volume of equity issues and share repurchases compared to the development of the S&P 500 index. Panel A shows that the volume proceeds of equity issues and the development of the S&P 500 index positively correlate. In other words, when the stock index experienced an increase in value, firms engaged in higher equity issue transactions and vice versa. This observation would suggest market-timing behavior of firms. However, it must be noted that equity issues follow a delay in response to the S&P 500 index. For instance, the S&P 500 index experienced a peak in the year 1999, decreasing thereafter due to the internet bubble. However since 2002 the index gained momentum and reached a new peak in 2007.

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747 The majority of studies dealing with the market-timing hypotheses all fail to apply direct equity measures, such as equity offerings or share repurchase. See for instance, Baker and Wurgler (2002), Elliot et al. (2008), Fan et al. (2008), Saumet and Sprianger (2009) and Frank and Goyal (2009).

748 As has been explained in Chapter 6.1, every single equity issue of every company in our sample has been extracted from financial databases. The same procedure accrues to share repurchases, which have been conducted more frequently than equity issues.

plumping thereafter due to the credit crisis. In comparison, equity issues experienced their peak in the year 2001, facing a decreasing pattern until the year 2005.

Panel B in Figure 7.2 shows the development of share repurchase transactions compared to the S&P 500 index. It can be observed that share repurchase transactions experienced a rather modest development until the year 2003.

In particular when the index experienced an increase in value, firms engaged in low share repurchase transactions, which is in line with the notion of the market-timing hypothesis. However, the development since the year 2003 is contrary to the essence of the hypothesis. While the S&P 500 index experienced a rise in value, the volume of share repurchase transactions also increased, culminating into a peak in the year 2007. In other words, firms engaged in share repurchase activities when the market seemed overvalued. This financing pattern stays in stark contrast to the essence of the market-timing behavior, postulated by Baker and Wurgler (2002).

The following analysis attempts to tackle the issue that has been observed in Figure 7.2 by empirically proving the validity of the market-timing effect on equity issues and share repurchases. In essence, the subsequent regression analysis will offer two more contributions to the strand of market-timing literature.

First, while our previous study was able to assert that a high MB ratio of a firm is associated with an increase in net equity issues, it failed to provide any reliable results for share repurchases. Regarding the market-timing of Baker and Wurgler (2002), share repurchases will be mainly conducted when the value of a firm is relatively low. Applying $R/A$ as our dependent variable, we will be able to detect direct determinants of share repurchase.

Second, while previous studies, such as the one of Baker and Wurgler (2002), always had to calculate their dependent variable, our direct measures of equity issues and share repurchase enable us to observe a direct connection between market-timing and equity changes of firms.
Figure 7.2
Total Value of Equity Issues and Share Repurchases

The following figure shows issuance proceeds of equity and share repurchases compared to the S&P 500 Index. Panel A shows the development of equity issues and the S&P 500 Index, while Panel B depicts the proceeds of share repurchases compared to the S&P 500 Index.

Panel A: Total Value of Equity Issues compared to S&P 500 Index

Panel B: Total Value of Share Repurchases compared to S&P 500 Index
The following findings can be drawn from Table 7.7, focusing on the sample results of the OLS regression. First, Panel A shows that an increase in the market-to-book ratio of firms is positively related to the issuance of seasoned equity. Hence, as predicted, Hypothesis 12 can be confirmed. This result is in line with the observation of Panel A in Figure 7.2. Panel B of Table 7.7, however, also shows that the value of a firm follows a positive trend on the action of share repurchase. This result stays in stark contrast to the notion of the market-timing theory. In essence, our results show that firms still commit share repurchase despite high market-to-book ratio. Consequently, Hypothesis 13 must be rejected. However, when comparing the impact of MB on both dependent variables, it is worth noting, that the effect of a high market-to-book value is essentially larger for equity issues than for share repurchases. The empirical finding is in line with the observation in Panel B of Figure 7.2 where a high S&P 500 index coincided with large share repurchase transaction volumes.

A study of Ginglinger and Hamon (2007), studying the timing ability of managers in share repurchase transactions in France, show that share repurchase activities largely reflect contrarian trading rather than managerial timing ability. In contrast, a study of Brockman and Chung (2001) find timing ability of managers when analyzing share repurchase activities in Hong Kong.

Second, while previous results have shown that tangibility is positively related to leverage (Table 7.2), it is expected that tangibility therefore is negatively related to equity issues. Indeed, the coefficient shows the expected sign, however the results lacks statistical significance. In contrast to equity issue, tangibility exhibits a statistical significant impact on share repurchases. In essence, the results show that firms tend to conduct more share repurchases the less tangible assets the firm holds.

Third, profitability exhibits an inverse relationship to equity issues, implying that profitable firms tend to restrain from equity issues. This finding is in line with our previous result in Chapter 7.2.1.2. In contrast, profitable firms tend to engage themselves more in share repurchases. Both results exhibit strong statistical power.

---

750 Both results exhibit strong statistical power at the 1 percent confidence level.
751 See Ginglinger and Hamon (2007), pp.915.
Finally, while it has been shown that firm size is positively related to leverage, the opposite can be detected for equity issues and share repurchases. Panel A and Panel B show that the bigger a firm becomes the less equity the firm tends to issue and the less share repurchase it tends to tackle.\textsuperscript{733} While both results are statistical significant at the 1 percent confidence level, firms size does have a stronger material effect on equity issues than on share repurchases.\textsuperscript{734}

\textsuperscript{733} The OLS regression analysis in Chapter 7.2.1.2 have also detected that large firms tend to issue less net equity issues. Thus, it has been proven that the bigger a firm the less equity it tends to issue.

\textsuperscript{734} An in-depth analysis on factors influencing the equity issue and share repurchase activity will be provided in Chapter 8.3.6.
Table 7.7
Market-Timing of Equity and Share Repurchase

OLS regressions of equity issue and share repurchase on the market-to-book ratio, fixed assets, profitability, firm size.

\[
\frac{E_i}{A_i} = \frac{R_i}{A_i} = a + b \left( \frac{M_i}{B_i} \right)_{t-1} + c \left( \frac{PPE_i}{A_i} \right)_{t-1} + \left( \frac{EBITDA_i}{A_i} \right)_{t-1} + e \log (S_{i-1}) + \epsilon_i
\]

EA is defined as equity issuance divided by total assets and R/A is share repurchase over total assets. The M/B ratio is total assets minus book equity plus market equity divided by total assets. Firm-year observations with an excessive market-to-book (larger than ten) are excluded. Fixed assets intensity (PPE/A) is defined as net property, plant, and equipment over total assets. Profitability (EBITDA/A) equals operating income before depreciation divided by total assets. Firm size is defined as the natural log of net sales. The impact of the four explanatory variables is shown in Panel A. Panel B represents results for share repurchase. Robust t-statistics are also presented.

<table>
<thead>
<tr>
<th>Industry</th>
<th>N</th>
<th>M/B-1 %</th>
<th>PPE/At-1 %</th>
<th>EBITDA/At-1 %</th>
<th>log(S)-1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>b</td>
<td>t(b)</td>
<td>e</td>
<td>t(c)</td>
</tr>
<tr>
<td>Panel A: Equity Issue</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sample</td>
<td>734</td>
<td>0.1231</td>
<td>5.27</td>
<td>0.1544</td>
<td>-0.55</td>
</tr>
<tr>
<td>Industry</td>
<td>72</td>
<td>-0.0153</td>
<td>-0.42</td>
<td>0.1706</td>
<td>1.19</td>
</tr>
<tr>
<td>Health Care</td>
<td>78</td>
<td>0.2570</td>
<td>3.78</td>
<td>0.4345</td>
<td>-0.42</td>
</tr>
<tr>
<td>Consumer Disc</td>
<td>136</td>
<td>0.1132</td>
<td>0.66</td>
<td>-0.7922</td>
<td>-0.64</td>
</tr>
<tr>
<td>Consumer Staples</td>
<td>50</td>
<td>0.0334</td>
<td>11.62</td>
<td>0.1266</td>
<td>0.75</td>
</tr>
<tr>
<td>Information Tech</td>
<td>167</td>
<td>0.1313</td>
<td>3.62</td>
<td>2.5580</td>
<td>1.86</td>
</tr>
<tr>
<td>Utilities</td>
<td>81</td>
<td>0.1356</td>
<td>3.49</td>
<td>-0.0056</td>
<td>-0.11</td>
</tr>
<tr>
<td>Materials</td>
<td>40</td>
<td>0.0041</td>
<td>0.14</td>
<td>0.0405</td>
<td>0.24</td>
</tr>
<tr>
<td>Energy</td>
<td>101</td>
<td>0.0603</td>
<td>2.29</td>
<td>-0.2149</td>
<td>-1.35</td>
</tr>
<tr>
<td>Panel B: Share Repurchase</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sample</td>
<td>1155</td>
<td>0.0129</td>
<td>4.03</td>
<td>0.1570</td>
<td>-0.31</td>
</tr>
<tr>
<td>Industry</td>
<td>183</td>
<td>0.0202</td>
<td>2.03</td>
<td>-0.0276</td>
<td>-1.08</td>
</tr>
<tr>
<td>Health Care</td>
<td>149</td>
<td>0.0078</td>
<td>0.81</td>
<td>0.2872</td>
<td>-2.28</td>
</tr>
<tr>
<td>Consumer Disc</td>
<td>238</td>
<td>0.0576</td>
<td>4.38</td>
<td>-0.0119</td>
<td>-0.18</td>
</tr>
<tr>
<td>Consumer Staples</td>
<td>136</td>
<td>0.0427</td>
<td>1.61</td>
<td>-0.4658</td>
<td>-3.35</td>
</tr>
<tr>
<td>Information Tech</td>
<td>260</td>
<td>0.0022</td>
<td>0.44</td>
<td>-0.4617</td>
<td>-4.03</td>
</tr>
<tr>
<td>Utilities</td>
<td>40</td>
<td>0.0249</td>
<td>1.98</td>
<td>0.0470</td>
<td>1.22</td>
</tr>
<tr>
<td>Materials</td>
<td>77</td>
<td>0.0096</td>
<td>0.54</td>
<td>-0.0646</td>
<td>-0.60</td>
</tr>
<tr>
<td>Energy</td>
<td>62</td>
<td>0.0307</td>
<td>2.15</td>
<td>-0.0469</td>
<td>-1.19</td>
</tr>
</tbody>
</table>
Next, we will analyze the results of the different business segments. Before delving into the single explanatory variables, it is noteworthy to mention, that many cross-sectional differences in the impact of the factors on the dependent variables cannot be found. Basically, the industries exhibit a relatively consistent picture. Referring to the value effect, in all industries, except in the industrial sector, the market-to-book ratio is positively related to equity issues. These results are statistically significant for the health care, consumer staples, information technology, utilities, and energy sector, all being significant at the 1 percent level. The same financing pattern can be detected for share repurchases. Here, the MB ratio is positively related to all single business segments.\textsuperscript{755}

Tangibility seems to exert a negative impact on share repurchases in all industries, while rather mixed results can be found for equity issues. However, only significant results can be found in the information technology, where PPE leads to an increase in equity issue. This result is also materially significant. Concerning share repurchases, the results are statistically significant for the health care, consumer staples, and information technology industry.

Profitability is mainly negatively related to equity issues in most of the industries. Only in the consumer discretionary, materials, and energy sector can the opposite be discovered.\textsuperscript{756} In contrast, in all industries, except the utilities, profitable firms tend to conduct more share repurchases.

Finally, firm size is inversely related to equity issues in every single business industry. This result indeed confirms the assumption that the bigger a firm the less equity it tends to issue. These results are strong statistical significant at the 1 percent level for all industries, except for the health care business. Statistically significant results in Panel B show that firm size exhibits also a negative impact on share repurchase.

To sum up, the results of the alternative equity measures are straightforward. First, a high market-to-book ratio is associated with an increase in equity issues. This

\textsuperscript{755} Statistically significances accrue only to firms in the industrial, consumer discretionary, consumer staples, and energy sector.

\textsuperscript{756} Statistical power is achieved for the consumer staples, information technology, and materials sector.
market behavior implies market-timing. Second, a high market-to-book ratio is associated with an increase in share repurchases. This financing pattern is not in line with the notion of the market-timing theory.

7.5 Conclusion

The main goal of Chapter 7 is to provide an answer to the first research question under study: Do managers time the market when engaging in equity financing? In order to validate the research question 13 hypotheses have been developed that have been tested by conducting several OLS regressions. Basically, the following results can be summarized:

1. Firms characterized by a high market-to-book ratio are associated with a decrease in leverage, compared to those with a low market-to-book ratio. While the finding does not provide any hints on how the decrease in leverage is achieved, it prudently shows that overvalued firms do engage in certain capital structure decisions to diminish the amount of leverage they employ.

2. The phenomenon that overvalued firms attempt to decrease their leverage is consistent across the various business industries. These results show that market-timing behavior fails to be a firm-specific occurrence.

3. The decrease in leverage due to higher market-to-book ratio is mainly achieved by means of net equity issues. In specific, we have shown that firms with a high market-to-book ratio tend to have larger net equity issues, compared to those with a low market-to-book ratio. Further, it has been shown that overvalued firms tend to retain fewer earnings as they invest more.

4. The calendar-time regression analysis has proven that market-timing behavior is consistent throughout different time periods. In specific it has been shown that throughout the various time periods a high market-to-book ra-
5. Our results lack evidence that market-timing has a persistent effect in the leverage decision of firms. In contrast to the results of Baker and Wargler (2002), our results fail to show a persistent market-timing effect on leverage.

6. Firms that are overvalued tend to issue more seasoned equities compared to those that are undervalued. In specific, it has been shown that firms with a high market-to-book ratio tend to issue more equity. However, our results also show that firms still engage in share repurchase activities despite the fact that they are overvalued. In contrast to the notion of the market-timing hypothesis firms conduct share repurchases when their market-to-book ratio is high.

7. The last findings do not directly provide answers to our research question and therefore only deserve limited attention. Basically, it has been shown that asset tangibility and size are positively related to the amount of leverage a firm holds. Profitable firms tend to have lower leverage compared to non-profitable firms.\textsuperscript{757}

Based on the findings mentioned above, two implications can be drawn for our research question under study. First, a short-term market-timing behavior can be confirmed. In specific, firms do engage in market-timing behavior when issuing equity. In specific, firms do issue equity when firm value is considered to be overvalued. However, firms do not engage in market-timing behavior when tackling share repurchase activities. Firms do repurchase their shares despite the fact that they are overvalued. Second, a persistent market-timing behavior could not be found. Based on the rationale mentioned above it must be concluded that managers per se do not always time the market when engaging in capital structure decisions.

\textsuperscript{757} Chapter 8 provides a detailed analysis on the capital structure determinants of leverage.
Additionally, a long-term market-timing effect does not exist, implying that firms follow a target debt level and attempt to adjust their capital structure when temporarily deviating from it. This temporarily deviation occurs due to the fact that firms engage in short-term market-timing behavior. A summary of the hypotheses is shown in Table 7.8.

<table>
<thead>
<tr>
<th>Hypotheses</th>
<th>Statistics</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1  Firms with a high market-to-book ratio are associated with a decrease in leverage, compared to those with a low market-to-book ratio.</td>
<td>Significant Results</td>
<td>↑</td>
</tr>
<tr>
<td>H2  Asset tangibility has a positive impact on leverage.</td>
<td>Significant Results</td>
<td>↑</td>
</tr>
<tr>
<td>H3  Profitable firms tend to have more leverage compared to non-profitable firms.</td>
<td>Significant Results</td>
<td>↓</td>
</tr>
<tr>
<td>H4  The bigger a firm, the more leverage it tends to employ compared to smaller firms.</td>
<td>Significant Results</td>
<td>↑</td>
</tr>
<tr>
<td>H5  Market-timing behavior fails to be consistent across various business industries.</td>
<td>Significant Results</td>
<td>↓</td>
</tr>
<tr>
<td>H6  Firms with a high market-to-book ratio tend to have larger net equity issues.</td>
<td>Significant Results</td>
<td>↑</td>
</tr>
<tr>
<td>H7  Firms with a high market-to-book ratio tend to retain fewer earnings as they invest more.</td>
<td>Significant Results</td>
<td>↑</td>
</tr>
<tr>
<td>H8  Firms with a high market-to-book ratio tend to have larger asset growth compared to firms with lower market-to-book ratio.</td>
<td>Significant Results</td>
<td>↑</td>
</tr>
<tr>
<td>H9  The effect that a high market-to-book ratio leads to a decrease in leverage is consistent over time</td>
<td>Significant Results</td>
<td>↑</td>
</tr>
<tr>
<td>H10 The effect that an increase in the market-to-book ratio leads to a rise in net equity issues is consistent over time</td>
<td>Significant Results</td>
<td>↑</td>
</tr>
<tr>
<td>H11 The market-timing behavior of firms has a long lasting effect on leverage.</td>
<td>Significant Results</td>
<td>↓</td>
</tr>
<tr>
<td>H12 Firms with a high market-to-book ratio tend to issue more seasoned equity offerings.</td>
<td>Significant Results</td>
<td>↑</td>
</tr>
<tr>
<td>H13 Firms with a high market-to-book ratio tend to engage in less share repurchase activities.</td>
<td>Significant Results</td>
<td>↓</td>
</tr>
</tbody>
</table>
Determinants of Capital Structure

Despite a vast number of research studies over the determinants of a firm’s capital structure, a lack of consensus which factors are reliably important is omnipresent. However, most of the studies do have one important issue in common – their limited set of variables. Referring to studies such as Titman and Wessels (1988), Harris and Raviv (1991) and Rajan and Zingales (1995), it is striking that these studies apply a similar set of independent variables.\textsuperscript{78} It has been shown that leverage actually increases with firm size, fixed assets and growth opportunities, and decreases with profitability, bankruptcy probability and R&D expenditures.\textsuperscript{79}

Our study tries to fill the gap between the different empirical studies by tackling the following steps. First, a convolute of debt factors are tested and analyzed whether or not they exhibit a reliable and significant impact on the leverage decision of firms.\textsuperscript{80} The goal of Chapter 8 is to provide an answer to the following key research question:

\textit{Which debt factors determine the capital structure of firms?}

Second, referring to the quote of Myers (2002), it will be examined how the debt factors differ among every industry. \textit{“There is no universal theory of capital structure, and no reason to expect one. There are useful conditional theories, however. Each factor could be dominant}\textsuperscript{81}

\begin{flushleft}\textsuperscript{78} Also refer to recent studies of Kayhan and Titman (2007), Deloore (2007), Fan et al. (2008), Elliot et al. (2008), De Jong et al. (2008), Antoniou et al. (2008b) and Spranger and Sautner (2009).

\textsuperscript{79} A recent study of Smith (2010) analyzes the determinants of leverage for tax-exempt organizations. He finds, that debt is positively related to asset tangibility, growth, and size, and inversely related to age, liquidity, and profitability.

\textsuperscript{80} A recent study of Frank and Goyal (2009) has been the first to examine the relative importance of a large set of factors that might influence the leverage decisions of firms. They actually find that market-to-book, profits and dividends do have a positive impact on leverage, whereas expected inflation, asset tangibility as well as collateral all lead to an increase in the use of leverage.\end{flushleft}
for some firms or in some circumstances, yet unimportant elsewhere. Hence, our study tries to examine the following sub-research question: Are certain debt factors dominant in some industries, yet unimportant elsewhere?

Third, our study controls for the eventuality that the importance of certain debt factors diminishes over time. Here, our study attempts to scrutinize the following sub-research question: Are certain debt factors only temporarily important in the leverage decision or do they exhibit a consistent impact over time?

Fourth, direct measures of debt financing are incorporated in the OLS regression. Thus, the study attempts to offer an answer to the following sub-research question: Which debt factors determine the bond and/or loan decision of firms?

Fifth, while the previous research questions focus on debt factors per se, it is of utmost importance to study the effects of certain determinants of the equity issue and share repurchase decision of firms. Thus, the subsequent sub-research question is derived: Which factors influence the equity issue and share repurchase decision of firms?

The outline of this chapter is as follows: While Chapter 8.1 deals with the development of the hypotheses, Chapter 8.2 applies a factor selection model in order to detect the most relevant debt factors that will be included in our empirical study. Chapter 8.3 offers empirical results. In specific, this chapter offers sample-, cross-sectional- and calendar-time results. Furthermore, results on alternative leverage measures will be also provided. Specifically, the chosen debt factors will be regressed against direct measures of leverage, such as bonds and loans. In a similar vein, the chapter additionally attempts to find out which factors influence the equity issue and share repurchase decision of firms. Finally, Chapter 8.4 summarizes the main findings of the empirical study and provides an overview of the outcome of the tested hypotheses.

8.1 Development of Hypotheses

In order to obtain a clear picture of which factors do have a significant impact on the leverage decisions of firms a vast number of potential variables have been included in our study. Table 8.1 provides an overview of all the variables that are considered to have a possible effect on leverage.

Table 8.1
Overview of Explanatory Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>TA</td>
<td>Natural log of total assets</td>
<td>Real</td>
</tr>
<tr>
<td>REV</td>
<td>Natural log of net revenues</td>
<td>Real</td>
</tr>
<tr>
<td>AGE</td>
<td>Natural log of years since foundation</td>
<td>Real</td>
</tr>
<tr>
<td>MB</td>
<td>Market-to-book ratio</td>
<td>Percent</td>
</tr>
<tr>
<td>PRICE_SALES</td>
<td>Price-to-sales ratio</td>
<td>Percent</td>
</tr>
<tr>
<td>PRICE_BOOK</td>
<td>Price-to-book ratio</td>
<td>Percent</td>
</tr>
<tr>
<td>RND</td>
<td>Research and development costs divided by sales</td>
<td>Percent</td>
</tr>
<tr>
<td>SGA</td>
<td>Selling, general and administrative expenses divided by sales</td>
<td>Percent</td>
</tr>
<tr>
<td>COLLTRL</td>
<td>Collateral Assets divided by assets</td>
<td>Percent</td>
</tr>
<tr>
<td>PPE</td>
<td>Property, plant and equipment divided by total assets</td>
<td>Percent</td>
</tr>
<tr>
<td>INV</td>
<td>Inventory divided by total assets</td>
<td>Percent</td>
</tr>
<tr>
<td>AR</td>
<td>Accounts receivables divided by total assets</td>
<td>Percent</td>
</tr>
<tr>
<td>INTANG</td>
<td>Intangible assets divided by total assets</td>
<td>Percent</td>
</tr>
<tr>
<td>CASH</td>
<td>Cash flow divided by total assets</td>
<td>Percent</td>
</tr>
<tr>
<td>WC</td>
<td>Working capital divided by total assets</td>
<td>Percent</td>
</tr>
<tr>
<td>PROF</td>
<td>EBITDA divided by total assets</td>
<td>Percent</td>
</tr>
<tr>
<td>G_TA</td>
<td>Annual growth rate of total assets</td>
<td>Percent</td>
</tr>
<tr>
<td>G_REV</td>
<td>Annual growth rate of net revenues</td>
<td>Percent</td>
</tr>
<tr>
<td>CAPEX</td>
<td>Capital expenditures divided by total assets</td>
<td>Percent</td>
</tr>
<tr>
<td>OPEX</td>
<td>Operating expenditure divided by total assets</td>
<td>Percent</td>
</tr>
</tbody>
</table>
Table 8.1, continued
Overview of Explanatory Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>INDUST_LEV</td>
<td>Median industry leverage</td>
<td>Percent</td>
</tr>
<tr>
<td>INDUST_G</td>
<td>Median industry growth</td>
<td>Percent</td>
</tr>
<tr>
<td>RISK</td>
<td>Standard deviation of growth rate of operating profit calculated over all periods</td>
<td>Real</td>
</tr>
<tr>
<td>TAX</td>
<td>Top tax rate</td>
<td>Percent</td>
</tr>
<tr>
<td>NTDS</td>
<td>Depreciation and amortization divided by total assets</td>
<td>Percent</td>
</tr>
<tr>
<td>DIV</td>
<td>Dividend paying dummy</td>
<td>Dummy</td>
</tr>
<tr>
<td>LOSS</td>
<td>Loss making dummy</td>
<td>Dummy</td>
</tr>
<tr>
<td>RATING</td>
<td>Investment grade rating dummy</td>
<td>Dummy</td>
</tr>
<tr>
<td>Z-Score</td>
<td>Bankruptcy possibility</td>
<td>Real</td>
</tr>
<tr>
<td>INFLATION</td>
<td>Historical Inflation Rate</td>
<td>Percent</td>
</tr>
<tr>
<td>GDP</td>
<td>Growth in GDP</td>
<td>Percent</td>
</tr>
<tr>
<td>NBER</td>
<td>NBER recession dummy</td>
<td>Dummy</td>
</tr>
<tr>
<td>TBILL</td>
<td>Discount Rate</td>
<td>Percent</td>
</tr>
</tbody>
</table>

Chapter 8.1 develops the hypotheses that need to be tested, based on a brief explanation of the independent variables under study. The hypotheses are created in order to provide an answer to the main research question in this chapter: Which debt factors determine the capital structure of firms?

8.1.1 Size

While in most studies only the natural logarithm of total assets is used to capture the size effect, our study determines the size of a firm through the natural logarithm of assets, the natural logarithm of revenues and the age of a firm. While the maturity of the firm has been neglected in most capital structure studies, we believe
that especially the age of a company might have a direct impact on the debt decision of firms.\textsuperscript{762}

Generally, the impact of the size effect on leverage basically depends on which capital structure theory to look at. According to the trade-off theory, a positive relationship between the size of a firm and leverage can be expected. It is argued that the bigger a firm becomes, the less it will face bankruptcy risk. In other words, these companies are too big to fail. Furthermore, the larger a firm the less volatile the cash flows of the company will be due to diversification effects that mostly materialize the bigger a company is.\textsuperscript{763} This lower cash volatility might lead to the fact that firms are able to benefit from the full tax savings effect. Hence, a decrease in the bankruptcy risk and a rise in the probability of tax shield lead to the fact that size is positively related to leverage.\textsuperscript{764}

However, according to the pecking-order theory the situation changes drastically. As large companies are exposed to more monitoring through the capital market and asymmetric information will be lowered due to extensive exposure duties, the pecking-order theory predicts a negative relationship.\textsuperscript{765}

Table 8.2 provides an overview of the eminent line of research dealing with the impact of size on the debt decision of firms. Apparently, the majority of the empirical studies have found a positive relationship between firm size and leverage. Hence, the trade-off theory seems to account for the size effect. According to the empirical results in Table 8.2 we also expect a positive relationship between firm size and the amount of debt a firm employs.

\textsuperscript{762} Empirical studies applying solely the natural logarithm of assets when controlling for the size effect include for instance Baker and Wurgler (2002), Frank and Goyal (2003), Dittmar (2004), Delcoure (2007), Antoniou et al. (2008b), Beek et al. (2008) and Sautner and Sprunger (2009).

\textsuperscript{763} Titman and Wessels (1988) show that bigger companies in general are more diversified compared to smaller firms and hence less prone to bankruptcy. See Titman and Wessels (1988), p.6.

\textsuperscript{764} Diamond (1991) empirically proves that bigger firms face a competitive advantage over smaller firms when engaging in debt financing. This is mainly due to well established reputation and better creditworthiness of big companies. See Diamond (1991), pp.709.

Table 8.2
Research Overview - Leverage and Firm Size

<table>
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<tr>
<th>Author</th>
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<th>Geographical Focus</th>
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In line with the above rationale the following is hypothesized:

**Hypothesis 1 (\(= \beta(\xi_1)\)):** The size effect is positively related to the amount of leverage a firm employs.

Based on the notion that bigger firms are associated with more debt financing, the subsequent sub-hypotheses are derived:

**Hypothesis 1.1 (\(= \beta(\xi_{11})\)):** The amount of total assets a company possesses is positively related to the amount of leverage a firm holds.

**Hypothesis 1.2 (\(= \beta(\xi_{12})\)):** The amount of net revenues is positively related to the amount of leverage a firm holds.

While the two sub-hypotheses support the notion of the trade-off theory, we believe that the variable \(AGE\) will rather pursue the idea of the pecking-order theory, i.e. an inverse relationship between maturity and leverage exists. For instance, young firms are often characterized by a lack of internal funds to meet investment needs and by limited access to equity financing.\(^{76}\) Consequently, young firms are forced to rely on debt financing in order to fund investment needs.\(^{77}\) These in turn increases the bankruptcy likelihood, implying a negative relation between young firms and leverage.\(^{78}\)

Combining the above insights from the effect of maturity on leverage, the following sub-hypothesis is derived:

\(^{76}\) See Beck et al. (2008) for the issue that young firms often fail to have sufficient internal funds to finance investments.  

Dealing with the issue of limited access to equity capital for young firms, see Diamond (1991), Berger and Udell (1998) and Beck and Demirguc-Kunt (2006). 

\(^{77}\) Berger and Udell (1998) as well as Gordon and Lee (2001) empirically prove, that young firms abide more on debt financing. 

\(^{78}\) For an in-depth analysis of the interdependency between the maturity of a firm and their operational bankruptcy risk, see Darnoldarz (2002), pp.642-653.
Hypothesis 1.3 ($= \beta = \xi_{13}$): The older a firm the less leverage it tends to employ compared to younger firms.

While the trade-off theory predicts a positive relationship between the three independent variables and leverage, the pecking-order theory expects an inverse relationship.\footnote{In Chapter 10, all explanatory variables in this study will be tested according to the different capital structure theories in order to find out which theory survives in practice.}

8.1.2 Value

As has been shown in Chapter 7, firm valuation does have an impact on the leverage decision of firms. However, besides the current market-to-book ratio, the price-to-sales as well as the price-to-book ratio will be included in order to seize the value effect on leverage. In essence, it will be expected that the value of a company will have a negative influence on the amount of leverage a firm employs. According the notion of the market-timing theory it is expected that valuation will exert a negative impact on leverage. The same negative trend is predicted in light of the trade-off theory. The results in Table 8.3 show that most of the empirical studies have detected a negative relationship between market-to-book ratio and leverage.

Based on the rationale and findings mentioned above the following hypotheses have been derived:

Hypothesis 2 ($= \beta(\xi_2)$): The value effect is negatively related to the amount of leverage a firm employs.

Hypothesis 2.1 ($= \beta(\xi_{21})$): The market-to-book ratio is associated with a decrease in leverage.
Hypothesis 2.2 ($\beta(\xi_{22})$): The price-to-sales ratio is associated with a decrease in leverage.

Hypothesis 2.3 ($\beta(\xi_{23})$): The price-to-book ratio is associated with a decrease in leverage.

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<th>Table 8.3</th>
<th>Research Overview - Leverage and Market-to-Book Ratio</th>
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<td>Titman and Wessels</td>
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8.1.3 Nature of Assets

It is believed that the nature of assets does have a significant impact on the leverage decision. In order to test a possible dependency between leverage and the nature of assets, three variables will be used in the study.

First, Research and Development (R&D) expenses are considered to have a positive impact on leverage according to the pecking-order theory. This is mainly due to the fact that R&D expenditures can be better gauged by firm insiders and therefore are especially prone to adverse selection problems.

However, referring to the trade-off theory, outsiders encounter difficulties in doing a fair valuation of the expenditures. Hence, large R&D expenditures are considered to be lower than actually incurred, increasing the possibility of financial distress. Thus, a negative relationship between R&D expenditure and leverage might be observed. Statistical significant results regarding the impact of R&D expenses on the debt decision of firms are not omnipresent in the academic literature. Dealing with the weakness of other empirical studies, our study tries to fill the gap in order to detect a possible relationship.

Second, the impact of Selling, General and Administrative (SGA) expenses on the leverage decision of firms will be examined. In a similar vein to the prediction of R&D expenses, SGA expenses are also expected to exhibit a positive impact on leverage according to the pecking-order theory and a negative relationship on leverage regarding the trade-off theory.

Third, it is believed that collateral assets exhibit a positive impact on leverage. If companies possess a large amount of collaterals, debt financing is cheaper, implying that firms will make use of more leverage.\textsuperscript{770} However, referring to the pecking-order theory, firms with large amounts of collateral assets are less prone to asymmetric information problems and therefore less likely to issue debt. This rational implies a negative relationship between collateral assets and the amount of leverage a firm employs.

\textsuperscript{770} This prediction is in line with the notion of the trade-off theory.
Based on the rationale mentioned above, the subsequent three hypotheses have been developed:

**Hypothesis 3.1** ($= \beta(\xi_{31})$): Research and Development expenses are positively related to the amount of leverage a firm employs.

**Hypothesis 3.2** ($= \beta(\xi_{32})$): Selling, general and administrative expenses are positively related to the amount of leverage a firm employs.

**Hypothesis 3.3** ($= \beta(\xi_{33})$): Collateral assets are positively related to the amount of leverage a firm employs.

8.1.4 Tangibility

Property, plant and equipment (PPE) over total assets is the most common variable in order to capture tangibility effects on leverage. Table 8.4 shows the various academic studies dealing with the impact of tangibility of assets on leverage. In essence, the majority of these studies have always applied PPE as the single variable to control for the tangibility effect.

Our study however tries to overcome the weakness of the other studies by including three additional independent variables that contribute to the tangibility effect. Specifically, the impact of inventory, accounts receivables as well as intangible assets on the leverage decision of firms will be tested in our OLS regression. Referring to the research overview in Table 8.4, the impact of asset tangibility on leverage is straightforward. Hence, we will also expect a positive relationship between tangibility and leverage.
This notion is also in line with the essence of the trade-off theory, since tangible assets often serve as collateral for debt financing, hence decreasing costs of financial distress and raising the debt capacity of firms. This is also consistent with the pecking-order theory, in which the collateral is used in order to diminish the relevance of asymmetric information, thereby making the preference order less stringent.\textsuperscript{771}

Following the above rationale based on asset tangibility and leverage the following hypotheses are derived:

Hypothesis 4 \( ( = \beta(\xi_4) ) \): Tangible assets are positively related to the amount of leverage a firm holds.

Hypothesis 4.1 \( ( = \beta(\xi_{4,1}) ) \): Property, plant and equipment is positively related to the amount of leverage a firm holds.

Hypothesis 4.2 \( ( = \beta(\xi_{2,4}) ) \): Inventory is positively related to the amount of leverage a firm holds.

Hypothesis 4.3 \( ( = \beta(\xi_{4,3}) ) \): Accounts receivables are positively related to the amount of leverage a firm holds.

Hypothesis 4.4 \( ( = \beta(\xi_{4,4}) ) \): Intangible assets are inversely related to the amount of leverage a firm holds.

### Table 8.4
Research Overview - Leverage and Asset Tangibility

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### 8.1.5 Liquidity

The liquidity of a firm is measured in terms of cash available as well as working capital. According to Jensen’s free cash flow hypothesis, managers tend to engage more frequently in wasteful investments if large amounts of cash flows are available.\footnote{For a detailed analysis on this issue, see Chapter 2.3.1.1 in this dissertation.} Debt issuance might mitigate these wasteful actions by binding managers to
spend available money in interest payments. Hence, a positive relationship between liquidity and leverage is anticipated.

This positive relationship is mirrored in the notion of the trade-off theory. In contrast, the pecking-order theory predicts a negative relationship between cash holdings and the amount of leverage a firm employs. This rationale is accounted by the fact that large cash holdings are associated with large internal funds, making external financing less relevant to the firm.

Table 8.5 shows only a limited number of available academic studies that deal with the impact of liquidity on the debt decision of firms. The results are rather mixed. While Myers and Rajan (1998) and Morellec (2001) find a negative relationship between liquidity and leverage, other academics find a positive impact of liquidity on leverage. However, it must be noted, that in most of the studies dealing with liquidity, the variables cash and working capital are not applied in their analysis. Hence, our study contributes to the academic research on the determinants of capital structure by explicitly dealing with the impact of cash and working capital in the leverage decision of firms.

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773 In their seminal paper, Grossman and Hart (1982) already recognized the bonding role of debt when dealing with the free cash flow problem. However, Jensen (1986) popularized this idea and provided anecdotal evidence that leverage mitigates this type of agency conflict. See Jensen (1986), p. 324-329.

774 While our study focuses on the liquidity of assets, a recent empirical study by Lipson and Mortal (2009) analyze the relation between capital structure and equity market liquidity. In essence, the authors found out that firms characterized by more liquid equity are associated with lower leverage. For more in-depth information on that issue, see Lipson and Mortal (2009), pp.611.

775 The studies in Table 8.5 try to analyze the effect of asset liquidity on leverage. They define liquid assets as those that can be easily turned into money. These studies fail to include cash and working capital as important liquidity measures.
Table 8.5
Research Overview - Leverage and Liquidity

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</table>

Three hypotheses have been developed dealing with the liquidity effect on the debt decision of firms:

**Hypothesis 5** ($\beta(\xi_3)$): Liquidity leads to an increase in leverage.

**Hypothesis 5.1** ($\beta(\xi_{5.1})$): The more cash a firm holds the more leverage it tends to employ.

**Hypothesis 5.2** ($\beta(\xi_{5.2})$): Working Capital is negatively related to the amount of leverage a firm holds.

8.1.6 Profitability

Generally, profitable firms are associated as being less indebted compared to unprofitable companies. Our analysis in Chapter 7 has already shown that a negative relationship between profitability and leverage exists.\(^{776}\)

\(^{776}\) See Table 7.2 in Chapter 7.2.1 of this dissertation.
According to the trade-off theory, one would expect that higher profitability leads to an increase in leverage. This positive relationship can be accounted by the fact that profitable firms incur lower expected costs of financial distress, i.e. making debt financing less costly.

However, the more profitable a firm is the more cash it will carry, thus debt should be more valuable due to its disciplinary effect on managers’ actions. Since the pecking-order theory suggests that internal capital should be employed first, higher cash flows ceteris paribus reduce the necessity to issue debt.777 Hence, according to the pecking-order theory, a negative relationship between profitability and leverage is predicted.

A convolute of academic studies have emerged all covering the impact of profitability on the debt decision of firms. Table 8.6 perfectly shows that a broad consensus between the different academics exists on the negative impact of profitability on leverage.

Based on the analysis in Chapter 7.2.1 and the research overview in Table 8.6 our next hypothesis is as follows:

**Hypothesis 6 ( = \( \beta(\xi) \))**: Profitable firms tend to have less leverage compared to non-profitable companies.

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<th>Author</th>
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<td>USA, Japan</td>
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8.1.7 Growth

Four variables have been included in order to capture the growth effect in the leverage decision of firms. In essence, it is expected that growth and leverage exhibit a positive relationship. Growth in assets as well as revenues is associated with an increase in leverage, according to the trade-off theory. The more a company grows, the bigger it becomes and hence the lower the likelihood of default. Hence, the costs of debt financing will be reduced.

Referring to the pecking-order theory, an increase in capital expenditure diminishes income and consequently, firms have to make use of more external finance, i.e. debt financing. The same applies to operating expenditures. Both expenditures need to be paid for and they directly enter the financing deficit as explained by Shyam-Sunder and Myers (1999).  

Hence, a positive relationship can be expected.

However, the prediction of the pecking-order theory and the trade-off theory in particular diverge with the empirical results of academics. Table 8.7 shows that the majority of academic studies have found an inverse relationship between growth opportunities and leverage. However, the empirical results of Titman and Wessels (1988), Lang et al. (1996) and Chen (2004) have detected a positive effect.

Most of the studies in Table 8.7 share one common weakness. They only include one variable to control for the growth effect and based on this single independent variable, form beliefs and claims about the impact of growth on leverage. In order to deviate from this weakness, our study has included four explanatory variables, that all specify the growth opportunities of firms.

Based on the majority of empirical findings in Table 8.7, the following hypotheses have been developed:

Hypothesis 7 ($= \beta(\xi_T)$): Firms facing growth opportunities tend to have lower levels of leverage compared to firms with low growth potentials.

---

* See Shyam-Sunder and Myers (1999), pp.219.
Hypothesis 7.1 ($\beta(\xi_{7,1})$): The annual growth rate of total assets is negatively related to the amount of leverage.

Hypothesis 7.2 ($\beta(\xi_{7,2})$): The annual growth rate of net revenues is negatively related to the amount of leverage.

Hypothesis 7.3 ($\beta(\xi_{7,3})$): Capital expenditure is negatively related to the amount of leverage.

Hypothesis 7.4 ($\beta(\xi_{7,4})$): Operating expenditure is negatively related to the amount of leverage.

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<th>Author</th>
<th>Year</th>
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<td>Long and Malitz</td>
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8.1.8 Industry

Whether or not peer groups might have an influence on the leverage decision of firms is questionable. Undoubtedly, firms within the same industry are often exposed to similar micro- as well as macro conditions. Competition within these industries might prompt companies to mimic the capital structure of its competitors. Since regulated companies are expected to have stable cash flows and to face lower expected financial distress costs and thus have more leverage, peer groups might follow to do the same. Hence, a positive relationship between the industry median leverage and debt financing is likely to occur.

Empirical findings have proven that firms competing in industries in which the median firm has high leverage tend to employ larger amounts of debt financing (Table 8.8).

In these studies the median industry leverage has been applied as a single factor controlling for the industry effect. Our study includes an additional variable, dealing with the growth rate of the industry in general. It is expected that the median industry growth rate has a significant impact on leverage.

<table>
<thead>
<tr>
<th>Table 8.8</th>
<th>Research Overview - Leverage and Median Industry Leverage</th>
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<table>
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</table>
Based on the rationale mentioned above, the following hypotheses are derived:

**Hypothesis 8.1 (\( \beta(\xi_{8.1}) \))**: Firms that compete in industries in which the median firm has high leverage tend to have high leverage.

**Hypothesis 8.2 (\( \beta(\xi_{8.2}) \))**: Firms that compete in industries in which the median firm faces high growth potentials tend to have high leverage.

### 8.1.9 Risk

In our sense, business risk is defined as the standard deviation of growth rate of operating profit. It is assumed that higher risk indicates higher volatility of earnings which in turn leads to higher probability of default. The trade-off theory in particular predicts a negative relationship between business risk and leverage.

Table 8.9 provides an overview of some empirical studies dealing with the risk effect on leverage. The results show that the increased volatility of earnings due to business risk is associated with a decrease in leverage.

Based on the empirical findings, the following hypothesis has been developed:

**Hypothesis 9 (\( \beta(\xi_{9}) \))**: The standard deviation of growth rate of operating profit is associated with a decrease in leverage.
8.1.10 Tax

On the one hand, a higher tax rate enables larger benefits of the tax-shield, which makes debt financing more attractive to firms. Hence, according to the trade-off theory, it is anticipated that a higher marginal tax rate leads to larger amounts of leverage.\footnote{Refer to Chapter 2.1.4m dealing with the benefits of debt taxes.}

Not many empirical studies exist analyzing the tax effect on leverage. However, the three studies shown in Table 8.10 all come to the same conclusion. Basically, a higher tax rate is associated with an increase in leverage due to the tax shield benefit of debt.

Hence, the hypothesis will be as followed:

**Hypothesis 10.1 ($\beta(\xi_{10.1})$):** The tax rate exerts a positive relationship to the amount of leverage a firm employs.
Table 8.10

Research Overview - Leverage and Taxes

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<th>Author</th>
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On the other hand, non-debt tax shields stay in stark contrast to the tax benefits of leverage and consequently, a negative relationship can be expected.\(^{780}\) Consequently, the tax benefits of debt financing diminish as other non-debt tax shields, such as depreciation, increase.\(^{781}\)

The empirical findings in Table 8.11 are rather mixed and often do not convey significant results. While the trade-off theory predicts a negative relationship between non-debt tax shield and leverage, some empirical studies detect a positive effect, while others find a negative one.

We follow the notion of the trade-off theory and also claim that the non-debt tax shield is negatively related to the amount of leverage:

**Hypothesis 10.2 \( (\beta(\xi_{102}) )\):** Non-debt tax shield is negatively related to the amount of leverage a firm employs.

---

\(^{780}\) See DeAngelo and Masulis (1980), pp.4.

\(^{781}\) For further information on this issue, refer to Chapter 2.4.1.
### Table 8.11

**Research Overview - Leverage and Non-Debt Tax Shield**

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### 8.1.11 Financial Constraints

The impact of dividends on the capital structure of firms has been less commonly examined in empirical studies. The result of the payout policy of firms on the leverage decision of firms seems ambiguous (Table 8.12). According to the notion of the pecking-order theory, dividends increase the amount of debt financing. Since the amount of dividends is related to the profit a firm incurs, dividends are part of the financing deficit. In other words, dividend payments reduce the amount of internal capital and consequently, the need for external financing increases. Thus, a positive relationship between dividends and leverage can be expected.

However, according to the trade-off theory, dividend paying companies are associated with less debt financing, due to higher bankruptcy costs.\(^{782}\)

---

\(^{782}\) A detailed analysis of the various capital structure theories on the determinants of leverage will be provided in Chapter 9.
Hypothesis 11.1 ($= \beta(x_{111})$): Dividend paying firms tend to have larger amounts of leverage compared to non-payers.

Table 8.12
Research Overview - Leverage and Dividend

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According to the trade-off theory, the loss making dummy predicts a negative relationship to leverage. This accrues to higher expected costs of financial distress and no need for firms to shield profits from taxes. The combination of higher distress costs and a lack of tax shield benefits ultimately lead into a lower employment of leverage.

However, according to the notion of the pecking-order theory, companies will employ larger amounts of leverage when they incur losses. This trend can be accounted by the fact that losses lead to a decrease in retained earnings, which in turn diminishes potential internal capital. Consequently, firms tend to raise leverage in case internal capitals are not sufficient.

Hence, the following hypothesis has been derived:

Hypothesis 11.2 ($= \beta(x_{112})$): Loss making firms tend to have more leverage than non-loss making firms.
The third variable capturing the impact of financial constraints on the leverage decision revolves around the credit rating of firms. In essence, companies are obliged to reveal certain information in order to be rated by credit agencies.\textsuperscript{783} Thus, companies possessing an investment grade rating face lower problems with adverse selection. Consequently, according to the pecking-order theory, firms with an investment grade will make use of less debt and more equity financing.

However, referring to the trade-off theory, an investment grade is associated with lower bankruptcy costs and therefore debt financing might become more attractive than equity. Hence, a positive relationship between leverage and investment grade rating might be observed.\textsuperscript{784}

Based on the rationale mentioned above the next hypothesis is developed:

**Hypothesis 11.3 (\( \beta(s_{11.3}) \))**: Investment grade firms are associated to have more leverage than non-investment grade firms.

Altman’s z-score is applied in the study, capturing the bankruptcy possibility of firms. According to Altman (1968) the z-score combines five common business ratios, using a weighting system to determine the likelihood of a company going bankrupt. It has been calculated as follows:\textsuperscript{785}

\[
Z = 1.2T_1 + 1.4T_2 + 3.3T_3 + 0.6T_4 + 0.999T_5
\]

(8.1)

where \( T_1 \) estimates the liquid assets of a company in relation to its size.\textsuperscript{786} \( T_2 \) measures the profitability that mirrors a firm’s age and earning power.\textsuperscript{787} \( T_3 \) deter-

\textsuperscript{783} The most prominent credit rating agencies are for instance, Fitch Ratings, Moody’s Analytics and Standard & Poor’s.

\textsuperscript{784} Chapter 9.2 provides an in-depth analysis of the impact of credit rating on capital structure decision of firms.

\textsuperscript{785} See Altman (1968), p. 594.

\textsuperscript{786} \( T_1 = WC/Total \text{ Assets} \)

\textsuperscript{787} \( T_2 = \text{Retained Earnings}/\text{Total Assets} \)
mines the operating profitability of firms. T₄ adds market dimension, whereas T₅
determines the sales turnover of firms.

“Safe” companies, i.e. companies that have a low probability of bankruptcy,
have an Altman Z-Score greater than 3.0. In contrast, a score less than 1.8 implies
high bankruptcy risk for a company.

Hence, according to the trade-off theory, a high z-score is associated with more
debt financing, due to the lower financial distress costs. The hypothesis is stated as
follows:

Hypothesis 11.4 (\( \beta(\xi_{11.4}) \)): The higher the bankruptcy possibility, the lower the level of
leverage a firm employs.

8.1.12 Macroeconomic Factors

The last variables revolve around macroeconomic factors that might have an
influence on the capital structure decisions of firms. The first variable deals with the
development of inflation in the US, which has been often neglected in the study of
the determinants of the capital structure decision of firms. It is expected that
inflation is positively related to debt financing. According to the market-timing theo-
ry, if inflation is expected, managers will time the market by increasing their leverage
in order to pay off the debt in devalued dollars. Tax considerations in the trade-off
theory make debt more attractive due to apparent inflation.

---

788 T₄ = EBIT/Total Assets
789 T₅ = MV of Equity/BV of Total Liabilities; T₆ = Sales/Total Assets
791 A recent study by Frank and Goyal (2009) find that inflation does have a positive impact on the lever-
age decision of firms. Beck et al. (2008) also study the inflation effect on the capital structure of firms and
fail to find significant results.
Hypothesis 12.1 ($\beta(\xi_{121})$): Inflation is positively related to the amount of leverage a firm employs.

GDP growth is expected to exert a negative and positive impact on the leverage decision of firms. According to the pecking-order theory, GDP growth is associated with higher profits for firms, being able to make use of more internal capital instead of debt financing. However, the trade-off theory predicts that higher profits make debt financing due to larger tax shield benefits more attractive.

Hypothesis 12.2 ($\beta(\xi_{122})$): Growth in GDP is positively associated with the amount of leverage a firm holds.

During a recession, companies face higher bankruptcy costs and consequently, a lower amount of debt financing can be anticipated, following the notion of the trade-off theory. However, according to the market-timing theory, a recession often leads to a decrease in stock valuation and therefore, companies forego to issue equity and increase their leverage. Here, a positive relation can be expected.

Hypothesis 12.3 ($\beta(\xi_{123})$): Recessions are negatively related to the level of debt a firm holds.

The discount rate also exhibits a positive as well as negative impact on leverage. If interest rates rise, equities and bonds will ultimately fall in value. In essence, the impact of an increase in interest rates will be greater for equity than for debt. Consequently, equity decreases in value by a larger amount, compared to leverage, leaving the firm highly levered. Hence, according to the trade-off model, interest rates have a positive impact on leverage. However, the pecking-order as well as the market-timing theory asserts a negative relationship.
Following the notion of the trade-off theory the following hypothesis has been developed:

Hypothesis 12.4 ($\beta(\xi_{12.4})$): The discount rate is positively related to the level of leverage a firm holds.

While the developed hypotheses so far all have been created to find empirical evidence on which factors determine the capital structure decision of firms in general, our study also analyzes which debt factors are important in different business industries. Hence, the subsequent hypotheses have been developed in order to offer an answer to the following sub-research question: Are certain debt factors dominant in some industries, yet unimportant elsewhere?

Hypothesis 13 ($\beta(\xi_{13})$): The size effect on a firm's capital structure differs among industries.

Hypothesis 14 ($\beta(\xi_{14.3})$): The value effect on a firm's capital structure differs among industries.

Hypothesis 15 ($\beta(\xi_{15})$): The effect of the nature of assets on a firm's capital structure differs among industries.

Hypothesis 16 ($\beta(\xi_{16})$): The effect of tangibility on a firm's capital structure differs among industries.

Hypothesis 17 ($\beta(\xi_{17})$): The liquidity effect on a firm's capital structure differs among industries.
Hypothesis 18 ($= \beta(\xi_{18})$): The effect of profitability on a firm’s capital structure differs among industries.

Hypothesis 19 ($= \beta(\xi_{19})$): The growth effect on a firm’s capital structure differs among industries.

Hypothesis 20 ($= \beta(\xi_{20})$): The industry effect on a firm’s capital structure differs among industries.

Hypothesis 21 ($= \beta(\xi_{21})$): The risk effect on a firm’s capital structure differs among industries.

Hypothesis 22 ($= \beta(\xi_{22})$): The tax effect on a firm’s capital structure differs among industries.

Hypothesis 23 ($= \beta(\xi_{23})$): The effect of financial constraints on a firm’s capital structure differs among industries.

Hypothesis 24 ($= \beta(\xi_{24})$): The effect of macroeconomic variables on a firm’s capital structure differs among industries.

To this point, we have come up with hypotheses to test which factors influence the leverage decision in general and in particular how these factors behave in each industry under study. In the next step, we will analyze whether these debt factors lose significance over time. Our study controls for the fact that certain debt factors that seem important in our sample analysis in general, do fail to have a permanent and
consistent impact on the capital structure of firms over time. Hence, the following sub-research question needs to be answered: Are certain debt factors only temporarily important in the leverage decision of firms or do they exhibit a consistent impact over time?

Based on the rationale mentioned above the following hypotheses have been derived:

Hypothesis 25 \((= \beta(\xi_{25}))\): The positive/negative impact of the size effect on a firm’s capital structure remains the same over time.

Hypothesis 26 \((= \beta(\xi_{26}))\): The positive/negative impact of the value effect on a firm’s capital structure remains the same over time.

Hypothesis 27 \((= \beta(\xi_{27}))\): The positive/negative impact of the nature of assets on a firm’s capital structure remains the same over time.

Hypothesis 28 \((= \beta(\xi_{28}))\): The positive/negative impact of tangibility on a firm’s capital structure remains the same over time.

Hypothesis 29 \((= \beta(\xi_{29}))\): The positive/negative impact of liquidity on a firm’s capital structure remains the same over time.

Hypothesis 30 \((= \beta(\xi_{30}))\): The positive/negative impact of profitability on a firm’s capital structure remains the same over time.

Hypothesis 31 \((= \beta(\xi_{31}))\): The positive/negative impact of growth on a firm’s capital structure remains the same over time.
Hypothesis 32 ($= \beta_3$): The positive/negative impact of industry effects on a firm’s capital structure remains the same over time.

Hypothesis 33 ($= \beta_3$): The positive/negative impact of business risk on a firm’s capital structure remains the same over time.

Hypothesis 34 ($= \beta_4$): The positive/negative impact of the tax effect on a firm’s capital structure remains the same over time.

Hypothesis 35 ($= \beta_5$): The positive/negative impact of financial constraints on a firm’s capital structure remains the same over time.

Hypothesis 36 ($= \beta_6$): The positive/negative impact of macroeconomic variables on a firm’s capital structure remains the same over time.

While the developed hypotheses all make use of an aggregated amount of leverage when providing an answer to the different research question, in a next step, we will apply direct measures of leverage in our OLS regression. In specific, our study attempts to answer the following sub-research question: Which debt factors determine the bond and/or loan decision of firms? Despite the fact that we will provide an overview of the factors influencing the bond and/or loan financing, only one hypothesis will be tested:

Hypothesis 37 ($= \beta_7$): The debt factors determining the capital structure of firms are the same that determine the bond and/or loan decision of firms.
8.1.13 Model Summary

In Chapter 8.1 the theoretical framework and hypotheses have been developed. The main goal of this chapter is to draw inferences on the main research question:

Which debt factors determine the capital structure of firms?

Based on that, three sub-research questions have been developed:

1. Are certain debt factors dominant in some industries, yet unimportant elsewhere?
2. Are certain debt factors only temporarily important in the leverage decision of firms or do they exhibit a consistent impact over time?
3. Which debt factors determine the bond and/ or loan decision of firms?
4. Which factors influence the equity issue and share repurchase decision of firms?

Table 8.13 provides an overview of the previously derived hypotheses.
## Table 8.13
### Overview of Hypotheses

<table>
<thead>
<tr>
<th>Hypotheses</th>
<th>Which debt factors determine the capital structure of firms?</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1 The size effect is positively related to the amount of leverage a firm employs.</td>
<td></td>
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<tr>
<td>H1.1 The amount of total assets a firm possesses is positively related to the amount of leverage a firm holds</td>
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<tr>
<td>H1.2 The amount of net revenues is positively related to the amount of leverage a firm holds</td>
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<tr>
<td>H1.3 The older a firm the less leverage it tends to employ compared to younger firms</td>
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<tr>
<td>H2 The value effect is negatively related to the amount of leverage a firm employs</td>
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<tr>
<td>H2.1 The market-to-book ratio is associated with a decrease in leverage</td>
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<tr>
<td>H2.2 The price-to-sales ratio is associated with a decrease in leverage</td>
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<tr>
<td>H2.3 The price-to-book ratio is associated with a decrease in leverage</td>
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<tr>
<td>H3.1 Research and development expenses are positively related to the amount of leverage a firm employs</td>
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<tr>
<td>H3.2 Selling, general and administrative expenses are positively related to the amount of leverage a firm employs</td>
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<tr>
<td>H3.3 Collateral assets are positively related to the amount of leverage a firm employs</td>
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<tr>
<td>H4 Tangible assets are positively related to the amount of leverage a firm holds</td>
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<tr>
<td>H4.1 Property, plant and equipment is positively related to the amount of leverage a firm holds</td>
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<tr>
<td>H4.2 Inventory is positively related to the amount of leverage a firm holds</td>
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<tr>
<td>H4.3 Accounts receivables are positively related to the amount of leverage a firm holds</td>
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<tr>
<td>H4.4 Intangible assets are inversely related to the amount of leverage a firm holds</td>
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<tr>
<td>H5 Liquidity leads to an increase in leverage</td>
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<tr>
<td>H5.1 The more cash a firm holds the more leverage it tends to employ</td>
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<tr>
<td>H5.2 Working capital is negatively related to the amount of leverage a firm holds</td>
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<tr>
<td>H6 Profitable firms tend to have less leverage compared to non-profitable firms</td>
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<tr>
<td>H7 Firms facing growth opportunities tend to have lower levels of leverage compared to firms with low growth potentials</td>
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<tr>
<td>H7.1 The annual growth rate of total assets is negatively related to the amount of leverage</td>
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<tr>
<td>H7.2 The annual growth rate of net revenues is negatively related to the amount of leverage</td>
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<tr>
<td>H7.3 Capital expenditure is negatively related to the amount of leverage</td>
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<tr>
<td>H7.4 Operating expenditure is negatively related to the amount of leverage</td>
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<tr>
<td>H8.1 Firms that compete in industries in which the median firm has high leverage tend to have high leverage</td>
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<tr>
<td>H8.2 Firms that compete in industries in which the median firm faces high growth potentials tend to have high leverage</td>
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<tr>
<td>H9 The standard deviation of growth rate of operating profit is associated with a decrease in leverage</td>
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<tr>
<td>H10.1 The tax rate exerts a positive relationship to the amount of leverage a firm employs</td>
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<td>H10.2 Non-debt tax shield is negatively related to the amount of leverage a firm employs</td>
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<td>H11.1 Dividend paying firms tend to have larger amounts of leverage compared to non-payers</td>
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<td>H11.4 The higher the bankruptcy possibility, the lower the level of leverage a firm employs</td>
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<tr>
<td>H12.1 Inflation is positively related to the amount of leverage a firm employs</td>
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<tr>
<td>H12.2 Growth in GDP is positively associated with the amount of leverage a firm holds</td>
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<tr>
<td>H12.3 Recessions are negatively related to the level of debt a firm holds</td>
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8.2 Factor Selection

Table 8.1 has provided an overview of the different variables under study. However, in the interest of parsimony and of multicollinearity, it is recommendable to include only essential determinants in our regression. In order to choose the most relevant variables two prerequisites need to be met.792

First, a correlation analysis between the different factors will be applied in order to remove those variables that are exposed to high correlation.

Second, three of the most commonly used model selection criteria will be used to determine which of the remaining leverage determinants to keep in the regression analysis. In specific, the Akaike Information Criterion (AIC), the Bayesian Information Criterion (BIC)793 and finally the Hannan-Quinn Information Criterion (HQC) have been conducted.794 The main reason to apply all three model criteria in the factor selection process stems from the indispensable aim to find the best fitted model, that best explains the leverage decision of firms.

Linear regressions will be run in order to select the most relevant factors that might have an impact on the leverage decisions of firms. Let $L_{it}$ designate the amount of leverage of firm $i$ on date $t$. The independent factors are lagged one year in order to be in the information set and are denoted $F_{it-1}$. While $\alpha$ and $\beta$ are the parameters that need to be determined, the error term follows $\epsilon \sim N(0, \sigma^2I)$. Hence, the basic model is as follows:

$$L_{it} = \alpha + \beta F_{it-1} + \epsilon_{it}$$ (8.2)

792 For further detail on the assumptions underlying the classical linear regression model, see Brooks (2002), pp.43.
793 The Bayesian Information Criterion (BIC) is also often called Schwarz Criterion (SBC).
794 See Hastie et al. (2009).
During the regression AIC, BIC as well as HQC have been determined. Let $P$ denote the number of parameters used during the regression, while $N$ represents the number of observations in a fitted model.\footnote{For further detail, see Burnham and Anderson (2002).}

The generic form of AIC is determined as follows:\footnote{See Akaike (1974), pp.717.}

$$AIC = 2P - 2\ln(L)$$  \hfill (8.3)

In essence, the AIC is often applied in model selection for non-nested alternatives, implying that smaller values of the AIC are preferred. One of the main benefits of AIC accrues to its application not only for in-sample data but also for out-of-sample forecasting performance of a model. More specific, in-sample forecasting primarily provide information how the chosen model fits the data in a given sample. In contrast, out-of-sample forecasting is able to dictate how a fitted model prognosticates future value of the regressed variables. Further, the Akaike Information Criterion renders itself of being advantageous for both nested as well as non-nested models. However, the main disadvantages of the information criterion revolve around its inconsistency.\footnote{See Akaike (1974), pp.716.}

The Bayesian Information Criterion is an alternative to the AIC that imposes a larger penalty for additional coefficients and is defined in a similar vein:\footnote{See Schwarz (1978), pp.461-463.}

$$BIC = -2\ln(N) + P\log(N)$$  \hfill (8.4)

The main demerit of the BIC occurs when the sample size grows to infinity. Emphatically, the probability that BIC is able to pick the true model converges to unity as the sample size becomes bigger. In line with the AIC, the lower the value of BIC, the better the chosen model. Also similar to the characteristics of AIC, BIC can
be applied in order to contrast in-sample or out-of-sample forecasting performance of a model.

Finally, the Hannan-Quinn Information Criterion is calculated in the following way:

$$HQN = N \ln \left( \frac{RSS}{N} \right) + 2 \ln(\ln(N)) \quad (8.5)$$

As can be observed, the equations of the models are quite alike and therefore almost yield similar results. In essence, AIC, BIC and HQN exhibit a relatively sensible structure. For instance, as the log-likelihood rises, the three measures decrease. At the opposite, the measures increase, when the number of parameters has risen. Finally, the number of observations is positively related to the value of the Bayesian Information Criterion. However, the models are obliged to the same rule of the game: *The lower their value the better the model.*

When trying to determine the best fitted model, there is no clear choice between AIC and BIC. In essence, the Bayesian Information Criterion is characterized as asymptotically consistent. That means that given a convolute of possible models, including the true model, the probability that BIC will choose the true model reaches one as the sample size grows to infinity. However, this does not apply to AIC, which tends to pick complex models as $N \to \infty$. In contrast, in small samples it is not clear whether one of the three models is better in picking the true model. Specifically, BIC might select models that seem too simple, due to its heavy penalty on complexity.

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800 The three information criteria are all based on -2 times the average log-likelihood function, adjusted by a penalty function.
801 For further information on the different information criterions, see Hastie et al. (2009), pp. 233-235.
8.2.1 Empirical Results on Factor Selection

Before a detailed model testing has been carried out, a correlation matrix among the different independent variables was created to remove those factors whose correlation seems to be rather high.

In general, an implicit assumption that is made when using the OLS estimation method is that the explanatory variables are not correlated with one another. A problem occurs when the explanatory variables are highly correlated with each other and this problem is known as multicollinearity. Testing for multicollinearity is difficult and therefore all that is presented here is a simple method to investigate the presence of near multicollinearity. One way to examine multicollinearity is to observe the correlation matrix.

Table 8.14 presents the results of a correlation matrix of the different explanatory variables. As can be seen, a relatively high correlation between certain variables exists and therefore might lead to multicollinearity. Based on the correlation analysis, two factors have been dropped due to high correlations to other factors. First, the leverage determinant $SGA$ exhibits a huge correlation with $R\&D$ (0.93), suggesting that one variable can be dropped. Further, a relatively consistent high correlation with $PRICE\_SALES$ (0.49), $REV$ (0.38), $CASH$ (0.37) and $PROF$ (0.33) corroborate our acting of removing the variable $SGA$. Second, the factor $COLLTRL$ has also been excluded in the regression analysis due to high correlation with $PPE$ (0.85), $INV$ (0.64), $OPEX$ (0.51) and $INDUST\_LEV$ (0.47).

Next to a simple correlation matrix, the calculation of the Variance Inflation Factors (VIF) will be applied to test for possible multicollinearity (Table 8.15).

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103 “Near” multicollinearity arises when there is a non-eligible, but not perfect, relationship between two or more of the explanatory variables. In contrast, “perfect” multicollinearity occurs when there is an exact relationship between two or more variables (Brooks, 2002).
104 For further detail on multicollinearity, see Chapter 5.2 in this dissertation.
105 The correlation matrix shows that several other cases exist where the absolute value of the correlation coefficient exceeds 0.5. However, variables are excluded based on the number of high correlations with other factors.
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8 Determinants of Capital Structure

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Usually, the multicollinearity between independent factors might be severe when the following two criteria are met. First, the largest variance inflation factor exceeds ten, meaning that $R^2$ is greater than 0.9. Second, the mean of the variance inflation factors, $\overline{VIF}$, for the independent variables is substantially greater than one.

Basically, five variables do have a variance inflation factor of more than ten, and the average of the variance inflation factors (109.43) is indeed substantially larger than one. To be more specific, while all other explanatory variables do have relatively low VIFs, the factors COLLTRL (1797.98), PPE (1084.32), INV (499.49), and REV (79.25) exhibit a high variance inflation factor. Hence, the multicollinearity among these variables can be considered to be severe.

The following analysis to determine the best fitted model makes use of dropping off one of the collinear variables, in which only variables that are not highly correlated to each other are included. Excluding the factor R&D due to lack of available data as well as $SG&A$ and $COLLTRL$ due to high correlations with other variables, a total number of 30 independent variables remains.806

806 In the final regression analysis testing for the determinants of capital structure (Chapter 8.2.1), the factors being exposed to severe multicollinearity will be excluded in the regression analysis. This accrues to the factors COLLTRL (1797.98), PPE (1084.32), INV (499.49) and REV (79.25)
### Table 8.15

The Variance Information Factors

The following table shows the variance inflation factors for the set of independent variables. VIF is determined as $1/(1-R^2)$.

<table>
<thead>
<tr>
<th>Variable</th>
<th>VIP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Z_SCORE</td>
<td>3.32</td>
</tr>
<tr>
<td>WC</td>
<td>3.17</td>
</tr>
<tr>
<td>TBILL</td>
<td>1.81</td>
</tr>
<tr>
<td>TAX</td>
<td>1.43</td>
</tr>
<tr>
<td>TA</td>
<td>70.23</td>
</tr>
<tr>
<td>SGA</td>
<td>9.17</td>
</tr>
<tr>
<td>RISK</td>
<td>1.07</td>
</tr>
<tr>
<td>REV</td>
<td>79.25</td>
</tr>
<tr>
<td>RD</td>
<td>8.92</td>
</tr>
<tr>
<td>RATING</td>
<td>1.94</td>
</tr>
<tr>
<td>PROF</td>
<td>2.45</td>
</tr>
<tr>
<td>PRICE_SALES</td>
<td>2.14</td>
</tr>
<tr>
<td>PRICE_BOOK</td>
<td>1.01</td>
</tr>
<tr>
<td>PPE</td>
<td>1084.32</td>
</tr>
<tr>
<td>OPEx</td>
<td>7.94</td>
</tr>
<tr>
<td>NDTTS</td>
<td>1.46</td>
</tr>
<tr>
<td>NBER</td>
<td>2.37</td>
</tr>
<tr>
<td>MB</td>
<td>2.40</td>
</tr>
<tr>
<td>LOSS</td>
<td>1.39</td>
</tr>
<tr>
<td>INV</td>
<td>499.49</td>
</tr>
<tr>
<td>INTANG</td>
<td>2.95</td>
</tr>
<tr>
<td>INFLATION</td>
<td>1.53</td>
</tr>
<tr>
<td>INDUST_LEV</td>
<td>2.88</td>
</tr>
<tr>
<td>INDUST_G</td>
<td>2.04</td>
</tr>
<tr>
<td>GDP</td>
<td>2.89</td>
</tr>
<tr>
<td>G_TA</td>
<td>1.89</td>
</tr>
<tr>
<td>G_REV</td>
<td>1.92</td>
</tr>
<tr>
<td>INV</td>
<td>1.84</td>
</tr>
<tr>
<td>COLLTRL</td>
<td>1797.90</td>
</tr>
<tr>
<td>CASH</td>
<td>3.84</td>
</tr>
<tr>
<td>CAPEX</td>
<td>2.34</td>
</tr>
<tr>
<td>AR</td>
<td>1.91</td>
</tr>
<tr>
<td>AGE</td>
<td>1.48</td>
</tr>
<tr>
<td>Mean</td>
<td>109.43</td>
</tr>
</tbody>
</table>
Table 8.16 shows which factors are worth keeping regarding the calculations of the three different information criterions. The first step is to conduct a regression analysis with all factors under study, reporting the corresponding summary statistics. Second, the variable with the lowest t-value will be dropped (here, Treasury Bill) and finally, the process is continued by re-determining all statistics on the reduced sample that excludes the variable TBILL. As can be observed the model enhances slightly, as AIC falls from 0.0145 to 0.0141, BIC drops from 0.0538 to 0.0522 and HQN decreases from 0.0282 to 0.0274. Next, the variable G_REV will be removed since it has the lowest t-value in the reduced sample. Again the model improves marginally. This process endures excluding one factor at a time until at the top of the table one single determinant remains – profitability.

As can be perceived, the associated t-statistics of the corresponding independent variables increase when reaching the top of the table. However, this pattern fails to be consistent, due to the fact that the number of observations alters when dropping certain factors in the regression analysis.

Aim of this procedure has been to pick a fitted model with the minimum value of AIC, BIC and HQN. Table 8.16 perfectly shows that the best model has been determined where BIC reaches a value of 0.042, AIC approaches 0.011 and HQN 0.022. All factors beneath G_TA fail to be included in the model. Hence, a total of 23 factors are selected to be incorporated by the minimum information criterion.
Table 8.16
Factor Selection

The following table provides an overview of the importance of each independent variable. All factors are lagged one year and are regressed on the dependent variable Book Leverage, which is defined as book debt to total assets. "Own R" represents the R from simple univariate regressions. "Cumulative R" shows R from a regression that contains the variables listed, along with all variables listed above it in the table. The factors are represented in the order of the amount of additional variation explained. First, a regression including all variables will be run. The obtained R can be found in the column "Cumulative R" at the bottom of the table. Then, we drop the factor that exhibits the lowest t-value and run the regression with the remaining variables. The R is shown in the second to the bottom cell in the table. We continue in this manner all the way up. Bayesian Information Criterion (BIC) is defined as \( -2\log\text{-likelihood} + P\log(N) \), where \( P \) represents the number of parameters and \( N \) is the number of observations. Akaike Information Criterion (AIC) is defined as \( -2\log\text{-likelihood} + 2P \), where \( P \) represents the number of parameters. Hannan-Quinn Information Criterion (HQC) is determined as \( N\log(RSS/N) + P\log(n/N) \), where \( P \) is the number of parameters, \( N \) the number of observations and \( RSS \) is the residual sum of squares.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient estimate in the last regression in which the variables were included</th>
<th>t-value in the last regression in which the variable was included</th>
<th>Own R²</th>
<th>Cumulative R²</th>
<th>BIC</th>
<th>AIC</th>
<th>HQC</th>
</tr>
</thead>
<tbody>
<tr>
<td>PROF</td>
<td>-1.075</td>
<td>-13.315</td>
<td>0.027</td>
<td>0.027</td>
<td>2.508</td>
<td>2.506</td>
<td>2.506</td>
</tr>
<tr>
<td>INDUST_LEV</td>
<td>0.712</td>
<td>6.486</td>
<td>0.009</td>
<td>0.033</td>
<td>2.503</td>
<td>2.500</td>
<td>2.501</td>
</tr>
<tr>
<td>Z_SCORE</td>
<td>-0.001</td>
<td>-1.897</td>
<td>0.001</td>
<td>0.034</td>
<td>2.505</td>
<td>2.501</td>
<td>2.502</td>
</tr>
<tr>
<td>WC</td>
<td>0.003</td>
<td>2.820</td>
<td>0.000</td>
<td>0.035</td>
<td>2.506</td>
<td>2.501</td>
<td>2.503</td>
</tr>
<tr>
<td>TA</td>
<td>0.011</td>
<td>1.538</td>
<td>0.004</td>
<td>0.035</td>
<td>2.508</td>
<td>2.501</td>
<td>2.504</td>
</tr>
<tr>
<td>MB</td>
<td>-0.009</td>
<td>-4.481</td>
<td>0.017</td>
<td>0.152</td>
<td>0.151</td>
<td>0.144</td>
<td>0.147</td>
</tr>
<tr>
<td>CASH</td>
<td>-0.209</td>
<td>-7.623</td>
<td>0.014</td>
<td>0.160</td>
<td>0.144</td>
<td>0.135</td>
<td>0.138</td>
</tr>
<tr>
<td>INV</td>
<td>-0.224</td>
<td>-8.270</td>
<td>0.000</td>
<td>0.169</td>
<td>0.142</td>
<td>0.132</td>
<td>0.136</td>
</tr>
<tr>
<td>OPEX</td>
<td>0.042</td>
<td>7.279</td>
<td>0.008</td>
<td>0.176</td>
<td>0.135</td>
<td>0.124</td>
<td>0.128</td>
</tr>
<tr>
<td>LOSS</td>
<td>0.059</td>
<td>5.252</td>
<td>0.000</td>
<td>0.179</td>
<td>0.132</td>
<td>0.120</td>
<td>0.124</td>
</tr>
<tr>
<td>AR</td>
<td>0.178</td>
<td>5.249</td>
<td>0.014</td>
<td>0.181</td>
<td>0.128</td>
<td>0.115</td>
<td>0.120</td>
</tr>
<tr>
<td>INTANG</td>
<td>-0.079</td>
<td>-3.895</td>
<td>0.000</td>
<td>0.194</td>
<td>0.085</td>
<td>0.069</td>
<td>0.075</td>
</tr>
<tr>
<td>AGE</td>
<td>0.000</td>
<td>3.644</td>
<td>0.003</td>
<td>0.196</td>
<td>0.084</td>
<td>0.067</td>
<td>0.073</td>
</tr>
<tr>
<td>CAPEX</td>
<td>-0.217</td>
<td>-3.051</td>
<td>0.011</td>
<td>0.197</td>
<td>0.084</td>
<td>0.066</td>
<td>0.072</td>
</tr>
<tr>
<td>NDIFS</td>
<td>0.236</td>
<td>2.590</td>
<td>0.007</td>
<td>0.198</td>
<td>0.084</td>
<td>0.065</td>
<td>0.072</td>
</tr>
</tbody>
</table>
## Table 8.16, continued

### Factor Selection

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient estimate in the last regression in which the variables was included</th>
<th>t-value in the last regression in which the variable was included</th>
<th>Own R²</th>
<th>Cumulative R²</th>
<th>BIC</th>
<th>AIC</th>
<th>HQC</th>
</tr>
</thead>
<tbody>
<tr>
<td>RISK</td>
<td>0.000</td>
<td>2.337</td>
<td>0.000</td>
<td>0.199</td>
<td>0.085</td>
<td>0.065</td>
<td>0.072</td>
</tr>
<tr>
<td>INFLATION</td>
<td>0.007</td>
<td>1.692</td>
<td>0.001</td>
<td>0.199</td>
<td>0.086</td>
<td>0.065</td>
<td>0.072</td>
</tr>
<tr>
<td>REV</td>
<td>-0.021</td>
<td>-1.550</td>
<td>0.001</td>
<td>0.199</td>
<td>0.087</td>
<td>0.065</td>
<td>0.072</td>
</tr>
<tr>
<td>PRICE_BOOK</td>
<td>0.000</td>
<td>1.480</td>
<td>0.000</td>
<td>0.205</td>
<td>0.081</td>
<td>0.057</td>
<td>0.065</td>
</tr>
<tr>
<td>DIV</td>
<td>0.009</td>
<td>0.922</td>
<td>0.005</td>
<td>0.206</td>
<td>0.083</td>
<td>0.057</td>
<td>0.066</td>
</tr>
<tr>
<td>PPE</td>
<td>-0.005</td>
<td>-0.200</td>
<td>0.001</td>
<td>0.208</td>
<td>0.083</td>
<td>0.056</td>
<td>0.066</td>
</tr>
<tr>
<td>PRICE_SALES</td>
<td>0.000</td>
<td>-0.161</td>
<td>0.000</td>
<td>0.208</td>
<td>0.085</td>
<td>0.057</td>
<td>0.067</td>
</tr>
<tr>
<td>G_TA</td>
<td>-0.015</td>
<td>-1.033</td>
<td>0.001</td>
<td>0.220</td>
<td>0.042</td>
<td>0.011</td>
<td>0.022</td>
</tr>
<tr>
<td>NBER</td>
<td>0.009</td>
<td>0.915</td>
<td>0.000</td>
<td>0.220</td>
<td>0.043</td>
<td>0.012</td>
<td>0.023</td>
</tr>
<tr>
<td>RATING</td>
<td>-0.008</td>
<td>-0.923</td>
<td>0.001</td>
<td>0.220</td>
<td>0.045</td>
<td>0.012</td>
<td>0.024</td>
</tr>
<tr>
<td>GDP</td>
<td>0.003</td>
<td>0.713</td>
<td>0.000</td>
<td>0.220</td>
<td>0.047</td>
<td>0.013</td>
<td>0.025</td>
</tr>
<tr>
<td>TAX</td>
<td>0.006</td>
<td>0.407</td>
<td>0.001</td>
<td>0.221</td>
<td>0.048</td>
<td>0.013</td>
<td>0.025</td>
</tr>
<tr>
<td>INDUST_G</td>
<td>0.029</td>
<td>0.357</td>
<td>0.007</td>
<td>0.221</td>
<td>0.050</td>
<td>0.013</td>
<td>0.026</td>
</tr>
<tr>
<td>G_REV</td>
<td>0.004</td>
<td>0.239</td>
<td>0.003</td>
<td>0.221</td>
<td>0.052</td>
<td>0.014</td>
<td>0.027</td>
</tr>
<tr>
<td>TBILL</td>
<td>0.000</td>
<td>0.111</td>
<td>0.003</td>
<td>0.221</td>
<td>0.054</td>
<td>0.014</td>
<td>0.028</td>
</tr>
</tbody>
</table>
8.3 Empirical Results

The following chapter deals with the empirical findings of our regression analysis. While Chapter 8.3.1 provides remarks and annotations to the empirical results in general, Chapter 8.3.2 delivers sample results for the first research question under study: Which debt factors determine the capital structure of firms?

Chapter 8.3.3 provides cross-sectional results, dealing with the second research question: Are certain debt factors dominant in some industries, yet unimportant elsewhere?

Chapter 8.3.4 offers calendar-time results in order to answer the third research question: Are certain debt factors only temporarily important in the leverage decision of firms or do they exhibit a consistent effect over time?

Chapter 8.3.5 revolves around the results of alternative leverage measures. While in most of the academic papers, an aggregated amount of debt (book leverage or market leverage) has been applied in the regression analysis, this sub-chapter uses direct measures of leverage. Thus, the fourth research question should be answered: Which debt factors determine the bond and/or loan decision of firms?

Finally, Chapter 8.3.6 provides a brief overview of the most relevant factors influencing the equity issue and share repurchase decision of firms.

8.3.1 Annotations to the Results

Series of preliminary tests have been conducted, testing for heteroscedasticity and autocorrelation problem. Thus, in order to detect whether the variance of the errors in the OLS is constant or not, White’s general test for heteroscedasticity has been used.\textsuperscript{807} The consequences of applying OLS in the presence of heteroscedasticity are that, “OLS estimators will still give unbiased (and therefore also consistent) coefficient estimates, but they are no longer BLUE – that is, they no longer have the minimum variance

\textsuperscript{807} For a description of testing heteroscedasticity, see White (1980), pp.817 and Wilcox (2009), pp.1.
among the class of unbiased estimators.”

In other words, ignoring heteroscedasticity might entail distorted inferences about the variables.

Furthermore, a Durbin-Watson (DW) test has been generated, testing whether the residual series are autocorrelated (i.e. testing for a relationship between an error and its immediately previous value).

Appealing to the central limit theorem, any violation of the normality assumption is virtually inconsequential due to a large employed sample size. Consequently, no testing for normality (e.g. Bera-Jarque test) has been conducted since the test statistics will asymptotically pursue the appropriate distributions even in the absence of error normality.

In addition, all return indices as well as company stock returns were checked for Unit Root, utilizing Dickey-Fuller test. Consistent with previous literature, all data are stationary and therefore a co-integration test of the different regressions could be performed. Also, the results show that all the residuals of the regressions under study are stationary and thus the series are co-integrated.

After having chosen a set of 23 factors that seem to be most important according to the three information criterions, the next step will be to determine which factors have an impact on the leverage decision of firms. As has been shown in Chapter 8.2.1, the variables $PPE$, $INV$, $REV$ do exhibit a large value of VIF, indicating severe multicollinearity. In order to ensure reliable results, these explanatory

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808 Brooks (2002), p.150

809 The eventuality of heteroscedasticity is often unchecked in multivariate regression analysis. Ignoring this issue might lead to biased statistical results. For further information, see Brooks (2002), pp.150 and Korendijk et al. (2008), pp.67.

810 The Durbin-Watson statistic is a test for first-order serial correlation. More formally, the DW statistic measures the linear association between adjacent residuals from a regression model. If there is no serial correlation, the DW statistic will be around 2. The DW statistic will fall below 2 if there is positive serial correlation (in the worst case, it will be near zero). If there is negative correlation, the statistic will lie somewhere between 2 and 4. Positive serial correlation is the most commonly observed form. As a rule of thumb, with 50 or more observations and only a few independent variables, a DW statistic below about 1.5 is a strong indication of positive first order serial correlation.
variables will not be incorporated in our analysis. Hence, a total of 20 variables will be included in our study to determine the most relevant debt factors.

Table 8.17 shows the parameter estimates of the different factors, differentiating between the sample and the eight various industries. Aim of this analysis is to find out, which factors are reliably important for the leverage decision. In order to test this, the analysis has also been run for the different industries, since different industries might be exposed to different leverage determinants. The study covers the time frame 1990 – 2008.


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811 Chapter 8.3.3 provides OLS results on direct measures of debt. Here, loans and bonds are applied as dependent variables.
Table 8.17
Determinants of Leverage

The following table provides an overview of the determinants of leverage. All factors are lagged one year and are regressed on the dependent variable Book Leverage, which is defined as book debt to total assets. Regressions are run for the whole sample and every single business sector. Numbers in italic represent t-values, N represents the number of observations, R², the adjusted R² as well as the F-Statistic can be found at the bottom of this table.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Sample</th>
<th>Telecom Svc</th>
<th>Industry</th>
<th>Health Care</th>
<th>Consumer Disc</th>
<th>Consumer Staples</th>
<th>Information Tech</th>
<th>Utilities</th>
<th>Materials</th>
<th>Energy</th>
</tr>
</thead>
<tbody>
<tr>
<td>PROF</td>
<td>-0.4056</td>
<td>-0.3613</td>
<td>-0.0463</td>
<td>0.2273</td>
<td>-1.1834</td>
<td>1.5150</td>
<td>-0.4375</td>
<td>0.6148</td>
<td>0.3512</td>
<td>-0.1726</td>
</tr>
<tr>
<td>INDUST_LEV</td>
<td>-0.23</td>
<td>-0.33</td>
<td>1.42</td>
<td>-7.61</td>
<td>12.46</td>
<td>5.11</td>
<td>5.11</td>
<td>3.89</td>
<td>2.00</td>
<td>-4.98</td>
</tr>
<tr>
<td>Z_SCORE</td>
<td>13.09</td>
<td>0.85</td>
<td>0.71</td>
<td>-0.61</td>
<td>-0.66</td>
<td>-2.65</td>
<td>3.35</td>
<td>1.90</td>
<td>0.86</td>
<td>-1.11</td>
</tr>
<tr>
<td>ZI</td>
<td>-0.0007</td>
<td>-0.0728</td>
<td>-0.0016</td>
<td>-0.0199</td>
<td>-0.0328</td>
<td>-0.1294</td>
<td>-0.0019</td>
<td>-0.1814</td>
<td>-0.0734</td>
<td>-0.0968</td>
</tr>
<tr>
<td>WC</td>
<td>-11.47</td>
<td>-1.23</td>
<td>-5.97</td>
<td>-4.67</td>
<td>-7.60</td>
<td>-9.57</td>
<td>-5.50</td>
<td>-11.08</td>
<td>-11.86</td>
<td>-12.19</td>
</tr>
<tr>
<td>TA</td>
<td>0.0312</td>
<td>-0.1306</td>
<td>0.0071</td>
<td>-0.0162</td>
<td>0.0406</td>
<td>0.0016</td>
<td>0.0103</td>
<td>0.0018</td>
<td>0.0008</td>
<td>-0.0005</td>
</tr>
<tr>
<td>MB</td>
<td>11.14</td>
<td>-3.66</td>
<td>1.63</td>
<td>-0.87</td>
<td>5.48</td>
<td>0.36</td>
<td>1.95</td>
<td>0.54</td>
<td>0.68</td>
<td>-0.12</td>
</tr>
<tr>
<td>CASH</td>
<td>-0.0302</td>
<td>0.0618</td>
<td>-0.0119</td>
<td>-0.0738</td>
<td>-0.1917</td>
<td>-0.1292</td>
<td>0.0029</td>
<td>-0.1489</td>
<td>-0.1373</td>
<td>-0.1401</td>
</tr>
<tr>
<td>OPX</td>
<td>-10.45</td>
<td>0.85</td>
<td>-1.31</td>
<td>-6.96</td>
<td>-15.77</td>
<td>-42.04</td>
<td>0.54</td>
<td>-7.61</td>
<td>-6.67</td>
<td>-9.01</td>
</tr>
<tr>
<td>LOSS</td>
<td>0.0055</td>
<td>-0.34</td>
<td>-6.09</td>
<td>3.39</td>
<td>-2.26</td>
<td>14.55</td>
<td>2.68</td>
<td>7.44</td>
<td>3.18</td>
<td>5.02</td>
</tr>
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<td>AR</td>
<td>0.1957</td>
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<td>0.2864</td>
<td>1.3864</td>
<td>0.5048</td>
<td>0.1276</td>
<td>0.3740</td>
<td>0.0332</td>
<td>-0.4264</td>
<td>-0.1172</td>
</tr>
<tr>
<td>INTANG</td>
<td>5.26</td>
<td>-0.71</td>
<td>7.48</td>
<td>-4.40</td>
<td>6.29</td>
<td>1.26</td>
<td>3.27</td>
<td>0.32</td>
<td>-2.49</td>
<td>-1.39</td>
</tr>
<tr>
<td>INTANG</td>
<td>-0.0698</td>
<td>0.2503</td>
<td>-0.1834</td>
<td>0.0017</td>
<td>-0.1235</td>
<td>0.0651</td>
<td>-0.2312</td>
<td>-0.0982</td>
<td>-0.2481</td>
<td>-0.3348</td>
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<tr>
<td>INTANG</td>
<td>-3.19</td>
<td>0.99</td>
<td>-5.70</td>
<td>0.01</td>
<td>-1.97</td>
<td>2.02</td>
<td>-4.83</td>
<td>-1.86</td>
<td>-3.28</td>
<td>-4.91</td>
</tr>
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</table>
Table 8.17, continued
Determinants of Leverage

<table>
<thead>
<tr>
<th>Variable</th>
<th>Sample</th>
<th>Telecom Svc</th>
<th>Industry</th>
<th>Health Care</th>
<th>Consumer Disc</th>
<th>Consumer Staples</th>
<th>Information Tech</th>
<th>Utilities</th>
<th>Materials</th>
<th>Energy</th>
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<tr>
<td>AGE</td>
<td>0.0002</td>
<td>-0.0037</td>
<td>0.0007</td>
<td>-0.0012</td>
<td>0.0005</td>
<td>-0.0001</td>
<td>0.0004</td>
<td>0.0000</td>
<td>-0.0003</td>
<td>0.0001</td>
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<tr>
<td>CAPEX</td>
<td>-0.1324</td>
<td>0.0204</td>
<td>-0.5977</td>
<td>-1.2600</td>
<td>-0.5474</td>
<td>0.1614</td>
<td>-0.7149</td>
<td>-0.0984</td>
<td>-0.0918</td>
<td>0.1320</td>
</tr>
<tr>
<td>NDFN</td>
<td>0.2188</td>
<td>2.1877</td>
<td>0.5033</td>
<td>-2.4779</td>
<td>1.5401</td>
<td>0.5125</td>
<td>0.3264</td>
<td>-0.4189</td>
<td>-3.7161</td>
<td>-0.2953</td>
</tr>
<tr>
<td>RISK</td>
<td>0.0060</td>
<td>-0.3838</td>
<td>0.0140</td>
<td>-0.0413</td>
<td>0.0117</td>
<td>0.0036</td>
<td>0.0005</td>
<td>0.0013</td>
<td>-0.0345</td>
<td>-0.0035</td>
</tr>
<tr>
<td>INFLATION</td>
<td>0.0112</td>
<td>0.0740</td>
<td>0.0079</td>
<td>0.0017</td>
<td>0.0095</td>
<td>0.0060</td>
<td>0.0161</td>
<td>-0.0130</td>
<td>0.0024</td>
<td>-0.0110</td>
</tr>
<tr>
<td>PRICE_BOOK</td>
<td>0.0001</td>
<td>-0.0276</td>
<td>0.0009</td>
<td>-0.0008</td>
<td>0.0007</td>
<td>0.0000</td>
<td>0.0012</td>
<td>0.0171</td>
<td>0.0003</td>
<td>0.0187</td>
</tr>
<tr>
<td>DIV</td>
<td>0.0108</td>
<td>0.3266</td>
<td>-0.0409</td>
<td>0.2273</td>
<td>-0.0557</td>
<td>-0.0287</td>
<td>0.0390</td>
<td>-0.0028</td>
<td>-0.0419</td>
<td>0.0421</td>
</tr>
<tr>
<td>PRICE_SALES</td>
<td>-0.0046</td>
<td>0.0040</td>
<td>-0.0100</td>
<td>-0.0006</td>
<td>-0.0786</td>
<td>0.0056</td>
<td>-0.0017</td>
<td>-0.0157</td>
<td>0.0027</td>
<td>-0.0320</td>
</tr>
<tr>
<td>G_TA</td>
<td>-0.0091</td>
<td>-0.1638</td>
<td>0.0011</td>
<td>-0.0902</td>
<td>0.0595</td>
<td>-0.0411</td>
<td>-0.0187</td>
<td>0.0101</td>
<td>-0.0273</td>
<td>0.0290</td>
</tr>
<tr>
<td></td>
<td>-0.64</td>
<td>-2.61</td>
<td>0.05</td>
<td>-1.36</td>
<td>1.58</td>
<td>-1.68</td>
<td>-0.88</td>
<td>0.65</td>
<td>-0.93</td>
<td>1.45</td>
</tr>
<tr>
<td>N</td>
<td>5223</td>
<td>39</td>
<td>779</td>
<td>563</td>
<td>1024</td>
<td>568</td>
<td>872</td>
<td>480</td>
<td>390</td>
<td>516</td>
</tr>
<tr>
<td>R²</td>
<td>0.28</td>
<td>0.83</td>
<td>0.34</td>
<td>0.18</td>
<td>0.37</td>
<td>0.71</td>
<td>0.38</td>
<td>0.66</td>
<td>0.42</td>
<td>0.68</td>
</tr>
<tr>
<td>Adj. R²</td>
<td>0.27</td>
<td>0.64</td>
<td>0.33</td>
<td>0.15</td>
<td>0.35</td>
<td>0.70</td>
<td>0.37</td>
<td>0.65</td>
<td>0.39</td>
<td>0.67</td>
</tr>
<tr>
<td>F-Statistic</td>
<td>65.86</td>
<td>4.31</td>
<td>45.22</td>
<td>5.98</td>
<td>28.83</td>
<td>67.08</td>
<td>26.25</td>
<td>44.63</td>
<td>13.64</td>
<td>52.56</td>
</tr>
</tbody>
</table>
8.3.2 Sample Results

According to the sample results in Table 8.17, 17 out of 20 tested independent variables exhibit strong statistical significance and thus do have a reliable impact on the leverage decision of firms.\textsuperscript{812} Figure 8.1 depicts whether the debt factors under study exert a positive or negative impact on the amount of debt firms carry. The subsequent sub-chapters offer a sophisticated elaboration on the different OLS results.

8.3.2.1 Size

Three variables have been initially generated in order to find out how size affects the capital structure choice of US firms. However, due to multicollinearity, the variable \textit{REV} (revenues) has been dropped in our regression analysis.\textsuperscript{813} In particular, the more assets a firm holds the more leverage it will employ. Table 8.17 shows that the independent variable TA (total assets) exhibits a positive impact on debt financing. The same applies to the factor \textit{AGE} which, however, is materially not as significant as \textit{TA}. These findings are in line with the notion of the trade-off theory, suggesting that the older and the bigger a firm becomes the less it is exposed to bankruptcy risk and consequently the more leverage the company tends to hold.

While all variables feature strong statistical significance, it can be concluded that the effect of size on the capital structure decision of firms is straightforward. In particular, the more assets a company holds and the more mature the firm is, the more debt it carries. The trade-off theory has been confirmed in respect to size. Hence, it can be claimed that size does have a positive impact on the debt decision of companies.

\textsuperscript{812} These data are all statistically significant at the 1 percent confidence level.

\textsuperscript{813} See Chapter 8.2.1.
Based on the results in Table 8.17 and the rationale mentioned above, **Hypothesis 1, Hypothesis 1.1 and Hypothesis 1.3** can be confirmed.\(^{814}\)

![Figure 8.1: Determinants of Capital Structure - Sample](image)

### 8.3.2.2 Value

It has been predicted that value exploits a negative impact on the leverage decision of firms. The coefficients of the variables *MB* (market to book) as well as *PRICE_SALES* do show that companies refuse taking leverage when their valuation tends to be rather high. This finding mirrors the notion of the market-timing theory

\(^{814}\) Due to the omission of the variable *REV*, **Hypothesis 1.2** could not be tested.
and is also in line with the results found in our equity market-timing analysis in Chapter 7.2. Both explanatory variables exhibit strong statistical significance. In contrast, the variable \textit{PRICE\_BOOK} shows a marginal positive impact on leverage. However, it must be noted that this result is materially insignificant due to its tiny coefficient value.

Based on the results in Table 8.17, the value effect exhibits a negative impact on the leverage decision of firms. Hence, \textbf{Hypothesis 2} must be confirmed. Further, it has been shown that the variables \textit{MB} and \textit{PRICE\_SALES} also exhibit a negative impact on the leverage decision of firms. Thus, \textbf{Hypothesis 2.1} and \textbf{Hypothesis 2.2} can be confirmed. However, the coefficient of the variable \textit{PRICE\_BOOK} is positive and stays in contrast to the notion of the value effect on leverage. Consequently, \textbf{Hypothesis 2.3} must be rejected.

8.3.2.2 Nature of Assets

Due to severe multicollinearity, the three variables under study (\textit{RND}, \textit{SGA} and \textit{COLL\_TRL}) could not be tested in our regression analysis. Therefore, no results for \textbf{Hypothesis 3.1}, \textbf{Hypothesis 3.2} and \textbf{Hypothesis 3.3} can be provided.\textsuperscript{815}

8.3.2.3 Tangibility

Two out of four initially created variables have not been included due to severe multicollinearity (\textit{PPE} and \textit{INV}). As one proxy for tangibility the variable \textit{AR} (accounts receivables) exhibits the predicted positive relationship with debt financing. In general, it is predicted that tangibility leads to an increase in leverage due to the collateral characteristic of tangibility. This is in line with the idea of the trade-off theory.

\textsuperscript{815} See Chapter 8.2.1.
The variable \textit{INTANG} (intangible assets) exhibits a negative coefficient, suggesting that companies make use of less debt when intangible assets are high. This stays in contrast to the pecking-order as well as the trade-off theory. However, this result might indicate that intangible assets fail to serve as collaterals and hence less debt financing is employed by firms.

According to the results in Table 8.18 and the explanation mentioned above, \textit{Hypothesis 4}, \textit{Hypothesis 4.3} and \textit{Hypothesis 4.4} must be confirmed.\textsuperscript{816}

8.3.2.4 Liquidity

The two variables examining how liquidity impacts the debt decision of companies both validate the concept of the pecking-order theory. \textit{CASH} demonstrates a negative relationship with the dependent variable, suggesting that the more cash a firm carries, the less leverage it employs. Referring to the essence of the pecking-order theory, firms are obliged to make use of internal capital first before employing external capital. Internal capital is mainly raised by means of retained earnings, whose amount again depends on the cash a firm can generate through profits. Hence, cash is positively related to internal capital and negatively related to external capital, such as debt financing.

The second explanatory variable, \textit{IFC} (working capital) shows a positive impact on debt financing, which also seems to be in line with the notion of the pecking-order theory. If working capital increases in a company, its cash is tied up in ongoing processes and hence cannot be used for internal capital. Consequently, the company needs to make use of external capital, implying a positive impact on debt financing.

To sum up, both variables, being strong statistically significant, support the idea of the pecking-order theory and refute Jensen’s free cash flow hypothesis.\textsuperscript{817} Thus, \textit{Hypothesis 5}, \textit{Hypothesis 5.1} and \textit{Hypothesis 5.2} must be rejected.

\textsuperscript{816} \textsuperscript{816} Hypothesis 4.1 and \textit{Hypothesis 4.2} cannot be tested due to the fact that the variables \textit{PPE} and \textit{INV} are excluded in our regression analysis due to severe multicollinearity. See Chapter 8.2.1.

\textsuperscript{817} For a discussion on Jensen’s free cash flow hypothesis, refer to Chapter 2.3.1.1 in this dissertation.
8.3.2.5 Profitability

Our analysis in Chapter 7.2 has shown that a negative relationship between profitability and leverage exists. This finding is confirmed by the coefficient variable \( PROF \) (profitability) in Table 8.17. In other words, the results show that profitable firms tend to have less leverage compared to non-profitable firms. This finding is in line with the belief of the pecking-order theory and clearly dilutes the idea of the trade-off theory. Thus, **Hypothesis 6** can be confirmed.

8.3.2.6 Growth

While the trade-off as well as the pecking-order theory suggests a positive relationship between leverage and growth, the three variables under study provide opposite results. In specific, \( CAPEX \) (capital expenditures), \( OPEX \) (operating expenditures) as well as \( G_TA \) (growth in assets) all exhibit a negative coefficient. Here, the notion of the agency theory can be validated, suggesting that growth is inversely related to debt financing of firms. Consequently, **Hypothesis 7, Hypothesis 7.1, Hypothesis 7.3** and **Hypothesis 7.4** can be confirmed.\(^{818}\)

8.3.2.7 Industry

In order to test how peer companies influence the leverage decision of companies, two variables have been constructed. However, the variable \( INDUST_G \) has not been selected in the regression analysis due to the information criterion test in Chapter 8.2.1. Hence, only the variable \( INDUST_LEV \) has been applied in our study. Basically, it can be argued, that companies being embraced in a highly levered industry tend to carry more leverage. This variable is by far the most materially significant variable, compared to the other positive factors.\(^{819}\) This outcome is not surprising since firms within the same industry often face the same environmental as well as political forces. The result is in line with idea of the trade-off theory, suggest-

\(^{818}\) Hypothesis 7.2 cannot be tested due to the omission of the variable \( G_REV \) in regard to the factor selection analysis in Table 8.16 in Chapter 8.2.1.

\(^{819}\) See Figure 8.1.
ing that companies with lower financial distress costs increase their debt financing, which in turn are mimicked by its competitors. Hence, Hypothesis 8.1 must be confirmed.\textsuperscript{820}

8.3.2.8 Risk

The result of the debt factor RISK in Table 8.17 stays in stark contrast to the previous academic findings.\textsuperscript{821} In our regression analysis, the standard deviation of growth rate of operating profit (business risk) is associated with an increase in leverage.\textsuperscript{822} Hence, Hypothesis 9 must be rejected.

8.3.2.9 Tax Rate

Surprisingly, the debt factor NDT5 (non-debt tax shields) exhibits a positive impact on debt financing, which is in line with empirical studies of Bradley et al. (1984), Boquist and Moore (1984) and Harris and Raviv (1991).\textsuperscript{823} Hence, Hypothesis 10.2 must be rejected. Our result stays in contrast to the main idea of the trade-off theory, which suggests that non-debt tax shields should rather lead to a decrease in debt financing. The other explanatory variable TAX has been excluded in the study due to the information criterion test conducted in chapter 8.2.1. Thus, Hypothesis 10.1 cannot be tested.

8.3.2.10 Financial Constraints

The results in Table 8.17 show that dividend-paying companies tend to have more leverage than non-payers. This result is in line with the notion of the pecking-order as well as the signaling theory. Regarding the pecking-order theory, firms pay

\textsuperscript{820} Hypothesis 8.2 could not be tested due to the omission of the variable INDUST_G.

\textsuperscript{821} For an overview of the academics dealing with leverage and business risk, refer to Table 8.9 in Chapter 8.1.9 in this dissertation.

\textsuperscript{822} While the value is strong statistically significant, the material effect is rather weak.

\textsuperscript{823} Other studies have found an inverse relationship between NDT5 and leverage. See Table 8.11 in Chapter 8.1.10 in this dissertation.
out dividends in form of cash that could have been otherwise used for internal capital expenditures. Hence, these firms need to make use of external financing in case of financing needs. According to the signaling model, firms signaling their ability to pay out dividends do so in order to reap the positive feedback from the capital market. In essence, only firms that will be profitable in the future decide to pay dividends, implying larger holdings of leverage. Thus, Hypothesis 11.1 can be confirmed.

Hypothesis 11.2 postulates that loss incurring companies tend to issue more leverage than non-loss incurring firms. In specific, firms that incur losses do not decrease their debt financing, as it is believed according to the trade-off theory. However, the result shows that firms facing losses do make use of even more leverage, which is in line with the pecking-order theory. Hence, Hypothesis 11.2 can be confirmed.

Companies facing larger risk of bankruptcy tend to issue less debt, compared to firms that face lower distress costs. The result shows that the variable Z\_SCORE is slightly negative, suggesting that firms indeed make use of lower levels of leverage when bankruptcy is apparent. This result is in line with the view of the trade-off theory. Thus, Hypothesis 11.4 can be confirmed.

8.3.2.11 Macroeconomic Variables

The only macroeconomic variable tested in the leverage decision of firms is the factor INFLATION. In line with the notion of the market-timing as well as trade-off theory, the results in Table 8.17 show that an increase in inflation is associated with an increase in debt financing. Hence, Hypothesis 12.1 can be confirmed.\textsuperscript{124}

\textsuperscript{124} Due to the fact that the variables GDP, NBER and TBILL fail to meet the VIF criterions, leading to exclusion in our regression analysis, Hypothesis 12.2, Hypothesis 12.3 and Hypothesis 12.4 cannot be tested.
8.3.2.12 Summary

Twenty variables have been tested in order to find out which factors do have an impact on the firm’s leverage decision. Out of these debt determinants, 17 factors exhibit strong statistical significance.

The following focal findings can be drawn from the debt factors exhibiting a positive impact on the leverage decision of firms:\textsuperscript{825}

- Firms in industries in which the median firm employs large amounts of debt tend to have high leverage.
- Firms that face large non-debt tax shields tend to have more leverage.
- Firms that employ tangible assets in form of accounts receivables tend to issue more leverage.
- Firms that incur losses tend to make use of more debt financing.
- The bigger a firm the more leverage it employs. In specific, the more mature a firm is and the more assets it holds the more leverage the firm tends to have.
- When inflation is anticipated to be high firms tend to have high levels of leverage.
- Firms that pay dividends tend to have more leverage than non-payers.

Based on the debt factors exhibiting a negative impact on the leverage decision of firms, the following chief findings can be drawn:\textsuperscript{826}

- Profitable firms tend to have less leverage than non-profitable companies.
- Firms that have large amounts of cash tend to have less leverage.
- Firms that are exposed to large amounts of capital expenditures tend to have less leverage.

\textsuperscript{825} The findings are listed according to their material significance. Hence, the impact of the peer groups tends to exhibit the highest positive material effect on the leverage decision of firms.

\textsuperscript{826} The findings are listed according to their material significance. Hence, the impact of profitability tends to exhibit the highest negative material effect on the leverage decision of firms.
• Firms that have more intangible assets tend to make use of less debt financing.
• Firms that have a high market-to-book ratio tend to have less leverage.

8.3.3 Cross-Sectional Results

The aim of differentiating between various industries in our sample is to detect possible cross-sectional variations in the effect of certain debt factors. The following cross-sectional analysis attempts to provide answer to the second research question under study: *Are certain debt factors dominant in some industries, yet unimportant elsewhere?*

Table 8.17 depicts the results of the cross-sectional analysis. The results show that the importance of various debt factors diverges in different business industries. The following sub-chapters provide cross-sectional results on the different debt factors under study.

8.3.3.1 Size

Figure 8.2 shows how the two different explanatory variables *AGE* and *TA* behave within the nine diverse industries. The variable *TA* seems to exhibit the strongest material significance in all industries, while *AGE* is only marginally important. While the independent variables exhibit a positive relationship in some industries, the opposite can be detected in others. Hence, the size effect does not ultimately lead to an increase in debt financing, as it has been detected in our sample regression results in Chapter 8.3.2. In particular, the following results can be drawn:
• Firms in the industrial, consumer discretionary, information technology and utility sector, tend to employ more leverage the older and bigger they are.

• Mixed results can be found for firms in the consumer staples, materials as well as energy sector. Here, the variables AGE and TA do not converge in respect to the coefficient sign.

• Referring to the statistical significance, the variable TA is statistical significant in the telecommunication, industrial, consumer discretionary and information technology sector. The other explanatory factor AGE exhibits statistical significance in the telecommunication, industrial, health care, and consumer discretionary industry.827

The findings mentioned above show that Hypothesis 13 needs to be confirmed.

827 For numerical results, see Table 8.17.
8.3.3.2 Value

It has been predicted that high valuation is associated with a decrease in debt financing. Figure 8.3 depicts the results of the three different explanatory variables. Interesting to note is the fact that the factor $MB$ has the strongest material significance, implying that this variable seems to be most important in the debt decision of companies. The other two variables $PRICE_{SALES}$ as well as $PRICE_{BOOK}$ are only marginally important. The following results can be retrieved:

- In general, it can be argued, that high valuation leads to a reduction in leverage financing.
- In particular, market-to-book ratio has an inversely relationship to leverage for companies in the industrial, health care, consumer discretionary, consumer staples, utilities, materials as well as energy sector. In addition, these results also have strong materially significance.
- The result for the variable $PRICE_{SALES}$ is in line with $MB$. In most industries, an increase in $PRICE_{SALES}$ leads to a decrease in leverage, as can be observed for firms in the industrial, health care, consumer discretionary, information technology, utilities and energy sector.
- Only the variable $PRICE_{BOOK}$ exhibits rather mixed results. In specific, only in the telecommunication as well as health care sector does the variable exhibit a negative relationship to leverage. However, it must be noted, that the coefficients are only marginal and therefore lack materially significance.
- The variable $MB$ exerts strong statistical evidence in the health care, consumer discretionary, consumer staples, utilities, materials and energy sector. Statistically significant are the results for the variable $PRICE_{SALES}$ for firms in the industrial, health care, consumer discretionary, information technology, utilities, and energy sector. Finally, the explanatory variable
PRICE\_BOOK is only statistically significant for companies in the industrial, information technology, utilities, and energy business.\footnote{828}

The results have demonstrated that the value effect seems to exhibit a consistent pattern across the different business segments. In essence, it has been shown that overvalued firms tend to have less leverage compared to undervalued firms. Hence, Hypothesis 14 must be rejected.

Figure 8.3: Value

8.3.3.3 Tangibility

While the sample results in Chapter 8.3.2 have shown that account receivables lead to an increase in leverage and intangible assets lead to a decrease in debt financing, the cross-sectional results are rather mixed.\footnote{829} In line with the findings of our

\footnote{828} For numerical results, see Table 8.17.

\footnote{829} The impact of the nature of assets on the leverage decision of firms cannot be tested due to omission of the independent variables. Hence, Hypothesis 15 cannot be validated.
sample analysis, the variable \( AR \) has the strongest material significance, compared to \( INT\ANG \).

Referring to Figure 8.4, the following main results can be detected:

- Tangibility is positively related to debt financing only for firms in the industrial, consumer discretionary, consumer staples, information technology, and utilities sector.

- In the industrial, consumer discretionary, information technology, utilities, materials, and energy sector, firms tend to issue less leverage when intangible assets are large.

- Strong statistical significance for the variable \( AR \) can be found in all industries, except in the telecommunication, consumer staples, utility, and energy sector. \( INT\ANG \) is statistically significant in all industries, except in the telecommunication and health care sector. \(^{830} \)

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\(^{830}\) For numerical results, see Table 8.17.
The mixed cross-sectional results of the tangibility effect on the leverage decision of firms leads to the fact that **Hypothesis 16** needs to be confirmed. Thus, the tangibility effect does not seem to be consistent across industry.

### 8.3.3.4 Liquidity

While *CASH* is negatively and *WC* positively related to leverage in the sample analysis, this does not necessarily apply to the different business segments in Figure 8.5. However, the reciprocal effect remains in almost all industries. It is interesting to discover, that some variables are materially important in one industry, while they exhibit only marginal importance in the other.

In essence, the following findings can be drawn:

- The more cash a firm possesses the less leverage it tends to employ. This accrues to firms in the telecommunication, health care, consumer staples, and materials sector.
- *WC* is positively related to debt financing only for companies in the telecommunication, health care and utility industry.
- *CASH* exhibits only weak statistical significance in most of the industries under study. Only for firms in the health care and consumer staples industry are the results statistically significant. *WC* is statistically significant for firms in the industrial, health care, consumer discretionary, information technology, and materials business segment.\(^{851}\)

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\(^{851}\) For numerical results, see Table 8.17.
The diffuse cross-sectional results of the liquidity effect on the capital structure decision of industries prompts to confirm Hypothesis 17.

8.3.3.5 Profitability

Mixed results can be found regarding the explanatory variable PROF. While in the sample, profitability is associated with a decrease in debt financing, this finding accrues only to some of the business segments. The following main results can be found according to Figure 8.6:

- Profitable firms in the telecommunication service, consumer discretionary, information technology, and energy sector tend to employ less leverage than non-profitable firms.
- Firms in the industrial, health care, consumer staples, utilities, and materials business segment tend to have high leverage when they are profitable.
- Especially strong material significance can be found for firms in the consumer discretionary as well as consumer staples industry.
• PROF is statistically significant in all industries, except in the telecommunication, industrial and health care industry.932

![Figure 8.6: Profitability](image)

Due to the undeniable fact that the debt factor fails to exert a consistent effect on the different business segments, Hypothesis 18 needs to be confirmed.

8.3.3.6 Growth

Different results for the various industries can be found in Figure 8.7. While in the sample regression study all three proxies are negatively related to leverage, the results of the cross-sectional analysis fail to provide similar results. Furthermore, interesting to notice is the fact that the variable CAPEX seems to exhibit the

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932 For numerical results, see Table 8.17.
strongest effect on the leverage decision of firms. The growth in assets seems to be rather marginally relevant due to its relatively low coefficient value.

Basically, the following findings can be observed:

- In seven out of nine industries growth, measured in terms of capital expenditures, feature a negative relationship to debt financing.\textsuperscript{833}
- However, the results of the variable \textit{OPEX} diverge with \textit{CAPEX}. In particular, companies facing large operating expenditures tend to increase their leverage in industries such as health care, consumer staples, information technology, utilities, materials, as well as energy sector.
- While the variable \textit{G_TA} is mostly negatively related to leverage for the various industries, it shows only weak material significance.
- In particular, firms in the energy sector tend to make use of more leverage, when their growth seems to be high. All three variables exhibit a positive relationship.
- Referring to the statistical significance of the explanatory variables, \textit{CAPEX} shows strong statistical significance for firms in the industrial, health care, consumer discretionary, information technology, and energy business unit. \textit{OPEX} has very strong statistical power in all industries, except in the telecommunication service business segment. In contrast, the explanatory variable \textit{G_TA} exhibits only statistical significance in the telecommunication, consumer discretionary, and consumer staples industry.\textsuperscript{834}

\textsuperscript{833} Only the telecommunication and energy industry exhibit a positive relationship with leverage.
\textsuperscript{834} For numerical results, see Table 8.17.
Based on the results mentioned above, **Hypothesis 19** must be confirmed.

8.3.3.7 Industry

While the sample regression results have indicated that firms competing in industries in which the median firm has high leverage tend to possess higher levels of debt ratio, cross-sectional results in Figure 8.8 differ in that respect. In specific, the independent variable `INDUSTRY_LEV` exhibits mixed results and does not necessarily conform to the notion of the trade-off theory.

The following three results are worth mentioning:

- Only firms in the telecommunication service, industrial, information technology, utility, and materials industry employ more debt financing when the median firm in their industry has a high amount of leverage.
- In contrast, firms that observe large amounts of leverage of their peers, tend to diminish their debt financing in the health care, consumer discretionary, consumer staples, as well as energy sector.
The variable exhibits relatively weak statistical significance. Only the values in the consumer discretionary, consumer staples and information technology business segment possess statistical significance.

Cross-sectional results in Table 8.17 show that the industry effect seems to exert a positive as well as a negative impact on the leverage decision of firms, depending on the industry under study. Hence, **Hypothesis 20** must be confirmed.

### 8.3.3.8 Risk

While sample regression results have detected a positive impact of the debt factor \( \text{RISK} \) on leverage, mixed results can be found in Figure 8.9 for the cross-sectional regression analysis. The main observations regarding the impact of \( \text{RISK} \) on the leverage decision of firms are as follows:
Firms in the telecommunication sector tend to have less leverage when the standard deviation of their profit growth seems to be rather high. This result employs the strongest material effect compared to the other business industries. The same inverse relationship between RISK and leverage also applies to firms in the health care, materials, and energy sector.

In contrast, firms competing in the industrial, consumer discretionary, consumer staples, information technology and utility business sector are characterized by possessing more leverage when the debt factor RISK increases.

Regarding the variable’s statistical significance, it can be concluded, that in all industries, except in the health care and consumer staples, the results exhibit strong statistical power.\textsuperscript{835}

Based on the results mentioned above, \textbf{Hypothesis 21} must be confirmed.

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{figure89.png}
\caption{Risk}
\end{figure}

\textsuperscript{835} For numerical results, see Table 8.17.
8.3.3.9 Tax Rate

Sample regression results have revealed that non-debt tax shields exhibit a positive impact on the leverage decision of firms. Furthermore, it has been shown that the debt factor $N_DTS$ has the second strongest positive material effect on the capital structure decision of firms. However, according to the cross-sectional results in Figure 8.10 a uniform impact of $N_DTS$ on leverage cannot be detected. Basically, the main findings in Table 8.18 in are as follows:

- Firms in the telecommunication service, industrial, consumer discretionary, consumer staples, and information technology industry are characterized by higher leverage when non-debt tax shields increase.
- In contrast, $N_DTS$ and leverage are inversely related for firms in the health care, utilities, materials, and energy sector.
- The results are statistical significant in the consumer discretionary, information technology, utilities, materials, and energy sector.

Figure 8.10: Tax Rate

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856 See Figure 8.1 in Chapter 8.3.2 in this dissertation.
In five industries, NDTS exhibits a positive impact on the leverage decision of firms, which is in line with sample regression results. However, in four industries the same debt factor exerts an inverse relationship, suggesting that a consistent tax effect is missing across industry. Thus, Hypothesis 22 must be confirmed.

8.3.3.10 Financial Constraints

Three variables have been tested in order to see how financial constraints might impact the leverage decision of firms. Sample regression results have shown that dividend paying firms tend to have larger amounts of leverage compared to non-payers. The positive impact on leverage has also been detected for loss making firms. In other words, firms incurring losses tend to have higher levels of leverage compared to firms that experience profits. The debt factor Z_SCORE exhibits a negative relationship to the leverage decision of firms. Referring to the cross-sectional results, only the variable Z_SCORE exerts a consistent negative impact in all industries (Figure 8.11).

In essence, the following results are worth mentioning:

- Firms that pay dividends in the telecommunication, health care, information technology, and energy sector, tend to have more leverage than non-payers.
- Especially material strong results can be found for the variable DIV in the telecommunication as well as health care sector.
- Firms incurring losses tend to have more leverage in industries such as industrial, health care, consumer staples, information technology, utilities, materials, and energy business unit.
- Firms facing high probability of bankruptcy tend to employ less leverage, compared to those of lower distress costs. This applies to all industries.
- The Z_SCORE exhibits strong statistical significance in all industries, except in the telecommunication service sector. The explanatory variable DIV also exhibits strong statistical power in all industries, except in the
utility industry. Finally, LOSS only embodies statistical significance for firms in the industrial, consumer staples, and materials industry.\textsuperscript{837}

Due to the fact that the debt factor $Z_{\text{SCORE}}$ provides a uniform effect on leverage in all nine industries and that the factor LOSS exhibits a consistent positive impact in six industries, \textbf{Hypothesis 23} must be rejected. Thus, a consistent impact of financial constraints on the leverage decision of firms does exist.

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{figure811.png}
\caption{Financial Constraints}
\end{figure}

\subsection*{8.3.3.11 Macroeconomic Variables}

The only variable testing macroeconomic impact on the leverage decision of firms is \textit{INFLATION}. Sample regression results have shown that firms will issue large amounts of leverage when inflation is expected to be high. Referring to Figure 8.12 the following results can be drawn:

\textsuperscript{837} \textsuperscript{837} For numerical results, see Table 8.17.
• When inflation is anticipated to be high, firms in the telecommunication sector, industrial, health care, consumer discretionary, consumer staples, information technology, and materials sector tend to have higher leverage.

• Statistical significant results can be found in the telecommunication service, industrial, consumer discretionary, consumer staples, information technology and utility business sector.

It has been shown that inflation exhibits a positive impact on the capital structure decision in seven out of nine industries under study. Based on this finding, Hypothesis 24 must be rejected.

8.3.3.12 Summary

Chapter 8.3.3 deals with a cross-sectional analysis that has been conducted to provide an answer to the second research question. In essence, most of the debt factors do exhibit different effects in different industries. Only the value effect, the
financial constraint effect and inflation exert a uniform effect in the various business segments. Nevertheless, the results in Table 8.17 have shown that certain debt factors are dominant in some industries, while unimportant elsewhere. Hence, the second research question must be affirmed.838

8.3.4 Calendar-Time Results

The following chapter deals with the third research question: Are certain debt factors only temporarily important in the leverage decision of firms or do they exhibit a consistent effect over time?

In order to provide an answer to this research question a multivariate regression analysis of the sample will be conducted. Table 8.18 in Appendix D delivers an overview of the results, differentiating between three time periods.839 The main reason for conducting such a calendar-time analysis is basically to find out, whether or not certain debt factors have changed over the years regarding their importance and impact on the leverage decision of firms.

8.3.4.1 Sample Results

Figure 8.13 provides a graphical representation of the development of the different capital structure determinants of the whole sample. Changes in their coefficients and hence, in their impact on the leverage decision can be detected. The following interesting findings can be made:

First, referring to the size effect on the leverage decision of firms, our results in Chapter 8.3.2 have shown that in general, bigger and older firms are associated with larger amounts of leverage. While calendar-time results show that the positive impact

838 The second research question is as follows: Are certain debt factors dominant in some industries, yet unimportant elsewhere?
839 As can be seen, Panel A shows the results for the time period 1990-1995, Panel B for 1996-2001, and Panel C represent the results for 2002-2008.
of the two variables \( TA \) and \( AGE \) is still permanent, the material importance has faded away. Figure 8.13 shows that the size effect becomes materially less significant over time. Both variables, \( TA \) and \( AGE \), experience a harsh decrease in coefficient value within the three different time periods.\(^{840}\) Hence, our study claims, that the size effect over time has diminished, implying that size might fail to embody material importance for the leverage decision of firms in the future. However, the results also show that the positive impact of the size effect on the leverage decision of firms remains the same throughout the three different time periods. Hence, Hypothesis 25 can be confirmed.

Second, changes of material significance can also be observed for the value effect. Figure 8.13 shows that the market-to-book ratio loses significance during the time period 1996-2001, culminating with the burst of the dot.com bubble. However, the \( MB \) variable has gained material significance in recent years. However, a general change in the value effect based on the market-to-book ratio cannot be found. The two other explanatory variables \( PRICE\_SALES \) and \( PRICE\_BOOK \) show that especially for the time period 2002-2008 the value effect gains strong importance and relevance in the leverage decision of firms. However, Figure 8.13 also illustrates that the negative impact of the value effect on leverage maintains throughout the years. Thus, Hypothesis 26 can be confirmed.

Third, due to the fact that all explanatory variables controlling for the effect of the nature of assets on the leverage decision of firms are omitted, Hypothesis 27 cannot be tested.\(^{841}\)

Fourth, the results in the sample regression in Table 8.17 in Chapter 8.3.2 have proven that tangibility has a positive effect on debt financing, while intangibility exhibits the opposite. Referring to the calendar-time results, the positive relationship

\(^{840}\) Table 8.18 in Appendix D represents the exact coefficient values and their corresponding t-value. While, the independent variable \( TA \) has strong statistical power throughout the three different time intervals, the other variable \( AGE \) lacks statistical significance.

\(^{841}\) See Chapter 8.2.
between the amount of accounts receivables (AR) and the amount of leverage a 
firms holds stays the same. However, the impact of the debt factor INTANG on the 
leverage decision of firms seems to alter over time. While during the time period 
1990-1995 intangibility exhibits a positive relationship to leverage, the time interval 
1996-2001 and 2002-2008 shows that INTANG has a negative relationship to lever-
age. Hence, a significant change can be detected for the independent variable IN-
TANG. Based on the findings mentioned above, Hypothesis 28 must be rejected.

Fifth, the liquidity effect seems to be consistent throughout the time periods. In 
specific, the variable CASH exerts a negative relationship with leverage, suggesting 
that the more cash a firm carries, the less leverage it tends to employ. Despite the 
fact that the material importance changes significantly over the three time frames, 
the negative impact maintains. A similar development can be detected for the vari-
able IPC. While materially strong significant in the years 1990-1995, the positive im-
 pact on leverage diminishes since the year 1995. However, the positive impact of 
working capital on the leverage decision of firms sustains. If working capital increas-
es in a company, its cash is tied up in ongoing processes and hence cannot be used 
for internal capital, as suggested by the pecking-order theory. The calendar-time 
results are in line with the sample regression results, implying that liquid firms are 
associated with less leverage compared to non-liquid ones. Thus, Hypothesis 29 
can be confirmed.

Sixth, the influence of profitability on the leverage decision of firms continues 
to be negative. Furthermore, the material importance of this debt factor has in-
creased over the years. Based on this rationale, Hypothesis 30 can be confirmed. 
Figure 8.1 has shown that profitability seems to the most important factor negatively 
influencing the debt decision of firms. The graphical depiction in Figure 8.13 shows 
that profitability even gained in importance in recent years. Thus, it can be argued 
that the profitability effect is one of the most important debt factors.

Seventh, Figure 8.13 shows that the growth effect on the leverage decision has 
been exposed to severe changes throughout the years. In specific, for the time peri-
od 1990-1995 all three variables exhibit a positive coefficient, implying that during this time, growth has been positively related to debt financing. However, since then, the tree variables tend to show an inverse relationship to leverage. The results for the time period 1996-2001 and 2002-2008 have shown that growth oriented firms are associated with less debt compared to non-growth oriented ones. Thus, a consistent growth effect throughout the years under study fails to be detected and therefore **Hypothesis 31** needs to be rejected.

Eighth, in line with the sample regression results, Figure 8.13 displays the positive impact of the industry effect on the leverage decision of firms. While the positive effect maintains throughout the three different time periods, the material importance diminishes. Nevertheless, the consistent positive industry effect on debt financing leads to the fact that **Hypothesis 32** must to be confirmed.

Ninth, the sample results have shown that the explanatory debt factor **RISK** exhibits a positive relationship to debt financing, implying that an increase in the standard deviation of growth rate of operating profits is associated with an increase in leverage. However, the calendar-time results provide different results. While within the two time frames 1996-2001 and 2002-2008 **RISK** is positively related to leverage, the explanatory variable exhibits an inverse relationship to debt financing in the years 1990-1995. Thus, the risk effect on the leverage decision of firms is not consistent and uniform throughout the years, resulting in the rejection of **Hypothesis 33**.

Tenth, the tax effect, controlled by the variable **NDTV**, stays positive throughout the three different time frames. Hence, **Hypothesis 34** can be confirmed. However, the most interesting finding here is the undeniable fact that the material importance of this debt factor experiences a harsh decline within the years. While for instance the coefficient of **NDTV** was on average approximately 0.8 in the years 1990-1995, the coefficient reached less than 0.1 in the years 2002-2008.
Eleventh, while the debt factors LOSS and ZSCORE exhibit the same effect throughout the years from 1990-2008, DIV fails to have a consistent pattern. In specific, during the years 1990-1995 dividend paying companies employed less debt compared to non-payers. This trend, however, altered slightly, reaching a marginal positive relationship in the years 1996-2001 and increasing thereafter. Based on the inconsistent effect of dividends on the leverage decision, Hypothesis 35 must be rejected.

Finally, Figure 8.13 shows the development of the variable INFLATION, which maintains its positive effect on debt financing. Thus, when inflation is anticipated to be high, firms tend to have more leverage. This trend has gained momentum and material significance throughout the years. Thus, Hypothesis 36 must be confirmed.
Figure 8.13
Development of Capital Structure Determinants - Sample
The figure shows the development of the different independent variables under study, being divided into three time periods. The first time period last from 1990-1995, the second from 1996-2001 and the third from 2002-2008. The y-axis represents the coefficient estimate of the OLS regression.
Figure 8.13, continued
Development of Capital Structure Determinants - Sample
8.3.5 Determinants of Bond and Loan Issues

While the previous results have focused on the determinants of leverage in general, Chapter 8.3.5 will scrutinize which debt factors influence the issuance of bonds and loans in specific. In essence, the main goal of the following chapter is to provide an answer to the fourth research question under study: *Which debt factors determine the bond and loan decision of firms?*

Compared to the results where book leverage has been applied as the dependent variable, many explanatory variables in Table 8.19 in Appendix E exhibit relatively low statistical power when regressed against the variable *LOANS* or *BONDS*.

8.3.5.1 Sample Results

Figure 8.14 depicts the debt factors that exhibit statistical significance, differentiating between bonds and loans as the dependent variable. The results will be compared to the sample results mentioned in Chapter 8.3.2, in which book leverage has been applied as the dependent variable.842

In a first step, it will be scrutinized which debt factors influence the decision of a firm to make use of loan financing.843 In specific, seven variables exert statistical significance, whose effect sometimes differs from the leverage results. Based on Figure 8.14, the following results are worth mentioning:

- Firms in industries in which the median firm has high level of leverage tend to have larger amounts of loans. This result is in line with the leverage results.
- The more growth options a firm faces (measured by the two variables *CAPEX* and *G_TA*) the more loans the firm tends to hold. This result diverges with the findings in the leverage decision.

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842 Throughout Chapter 8.3.5 the expression “leverage results” refer to the sample results in Chapter 8.3.2. Here, book leverage serves as the dependent variable.

843 The same 20 independent variables are included in this regression analysis as shown in Table 8.1.
• Dividend-paying firms tend to engage in more loan financing compared to non-payers. This result is in line with the leverage decision.
• Firms incurring losses tend to have larger levels of loan financing compared to firms without losses. This result also converges with previous results on the leverage decision of firms.
• The variable INDUST_LEV and CAPEX exhibit strong material power and seem to be the most important loan factor.

Figure 8.14: Significant Debt Factors - Sample

• Profitable firms tend to make use of less loan financing compared to non-profitable ones. The inverse relationship has also been found in the leverage decision. Profitability exhibits strong material significance and seems to be the most significant factor in the loan decision of firms.
• Cash-rich firms tend to have lower levels of loan financing. This finding is in line with the leverage results. Similar to the variable PROF, CASH exhibits strong material significance.
• In line with the results of the leverage decision, the value effect also features a negative effect on the dependent variable. Specifically, the higher the market-to-book ratio of a firm the less loans the firm tends to hold.

• The size effect, proxied by \( TA \), is also negatively related to the loan decision of firms. This finding stays in contrast to the leverage decision of firms.

In a second step, the factors that have a statistically significant impact on the bond decision of firms will be analyzed. In total, nine factors are statistically significant. However, these factors seem to have much smaller material effect compared to the loan results. The following findings can be drawn from Figure 8.14:

• In line with the results of the leverage and loan results, \( INDUST\_LEV \) exhibits a positive relationship. In specific, firms competing in industries in which the median firm has high level of leverage tend to have larger amounts of bonds.

• The more growth options a firm faces (measures by the two variables \( CAPEX \) and \( G\_TA \)) the more bonds the firm tends to hold. This finding converges with the result of the loan results, but not with the leverage results.

• Firms incurring losses tend to have larger amount of bonds compared to firms not exposed to losses. This result is in line with the leverage decision of firms.

• Meeting loan and leverage results, dividend-paying firms also make use of more bond financing compared to non-payers.

• The size and the value effect both exhibit a negative effect on the bond decision. In specific, the bigger a firm the fewer bonds it tends to hold. In a similar vein, the higher the market-to-book ratio of a firm the less bonds the firm tends to issue. While the results of the value effect are in line with the leverage and loan results, the size effect contradicts the leverage results.
The more cash a firm holds the fewer the amount of bonds the firm tends to employ. This result is in line with the loan and leverage results.

The effect of non-debt tax shields seems to exhibit the strongest material effect in the bond decision. Fundamentally, an increase in non-debt tax shield is associated with less bond financing. This finding is not in line with the leverage results.

Profitable firms tend to issue less bonds compared to non-profitable firms. This finding is in line with loan and leverage results. However, the material significance is rather low compared to the impact of the loan decision.

Sample results have shown that different factors exert a significant impact on the bond/loan decision compared to the debt factors determined in Chapter 8.3.2 Thus, Hypothesis 37 must be rejected.

8.3.5.2 Cross-Sectional Results

The following abstract deals with the cross-sectional regression analysis, scrutinizing the different set of debt factors that might have an influence in the bond and loan decision of firms (Table 8.19 in Appendix E).

While a regression analysis in the telecommunication sector cannot be conducted due to lack of observations, most of the independent variables in the industrial sector fail to possess statistical power. In essence, the dependent variable BONDS and LOANS are mainly exposed to a different set of significant debt factors.\(^{544}\) Referring to the dependent variable LOANS, only three out of 20 explanatory variables exhibit statistical significance. The strongest material effect on the loan decision is derived from the explanatory variable NDTS, exhibiting an inverse relationship to the amount of loans. Further, the bigger a firm (proxied by T/A) the less loans the firm will employ. Finally, RISK is associated with an increase in loan financing.

\(^{544}\) Only the variable T/A exhibits in both regressions a negative relationship.
which is in line with previous results. Basically, while NDT3 experiences the strongest material effect on the loan decision, the variable TA exhibits the biggest statistical power.845

The results in Figure 8.15 show that TA is the only significant explanatory variable that both dependent variables have in common. Next to TA, three other variables exhibit statistical power in the regression, in which BONDS serve as the dependent factor. The biggest impact on the bond decision seems to have the variable INTANG. Here, a positive relationship between intangibility and bond issues can be detected. A negative impact on bond financing can be expected through an increase in INFLATION. The same applies to the independent variable Z_SCORE. In line with the results of the dependent variable LOANS, the strongest statistical power of the variables has been achieved by TA.

![Figure 8.15: Significant Debt Factors - Industry](image)

In contrast to the previous results, the multivariate regression analysis for the health care industry shows a much larger amount of significant debt factors (Figure

845 See Table 8.17.
In specific, for the dependent variable $BONDS$, eight variables have statistical power, while ten factors are statistically significant for $LOANS$. Again, the variable $NDTS$ reveals the strongest material significance, showing a negative relationship to loan financing. The second strongest impact seems to have the debt factor $CAPEX$, which shows a positive relationship to the loan decision. The variables $PROF$ and $W/C$ also exhibit materially significant positive results. Minor material importance accrues to the variables $Z\_SCORE$ $($,$), $TA$ $($,$), $INTANG$ $($,$), $RISK$ $($,$), $PRICE\_SALES$ $($,$)$, and $PRICE\_BOOK$ $($,$)$.

Referring to $BONDS$ as the dependent variable, $NDTS$ also exhibits the strongest material effect, however in the opposite direction (Figure 8.16). Here, non-debt tax shield is positively related to bond issue. $CASH$ features a negative impact on firms’ decision to issue bond. Referring to $LOAN$ as the dependent variable it can be found that $PROF$ $($,$)$, $W/C$ $($,$)$, and $TA$ $($,$)$ exert a significant impact. Only minor impact on bond financing exhibits $INFLATION$, $PRICE\_SALES$ and $G\_TA$, which all have a positive effect on bond financing.

146 The sign in brackets show the effect of the variable on the dependent variable.
Figure 8.16: Significant Debt Factors - Health Care

Figure 8.17 addresses multivariate regression results on the consumer discretionary industry. Referring to LOANS as the dependent variable, a total of eight explanatory variables are statistically significant. Also, the standard deviation of the growth rate of operating profit seems to have a relatively significant influence on loans. Here, an increase in the variable RISK is associated with an increase in loan financing. Next to these two variables, the two debt factors Z_SCORE and OPEX are positively related to the dependent variable. The materially strongest negative impact seems to have the variable CASH. In specific, the more cash a firm holds in the consumer discretionary industry, the less loans it tends to employ. Furthermore, the two variables MB and PRICE_SALES are inversely related to loans. Finally, Figure 8.17 shows that PROF and TA also bear a negative impact on the loan decision of firms. In specific, profitable firms tend to engage in fewer loan financing. The same reasoning applies to the size of a firm. The bigger a firm the less loans a firm tends to employ.
According to the regression in which BONDS serve as the dependent variable, a total of 12 variables feature significant statistical power. CASH also seems to be the most relevant and significant bond factor, exhibiting a negative relationship. The liquidity effect is complemented by the negative exposure of WC, which is in line with the results of the leverage decision. Next, the growth effect (proxied by OPEX and G.TA) seems to bear a positive impact on bond issue. Other minor positive related explanatory variables are LOSS, AR, AGE, RISK, and PRICE_BOOK. Inversely related are WC, TA and MB, which exhibit only a marginal material effect.

Figure 8.17: Significant Debt Factors - Consumer Discretionary

Figure 8.18 shows the significant debt factors for bonds and loans in the consumer staples industry. Profitability seems to have a relatively strong positive effect on both, the bond and loan decision. However, the materially strongest impact on loan issue accrues to the variable CAPEX, being inversely related to loans. The debt factors CASH, LOSS, DIV, Z_SCORE, and TA also exhibit a negative relationship. Consequently, the only positive effect on loan issue derives from the variable PROF. In other words, profitable firms tend to issue more loans, than non-profitable ones.
Besides profitability, the growth of assets as well as the amount of inflation leads to an increase in bond issue. While the explanatory variables $Z_{SCORE}$ and $AGE$ are materially less significant, they are negatively related to bonds.

The next regression delves into the *information technology industry* (Figure 8.19). Referring to $LOANS$ as the dependent variable, only four explanatory factors are statistically significant. In specific, the liquidity as well as the size effect are the only debt factors that exert significant influence on the decision how much loans to issue. Especially the liquidity effect seems to appeal a strong material power on the loan decision of information technology companies. While $WC$ reveals a positive relationship, $CASH$ is inversely related to loans. Mixed results can also be found in the size effect. While tangible assets ($TA$) have a negative impact on loans, $AGE$ exhibits a marginally positive effect on loan financing.

According to Figure 8.19, $PROF$ seems to have the strongest positive effect on bond financing for technological firms. Hence, profitable firms tend to issue more
bonds, compared to non-profitable ones. Furthermore, firms incurring losses also tend to increase bond financing. The tangibility effect also exhibits a relatively strong material effect on bonds. As can be observed, tangibility (measured by $AR$) leads to an increase in bonds, while intangible assets ($INTANG$) exert a negative impact on the bond decision. While $G\_TA$ leads to a rise in bond issues, the size effect proxied by $TA$ and $INFL\_ATION$ has a negative impact on bonds.

![Figure 8.19: Significant Debt Factors - Information Technology](image)

Only a limited amount of debt factors are statistically significant for firms in the utility industry (Figure 8.20). In essence, $CAPEX$ is the biggest influential factor in the loan decision. To be more specific, growth leads to an increase in loans. $PRICE\_SALES$ and $TA$ exhibit a negative and positive relationship to loans, respectively. Referring to $BONDS$ as the dependent variable, five explanatory variables exhibit statistical significance. All significant debt factors, except $AGE$, are inversely related to bonds. Especially, working capital ($WFC$) seems to offer the strongest material effect, followed by the variables $LOSS$, $DIV$, and $TA$. 
According to the regression analysis for firms in the material industry, \textit{INDUST\_LEV} seems to exhibit the strongest material impact on the loan decision of firms (Figure 8.21). In essence, firms in industries in which the median firm has high leverage tend to have fewer loans. Also negatively related to the loan decision are the explanatory variables \textit{TA}, \textit{INFLATION}, and \textit{G\_TA}. Concerning \textit{BONDS}, profitability (\textit{PROP}) exhibits the strongest material power. In essence, profitable firms tend to make use of more bond issues. Same applies to dividend-paying firms and to firms with a high \textit{PRICE\_BOOK} value. Negatively related to the issue of bonds is the market-to-book ratio (\textit{MB}), as well as the amount of assets (\textit{TA}) and of operating expenses (\textit{OPEX}).
The last cross-sectional regression accrues to firms in the energy sector (Figure 8.22). Here, $INDUST\_LEV$ again appears to have the strongest material effect on the loan decision. Along with other variables, such as $TA$ and $MB$, $INDUST\_LEV$ exhibits a negative relationship to loan financing. The only positively related debt factors are the $Z\_SCORE$ and $PRICE\_SALES$.

Only four explanatory variables are considered to be statistically significant and have a materially significant impact on bonds. While the value effect implies a negative trend to bond issues, the amount of total assets also shows an inverse relationship. The amount of capital expenditure ($CAPEX$) and $RISK$ are the only two variables being associated with an increase in bond issue.
8.3.6 Determinants of Equity Issues and Share Repurchase Transactions

So far no empirical study exists in the academic world which studies a convolute of various factors that might exert a significant impact on the equity and share repurchase decision. In specific, our study is the first to offer an in-depth analysis, detecting the most relevant equity and share repurchase factors. Hence, answers to the following sub-research question needs to be found: *Which factors influence the equity issue and share repurchase decision of firms?* An OLS regression analysis is run in a similar vein to the previous studies. Table 8.20 in Appendix F delivers results on the diffuse determinants.

Figure 8.23 depicts those factors that exhibit statistical power. In essence, *eleven factors* do exhibit a statistical significant impact on the equity decision of firms. In specific the following main results can be retrieved:

- The growth effect, proxied by *CAPEx* and *G_TA*, exhibit a positive impact on the equity decision of firms. In other words, firms facing large
growth opportunities tend to engage in more equity issues. Thus, growth opportunities are often financed by means of equity financing. These results exhibit strong material power.

- Cash-rich firms tend to have larger levels of equity issues compared to firms with less cash flow available. This result exhibits the second strongest material effect and hence can be considered as one of the main factors in the equity decision of firms.
- In line with the notion of the market-timing effect, firms tend to engage in larger equity issues when the firm seems overvalued.
- Loss-making firms tend to have larger equity issue proceeds compared to non-loss firms. This finding is quite intuitive, since firms incurring losses are in need of additional financing. The result shows that firms in need of financing tend to engage in more equity issues.
- Profitability is inversely related to the equity decision of firms. Thus, the more profitable the firm, the less equities are issued. This result is also quite appealing.
- The size effect exhibits a negative relation to equity issues. The larger a firm the less it tends to issue. This finding is in line with previous results, where the size effect has been positively related to leverage. Thus, bigger firms tend to engage in more debt financing than equity financing.
- Inflation is negatively related to equity issues. The higher the anticipated level of inflation the lower the equity issue proceeds. This finding is in line with the results of leverage financing.
- Firms facing larger risk of bankruptcy tend to issue less equity, compared to firms facing lower distress costs. This result is in line with the leverage results. In essence, the higher the bankruptcy risk of firms, the lower the debt and equity issue proceeds.

According to share repurchases, a total of nine variables exhibit statistical power. The main results are as follows:
• Profitability seems to exhibit a significant material effect on the share repurchase decision of firms. In specific, it can be observed that profitable firms tend to engage more in share repurchase transactions. This finding seems plausible, since profitable firms tend to have the necessary capital in order to conduct such a transaction.

• In line with the previous result, Cash-rich firms are inclined to buy back shares in higher volumes compared to non-cash-rich firms. This finding is in line with the notion of the free cash flow hypothesis by Jensen (1976), suggesting that firms should make use of available cash flow in order to refrain from perk consumption.

• In line with the previous results and in contrast to the essence of the market-timing behaviour, overvalued firms also tend to tackle share repurchase in higher volume compared to undervalued firms. However, this factor is exhibits only marginal material importance in comparison to the other two variables PROF and CASH.

• NDTFS exhibits strong material effect on the repurchase decision of firms. In essence, the amount of non-debt tax shields a firm carries is inversely related to the amount of share repurchase a firm conducts.

• The tangibility effect, measured by AR, is negatively related to share repurchases. Thus, the more tangible assets a firm holds, the less it engages in share repurchases.

• Loss-making firms tend to have lower share repurchase transactions compared to non-loss-making firms. This finding is in line with the premise, that CASH and PROF play a significant positive impact on the repurchase decision of firms. Hence, firms need to be profitable and in lieu of massive cash available in order to stem possible share repurchase transactions.

• The size effect is negatively related to the share repurchase decision. Specifically, the variable TA and AGE exhibit a negative relation to share repurchases. Thus, the bigger a firm the less it tends to engage in share repurchases.
8.4 Conclusion

In essence, the goal of Chapter 8 is to offer answers to five research questions. To provide an answer to the question, a convolute of hypotheses have been developed that has been tested by running several OLS regressions. The subsequent results are worth mentioning:

1. Size, tangibility, industry leverage, operating risk, non-debt tax shields, dividends, loss and inflation do have a positive impact on the leverage decision of firms. In specific, the factor industry leverage seems to be the most materially significant debt factor, followed by tax- and tangibility effects.

2. Liquidity, measured in cash terms, value, profitability, growth opportunities and bankruptcy risk are associated with a decrease in leverage. Specifically,
profitability seems to be the most important debt factor, followed by the liquidity effect.

3. Different debt factors have an influence of the capital structure decision of firms in various industries. However, the value effect, loss and bankruptcy risk as well as inflation do exert a consistent impact on a firm’s leverage decision across various industries.

4. Most of the debt factors are consistent over time. However, the tangibility effect, growth effect, risk effect and dividends fail to exhibit a consistent effect over time. For instance, while between the years 1996-2008 dividends exert a positive relationship to leverage, dividend paying firms employed less leverage during the years 1990-1995.

5. Industry leverage, growth opportunities, dividends and losses are positively related to the amount of loans a firm tends to issue. In specific, industry leverage seems to be the most relevant loan factor.

6. Profitability, liquidity, value and size are negatively related to the loan decision of firms. PROF and CASH exert the highest material importance.

7. Industry leverage, growth opportunities, dividends and losses are positively related to the amount of bonds to issue. Thus, the same factors that have a positive impact on loan financing also apply to bond financing.

8. Profitability, liquidity, value, size and non-debt tax shields are inversely related to bonds. Again, the factors influencing the bond and loan decision are almost identical. However, it must be noted, that the debt factors exhibit a much larger material importance in the loan decision. Hence, these factors play a more important role in the decision how much loans to issue compared to the bond decision.

9. Growth opportunities, liquidity, value and losses are positively related to equity issues. In contrast, profitability, size, inflation and bankruptcy risk are negatively related to the amount of equity a firm tends to issue.

10. Profitability, liquidity and value have a positive impact on share repurchase transaction. In contrast, non-debt tax shields, tangibility, size and losses are negatively related to share repurchases.
8.4 Conclusion

The analysis in Chapter 8 has shown that factors exist that exhibit a universal impact on the financing decision of firms. Table 8.21 provides a summary of the tested hypotheses.
Table 8.2
Overview of Tested Hypotheses

<table>
<thead>
<tr>
<th>Hypotheses</th>
<th>Statistics</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Which debt factors determine the capital structure of firms?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H1 The size effect is positively related to the amount of leverage a firm employs.</td>
<td>Significant Results</td>
<td>↑</td>
</tr>
<tr>
<td>H1.1 The amount of total assets a firm possesses is positively related to the amount of leverage a firm holds</td>
<td>Significant Results</td>
<td>↑</td>
</tr>
<tr>
<td>H1.2 The amount of net revenues is positively related to the amount of leverage a firm holds</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>H1.3 The elder a firm the less leverage it tends to employ compared to younger firms</td>
<td>Significant Results</td>
<td>↑</td>
</tr>
<tr>
<td>H2 The value effect is negatively related to the amount of leverage a firm employs</td>
<td>Significant Results</td>
<td>↑</td>
</tr>
<tr>
<td>H2.1 The market-to-book ratio is associated with a decrease in leverage</td>
<td>Significant Results</td>
<td>↑</td>
</tr>
<tr>
<td>H2.2 The price-to-sales ratio is associated with a decrease in leverage</td>
<td>Significant Results</td>
<td>↑</td>
</tr>
<tr>
<td>H2.3 The price-to-book ratio is associated with a decrease in leverage</td>
<td>Significant Results</td>
<td>↓</td>
</tr>
<tr>
<td>H3 Research and development expenses are positively related to the amount of leverage a firm employs</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>H3.1 Selling, general and administrative expenses are positively related to the amount of leverage a firm employs</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>H3.2 Gollateral assets are positively related to the amount of leverage a firm employs</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>H4 Tangible assets are positively related to the amount of leverage a firm holds</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>H4.1 Property, plant and equipment is positively related to the amount of leverage a firm holds</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>H4.2 Inventory is positively related to the amount of leverage a firm holds</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>H4.3 Accounts receivables are positively related to the amount of leverage a firm holds</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>H4.4 Intangible assets are inversely related to the amount of leverage a firm holds</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>H5 Liquidity leads to an increase in leverage</td>
<td>Significant Results</td>
<td>↑</td>
</tr>
<tr>
<td>H5.1 The more cash a firm holds the more leverage it tends to employ</td>
<td>Significant Results</td>
<td>↑</td>
</tr>
<tr>
<td>H5.2 Working capital is negatively related to the amount of leverage a firm holds</td>
<td>Significant Results</td>
<td>↓</td>
</tr>
<tr>
<td>H6 Profitable firms tend to have less leverage compared to non-profitable firms</td>
<td>Significant Results</td>
<td>↓</td>
</tr>
<tr>
<td>H7 Firms facing growth opportunities tend to have lower levels of leverage compared to firms with low growth potentials</td>
<td>Significant Results</td>
<td>↑</td>
</tr>
<tr>
<td>H7.1 The annual growth rate of total assets is negatively related to the amount of leverage</td>
<td>Significant Results</td>
<td>↑</td>
</tr>
<tr>
<td>H7.2 The annual growth rate of net revenues is negatively related to the amount of leverage</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>H7.3 Capital expenditure is negatively related to the amount of leverage</td>
<td>Significant Results</td>
<td>↑</td>
</tr>
<tr>
<td>H7.4 Operating expenditure is negatively related to the amount of leverage</td>
<td>Significant Results</td>
<td>↑</td>
</tr>
<tr>
<td>H8.1 Firms that compete in industries in which the median firm has high leverage tend to have high leverage</td>
<td>Significant Results</td>
<td>↓</td>
</tr>
<tr>
<td>H8.2 Firms that compete in industries in which the median firm faces high growth potentials tend to have high leverage</td>
<td>Significant Results</td>
<td>↑</td>
</tr>
<tr>
<td>H9 The standard deviation of growth rate of operating profit is associated with a decrease in leverage</td>
<td>Significant Results</td>
<td>↓</td>
</tr>
<tr>
<td>H10.1 The tax rate exerts a positive relationship to the amount of leverage a firm employs</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>H10.2 Non-debt tax shield is negatively related to the amount of leverage a firm employs</td>
<td>Significant Results</td>
<td>↓</td>
</tr>
<tr>
<td>H11.1 Dividend paying firms tend to have larger amounts of leverage compared to non-payers</td>
<td>Significant Results</td>
<td>↑</td>
</tr>
<tr>
<td>H11.2 Loss making firms tend to have more leverage than non-loss making firms</td>
<td>Significant Results</td>
<td>↑</td>
</tr>
<tr>
<td>H11.3 Investment grade firms are associated to have more leverage than non-investment grade firms</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>H11.4 The higher the bankruptcy possibility, the lower the level of leverage a firm employs</td>
<td>Significant Results</td>
<td>↑</td>
</tr>
<tr>
<td>H12.1 Inflation is positively related to the amount of leverage a firm employs</td>
<td>Significant Results</td>
<td>↑</td>
</tr>
<tr>
<td>H12.2 Growth in GDP is positively associated with the amount of leverage a firm holds</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>H12.3 Recession are negatively related to the level of debt a firm holds</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>H12.4 The discount rate is positively related to the level of leverage a firm holds</td>
<td>*</td>
<td></td>
</tr>
</tbody>
</table>
### Table 8.21, continued
Overview of Tested Hypotheses

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>H13 The size effect on a firm’s capital structure differs among industries</td>
<td>Significant Results</td>
</tr>
<tr>
<td>H14 The value effect on a firm’s capital structure differs among industries</td>
<td>Significant Results</td>
</tr>
<tr>
<td>H15 The effect of the nature of assets on a firm’s capital structure differs among industries</td>
<td>Significant Results</td>
</tr>
<tr>
<td>H16 The effect of tangibility on a firm’s capital structure differs among industries</td>
<td>Significant Results</td>
</tr>
<tr>
<td>H17 The liquidity effect on a firm’s capital structure differs among industries</td>
<td>Significant Results</td>
</tr>
<tr>
<td>H18 The effect of profitability on a firm’s capital structure differs among industries</td>
<td>Significant Results</td>
</tr>
<tr>
<td>H19 The growth effect on a firm’s capital structure differs among industries</td>
<td>Significant Results</td>
</tr>
<tr>
<td>H20 The industry effect on a firm’s capital structure differs among industries</td>
<td>Significant Results</td>
</tr>
<tr>
<td>H21 The risk effect on a firm’s capital structure differs among industries</td>
<td>Significant Results</td>
</tr>
<tr>
<td>H22 The tax effect on a firm’s capital structure differs among industries</td>
<td>Significant Results</td>
</tr>
<tr>
<td>H23 The effect of financial constraints on a firm’s capital structure differs among industries</td>
<td>Significant Results</td>
</tr>
<tr>
<td>H24 The effect of macroeconomic variables on a firm’s capital structure differs among industries</td>
<td>Significant Results</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>H25 The positive/negative impact of the size effect on a firm’s capital structure remains the same over time</td>
<td>Significant Results</td>
</tr>
<tr>
<td>H26 The positive/negative impact of the value effect on a firm’s capital structure remains the same over time</td>
<td>Significant Results</td>
</tr>
<tr>
<td>H27 The positive/negative impact of the nature of assets on a firm’s capital structure remains the same over time</td>
<td>Significant Results</td>
</tr>
<tr>
<td>H28 The positive/negative impact of tangibility on a firm’s capital structure remains the same over time</td>
<td>Significant Results</td>
</tr>
<tr>
<td>H29 The positive/negative impact of liquidity on a firm’s capital structure remains the same over time</td>
<td>Significant Results</td>
</tr>
<tr>
<td>H30 The positive/negative impact of profitability on a firm’s capital structure remains the same over time</td>
<td>Significant Results</td>
</tr>
<tr>
<td>H31 The positive/negative impact of growth on a firm’s capital structure remains the same over time</td>
<td>Significant Results</td>
</tr>
<tr>
<td>H32 The positive/negative impact of industry effect on a firm’s capital structure remains the same over time</td>
<td>Significant Results</td>
</tr>
<tr>
<td>H33 The positive/negative impact of risk on a firm’s capital structure remains the same over time</td>
<td>Significant Results</td>
</tr>
<tr>
<td>H34 The positive/negative impact of tax effect on a firm’s capital structure remains the same over time</td>
<td>Significant Results</td>
</tr>
<tr>
<td>H35 The positive/negative impact of financial constraints on a firm’s capital structure remains the same over time</td>
<td>Significant Results</td>
</tr>
<tr>
<td>H36 The positive/negative impact of macroeconomic variables on a firm’s capital structure remains the same over time</td>
<td>Significant Results</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>H37 The debt factors determining the capital structure of firms are the same that determine the bond and/or loan decision of firms.</td>
<td>Significant Results</td>
</tr>
</tbody>
</table>

†  Hypothesis confirmed
↓  Hypothesis rejected
*  Variables has been excluded in the study due to multicollinearity, high correlation or lack of information
9  Market-Timing of Leverage

While Chapter 7 is concerned about the issue whether managers time the market when engaging in equity issues or share repurchases, Chapter 8 primarily revolves around the determinants of the leverage decision of firms. Based on the content of these two chapters, Chapter 9 will scrutinize the ability of firms to time the debt market when exposed to debt financing. While the market-to-book ratio served as a key proxy for equity market-timing in Chapter 8, our focus will lie on changes in interest rates as well as on changes in credit ratings as the two core influential factors of timing debt issuance. So far, only a limited number of empirical studies have focused on the timing of debt issues. These studies, however, fail to inspect the extent to which firms successfully time the debt market relative to future interest rate changes and credit rate changes. Furthermore, these studies apply an aggregated amount of leverage when testing the timing ability of debt issues. Chapter 9 in this dissertation fills this void by examining debt issuance in relation to past and future interest rates as well as credit rate changes. Additionally, Chapter 9 contributes to the academic literature by applying direct measures of leverage. In particular, next to the aggregated amount of debt, our study will find out how firms time their bond and/or loan issues. In specific, our study will examine how the interest rate and the credit rating influence the bond and loan decision of firms. Hence, the goal of Chapter 9 is to provide an answer to the following research question:

Do managers time the market when engaging in debt financing?

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148 Throughout this chapter, debt issuance is often used to refer to both bonds and loans issuance.
149 In this chapter the development of the hypotheses are integrated in the sub-chapters. This procedure differs from Chapter 7 and Chapter 8, in which a separate sub-chapter dealt with the development of hypotheses.
The outline of this chapter is as follows: Chapter 9.1 examines a number of aspects of debt issuance in relation to historical and future interest rates. While Chapter 9.2 examines the impact of credit rating changes on the timing effect of debt, Chapter 9.3 provides concluding remarks on the issue of market-timing of leverage.

9.1 Interest Rate Changes and the Timing of Debt Issues

Surveys provided by Graham and Harvey (2001) as well as by Bancel and Mittoo (2004) have shown that managers tend to time interest rates by issuing debt when they conceive interest rates as particularly low. Since then, empirical studies emerged testing the relationship between debt issuance and the level of interest rates. Faulkender (2005) examines whether managers are hedging or timing the market when choosing the interest rate exposure of their new debt issuance. His results defy hedging considerations and rather suggest that managers try to time debt issuance. Barry et al. (2008) scrutinize the relation between debt issuance and the level of interest rates relative to historical rates. In essence, the authors confirm the survey results of Graham and Harvey (2001) and Bancel and Mittoo (2004) by providing empirical proof that managers indeed issue more debt when current interest rates relative to past rates are low. While the research of Barry et al. covers only backward-looking timing, a recent study of Barry et al. (2009) examines the relation of debt issuance and future interest rates. Basically, their study fails to find clear evidence of timing ability for debt issues.

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852 See Barry et al. (2008), pp.419-424.
853 See Barry et al. (2009), pp.604-608.
9.1.1 Data Characteristics

Our study period covers the time frame 1990-2008. Data on bond and loan issues are retrieved from the databank Thomson ONE Banker. To account for the effect of interest rate changes on the issuance of bonds and loans various interest rates have been incorporated in our study. These include the 90-day Treasury-Bill rate, the 10-year constant maturity Treasury yield, and the Baa corporate yield. The term spread is measured as the difference between the 10-year constant maturity Treasury rate and the 90-day Treasury-Bill yield, whereas the credit spread is determined as the difference between the Baa rate and the 10-year constant maturity Treasury rate. The total amount of bonds and loans issued in our sample is $2.67 trillion and $3.25 trillion, respectively. The largest amount of debt issued in a single year adds up to $3.22 billion in the year 2001 for bonds and $3.76 billion in the year 2007 for loans. The largest number of bond and loan issues occurred in 2008 and 2004, respectively.

Panel A of Figure 9.1 shows the average monthly amount of bonds issued compared to the mean Baa yield for the whole sample under study. Panel B compares the development of the Baa rates with the issuance proceeds of loans. In essence, both panels show that an increase in debt issuance (bonds or loans) coincides with a drop in interest rates. Both panels are characterized by considerable within-year interest rate variations and debt issuance, hence endorsing the benefit of applying monthly data to scrutinize timing attempts.

Interesting to examine seems to be the time period 2001-2004 and 2004-2007. Panel A in Figure 9.1 shows that during the years 2001-2004 bond issues experienced its highest amount, followed by a heavy decrease in the subsequent years. In comparison, loan issuances follow a rather smooth development. However, during the years 2004-2007, loan issues gained momentum and reached its peak in the year 2007. During this time, bonds faced a drastic downward trend, culminating in the lowest issuance proceeds in 2004 since the year 1998.

834 Detailed overview of the data requirements can be read in Chapter 6.1.
9.1 Interest Rate Changes and the Timing of Debt Issues

Figure 9.1

Monthly Debt Issuance Proceeds and Baa Yields

The following figure compares the development of the interest rate with total bonds issue and total loans issue. The data accrue to the sample and cover the time frame from January 1990 through December 2008. Panel A shows the development of average monthly bond issue, while Panel B shows average monthly loan issue. The Baa yields are shown as lines. The proceeds are depicted as bars.

Panel A: Bonds Issue Proceeds Compared to Baa Yields
(Annual bond issues is divided by 12 so as to generate average monthly issuance)

Panel B: Loans Issue Proceeds Compared to Baa Yields
(Annual bond issues is divided by 12 so as to generate average monthly issuance)
Next, the debt issuance proceeds and the number of issues are depicted in Figure 9.2. Basically, three important findings can be drawn. First, the number of loans issued follows a steady increasing trend until the year 2004, decreasing thereafter, while bond issues experience an up and down development. Second, between the years 1995 and 2007 the number of loans issued exceeds the number of bond issues. Only between 1990 and 1994 and in the year 2008, firms engaged in more bond than loans issues. Third, while during 1990 and 2001 bond issuance proceeds experienced a steady increase, since 2001 it suffered an immense downward trend. The decrease in bonds issued is compensated by an enormous increase in loan issues. Since 2003, the gap between the amount of loans and bonds issued widens. Only in 2008, the amount of loans issued also experienced a decrease.855

Table 9.1 delivers stylized facts about bond and loan issuance and illustrates yields on issued debt, Treasury-Bills, and 10-year Treasury securities over the sample period. The largest average amount of bonds and loans issued incurs in the years 2001 and 2007, respectively. The year 2003 shows the lowest median level of short-term rates (measured by T-Bill 90s) and the second lowest median level of long-term rates (measured by 10-year Treasuries). Hence, it can be concluded, that the highest amount of bonds and loans issued did not coincide with the lowest level of interest rates.

Table 9.1 also shows results of the ratio of bonds/loans issued to the sum of total issuance, including debt and seasoned equity offerings (SEO). While in 1990, 75 percent of total fund issuance accrues to bond issuance, this quota drops to 37 percent in the year 2008. Actually, a steady decrease in the amount of bond issuance can be detected during 1990 and 2008. In contrast, while in 1990 only 18 percent of total issuance proceeds pertain to loan issues, the fraction reached 56 percent in 2008. In other words, while bonds used to be the most favorite financial instrument concerning financial needs during the beginning of the 1990s, loan issuance gained momentum and displace bonds as the most important financial instrument for firms.

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855 Due to a possible credit crunch, originated by the financial crisis of 2007, the amount of loans granted was limited.
Figure 9.2
Debt Issuance Proceeds and Number of Issues

This figure depicts debt issuance proceeds and the number of debt issues. The data accrue to the sample and cover the time frame from January 1990 through December 2008. Panel A shows total bonds and loans issues compared to the number of issues, while Panel B shows average debt issues. The issues are shown as lines. The numbers of debt issues are depicted as bars.

Panel A: Total Bonds and Loans Issues Compared to the Number of Issues

Panel B: Average Bonds and Loans Issues Compared to the Number of Issues
Table 9.1
Characteristics of Debt Issues

This table provides the annual characteristics of a sample of 1977 bond issues and 2398 loan issues during January 1990-December 2008. "T-Bills" are US Treasury bills and "SEOs" stand for seasoned equity offerings.

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Bonds (Loans) Issues</th>
<th>Average Monthly Amount of Bonds Issued ($milions)</th>
<th>Average Ratio of Bonds to Total Monthly Issue Amount (Debt+SEOs)</th>
<th>Average Monthly Amount of Loans Issued ($millions)</th>
<th>Average Ratio of Loans to Total Monthly Issue Amount (Debt+SEOs)</th>
<th>Mean (Median) Yield of 90-Day T-Bills</th>
<th>Mean (Median) 10-Year Treasury Constant Maturity Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990</td>
<td>68 (20)</td>
<td>3416</td>
<td>75%</td>
<td>801</td>
<td>10%</td>
<td>7.69 (7.84)</td>
<td>8.58 (8.52)</td>
</tr>
<tr>
<td>1991</td>
<td>85 (25)</td>
<td>5632</td>
<td>73%</td>
<td>896</td>
<td>12%</td>
<td>5.46 (5.62)</td>
<td>7.84 (8.02)</td>
</tr>
<tr>
<td>1992</td>
<td>79 (37)</td>
<td>6108</td>
<td>70%</td>
<td>1983</td>
<td>23%</td>
<td>3.51 (3.59)</td>
<td>7.04 (7.04)</td>
</tr>
<tr>
<td>1993</td>
<td>75 (39)</td>
<td>6336</td>
<td>57%</td>
<td>3985</td>
<td>36%</td>
<td>3.06 (3.09)</td>
<td>5.85 (5.88)</td>
</tr>
<tr>
<td>1994</td>
<td>64 (61)</td>
<td>4658</td>
<td>39%</td>
<td>6753</td>
<td>56%</td>
<td>4.39 (4.43)</td>
<td>7.11 (7.21)</td>
</tr>
<tr>
<td>1995</td>
<td>78 (99)</td>
<td>5829</td>
<td>36%</td>
<td>9599</td>
<td>59%</td>
<td>5.60 (5.56)</td>
<td>6.52 (6.39)</td>
</tr>
<tr>
<td>1996</td>
<td>76 (104)</td>
<td>6750</td>
<td>35%</td>
<td>11347</td>
<td>59%</td>
<td>5.12 (5.12)</td>
<td>6.45 (6.34)</td>
</tr>
<tr>
<td>1997</td>
<td>88 (126)</td>
<td>8664</td>
<td>36%</td>
<td>14258</td>
<td>59%</td>
<td>5.20 (5.20)</td>
<td>6.38 (6.42)</td>
</tr>
<tr>
<td>1998</td>
<td>121 (108)</td>
<td>11479</td>
<td>51%</td>
<td>9467</td>
<td>42%</td>
<td>4.89 (5.03)</td>
<td>5.28 (5.46)</td>
</tr>
<tr>
<td>1999</td>
<td>122 (130)</td>
<td>15572</td>
<td>55%</td>
<td>16034</td>
<td>37%</td>
<td>4.83 (4.75)</td>
<td>5.69 (5.82)</td>
</tr>
<tr>
<td>2000</td>
<td>113 (149)</td>
<td>14125</td>
<td>47%</td>
<td>13354</td>
<td>44%</td>
<td>5.96 (5.84)</td>
<td>6.00 (6.06)</td>
</tr>
<tr>
<td>2001</td>
<td>157 (190)</td>
<td>26886</td>
<td>52%</td>
<td>20397</td>
<td>39%</td>
<td>3.39 (3.55)</td>
<td>5.06 (5.06)</td>
</tr>
<tr>
<td>2002</td>
<td>143 (201)</td>
<td>24964</td>
<td>54%</td>
<td>17356</td>
<td>38%</td>
<td>1.62 (1.69)</td>
<td>4.58 (4.63)</td>
</tr>
<tr>
<td>2003</td>
<td>141 (205)</td>
<td>18123</td>
<td>47%</td>
<td>17217</td>
<td>38%</td>
<td>1.02 (0.96)</td>
<td>4.01 (4.01)</td>
</tr>
<tr>
<td>2004</td>
<td>95 (206)</td>
<td>10148</td>
<td>30%</td>
<td>21899</td>
<td>62%</td>
<td>1.41 (1.32)</td>
<td>4.26 (4.23)</td>
</tr>
<tr>
<td>2005</td>
<td>93 (197)</td>
<td>11731</td>
<td>29%</td>
<td>27605</td>
<td>67%</td>
<td>3.20 (3.18)</td>
<td>4.29 (4.27)</td>
</tr>
<tr>
<td>2006</td>
<td>110 (175)</td>
<td>11338</td>
<td>25%</td>
<td>30942</td>
<td>67%</td>
<td>4.76 (4.83)</td>
<td>4.79 (4.69)</td>
</tr>
<tr>
<td>2007</td>
<td>122 (186)</td>
<td>15657</td>
<td>31%</td>
<td>31395</td>
<td>62%</td>
<td>4.93 (4.93)</td>
<td>4.60 (4.61)</td>
</tr>
<tr>
<td>2008</td>
<td>147 (132)</td>
<td>14542</td>
<td>37%</td>
<td>21571</td>
<td>56%</td>
<td>4.93 (4.93)</td>
<td>3.63 (3.82)</td>
</tr>
</tbody>
</table>

All Years: 1977 (2398) 22285.8 42% 270948 51% 4.26 (4.92) 5.68 (5.63)
9.1.2 Debt Issues and Firm-Level Characteristics

A large number of possible determinants exist that might influence the debt issuance decision.\textsuperscript{856} While some authors try to find a link between macroeconomic factors and the borrowing decisions of firms, others directly focus on the level of interest rate as an important debt determinant.\textsuperscript{857} A study of Baker et al. (2003) shows that debt issuance decision is positively related with changes in future interest rates.\textsuperscript{858} Further, a recent empirical work by Barry et al. (2008) claims that the current level of interest rates as well as historical rates do have a significant impact on the amount of debt a firm decides to issue.\textsuperscript{859}

We conduct logistic regressions for the period 1990-2008, where the probability of issuing debt is modeled as a function of current interest rates, changes in current rates relative to historical rates, and changes in future rates relative to current rates. Our study controls for the credit spread, term spread and some firm characteristics. In essence, the term spread is defined as the difference between the 10-year constant maturity Treasury rate and the 90-day Treasury Bill rate. The risk spread is measured as the difference between the Baa rate and the 10-year constant maturity Treasury rate. Firm characteristics, such as the total amount of assets (TA), market-to-book ratio (MB), book leverage, as well as the standard deviation of earnings growth (RISK) are included.\textsuperscript{860}

Table 9.2 provides results for three logistic regressions. In essence, the first column of results refers to the probability of issuing bonds versus not issuing debt, while the second column is based on the probability of issuing loans instead of issuing no debt. The last column tests the probability of issuing bonds instead of issuing loans, given that a debt issue took place.

\textsuperscript{856} Refer to Chapter 8 for an overview of possible debt determinants.
\textsuperscript{857} See De Jong et al. (2008) and Bonfim (2009).
\textsuperscript{858} See Baker et al. (2003), pp.270-281.
\textsuperscript{859} Other studies suggesting that managers must time their debt issuance according to interest rates include Taggart (1977), Marsh (1982), Faulkender (2005), Butler et al. (2006), Dutordoir (2007), and Barry et al. (2009).
\textsuperscript{860} For an explanation of the variables, refer to Table 8.1, Chapter 8.1 in this dissertation.
Table 9.2
Firm-Level Logistic Regressions

The table reports logistic regressions using firm-level data from 1990-2008. Chi-Square values are presented in parentheses below the parameter estimates. The dependent variable differs between bonds and loans issuance.

<table>
<thead>
<tr>
<th>Explanatory Variables</th>
<th>Probability of issuing bonds vs. no issue</th>
<th>Probability of issuing loans vs. no issue</th>
<th>Probability of issuing bonds instead of loans, given issuance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>-6.88***</td>
<td>0.52</td>
<td>-6.45***</td>
</tr>
<tr>
<td>Baa Yield (0)</td>
<td>0.22**</td>
<td>-0.23**</td>
<td>0.32*</td>
</tr>
<tr>
<td>Baa Yield Change:</td>
<td>0.20***</td>
<td>0.49***</td>
<td>-0.45***</td>
</tr>
<tr>
<td>Baa(-90)-Baa(-60)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baa Yield Change:</td>
<td>0.03</td>
<td>0.30***</td>
<td>-0.44***</td>
</tr>
<tr>
<td>Baa(-60)-Baa(-120)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baa Yield Change:</td>
<td>0.19*</td>
<td>-0.09</td>
<td>0.18</td>
</tr>
<tr>
<td>Baa(24)-Baa(0)</td>
<td>0.09**</td>
<td>0.18***</td>
<td>-0.21***</td>
</tr>
<tr>
<td>Term Spread</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Credit Spread</td>
<td>0.12*</td>
<td>-0.46***</td>
<td>0.66***</td>
</tr>
<tr>
<td>TA</td>
<td>0.41***</td>
<td>0.24***</td>
<td>0.05*</td>
</tr>
<tr>
<td>MB</td>
<td>-0.03</td>
<td>-0.13***</td>
<td>0.12***</td>
</tr>
<tr>
<td>Book Leverage</td>
<td>1.25***</td>
<td>0.97***</td>
<td>-0.11</td>
</tr>
<tr>
<td>HISK</td>
<td>-0.08***</td>
<td>-0.00*</td>
<td>0.00</td>
</tr>
</tbody>
</table>

* ** *** denote significance at the 10%, 5%, and 1% confidence interval, respectively.

The results show that changes in current rates and historical rates do indeed exert a significant influence on the debt issuance decision of firms. Additionally, we show that future interest rate changes significantly influence the debt issuance decision. Furthermore, the results also support the notion that credit spread as

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861 This finding is consistent with the results of Barry et al. (2008).
862 This result is in line with the study of Baker et al. (2003).
9.1 Interest Rate Changes and the Timing of Debt Issues

well as term spread are two important factors for firms deciding to issue bonds and/or loans.

As has been shown in the regression analysis in Chapter 8.3.2, firm specific variables also exhibit a certain impact on the firm decision to issue debt. In specific, Table 9.2 shows that principally larger firms tend to issue more debt through bonds and/or loans. Likewise, the high market-to-book ratio is negatively associated with the issue of bonds or loans. Firms, facing larger risk in earnings growth are less likely to issue bonds or loans.

To sum up, the logistic regression analysis has proven that current, historical and future interest rate changes do have an impact on the debt issuance decision of firms. However, due to the immutable fact that the logistic regression fails to capture the amounts of debt issued, a timing of debt issuance cannot be estimated. Hence, the next section will focus on the timing success of bond or loan issues in further detail, differentiating between backward-looking and forward-looking timing.

9.1.3 Interest Rate Levels and Historical Rates

To detect a possible relationship between historical interest rates and the issuance of bonds and loans, two measures of historical rates are determined. Referring to the study of Barry et al. (2008) the first measure estimates the decile ranking of current interest rates relative to rates over the previous ten years. The first decile accrues to those interest rates, which are below the 10th percentile of average monthly rates in the prior ten years. Consequently, the second decile covers those rates from the 10th percentile to below the 20th percentile. In the same procedure the remaining deciles are determined. This measurement ensures that interest rates can be high or low relative to historical values. In a similar vein to the study of Graham and Harvey (2001), interest rates are conceived as “low” if they pertain to one of the

---

863 A study of Graham and Harvey (2001) has shown that especially managers of larger firms tend to engage in interest rate timing more compared to those of smaller firms.
864 The results of the firm characteristics are in line with the sample results in Chapter 8.3.2.
bottom three deciles and as “high” if they belong to one of the top three deciles. A second interest rate measurement accounting for historical rates is to use five-year and ten-year lagged rates.\textsuperscript{65}

Figure 9.3: Issuance Proceeds across Baa Yield Quintiles

Figure 9.3 exemplifies the point showing quintiles of current interest rates relative to historical levels. The graph shows the total as well as the average amount of bonds and loans issued across the whole sample. In essence, quintile 1 is considered to be the lowest quintile and quintile 5 represents the highest quintile. In specific, the depiction indicates that bonds and loans are issued when interest rates are low. This finding particularly pertains to loan financing, identifying a linearly increasing pattern analogously to low interest rates. Concerning bond issuance, an increase can be detected for the quintiles 5 through 2, but not for quintile 1 with the lowest interest rate.

\textsuperscript{65} The reason to make use of five-year and ten-year lagged rates is to detect long-term trends. Most of the academic literatures apply the same rates when dealing with historical interest rates. For example, see Barry et al. (2008).
9.1 Interest Rate Changes and the Timing of Debt Issues

To sum up, we have shown that in general, firms issue more bonds and loans when interest rates are low. This finding in particular affects loan financing.

9.1.4 Debt Issuance, Interest Rates, Spreads, and Growth

Next to the logistic regression, an OLS regression analysis will be conducted in order to detect the impact of low historical interest rates on the amount of bonds and loans issued. Hence, the following hypothesis will be tested:

**Hypothesis 1** ($= \beta(\xi_t)$): Firms issue more bonds and/or loans when interest rates are particularly low.

Variables included that might affect debt issuance are the interest rate at issuance (Baa (0)), rate deciles (relative to historical rates), credit and term spreads and various factors controlling for market growth. As another historical measurement, lagged interest rates are also applied in the regression.

The main reason to incorporate spreads in our analysis is to control for possible debt issuance that might occur because of attractive credit and term spreads instead of low interest rates. Panel A of Table 9.3 deals with the total amount of bonds and loans issued. It can be observed that the term spread fails to be significantly related to the amount of debt issued. In contrast, credit spread is statistically significant and negatively associated with bonds issued. This finding is consistent with the notion of timing the credit spread. Referring to loan issues, spreads do not play any significant role in the amount issued.

The inclusion of various growth measurements in the regression is due to the concern that expected growth potential might drive the amounts of debt issued. This result would be in line with the notion that growth and investments due to debt issuance are strongly related. Hence, in order to account for such a possible outcome, the growth of assets ($G_{TA}$), growth of revenues ($G_{REV}$), capital expenditures ($CAPEX$), operating expenditures ($OPEX$) and the market-to-book ratio ($MB$) are included as control variables.
Table 9.3 shows that the historical interest rate deciles are mostly highly significant even when spread and growth variables are included. Referring to Panel A in Table 9.3, the highest amount of bonds issued occur when growth proxies are high and historical interest rates are low. In specific, an increase in the decile rank of the relative interest rates is associated with a decrease in bonds issued. This result perfectly shows that firms tend to issue more bonds when interest rates are particularly low. This financing pattern can also be detected in the loan decision. In specific, an increase in the historical interest rates is associated with a decrease in the amount of loans to hold. Finally, lagged interest rates have also been included in the regression, however, do not show any statistical significance.

Based on the rationale mentioned above, Hypothesis 1 can be confirmed.
Table 9.3
Debt Issuance across Interests Rates and Growth Measures

The table shows OLS tests of total amount of bonds and loans issued (Panel A), the ratio of total bonds and loans issued to equity offerings (SEOs) (Panel B), and the firm-level ratio of debt issued to the annual capital expenditures (Panel C) as a function of diverse interest rates and control variables. While the first three panels try to measure backward-looking debt timing, Panel D represents results of forward-looking debt timing. Baa is defined as Moody's Seasoned Baa Corporate Bond Yield. The Baa decile is the decile rating of the rate at the time of issuance among rates over the prior ten years. Term spread is defined as the difference between the 10-year constant maturity Treasury rate and the 90-day Treasury Bill rate. The risk spread is measured as the difference between the Baa rate and the 10-year constant maturity Treasury rate. Coefficient estimates and the corresponding t-values are shown in the table. Independent variables controlling for growth opportunities are the growth of assets (G_TA), the growth of earnings (G_REV), capital expenditures (CAPEX), operating expenditures (OPEX), and the market-to-book ratio (MB). Lagged values of interest rates are also applied in order to control for historical interest rates.

<table>
<thead>
<tr>
<th>Explanatory Variables</th>
<th>Bonds</th>
<th></th>
<th>Loans</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>h(b)</td>
<td>t(b)</td>
<td>l</td>
<td>t(l)</td>
</tr>
<tr>
<td>Panel A: Amount Issued per Year</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td>-0.0992</td>
<td>-0.78</td>
<td>-1.4517</td>
<td>-1.04</td>
</tr>
<tr>
<td>Baa Decile</td>
<td>-0.0162</td>
<td>-2.32</td>
<td>-0.0203</td>
<td>-2.27</td>
</tr>
<tr>
<td>Baa (0)</td>
<td>0.0738</td>
<td>3.35</td>
<td>0.0682</td>
<td>0.30</td>
</tr>
<tr>
<td>Credit Spread</td>
<td>-0.0432</td>
<td>-2.07</td>
<td>-0.0650</td>
<td>-0.27</td>
</tr>
<tr>
<td>Term Spread</td>
<td>0.0012</td>
<td>0.14</td>
<td>0.0576</td>
<td>0.59</td>
</tr>
<tr>
<td>G_TA</td>
<td>0.2034</td>
<td>4.89</td>
<td>0.5914</td>
<td>1.44</td>
</tr>
<tr>
<td>G_REV</td>
<td>0.1832</td>
<td>4.40</td>
<td>0.9662</td>
<td>2.18</td>
</tr>
<tr>
<td>CAPEX</td>
<td>0.4185</td>
<td>3.33</td>
<td>-0.3839</td>
<td>-0.27</td>
</tr>
<tr>
<td>OPEX</td>
<td>0.0946</td>
<td>0.42</td>
<td>-0.0869</td>
<td>-0.06</td>
</tr>
<tr>
<td>MB</td>
<td>0.0398</td>
<td>6.22</td>
<td>0.2220</td>
<td>3.21</td>
</tr>
<tr>
<td>Baa Lagged 60 Months</td>
<td>-0.0217</td>
<td>-1.22</td>
<td>0.0480</td>
<td>0.23</td>
</tr>
<tr>
<td>Baa Lagged 120 Months</td>
<td>-0.0128</td>
<td>-1.27</td>
<td>0.1372</td>
<td>1.19</td>
</tr>
<tr>
<td>Adj. R²</td>
<td>0.12</td>
<td></td>
<td>0.11</td>
<td></td>
</tr>
<tr>
<td>Observations</td>
<td>1711</td>
<td></td>
<td>2214</td>
<td></td>
</tr>
<tr>
<td>Panel B: Proportion of Debt Issued to Total Issues</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td>0.2512</td>
<td>1.92</td>
<td>1.1747</td>
<td>9.44</td>
</tr>
<tr>
<td>Baa Decile</td>
<td>-0.0150</td>
<td>-2.10</td>
<td>-0.0149</td>
<td>-2.14</td>
</tr>
<tr>
<td>Baa (0)</td>
<td>-0.0006</td>
<td>-0.03</td>
<td>-0.0002</td>
<td>-0.01</td>
</tr>
<tr>
<td>Credit Spread</td>
<td>0.0593</td>
<td>2.77</td>
<td>-0.1101</td>
<td>-5.24</td>
</tr>
<tr>
<td>Term Spread</td>
<td>-0.0308</td>
<td>-3.39</td>
<td>0.0259</td>
<td>2.90</td>
</tr>
<tr>
<td>G_TA</td>
<td>-0.0423</td>
<td>-0.99</td>
<td>-0.0872</td>
<td>-2.55</td>
</tr>
<tr>
<td>G_REV</td>
<td>0.0069</td>
<td>0.16</td>
<td>-0.0202</td>
<td>-0.55</td>
</tr>
<tr>
<td>CAPEX</td>
<td>0.0571</td>
<td>0.44</td>
<td>-0.5402</td>
<td>-4.10</td>
</tr>
<tr>
<td>OPEX</td>
<td>-0.0828</td>
<td>-0.24</td>
<td>0.0332</td>
<td>3.10</td>
</tr>
<tr>
<td>MB</td>
<td>0.0292</td>
<td>4.45</td>
<td>-0.0164</td>
<td>-3.31</td>
</tr>
<tr>
<td>Baa Lagged 60 Months</td>
<td>-0.0194</td>
<td>-1.06</td>
<td>0.0247</td>
<td>1.37</td>
</tr>
<tr>
<td>Baa Lagged 120 Months</td>
<td>0.0469</td>
<td>4.55</td>
<td>-0.0639</td>
<td>-6.39</td>
</tr>
<tr>
<td>Adj. R²</td>
<td>0.15</td>
<td></td>
<td>0.18</td>
<td></td>
</tr>
<tr>
<td>Observations</td>
<td>1711</td>
<td></td>
<td>2214</td>
<td></td>
</tr>
</tbody>
</table>
Table 9.3, continued
Debt Issuance across Interests Rates and Growth Measures

<table>
<thead>
<tr>
<th>Explanatory Variables</th>
<th>Bonds</th>
<th>Loans</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>b</td>
<td>t(b)</td>
</tr>
<tr>
<td>Panel C: Firm-Level Ratio of Debt Issued Divided by Capital Expenditures</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td>1.2267</td>
<td>2.99</td>
</tr>
<tr>
<td>Baa Decile</td>
<td>-0.0633</td>
<td>-2.29</td>
</tr>
<tr>
<td>Baa (0)</td>
<td>1.0785</td>
<td>1.52</td>
</tr>
<tr>
<td>Credit Spread</td>
<td>-1.7826</td>
<td>-2.66</td>
</tr>
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<tr>
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<tr>
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<tr>
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</tr>
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<td>Baa Lagged 120 Months</td>
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<td>Panel D: Forward-Looking Debt Timing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
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</tr>
<tr>
<td>Baa6</td>
<td>-0.0726</td>
<td>-1.27</td>
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<td>Baa12</td>
<td>0.0256</td>
<td>0.79</td>
</tr>
<tr>
<td>Baa24</td>
<td>-0.0269</td>
<td>-1.33</td>
</tr>
<tr>
<td>Baa36</td>
<td>0.0140</td>
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<tr>
<td>Credit Spread</td>
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<td>-1.05</td>
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<td>Term Spread</td>
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<td>G_TA</td>
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<td>G_REV</td>
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<td>OPEX</td>
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<td>MB</td>
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<td>Adj. R²</td>
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<td></td>
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<tr>
<td>Observations</td>
<td>1711</td>
<td></td>
</tr>
</tbody>
</table>

9.1.5 Proportion of Debt Issued to Total Issuance
While the previous results in Panel A of Table 9.3 have shown that bond and loan issues experience an upward drift when interest rates are historically low, Panel
B deals with the question whether or not the interest rate effect accrues to raising funds in general. In order to control for this phenomenon a ratio of bonds to total issuance (debt plus equity) and a ratio of loans to total issuance has been determined. The question is whether the ratio of the amount of bonds/loans to the total amount of debt and equity issued rises as interest rates are historically low. If so, it can be proven, that historical interest rates do indeed ultimately affect the debt issuance decision and not just total firm issuance.

Based on the rationale mentioned above the following hypothesis is derived:

**Hypothesis 2 (\(\beta(\xi_2)\)): The interest rate effect accrues mainly to the debt decision and not to the raising funds in general.**

The results in Panel B of Table 9.3 confirm that lower deciles of current interest rates relative to historical values are associated with higher bonds-to-total issuance. These characteristics can be also observed for loan issues. In specific, lower current interest rates relative to historical values lead to an increase in the ratio loans to total issuance.

To sum up, the results in Panel B have shown that the amount of debt (bonds and/or loans) issued relative to total funds raised is greater when interest rates are lower relative to historical rates.\(^{866}\) Thus, **Hypothesis 2** can be confirmed.

### 9.1.6 Debt Issuance and Capital Expenditures

The following regression analysis in Panel C of Table 9.3 deals with the relation between low interest rates and potential investment opportunities. In specific, low interest rates are associated with higher net present value projects due to lower dis-

\(^{866}\) This finding is in line with the empirical results of Barry et al. (2008) and the survey results in Graham and Harvey (2001).
count rates. Hence, it can be argued that in the presence of low interest rates, firms do not engage in debt timing per se, but issue debt to meet possible investment opportunities. Based on the reasoning mentioned above the following hypothesis is derived:

**Hypothesis 3** (= $\beta(\xi_1)$): *Firms engage in more bond and/or loan issues when interest rates are low in order to finance potential investment opportunities.*

To control for the aforementioned issue we regress the ratios of bonds relative to capital expenditures and loans relative to capital expenditures on the interest rate levels, interest rate deciles, lagged interest rates, and control variables. The results in Panel C of Table 9.3 show that the current interest rates relative to historical rates are statistically and negatively significant on the bond as well as on the loan ratio. Hence, an increase in the Baa decile leads to a decrease in the quantity of bonds/loans issued relative to capital expenditures of the issuing firm. Furthermore, the current interest rate levels are not significant for both the bonds and loans ratio.

To sum up, the results in Panel C have proven that debt timing, based on the historical interest rate measure is significant and not related with a need for capital expenditures. Although lower interest rates are also associated with an increase in capital expenditures, they fail to account for the amount of bonds and loans issued.\(^{867}\) Hence, **Hypothesis 3** can be rejected.

### 9.1.7 Forward-Looking Debt Timing

While Panel A in Table 9.3 examines the question whether managers do issue more debt when current interest rates are lower relative to historical rates, Panel D is

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\(^{867}\) This finding is also in line with the empirical work of Barry et al. (2008).
concerned about the ability of managers to engage in forward-looking debt timing. In other words, do managers attempt to issue debt in form of bonds or loans when they believe that future interest rates will rise? If managers are successful in timing debt issues, we should observe larger amounts of debt issues that are followed by an increase in interest rates. This timing ability would ultimately lead to an increase in firm value due to the lower cost of capital, which arises when debt is issued at lower interest rates.

Based on the rationale mentioned above the following hypothesis will be tested:

**Hypothesis 4 (\( \beta(\xi_t) \)):** Firms issue more bonds and/or loans when future interest rates will rise.

To detect possible forward-looking debt timing ability of managers, we scrutinize interest rate changes subsequent to debt issues. Basically, the results refer to future interest rate yields, 6, 12, 24 and 36 months in the future after debt issuance. The results, however, do not show any timing ability of managers. Thus, managers fail to have any forward-looking timing ability since larger amounts of bonds or loans are not issued before the interest rate increases. Thus, **Hypothesis 4** must be rejected.

Our results are in line with the findings of Barry et al. (2009), who studied the timing ability of fixed-rate debt issues and floating-rate debt issues in the long run. In essence, the authors conclude:

“Overall, we find that managers are not successful in issuing debt and locking in fixed interest rates in anticipation of increased future interest rates or in issuing high levels of floating debt prior to debt decreases. These results contradict the idea that corporate managers possess informational advantage.

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868 Barry et al. (2009) cover this issue and find a negative outcome.
869 Recent empirical study by Song (2009) examines differences in firm value across companies that engage in debt timing and those that do not. In essence, their research fails to find evidence that timers and non-timers differ in firm value.
9.1.8 Debt Issuance across Business Industries

While the previous studies have focused their analysis on the sample as a whole, the following abstract will examine the debt issuance across various industries. Figure 9.4 depicts the total amount of loans and bonds issued. While Panel A and Panel C show the total issuance proceeds of bonds and loans, respectively, Panel B and Panel D show the average value of issues. A first glance at the figure leads to the impression that debt issuance varies across industries as well as time. For instance, while the industrial business sector generally exhibits one of the highest debt issues relative to the other industries, low issuance can be detected in the years 1990, 1991 and 1992 for loan issues and 1993 for bond issues. By far the highest total amount of debt issuance accrues to the industrial, consumer discretionary and consumer staples industry.

However, due to the immutable fact that the number of firms in each industry under study diverge, the average amount of debt issues should be analyzed. Referring to Panel B of Figure 9.4, the telecommunication sector exhibits strong bond and loan issues. The same applies to the information technology sector. However, a clear financing pattern of the various industries cannot be observed.

Interesting to find out is how the backward-looking as well as forward-looking debt timing applies to the various industries under study. In Table 9.4 we consider the various interest rate effects on the different business industries. As can be seen the backward-looking debt timing for bonds only holds for the industrial, consumer discretionary, and energy sector. Concerning the loan issuance, firms did not tend to issue more loans when current interest rates were particularly low relative to histori-

\(^{870}\) Barry et al. (2009), p.608.
9.1 Interest Rate Changes and the Timing of Debt Issues

...cal values. In an untabulated analysis (reported by request), the capability of manag-
ers to issue more debt before interest rates increase in the future have been tested. In
essence, the results were in line with sample results. All results led to the same con-
cluding remarks, implying that a successful ability of managers to time the debt
issuance could not be found for none of the financing instruments.
Figure 9.4
Debt Issuance across Industries

This figure depicts debt issuance proceeds across the different industries. The data accrue to the sample and cover the time frame from January 1990 through December 2008. While Panel A and Panel B show the total amount of bonds issued and the average amount of bonds issued, respectively, Panel C and Panel D focus on loans issuance.

Panel A: Total Bonds Issued across Industries

Panel B: Average Bonds Issued across Industries
Figure 9.4, continued

Debt Issuance across Industries

Panel C: Total Loans Issued across Industries

Panel D: Average Loans Issued across Industries
Table 9.4
Debt Issuance Activity across Business Industries

The table presents OLS regressions for the various business industries, including the level of interest rate, the
rate’s decile among historical rates, the credit spread, the term spread, and the various growth variables. The
Baa decile is the decile rating of the rate at the time of issuance among rates over the prior ten years. Baa is the
Moody’s Seasoned Baa Corporate Bond Yield. Credit spread is defined as the difference between the Baa and the
10-year constant maturity Treasury rate. Term spread is the difference between the 10-year Treasury constant
maturity rate and the yield on 90-day T-Bills. Panel A regresses the independent variables on the dependent
variable bonds and Panel B represents results for loan issues. T-values are presented in italics.

### Panel A

<table>
<thead>
<tr>
<th>Variable</th>
<th>Telecomm</th>
<th>Industy</th>
<th>Health Care</th>
<th>Consumer Disc</th>
<th>Consumer Staples</th>
<th>Informatio Tech</th>
<th>Utilities</th>
<th>Materials</th>
<th>Energy</th>
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</thead>
<tbody>
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<td>0.1661</td>
<td>-0.3347</td>
<td>-0.0825</td>
<td>-0.0443</td>
<td>0.4196</td>
<td>-0.1981</td>
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<td>0.96</td>
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<td>0.0104</td>
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<td>-0.69</td>
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<td>-2.23</td>
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<td>0.0201</td>
<td>0.0217</td>
<td>0.0132</td>
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</table>
9.1 Interest Rate Changes and the Timing of Debt Issues

Table 9.4, continued
Debt Issuance Activity across Business Industries

<table>
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<tr>
<th>Variable</th>
<th>Tele-</th>
<th>Com Indus</th>
<th>Health Care</th>
<th>Consumer Disc</th>
<th>Consumer Staples</th>
<th>Information Tech</th>
<th>Utilities</th>
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<th>Energy</th>
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<tbody>
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<td>Baa Decile</td>
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<td>0.0411</td>
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<td>0.0594</td>
<td>0.0370</td>
<td>0.0343</td>
<td>0.0057</td>
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<td>OPEX</td>
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</table>

9.1.9 Summary

Chapter 9.1 has examined the issue how changes in the interest rate influence the timing ability of debt issues. In specific, this chapter has tried to examine the relationship of bonds and loans to the level of interest rates. The findings of Chapter 9.1 are as follows:
The development of bond and loan issues experienced a reciprocal development. While bonds used to be favored over loan issues in the beginning of the 1990s, loan issues gained momentum and displaced bonds as the most important financial instrument in terms of debt financing.

Current, historical and future interest rate changes do have a significant impact on the decision how much loans and/or bonds to employ.

Firms issue more bonds and/or loans when interest rates are particularly low.

The amount of bonds and/or loans issued relative to the total funds raised is greater when interest rates are lower than historical rates.

The issuance of debt financing in form of bonds and/or loans due to low historical interest rates is not related to the need of meeting growth investment needs.

Firms do not issue bonds and/or loans when they anticipate that future interest rates will rise. Thus, firms fail to engage in forward-looking debt timing.
9.2 Credit Rate Changes and the Timing of Debt Issues

Survey studies of Graham and Harvey (2001, 2002) as well as Bancel and Mittoo (2004) have shown that credit rating concerns are the second most important determinant of firm’s debt policy.\textsuperscript{871} Thus, Chapter 9.2 will examine how changes in credit ratings influence the capital structure decision of firms.

9.2.1 Data Characteristics

Figure 9.5 depicts the relation between credit rating and leverage as well as equity financing for the time period 1990-2008. In Panel A credit ratings and leverage are compared. The following main drawings can be retrieved. First, the majority of firms under study do have an A rating (811), followed by BBB (666) and BBB+ (579). Hence, most firms possess an investment grade rating. Second, the amount of leverage linearly increases with a decrease in credit ratings. For example, while firms with a rating of AA+ do have an average leverage ratio of roughly 46 percent of total assets, firms with a rating of CCC+ or below have almost 80 percent.\textsuperscript{872} This observation that the quality of credit rating is negatively related to the amount of debt employed is in line with the omnipresent academic literature.\textsuperscript{873}

In Panel B of Figure 9.5 the quality of credit ratings and the amount of debt issuance, differentiating between bonds and loans, is examined. The main finding here is the fact that the amount of issuance diminishes the lower the credit rating quality of firms. Referring to loans, firms with an AAA rating engaged in the largest average loan issuance, while firms with a CCC+ or below rating obtain the lowest level. Bonds issuance also experiences a negative trend; however, firms with a rating


\textsuperscript{872} For a detailed overview of the numbers see Table 9.5, Appendix G.

\textsuperscript{873} For instance, see Kisgen (2006, 2009), Hovakimian et al. (2009), Mittoo and Zhang (2010) and Ouni and Omri (2010).
of B or below experience still a relatively high amount of bond issuance. The results also show that firms with high quality credit rating issue larger amounts of loans than bonds, while this financing pattern reverses when credit quality deteriorates. In specific, it can be detected, that firms with lower credit ratings tend to issue larger amounts of bonds than loans. While the cost of debt increases the lower the credit rating quality, the cost of debt for bonds appears to be lower than for loan financing.

While Panel A and Panel B of Figure 9.5 revolve around credit ratings and leverage, Panel C mainly deals with the interaction between credit ratings and equity issuance. In line with the findings in Panel A and Panel B, it can be shown that equity issuance as well as share repurchases decrease the lower the rating quality of firms. The highest amount of equity issuance and share repurchases are obtained for firms with an AAA rating.
The following figure shows leverage relative to credit ratings. The data accrue to the sample and cover the time frame from January 1990 through December 2008. Panel A shows the amount of book leverage pertaining to the corresponding credit rate. Panel B compares the firm-year level ratings with bonds and loans issuance. Panel C shows equity offerings and share repurchases regarding credit rating.

Panel A: Ratings and Book Leverage

Panel B: Ratings and Debt Issuance
Figure 9.5, continued
Ratings, Leverage and Equity

Panel C: Ratings and Equity Issuance

Panel D: Ratings and Net Debt Issuance
Finally, Panel D depicts the relation between credit quality and net debt issuance. Here, net debt issuance is defined as net debt minus net equity. Basically, the figure perfectly illustrates that firms with a high credit quality tend to issue more leverage compared to equity. For example, firms with an AAA rating issue approximately 8 percentage points more debt than equity. However, this trend evaporates as soon as the credit rating quality depreciates. A relatively significant decrease in net debt issuance can be detected along the credit rating quality. For instance, firms with a BB- rating or below, tend to issue more net equity than net debt. This finding can be best explained basically by two reasons for this phenomenon. First, firms with low credit quality face higher leverage costs. Second, firms trying to improve their credit rating need to increase their equity ratio and lower their gearing.

9.2.2 The Impact of Bond Market Access on Leverage

The following section attempts to examine how a firm’s access to the public bond market influences its capital structure decision.\(^{874}\) In essence, a convolute of capital structure literature implicitly embraces the idea that supply-side constraints of capital have only a marginal impact on the capital structure decision of firms. For instance, the notion of the trade-off theory postulates that a firm determines its optimal capital structure by balancing its costs and benefits of issuing new debt, assuming that the supply of capital is infinitely elastic. Theoretically, bond market access is associated with lower cost of debt and increased supply of debt capital.\(^{875}\)

Empirical studies of Faulkender and Petersen (2006) and Mittoo and Zhang (2010) pursue this assumption and have found a positive relationship between bond market access and the amount of leverage.\(^{876}\) In essence, Faulkender and Petersen (2006) show that firms with bond market access possess approximately six and eight percentage

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\(^{874}\) A firm’s access to the public bond market is measured by the the availability of a credit rating. Hence, firms lacking a credit rating do not have access to the bond market and vice versa.

\(^{875}\) See Faulkender and Petersen (2006) and Mittoo and Zhang (2010)

\(^{876}\) Also see Tang (2009), who examines the impact of firm’s credit market access and information asymmetry on the financing decision of firms.
points higher leverage than firms without access.\textsuperscript{877} In a similar vein, Mittoo and Zhang (2010) find that firms with bond market access have 7.55 percentage points higher leverage than firms without access.\textsuperscript{878} Similar to the studies mentioned above, amongst others, our study tries to examine the following hypothesis:

**Hypothesis 5 (\(= \beta(\xi_s)\)):** Firms having a credit rating will have higher leverage than firms without a credit rating, ceteris paribus.

To evaluate the impact of bond market access on the leverage decision of firms after controlling for demand-side effects, the following equation will be applied:

\[
LEV_{it} = \alpha + \beta_1 \text{CREDIT\_RATING}_{it} + \beta_2 TA_{it} + \beta_3 MB_{it} + \beta_4 INTANG_{it} + \beta_5 PROF_{it} + \beta_6 NDTVS_{it} + \beta_7 RISK_{it} + \epsilon_{it} \tag{9.1}
\]

where \(LEV\) denotes book leverage and market leverage. The dummy variable \(CREDIT\_RATING\) equals 1 if the firm has a credit rating and 0 otherwise. Explanatory variables are included that best suit our OLS regression analysis. Additionally, these variables are the most common factors used in the capital structure literature.\textsuperscript{879} \(TA\) is the natural logarithm of total assets and controls for the size effect. \(MB\) is the market-to-book ratio and controls for the value effect. \(INTANG\) is determined as intangible assets divided by total assets and controls for the tangibility effect. \(PROF\) is \(EBITDA\) divided by total assets and controls for the profitability effect. \(NDTV\) is the ratio of depreciation and amortization over total assets. \(RISK\) is the standard deviation of growth rate of operating profit calculated over all periods.\textsuperscript{880}

\textsuperscript{877} See Faulkender and Petersen (2006), pp.56.
\textsuperscript{878} See Mittoo and Zhang (2010), pp.591-593.
\textsuperscript{879} See Rajan and Zingales (1995).
\textsuperscript{880} \(i\) and \(t\) denote the \(i\)th firm and \(t\)th year, respectively.
Table 9.6 shows the results of the OLS regression analysis, differentiating between book and market leverage. Referring to book leverage as the dependent variable first, the coefficient on the dummy variable \textit{CREDIT\_RATING} is statistically as well as materially positively strong significant at the 1 percent confidence level. In essence, the results show that firms with bond market access (having a credit rating) have higher book leverage than firms without access. This finding can be confirmed when referring to the market leverage as the dependent variable. Here, the coefficient of the dummy variable is also statistically significant and exhibits a positive relationship to market leverage.

The signs of the coefficients on the control variables are generally consistent with our previous study in Chapter 8.3. As expected, the market-to-book ratio, intangible assets and profitability have an inverse impact on leverage, while net debt tax shields exhibit a positive relationship. The size effect is only statistically significant on market leverage (negative) and the variable \textit{RISK} is not significant in any specification.

The results in Table 9.6 do not diverge with previous research and hence it can be claimed that firms with a credit rating indeed engage in larger gearing compared to firms that lack bond market access. Hence, \textbf{Hypothesis 8} must be confirmed.
Table 9.6
Bond Market Access and Leverage

The following table provides OLS results of the sample during 1990-2008. The dependent variable is book leverage, which is defined as book debt over total assets, and market leverage, which is defined as book debt divided by total assets plus market equity minus book equity. CREDIT_RATING is a dummy variable, equaling 1 if the firm has a credit rating and 0 otherwise. TA is the natural logarithm of total assets and controls the size effect. MB is the market-to-book ratio and controls the value effect. INTANG is determined as intangible assets divided by total assets and controls for the tangibility effect. PROF is EBITDA divided by assets and controls for the profitability effect. NDT S is the ratio of depreciation and amortization over total assets. RISK is the standard deviation of growth rate of operating profit calculated over all periods. T-values are represented in italics.

<table>
<thead>
<tr>
<th>Explanatory Variables</th>
<th>Book Leverage</th>
<th>Market Leverage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>0.2099</td>
<td>2.0947</td>
</tr>
<tr>
<td>CREDIT_RATING</td>
<td>12.55</td>
<td>13.52</td>
</tr>
<tr>
<td></td>
<td>0.1209</td>
<td>0.1670</td>
</tr>
<tr>
<td>TA</td>
<td>12.62</td>
<td>2.64</td>
</tr>
<tr>
<td></td>
<td>0.0281</td>
<td>-0.1293</td>
</tr>
<tr>
<td>MB</td>
<td>1.01</td>
<td>-6.95</td>
</tr>
<tr>
<td></td>
<td>-0.0043</td>
<td>-0.0547</td>
</tr>
<tr>
<td></td>
<td>-1.90</td>
<td>-3.86</td>
</tr>
<tr>
<td>INTANG</td>
<td>-0.0724</td>
<td>-0.4242</td>
</tr>
<tr>
<td></td>
<td>-3.57</td>
<td>-3.17</td>
</tr>
<tr>
<td>PROF</td>
<td>-0.2884</td>
<td>-3.7115</td>
</tr>
<tr>
<td></td>
<td>-8.29</td>
<td>-2.47</td>
</tr>
<tr>
<td>NDT S</td>
<td>0.2845</td>
<td>2.6894</td>
</tr>
<tr>
<td></td>
<td>3.40</td>
<td>4.98</td>
</tr>
<tr>
<td>RISK</td>
<td>0.0002</td>
<td>-0.0017</td>
</tr>
<tr>
<td></td>
<td>1.09</td>
<td>-1.44</td>
</tr>
<tr>
<td>Adj, R²</td>
<td>0.1043</td>
<td>0.1083</td>
</tr>
<tr>
<td>Observation</td>
<td>5623</td>
<td>5330</td>
</tr>
</tbody>
</table>

Figure 9.6 depicts the impact of bond market access on capital structure decisions among the different business industries. In line with our OLS regression analysis, firms having a credit rating do have higher book leverage compared to those that do not have any ratings. This finding persists for all nine industries under study. The same financing pattern can also be detected for market leverage. However, only the results in the health care sector are contrarian to the common belief that bond market access lead to higher leverage than no access. Here, firms without credit ratings
have more than double the amount of leverage than firms with credit ratings. However, in essence, Figure 9.6 conveys the important insight that industries with access to bond markets tend to have more leverage than those without access, ceteris paribus.881

Figure 9.6: Bond Market Access and Capital Structure among Industries

Figure 9.7 illustrates the issuance proceeds of bonds and loans for firms with and without a credit rating for every single year from 1990-2008. Panel A compares the number of firms with access to the bond market with the debt issuance proceeds. In essence, it can be found that since the year 1990, the number of firms with a credit rating has experienced a steady increase. Again, the figure shows that the issuance proceeds of bonds have been much higher in the beginning of the 1990s than that of loans. However, in recent years this financing pattern has altered. The amount of loans issued exceeds the amount of bonds issued. Panel B in Figure 9.7 depicts the relationship between the number of firms without a credit rating and the issuance proceeds of bonds and loans. It can be seen that the number of firms with-

881 For a relationship between bank loan ratings and financing behavior of firms, see Sufi (2009a, 2009b).
out bond market access has decreased over the years. However, the figure also shows that firms without a credit rating do most the time engage in loan financing.
9.2 Credit Rate Changes and the Timing of Debt Issues

Figure 9.7
Credit Rating vs. No Credit Rating

The following figure shows issuance proceeds of firms with and without credit ratings. The data accrue to the sample and cover the time frame from January 1991 through December 2008. Panel A shows the amount of bonds and loans issuance of firms with a credit rating. In contrast, Panel B depicts the issuance proceeds of firms without a credit rating.

Panel A: Issuance Proceeds of Firms with Credit Rating

Panel B: Issuance Proceeds of Firms without Credit Rating
So far we have proven that credit rating does indeed have an immense impact on the capital structure decision of firms. In a next step, we try to find out whether the impact of bond market access on leverage differs between firms that have a high credit rating to those firms that possess a low credit rating. It is believed that low credit rating firms face more severe supply-side constraints relative to high credit rating firms.

According to the sample survey of Graham and Harvey (2001, 2002) and Bancel and Mittoo (2004), financial flexibility and credit rating concerns are the two most important determinant of firm’s debt policy. In particular these two factors, financial flexibility and credit ratings are the main reason to ascertain that credit quality might have an impact on firm’s capital structure decision. “...high-quality firms could maintain less than optimal leverage because of their greater concern of rating downgrade whereas low-quality firms could increase their leverage after access to public debt market to enhance their financial flexibility.” Hence, the concern for financial flexibility and credit ratings might diverge between high and low quality firms. The following hypothesis will be tested:

**Hypothesis 6 (β(ξ))**: The impact of having a credit rating on leverage will be larger for low credit quality firms than for high credit quality firms, ceteris paribus.

To examine the impact of bond market access on high and low quality firms the following equation will be applied in our OLS regression:

\[
LEV_{it} = \alpha + \beta_1 \text{CREDIT\_RATING}_{it} + \beta_2 \text{CREDIT\_LQ}_{it} + \beta_3 \text{TAR}_{it} + \beta_4 \text{MB}_{it} + \\
\beta_5 \text{NTANG}_{it} + \beta_6 \text{PROF}_{it} + \beta_7 \text{NDTS}_{it} + \beta_8 \text{RISK}_{it} + \epsilon_{it}
\]  

(9.2)

---

882 See Chapter 4.2 for a detailed overview of the survey results of Graham and Harvey (2001,2002) and Bancel and Mittoo (2004).
885 Low quality firms are those with a credit rating of BB or below. High quality firms have a credit rating of better than BB.
where $CREDIT_{1Q}$ is an interactive term of $CREDIT_{RATING}$ and $1Q$. $1Q$ equals 1 if the firm has a credit rating of BB or below and 0 otherwise. The control variables are the same as in the previous analysis.

The results in Table 9.7 support the notion of our hypothesis. When applying book leverage as the dependent variable, a positive impact of low quality firms and leverage can be detected, as hypothesized. The coefficient on $CREDIT_{1Q}$ is positive and statistically significant at the 1 percent confidence level. The same finding can be found when utilizing market leverage as the dependent variable in our OLS regression. In specific, our OLS regression analysis in Table 9.7 has proven that low quality firms do possess more leverage compared to high quality firms. The impact of having a credit rating on leverage is larger for low quality firms than for high quality firms. Thus, Hypothesis 6 can be confirmed.

The following two sections will examine how the capital structure of firms alters when credit rating changes are imminent. Two measures will be employed in order to detect possible implications. The first measure revolves around a change in “Broad Credit Rating” conducting the “Plus or Minus (POM)” test. A second way of dealing with the concern of a credit change is to apply a “Credit Score” test and ranking each firm according to their score within each “Micro Rating”.

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886 $CREDIT_{RATING}$ equals 1 if the firm has a credit rating and 0 otherwise.
887 Our study resembles the work of Kisgen (2006), whose paper also analyzes the impact of credit rating changes on capital structure decisions.
Table 9.7

Bond Market Access and Leverage for High and Low Quality Firms

The following table provides OLS results of the sample during 1990-2008. The dependent variable is book leverage, which is defined as book debt over total assets, and market leverage, which is defined as book debt divided by total assets plus market equity minus book equity. CREDIT_RATING is a dummy variable, equaling 1 if the firm has a credit rating and 0 otherwise. CREDIT_LQ is the interactive term of CREDIT_RATING and LQ. LQ equals 1 if the firm has a credit rating of BB or below and 0 otherwise. TA is the natural logarithm of total assets and controls the size effect. MB is the market-to-book ratio and controls the value effect. INTANG is determined as intangible assets divided by total assets and controls for the tangibility effect. PROF is EBITDA divided by assets and controls for the profitability effect. NDTS is the ratio of depreciation and amortization over total assets. RISK is the standard deviation of growth rate of operating profit calculated over all periods. T-values are represented in italics.

<table>
<thead>
<tr>
<th>Explanatory Variables</th>
<th>Book Leverage</th>
<th>Market Leverage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>0.2682</td>
<td>2.1975</td>
</tr>
<tr>
<td></td>
<td>11.47</td>
<td>14.80</td>
</tr>
<tr>
<td>CREDIT_RATING</td>
<td>0.1083</td>
<td>0.2267</td>
</tr>
<tr>
<td></td>
<td>11.00</td>
<td>3.48</td>
</tr>
<tr>
<td>CREDIT_LQ</td>
<td>0.0682</td>
<td>-0.3233</td>
</tr>
<tr>
<td></td>
<td>5.35</td>
<td>-3.85</td>
</tr>
<tr>
<td>TA</td>
<td>0.0307</td>
<td>-0.1420</td>
</tr>
<tr>
<td></td>
<td>10.97</td>
<td>-7.52</td>
</tr>
<tr>
<td>MB</td>
<td>-0.0042</td>
<td>-0.5806</td>
</tr>
<tr>
<td></td>
<td>-1.56</td>
<td>-3.82</td>
</tr>
<tr>
<td>INTANG</td>
<td>-0.9700</td>
<td>-0.4550</td>
</tr>
<tr>
<td></td>
<td>-3.46</td>
<td>-3.26</td>
</tr>
<tr>
<td>PROF</td>
<td>-0.2627</td>
<td>-5.8339</td>
</tr>
<tr>
<td></td>
<td>-7.50</td>
<td>-25.62</td>
</tr>
<tr>
<td>NDTS</td>
<td>0.2517</td>
<td>2.8464</td>
</tr>
<tr>
<td></td>
<td>3.01</td>
<td>5.18</td>
</tr>
<tr>
<td>RISK</td>
<td>0.0002</td>
<td>-0.0016</td>
</tr>
<tr>
<td></td>
<td>0.91</td>
<td>-1.32</td>
</tr>
<tr>
<td>Adj. R²</td>
<td>0.1087</td>
<td>0.1105</td>
</tr>
<tr>
<td>Observation</td>
<td>5623</td>
<td>5539</td>
</tr>
</tbody>
</table>
9.2.3 Plus or Minus Tests

In this section, the POM test will be conducted to explore the impact of capital credit changes on firm’s capital structure. It is hypothesized that firms possessing a minus or plus rating will issue less debt relative to equity than firms in the middle. This assumption is based on the notion that too much gearing is often ultimately leading to a lower credit rating due to the resulting higher distress costs. Based on the reasoning mentioned above the following hypothesis will be tested:

**Hypothesis 7 (= β(ξ)]:** Firms having a minus or plus credit rating tend to issue less debt relative to equity.

To verify this hypothesis the following two regressions will be run:

\[ Y_{it} = \alpha + \beta_0 CR_{POM} + \varnothing K_{it} + \varepsilon_{it} \]  \hspace{1cm} (9.3)

\[ Y_{it} = \alpha + \beta_1 CR_{PLUS} + \beta_2 CR_{MINUS} + \varnothing K_{it} + \varepsilon_{it} \]  \hspace{1cm} (9.4)

where \( CR_{POM} \) represents a dummy variable, which equals 1 if the firm has either a plus or minus credit rating and 0 otherwise. \( CR_{PLUS} \) and \( CR_{MINUS} \) are credit rating dummy variables equal to 1 if the firm has a plus or minus credit rating, respectively and 0 otherwise. \( \varnothing K_{it} \) embodies the different control variables that are included in the OLS regression analysis.\(^{888}\) Basically, these two equations above examine how a firm facing a credit change alters their financing decision. Three dependent variables will be employed in the study. The first \( NETDI \) measures a firm’s net issuance of debt versus equity. The second and third variables are \( BONDS \) and \( LOANS \), respectively.

---

\(^{888}\) The control variables consist of PROF (EBITDA over total assets), CAPEX (capital expenditures divided by assets), OPEX (operating expenses divided by assets), MB (market-to-book ratio), G_TA (growth of total assets), and G_REV (growth of revenues).
Table 9.8 shows the results of our OLS regression analysis. Referring to net issuance first as the primary dependent variable, it can be claimed that credit ratings, which are near an up- or downgrade do have statistically a significant impact on the financing decision of firms. In particular, the dummy variable \( CR_{POM} \) exhibits an inverse relationship to net debt issuance. In other words, firms facing a plus or minus credit rating, implying a near credit change, tend to issue less debt relative to equity when making use of external financing. To be more specific, firms near a credit change are likely to issue roughly 0.85 percent more equity relative to debt. Hence, the results for this particular variable show that firms try to avoid a potential credit downgrade and to accelerate an upgrade by making use of less debt financing when external capital is needed.

The results of equation 9.4 are in line with our previous findings and thus verify our hypothesis. Firms possessing a plus or minus rating issue in general more equity than debt compared to firms in the middle. To be more specific, firms near a credit rating downgrade issue approximately 1 percent less debt relative to equity, and firms close to an upgrade issue 0.6 percent less debt relative to equity compared to firms not facing a potential credit change.

While the results for the net issuance as the dependent variable are statistically as well as economically significant, the opposite is true for the other two dependent variables. In essence, the results for \( BONDS \) and \( LOANS \) fail to exhibit any statistical significance.

The results concerning firm's net debt issuance are in line with the findings of Kijgen (2006). He also studied the impact of credit rating changes on the financing decision of companies and concludes that firms indeed issue less debt relative to equity when facing an imminent credit rating change.\\footnote{See Kijgen (2006), pp.1050-1060.}
### 9.2 Credit Rate Changes and the Timing of Debt Issues

#### Table 9.8
Credit Rating and Capital Structure

The table provides OLS regressions of net issuance (net debt issued for the year minus net equity issued for the year divided by total assets), bonds, and loans on credit rating dummy variables and on control variables, **CR_POM** represents a dummy variable, which equals 1 if the firm has either a plus or minus credit rating and 0 otherwise. **CR_PLUS** and **CR_MINUS** are credit rating dummy variables equal to 1 if the firm has a plus or minus credit rating, respectively and 0 otherwise. The control variables consist of **PROF** (EBITDA over total assets), **CAPEX** (capital expenditures divided by assets), **OPEX** (operating expenses divided by assets), **MB** (market-to-book ratio), **G_TA** (growth of total assets), and **G_REV** (growth of revenues). The results accrue to the whole sample and cover the time period 1990-2008. T-values are shown in italics.

<table>
<thead>
<tr>
<th>Explanatory Variables</th>
<th>Net Issuance</th>
<th>Bonds</th>
<th>Loans</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>1</strong></td>
<td><strong>2</strong></td>
<td><strong>1</strong></td>
</tr>
<tr>
<td>Intercept</td>
<td>0.0112</td>
<td>0.0112</td>
<td>0.0384</td>
</tr>
<tr>
<td></td>
<td>-16.68</td>
<td>-16.89</td>
<td>2.49</td>
</tr>
<tr>
<td>CR_POM</td>
<td>-0.0085</td>
<td>0.0172</td>
<td>0.0170</td>
</tr>
<tr>
<td></td>
<td>-1.93</td>
<td>1.67</td>
<td>1.34</td>
</tr>
<tr>
<td>CR_PLUS</td>
<td>-0.0064</td>
<td>0.0143</td>
<td>0.0120</td>
</tr>
<tr>
<td></td>
<td>-1.93</td>
<td>1.18</td>
<td>0.81</td>
</tr>
<tr>
<td>CR_MINUS</td>
<td>-0.0109</td>
<td>0.0208</td>
<td>0.0229</td>
</tr>
<tr>
<td></td>
<td>-2.01</td>
<td>1.59</td>
<td>1.45</td>
</tr>
<tr>
<td>PROF</td>
<td>0.3480</td>
<td>0.3481</td>
<td>-0.2642</td>
</tr>
<tr>
<td></td>
<td>9.71</td>
<td>9.71</td>
<td>-2.52</td>
</tr>
<tr>
<td>CAPEX</td>
<td>0.0289</td>
<td>0.0302</td>
<td>0.5692</td>
</tr>
<tr>
<td></td>
<td>0.69</td>
<td>0.72</td>
<td>6.37</td>
</tr>
<tr>
<td>OPEX</td>
<td>0.0153</td>
<td>0.0153</td>
<td>0.0105</td>
</tr>
<tr>
<td></td>
<td>4.76</td>
<td>4.75</td>
<td>1.38</td>
</tr>
<tr>
<td>MB</td>
<td>-0.0094</td>
<td>-0.0094</td>
<td>0.0366</td>
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<tr>
<td></td>
<td>-4.66</td>
<td>-4.66</td>
<td>5.64</td>
</tr>
<tr>
<td>G_TA</td>
<td>-0.0089</td>
<td>-0.0089</td>
<td>0.0672</td>
</tr>
<tr>
<td></td>
<td>-0.73</td>
<td>-0.73</td>
<td>2.18</td>
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<tr>
<td>G_REV</td>
<td>0.0385</td>
<td>0.0385</td>
<td>0.0496</td>
</tr>
<tr>
<td></td>
<td>3.01</td>
<td>3.01</td>
<td>1.71</td>
</tr>
<tr>
<td>Adj. R²</td>
<td>0.0322</td>
<td>0.0321</td>
<td>0.0640</td>
</tr>
<tr>
<td>Observations</td>
<td>4470</td>
<td>4470</td>
<td>1589</td>
</tr>
</tbody>
</table>
Basically, Table 9.8 has provided the following two essential findings. First, firms near a credit change do engage in less debt financing relative to equity financing. Second, firms near a rating upgrade as well as a downgrade are more likely to issue more equity relative to debt. Hence, Hypothesis 7 can be confirmed.

In a next step, cross-sectional regression analysis will be conducted in order to examine how credit rating changes influence the capital structure decision of the various business segments. Table 9.9 provides cross-sectional results, differentiating between net debt, bond and loan issues. Unfortunately, most of the results exert weak statistical power, implying that credit rating changes fail to exhibit a significant impact on the financing decision of firms.
### 9.2 Credit Rate Changes and the Timing of Debt Issues

Table 9.9

**Credit Rating and Capital Structure - Business Segment**

The table provides OLS regressions of net issuance (net debt issued for the year minus net equity issued for the year divided by total assets), bonds, and loans on credit rating dummy variables and on control variables. CR_POM represents a dummy variable, which equals 1 if the firm has either a plus or minus credit rating and 0 otherwise. CR_PLUS and CR_MINUS are credit rating dummy variables equal to 1 if the firm has a plus or minus credit rating, respectively and 0 otherwise. The control variables consist of PROFIT (EBITDA over total assets), CAPEX (capital expenditures divided by assets), OPEX (operating expenses divided by assets), MB (market-to-book ratio), G_TA (growth of total assets), and G_REV (growth of revenues). The results accrue to the different business industries and cover the time period 1996-2008. T-values are shown in italics.

<table>
<thead>
<tr>
<th></th>
<th>Telecom Svc</th>
<th>Industrial</th>
<th>Health Care</th>
<th>Consumer Disc</th>
<th>Consumer Staples</th>
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399
9.2.4 Credit Score Test

The following section deals with the perennial question how firms change their capital structure due to changes in their credit ratings. In order to classify firms, which face a potential credit rate change, a Credit Score test for each company will be conducted. An OLS regression will be run to determine the equation for computing the credit scores. In a similar vein to the work of Harrigan (1966) and Kigen (2006) the dependent variable equals 1 for a rating of CCC+ or below, up to a value of 16 for a rating of AA+. Independent variables are included in the regression that best account for credit ratings. Previous studies have emerged with various factors that best predict ratings. Ederington (1985) claims that:

“…while the exact list of independent variables varies from study to study, measures of (1) leverage, (2) profitability, (3) firm size, and (4) subordinated status, have consistently appeared on the lists of important determinants of ratings.”

While in the study of Kigen (2006), the explanatory variables consist only of the (Log of) Total Assets, EBITDA/Total Assets, and Debt/Total Capitalization, we consider the following independent factors, which are in line with the citation of Ederington (1985) mentioned above: PROF (EBITDA/Assets), TA (Log of Total Assets), LEVERAGE, MB (market-to-book ratio), DIV, AGE, and AR (accounts receivables). Reaching an adjusted R² of approximately 0.42, we apply the coefficients from this OLS regression to determine the Credit Score as follows:

\[
CREDITSCORE = 10.18238(PROF) + 0.714166(TA) - 2.715719(LEVERAGE) + 0.227667(MB) + 2.653613(DIV) + 0.011594(AGE) + 4.977325(AR)
\]  

901 For a detailed overview of the explanatory variables used in this OLS regression, refer to chapter xxx.
902 In the beginning various explanatory variables have been included in order to predict credit ratings. However, after dropping redundant variables and those with low explanatory power, a regression consisting only of the aforementioned variables has been generated.
Equation 9.5 is applied for each firm-year and the resulting credit scores are ranked within each Micro Rating into high thirds, low thirds, and middle thirds. In a next step, dummy variables are created, which derive from the ranking. For example, CR_HOL is a dummy variable being 1 when firms are in a high or low third within their Micro Rating and 0 otherwise. CR_HIGH and CR_LOW are credit rating dummy variables equal to 1 if the firm has a high or low credit score, respectively and 0 otherwise. Similar to the “Plus or Minus” test in chapter 9.2.3, the following two regressions are run in our study.

\[ Y_{it} = \alpha + \beta_0 CR_{HOL} + \phi K_{it} + \epsilon_{it} \]  
\[ Y_{it} = \alpha + \beta_1 CR_{HIGH} + \beta_2 CR_{LOW} + \phi K_{it} + \epsilon_{it} \]  

where \( Y_{it} \) are the dependent variables Net Debt Issue, Bonds or Loans. \( \phi K_{it} \) represents the various control variables included in the regression. Due to the immutable fact that the individual explanatory variables used to determine the credit score are highly correlated with the financial condition of a firm, control variables have been applied in the two equations above.

Table 9.10 provides results of equation 9.6 (Regression 1) and 9.7 (Regression 2) for the sample as a whole and the various business industries. Referring to Panel A first, the table shows that the coefficient on \( CR_{HOL} \) is statistically significantly negative at the 5 percent confidence level. This result perfectly shows that firms near a credit rating change issue less net debt relative to net equity compared to those that are not close to a ratings change. Hence, managers are concerned with potential up or down ratings and try to influence these procedures by engaging in less debt financing compared to equity financing. These results are in line with the qualitative study of Graham and Harvey (2001, 2002), showing that credit rating concerns are one of the most important factors influencing the capital structure decision of firms.

---

803 Kingen (2006) make use this procedure and is also deployed in our study.
804 In order to control for various effects, the following variables have been included: PROF, CAPEX, OPEx, MB, G_TA, and G_REV.
their study approximately 57 percent of the respondents consider the fear of distress and the ultimate consequences on their credit rating important or very important in how they determine the appropriate amount of leverage.\footnote{\textsuperscript{55} See Chapter 4.2.1 for further details on the study of Graham and Harvey (2001,2002).}

Interesting results can be found when observing the results of the individual credit rating dummies $CR_{\text{HIGH}}$ and $CR_{\text{LOW}}$. While both variables exhibit strong statistical power, the coefficients merely differ. In essence, the dummy variable $CR_{\text{HIGH}}$ and the dependent variable Net Debt Issue are negatively related, while a positive relationship exists between $CR_{\text{LOW}}$ and the dependent variable. The results show that firms near a credit upgrade issue less net debt relative to net equity and those that face a credit downgrade engage in more net debt issuance compared to net equity issuance. This financing pattern also pertains to the different business industries. While not always statistically significant, the coefficient of $CR_{\text{LOW}}$ is always positive in all different industries. $CR_{\text{HIGH}}$ exhibits mostly also a negative relationship to net debt issuance. Hence, a difference in the capital structure decision of firms can be detected, depending on a potential up- or downgrade in credit ratings.

Similar findings can be observed in Panel B and Panel C of Table 9.10. Here, $CR_{\text{HIGH}}$ has a negative impact on the bonds and loans decision, while $CR_{\text{LOW}}$ exhibits a positive impact on the debt decision. In other words, firms facing a credit rating downgrade engage in more bonds financing than firms near a rating upgrade. Here, the results are statistically significant for the sample, industrial, health care, consumer staples, and energy sector. Same applies to loan financing. While firms near a credit downgrade exhibit a positive relationship to loans financing, firms facing an upgrade rather show an inverse relationship.
The results in Table 9.10 have basically provided four important results. First, firms near a credit rating change in general do issue less net debt relative to net equity. Second, firms facing a credit upgrade issue less net debt relative to net equity. Third, firms near a credit downgrade engage in more debt financing than equity financing. Fourth, cross-sectional results are similar for firms facing credit downgrades, while mixed results can be found for \textit{CR\_HIGH} and \textit{CR\_HOL}. 
Table 9.10
Credit Rating and Capital Structure - Credit Score Test

The table provides OLS regressions of net issuance (net debt issued for the year minus net equity issued for the year divided by total assets), bonds, and loans on credit rating dummy variables and on control variables. CR_HOL represents a dummy variable, which equals 1 if the firm has either a high or low credit score and 0 otherwise. CR_HIGH and CR_LOW are credit rating dummy variables equal to 1 if the firm has a high or low credit score, respectively and 0 otherwise. The control variables consist of PROF (EBITDA over total assets), CAPEX (capital expenditures divided by assets), OPEX (operating expenses divided by assets), MB (market-to-book ratio), G_TA (growth of total assets), and G_REV (growth of revenues). The results are from the sample as well as to the different business industries and cover the time period 1990-2008. T-values are shown in italics. Coefficients of the control variables are not listed.

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9.3 Conclusion

Chapter 9 has been exposed to the following research question: Do managers time the market when engaging in debt financing? To provide an answer to the research question, Chapter 9.1 mainly focused on the relation between interest rate changes and capital structure decision of firms. In essence, logistic regressions as well as OLS regressions have proven that the issuance of bonds and the issuance of loans are associated with current interest rates and changes in interest rates. Next, we have examined whether managers are capable of lowering their cost of debt capital by timing their bond and/or loan issuance. Overall, we have shown that managers fail to lock in fixed interest rates in anticipation of increased future interest rates. Thus, forward-looking timing ability of firms could not be proven.

In a next step, we have analyzed how the credit rating of a firm influences its capital structure decision (Chapter 9.2). Basically, we have proven that the availability of a credit rating and a change in credit rating does have a significant influence on the debt decision of firms. In specific, Chapter 9 has provided the following regression results:

1. Current and historical interest rate changes influence the capital structure decision of firms. In specific, firms issue more bonds and/or loans when interest rates are particularly low. Thus, a backward-looking timing ability of leverage exists.
2. Future interest rates also exhibit an immense impact on the leverage decision of firms. However, firms fail to issue more bonds and/or loans when they anticipate that future interest rates will rise. Thus, our study does not find evidence of forward-looking timing ability of leverage.
3. Firms having a credit rating tend to have higher levels of leverage than firms without a credit rating. In specific, this impact will be larger for low credit quality firms.
4. A potential credit rate change influences the capital structure decision of firms. In specific, firms tend to time the debt market when facing a poten-
tial credit rate change. The POM as well as the Credit Score Test has proven that firms near a credit rate change do engage in less debt financing.

The results mentioned above show that managers indeed attempt to time the debt market when engaging in debt financing. Thus, the research question can be affirmed, claiming that managers in general try to time the market when using debt financing. Table 9.11 provides an overview of the tested hypotheses.

Table 9.11
Overview of Tested Hypotheses

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<th>Hypotheses</th>
<th>Statistics</th>
<th>Result</th>
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<td>Significant Results</td>
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<td>H2 The interest rate effect accrues mainly to the debt decision and not to the raising funds in general</td>
<td>Significant Results</td>
<td>↑</td>
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<tr>
<td>H3 Firms engage in more bond and/or loan issues when interest rates are low in order to finance potential investment opportunities</td>
<td>Significant Results</td>
<td>↓</td>
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<tr>
<td>H4 Firms issue more bonds and/or loans when future interest rates will rise</td>
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<tr>
<td>H5 Firms having a credit rating will have higher leverage than firms without a credit rating, ceteris paribus</td>
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<tr>
<td>H6 The impact of having a credit rating on leverage will be larger for low credit quality firms than for high credit quality firms, ceteris paribus</td>
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<td>H7 Firms having a minus or plus credit rating tend to issue less debt relative to equity</td>
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<tr>
<td>H8 Firms with a high market-to-book ratio tend to have larger asset growth compared to firms with lower market-to-book ratios.</td>
<td>Significant Results</td>
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10 Discussion of Capital Structure Theories

Chapter 10 contributes to the capital structure literature by analyzing which existing capital structure theory can best explain the results obtained in the previous three chapters. In specific, the capital structure theories in Chapter 2 and Chapter 3 will be tested in order to offer an answer to the following research question:

Does a universal theory exist that best explains the capital structure decision of firms?

Our study is the first one to provide an in-depth analysis of the debt determinants and to combine these results with the notion of existing theory. We will find out whether the OLS results can be explained by existing capital structure literature. Chapter 10.1 provides an overview of the different predictions of the various capital structure theories. Based on these predictions, Chapter 10.2 offers discussion on the validity of each tested capital structure theory.

10.1 Predictions of Capital Structure Theories

Table 10.1 shows how each capital structure theory predicts the impact of the single variable on the capital structure decision of firms. The following section will provide a brief elaboration on the different predictions.\textsuperscript{896}

\textsuperscript{896} Our study offers some discussion about what patterns in the data might be expected under each leverage theory. It is the aim of the study to find proof which capital structure theory is able to best explain the leverage decision of firms. While some of the predictions tend to be uncontroversial, there is room for substantial disaccord in some cases.
Table 10.1
Predictions of Explanatory Variables

Overview of predictions. The explanatory variables will be tested according to the various capital structure theories discussed in Chapter 2 and Chapter 3 in this dissertation. In case ambiguity regarding the interpretation of the variable is apparent, the cell is left blank.

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Table 10.1, continued
Predictions of Explanatory Variables

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<td>Discount rate</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td></td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
10.1.1 Size

According to the notion of the trade-off theory, size is positively related to the amount of leverage a firm employs. It can be argued that the bigger a firm becomes, the less it will face bankruptcy risk. These firms are too big to fail and therefore should make use of the tax debt advantage by engaging in massive gearing.

However, the essence of the pecking-order theory predicts that size is inversely related to debt financing. \textit{Mayers and Majluf} (1984) argue that information asymmetries are smaller in the case of big firms, thus, making use of more equity issue.\footnote{Also see Rajan and Zingales (1995), pp.1451.}

Bigger firms are associated to face large agency costs and therefore are inclined to issue more leverage.\footnote{See Diamond (1989), pp.828.} Hence, the agency theory predicts a positive relationship between leverage and the variables $TA$, $REV$ and $AGE$.

According to the notion of the market-timing theory, size should be negatively related to the timing ability of managers. It is argued that small firms, in general, are characterized by a high price-earnings-ratio ($P/E$ ratio) and market-to-book ratio.\footnote{See Goodman et al. (1986).} This stems from the fact that smaller firms tend to retain most of their earnings in order to invest into positive NPV projects. In other words, small firms pursue a growth strategy and consequently, are mostly overvalued compared to bigger firms. In contrast, bigger/mature firms are rather considered as “value firms”, which tend to payout cash proceeds to shareholders. Hence, these firms are associated with a high dividend yield, low $P/E$ ratio and low market-to-book ratio. Analysts often classify firms with a low $P/E$ ratio and low $MB$ ratio as value stocks, and those with a high $P/E$ ratio and high $MB$ ratio as growth stocks.\footnote{See Berk and DeMarzo (2007), p.25.} Based on the rationale mentioned above, we argue that smaller firms generally are more inclined to engage in market-timing practices due to their overvaluation.

Bigger firms are associated with less bankruptcy risk leading to higher firm value. In order to signal their good quality to the financial market, bigger firms are
willing to have a higher degree of leverage. Thus, the leverage signalling theory predicts a positive relationship between size and debt.901

In essence, the predatory theory postulates that bigger firms are less susceptible to predatory behaviour of its competitors. Thus, these firms tend to carry larger amounts of leverage.902

Due to the fact that bigger/mature firms tend to pay out cash proceeds to shareholders in form of dividends or share repurchases, debt financing is less needed as a disciplinary device according to the free cash flow theory and overinvestment theory. Thus, an inverse relationship between size and leverage is expected.

According to the corporate control theory firms issue leverage in order to diminish the threat of a takeover. Due to the fact that bigger/mature firms are less susceptible to takeover threats the need for an increase in debt financing is limited.903 Thus, an inverse relationship between size and leverage can be expected.

10.1.2 Value

The trade-off theory predicts that the value effect is negatively related to leverage. In essence, it is believed that overvalued firms tend to be growth firms, which are characterized by large investments. In general, such firms face higher bankruptcy costs, leading to a decrease in firm value.

The prediction of the value effect on the market-timing hypothesis is straightforward. The higher the valuation the more equity will be issued and hence the less leverage a firm employs. Hence an inverse relationship between the three value variables and the leverage decision of firms is anticipated.

The leverage signalling theory anticipates a positive relationship between leverage and the value of a firm. In other words, higher-value firms will make use of more leverage, since a higher degree of leverage conveys a positive signal to outside investors.

901 See Rajan and Zingales (1995) and Frank and Goyal (2000).
902 See Bolton and Scharfstein (1990), pp.93.
According to the predatory theory overvalued firms are characterized by
overvalued firms are less prone to be taken over by other firms and conse-
sequently are in less need for external financing. Thus, a negative relationship
value and leverage can be anticipated according to the corporate control theory.

10.1.3 Tangibility
According to the trade-off theory tangible assets serve as collaterals for debt
financing, hence, decreasing the costs of financial distress and raising the debt capac-
y of firms. Thus, the variables PPE, INV, AR are expected to be positive, while
INTANG is negatively related to debt.
The same prediction can be found for the pecking-order theory, in which the
collateral is used in order to diminish the relevance of asymmetric information,
thereby making the preference order less stringent.
The agency theory predicts a positive relationship between leverage and tangibil-
ity. Jensen and Meckling (1976) claim that the agency cost of debt occurs as the firm
shifts to riskier investment after the issuance of leverage, and transfers wealth from
debtholders to equityholders. If a firm possesses large amounts of intangible assets,
these assets can serve as collateral, mitigating the lender’s risk of suffering such
agency costs of debt.604 Consequently, a high amount of tangible assets is associated
with a higher debt level and vice versa. The same prediction and string of argumenta-
tion applies to the underinvestment theory.605
In general it is believed that intangible assets are associated with a higher price-
earnings ratio and market-to-book ratio.606 More specifically, intangible assets, such
as corporate reputation increase a firm’s profitability, leading to a higher market valua-
tion.607 In contrast, tangible assets serve as collaterals and are often build up the
older and bigger a firm is. Hence, a positive relationship between tangible assets and

604 See Jensen and Meckling (1976), pp.305.
607 See Little and Little (2000).
the size of a firm exists. Based on the rationale mentioned above it is predicted that the variables \( PPE, INV \) and \( AR \) are positively related to leverage, while \( INT\ANG \) is negatively related to the leverage decision of firms.

The predatory theory predicts a positive relationship between collateral assets and leverage. This prediction stems from the fact that firms with large collateral assets are less prone to predatory behaviour of its competitors.\(^{908}\)

10.1.4 Liquidity

The trade-off theory predicts a positive relationship between \( CASH \) and leverage. The more cash a firm carries the lower the potential bankruptcy costs and hence, the more leverage a firm can employ.

In contrast, the pecking-order theory predicts an inverse relationship between cash holdings and the amount of leverage a firm employs. This rationale can be accounted by the fact that large cash holdings are associated with large internal funds, making external financing less relevant to the firm.

According to Jensen’s (1986) free cash flow hypothesis, cash-rich firms are characterized by higher agency costs. The more cash a firm possesses the higher the probability that managers will squander these funds.\(^{909}\) In contrast, \( WC \) is predicted to be inversely related to debt financing. The notion of the free cash flow hypothesis postulates that cash rich firms tend to engage in more wasteful actions. In order to counterattack such detrimental behaviour, firms need to increase their debt level. By issuing debt, it forces management to pay out the excessive cash flow, leading to a decrease in free cash flow which is at manager’s discretion and thus in danger of being sub-optimally invested. Consequently, management is obliged to service debt payments with free cash available instead of engaging in “empire building”. The same predictions and way of argumentation apply to the overinvestment theory.

\(^{908}\) See See Bolton and Scharfstein (1990), pp.93.

\(^{909}\) See Jensen (1986), pp.323.
Cash-rich firms are associated with higher firm value and more growth opportunities. A recent study of Fresard (2010) has shown that cash is positively related to the market-to-book ratio. Hence, the more cash a firm carries the more overvalued and consequently the less leverage it tends to employ, according to the notion of the market-timing behaviour. Firms having tight up a substantial amount of money in the firm are characterized by a lower \( P/E \) ratio and lower \( MB \) ratio. Hence, the market-timing hypothesis predicts a positive relationship between working capital (\( WC \)) and leverage.

Due to the immutable fact that cash-rich firms are connotated with higher firm value, these firms are apt to increase their level of debt in order to signal their good quality to the financial market. Thus, a positive relationship between leverage and cash can be expected. In contrast, \( WC \) is anticipated to be negatively related to the amount of leverage a firm holds.

The stakeholder theory postulates that cash-rich firms are in larger need for leverage in order to alleviate the bargaining power of stakeholders. Thus, a positive relationship between cash and leverage can be expected.

Cash-rich firms are associated with lower threats of being taken over. Thus, a negative relationship between cash and leverage is predicted according to the corporate control theory. In contrast, \( WC \) is anticipated to be positively related to debt financing.

The more liquidity a firm possesses the more it can counterattack predatory behaviour of its competitors. Thus, these firms tend to have larger levels of debt financing.

10.1.5 Profitability

According to the trade-off theory, one would expect that higher profitability leads to an increase in leverage. This positive relationship can be accounted by the

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910 For instance, determining firm value with the classical discounted cash flow (DCF) method, it is self-explanatory that a higher cash flow in the numerator leads to higher firm value.

fact that profitable firms incur lower expected costs of financial distress, i.e. making debt financing less costly.

However, the more profitable a firm is the more cash it will carry, thus debt should be more valuable due to its disciplinary effect on managers’ actions. Since the pecking-order theory suggests that internal capital should be employed first, higher cash flows ceteris paribus reduce the necessity to issue debt.\(^{92}\) Hence, according to the pecking-order theory, a negative relationship between profitability and leverage is predicted.

The more profitable a firm the more internal funds managers have to waste. Hence, similar to the rationale mentioned about liquidity, firms with higher profitability tend to have higher agency costs. Thus, according to the agency theory a positive relationship between PROF and leverage can be predicted. The same prediction and way of argumentation applies to the free cash flow and overinvestment theory.

According to the quintessence of the market-timing theory, profitability should be negatively related to debt financing. This is mainly due to several reasons. First, in general, the bigger/mature a firm the more profitable it is, ceteris paribus. The older and the more profitable a firm, the more it tends to payout to shareholders in the form of dividends or share repurchases. Thus, profitable firms can be conceived as value firms, whose \(P/E\) ratio and \(MB\) ratio generally are lower compared to small and growth firms. As a result, the market-timing theory predicts a negative relationship between PROF and leverage.

The capital structure signalling models predict that more profitable firms are apt to have a higher degree of debt financing in order to signal their intrinsic value to the financial market. Hence, a positive relationship between profitability and debt financing is predicted by the leverage signalling theory.

According to the stakeholder theory, more profitable firms tend to face larger bargaining power of stakeholders. In order to attenuate the impact of bargaining the firm is recommended to increase its level of debt financing.

The more profitable a firm the lower the likelihood of being taken over and thus the lower the need to make use of excessive leverage. Thus, the corporate control theory predicts an inverse relationship between PROF and leverage.

10.1.6 Growth

Growth in assets as well as revenues is associated with an increase in leverage, according to the trade-off theory. The more a company grows, the bigger it becomes and hence the lower the likelihood of default. Hence, the costs of debt financing will be reduced.

Referring to the pecking-order theory, an increase in capital expenditure diminishes income and consequently, firms have to make use of more external financing, i.e. debt financing. The same applies to operating expenditures. Both expenditures need to be paid for and they directly enter the financing deficit as explained by Shyam-Sunder and Myers (1999). Hence, a positive relationship can be expected.

According to the agency cost theory, equity financed firms tend to engage in suboptimal investments to expropriate wealth from bondholders. These agency costs are significantly higher for growth firms which have more flexibility in their choice of future investments. Myers’ (1977) underinvestment problem states that an inverse relationship between growth and long-term debt can be expected. Consequently, the agency theory and the underinvestment theory predict that growth is inversely related to debt financing. The same can be predicted for the free cash flow and overinvestment theory. Due to the fact that growth firms are in need of cash, wasteful spending is limited and hence decreases the necessity to raise debt financing as a disciplinary device.

According to the market-timing hypothesis, the growth effect is negatively related to leverage. In other words, growth firms are characterized by high investments,

914 See Myers (1977), pp.147.
915 See Jensen and Meckling (1976) and Titman and Wessels (1988).
high \( P/E \) ratio and high \( MB \) ratio, culminating into firm overvaluation. Thus, the level of debt financing will be reduced by means of equity issues.

Growth is associated with lower bankruptcy risk and hence higher firm value. Thus growth is expected to be positively related to leverage according to the notion of the leverage signalling theory.

According to the corporate control theory, the more a company grows the bigger it becomes and hence the lower the likelihood of a takeover threat. Hence, a negative relationship between growth and leverage can be predicted.

Growth in assets as well as revenues is associated with an increase in leverage, according to the predatory theory. The bigger a firm the less it is susceptible to predatory behaviour of its competitors.

10.1.7 Industry

Frank and Goyal (2007) show that managers make use of industry median leverage as a benchmark within the industry to which they adjust to. This observation meets the essence of the trade-off theory, postulating that firms follow a target capital structure. Thus, a positive relationship between \( INDUST\_LEV \) and leverage is predicted. The opposite can be predicted for the median industry growth, implying an inverse relationship.\(^{916}\)

The pecking-order theory predicts a positive relationship between \( INDUST\_G \) and debt financing. Firms within an industry of high growth potential also need to keep up with the pace of its competing firms. Thus, in order to meet growth opportunities, internal funds will not suffice and external finance in form of debt is needed.

The agency theory predicts a negative impact of \( INDUST\_G \) on the debt decision of firms. Same applies to the free cash flow, over- and underinvestment theory.

A high median industry leverage implies that firms are rather undervalued. Therefore, the market-timing hypothesis predicts that \( INDUST\_LEV \) is positively

\(^{916}\) The same prediction and way of argumentation applies to the predatory theory.
related to the debt level of firms. In contrast, the variable \textit{INDUST\_G} is negatively related to leverage.

10.1.8 Risk

It is assumed that higher risk indicates higher volatility of earnings which in turn leads to higher probability of default. Thus, the trade-off theory predicts a negative relationship between business risk and leverage. The same applies to the predatory theory.

The pecking-order theory expects firms to accumulate large cash holdings when facing volatile earnings. Firms, in general, do have larger internal funds available when exposed to volatile earnings in order to avoid underinvestment in the future. Thus, an inverse relationship between \textit{RISK} and leverage is predicted.

According to the agency theory, volatile earnings are associated with higher agency costs. In specific, as distress costs increase due to less stable earnings, the agency problems related to debt financing even aggravates. Hence, a negative relationship between \textit{RISK} and leverage is predicted.

In essence, a high volatile operating profit is associated with higher business risk. In general, small, growth firms are associated with more volatile cash flows and earnings.\textsuperscript{917} Especially during booming economic times, volatile earnings lead to a higher \textit{P/E} ratio and \textit{MB} ratio. Thus, \textit{RISK} is predicted to be inversely related to leverage.

10.1.9 Tax Rate

Based on the essence of the trade-off theory, an increase in the corporate tax rate is associated with more debt financing, exploiting the tax shield advantage. In

\textsuperscript{917} See Dittrmar and Mahr-Smith (2007), pp.605.
contrast, _NDTS_ is expected to be negatively related to debt financing due to its
deductions from firm’s taxable income.

The same predictions apply to the pecking-order theory. A high corporate tax
rate reduces internal funds and therefore induces firms to make use of the debt tax
advantage. It is predicted, that _NDTS_ has a negative impact on debt financing.

10.1.10 Financial Constraints

According to the trade-off theory dividend-paying firms have less cash available
and therefore face higher bankruptcy costs. Due to the fact that dividends are per-
ceived as rather “sticky” firms in distress have difficulty to cut those payments. A
negative relationship can also be predicted for _LOSS_ and _Z_SCORE_, due to the
increased bankruptcy costs. Furthermore, an investment credit rating is associated
with lower bankruptcy costs and therefore debt financing might become more at-
tractive than equity. Hence, a positive relationship between leverage and investment
grade rating might be observed.

The pecking-order theory predicts that dividends exert a positive impact on
leverage. This is mainly due to the fact that cash will be paid out to shareholders,
decreasing the amount of internal funds. Hence, the need for external financing
increases. A positive impact can also be predicted for _LOSS_ and _Z_SCORE_. Firms
possessing an investment grade rating face lower problems with adverse selection
since these companies are obliged to reveal financial information in order to be rated
by credit agencies. Hence, according to the pecking-order theory, firms with an
investment credit rating will make use of less debt and more equity financing.

According to the agency theory, dividend paying firms face lower agency costs.
This is mainly due to the fact that dividend payments reduce the risk that managers
waste available funds. Hence a negative relationship between _DIV_ and leverage can
be expected. The same negative effect can be predicted for the variables _LOSS_ and
_Z_SCORE_. The same prediction and way of argumentation can be applied to the
free cash flow and overinvestment theory.
Referring to the essence of the market-timing hypothesis, dividend paying firms are associated with a lower $P/E$ ratio and $MB$ ratio. The reasoning is similar to that of value firms and therefore a positive relationship between $DIV$ and leverage can be anticipated.\textsuperscript{918} Loss making firms are generally characterized by lower firm value. Consequently, a positive relationship between $LOSS$ and debt financing is predicted.

According to the leverage signalling theory, dividend paying firms as well as firms possessing an investment grade rating want to signal their good quality via an increase in leverage. Financially constrained firms are not able to pay out dividends and therefore would rather prefer lower levels of leverage. Thus, loss making firms as well as firms near bankruptcy prefer to have lower levels of debt financing.

Firms facing losses or bankruptcy are already financially constrained and in a bad position vis-à-vis their competitors. A high level of debt financing would even exacerbate their position when facing predatory behaviour. Thus, an inverse relationship between leverage and the two variables $LOSS$ and $Z_{SCORE}$ is predicted.

The stakeholder theory postulates that loss making firms as well as firms near bankruptcy face larger bargaining power of stakeholders. Thus, in order to diminish the bargaining power these firms tend to have lower levels of leverage. In contrast, firms paying our dividends as well as having an investment grade are willing to increase their debt financing.

The corporate control theory predicts a positive relationship between leverage and the two variables $LOSS$ and $Z_{SCORE}$. In contrast, firms paying out dividends as well as being characterized by an investment grade rating face lower takeover threats and therefore are less in need for debt financing.

10.1.11 Macroeconomic Factors

The trade-off theory predicts a positive impact of $INFLATION$, $GDP$ and $TBILL$, on the leverage decision of firms. Tax considerations in the trade-off theory make debt financing more attractive due to apparent inflation. $GDP$ is associated

\textsuperscript{918} See Fresard (2010).
with higher profits for firms and consequently the theory predicts that higher profits make debt financing more attractive due to larger tax shield benefits. The same predictions apply to the predatory theory.

The pecking-order theory predicts a negative relationship between GDP and TBILL, due to more internal funds available for firms.

The agency theory predicts a positive relationship between GDP and leverage. Due to a rise in GDP, firms are characterized by more profits and cash, aggravating the free cash flow problem postulated by Jensen (1976). Thus, the free cash flow and overinvestment theory also predict a positive impact on leverage.

According to the market-timing theory, if inflation is expected, managers will time the market by increasing their leverage in order to pay off the debt in devalued dollars. In a similar vein, a recession often leads to a decrease in stock valuation and therefore, companies forego to issue equity and increase their leverage. Here, a positive relation can be expected. Finally, an increase in the discount rate leads to a decrease in share prices, making equity issues less attractive. Hence, a positive relationship between TBILL and leverage can be expected.

10.2 Discussion

The following chapter combines the predicted relationship of each capital structure theory with empirical results. Table 10.2 shows how each theory’s prediction meets empirical proof. In essence, the market-timing theory seems to be the best theory in explaining capital structure observations.

Empirical study in Chapter 8 has shown that a total of 20 variables do exert a significant impact on the capital structure decision of firms. The market-timing hypothesis is able to account for 80 percent of the empirical proven financing patterns of firms. When referring to only the predicted variables, the market-timing theory reaches a matching profile of approximately 90 percent. In contrast, the notion of the pecking-order theory is one of the the least valuable theory in accounting

\(^{519}\) See Frank and Goyal (2009).
capital structure decision of firms. Only 25 percent of factors influencing the financing decision of firms can be explained by the pecking-order theory.
Table 10.2
Theoretical and Empirical Relationship

<table>
<thead>
<tr>
<th>Variables</th>
<th>Theoretical Predicted Signs</th>
<th>Major Empirical Studies' Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size</td>
<td>T/A</td>
<td>+</td>
</tr>
<tr>
<td>Value</td>
<td>Age</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>MB</td>
<td>-</td>
</tr>
<tr>
<td>Tangibility</td>
<td>AR</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>Intang</td>
<td>+</td>
</tr>
<tr>
<td>Liquidity</td>
<td>Cash</td>
<td>-</td>
</tr>
<tr>
<td>Profitability</td>
<td>PROF</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>G_TA</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>OPEX</td>
<td>+</td>
</tr>
<tr>
<td>Industry</td>
<td>INDUST_LEV</td>
<td>+</td>
</tr>
<tr>
<td>Risk</td>
<td>Risk</td>
<td>+</td>
</tr>
<tr>
<td>Tax Rate</td>
<td>NDF</td>
<td>-</td>
</tr>
<tr>
<td>Financial Constraints</td>
<td>Div</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Loss</td>
<td>-</td>
</tr>
<tr>
<td>Macro</td>
<td>Z_SCORE</td>
<td>-</td>
</tr>
<tr>
<td>Inflation</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Matching (Predicted) | 45% 57% 36% 33% 89% 36% 36% 0% 0% 100% 0% 0% 47% 33% 0% 64% |

Matching (All)       | 43% 60% 25% 25% 80% 20% 20% 0% 0% 33% 0% 0% 36% 10% 0% 45% |
In comparison, the trade-off theory and agency theory can account for 45 percent and 40 percent of empirical results, respectively. Based on these findings the research question under study can be answered. Indeed, a capital structure theory does exist that is able to explain most of the observed capital structures of firms. The market-timing theory seems to be superior over the other theories, followed by the corporate control theory, trade-off theory and agency theory. The pecking-order theory is weak in accounting financing patterns. The fact that the notion of the pecking-order theory is weak in accounting for the financing patterns in reality confirms the findings of Fama and French (2005), Barclay et al. (2006) and Seifert and Goenec (2008), among others. They show that equity still plays a dominant role when firms make use of external financing and that the pecking-order theory is not best in explaining capital structure decision of firms.

Chapter 7 and Chapter 9 have proven that managers do time the market when engaging in external financing. On the one hand, it has been shown that firms do decrease their leverage by means of equity issues when the market-to-book ratio is high. On the other hand, it has been shown that firms also attempt to time the market when issuing bonds or loans. In specific, firms have increased their issuance proceeds when historical interest rates were particularly low. Furthermore, firms time the market when credit rating up- or downgrades are imminent. However, it should also be noted that a perfect market-timing behaviour of firms does not exist. First, managers fail to time the market when engaging in share repurchase transactions and second, firms fail to issue more bonds and/or loans when they anticipate that future interest rates will rise. Thus, our study does not find evidence of forward-looking timing ability of leverage.

Of course, no capital structure theory exists that is able to account for all capital structure decisions of firms. This is not possible. A sub-goal of this dissertation was not to prove that every single observed financing pattern can be explained by a single theory, but rather to find out which existing theory so far is best in explaining the capital structure of firms. While it has been shown that the market-timing theory is applicable when issuing equity and debt, 80 percent of the most significant debt factors influencing the capital structure of firms can be explained by the essence of
the market-timing theory. Thus, it can be claimed that the market-timing theory is the most superior one in the capital structure literature.
11 Conclusion

In this Chapter the major findings of this dissertation are summarized. Based on these insights, Chapter 11.1 presents final comments and recommendations. Finally, implications and areas for future research are identified in Chapter 11.2.

11.1 Final Comments and Recommendations

The results of this dissertation should be useful for executives since they shed further light on the perennial question, which factors do have an influence on the capital structure decision of firms. In specific, based on the determined factors, executives are able to determine how much bonds, loans and equity to issue as well as how much shares to repurchase. At the same time, the results should be useful for academics, since they broaden the theoretical approaches applied in capital structure literature. Specifically, according to the practical and scientific research gaps explained in Chapter 1.2, the following research questions have been answered.

1. Do managers time the market when engaging in equity financing
2. Which debt factors determine the capital structure of firms?
   i. Are certain debt factors only temporarily important in the leverage decision or do they exhibit a consistent impact over time?
   ii. Are certain debt factors dominant in some industries, yet unimportant elsewhere?
   iii. Which debt factors determine the bond and/or loan decision of firms?
   iv. Which factors influence the equity issue and share repurchase decision of firms?
3. Do managers time the market when engaging in debt financing?
4. Does a universal theory exist that best explains the capital structure decision of firms?

The dissertation has provided an in-depth analysis of the aforementioned research questions. Thus, the study enriches each theoretical view and inspires academics to follow this path for further investigation.

To recapitulate, the dissertation has offered theoretical and empirical results in order to bring the capital structure debate up to a new level of quality. In essence, a theoretical analysis has offered the following insights:

1. The seminal work of Modigliani and Miller (1958) and its foundation of the irrelevance theory have started the capital structure discussion among academics. Specifically, the theory shows that, under atomistic competition, capital structure decisions per se do not have an impact on firm value and consequently can be considered as irrelevant.

2. The trade-off theory, based on Kraus and Litzenberger (1973), meets the shortcomings of the irrelevance theory by combining the impact of the debt tax shield and the bankruptcy cost in the leverage decision of firms. In specific, according to the trade-off theory the optimal debt-equity ratio can be reached by balancing the corporate tax advantages of debt financing against the costs of financial distress that evolve from bankruptcy risk and agency cost. It has been empirically proven that debt taxes and bankruptcy costs, particularly indirect costs, do have a significant impact on the capital structure decision of firms.

3. The capital structure based on agency theory revolves around identifying conflict of interests between managers, equityholders and debtholders. In specific, the theories attempt to show how agency costs might influence the capital structure decision of firms. One of the most influential contribution has been the free cash flow hypothesis by Jensen (1986), postulating that cash-rich firms should rely more heavily on debt financing in order to at-
tenuate managerial entrenchment. Empirical evidence exists showing that agency costs significantly influence the financing decision of firms.

4. The capital structure based on asymmetric information assumes that heterogeneous information among stakeholders exist, culminating into opportunistic behaviour. The underlying rationale behind the pecking-order theory is mainly driven by problems of asymmetric information among firm’s stakeholders, i.e. issues of adverse selection or moral hazard. Hence, a company’s capital structure decision is not driven by the trade-off theory, but rather simply based upon the firm’s willingness to curtail information asymmetry. In contrast to the trade-off theory, the pecking-order suggests that firms do not have a target debt ratio because the ordering determines their preference regarding the issuance of new capital. Empirical evidence validating the essence of the theory is rather mixed.

5. The new capital structure theories follow an inductive and interdisciplinary approach, linking findings of applied economics to the capital structure decision of firms. In contrast to the classical, static and deductive capital structure theories mentioned above, the new dynamic theories attempt to find out how specific business-related aspects influence the financing mix of firms.

6. One of the first capital structure theory combining dynamic aspects in the financing decision of firms has been immensely influenced by the work of Brander and Lewis (1986). Capital structure theory based on product/market interactions attempts to examine the relationship between factor-product markets and the capital structure of a firm. First, the firm’s competitive strategy was linked to the capital structure. However, no empirical evidence so far exists that is able to empirically prove the hypothesis that an increase in leverage ultimately leads to more competitive action among firms. Second, a link between the stakeholder theory and the capital structure theory decision of a firm has been discussed. In general, it has been shown that firms trying to mitigate the bargaining power of stakeholders tend to have lower levels of debt. Third, a linkage between the capital structure and market structure has been provided. Studies of Opler and
Titman (1994) and Chevalier (1995a, 1995b) have shown that highly indebted firms are associated with a lower market share.

7. The capital structure theory based on corporate control mainly emerged due to the intense takeover activities in the 1980s, testing how corporate control in general, and takeover threat in specific, might influence the capital structure decision of firms. In essence, the capital structure theories based on the notion of corporate control, all come to the conclusion that firms generally engage in massive gearing when a takeover threat is apparent. While these approaches are able to account for the short-term fluctuations in the capital structure of firms, they all fail to provide an explanatory contribution to the long-term capital structure of firms.

8. The study of Baker and Wurgler (2002) and Konijczyk and Levy (2003) have shown that capital structures per se are not static and rather follow a dynamic trend, deviating from the target debt level. This deviation mainly occurs through the market-timing behaviour of firms. While Baker and Wurgler (2002) has shown that in specific the capital market has an influence on the financing mix of firms, Konijczyk and Levy (2003) have proven that macroeconomic variables might account for irrational behaviour of firms. These studies show in particular that firms generally pursue a target capital structure in the sense of the trade-off theory and deviate from this target due to market-timing opportunities. While a large body of empirical studies find evidence in favour of the market-timing effect of equity in the USA, other studies fail to validate the essence of the market-timing theory for firms other than those of the USA. In specific, a long-lasting effect of market-timing can hardly be found.

9. Other capital structure studies, dealing with strategic aspects, behavioural finance and the maturity structure of debt, also play an important aspect in the capital structure decision of firms. In specific, the theory of behavioural finance attempts to find a relation between cognitive behaviour and financing decision of firms. In specific the theory shows that overconfident managers tend to engage in massive gearing and that firms often mimic the capital structure of the herd or of the leading firm in an industry.
Next to the theoretical information, the dissertation has delivered an empirical analysis, which can be summarized as follows:

1. According to the market-timing of equity it has been empirically proven that (i) firms do engage in short-term equity market-timing. In specific, it has been shown that firms do issue more equity when the market-to-book ratio is overvalued. Cross-sectional and calendar-time results show that short-term market-timing is prevalent in all industries and that the market-timing effect does not alter over time, respectively. Furthermore it has been proven that (ii) firms fail to engage in long-term market-timing. Thus, firms seem to adjust their capital structure to a target debt level, as suggested by the trade-off theory. Finally, it has been demonstrated that (iii) firms fail to time the market when tackling share repurchase transactions. However, these results are materially only marginal significant.

2. The empirical analysis concerning the determinants of capital structure has shown that (i) size, tangibility, industry leverage, operating risk, non-debt tax shields, dividends, loss and inflation do have a positive impact on the leverage decision of firms. In specific, the factor industry leverage seems to be the most materially significant debt factor, followed by tax- and tangibility effects. In contrast, (ii) liquidity, measured in cash terms, value, profitability, growth opportunities and bankruptcy risk are associated with a decrease in leverage. Specifically, profitability seems to be the most important debt factor, followed by the liquidity effect. Industry leverage, growth opportunities, dividends and losses are positively related to the amount of loans a firm tends to issue. In specific, industry leverage seems to be the most relevant loan factor. (iii) Profitability, liquidity, value and size are negatively related to the loan decision of firms. PROF and CASH exert the highest material importance. (iv) Industry leverage, growth opportunities, dividends and losses are positively related to the amount of bonds to issue. Thus, the same factors that have a positive impact on loan financing also apply to bond financing. (v) Profitability, liquidity, value, size and non-debt tax shields are inversely related to bonds. Again, the factors influencing the bond and loan decision are almost iden-
tical. However, it must be noted, that the debt factors exhibit a much larger material importance in the loan decision. Hence, these factors play a more important role in the decision how much loans to issue compared to the bond decision. (vi) Growth opportunities, liquidity, value and losses are positively related to equity issues. In contrast, profitability, size, inflation and bankruptcy risk are negatively related to the amount of equity a firm tends to issue. (vii) Profitability, liquidity and value have a positive impact on share repurchase transaction. In contrast, non-debt tax shields, tangibility, size and losses are negatively related to share repurchases.

3. Empirical results on the market-timing of leverage have shown that (i) current and historical interest rate changes influence the capital structure decision of firms. In specific, firms issue more bonds and/or loans when interest rates are particularly low. Thus, a backward-looking timing ability of leverage exists. In contrast, (ii) future interest rates also exhibit an immense impact on the leverage decision of firms. However, firms fail to issue more bonds and/or loans when they anticipate that future interest rates will rise. Thus, our study does not find evidence of forward-looking timing ability of leverage. (iii) Firms having a credit rating tend to have higher levels of leverage than firms without a credit rating. In specific, this impact will be larger for low credit quality firms. (iv) A potential credit rate change influences the capital structure decision of firms. In specific, firms tend to time the debt market when facing a potential credit rate change. The POM as well as the Credit Score Test has proven that firms near a credit rate change do engage in less debt financing.

Having provided theoretical as well as empirical results on the capital structure debate, it is of utmost importance to close this dissertation by analyzing the interaction between the two. Thus, Chapter 10 has tried to combine the theoretical knowledge retrieved from Chapter 2, Chapter 3 and Chapter 4 with the empirical results of Chapter 7, Chapter 8 and Chapter 9. The main result can be summarized as follows:
1. The notion of the **market-timing theory** is best in accounting for the empirically observed financing pattern of firms. In specific, the theory is able to explain 80 percent of the capital structure determinants. In comparison, the pecking-order theory is one of the weakest theories, explaining only 25 percent.

To conclude, the results have shown that the market-timing theory serves as the best theory in capital structure literature to explain observed financing patterns. Furthermore, it has been shown that managers indeed attempt to time the market when engaging in equity or debt decisions.

### 11.2 Implications for Future Research

The results of this dissertation reveal interesting, partly unexpected, and certainly challenging outcomes for further research. Furthermore, the dissertation provides just a flavour of the overall capital structure situation, which offers possible further studies. First, the empirical results about the market-timing effect and the capital structure determinants are country-specific. Hence, it should be studied whether the observed financing effects and the market-timing of leverage have the same influence on firms in countries other than the USA. Second, while the dissertation has contributed to the capital structure discussion by providing results on the market-timing of equity and the market-timing of leverage it would be interesting to test the interaction between the two. Could it be possible to detect a hierarchy when analysing equity-timing and debt-timing simultaneously? Empirical study is needed to shed light on the question which effect is stronger. For example, if interest rates are particularly low and the market-to-book ratio is relatively high, do the firms rather engage in debt or equity issuance? In other words, is the market-timing effect of debt stronger than the market-timing effect of equity?
Bibliography


Appendices

List of Appendices

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### Table 6.1 Sample Overview

The table shows the companies included in the sample under study. In total, 421 companies have been chosen from the S&P 500 index.

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Appendix B:

Table 6.6
Development of Capital Structure (Telecommunication)

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### Notes

- Assets %
- Liabilities %
- Shareholders’ Equity %

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- Common Stock
- Capital Surplus
- Retained Earnings
- Total Shareholders Equity
- Total Liabilities & Shareholders Equity
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<td>57.99</td>
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</table>

- Minority Interest  
- Common Equity  
- Common Stock  
- Capital Surplus  
- Retained Earnings  
- Total Shareholders Equity  
- Total Liabilities & Shareholders Equity
### Table 6.14
**Development of Capital Structure (Energy)**

<table>
<thead>
<tr>
<th>Year</th>
<th>Assets %</th>
<th>Liabilities %</th>
<th>Shareholders' Equity %</th>
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<tr>
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<td>1.03</td>
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<tr>
<td>Non-Convertible Debt</td>
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<td>27.11</td>
<td>31.09</td>
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<tr>
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<td>57.48</td>
<td>58.57</td>
<td>58.17</td>
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<tr>
<td>Shareholders' Equity</td>
<td>57.72</td>
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<td>59.58</td>
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**Minority Interest**

- 0.71
- 0.34
- 0.29
- 0.32
- 0.50
- 0.55
- 0.61
- 0.68
- 1.50
- 1.63
- 1.61
- 1.36
- 1.22
- 1.25
- 1.05
- 1.05
- 0.94
- 0.78

**Common Equity**

- 39.98
- 38.52
- 39.03
- 40.30
- 38.36
- 38.73
- 39.37
- 39.94
- 32.16
- 33.46
- 38.21
- 36.80
- 34.97
- 36.59
- 40.10
- 42.43
- 42.91
- 43.84
- 45.27

**Common Stock**

- 48.86
- 38.22
- 38.92
- 40.30
- 37.73
- 37.31
- 39.24
- 40.53
- 36.95
- 36.97
- 38.67
- 37.74
- 36.06
- 39.96
- 42.49
- 44.96
- 45.52
- 44.68
- 46.80

**Capital Surplus**

- 0.20
- 0.45
- 0.23
- 0.34
- 0.21
- 0.40
- 0.19
- 0.09
- 0.19
- 0.57
- 0.46
- 0.45
- 0.47
- 0.37
- 0.53
- 0.40
- 0.48
- 0.32

**Retained Earnings**

- 23.16
- 23.08
- 24.52
- 26.02
- 23.42
- 27.58
- 26.65
- 27.39
- 26.39
- 27.83
- 28.50
- 25.72
- 26.31
- 24.58
- 23.48
- 23.34
- 19.77
- 18.26
- 18.47

**Total Shareholders Equity**

- 14.25
- 41.33
- 41.83
- 42.91
- 42.50
- 42.64
- 42.56
- 42.37
- 35.76
- 37.43
- 41.27
- 39.97
- 37.58
- 39.00
- 41.81
- 44.23
- 44.75
- 45.26
- 46.09

**Total Liabilities & Shareholders Equity**

- 100.00
- 100.00
- 100.00
- 100.00
- 100.00
- 100.00
- 100.00
- 100.00
- 100.00
- 100.00
- 100.00
- 100.00
- 100.00
- 100.00
- 100.00
- 100.00
- 100.00
- 100.00
- 100.00


### Appendix C:

#### Table 7.3

**Determinants of Annual Changes in Leverage and Components (1990-1995)**

OLS regressions of changes in book leverage and its components on the market-to-book ratio, fixed assets, profitability, firm size, and lagged leverage. Book leverage is defined as book debt to total assets. The M/B ratio is total assets minus book equity plus market equity divided by total assets. Firm-year observations with an excessive market-to-book (larger than ten) are excluded. Fixed assets intensity (PPE/A) is defined as net property, plant, and equipment over total assets. Profitability (EBITDA/A) equals operating income before depreciation divided by total assets. Firm size is defined as the natural log of net sales. The total change in leverage is depicted in Panel A. The net equity issues are in Panel B, while newly retained earnings are in Panel C. Panel D represents the growth in the assets components. Robust t-statistics are also presented.

<table>
<thead>
<tr>
<th>Industry</th>
<th>N</th>
<th>M/B +1 %</th>
<th>PPE/A+1 %</th>
<th>EBITDA/A+1 %</th>
<th>log(S)+1</th>
<th>D/A+1 %</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>b</td>
<td>t(b)</td>
<td>e</td>
<td>d</td>
<td>t(c)</td>
<td>f</td>
</tr>
</tbody>
</table>

**Panel A: Change in book leverage**

<table>
<thead>
<tr>
<th>Sample</th>
<th>1466</th>
<th>-0.0053</th>
<th>2.64</th>
<th>0.0197</th>
<th>2.36</th>
<th>-0.0266</th>
<th>4.55</th>
<th>-0.1299</th>
<th>-20.67</th>
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</thead>
<tbody>
<tr>
<td>Industry</td>
<td>231</td>
<td>-0.0022</td>
<td>-0.34</td>
<td>0.0131</td>
<td>0.67</td>
<td>-0.0412</td>
<td>-0.41</td>
<td>0.0106</td>
<td>1.44</td>
</tr>
<tr>
<td>Health Care</td>
<td>147</td>
<td>-0.0092</td>
<td>-2.39</td>
<td>0.0480</td>
<td>0.96</td>
<td>0.0658</td>
<td>1.05</td>
<td>-0.0183</td>
<td>-1.57</td>
</tr>
<tr>
<td>Consumer Disc</td>
<td>292</td>
<td>0.0078</td>
<td>1.99</td>
<td>-0.0402</td>
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<td>-0.3039</td>
<td>-3.42</td>
<td>0.0239</td>
<td>2.80</td>
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<td>0.1692</td>
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<td>0.0168</td>
<td>1.90</td>
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<tr>
<td>Information Tech</td>
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<td>-1.83</td>
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<td>-1.69</td>
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<tr>
<td>Energy</td>
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<td>0.1945</td>
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**Panel B: Change in book leverage due to net equity issues**

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<td>0.05</td>
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Table 7.3, continued
Determinants of Annual Changes in Leverage and Components (1990-1995)

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<th>Industry</th>
<th>N</th>
<th>M/B-1 %</th>
<th>PPE/A-1 %</th>
<th>EBITDA/A-1 %</th>
<th>log(S)-1</th>
<th>D/A-1 %</th>
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</thead>
<tbody>
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<td>t(c)</td>
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Panel C: Change in book leverage due to newly retained earnings

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<th>PPE/A-1 %</th>
<th>EBITDA/A-1 %</th>
<th>log(S)-1</th>
<th>D/A-1 %</th>
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<tr>
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<td>-0.1325</td>
</tr>
<tr>
<td>HealthCare</td>
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<td>1.24</td>
<td>0.0419</td>
<td>0.06</td>
<td>-0.5667</td>
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<tr>
<td>Consumer Disc</td>
<td>292</td>
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<td>-4.91</td>
<td>-0.0193</td>
<td>-0.74</td>
<td>0.1919</td>
</tr>
<tr>
<td>Consumer Staples</td>
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<td>-3.47</td>
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<td>-0.0575</td>
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<tr>
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</table>

Panel D: Change in book leverage due to growth in assets

<table>
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<th>Industry</th>
<th>N</th>
<th>M/B-1 %</th>
<th>PPE/A-1 %</th>
<th>EBITDA/A-1 %</th>
<th>log(S)-1</th>
<th>D/A-1 %</th>
</tr>
</thead>
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<tr>
<td>Sample</td>
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<td>0.79</td>
<td>0.0364</td>
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<td>2.69</td>
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<td>1.08</td>
<td>0.1325</td>
</tr>
<tr>
<td>HealthCare</td>
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<td>1.24</td>
<td>0.0419</td>
<td>0.06</td>
<td>0.5667</td>
</tr>
<tr>
<td>Consumer Disc</td>
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<td>4.91</td>
<td>0.0193</td>
<td>0.74</td>
<td>0.1919</td>
</tr>
<tr>
<td>Consumer Staples</td>
<td>162</td>
<td>0.0213</td>
<td>3.47</td>
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<td>0.2792</td>
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<td>0.96</td>
<td>0.1651</td>
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</tr>
<tr>
<td>Utilities</td>
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<td>0.0891</td>
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</tr>
<tr>
<td>Materials</td>
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<td>0.0575</td>
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<tr>
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<td>1.18</td>
<td>0.0064</td>
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</table>
### Table 7.4

Determinants of Annual Changes in Leverage and Components (1996-2001)

OLS regressions of changes in book leverage and its components on the market-to-book ratio, fixed assets, profitability, firm size, and lagged leverage. Book leverage is defined as book debt to total assets. The M/B ratio is total assets minus book equity plus market equity divided by total assets. Firm-year observations with an excessive market-to-book (larger than ten) are excluded. Fixed assets intensity (PPE/A) is defined as net property, plant, and equipment over total assets. Profitability (EBITDA/A) equals operating income before depreciation divided by total assets. Firm size is defined as the natural log of net sales. The total change in leverage is depicted in Panel A. The net equity issues are in Panel B, while newly retained earnings are in Panel C. Panel D represents the growth in the assets components. Robust t statistics are also presented.

<table>
<thead>
<tr>
<th>Industry</th>
<th>N</th>
<th>M/Br-1 %</th>
<th>PPE/At-1 %</th>
<th>EBITDA/At-1 %</th>
<th>log(S)-1</th>
<th>D/At-1 %</th>
<th>R²</th>
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<td>M</td>
<td>b</td>
<td>c</td>
<td>d</td>
<td>e</td>
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Panel B: Change in book leverage due to net equity issues

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<tr>
<th>Industry</th>
<th>N</th>
<th>M/Br-1 %</th>
<th>PPE/At-1 %</th>
<th>EBITDA/At-1 %</th>
<th>log(S)-1</th>
<th>D/At-1 %</th>
<th>R²</th>
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<td></td>
<td></td>
<td>M</td>
<td>b</td>
<td>c</td>
<td>d</td>
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<tr>
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<td>-7.19</td>
<td>-0.0667</td>
<td>-5.54</td>
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<tr>
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### Determinants of Annual Changes in Leverage and Components (1996-2001)

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<th>MBt+1 %</th>
<th>PPE/At+1 %</th>
<th>EBITDA/At+1 %</th>
<th>log(S)t+1</th>
<th>D/At+1 %</th>
<th>R²</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>b</td>
<td>e</td>
<td>d</td>
<td>e</td>
<td>f</td>
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<tr>
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<td>t(e)</td>
<td>t(d)</td>
<td>t(e)</td>
<td>t(f)</td>
<td></td>
</tr>
</tbody>
</table>

#### Panel C: Change in book leverage due to newly retained earnings

| Sample | 2091 | 0.0093 | 3.07 | 0.0943 | 6.12 | -0.5814 | -13.50 | -0.0142 | -2.14 | -0.0358 | -2.44 | 0.10 |
| Telecom Svc | 20 | 0.0027 | 0.19 | 0.3052 | 4.74 | -0.9703 | -4.60 | 0.0195 | 3.19 | -0.1195 | -2.30 | 0.74 |
| Industry | 317 | -0.0157 | -4.16 | 0.0015 | 0.11 | -0.1256 | -2.07 | 0.0107 | 2.10 | 0.00122 | 0.70 | 0.22 |
| Health Care | 234 | 0.0114 | 4.08 | 0.3811 | 5.34 | -1.0796 | -20.61 | 0.0010 | 0.10 | -0.0156 | -1.33 | 0.72 |
| Consumer Disc | 404 | 0.00009 | 0.01 | -0.0483 | -1.63 | -0.4515 | -6.13 | 0.0256 | 2.28 | 0.0011 | 0.06 | 0.15 |
| Consumer Staples | 214 | -0.0131 | -2.57 | 0.0267 | 0.89 | 0.0104 | 0.94 | -0.0022 | -0.26 | -0.0198 | -0.69 | 0.06 |
| Information Tech | 364 | -0.0063 | -0.51 | -0.1778 | -1.18 | -0.8499 | -4.61 | 0.0176 | 0.58 | -0.3613 | -3.11 | 0.08 |
| Utilities | 184 | -0.0185 | -1.76 | 0.0196 | 1.03 | -0.0231 | -0.29 | 0.0085 | 1.55 | 0.0188 | 0.50 | 0.05 |
| Materials | 153 | -0.0084 | -1.03 | 0.0380 | 1.38 | -0.3256 | -3.38 | -0.0041 | -0.12 | 0.0036 | 2.18 | 0.24 |
| Energy | 281 | -0.0204 | -1.27 | 0.0414 | 1.06 | -0.2561 | -2.71 | -0.0103 | -0.91 | -0.0743 | -1.48 | 0.06 |

#### Panel D: Change in book leverage due to growth in assets

| Sample | 2091 | -0.0063 | -2.48 | 0.0109 | 0.85 | -0.1948 | -5.10 | 0.0373 | 6.68 | 0.1132 | 9.20 | 0.11 |
| Telecom Svc | 20 | -0.0664 | -0.99 | 0.2334 | 1.74 | -1.7321 | -17.6 | 0.2229 | 3.07 | 0.1459 | 0.60 | 0.65 |
| Industry | 317 | -0.0128 | -1.96 | -0.1430 | -0.64 | 0.0975 | 0.93 | 0.0175 | 5.41 | 0.0967 | 3.22 | 0.20 |
| Health Care | 234 | -0.0110 | -1.93 | 0.1444 | 1.23 | -0.4752 | -5.51 | 0.0049 | 3.46 | 0.1140 | 5.90 | 0.25 |
| Consumer Disc | 404 | -0.0241 | -7.34 | -0.0076 | -0.32 | 0.1572 | 2.67 | 0.0160 | 4.47 | 0.1587 | 11.44 | 0.38 |
| Consumer Staples | 214 | -0.0025 | -0.63 | -0.0026 | -1.94 | 0.0724 | 0.82 | 0.0046 | 0.71 | 0.0561 | 2.53 | 0.06 |
| Information Tech | 364 | -0.0043 | -0.45 | 0.0051 | 0.65 | -0.3923 | -2.70 | 0.0062 | 2.60 | 0.0393 | 0.43 | 0.05 |
| Utilities | 184 | -0.0462 | -2.27 | 0.0515 | 1.47 | -0.0736 | -0.53 | 0.0121 | 1.14 | 0.0409 | 0.64 | 0.07 |
| Materials | 153 | -0.0151 | -1.42 | -0.0599 | -1.68 | -0.2000 | -1.77 | -0.0048 | -0.31 | 0.0065 | 3.02 | 0.16 |
| Energy | 281 | 0.0037 | 0.32 | -0.0154 | -0.55 | 0.0815 | 1.24 | 0.0203 | 2.45 | 0.2566 | 7.07 | 0.25 |
Table 7.5
Determinants of Annual Changes in Leverage and Components (2002-2008)

OLS regressions of changes in book leverage and its components on the market-to-book ratio, fixed assets, profitability, firm size, and lagged leverage. Book leverage is defined as book debt to total assets. The M/B ratio is total assets minus book equity plus market equity divided by total assets. Firm-year observations with an excessive market-to-book (larger than ten) are excluded. Fixed assets intensity (PPE/A) is defined as net property, plant, and equipment over total assets. Profitability (EBITDA/A) equals operating income before depreciation divided by total assets. Firm size is defined as the natural log of net sales. The total change in leverage is depicted in Panel A. The net equity issues are in Panel B, while newly retained earnings are in Panel C. Panel D represents the growth in the assets components. Robust t statistics are also presented.

<table>
<thead>
<tr>
<th>Industry</th>
<th>$\Delta M/B_{i,t}$ %b</th>
<th>$\Delta PPE/A_{i,t}$ %c</th>
<th>$\Delta EBITDA/A_{i,t}$ %d</th>
<th>$\Delta \log(S)^{c,1}$</th>
<th>$\Delta D/A_{i,t}$ %f</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>b, t(b)</td>
<td>e, t(c)</td>
<td>d, t(d)</td>
<td>e, t(e)</td>
</tr>
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<td><strong>Panel A: Change in book leverage</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sample</td>
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<td>-0.0017, -0.17</td>
<td>-0.0279, -0.89</td>
<td>0.0157, 3.95</td>
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<td>0.0408, 0.75</td>
</tr>
<tr>
<td>Industry</td>
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<td>-0.0022, -0.16</td>
<td>0.0525, 0.76</td>
<td>0.0102, 1.75</td>
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<tr>
<td>Health Care</td>
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<td>-0.1155, -0.71</td>
<td>0.0294, 1.01</td>
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<td>-0.0066, -0.33</td>
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<tr>
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<td>0.0156, 1.38</td>
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<tr>
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<td><strong>Panel B: Change in book leverage due to net equity issues</strong></td>
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<tr>
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</tr>
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<td>0.0839, 2.05</td>
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<tr>
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### Determinants of Annual Changes in Leverage and Components (2002-2008)

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<th>N</th>
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<th>EBITDA/A+1 %</th>
<th>log(S)+1</th>
<th>D/A+1 %</th>
<th>R²</th>
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<td>t(c)</td>
<td>d</td>
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</table>

Panel C: Change in book leverage due to newly retained earnings

Panel D: Change in book leverage due to growth in assets
Appendix D:

Table 8.18
Determinants of Leverage – Calendar-Time

The following table provides an overview of the determinants of leverage. All factors are lagged one year and are regressed on the dependent variable Book Leverage, which is defined as book debt to total assets. Regressions are run for the whole sample and every single business sector. Numbers in italics represent t-values, N represents the number of observations. R²; the adjusted R² as well as the F-Statistic can be found at the bottom of this table. Panel A shows the results for the time period 1990-1995, whereas Panel B represents the time frame 1996-2001. Finally, Panel C depicts the findings for the time 2002-2008.

<table>
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<th>Variable</th>
<th>Sample</th>
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<th>Health Care</th>
<th>Consumer Disc</th>
<th>Consumer Staples</th>
<th>Information Tech</th>
<th>Utilities</th>
<th>Materials</th>
<th>Energy</th>
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</thead>
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</tr>
<tr>
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<td>-0.39</td>
<td>1.28</td>
<td>0.36</td>
<td>0.24</td>
<td>0.27</td>
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</tr>
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<td>-0.0227</td>
<td>-0.1770</td>
<td>-0.1994</td>
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Determinants of Leverage – Calendar-Time

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**Determinants of Leverage – Calendar-Time**

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Determinants of Leverage – Calendar-Time

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Table 8.19
Determinants of Bonds and Loans

The following table provides an overview of the determinants of leverage. All factors are lagged one year and are regressed on the dependent variable. Panel A represents Loans as the dependent variable, whereas Panel B's regression is based on Bonds as the dependent variable. Regressions are run for the whole sample and every single business sector. Numbers in italic represent t-values, N represents the number of observations, R², the adjusted R² as well as the F-Statistic can be found at the bottom of this table.

Panel A: Loans

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### Table 8.9, continued

**Determinants of Bonds and Loans**

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| N        | 1933    | 317       | 195         | 402            | 249              | 193               | 173       | 164       | 192    |
|          | R²      | 0.20      | 0.29        | 0.43           | 0.35             | 0.22              | 0.19      | 0.23      | 0.31   |
| Adj. R²  | 0.19    | 0.25      | 0.31        | 0.31           | 0.31             | 0.15              | 0.09      | 0.12      | 0.23   |
| F-Statistic| 4.94    | 6.74      | 6.52        | 10.11          | 3.22             | 1.97              | 2.23      | 2.02      | 3.85   |
## Table 8.B, continued

### Determinants of Bonds and Loans

#### Panel B: Bonds

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### Determinants of Bonds and Loans

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Appendix F:

Table 8.20  
Determinants of Equity Issue and Share Repurchase

The following table provides an overview of the determinants of equity issue and share repurchase. All factors are lagged one year and are regressed on the dependent variable. Panel A represents Equity Issue as the dependent variable, whereas Panel B’s regression is based on Share Repurchase as the dependent variable. Regressions are run for the whole sample and every single business sector. Numbers in italics represent t-values, N represents the number of observations, R², the adjusted R² as well as the F-Statistic can be found at the bottom of this table.

Panel A: Equity Issue

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| N        | 1014   | 164      | 131         | 215           | 123              | 216               | 38        | 66        | 55    |
| R²       | 0.22   | 0.42     | 0.41        | 0.26          | 0.36             | 0.55              | 0.43      | 0.61      | 0.38  |
| Adj. R²  | 0.20   | 0.33     | 0.39        | 0.35          | 0.29             | 0.36              | 0.02      | 0.18      | 0.38  |
| F-Statistic | 13.93 | 5.10     | 5.13        | 6.81          | 1.94             | 5.50              | 1.03      | 1.71      | 2.64  |
Appendix G:

Table 9.5  
Sample Summary Statistics - Ratings, Leverage and Equity

The table provides means and median of book leverage, bonds issuance, loans issuance, and net debt issuance by credit rating within the sample. The number of firm-years refers to the rating at the beginning of the firm-year. Book Leverage is defined as book debt to total assets.

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### Table 9.5, continued

**Sample Summary Statistics - Ratings, Leverage and Equity**

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