The influence of financial leverage on investment

An examination of overinvestment and underinvestment in Danish listed companies

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Summary

In this report the relationship between leverage and investment is examined. The relationship between leverage and investment is used to indicate the presence and extent of the agency problems overinvestment and underinvestment in Danish listed companies between the years 2006-2010. This thesis additionally focuses on the effect of managerial and institutional shareholdings on the leverage-investment relationship and the agency problems. The research question in this thesis is '*To what extent does leverage influence investment of Danish listed companies and to what extent can the relationship be explained by agency problems?*'.

Past literature has focused on the relationship between leverage and investment, and the agency problems. The literature is contradictive because empirical evidence is found supporting and not supporting the agency problems. Literature is also contradictive about the effects of insider share ownership on the agency problems. Insider shareholders can align the interests of managers and shareholders and decrease overinvestment but increasing insider share ownership might lead to the expropriation of minority shareholders and increase overinvestment. Insider ownership might reduce underinvestment because of alignment of interests between managers and shareholders, but might also decrease the underinvestment problem due to the risk of default combined with the risk of declining share prices. In past research the relationship between cash flow and investment is also used to detect agency problems. Based on the outcomes of the literature eight hypotheses are developed.

The sample consists of 68 Danish listed companies with 312 year-based observations. The research method used in this thesis is a mixed method research through a combination of quantitative and qualitative research. Data for the quantitative research is collected from annual reports. Data for the qualitative research is collected using semi-structured interviews with four financial managers of Danish listed companies. Quantitative analysis is performed in the form of a correlation analysis and a regression analysis to indicate whether and to what extent leverage and investment are related and whether the relationship can be explained by agency problems. Also the influence of share ownership on the relationship is examined using correlation analysis and regression analysis. Residual analysis is performed to analyze the magnitude of overinvestment and underinvestment and to analyze to what extent results found using correlation analysis and regression analysis hold. Qualitative analysis is performed to analyze whether the vision of managers on investment expenditure coincide with results found in the quantitative analysis.

After testing the hypotheses results indicate that debt is related to investment with its direction and magnitude depending on sector and year. Overinvestment problems are found for the Industrials & Materials sector for the year 2007 when long-term debt is the leverage proxy. Interest-bearing debt seems to restrict overinvestment for the Health care sector and the Industrials & Materials sector for the years 2008, 2009 and 2010. Underinvestment problems are found in all sectors and all years when interest-bearing debt is the leverage proxy. Managerial share ownership does not influence the overinvestment problem. Managerial and institutional share ownership seem to reduce the underinvestment problem when ownership stakes are sufficiently large. The magnitude of the overinvestment and underinvestment problem are not severe, nor do they differ in magnitude.

The result of the quantitative and qualitative analysis resemble, which indicates that the leverage-investment relationship is a feasible mechanism to detect agency problems. But the method has problems with isolating the effects of the agency problems. A relationship between leverage and

investment does not necessarily indicate agency problems. Agency problems might also be influenced by different variables than debt, such as internal funding of projects, return on investment, law, and adjustment of the debt level in anticipation on future growth opportunities. Therefore additional research is required to determine which aspects influence investment expenditure and so the agency problems. These factors should be included in the agency theory, because the agency theory implies a relatively large role of debt in the agency problems while this might not be the case. Because quantitative research has difficulties in isolating the effects of overinvestment and underinvestment future research should combine both quantitative and qualitative analysis. Qualitative analysis could be conducted to gain insight in which aspects influence investment behavior so the quantitative analysis could be adjusted and defined to the aspects that influence investment behavior. Finally future research should focus on agency problems on the firm level instead of per sector because the presence and extent of agency problems might differ per firm.

Preface

This master thesis marks the end of my master study Business Administration, Financial Management at the University of Twente in Enschede. I took great pleasure in completing the workshops, projects and courses in this study. During this two years in which I completed a pre-master and master, the courses, workshops and projects increased my knowledge and allowed me to meet people which I hope to stay in contact with after graduation. I believe that this study provides me a basis for beginning a career in financial management. This study on agency problems in Denmark is executed with the assistance of and cooperation with people with whom I enjoyed working together.

First of all I would like to thank Henk Kroon who was my first supervisor during the project. His critical view, flexibility and the good working atmosphere contributed to the completion of this study. I also would like to thank Harry van der Kaap for his time in which he gave useful criticism on and insights in the analysis part of this thesis. A special thanks to Aart Kroon for his hospitality in Denmark. Thanks to the four financial managers of Danish listed companies which I interviewed for the time and effort they took for this thesis. I would like to thank prof. dr. J. Bilderbeek for being the second supervisor and his flexibility and time in a short notice.

Finally I would like to thank my boyfriend Lennart Zuidema for his support and positivism when writing this thesis and sometimes listening to my frustrations during the time I have written this thesis. Thanks to my parents and sister for their support and encouragement not only during this thesis but during the entire study. I wish you take pleasure in reading this thesis. Your interest is appreciated.

Enschede, September 12, 2011

Evelyn Tempel

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1. Introduction

1.1 Managerial investment behavior

During the last decade managerial behavior has gained increasing attention as confidence in financial managers has deteriorated (Financial Times, 2010). The behavior and financial decisions made by financial managers could not always endorse the public. That management bonuses were granted in financial distressed times is one example of managerial decision making that has raised concern with the public. The ENRON scandal in 2001, the Parmalat scandal in 2003 and the Palm Invest scandal in 2008 are well-known extreme examples of financial managers' misuse of corporate resources for their own benefit. These examples contribute to the degradation of the image of financial management. It raises the question whether this managerial value-destroying behavior is widespread or that these examples are just exceptions that negatively stigmatize trustworthy and reliability of financial management.

1.2 Introductory theory and literature

This thesis focuses on managerial investment behavior through an examination of the relationship between leverage (debt) and investment. Agency theory describes two agency problems related to managerial investment behavior. Managers with substantial free cash flow might *overinvest* to increase personal compensation and benefits (Jensen, 1986; Stulz, 1990; Hillier, 2010); When a company is financed with equity, management is not required to pay dividend. In not doing so the management can waste free cash flow for personal benefits and neglect the dividend payments to shareholders. Debt serves as a protection mechanism against overinvestment, because free cash flow that can be used for personal benefits of the managers should be paid to bondholders in the form of interest. Unlike dividends the interest payments are mandatory and not paying them leads to default and eventually bankruptcy. Second, managers might *underinvest* when they fear that investments might not generate enough cash to pay the interest and principal of debt that is required to fund investments. Increasing debt leads to underinvestment as the possibility of default rises which results in management keeping the level of debt as low as possible (Myers & Meckling, 1974; Myers & Majluf 1976; Hillier, 2010). According to Fiegenbaum & Thomas (1988) managers might overinvest when they assess their return on a project too low regarding a target return (ROI) ratio and want to increase the return by increasing investment in more risky projects. On the other hand managers might assess the risk of a project too high and the investment return too low, leading to underinvestment to decrease the project risk. But due to time constraints and narrowing the scope of the research the influence of return on investment decisions will not be part of this research.

Theory implies that managerial shareholdings influences the overinvestment and underinvestment problems. Managerial shareholdings reduces overinvestment because they align the interest of managers and shareholders; increasing the value of the company instead of growth. But when the power of management increases because of increasing levels of share ownership, managerial shareholdings can also create a new agency problem. Managers might expropriate the rights of minority shareholders (Morck et al., 2005; Pawlina & Renneboog, 2005). Underinvestment is expected to be more persistent with increasing insider ownership. Investment in (high-risk) projects can negatively affect managerial wealth due to a decline in share price which is combined with the risk of default when a project does not yield sufficient cash flow to pay the interest (Pawlina & Renneboog, 2005; Pindado & La Torre, 2009). Empirical results of Goergen & Renneboog (2001) imply that outsider shareholders (e.g. institutions or governments) can decrease the extent of agency problems. Through effective monitoring of the company and its managers, outsiders can influence and control

investment decisions of the management. It has to be noticed that overinvestment and underinvestment might not necessarily be influenced by solely debt, but also by the risk-attitude of management..

Recent studies have investigated the relationship between leverage and investment, and the presence of agency problems: Lang et al. (1996) in the US, Goergen & Renneboog (2001), and Richardson (2006) in the UK, De Gryse & De Jong (2006), and De Jong & Van Dijk (2007) in The Netherlands, Aivazian et al. (2005) in Canada, Odit & Chittoo (2008) in Mauritius, Pindado & De la Torre (2009) in Spain, and finally Zhang (2009) in China. These studies have led to different result and conclusions regarding the existence and magnitude of agency problems. This might indicate that the presence and extent of overinvestment and underinvestment differs per country. No such study has been performed for companies in Denmark. Because most studies are performed in market-oriented settings characterized by an active external market for corporate control (US, UK, and Canada) and aforementioned studies have found that investment is influenced by corporate governance, results found in prior research might not be generalizable to companies in Denmark. Danish companies are characterized by a network-oriented corporate governance structure where only a few listed companies are widely held and companies are most often controlled by family-founders and institutions (Weiner & Pape, 1999; Enriques & Volpin, 2007). Denmark has an international economy in which 22% of the turnover in 2006 was made by international companies (Foreign Investor Survey, Statistics Denmark 2008). This implies that the value-destroying overinvestment and underinvestment might affect the wealth of international companies as well because the cost of overinvestment and underinvestment affects those companies.

1.3 Research question and objective

The research question serves as the basis of this study. The research question that is posed on the basis of the aforementioned introduction is the following:

> *To what extent does leverage influence investment of Danish listed companies and to what extent can the relationship be explained by agency problems?*

This research question is divided into the following two sub-questions:

> *To what extent is leverage related to investment?*
>
> *To what extent can the relationship between leverage and investment be explained by agency problems?*

As has been mentioned in the introduction of this chapter recent studies suggest that share ownership affects the relationship between leverage and investment and the agency problems. Neglecting them when studying the leverage-investment relationship and agency problems would give an incomplete representation of the leverage-investment relationship and the presence and extent of agency problems. Therefore this thesis additionally focuses on the effect of share ownership on the leverage investment relationship by answering the following two sub-questions:

> *What is the effect of insider ownership on the relationship between leverage and investment?*
>
> *What is the effect of outsider ownership on the relationship between leverage and investment?*

This research aims to identify the existence and magnitude of the agency problems overinvestment and underinvestment in Danish listed companies by investigating the relationship between leverage and investment. It intends to gain insight in to what extent managerial and outsider (external) share ownership influence the leverage-investment relationship and so the agency problems. This study aims to test the generalizability of the aforementioned agency theories as the study is performed in the

underexplored Danish setting. This research is relevant for theory. The findings will enrich available literature by performing the study about agency problems in unexplored time frames (2006-2010) and settings (Denmark). Results will imply whether the agency theories hold and are generalizable to different settings. The study also has practical relevance. The findings will provide insight of managerial investment behavior in Danish companies which creates awareness of investment behavior of financial management. The created awareness allows stakeholders to act upon the found results. When no agency problems are found in this thesis it can positively contribute to the image of financial management.

1.4 Research strategy

This study follows a deductive approach because it is based on testing established theories (Saunders et al., 2009). To answer the research questions literature regarding agency theory is described, compared and criticized on. The four research questions are used as a basis for the literature review. The relevant literature is used to propose a set of hypotheses. To answer the research questions and test the hypothesis a mixed method research method is used through a combination of quantitative and qualitative research methods. Quantitative research in the form of correlation analysis and regression analysis is performed to examine the presence and magnitude of the relationship between leverage and investment. The existence and magnitude of the leverage-investment relationship should according to agency theory gain insight in to what extent the Danish listed companies face overinvestment and underinvestment problems. The influence of insider and outsider shareholdings on agency problems is examined by analyzing to what extent the magnitude of the leverage-investment relationship changes with increasing share ownership. To examine to what extent the leverage-investment relationship is a suitable and correct measure of agency problems, residual analysis is performed. Residual analysis is an alternative quantitative research method used to analyze to which extent overinvestment and underinvestment are present. The outcomes of the residual analysis will indicate which investment level is expected and which is abnormal. Data for the quantitative analysis is collected using annual reports of 68 Danish listed companies covering the time period 2006-2010. Qualitative research in the form of semi-structured interviews with financial managers of Danish listed companies is performed to corroborate on findings of the quantitative analysis. Results of the qualitative analysis are expected to gain insight in internal company dynamics that cannot be achieved solely using the annual account-based quantitative analysis. Qualitative analysis reveals whether practice coincides with theory.

The remainder of this paper is organized as follows. In chapter 2 literature regarding leverage, investment, managerial share ownership and the agency problems is described, compared and criticized. Chapter 2 also contains the hypotheses which are composed based on the literature review and are in line with the research questions. Chapter 3 focuses on the methodology used to answer the research questions and test the hypotheses. The Danish sample, the data collecting methods and data processing methods are described and explained. The chapter also focuses on the operationalization of variables. Finally both quantitative and qualitative research methods are described and discussed. Chapter 4 contains the results of the quantitative and qualitative analysis. First the results of the correlation analysis and regression analysis are described, followed by the results of the residual analysis. Finally the results of the qualitative analysis are described, discussed and compared to results of the quantitative analyses. Chapter 5 contains the conclusion. In this chapter it is discussed which hypotheses are supported and which are not and provides an answer to the research questions. Chapter 6 provides a discussion about results found and the implications for theory, practice and methodology. Limitations of this research are discussed and finally the chapter provides suggestions for future research.

2. Literature review

In this chapter literature is described, compared and criticized which contributes to answering the research questions. The aim of this literature review is to give a description of the basic agency theories and the recent empirical evidence of the existence of the agency problems by using both the leverage-investment relationships and alternative methods. It also aims at describing literature regarding share ownership and its effect on agency problems.

The first four paragraphs of the literature review focus on describing, comparing and criticizing on theory regarding the agency problems of overinvestment and underinvestment, the leverage-investment relationship and its explanations. The paragraphs contribute to answering the first two research questions. First, the construct of leverage will shortly be explained in paragraph 2.1. A description of the agency theories and the role of debt in agency theory is given in paragraph 2.2, followed by a description and comparison of empirical evidence regarding the existence and extent of agency theory and its relationship to the leverage-investment relationship in paragraph 2.3. A description is given about different ways to determine the existence and extent of agency problems in paragraph 2.4 as the relationship between leverage and debt is not the only methods used in prior research. In paragraph 2.5 the literature review focuses on corporate governance by describing, comparing and criticizing literature regarding the influence of insider and outsider shareholdings on the agency problems. This part of the literature review covers the last two research questions. Finally, hypotheses are developed which are derived from the literature review and consequently the research questions.

2.1 Leverage

Leverage is a construct that has been widely studied. Many studies about agency theory in combination with leverage have conceptualized leverage but did not define the construct. Not explaining leverage is a deficiency of the studies because leverage is a phenomenon depending on different situations, settings and samples which will be described in this first paragraph. (Financial) leverage is the extent to which a firm relies on debt (Hillier et al., 2010:326). Many authors have studied leverage and its determinants and conducted their study in different countries using different techniques. This has led to different outcomes and results.

Myers (2001) states there are many theories that explain the concept of leverage. There exists no universalistic theory about leverage because the explanatory power of theories that might explain leverage is based on various conditions and circumstances. Myers however does not describe or empirically test such conditions and circumstances in his article. More recent research did focused on empirical evidence of determinants of leverage and investigates different settings and conditions in which leverage decisions occur. Although their study was performed using different sample sizes, different European countries and different type of companies, Bancel & Mittoo (2004) and Brounen et al. (2006) used identical questionnaires to investigate the determinants of leverage in Europe. While they both found empirical evidence that for example financial flexibility obtained by selecting the timing of issuing debt or equity based on interest rates and market value is the most important determinant of leverage, they used different theoretical explanations for their findings. Furthermore, their findings differed a lot as they found differences (in the extent to) which other variables such as having a target-debt ratio and tax advantages determined leverage. Leary and Roberts (2005) on the other hand argue that the leverage decisions mainly depend on adjustment costs of leverage instead of the aforementioned determinants. These adjustment costs, both fixed and variable, withhold managers from actively rebalancing their capital structure to an optimal point. In contrast to aforementioned

research, De Jong et al. (2008) took the influence of firm-specific factors in leverage decisions into account and conducted a world-wide survey to investigate the leverage determinants. The authors found that country specific factors as creditor right protection, tax rate, bond market development and GDP growth rate have a significant influence on corporate capital structure. Furthermore, there is a difference in the magnitude of firm-specific factors affecting leverage decision in different countries, such as firm growth and profitability. Finally, the authors state that in countries with a better legal environment and relatively more stable and healthier conditions to conduct business, firms relatively take on more debt.

When looking at literature describing leverage and its determinants, one can conclude that results found are quite mixed. There is no general answer to which factors influence leverage. This can be due to difference in settings, sample size differences, differences in variables used and differences in variable measurements. But although the results differ, one can conclude that leverage is a phenomenon whose determinants differ per country and firm. This thesis does not focus on the determinants of leverage. But aforementioned research has shown that leverage and so the existence and magnitude of a significant leverage-investment relationship might differ per country, which might make empirical findings regarding leverage and the leverage-investment relationship not generalizable to the Danish setting.

2.2 Agency theory

The second paragraph of this chapter focuses on a description of the agency theories. In contrast to the theory of Modigliani and Miller (1958) who state that financial structure of the company is irrelevant, it is generally accepted that a firm's investment policy is affected by its financial position. Agency theory describes two types of costs associated with investment; the cost of overinvestment and underinvestment.

2.2.1 Overinvestment

A theory related to overinvestment is the free cash flow theory, which states that in companies with substantial free cash flow (cash flow in excess of that required to fund all positive net present value (NPV) projects when discounted at the relevant cost of capital) managers invest in negative NPV projects when all the positive NPV projects are taken. This phenomenon is called overinvestment (Jensen, 1986). Jensen argues that managers have incentives to overinvest and cause their firms to grow beyond the optimal size as growth is related to performance management. Because there is no obligation to pay dividend to shareholders, managers keep resources under their own control resulting in wasteful activities. This causes a manager-shareholders conflict, because the aim of shareholders is maximizing firm value (Hillier et al. 2010), while this is not enhanced by management. Jensen states that overinvestment is more likely to occur in situations when growth opportunities are low, because managers want to increase firm size despite the lack of positive NPV projects. Overinvestment can also be caused when firms take on debt. Debt can be used to increase the level investments, resulting in availability of cash generated from investment to conduct wasteful activities. But taking on debt to overinvest has its limits. Jensen (1986) and Stulz (1990) state that overinvesting companies who have low growth opportunities have advantage in turning to debt. Debt serves as a protection mechanism not to overinvest. Debt reduces free cash flow and managerial wasteful activities because managers have an obligation to pay interest and principal. When companies turn to debt financial markets have an opportunity to evaluate the company and its management. The agency problem of overinvestment indicates a positive relationship between leverage and debt (assuming projects are fund externally) as managers increase debt to fund their projects. Debt serving as a protection mechanism not to

overinvest indicates a negative relationship between leverage and investment as debt limits investment spending due to the obligation to pay interest and the possibility of default.

2.2.2 Underinvestment

The debt-overhang, or underinvestment theory states that levered firms tend to decrease investment due to the cost of external capital and the possibility of default (Myers, 1977). When growth opportunities are high and management want to fund that growth opportunities with debt, creditors might see firms turning to debt as a signal, indicating that the firm has a low future cash flow and a low future profitability (Stulz, 1990). Therefore the creditors increase the risk premium of debt, resulting in management passing up valuable investment opportunities, opportunities that could make a positive net contribution to the market value of the firm. This phenomenon is known as underinvestment. Management has an incentive to underinvest, as they bear the cost of debt and bondholders/creditors will get all the benefit from investment. This creates an agency problem between bondholders/creditors and shareholders (which can also be management). Myers and Majluf (1984) expand this theory by stating that when firms have high growth opportunities the market might not recognize these growth opportunities due to information asymmetry. Bondholders might not have enough information to recognize the true quality of a project (Stiglitz & Weiss, 1988). Managers may refuse to issue new stocks or refuse to increase debt and pass up positive NPV projects, because the providers of these stocks or debt include a risk premium in the cost of capital that is too high reflecting the true risk of a positive NPV project. Underinvestment implies a negative relationship between leverage and investment. Because underinvestment can only occur when there are growth opportunities underinvestment is expected to occur in a setting with high growth opportunities, while overinvestment occurs in the situation when growth opportunities are low.

It has to be noticed that a positive or negative relationship between leverage and investment does not per definition mean that overinvestment or underinvestment are present. When the company has sufficient internal cash flow to fund all positive NPV projects, the relationship between leverage and investment is negative which might not per definition indicate agency problems (Lang et al., 1996). A positive relationship between leverage and investment might indicate overinvestment problems when debt is used to invest beyond the optimum (Jensen, 1986). But it can also indicate the lack of agency problems. When the market recognize the company's growth opportunities, cost of external capital will decrease. The market expects a high future cash flow and profitability of companies. This allows firms to borrow at favorable loan conditions, resulting in a positive relationship between leverage and debt (Ross, 1977).

2.3 Empirically testing the relationship between leverage and investment

The following paragraph gives an overview of recent studies of the leverage-investment relationship (research question 1) and how the relationship explains overinvestment and underinvestment. This is followed by an overview of research who claim that other variables and conditions might explain or bias the leverage-investment relationship (research question 2).

2.3.1 Leverage and investment

Lang et al. (1996) were one of the first authors to empirically examine the relationship between leverage and investment controlling for growth opportunities at the firm level. Using a basic investment regression model and a US sample, the authors find that leverage reduces investment and conclude that the negative relationship is due to agency problems. The negative relationship between leverage and investment is stronger for firms with low growth opportunities. Growth opportunities are measured using Tobin's Q which measures the difference between market value and book value of

assets. The found results hold for different industries. The authors conclude that the negative relationship between investment and leverage does apply to firms with high growth opportunities, but only to those firms with growth opportunities that are not recognized by the external market. The authors however did not mention that the found negative relationship between leverage and investment does not necessarily mean that overinvestment or underinvestment is present. Furthermore, it is not clear which agency problem is more persistent.

Both Aivazian et al. (2005) for Canada and Odit & Chittoo (2008) for Mauritius conducted the same research as Lang et al. (1996) and founf that leverage is negatively related to investment. The effect is significantly stronger for firms with low growth opportunities (value of Tobin's Q<1) than for firms with high growth opportunities (value of Tobin's Q>1) expressed in correlation coefficients. Both authors did mention that agency problems are present and that debt serves as a protection mechanism against agency problems, but the authors did not mention that the found negative leverage-investment relationship does not necessarily mean that overinvestment or underinvestment is present. Therefore, these studies lack specificity and might be biased towards construct validity (Shadish et al., 2002). Furthermore, one may doubt the cut-off value for high and low growth opportunities as it is assumed in the aforementioned research to be homogeneous for all industries. Also, no evidence is found that when Tobin's Q is lower than 1 growth opportunities are low and when Tobin's Q is higher than 1 growth opportunities are high. It is an assumption made by the authors. Goergen & Renneboog (2001) and Richardson (2006) state that Tobin's Q is not a complete measure of growth opportunities as it only included past growth opportunities and not the future ones.

Zhang (2009) also finds a negative relationship between leverage and investment in Chinese listed companies and again, the relationship is stronger for firms characterized by low growth opportunities, or low Q firms. In contrast to Aivazian et al. (2005) and Odit & Chittoo (2008), Zhang included residual analysis in his research to determine 'abnormal' investment levels to analyze to what extent the leverage-investment relationship indicates agency problems. Both the residual analysis and the analysis between the relation of leverage and investment empirically show that debt serves as a protection mechanism not to overinvestment; In the sample of low growth opportunities the leverage-investment relationship is negative and the residuals show relatively low levels of debt. Finally Zhang states that agency problems are more severe in the sample of low growth opportunities indicating that overinvestment is more severe than underinvestment.

In contrast to aforementioned findings, De Jong & Van Dijk (2007) did not find evidence of agency problems. They empirically investigated the determinants of leverage and agency problems in The Netherlands. Using both a questionnaire and regression analysis, the authors find an insignificant coefficient between leverage and investment. They conclude that agency problems are only insignificant related to leverage. The results also indicate that overinvestment might be caused by more factors than solely leverage, such as growth opportunities, corporate governance characteristics and managerial performance measures. De Jong & Van Dijk however did not examine this. The contrary results found by De Jong et al. (2007) might be caused by the method and data gathering process used (questionnaire instead of annual reports and databases such as Datastream). In their questionnaire they used different indicators to determine agency problems than Aivazian et al. (2005) and Odit & Chittoo (2008) who used the leverage-investment relationship as an indicator. Furthermore the authors state that the Dutch setting differs from the Anglo-Saxon corporate governance system (such as in Canada) because large outside stakeholders in The Netherlands such as banks mitigate agency problems by effective monitoring.

2.3.2 Factors influencing the leverage-investment relationship

Although Aivazian et al. (2005), Odit & Chittoo (2008) and Zhang et al. (2009) attribute the negative leverage-investment relationship to agency problems, they did not mention or empirically investigate the role of net working capital in the relationship between leverage and investment. Fazzari and Petersen (1993) were the first to empirically examine the influence of net working capital on the leverage-investment relationship and the agency problems. They found evidence of firms smoothing fixed investment in the short run with working capital. The authors state that it is costly for firms to change the level of fixed investments and therefore, firms seek another way to change investment spending by funding investments internally. This finding is supported by De Gryse & De Jong (2006) who found that financially constrained firms with low growth opportunities reduce their working capital to smooth fixed investments when access to the external market is difficult. Firms reducing net working capital to smooth smoothing investments implies a negative relation between leverage and investment as investment increases but leverage and net working capital decrease. Hovakimian & Hovakimian (2007) find empirical evidence that when companies are characterized by high growth opportunities, managers build up financial reserves and increase net working capital to anticipate on financial constrains in the future. Management anticipating on the future by building up financial reserves also implies a negative leverage-investment relationship, which could affect and (partially) explain the relationship between leverage and investment as both net working capital and leverage increase while investment decreases.

There are other factors that might influence the relationship between leverage and debt. According to Ahn et al. (2006) the disciplining role of debt in preventing overinvestment is partially offset by the power of management in allocating debt to different business segments that results from the diversified organizational structure. This indicates that managers can fund low-risk projects with debt and high risk projects with internal cash flow, decreasing the cost of capital for the project and making overinvestment (using internal cash flow) easier for management. Finally, Pawlina (2010) finds evidence that underinvestment is exacerbated when debt is renegotiable in a period of financial distress when the firm is expanding. This causes a higher wealth transfer from shareholders to creditors as the cost of external capital can decrease. But one has to consider that debt is not always negotiable and costs of increasing or decreasing leverage might be too high for the firm (O'Leary & Roberts, 2005).

2.4 Alternative ways of detecting agency problems

Although the leverage-investment relationship is one way to detect agency problems, different methods and different variables are used in prior research to determine to what extent agency problems are present. This paragraph describes this different methods and research conducted by authors, because neglecting these methods would make the literature review incomplete towards empirical research and evidence of agency problems.

2.4.1 The relationship between cash-flow and investment

Not all research has focused on the relationship between leverage and investment to investigate and determine the extent of agency problems but acknowledged the existence of the two agency problems by investigating the relationship between cash flow and investment. By examining the relationship between cash flow and investment researchers focus on investments being funded internally instead of externally. Fazzari et al. (1988) were one of the first to find a significant positive correlation relationship between cash flow and investment. This relationship might indicate agency problems. The higher the cash flow, the higher the investment which can be overinvestment. Furthermore the relationship might also indicate underinvestment due to liquidity constraints as managers fund the

projects internally but stop investing as the internally funds are completely used. Fazzari et al. find that the relationship between cash flow and investment is more sensitive when dividend payouts, which serves as a proxy for financial constraints are relatively low.

In contrast to Fazzari et al. (1988), Vogt (1994) distinguishes between the two agency problems. He states that underinvestment is expected to occur in low-dividend paying firms who are characterized by high growth opportunities due to information asymmetry. Vogt states that as firm value is positively related to growth opportunities, the higher the growth opportunities the larger is the proportion of firm value attributed to growth opportunities. This results in a large undervaluation of the firm by external markets. Finally he states that overinvestment is expected to occur in large, low-dividend paying firms having low growth opportunities caused by management investing in negative NPV projects.

Both Pawlina & Renneboog (2005) for the UK and De Gryse & De Jong (2006) for The Netherlands find a positive relationship between cash flow and investment, indicating that investment is highly cash flow sensitive and this cash flow sensitivity does reflect financial constraints. By dividing the sample in low and high growth firms based on Tobin's Q they find that the relationship between cash flow and investment is more severe in low growth firms. Therefore they conclude that overinvestment due to managerial entrenchment is more severe than underinvestment due to asymmetric information. These two studies have the same validity issues as the aforementioned studies of the leverage-investment relationship. The positive relationship between cash flow and investment necessarily indicates agency problems. It might also indicate 'normal' investment behavior. The role of debt is not taken into account as companies might also fund projects externally. Pawlina & Renneboog and De Gryse & De Jong did not clearly define the variable cash flow because the variable was derived from a statistical database. It is not clear which (cash flow statement) items are included in the variable definition and conceptualization. Furthermore one has to consider the division into low and high growth opportunities made by De Gryse & De Jong (2006). Low growth opportunities are defined as Tobin's $Q < 1$, whereas high growth opportunities are defined as $Q > 1$. The cut-off line between high and low growth opportunities might be doubtful. No distinction has been made between industries assuming that growth opportunities are homogeneous across different sectors.

There exists also research contradicting the studies who found a positive relationship between cash flow and investment. Based on a sample of UK firms, Goergen & Renneboog (2001) did not find any evidence for a positive relation between levels on internally generated cash flows and investment, indicating that there is no evidence of the overinvestment or underinvestment problem. There are different possible explanations why the authors did not find a significant evidence of the over- and underinvestment problem. The authors did not include Tobin's Q as a measurement for (future) growth opportunities, but used investment as a percentage of capital stock to determine the future growth opportunities. The authors claim Tobin's Q is difficult to measure as the replacement value of assets is not reported in most European countries and Tobin's Q does not include future growth expectations. Finally the time-frame of the research of Goergen & Renneboog (2001) was 1988-1993, while the time frame of the research of Pawlina & Renneboog (2005) was 1992-1998. As different time frames might involve differences in financial constraints and macro-economic situations this might explain the different results found.

These results indicate that determining the presence and extent of agency problems and the disciplining role of debt cannot be done by solely looking at the leverage-investment or cash flow-investment relationship. Companies can fund projects internally and/or externally depending on the

availability of cash flow and cost of capital. Found relationships might be influenced by other factors such as net working capital and the renegotiability of debt. To determine the extent of agency problems and the disciplining role of debt additional analysis is required such as residual analysis or qualitative analysis. These additional analyses methods are described in paragraph 2.4.2.

2.4.2 Alternative research methods to detect agency problems

Recent studies have focused on alternative methods to detect the presence of overinvestment and underinvestment. Morgado & Pindado (2003) focused on an optimal level of investment. They state that when a firm is facing underinvestment problems, a marginal increase in investments positively affects the market value of shares, while a marginal increase in investments negatively affects the value of shares when a firm is facing overinvestment problems. Based on data of Spanish firms the authors find an absolute optimal investment level. The results found by Morgado & Pindado are arguable. They assumed that this optimal level is homogeneous across sectors and did not take into account that the optimal investment level might be affected by firm-characteristics such as profitability and size. Furthermore the authors do not mention which of the two agency problems is more severe. The optimal level of investment might only be optimal to the time-period in which the researchers conducted the study due to macro-economic effects such as accessibility to financial markets. Moyen (2007) solely focuses on the underinvestment problem. The author quantifies the magnitude of the underinvestment problem and finds that the underinvestment problem is larger with a more flexible investment policy. Leverage increases the underinvestment problem as value loss from operations is significant higher for levered firms (2.61%) than for unlevered firms (0.49%). This is consistent with the theory that underinvestment increases with high leverage due to the wealth transfer from bondholders/creditors to shareholders. D'Mello & Miranda (2010) have a different way of testing the existence of the free cash flow hypothesis and the corresponding overinvestment problem. They analyze the extent of investment of unlevered firms and compare the extent of investment when the firms become levered. They find that managers of unlevered firms retain excessive amounts of cash, which is significantly reduced as the firm becomes levered. The results are stronger for low Q firms, implying that debt serves as a disciplining factor in controlling overinvestment. Although debt reduces overinvestment, it does not completely obliterate the agency problem.

Richardson (2006) states that many studies try to identify agency problems by solely measuring the relationship between leverage and investment, or cash flow and investment. According to Richardson these methodologies alone are not sufficient and not clear because agency problems cannot be isolated and the extent of agency problems is impossible to determine. Literature examining the relation between investment and cash flow finding a positive association may merely indicate that cash flows serve as an effective proxy for investment opportunities instead of indicating the presence of agency problems (p. 162). To measure overinvestment, Richardson developed an accounting-based framework to determine the abnormal level of investment, or overinvestment. Richardson found that US firms between 1988-2002 overinvest 20% of their available free cash flow. He also found that overinvestment is concentrated in firms with the highest levels of free cash flow which is in line with the free cash flow hypothesis. And although Richardson did not measure underinvestment with his framework, his framework can be used for that. This allows comparison between the magnitude of the two agency problems. As already has been stated, Zhang (2009) used a comparable method by performing a residual analysis to determine the expected and abnormal levels of investment and concluded based on the residual analysis that overinvestment is more severe. Bergstresser (2006) recognizes that the framework of Richardson is a useful addition to the literature on the relationship between cash flow or leverage and investment, but he argues that Richardson assumes that the expected level of overinvestment is zero, without testing this assumption. Furthermore, Bergstresser is

doubtful about the set of explanatory variables used to measure expected investment by stating that using lagged cash is an incomplete explanatory variable for investment, as the total stock of cash has been neglected. Finally, Bergstresser argues that last year's overinvestment should not necessarily be included in the formula, as in the framework overinvestment is based on financial performance of only one year ago. This is a doubtful assumption as logic implies that investment decisions are based on financial decisions made more than a year ago. Therefore it can be concluded that the model of Richardson does not capture the true extent of agency problems.

2.5 Share ownership and the agency problems

The following paragraph focuses on the role of share ownership on the agency problems. First literature regarding managerial co-ownership is described and criticized, followed by literature regarding external share ownership. Finally alternative corporate governance mechanisms are described that are empirically found to influence the agency problems. By focusing on the effect of share ownership on the agency problems this paragraph addresses the third and fourth research question.

2.5.1 Managerial share ownership

Recent research has focused on the extent to which insider ownership by managers affects the overinvestment and underinvestment problem. Although the effect of managerial ownership on the relationship between leverage and investment has not been a research topic yet there exists empirical evidence that an increase in managerial share ownership reduces the sensitivity of cash flow and accordingly the overinvestment problem. Making managers co-owners of the firm is an effective way to align the interests of managers and outside shareholders as both groups strive for maximizing firm value instead of growth (Rose, 2005; Pawlina & Renneboog, 2005; Pindado & De la Torre, 2009). When co-ownership is relatively low, managers may accept a high risk premium on external capital and invest in negative NPV projects as it is assumed that the loss in firm value does not affect management to a large extent. By aligning the interests of managers and shareholders and increasing ownership stakes investments in negative NPV projects will not only be disadvantageous for shareholders anymore but also for management. Both Pawlina & Renneboog and Pindado & De la Torre emphasize that the relationship between increasing insider ownership and a decreasing overinvestment is not linear. They state that when insider ownership is relatively high managerial power increases. Management may become entrenched and expropriate the rights of minority shareholders. This finding is supported by Morck et al. (2005) who state that managerial share ownership creates a new agency problem as the interests of controlling and minority shareholders are not aligned. This might result in overinvestment problems as co-owners only satisfy their own interests by increasing the level of investment. These managers may have gained enough power to secure employment conditions that suits them best. Their compensation package might not fully depending on their equity stakes anymore. These findings suggest that managerial ownership can on one hand decrease overinvestment and on the other and increase increase overinvestment due to expropriation of minority shareholders.

Pawlina & Renneboog (2005) and Pindado & De la Torre (2009) also examine the effect of managerial share ownership on the underinvestment problem. While Pindado & De la Torre find empirical evidence that managerial shareholdings reduce underinvestment by the alignment of interests, Pawlina & Renneboog find that managerial ownership increases underinvest because the rising risk of default affects the share price. Both researchers investigate the role of insider ownership by including insider ownership variables in regression analyses. While Pindado & De la Torre find that the cash flow sensitivity increases with increasing managerial ownership, Pawlina & Renneboog

find the opposite and state that with increasing co-ownership managers are even more reluctant to pay the risk premium for investments. Although it is not clear why different results are found, it might be caused by the difference in defining managerial ownership. Pawlina & Renneboog defined managerial share ownership as low when the ownership percentage is lower than 16% and high when the ownership percentage is larger than 22%. Pindado & De la Torre used cut-off scores of smaller than 35% ownership stakes to indicate low insider ownership and high ownership stakes when managers owned more than 70% of the company shares. The difference is results might also be due to differences in settings, as Pindado & De la Torre perform their study in Spain and Pawlina & Renneboog perform their study in the UK.

Rose (2005) does not find empirical evidence that insider ownership affects investment and so the agency problems. He focuses on Danish listed companies and states that managerial ownership is not crucial in corporate governance and agency problems. Managerial ownership is insignificantly related to firm performance because ownership stakes are relatively low and companies have other performance mechanisms that are relatively larger than share ownership. Rose concludes that although insider ownership is not crucial in corporate governance and the agency problems managerial ownership is not without importance as share ownership reduces incentives to maximize firm value. Kanagarethman and Sarkar (2011) agree on the findings of Rose and state that managers should maximize the value of their compensation, which not only exists of equity value, but also of a fixed salary. The fixed component resembles the interest payments of debt, which aligns the interest of shareholders of bondholders. Co-ownership where managers own a part of the firm in the form of equity resembles variable payment and should align the interests of management and shareholders.

2.5.2 Share ownership by outsiders

There is not only significant evidence that insider ownership is an effective control mechanism to mitigate the investment agency problems. Outside blockholders such as the government, financial institutions and other multinationals also mitigate the problems. The controlling and monitoring role of outside shareholders seems to decrease underinvestment even more than overinvestment. Goergen & Renneboog (2001) find that outside blockholders decrease managerial value-destroying activities when they play an active monitoring role. Furthermore, outside blockholders reduce underinvestment as information asymmetry between management and shareholders and even between management and bondholders decreases. Information asymmetry is decreased as large blockholders spend time and effort in collecting information that will reflect the true quality of management and its investments. Both Pawlina & Renneboog (2005) and Morgado & Pindado (2009) reach the same conclusion. Pawlina & Renneboog even state that institutional blockholders facilitate the access to external capital and decrease the reliance of investment on internal cash flow (p. 12) Rose (2005) argues that outside monitoring by external shareholders may cause a free rider problem. He states that monitoring will only be effective when outside blockholders are large because small shareholders cannot bear the cost of monitoring. Small shareholders will most often have a portfolio which consists of shares of multiple firms meaning that the firm specific risk in their portfolio is eliminated. Rose concludes that in Denmark the most effective outside monitoring is conducted by large financial institutions and foundations, which have the largest incentive to discipline management as large blockholders do bear the firm specific risk.

In his accounting-based framework, Richardson (2006) makes a link to outside monitoring. He incorporates corporate governance measures to find out whether outside monitoring is effective in mitigating the overinvestment problem. He finds that some governance structures are effective in mitigating the overinvestment problem, such as activist shareholders, supermajority voting provisions

and firms incorporated in management. High levels of overinvestment are found in firms having staggered boards. But one has to consider that his analysis has an exploratory nature which has a relatively low explanation power. This might decrease the reliability of his findings.

2.5.3 Alternative agency control mechanisms

Although internal and external ownership might mitigate overinvestment and underinvestment, research has found that is does not completely eliminates the two agency problems. Rose (2005) acknowledges this and although Pawlina & Renneboog (2005) and Morgado & Pindado (2009) find a relatively high explained variance of the effect of inside and outside ownership on investment-cash flow sensitivity it does not fully explain the cash flow sensitivity. This might indicate that there are different mechanisms to control both overinvestment and underinvestment besides debt and share ownership. Dyck and Zingales (2004) quantify the amount of private benefits of controlling shareholders from companies they run. Using data of 39 countries the authors find that private benefits of control are higher in countries with weak investor protection. Law and so the right to sue management limits managerial power to extract private benefits. Furthermore, the authors find that relatively good accounting standards, legal protection of minority shareholders, a high rate of tax rate of compliance and a high degree of product markets are associated with lower private benefits of control. Finally, strong media and so a high level of diffusion from the press forces managers to bow to environmental pressures and let them behave in a more ethical way. Kalcheva and Lins (2007) reach the same conclusions. By studying 31 countries they find that the value of cash is discounted when companies face agency problems such as underinvestment and overinvestment. They state that in such companies managers appear to be entrenched. Such firms are characterized by low levels of protection of minority shareholders and a reluctance to pay dividend which results in a lower firm value. The authors finally state that strong external country-level protection mechanisms and paying dividend instead of retaining earnings for private benefits increased firm value.

2.5.4 Corporate governance in Denmark

Because this thesis focuses on the Danish setting, corporate governance in Denmark is described in brief. The largest owners of company shares in Denmark are foundations and institutions. Share ownership is not wide spread such as in the market-oriented settings of the US and Canada but is concentrated (Rose & Mejer, 2003). During the last two decades there has been a tendency in Denmark to move from the network-oriented corporate governance framework that is characterized by long-term business relationships and dispersed ownership to a more market-oriented corporate governance system which is more competitive and is characterized by wide spread share ownership and short-term business relationships. This tendency is driven by market globalization and aims at increasing foreign ownership of stock-listed companies to increase international Danish business (Recommendations on corporate governance, 2010).

A Danish committee involved in corporate governance is The Danish Corporate Governance Committee. The Danish Corporate Governance Committee exists of top Danish business executives, lawyers and academics who makes recommendations regarding corporate governance every five years. The recommendations made by this committee are not mandatory but are soft law which reflects best practices in corporate governance and is characterized by voluntariness to ensure flexibility in the recommendations. The recommendations are market-oriented because they aim for Danish companies to integrate and compete into the globalised capital market. Recommendations include shareholders to attend the yearly General Meeting (which is the highest decision making body) and act interactively to ensure competitiveness and value-adding performance of the companies and its boards. Increasing focus on share based management incentives should increase performance and value-added

managerial decision making. Furthermore governing bodies should promote active ownership (Corporate governance in the Nordic countries 2009 and Recommendations on corporate governance 2010) Both EU laws such as the EU Shareholder Right Directive and The Danish Company Act are mandatory regulations including corporate governance and share ownership regulation. These laws have a strong emphasis on the protection of (minority) shareholders. It states that no decision that might give an undue advantage to some shareholders or others at the expense of the company or the shareholders may be made. All shareholders must be treated equally. To ensure management is not misusing its power at increasing levels of share ownership the Danish Company Act states that at least half of the Board members should be independent from the major shareholders. Finally at the General Meeting decisions are only approved when two third of the members at the meeting agrees which entitles small shareholders with the power to block decisions when they disagree at the decisions. The recommendations and rules have led to an increase in foreign share ownership and spread in share ownership of stock-listed companies over the last few decades. Foreign ownership is now over one third in Denmark as a whole. But domestic ownership predominates. The question remains whether domestic ownership can survive in the future.

The development to a more market-oriented corporate governance system in Denmark might imply that (in contrary to the research and empirical findings of Rose, 2005) the increasing wide-spread (insider) share ownership affects company performance and reduces or eliminates the agency problems by aligning the interests of managers and shareholders. Minority shareholders might be sufficiently protected by laws and recommendations so they can control company performance and thereby limiting overinvestment or underinvestment. Because institutions and foundation are the largest shareholder they have the power to control management. But as no study has been performed to examine the effectiveness of the laws and recommendations in the Danish setting no empirical based conclusions can be drawn.

2.6 Hypotheses

This paragraph gives an overview of the hypotheses. The hypotheses are based on the (quantitative) available empirical studies described in the former of this chapter. The hypotheses will be tested in the Danish setting. For clarification purposes each hypothesis is shortly explained.

2.6.1 The leverage-investment relationship and growth opportunities

Overinvestment is expected to occur when growth opportunities are low. In the presence of low growth opportunities there might be a lack of positive NPV projects. But management might wants to increase the size of the firm and increase (free) cash flows to conduct activities that are in their best interest while the interest of the firm is ignored (Jensen, 1986; Stulz, 1990). Therefore they keep investing, even in negative NPV projects. This results in a positive relationship between leverage and investment as management uses debt to keep up the level of investment. But managers cannot keep increasing the level of debt. Debt can also serve as a protection mechanism not to overinvest as cash should be paid to bondholders limiting the possibility of conducting wasteful activities and bondholders have a possibility to evaluate management (Jensen, 1986; Aivazian et al., 2005; Zhang, 2009). This results in a negative relationship between leverage and investment, because management is reluctant to pay the required interest and principal which increased default. Underinvestment is expected to occur in the presence of high growth opportunities as first of all you can only underinvest when there are growth opportunities. Furthermore management might be reluctant to pay the cost of external capital (whether or not affected by information asymmetry) as risk of default rises (Myers 1977; Pawlina & Renneboog, 2005; De Gryse & De Jong, 2006). This results in a negative relationship between leverage and investment because debt limits investment spending due to the

obligatory cost of capital and increasing risk of default. Based on these theories and recent empirical findings supporting the theories, the following hypotheses are developed:

H1A: In the presence of low growth opportunities the relationship between leverage and investment is positive due to overinvestment caused by managers expropriating resources of the company for their own benefits

H1B: In the presence of low growth opportunities the relationship between leverage and debt is negative because of the protective role of debt limiting overinvestment caused by the obligation to pay interest and principal

H1C: In the presence of high growth opportunities the relationship between leverage and investment is negative due to underinvestment caused by the risk of default

2.6.2 Managerial share ownership

Managerial shareholdings can have two effects on the overinvestment problem. Co-ownership can align the interests of managers and shareholders as both groups strive for maximizing firm value instead of growth (Pawlina & Renneboog, 2005; Pindado & De la Torre, 2009). This results indicate that the (positive) leverage-investment relationship which indicates overinvestment will decrease in magnitude. On the other hand, managerial shareholdings can create another agency problems as manager power rises with increasing shareholdings (Morck, et al., 2005). This might result in managers expropriating the rights of minority shareholders, an increase of overinvestment and so an increase in the magnitude of the leverage-investment relationship. It has to be noticed that he hypotheses are contradictive as one predicts a decrease and one predicts an increase in the magnitude of the leverage-investment relationship. But as both results are found in empirical research both hypotheses will be examined. Finally, underinvestment is expected to increase as managerial co-ownership rises. The risk of declining share prices which affects the wealth of management combined with the risk of default and bankruptcy when projects are risky makes management reluctant to invest. This results in an increase of underinvestment and so an increase in the magnitude of the leverage-investment relationship in the presence of high growth opportunities. Examining the effect of insider shareholdings on the leverage-investment relationship and so the agency problems also provides an indication of the effectiveness of recommendations and laws regarding shareholders and the protection of the shareholders. The following hypothesis are developed:

H2A: In the presence of low growth opportunities increasing managerial share ownership decreases the magnitude of the leverage-investment relationship because of the alignment of interests between managers and shareholders

H2B: In the presence of low growth opportunities increasing managerial share ownership increases the magnitude of the leverage-investment relationship due to expropriation of minority shareholders

H3A: In the presence of high growth opportunities increasing managerial share ownership increases the magnitude of the leverage-investment relationship due to the risk of default and the risk of declining share price

2.6.3 Outsider share ownership

Empirical evidence has found evidence that outsider ownership, such as institutional ownership reduced both underinvestment and overinvestment (Goergen & Renneboog, 2001; Morgado & Pindado, 2009). Because of effective monitoring management gains insight of the true risk of projects and might be less reluctant to grant external financing. Rose (2005) states that outsider ownership only reduces agency problems as ownership stakes are relatively large as otherwise the cost of outside monitoring transcends the benefits of effective monitoring. As institutions and foundations are the

largest shareholders in Denmark they have the power to control management. Therefore increasing external share ownership should decrease agency problems and so decrease the magnitude of the leverage-investment relationship. This results in the following hypothesis:

H4A: Increasing external share ownership decreases the magnitude of the leverage-investment relationship because of effective monitoring

2.6.4 Comparing overinvestment to underinvestment

As many authors found that agency problems are present they did not distinguish between the extent of overinvestment and underinvestment and did not conclude which agency problem is more severe. (Aivazian et al., 2005; Pawlina & Renneboog, 2005; Odit & Chittoo, 2008) Therefore this thesis elaborates on previous empirical findings by focusing on the extent to which overinvestment or underinvestment are present in the Danish sample and thereby indirect assess the extent to which debt and share ownership can mitigate or even exacerbate the agency problems. This results in the following hypothesis:

H5A: The magnitude of the overinvestment problem differs from the magnitude of the underinvestment problem

Appendix 1 contains an enumeration of the hypotheses. This thesis contains multiple references to the hypotheses. It is ambiguous to mention and explain the hypotheses each time when referred to.
Appendix 1 can be used as an overview.

3. Methodology

In this chapter the methodology used to answer the research questions and test the hypotheses is described, explained and discussed. The research methodology consists of two research methods. The first method is a quantitative research method which includes correlation analysis, regression analysis and residual analysis using data from annual reports of 68 Danish listed companies. The second method is a qualitative method which includes semi-structured interviews with four financial managers of Danish listed companies. The qualitative research aims to corroborate on findings of the quantitative analysis by providing an internal view on investment and leverage decisions and thereby clarify found relationships. Furthermore qualitative analysis indicates whether views of financial managers coincide with theoretical agency explanations of the (quantitative) leverage-investment relationships.

Paragraph 3.1 contains a description of the sample, followed by a description of the data collection method and data processing method in paragraph 3.2. Paragraph 3.3 focuses on the operationalization of the variables that are used in the thesis. The quantitative and qualitative research method are described and discussed in respectively paragraph 3.4 and 3.5.

3.1 Sample definition

The unit of observation in this thesis are Danish companies listed on the Copenhagen Stock Exchange. Financial companies such as banks and insurance companies are excluded due to their different debt structure and the difference in operational- , investment- and financing activities (Richardson, 2006; Serrasqueiro & Nunes, 2010). Utilities are excluded because they receive subsidy from the government which affects the debt structure and might lead to biased results regarding the extent and magnitude of overinvestment and underinvestment. The sample period covers the years 2006-2010. In total 68 companies are included with 312 year-based observations. This sample size is comparable to Aivazian et al. (2005) but smaller than most research described and compared in the literature review such as De Jong & Van Dijk (2007) and Zhang (2009). These researchers used financial databases such as Datastream and Compustat. Due to inaccessibility of these databases data has to be collected by hand using annual reports, which is a time-consuming process resulting in a relatively low sample size. When working with financial databases (Datastream, Compustat) data cannot be checked on reliability and validity as the source of the information is difficult to trace. This is less of a problem when working with annual reports as one can to some extent trace the origin of certain numbers and ratios.

On the stock exchange companies are divided by size, or market capitalization. In the sample of this thesis 15 companies are listed on the Large cap, 25 companies are listed on the Mid cap and 28 companies are listed on the Small cap (see figure 1). Furthermore, companies are divided by sector based on GICS code. There are ten sectors that can be distinguished on the Copenhagen Stock Exchange. In this thesis sectors are clustered into four groups to increase sample size and to make statistical inference possible. 33 Companies in this thesis are in the Industrials & Materials sector, 14 companies are in the Health Care sector, 12 companies are in the Consumer Discretionary & Consumer Staples sector and finally 9 companies are in the Information Technology, Telecommunication Services & Energy sector. See figure 1. Since the units of observation in this sample are Danish listed companies external validity might be limited. An effect found in this study might not hold for other samples of other countries or other types of companies such as Danish private companies. Therefore caution is required in making claims of representativeness.

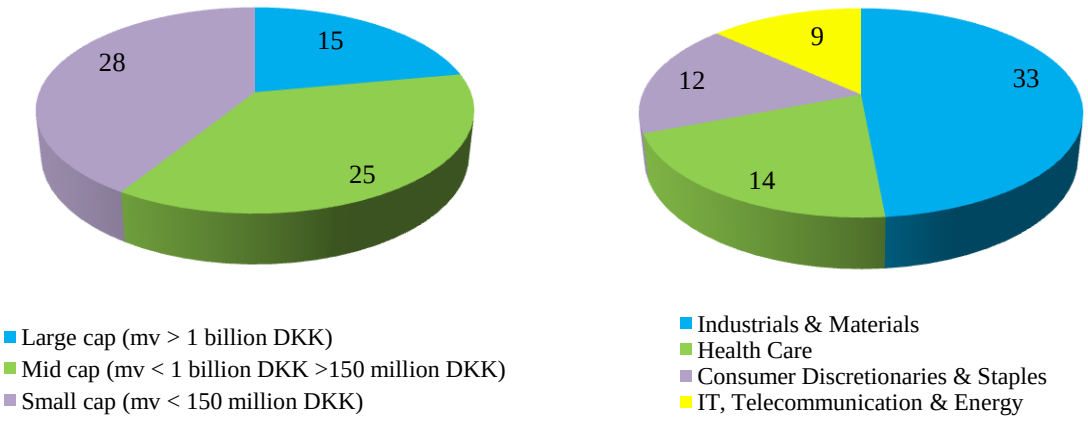

Figure 1. **Number of Danish listed companies by market capitalization and by sector.**

3.2 Data collection and progressing

As has been stated in the introduction of this chapter this research is a mixed-method research, combining quantitative and qualitative data and research methods. Sampling methods to acquire the data for both quantitative and qualitative research can be defined as non-probability methods using convenience sampling because cases only appear in the sample that can be obtained (Saunders et al., 2009). The quantitative data is gathered using annual accounts available on company websites. Annual accounts published in Danish or Swedish are excluded. Only the annual account written in English are taken into account which limits the sample size. The information in the annual accounts can be classified as secondary data; data that has already been collected for some other purposes. The advantage of using secondary data is that is has already been summarized, it is rather easy to obtain (annual accounts are available on the company website) and it is comparable to other annual reports (Saunders et al.). Furthermore, Ghauri and Gronhaug (2005) state that most of the data collected from international organizations is of high quality and reliability because the data is compiled and controlled by experts. This certainly accounts for annual accounts because they have been approved by external accountants. But secondary data such as annual reports has some advantages as well. One has to consider that aggregations and definitions derived from the annual reports may be unsuitable (Denscombe, 2007). Companies have different ways of presenting their accounts and defining balance sheet items and items in the cash flow statements. After the data collection process the quantitative data is entered in the statistical software program SPSS. This program is also used to perform the analyses with the quantitative data.

Qualitative data is collected using semi-structured interviews with four financial managers of Danish listed companies. A list of 34 companies located in a range of 30 kilometers around Copenhagen is compiled because having personal interviews with financial managers outside that range is difficult due to travelling expenses. Therefore the companies are selected based on convenience sampling (Saunders et al., 2009). Out of that 34 companies 29 companies are reached by telephone to make an appointment. The final sample consists of four companies who were willing to participate in a personal interview which equals to a response rate of 11.8%. The respondents stay anonymous. A list of indicative questions was sent per email to the respondent prior to the actual interview. By doing so the respondent could prepare for the interview and get an idea about the interview topic. This email can be found in appendix 2. To ensure the clarity and understandability of the questions, questions are controlled by experts and non-experts. The qualitative data can be classified as primary data; New data that has not been used for other purposes. The advantage of the qualitative data used in this thesis is that it is suited to the needs of this thesis. According to Babbie (2010) one can obtain relevant

responses by clarifying matters the respondent misunderstands. By observing respondents, questions can be elaborated when it seems the respondent is doubting about the given answer. When additional information is required the primary data can be supplemented by asking the interviewee. However the primary data also has some disadvantages; The interviewee might not be objective or and information granted might be incomplete because the financial managers might not want to share all information.
After the data collection the data is processed by generating summarizing transcripts of the interviews. According to Kvale (1996) a summarizing transcript of the interview is sufficient when the aim of the interview is illustrative. Therefore the transcripts of this thesis are in summarizing form. The transcripts were produced right after the interview took place, because it produces the most complete and reliable transcripts (Saunders et al.).

3.3 Variable operationalization

In this paragraph the variables used in this thesis are operationalized. Of each variable first a definition is given followed by a description of the variable in the Danish sample.

3.3.1 Investment

The dependent variable in this thesis is investment. Three proxies for investment are used; Net investment in property plant and equipment(PPE), net total investment, and net total investment plus research and development (R&D) expenses. Net total investment is measured as net investment in PPE plus net investment in intangibles plus net investment in financial assets plus net company acquisitions. The third mentioned variable of investment includes R&D expenses because a company has the opportunity to switch investments from capital expenditure to investments in R&D (Zhang, 2009). To make the definitions of investment comparable, relative and suitable for statistical analysis, net investment will be divided by total assets. To ensure that the variables are suitable for the analysis, the variables must be controlled for normality. After controlling for normality only the third investment variable remains. Net investment + R&D expenses is the only variable that follows a normal pattern. This has been controlled with a histogram and a Shapiro-Wilk test. The histogram can be found in appendix 3. Net investment in this thesis is operationalized as *(net investment in PPE, intangibles , financial assets and company acquisition + R&D expenses)/Total assets*$_{t-1}$. Following Aivazian et al., 2005; Richardson, 2006; Zhang, 2009 and Serrasquiero & Nunes, 2010 investment at time *t* is divided by total assets at time *t-1*. Although it is a non-controlled and doubtful assumption that the investment measure depends on the total assets of only one year ago the assumption remains as determining the variable-year influences on investment is a thesis on its own.

On average the companies in the sample are investing 14.9% of their total assets. The minimum investment is -13.3 % of total assets which indicates that companies disinvest. The largest part of the net investments are both net acquisitions and R&D expenses which represent both 5% of total assets. As can be seen in table 1 the median acquisition is 0.00 which indicates that acquisition does not appear at least at half of the year-based company observations during the research period. Finally the largest part of the net investment in PPE, intangibles and financial assets exists of investment in PPE. Investment in PPE accounts for 3.7% of the total of 4.6% of total assets.

Table 1 Descriptive analysis of the dependent variable net investment expenditure

Variable (N=312)	Mean	Median	SD	Min	Max	Q1	Q3
Total investment expenditure$_t$/total assets$_{t-1}$	0.149	0.124	0.114	-0.133	0.604	0.077	0.203
Net PPE + net intangibles + net financial assets$_t$/total assets$_{t-1}$	0.046	0.049	0.084	-0.408	0.676	0.017	0.049
Acquisitions$_t$/total assets$_{t-1}$	0.050	0.00	0.153	-0.252	2.22	0.00	0.009
R&D expenses$_t$/total assets$_{t-1}$	0.050	0.014	0.073	0.00	0.450	0.005	0.046
Net PPE$_t$/total assets$_{t-1}$	0.036	0.03	0.066	-0.312	0.676	0.008	0.062

3.3.2 Leverage, growth opportunities and cash flow

Leverage, growth opportunities and cash flow are the independent variables in this thesis. Two measurements for leverage are used. The first proxy for leverage is long-term debt divided by total assets and the second proxy is interest-bearing debt divided by total assets. Both variables have a normal distribution indicating they are suitable for statistical analysis. No leverage proxy of total liabilities/total assets is used, because short-term debt, long-term debt and interest-bearing debt differ among others on liquidity, maturity and payout contingencies (Berglof & Von Thadden, 1994). The used leverage proxies might have different implications for the leverage-investment relationship and the overinvestment and underinvestment problem.

Two different proxies for growth opportunities are used as well. The first proxy is Tobin's Q which is a measure of the difference of market value and book value of assets. In this thesis Tobin's Q is measured as market capitalization (at year-end) + book value of liabilities/book value of total assets. According to Adam and Goyal (2008) using market to book value measures to proxy for growth opportunities has relatively the highest information content (for outsiders) compared to other measures of growth opportunities. Because many authors used the measure in their study (Aivazian et al., 2005; De Gryse & De Jong, 2006; Odit & Chittoo, 2008) results of this thesis are comparable to the aforementioned studies. However using Tobin's Q has also disadvantages. Tobin's Q only focuses on past growth opportunities (De Jong & Van Dijk, 2001; Richardson, 2006). A proxy that focuses on future growth opportunities is R&D expenses/total assets and is used by Zhang (2009). But as R&D expenses are already used as a component of the dependent variable investment, using R&D expenses as a growth opportunity proxy would create measurement bias. Following Billett and King (2007) sales growth, or Δsales is the second proxy for growth opportunities as a growth in sales might indicate increasing market potential for the company. As has been stated in the literature review explanations of the leverage-investment relationship differ towards growth opportunities. Therefore a cut-off score of high and low growth opportunities must be determined. Following Aivazian et al., Pawlina & Renneboog, and De Gryse & De Jong, a Tobin's Q lower than 1 is defined as low growth opportunities and Tobin's Q higher than 1 is defined as high growth opportunities. But no empirical evidence exists that the aforementioned cut-off score is the actual cut-off score. The cut-off score might be affected by country characteristics, industry characteristics or macro-economic effects such as the credit crisis. Therefore an alternative cut-off score is maintained where low growth opportunities are defined as Tobin's Q smaller than the median Q and high growth opportunities are defined as Tobin's Q larger than the median Q. This measure is based on the sample as the cut-off score depends on the median of the sample. The mean Q is not the cut-off score because Tobin's Q does not show a normal distribution.

Finally recent literature has shown that investment is influenced by the availability of cash flow (Pawlina & Renneboog, 2005; De Gryse & De Jong, 2006). These researchers have used financial databases such as Datastream and Compustat to determine the availability of cash flow. As none of the studies explained which cash flow they used (from operations, investments or financing) in this thesis cash flow will be measured as cash flow after operating activities/total assets. This measures the cash flow that is left after the 'regular' investment activities such as production- sales- and replacement expenses. The measurement of cash flow is not a perfect measure. It only contains investments of operating activities while 'regular' cash flow of investment activities should also be taken into account. But in the annual accounts no distinction is made between 'regular' investments and overinvestment or underinvestment. Because isolating cash flow that is used to overinvest or underinvest is not possible, only those investments are taken into account which to some extent might be expected and are regular for the company, which are investments in production and sales. In table 2 an overview is given of the operationalization of the variables. Variable outliers are detected using a scatterplot and removed to create normality of the variables.

Table 2 Operationalization of independent variables leverage, growth opportunities and availability of cash flow

Variable	Definition	Operationalisation
Leverage	The extent to which a firm is financed with debt (Hillier et al. 2010:326)	(Long-term debt/total assets) $_{t-1}$
		(Interest-bearing debt/total assets)$_{t-1}$
Growth opportunities	Opportunities to invest in profitable projects (Hillier et al. 2010:134	(Tobin's Q)$_{t-1}$: (market capitalization at year-end + book value of liabilities)/book value of total assets
		(ΔSales)$_{t-1}$
Cash flow	The total amount of money being transferred into and out of a business related to operational activities (Oxford dictionaries)	Cash left after operational expenses$_t$/total assets$_{t-1}$

The average long-term debt in the sample is 22.8% of total assets, while the average interest-bearing debt is of 32.5% of total assets. On average Tobin's Q is 1.686. On average sales increases 5% per year but as can be seen at the minimum (-79%) and maximum (97%) change in sales growth, the spread of the variable is quite large. Finally the average cash flow amounts 9.9% of total assets and just as with the dependent variable investment the minimum cash flow has a negative value indicating a negative net cash flow of operations (see table 3).

Table 3 Descriptive analysis of the independent variables leverage, growth opportunities and cash flow

Variable (N=312)	Mean	Median	SD	Min	Max	Q1	Q3
(Long-term debt/total assets) $_{t-1}$	0.228	0.201	0.172	0.00	0.790	0.092	0.343
(Interest-bearing debt/total assets)$_{t-1}$	0.325	0.214	0.161	0.00	0.750	0.081	0.330
(Tobin's Q)$_{t-1}$	1.686	1.330	1.000	0.530	5.850	0.990	2.070
(ΔSales)$_{t-1}$	0.050	0.047	0.234	-0.790	0.970	-0.059	0.138
(Cash flow$_t$/total assets)$_{t-1}$	0.099	0.090	0.079	-0.010	0.390	0.040	0.140

3.3.3 Share ownership

Insider share ownership can be defined as the holding of company shares by management, non-executive directors, supervisory board and their relatives. Shares held by management is measured as the nominal value of shares owned by management and their relatives divided by total share capital. Following Pawlina & Renneboog (2005) outsider (external) share ownership can be defined as the holding of company shares by anyone who is not included in the company board structure and their relatives. Outsider share ownership is classified in four groups and involves shares owned by institutions (e.g. banks, insurance companies, foundations, pension funds) industrials, government and others. The share ownership of each group is measured as the nominal value of shares divided by total share capital.

In the sample, the average percentage of shares held by insiders is 7.3%. Because the median shares held by insiders is 1.1% in half of the observations managers hold a maximum of 1.1% of the company shares. When comparing Q3 and the maximum insider share ownership, the difference is by far larger than the difference between the other quartiles. This implies that most companies are characterized by relative low insider share ownership. On average 92.7% of the shares are held by outsiders of which the institutions hold the largest part of on average 28.9%. The smallest outside share owner is the government holding on average only 1,4% of the shares. This can be explained by the fact that the government only directly holds shares of two listed airports. According to the Danish company act only shareholdings larger than 5% has to be mentioned in the annual report, therefore in practice the distribution might show some differences as shareholdings smaller than 5% are not included in the analysis (see table 4).

Table 4 Descriptive analysis of the share ownership variables

Variable (N=312)	Mean	Median	SD	Min	Max	Q1	Q3
% shares held by insiders	0.073	0.011	0.126	0.000	0.577	0.040	0.095
% shares held by outsiders	0.927	0.989	0.126	0.423	1.000	0.908	0.999
% shares held by institutions	0.289	0.238	0.236	0.000	0.960	0.097	0.425
% shares held by industrials	0.099	0.00	0.201	0.000	0.880	0.000	0.084
% shares held by government	0.014	0.00	0.080	0.000	0.670	0.000	0.000
% of shares held by others	0.525	0.535	0.260	0.000	1.000	0.309	0.744
% of shares held by largest shareholder	0.239	0.224	0.175	0.000	0.880	0.120	0.357

3.4 Quantitative analysis

3.4.1 Bivariate analysis

The first quantitative analysis in this thesis is the correlation analysis. This analysis provides a measure for the strength of the linear relationship between two variables (De Veaux et al., 2008) which in this thesis is investment and leverage. According to Cohen et al. (2003) correlation analysis is highly general and flexible which makes results comparable to other studies and relatively easy to interpret. Assumptions of correlation analysis can be checked rather easily which makes it possible to determine which estimates are likely to be misleading and which are not. The correlation analysis will be performed between investment and the two proxies for leverage. Results of this correlation analysis indicate whether there is a relationship between leverage and investment and thereby tries to answer the first research question. Because the leverage-investment relationship has different theoretical implications for high and low growth opportunities, the sample will be split based on those growth

opportunities. This sample division aims at explaining the leverage-investment relationship and indicates the presence of agency problems. The sample division in low and high growth opportunities aims as answering the second research question and test hypothesis H1A, H1B and H1C[*]. Previous research has indicated that the leverage-investment relationship and the existence of agency problems is influenced by year (Pawlina & Renneboog, 2005) and sector (De Jong & Van Dijk, 2001; Richardson 2006). Therefore results will be controlled accordingly. A sample division in year and sector indicates whether found relationships hold.

Correlation analysis will also be performed to analyze the influence of shareholdings on the leverage-investment relationship and so the agency problems. First a correlation analysis will be performed between managerial share ownership and investment for both sub-samples of growth opportunities to analyze whether managerial ownership affects investment. Second, four equal cumulative classes of insider ownership will be generated. The first class includes the first 25% of the observations etcetera. Using correlation analysis on each of the four classes, the strength of the correlation coefficient will reveal whether increasing insider managerial share ownership influences the existence and strength of the leverage-investment relation. This analysis answers the third research question and tests hypotheses H2A, H2B and H3A[*]. The same analytical approach is used to analyze the effect of outsider shareholdings on the magnitude of the leverage-investment relationship. Because the percentage of outsider shared is equal to 1-the percentage of insider shares, performing a correlation analysis using the total percentage of outsider shares will yield the same results as the analysis regarding insider ownership. Therefore institutional share ownership is used as the proxy for outsider ownership. Institutions own relatively most shares. This analysis answers the fourth research question and tests hypothesis H4A[*]. Table 5 provides an overview of expected correlation coefficient per hypothesis.

Table 5 Expected correlation coefficient per hypothesis

Hypotheses	Growth opportunities	Expected correlation coefficient	Explanation
H1A	Low	Positive	Overinvestment
H1B	Low	Negative	Protective role of debt
H1C	High	Negative	Underinvestment
H2A	Low	Decrease in magnitude	Alignment of interests
H2B	Low	Increase in magnitude	Expropriation of minority shareholders
H3A	High	Increase in magnitude	Reluctance towards risk of default and declining share prices
H4A	Low & High	Decrease in magnitude	Effective monitoring

3.4.2 Multivariate analysis

Regression analysis will be performed to analyze whether found results using correlation analysis holds when more variables are included. Previous research has indicated that investment is not only influenced by leverage, but also by other variables. Both Pawlina & Renneboog (2005) and Goergen & Renneboog (2006) found that the availability internal cash flow affects investment, because projects

[*] An overview of the hypotheses can be found in appendix 1.

can also be funded internally which can also result in overinvestment or underinvestment. Furthermore, researchers found that growth opportunities positively influence investment as a company can invest more when there are more investment opportunities (Aivazian et al., 2005; Odit & Chittoo, 2008; Serrasquiero & Nunes, 2010) The regression model used in this thesis is based on the articles of Aivazian et al. and Odit & Chittoo. The variable sales is excluded of the regression analysis because sales is already used to measure growth opportunities and so including the variable in the regression model would cause measurement bias. The variables used are already explained in paragraph 3.3.2. The regression model has the following form:

$$I_{i,t}/K_{i,t-1} = \alpha + \beta 1(\text{Long-term debt}_{i,t}/\text{ Total assets}_{i.t-1}) + \beta 2(CF_{i,t}/K_{i,t-1}) + \beta 3(\text{Tobin's } Q_{i,t-1}) + \Sigma \text{ year} + \Sigma \text{ sector effect} + \varepsilon_{i,t}$$

$I_{i,t}/K_{i,t-1}$ denotes the dependent variable net investment at times t divided by total assets at times t-1 and α is the intercept. The first beta represents leverage at times t-1, the second beta represents cash flow at times t-1 and the final beta represents growth opportunities at times t-1. The results will be controlled for year and sector and $\varepsilon_{i,t}$ represents an error term. In this thesis this model will be referred to as model 1. As has already been written in the paragraph variable definition, different measures are included in the analysis to increase reliability and validity of the proxies used. Therefore the second (controlling) regression analysis (model 2) has the following form:

$$I_{i,t}/K_{i,t-1} = \alpha + \beta 1(\text{Interest-bearing debt}_{i,t}/\text{ Total assets}_{i.t-1}) + \beta 2(CF_{i,t}/K_{i,t-1}) + \beta 3(\Delta Sales_{,t-1}) + \Sigma \text{ year} + \Sigma \text{ sector effect} + \varepsilon_{i,t}$$

Both Aivazian et al. and Odit & Chittoo assume that investment depends on leverage, growth opportunities and cash flow of only one year ago. This assumption might not be valid as common logic implies that investment decisions are not solely determined by only last year financial events but investment decisions are affected by multiple year history. This argument is supported by Bergstresser (2006). Because indicating the determinants of investment is a thesis on its own, the assumption is maintained while remaining skeptical towards it.

The research questions and hypotheses are dealt with in the way as the correlation analysis. The first beta in the formula indicates whether debt influences investment and answers the first research question. Again by splitting the sample based on growth opportunities different theoretical explanations can be attributed to the relationship between leverage and investment and will answer the second research question and tests hypothesis H1A, H1B and H1C[*]. The sample will be split per year to control for macro-economic effects and per sector to control for industry-specific effects. To address the effects of insider (outsider) ownership on the leverage-investment relationship, insider (outsider) ownership is included in the regression formula. This indicates to what extent shareholdings affect investment. Again the sample is split into four equally cumulative groups of insider (outsider) ownership to analyze whether the magnitude of $\beta 1$ changes when insider (outsider) ownership is rising. This analysis answers the third and fourth research question and addresses hypotheses H2A, H2B, H3A and H4A[*]. Table 6 provides an overview of the expected beta coefficient per hypothesis.

[*] An overview of the hypotheses can be found in appendix 1.

Table 6 Expected beta coefficient per hypothesis

Hypotheses	Growth opportunities	Expected β1 (leverage)	Explanation
H1A	Low	Positive	Overinvestment
H1B	Low	Negative	Protective role of debt
H1C	High	Negative	Underinvestment
H2A	Low	Decrease in magnitude	Alignment of interests
H2B	Low	Increase in magnitude	Expropriation of minority shareholders
H3A	High	Increase in magnitude	Reluctance towards risk of default and declining share prices
H4A	Low & High	Decrease in magnitude	Effective monitoring

3.4.3 Residual analysis

As already has been stated in the literature review, solely analyzing the relationship between leverage and investment might not fully identify the presence of agency problems. The relationship can have alternative explanations such as internally financing projects instead of externally. Richardson (2006) states that previous research is not measuring *over*-investment but solely investment indicating that the leverage-investment relationship is not directly attributable to agency cost explanations. Following the methodology of Richardson (2006) and Zhang (2009) a residual analysis will be performed. The residual analysis identifies 'abnormal' investments by identifying which investments are deviations of the 'normal' investment level. The advantage of residual analysis over the performed correlation analysis and regression analysis is that residual analysis makes a distinction between overinvestment and underinvestment. It shows to what extent companies are characterized by 'abnormal' investment and statements can be made about which companies make those 'abnormal' investments.

Expected 'normal' investment will be measured using the two regression analyses explained in paragraph 3.4.2. An investment is classified as abnormal when the investment lies more than 2 standard deviations away from the expected investment level. A cut-off score of two standard deviations is chosen as those values theoretically contain 95% of all observations which makes values expected ones (De Veaux et al., 2008). The residual analysis contributes to identifying the presence of agency problems. When found results match those of the correlation analysis and regression analysis it increases validity of the leverage-investment relationship as a proxy to detect agency problems. Therefore residual analysis contributes to the second research question.

To indicate whether the overinvestment problem or underinvestment problem is more severe, a t-test will be performed between the standardized residuals of the values that lie more than 2 standard deviations from the mean investment and the standardized residual values that lie less than 2 standard deviations from the mean investment. This analysis answers hypothesis H5A[*]. Furthermore this analysis contributes to hypothesis H1A, H1B and H1C[*] by indicating to what extent agency problems are present. One assumptions that is made when performing the residual analysis is that the mean investment is equal to zero overinvestment or underinvestment. Although assuming the mean investment is equal to zero agency problems is doubtful the assumption is maintained. The quantitative analysis in this thesis and the literature described in chapter two does not contain a more direct measure of overinvestment and underinvestment.

[*] An overview of the hypotheses can be found in appendix 1.

3.5 Qualitative analysis

Both the leverage-investment relationship and the residuals of the residual analysis might be proxies for the presence of agency problems. Because it is not certain both quantitative analyses solely measures agency problems, qualitative research is performed in the form of semi-structured interviews. Including qualitative analysis in this thesis has the advantage that it gives an internal view on how decisions are made and uses information that cannot be retrieved using annual reports. The aim of the qualitative research is triangulation; It helps to corroborate on findings found using quantitative analysis. Qualitative analysis contributes to the explanation of the relationship between the quantitative variables leverage and investment. It provides an internal view on which factors affect investment and why investment decisions are made.

To identify whether there is a relationship between leverage and investment and provide an answer to the first research question, interview questions are asked as 'Which aspects influence investment decisions'. To detect the presence of agency problems questions are asked as 'To what extent do the providers of external capital recognize the potential of your investment projects' and 'To what extent are investments in negative NPV projects allowed'. Finally to identify the effect of share ownership on the leverage-investment relationship and so agency problems questions are asked as 'Which persons/institutions possess the company shares' and 'How do you protect the right of your minority shareholders'. The final interview questions can be found in appendix 4. Table 7 outlines the categorization of the interview questions. It shows which interview question is based on which research question and hypothesis[*]. In the appendix research questions are not categorized by interview question as some interview questions are meant to answer more than one research question.

Table 7 Expected beta coefficient per hypothesis

Research question	Hypotheses	Interview questions
1 (regarding existence leverage-investment relationship)	H1A, H1B, H1C	Q1, Q2, Q3,Q4
2 (regarding explaining the leverage-investment relationship	H1A, H1B, H1C, H5A	Q3, Q4, Q5, Q6, Q7
3 (regarding insider share ownership)	H2A, H2B, H3A	Q8, Q9, Q10, Q11, Q12, Q13
4 (regarding outsider share ownership)	H4A	Q8, Q9, Q12, Q14, Q15

According to Wengraf (2001) statistical analysis is inappropriate when the sample size of collected data is extremely low. Because the sample size of only four interviews is low and views of the interviewed managers might not be representative for the complete population, the qualitative data will not be statistically analyzed. Another method is used to analyze the data. The summarizing transcripts which include the answers and views of the four financial management and which are prepared right after the interviews will be compared to agency theory, the research questions, hypotheses and previous (quantitative) results found. Conclusions will be drawn regarding to which extent the views of financial managers coincide with theory regarding overinvestment and underinvestment and quantitative results found.

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[*] An overview of the hypotheses can be found in appendix 1.

4. Results

In this chapter the hypotheses are tested. A correlation analysis is performed to investigate whether there is a relationship between leverage and investment. By splitting the sample in low and high growth opportunities insight will be gained in how the leverage-investment relationship can be explained. Multiple regression analysis is performed to analyze whether found relationships hold when more variables are related to investment. Results will also be controlled for year to control for macro-economic effects (Aivazian et al., 2005; Hovakimian & Hovakimian, 2007) and per industry as several studies found that investment and debt are industry sensitive (De Gryse & De Jong, 2006; Goergen & Renneboog, 2006). Ownership variables are included in the correlation analyses and the regression analysis because both theory and empirical findings suggests that internal and external shareholdings affect the leverage-investment relationship and the agency problems. Residual analysis will be performed to determine the extent and magnitude of overinvestment and underinvestment. Finally, qualitative analysis will contribute to the explanation of found results and provide a practical view on results found.

Paragraph 4.1 contains the results of correlation analysis and paragraph 4.2 contains the results of the regression analysis. In paragraph 4.3 the results of the residual analysis are described. Paragraph 4.4 contains the results of the qualitative analysis. In this chapter references are made to the hypotheses. The hypotheses will not be described in detail in this chapter. For clarification appendix 1 can be used as an overview of the hypotheses.

4.1 Correlation analysis

In the following paragraph correlation analyses are conducted to determine the strength of the (linear) relationship between investment and leverage. Leverage is measured using two proxies which are interest-bearing debt/total assets and long-term debt/total assets. As already has been explained the sample will be split into high and low growth opportunities. Results will be controlled for year and sector. Finally, the influence of share ownership on the leverage-investment relationship will be analyzed.

4.1.1. Assumptions and alternative explanations

Before the correlation analysis can be conducted assumptions regarding correlation must be checked (De Veaux et al. 2008: 162). The data can be classified as ratio data and outliers have checked and removed when necessary. Finally appendix 5 shows a scatterplot which indicates that the relationship between leverage and the two proxies for leverage shows linear (straight) characteristics. The assumptions are fulfilled.

Net working capital (NWC) can also affect the relationship between leverage and investment. Companies might smooth investments in financially distressed times and fund investments using net working capital (Fazzari & Petersen. 1993). This indicates a positive relationship between ΔNWC and leverage. At the same time the leverage-investment relationship is negative although the relationship cannot be explained by agency problems. In financially prosperous times companies might build up financial reserves to anticipate on the future when access to the financial

Table 8 Correlation analysis between ΔNWC and leverage

$(\Delta \text{ NWC})_{t-1}$	Corr.	Sig.
(Long-term debt/Total assets)$_{t-1}$	-0.060	0.139
(Interest-bearing debt/Total assets)$_{t-1}$	-0.091*	0.054
No. of obs.	312	

*. Correlation is significant at the 0.10 level (1-tailed).

market might become difficult (Hovakimian & Hovakimian, 2007). This situation also indicates a positive relationship between ΔNWC and leverage while at the same time the relationship between leverage and investment is negative. The negative leverage-investment relationship is not explained by agency problems. Table 8 shows that the relationship between ΔNWC and leverage is insignificant when long term debt is the leverage proxy and negative when interest-bearing debt is the leverage proxy. These results indicate that the companies in the sample do not smooth investments with net working capital or anticipate on financial distressed times by building up financial reserves and increase their net working capital.

Theory also implies that firms will decrease the level of debt when they recognize valuable future growth opportunities (Aivazian et al., 2005; Pawlina, 2010). If debt creates incentives for management to overinvest or underinvest, managers lower the level of leverage and so the obligatory interest payments to attenuate the impact of leverage on growth. The level of debt signals management about the possibility of future investment opportunities. This situation implies a negative relationship between growth opportunities and leverage. At the same time there is a negative relationship between leverage and investment that cannot be explained by agency problems. To control for the situation where management regards leverage as a signal for future growth opportunities and adjust the debt level to anticipate on future growth opportunities, a correlation analysis is performed between the two proxies for growth opportunities and the two proxies for leverage. Results in table 9 shows that the relationship between both proxies for leverage and Tobin's Q is significantly negative. This indicates that firms might take on corrective actions when they recognize valuable growth opportunities. The relationship between ΔSales and the leverage proxies is negative but insignificant. Although the relationship is not significant the negative relationship suggests that firms take on corrective actions when they recognize valuable growth opportunities.

Table 9 Correlation analysis between leverage and growth opportunities

	$(\text{Tobin's Q})_{t-1}$	$(\Delta\text{Sales})_{t-1}$
$(\text{Long-term debt/Total assets})_{t-1}$	-0.209***	-0.051
$(\text{Interest-bearing debt/Total assets})_{t-1}$	-0.226***	-0.064
No. of obs.	312	

***. Correlation is significant at the 0.01 level (1-tailed).

4.1.2 Correlation analysis between leverage and investment for the complete Danish sample

Dependent on low and high growth opportunities hypothesis H1A, H1B and H1C predict that leverage and investment are related. Before conducting a correlation analysis based on a sample that is split on those growth opportunities a correlation analysis including the complete sample is performed. After conducting the correlation analysis between net investment expenditure and the two proxies for leverage results show that there is a significant negative relationship between leverage and investment. Long term-debt is significant related to net investment ($r(312) = -0.155$, $p < 0.01$) while interest-bearing debt has an even stronger negative significant relationship with net investment ($r(312) = -0{,}266$, $p < 0{,}01$). See table 10.

Table 10 Correlation analysis between net investment expenditure and leverage

Net investment expenditure $_t$/Total assets$_{t-1}$	**Corr.**	**Sig.**
$(\text{Long-term debt/Total assets})_{t-1}$	-0.155***	0.003
$(\text{Interest-bearing debt/Total assets})_{t-1}$	-0.266***	0.000
No. of obs.	312	

***. Correlation is significant at the 0.01 level (1-tailed).

When the results are split by sector results differ. When long-term debt serves as a proxy for leverage the negative significant relationship holds for the Health Care sector and the IT & Telecommunication Services & Energy sector. When interest-bearing debt serves as a proxy for leverage the negative leverage-investment relationship holds for all sectors except the IT & Telecommunication Services & Energy sector. For both leverage-proxies the Health Care sector has the strongest negative leverage-investment relationship ($r(56) = -0.338$, $p < 0.01$) and ($r(56) = -0.325$, $p < 0.01$). See appendix 6. When splitting the sample by year the negative leverage-investment relationship disappears for the year 2007. The relationship also disappears for the year 2008 when long-term debt is the leverage proxy. See appendix 6. Results show that investment is influenced by leverage. Although the sample is not split based on growth opportunities the results support hypothesis H1B and H1C indicating that the relationship between leverage and investments is negative. Without splitting the sample into low and high growth opportunities explanations for the relationship cannot be given. Results show that the leverage-investment relationship is affected by sector and year as the existence and the strength of the leverage-investment relationship differs per sector and year.

4.1.3 Growth opportunities and the leverage-investment relationship

In this paragraph the sample is split based on high and low growth opportunities to test hypothesis H1A, H1B and H1C. Hypothesis H1A predicts that a positive leverage-investment relationship in the subsample of low growth opportunities might indicate the presence of overinvestment. Hypothesis H1B predicts that a negative leverage-investment relationship in the subsample of low growth opportunities might indicate that debts serves as a protection mechanism for managers not to overinvest. A negative leverage-investment relationship in the subsample of high growth opportunities might indicate the existence of underinvestment problems which is predicted by hypothesis H1C. When using a cut-off score for low and high growth opportunities of Q<1 and Q>1 the sample size is unequally distributed. The low sample size in the group of low growth opportunities can affect reliability of the dataset and external validity (Shadish et al., 2002). Therefore the analysis will be performed once more dividing high and low growth opportunities based on median Q.

4.1.3.1 Low growth opportunities

In the sub-sample of low growth opportunities hypothesis H1A and H1B are tested. The results of the correlation analysis show that in the group of low growth opportunities (Q<1) there is a positive significant relationship between long-term debt and investment ($r(79) = 0.159$, $p = 0.08$). This supports hypothesis H1A indicating overinvestment problems. When interest-bearing debt serves as a proxy a significant negative relationship has been found between leverage and investment ($r(79) = -0.236$, $p = 0.018$) implying that interest-bearing debt serves as a protection mechanism against overinvestment. These results support H1B. When using the alternative median Q cut-off score for low growth opportunities the relationship between leverage and investment is significantly negative for both proxies for leverage. These results support hypothesis H1B indicating that debt serves as a protection mechanism not to overinvest. See appendix 7.

When splitting the results per industry the significant positive relationship between long-term debt and investment is only found in the sector Industrials & Materials. The results hold for both cut-off scores for low growth opportunities ($r(56) = 0.211$, $p = 0.059$) and ($r(103) = 0.207$, $p = 0.018$). See appendix 8a. These results support hypothesis H1A indicating that overinvestment occurs in the Industrials & Materials sector. A negative relationship between interest-bearing debt and investment is found for the same sector. This indicates that interest-bearing debt restrains overinvestment which supports hypothesis H1B. Because in several sectors the leverage-investment relationship disappears results indicate that the leverage-investment relationship is sensitive to industry effects. Results should be

treated with care as the sample size of those groups are all smaller than 20 and so extremely low for correlation analysis. See appendix 8a.

In the sample of low growth opportunities when interest-bearing debts serves as the leverage proxy negative significant leverage-investment relationships are only found for the years 2008, 2009 and 2010, implying that in those years interest-bearing debt serves as a protection mechanism against overinvestment. Results hold for both cut-off scores for growth opportunities. The results support hypothesis H1B indicating that interest-bearing debt serves as a protection mechanism against overinvestment. Results indicate that the protective role of interest-bearing debt is strongest for the years 2008, 2009 and 2010. Because no negative relationship is found between long-term debt and investment, no evidence is found that long-term debt has a protective role against overinvestment.

4.1.3.2 High growth opportunities

In the subsample of high growth opportunities hypothesis H1C is tested. Results in appendix 7 show that when using Q>1 as the cut-off score for growth opportunities there is a the significant negative relationship between both proxies for leverage and investment ($r(233) = -0.197$, $p = <0.01$) and ($r(233) = -0.280$, $p = <0.01$). This supports hypothesis H1C indicating the presence of underinvestment problems. The negative leverage-investment relationship holds when the cut-off score for high growth opportunities is the median Q.

The negative leverage-investment relationship has different implications per sector. In the subsamples of high growth opportunities (Q>1) Health Care has the strongest negative significant relationships for both leverage proxies ($r(54) = -0.355$, $p < 0.01$) and ($r(54) = -0.330$, $p < 0.01$). Results suggests that underinvestment problems are most severe in the Health Care sector. When median Q is used as the cut-off score for growth opportunities results hold as again the Health Care sector shows the strongest leverage-investment relationship. Furthermore for all sectors and both cut-off scores for high growth opportunities significant negative relationships between interest-bearing debt and investment are found. This indicates that all sectors have underinvestment problems due to the interest-bearing debt. This is not found when long-term debt is the leverage proxy because the only significant relationship between long-term debt and investment is in the Health Care sector. The results support hypothesis H1C indicating the presence of overinvestment for the Health Care sector and when interest-bearing debt serves as a proxy for leverage. See appendix 9a.

It is striking that in the sample of high growth opportunities for both leverage proxies and both cut-off scores for growth opportunities the year 2006 shows significant negative correlations between leverage and investment. This indicates that companies were facing underinvestment problems in the year 2006. Although for most years the negative relationship holds, for some subsamples the relationship disappears (2008) indicating that the relationship is sensitive to years. Results partially support hypothesis H1C as the relationship is year-based sensitive. See appendix 9b.

4.1.4 Insider ownership and agency problems

Hypothesis H2A, H2B and H2C adress insider share ownership affecting the relationship between leverage and investment. Theory implies that share ownership can align managers and shareholders and restrict the overinvestment problem (H2A). On the other hand share ownership might increase the overinvestment problem as power of management rises with increasing share ownership resulting in expropriation of minority shareholders (H2B). Theory implies that increasing share ownership by management increases the underinvestment problem because managers are more affected by a fluctuation in share price which might have negative consequences for their bonuses (H3A). This

results in management getting even more reluctant to invest, because besides the risk of default the risk of decreasing share prices affects the bonuses of managers. Hypothesis H2A and H2B are tested in the sample of low growth opportunities because they predict a change in magnitude in the leverage-investment relationship related to overinvestment. Because underinvestment is expected to occur in the sample of high growth opportunities hypothesis H3A is tested in the sample of high growth opportunities. The cut-off score for growth opportunities of Q<1 and Q>1 is not used because the two samples have an unequal and too small sample size making correlation analysis invalid and unreliable.

First hypothesis H2A and H2B are tested in the sample of low growth opportunities. Four equal cumulative groups of managerial share ownership are established to analyze whether the leverage-investment relationship changes in magnitude when insider shareholdings increase. To analyze whether an increase or decrease of the leverage-investment relationship is caused by insider share ownership a correlation analysis is performed between managerial share ownership and investment. Table 11 shows that in the four share ownership classes insider ownership is not significantly related to investment. Therefore the disappearance of the significant relationship between interest-bearing debt and investment in the fourth cumulative ownership group cannot be explained by increasing insider share ownership. This suggests that managerial shareholdings do not align the interests of managers and external shareholders. Hypothesis H2A is not supported. Because no increase in the leverage-investment relationship is found when insider ownership increases hypothesis H2B is not supported. There is no evidence that Danish listed companies in the sample expropriate the rights of minority shareholders.

Table 11 The relationship between insider share ownership and investment and the relationship between leverage and investment per cumulative insider share ownership group for low-q firms

Net investment expenditure $_t$/Total assets$_{t-1}$	**Cum. 0-0.25**		**Cum. > 0.25-0.50**		**Cum. >0.50-0.75**		**Cum. >0.75-1.00**	
	Corr.	**Sig.**	**Corr.**	**Sig.**	**Corr.**	**Sig.**	**Corr.**	**Sig.**
Insider ownership	0.187	0.127	-0.100	0.284	-0.292	0.130	-0.133	0.206
(Long-term debt/Total assets)$_{t-1}$	-0.216*	0.093	-0.121	0.244	0.067	0.337	-0.007	0.483
(Interest-bearing debt/Total assets)$_{t-1}$	-0.356**	0.013	-0.273*	0.057	-0.520***	0.000	-0.020	0.352
No of Obs.	39		35		42		40	

***. Correlation is significant at the 0.01 level (1-tailed).

**. Correlation is significant at the 0.05 level (1-tailed)

*. Correlation is significant at the 0.10 level (1-tailed).

Hypothesis H3A is tested in the sample of high growth opportunities. In the high-q sample investment is significantly related to insider ownership in the largest two cumulative ownership ($r(39) = 0.340$, $p = 0.016$) and ($r(39) = 0,255$, $p = 0.058$). See table 12. This indicates that changes in the leverage-investment relationship in the highest cumulative ownership group might be explained by managerial share ownership. The results indicate that when interest-bearing debt serves as the leverage proxy the relationship between leverage and investment disappears for the two largest cumulative share ownership groups. These results contradict hypothesis H3A and indicate that increasing managerial share ownership decreases underinvestment agency problems in the subsample of high growth opportunities.

Table 12 The relationship between insider share ownership and investment and the relationship between leverage and investment per cumulative insider share ownership group for high-q firms

Net investment expenditure $_t$/Total assets$_{t-1}$	Ownership cum. 0-0.25		Ownership cum. > 0.25-0.50		Ownership cum. >0.50-0.75		Ownership cum. >0.75-1.00	
	Corr.	Sig.	Corr.	Sig.	Corr.	Sig.	Corr.	Sig.
Insider ownership	0.101	0.273	-0.124	0.229	-0.340**	0.016	0.255*	0.058
(Long-term debt/Total assets)$_{t-1}$	-0.115	0.245	-0.551	0.170	-0.006	0.485	0.008	0.480
(Interest-bearing debt/Total assets)$_{t-1}$	-0.285**	0.041	-0.483***	0.001	-0.056	0.367	-0.179	0.137
No of Obs.	38		36		39		39	

***. Correlation is significant at the 0.01 level (1-tailed).

**. Correlation is significant at the 0.05 level (1-tailed)

*. Correlation is significant at the 0.10 level (1-tailed).

4.1.5 Institutional share ownership and agency problems

Hypothesis H4A predicts that the relationship between leverage and investment will decrease in magnitude when outsider ownership is increasing. Outside (external) shareholders monitor the company effectively when their shares are sufficiently high. When the percentage of shares held by all outsiders are analyzed results will be identical to insider ownership as the percentage of shares held by outsiders is equal to 1-percentage of shares held by insiders. Therefore the largest group of outsiders will be analyzed which are the institutions. Empirical findings indicate that institutional ownership is an effective way of external monitoring that reduces the underinvestment problem. Common logic implies that effective monitoring might as well reduce the overinvestment problem. Therefore the influence of institutional ownership on the leverage-investment relationship is analyzed in the sample of low growth opportunities and high growth opportunities. Comparable to the correlation analysis involving insider share ownership only the cut-off score regarding growth opportunities of median Q is used.

In the sample of low growth opportunities institutional share ownership is not significantly related to investment in all four cumulative institutional ownership classes. Changes in the magnitude of the leverage-investment relationship cannot be explained by institutional share ownership. This result does not support hypothesis H4A. The results indicate that share ownership is not an effective monitoring and control device for institutional shareholders to prevent or decrease the magnitude of the overinvestment agency problem. See table 13.

Table 13 The relationship between institutional share ownership and investment and the relationship between leverage and investment per cumulative institutional share ownership group for low-q firms

Net investment expenditure $_t$/Total assets$_{t-1}$	Cum. 0-0.25		Cum. > 0.25-0.50		Cum. >0.50-0.75		Cum. >0.75-1.00	
	Corr.	Sig.	Corr.	Sig.	Corr.	Sig.	Corr.	Sig.
Institutional ownership	0.254	0.107	-0.026	0.436	0.054	0.371	0.379	0.108
(Long-term debt/Total assets)$_{t-1}$	0.033	0.425	0.036	0.411	-0.136	0.210	-0.086	0.301
(Interest-bearing debt/Total assets)$_{t-1}$	-0.178	0.150	-0.411*	0.054	-0.387***	0.008	-0.153	0.173
No of Obs.	36		41		39		40	

***. Correlation is significant at the 0.01 level (1-tailed).

**. Correlation is significant at the 0.05 level (1-tailed)

*. Correlation is significant at the 0.10 level (1-tailed).

To analyze whether institutional share ownership affects the leverage-investment relationship and the underinvestment problem the aforementioned analysis is performed in the sample of high growth opportunities. Results in table 14 show that for high-q firms institutional ownership is significantly related to investment in the three largest cumulative groups institutional share ownership. For both leverage proxies the relationship between leverage and investment disappears in the three largest cumulative groups of institutional share ownership. Results indicate that increasing institutional share ownership decreases the underinvestment problem. Hypothesis H4A is supported.

Table 14 The relationship between institutional share ownership and investment and the relationship between leverage and investment per cumulative institutional share ownership group for high-q firms

Net investment expenditure $_t$/Total assets$_{t-1}$	Cum. 0-0.25		Cum. > 0.25-0.50		Cum. >0.50-0.75		Cum. >0.75-1.00	
	Corr.	Sig.	Corr.	Sig.	Corr.	Sig.	Corr.	Sig.
Institutional ownership	0.083	0.315	0.388***	0.006	0.268*	0.052	0.218*	0.091
(Long-term debt/Total assets)$_{t-1}$	-0.438***	0.004	0.134	0.199	-0.189	0.128	-0.538	0.102
(Interest-bearing debt/Total assets)$_{t-1}$	-0.539***	0.000	0.064	0.344	-0.143	0.196	-0.358	0.103
No of Obs.	36		42		38		39	

***. Correlation is significant at the 0.01 level (1-tailed).

**. Correlation is significant at the 0.05 level (1-tailed)

*. Correlation is significant at the 0.10 level (1-tailed).

4.2 Regression analysis

In this paragraph regression analysis will be conducted to analyze whether found results will hold when more variables are included in the analysis. First assumptions will be checked followed by a regression analysis between investment as dependent variable and leverage, cash flow and growth opportunities as independent variables. Just as has been done with the correlation analysis results will be controlled growth opportunities, year, sector, and share ownership.

4.2.1 Assumptions

Before the regression analysis can be performed the assumptions for regression analysis need to be checked. These assumptions are the assumptions regarding linearity, independence, equal variance, normal population and multicollinearity (De Veaux et al., 2008). Analyses indicate that all assumptions are fulfilled. For a more detailed assumption check see appendix 10a, 10b and 10c.

4.2.2 Relationship between leverage and investment for the complete Danish sample

To examine whether the relationship between leverage and investment holds when more variables are included a regression analysis is performed. For the regression analysis two different models with different independent variables are used. These models are explained in chapter three (p. 24). Table 15 shows that the negative relationship between leverage and investment holds for both models (β = -0.086, t (308) = -2.388, p = < 0.01) and (β = -0.178, t (308) = -4.846, p = < 0.01). Comparable to other research, cash flow and Tobin's Q are positively related to investment (Aivazian et al., 2005; Goergen & Renneboog, 2006; Zhang 2009) . Unexpected is the relationship between sales growth and investment which has a negative beta coefficient (β = -0.056, t (308) = -2.219, p = < 0.01) where one might expect a positive relationship. The results show that investment is influenced by debt, cash flow and growth opportunities. The explained variances of 14.7% and 16.7% indicate that net investment is influences by more variables than solely growth opportunities, cash flow and leverage.

Table 15 Regression analysis with net investment expenditure as dependent variable

Net investment expenditure $_t$/Total assets$_{t-1}$	**Model 1**			**Model 2**		
	B	**SE**	**t-value**	**B**	**SE**	**t-value**
Constant	0.100***	0.016	6.276	0.150***	0.013	11.450
(Long-term debt/Total assets)$_{t-1}$	-0.086**	0.036	-2.388			
Cash flow$_t$/total assets$_{t-1}$	0.357***	0.083	4.285			
(Tobin's Q)$_{t-1}$	0.020***	0.007	2.956			
(Interest-bearing debt/Total assets)$_{t-1}$				-0.178***	0.037	-4.846
Cash flow$_t$/total assets$_{t-1}$				0.423***	0.075	5.600
(ΔSales)$_{t-1}$				-0.056***	0.025	-2.219
No. of obs.	312			312		
R^2	0.147			0.167		
F	17.731***			21.804***		

***. Correlation is significant at the 0.01 level (1-tailed).

**. Correlation is significant at the 0.05 level (1-tailed).

When splitting the sample based on sector results show no significant relationship between long-term debt and investment except for the Health Care sector (β = -0.343, t(52) = -2.714, p < 0.01). When interest-bearing debt serves as a proxy for leverage the negative leverage-investment relationship holds for all sectors. Comparable to results obtained using correlation analysis the relationship between leverage and investment is most strong for the Health Care sector. See appendix 11a. When splitting the sample based on year results show that for all years interest-bearing debt is significant and negatively related to investment. No significant relationship between long-term debt and investment is found. The negative relationship between interest-bearing debt and investment is most strong for 2010 and least strong for 2006. See appendix 11b. Results indicate that interest-bearing debt is an effective

control mechanism not to overinvest and results indicate the presence of underinvestment. Hypothesis H1A, H1B and H1C include a distinction between high and low growth opportunities to explain the relationship between leverage and investment. The negative significant relationships found solely are in line with hypothesis H1B and H1C. Without dividing the sample the hypothesis cannot be supported.

4.2.3 Growth opportunities affecting the leverage-investment relationship

To explain the relationship between leverage and investment the sample is split based on low and high growth opportunities. Comparable to the correlation analysis two cut-off scores for growth opportunities is used. The first cut-off score is Q<1 and Q>1. Because the aforementioned sample division produces unequal and small samples which makes statistical analysis less valid and reliable an alternative cut-off score will be used. This cut-off score divides the sample based on median Q.

4.2.3.1 Low growth opportunities

The sample of low growth opportunities focuses on testing hypotheses H1A and H1B. Results in appendix 12 show that in the sample of low-q firms there is no significant relationship between long-term debt and investment. This implies that overinvestment nor underinvestment occurs when projects are funded using long-term debt. When interest-bearing debt serves as the leverage proxy the negative leverage-investment relationship holds for both cut-off scores for low growth opportunities (β = -0.081, $t(75) = -1.679$, $p < 0.10$) and (β = -0.145, $t(152) = -3.252$, $p < 0.01$). The negative relationship between interest-bearing debt and investment indicate that interest-bearing debt serves as a protection mechanism not to overinvest. This supports hypothesis H1B. Because no positive leverage-investment relationships have been found results imply that overinvestment does not occur. Hypothesis H1A is not supported.

When controlling the results per sector and per year the sample is only split in growth opportunities by median Q as otherwise the sample size would be too low and extremely unequal. Comparable to results found using correlation analysis the sector Industrials & Materials shows a significant positive relationship between long-term debt and investment (β= 0.143, $t(75) = 1.742$, $p < 0.10$). This positive relationship might indicate overinvestment problems in the Industrials & Materials sector and supports hypothesis H1A. When long-term debt serves as a proxy for leverage only the sector Health Care shows a significant negative leverage-investment relationship. Furthermore interest-bearing debt is negative significantly related to investment for all sectors. These results indicate that interest-bearing debts serves as a protection mechanism not to overinvest which supports hypothesis H1B. See appendix. When controlling the results for year a negative significant relationship is found between interest-bearing debt and investment for all years. No significant negative relationship between long-term debt and investment is found. Results coincide results found using correlation analysis.. The results of the regression analysis split per sector and year for low growth opportunities are not included in the thesis because they cover more than 25 pages.

4.2.3.2 High growth opportunities

In the sample of high growth opportunities hypothesis H1C is tested. Results indicate that for both cut-off scores for growth opportunities, both proxies for leverage are significantly negative related to investment indicating underinvestment agency problems. These results match results found in the correlation analysis and support hypothesis H1C. See appendix 13. When controlling the results for industry effects the negative relationship holds for all sectors when interest-bearing debt serves as the leverage proxy. Long-term debt is only negative significantly related to investment in the Health Care sector. Results support hypothesis H1C indicating that underinvestment is present when firms use

interest-bearing debt. Underinvestment seems also present in the Health care sector with long-term debt. When controlling the sample of high growth opportunities for year effects both proxies for leverage are significantly negative related to investment for the years 2006 and 2007. Consistent with the results of the correlation analysis underinvestment problems might seems to be present in the year 2006 and 2007. There is a plausible probability that results controlled for sector and year are biased by its low sample size. Therefore drawing conclusions out of this analysis should be done with care. The analyses regarding control for sector and industry are not included in the thesis as they cover more than 25 pages.

4.2.4 Insider ownership and the agency problems

To analyze the effect of managerial share ownership the same procedures are followed as in the correlation analysis. First the variable managerial share ownership is included in the regression analysis. Including the variable shows to what extent managerial share ownership affects investment and to what extent fluctuations in the strength of the leverage-investment relationship can be explained by managerial share ownership. By dividing the sample into four equal classes of managerial share ownership regression analysis shows whether the leverage-investment relationship will increase or decrease in magnitude. Hypotheses H2A and H2B are related to overinvestment agency problems and therefore are tested in the sample of low growth opportunities. H3A is related to underinvestment agency problems and therefore is tested in the sample of high growth opportunities. Again only the median Q cut-off score for growth opportunities is used due to sample size issues.

Results in appendix 14a show that in the sample of low-q firms for both regression models no significant relationship has been found between investment and insider ownership. This indicates that insider ownership is not significantly related to investment. Increasing insider ownership does not decrease overinvestment problems by aligning the interests of managers and shareholders. Hypothesis H2A is not supported. Increasing insider ownership also does not increase overinvestment problems by expropriating the rights of minority shareholders. Results do not support hypothesis H2B. The results match results found using correlation analysis.

The results of the analysis of firms characterized by high growth opportunities show that for the second regression model which includes interest-bearing debt, insider ownership and investment are significantly related in the two largest cumulative share ownership classes. The relationship between interest-bearing debt and investment disappears for the two largest cumulative ownership classes. See appendix 14b. The disappearance of the leverage-investment relationship when insider ownership and investment become significantly related indicates that insider share ownership decreases agency problems. Because the result is found in the sample of high growth opportunities the results suggest that insider share ownership reduces the underinvestment problem. Results contradict hypothesis H3A because insider share ownership seems to decrease underinvestment problems instead of increase underinvestment problems.

4.2.5 Institutional ownership and the agency problems

Hypothesis H4A predicts that institutional ownership decreases agency problems by monitoring and controlling the company effectively. Therefore hypothesis H4A predicts that the relationship between leverage and investment decreases when institutional share ownership increases.

For low-q firms a significant relationship between institutional ownership and investment is found for the highest cumulative institutional ownership groups. But as the leverage-investment relationship remains insignificant hypothesis H4A is not supported for low-1 firms. I institutional ownership does

not decrease agency (overinvestment) problems. See appendix 15a. For firms in the subsample of high growth opportunities institutional ownership is positively related to investment for the three largest cumulative groups of institutional ownership. In contrary to the smallest cumulative ownership group the leverage-investment relationship disappears. This finding supports hypothesis H4A indicating that institutional ownership decreases the underinvestment problem. These results match results found using correlation analysis. See appendix 15b.

4.2.6 Overview of results of the correlation analysis and the residual analysis

In this paragraph gives an overview is given of results found using correlation analysis and regression analysis. The table below shows which hypotheses are supported and which are not. A distinction is made between long-term debt and interest-bearing debt, sector and year. Hypothesis are only supported when the results of the correlation analysis and regression analysis coincide.

Table 16 Overview of the results of the correlation analysis and the regression analysis

Hypothesis	Explanation	Supported for the leverage-proxy	Supported for the sector	Supported for the year
H1A	In the presence of low growth opportunities the relationship between leverage and investment is positive due to overinvestment caused by managers expropriating resources of the company for their own benefits	Long-term debt	Industrials & Materials	2007
H1B	In the presence of low growth opportunities the relationship between leverage and debt is negative because of the protective role of debt limiting overinvestment caused by the obligation to pay interest and principal	Interest-bearing debt	Industrials & Materials and Health Care	2008, 2009, 2010
H1C	In the presence of high growth opportunities the relationship between leverage and investment is negative due to underinvestment caused by the risk of default	Long-term debt	Health Care	2006, 2010
		Interest-bearing debt	All sectors	2006, 2007
H2A	In the presence of low growth opportunities increasing managerial share ownership decreases the magnitude of the leverage-investment relationship because of the alignment of interests between managers and shareholders.	Not supported	Not supported	Not supported
H2B	In the presence of low growth opportunities increasing managerial share ownership increases the magnitude of the leverage-investment relationship due to expropriation of minority shareholders	Not supported	Not supported	Not supported
H3A	In the presence of high growth opportunities increasing managerial share ownership increases the magnitude of the leverage-investment relationship due to reluctance to accept the cost of external capital	Not supported	Not supported	Not supported
H4A	Increasing external share ownership decreases the magnitude of the leverage-investment relationship due to effective monitoring	Long-term debt and interest-bearing debt	Sample size too low to analyze	Sample size too low to analyze

4.3 Residual analysis

Aforementioned results indicate that to some extent agency problems are present in the sample because significant relationships between leverage and investment are found. Results however do not show whether overinvestment or underinvestment is more severe. The correlation analysis between leverage and growth opportunities in paragraph 4.1.1 indicates that the negative relationship between leverage and investment might also be partially caused by firms lowering debt in anticipation on future growth opportunities. Furthermore the found positive significant leverage-investment relationship for the Industrials & Materials sector might indicate overinvestment but might as well indicate 'normal' investment expenditure.

To analyze the existence and the magnitude of the agency problems in an alternative way residual analysis will be performed. Using both regression analyses used in paragraph 4.2 to determine the expected investment, residuals of the regression analysis indicate to what extent companies in the sample invest below the expected level of investment (underinvestment) and above the expected level of investment (overinvestment). This analysis will be performed for the complete sample for both leverage proxies. Both theory and common logic imply that most company investments do not precisely match the predicted (expected) investment level due to for example investments to keep assets in place and individual firm characteristics (Richardson, 2006). Therefore a cut-off score of 2 standard deviation from the expected investment level is maintained to determine abnormal investment (Zhang 2009). The residual analysis provides support for the correlation analysis and residual analysis by indicating to what extent overinvestment or underinvestment is present in the sample. By doing so the residual analysis contributes to testing hypothesis H1A, H1B and H1C. Finally this paragraph focuses on hypothesis H5A by distinguishing between the extent of overinvestment and underinvestment in the sample.

4.3.1 Abnormal investment and long-term debt

Using the first regression model which includes long-term debt as the leverage proxy , 5 observations have residual values that lie more than 2 standard deviation below the predicted investment level. 12 Observations have residual values that lie more than 2 standard deviations above the predicted investment level. These results imply that 5.45% of the companies in the sample are characterized by agency problems.

On average companies who invest more than 2 standard deviation below the expected level are disinvesting 10.92% of total assets and have an average debt of 26.03% of total assets. Companies who invest more than 2 standard deviation above the expected investment level are investing on average 47.58% of total assets and have a debt of 13.52% of total assets. Although not significantly supported in this residual analysis, results indicate that debt does influence investment behavior. The underinvestment group has relatively high debt and low investment level compared to the average debt level and investment level for the complete sample. The overinvestment group has relatively low debt and a high investment level. These results are in line with hypothesis H1B indicating that debt serves as a protection mechanism against overinvestment. See table 17.

Table 17 Variable description abnormal investment expenditure using long-term debt

	Observations < 2 sd below expected investment level (underinvestment)			Observations > 2 sd above expected investment level (overinvestment)		
	mean	**median**	**sd**	**mean**	**median**	**sd**
Net investment expenditure $_t$/Total assets$_{t-1}$	-0.1092	-0.1184	0.0411	0.4758	0.4758	0.0944
(Long-term debt/Total assets)$_{t-}$	0.2603	0.3297	0.1488	0.1352	0.1352	0.1327
(Cash flow$_t$/total assets$_{t-1}$	0.1380	0.1300	0.1248	0.0708	0.0708	0.1138
(Tobin's Q)$_{t-1}$	2.1134	1.543	1.1831	1.8964	1.6094	0.8660
Standardized residuals	-2.5545	-2.4689	0.4747	3.0651	2.8620	0.7751
No. of obs.	5			12		

In the overinvestment group 5 out of 12 observations are in the Industrials & Material sector. The relatively high presence of companies of the Industrials & Materials sector in the 'overinvestment' group is in line with hypothesis H1A and results found in the correlation analysis and regression analysis. Overinvestment occurs most in the Industrials & Materials sector. But as the observations in the overinvestment group is equal to 3,23% of the total observations in the Industrials & Materials sector, overinvestment does not seem a severe problem. The year-based observations are equally distributed in the overinvestment and underinvestment group. In the subgroup underinvestment 3 out of 5 observations are in the Health Care sector. This matches results found in the correlation and regression analysis indicating that underinvestment occurs most in the Health Care sector. The 3 observations in the Health Care group equal to 7.45% of the total observations in the Health Care sector. These results are in line with hypothesis H1C. Underinvestment is equally distributed among years.

Hypothesis H5A predicts that the overinvestment and underinvestment problem differs in magnitude. To analyze whether found differences in the observations are significant a two-sided two-sample t-test for the mean will be performed. To perform the t-test the means of the standardized residuals will be used as they show the magnitude of the agency problems. The assumptions for the t-test are fulfilled but one has to notice that the two groups are not completely independent of each other. Using an alpha-level of 5% the t-test reveals that there is no significant difference in the magnitude of the overinvestment problem and the underinvestment problem ($t(4) = 1.757$, $0.10 > p > 0.05$). Hypothesis H5A is not supported.

4.3.2 Abnormal investment and interest-bearing debt

Just as with long-term debt, abnormal investment will also be determined and analyzed when interest-bearing debt serves as a proxy for leverage. Studying both proxies is important as the correlation and regression analysis revealed that the negative leverage-investment relationship is on average stronger when interest-bearing debt serves as a proxy for leverage.

6 Observations show investments that lie more than two standard deviations below the expected investment level. 15 Observations show investments that lie more than two standard deviations above the expected investment level. Agency problems seems to occur at 6.73% of all observations. The average company-disinvestment of the underinvestment group is 7.58% of total assets and the average interest-bearing debt is 16.09% of total assets. In the overinvestment group the average investment is 45.93% of total assets and the average debt is 14.25% of total assets. Descriptives seem to confirm theory and hypothesis H1B as the underinvestment group shows a relatively low investment level and

high debt, while the overinvestment group shows a relatively high investment level accompanied by a relatively low debt level. This implies that debt influences investment behavior and has a protective role against overinvestment. Results are in line with hypothesis H1B. See table 18.

Table 18 Variable description abnormal investment expenditure using interest-bearing debt

	Observations < 2 sd below expected investment level (underinvestment)			Observations > 2 sd above expected investment level (overinvestment)		
	mean	**median**	**sd**	**mean**	**median**	**sd**
Net investment expenditure $_t$/Total assets$_{t-1}$	-0.0758	-0.1075	0.0687	0.4612	0.4593	0.0922
(Interest-bearing debt/Total assets)$_{t-1}$	0.1609	0.1610	0.1563	0.1425	0.0950	0.1463
Cash flow$_t$/total assets$_{t-1}$	0.1550	0.1500	0.1143	0.0980	0.1000	0.1345
(ΔSales)$_{t-1}$	0.0938	0.0747	0.2852	0.0475	-0.0068	0.2863
Standardized residuals	-2.473	-2.293	0.3777	2.8532	2.7228	0.7428
No. of obs.	6			15		

In the underinvestment group, 4 out of 6 observations are in the Health care sector. This equals to 9.93% of the total observations in the Health Care sector and is consistent woth H1C regarding underinvestment for the Health care sector. In the overinvestment group the sector Industrials & Materials sector stands out. 5 Out of 15 observations are in that sector which equals to 3.23% of the total observations in the Industrials & Materials sector. These results again match the correlation analysis- and regression analysis and support hypothesis H1A regarding overinvestment in the Industrials & Materials sector. Results indicating that underinvestment problems occurs most in the Health Care sector and overinvestment occurs most in the Industrials & Materials sector. Finally 5 out of 6 observations in the underinvestment groups are in the years 2009 and 2010 indicating that in those years underinvestment was relatively most present.

To analyze whether the two problems differ in magnitude a two-sided t-test for two means is conducted using the standardized residuals. Using an alpha-level of 5 % the t-test shows that there is no significant difference in the magnitude of the overinvestment and underinvestment problem ($t(4) = 1.015$, $0.20 > p > 0.15$). These results do not support hypothesis H5A.

4.5 Qualitative analysis

In addition to the quantitative analysis a qualitative analysis is conducted to gain a deeper understanding of managerial investment behavior. The qualitative analysis is based on four semi-structured interviews with financial managers of four different Danish listed companies. First a description is given about the vision of the four managers on the agency problems. Then the answers and visions of the management is compared with agency theory and results found in the quantitative analysis. Second a description is given about the vision of the four managers on the influence of shareholdings on investment expenditure. Again the answers and visions given are compared to agency theory and results found in the quantitative analysis.

4.5.1 Managers' vision on investment expenditure

According to the managers there are several aspects influencing investment decisions. Investments must suit the strategic direction and therefore must have a strategic fit. Furthermore in all companies investment decisions are based on return on investment (ROI), net present value (NPV) and weighted

average cost of capital (WACC). The companies most often fund 'small' investments using internally generated cash flow. When the investment becomes 'large' such as an acquisition of another company (long-term) bank loans are used. The companies rely on short-term debt (even more than on long-term debt) to be financially flexible. Long-term debt is kept as low as possible due to bank risk during the economic crisis and inflexibility. Alternative sources of financing are venture capitalists and pension funds which according to one manager play an important role in the financing needs of Danish listed companies.

All managers acknowledged that when the company needs finance the bank is very flexible. One company has faced an increasing cost of capital but when the bank took a few seats in the supervisory board getting funding for investments was not hard. An increasing cost of capital does limit investments to a small extent, because an increasing cost of capital is reflected in the net present value of the investment. But because of the stable and sufficient cash flows and the aforementioned business transparency the companies did not face an increasing cost of capital. One manager claimed that a decline in share price affects investments even more than an increase in interest rates as funding is based on future prospects and opportunities. The four managers stated that investments in negative NPV projects are not allowed. When an investment during its term becomes unprofitable projects are stopped. These decisions are made after meetings in which the projects are analyzed, which occurs a few times per year. The larger the investment the larger the control as more people analyze and approve the investment.

Using the outcomes of the qualitative analysis, the found positive long term debt-investment relationship in the sector & Materials can be explained. Companies want to keep (long-term) debt as low as possible which might decrease the power of debt serving as a protection mechanism, resulting in overinvestment problems. This supports hypothesis H1A. The results indicate that debt does serve as a protection mechanism against overinvestment; Investments are assessed based on NPV and WACC which includes the cost of capital. When the cost of capital is too high projects are not entered. Debt and the cost of capital are not the only factors affecting the investment decisions. The availability of internal cash flow and the business strategy influence investment. This might explain the relatively low explained variances in the regression analysis. The interviews support hypothesis H1B and match results found in the correlation analysis and regression analysis implying that debt serves as a protection mechanism. The protective purpose of debt is more severe for (short-term) interest-bearing debt such as a bank overdraft because managers intend to lower long-term debt. Interesting to note is that the effects described by the four managers are opposed to the study of D'Mello and Miranda (2010). They describe that when a firm tends to become levered the availability of cash flow is significantly reduced. The trend in Danish listed companies is that managers intend to become unlevered again, using internal cash flow to fund projects.

Finally the correlation and regression analysis have revealed underinvestment issues. Although this might be plausible as the cost of capital does affects investment decisions which might result in underinvestment, the residual analysis has shown that underinvestment problems are not substantial present. No indications towards underinvestment caused by debt or the cost of capital are present when interviewing the financial managers. The negative leverage-investment relationship might also partially be explained by the fact that many companies fund projects internally and want to keep the debt level as low as possible or adjust debt-level when managers believe debt restricts future growth opportunities. So although results support hypothesis H1C indicating underinvestment problems, those problems do not seem severe.

4.5.2 Managers' vision on the effect of shareholdings on investment

In general most shares are held by founders of the company and their relatives, and institutions such as pension funds and investment companies. The (large) shareholders are active as they for example hold positions in the supervisory board. One managers mentioned that once one large shareholder accused management of non-performance, resulting in a replacement of the board. In all the four companies management own shares. In one company where shares are a substantial part of the bonus structure shares increase managerial responsibility resulting in higher control. But the manager was not certain whether managerial shareholdings would affect investment decision that much as investment decisions are influenced by many more factors. In the other three firms shareholdings did not align the interests of managers and shareholders as the shareholdings were only a small part of the bonus structure. Contact with the shareholders is most often done electronically such as per mail or via the company website. For current and potential investors and analysts meetings are arranged. Finally none of the companies have internal legislation to protect minority shareholders. The managers claim that the minority shareholders are already protected by the Danish Company Act and European law.

Both the correlation analysis and the regression analysis have revealed that insider ownership only influences investment and agency problems when the ownership level is sufficiently high. But as the analyses also revealed insider ownership does not align the interest of managers and it also does not decrease the overinvestment problem. Answers provided by management acknowledges this, because in most companies managerial shareholdings are only a small part of the compensation package. This indicates that insider ownership does not align managers and shareholders. This finding does not support hypothesis H2A. The four managers acknowledged that no internal legislation exists to protect minority shareholders because minority shareholders are already protected by law. Because no evidence in the quantitative analysis is found regarding expropriation of minority shareholders the law seems effective in protecting the rights of minority shareholders. This does not support hypothesis H2B. Because managerial shareholders are only a small part of the compensation package of most Danish listed companies the shareholdings hardly influence investment spending. No indications towards the presence of underinvestment arises. This might be explained by the quantitative results. The results suggested that when shareholdings are sufficiently large they are effective in preventing underinvestment. Therefore hypothesis H3A is not supported, results found contradict the hypothesis.

Finally both the correlation analysis and the regression analysis have shown that institutional ownership decrease underinvestment because of the effective monitoring role of the institutions. The interviews support this finding. It is not rare in Danish listed companies that institutional investors take place in supervisory board of companies and intervene when they consider that management is not acting in the best interest of the company. This is in line with hypothesis H4A.

5. Conclusion

This research examines managerial investment behavior in Danish listed companies. By examining the relationship between financial leverage and investment this research analyzes the presence and magnitude of two agency problems: overinvestment and underinvestment. In addition the effect of managerial and institutional share ownership on the leverage-investment relationship is examined because agency theory implies that share ownership affects the leverage-investment relationship and the agency problems. The sample consists of 68 Danish listed companies over the period 2006 to 2010. This research combines both quantitative and qualitative data and research methods to offset their weaknesses and to draw on the strengths of both (Bryman 2006:106). The research question stated in the first chapter of this thesis is the following:

> *To what extent does leverage influence investment of Danish listed companies and to what extent can the relationship be explained by agency problems?*

This chapter aims to formulate an answer to the research question. Paragraph 5.1 addresses the two agency problems in the sample, i.e. overinvestment and underinvestment. The protective role of debt that limits overinvestment is discussed and a conclusion is drawn on which agency problem is more severe for the companies in the sample. Paragraph 5.2 addresses the influence of managerial and institutional share ownership on the leverage-investment relationship and the agency problems. Paragraph 5.3 discusses the feasibility of the leverage-investment relationship as an indicator of agency problems.

5.1 Agency problems in Danish listed companies

5.1.1 Overinvestment

The quantitative results indicate that companies in the Industrials & Materials sector during 2007 were characterized by overinvestment agency problems. The relationship between long-term debt and investment is positive. Because the positive relationship is not strong, results indicate that overinvestment is not severely present. Residual analysis confirmed this finding and showed that 5 out of 12 of the observations characterized by abnormal investment expenditure are in the Industrials & Materials sector. Because these 5 observations are equal to 3.23% of the total year-based observations in the Industrials & Materials sector it can be concluded that the overinvestment problem is not severely present. This finding is also confirmed by the qualitative analysis. The financial managers claimed that negative NPV projects are not allowed and projects are stopped when they become unprofitable. All projects are controlled by several people with the degree of control depending on the value of the project.

5.1.2 Debt limiting overinvestment

When companies prospect low growth opportunities the relationship between interest-bearing debt and investment is negative. This result is found in the Industrials & Materials sector and the Health Care sector and for the years 2008, 2009 and 2010. Results indicate that in these sectors and years interest-bearing debt (e.g. bank overdrafts) serve as a protection mechanism against overinvestment. Residual analysis shows that companies characterized by 'abnormal' (over) investment have a debt level below the average sample debt level, and investment levels above the average investment level. This also indicates that debt serves as a protection mechanism against overinvestment. The absence of a negative relationship between long-term debt and investment indicates that long-term debt is not an effective control mechanism against overinvestment. This might also explain the overinvestment problems in the Industrials & Materials sector. The financial managers have indicated that when they assess the feasibility and profitability of a project they consider the cost of external capital by

analyzing the companies weighted average cost of capital. Financial managers also indicated that when judging a project, the cost of capital and debt are not the only criteria for a go or no-go decision. Factors such as availability of internal cash flow and company strategy also play an influencing role in investment decisions. This might explain the relative weak correlations and explained variances found in the correlation analysis and regression analysis between leverage and investment. The managers have also indicated that they want to keep the long-term debt as low as possible due to bank risk and decreasing financial flexibility. This reduced the protective role of long-term debt against overinvestment.

5.1.3 Underinvestment

Underinvestment problems are expected to occur when companies are characterized by high growth opportunities.. The negative relationship between long-term debt and investment in the Health Care sector in 2006 and 2010 indicate underinvestment problems. The negative relationship between interest-bearing debt and investment for all sectors for 2006 and 2007 also indicate underinvestment problems. Residual analyses shows that in totals 2.24% of the total year-observations are characterized by overinvestment issued. This indicates that in general the underinvestment problem is not severe. Both correlation analysis and regression analysis have indicated that the relationship between debt and investment is most strong for the Health Care sector. Therefore it seems that the underinvestment is most severe in the Health Care sector. Results of the residual analysis indicate that 7.14% of the year-based observations in the Health Care sector are characterized by underinvestment problems. The financial managers supported results found in the quantitative analysis. They stated that investment is not severely limited by debt, because companies fund most projects internally. Therefore indications of underinvestment due to the cost of external capital and management reluctant to pay the cost of capital and bear the risk of default is hardly present.

5.1.4 The extent of agency problems in the sample

When comparing the strengths of the correlation coefficients, the magnitude of the overinvestment problem seems less than the magnitude of the underinvestment problem. The correlation coefficient indicating overinvestment is 0.159 while the correlation coefficients indicating underinvestment problems are stronger. The overinvestment problem seems to be restricted to the Industrials & Materials sector and 2007 while underinvestment problems seem to be present in all sectors and years. The results of the residual analysis show that although to some extent agency problems are present in the sample, the difference in magnitude of overinvestment and underinvestment is not significant.

5.2 Share ownership and the agency problems

5.2.1 Managerial share ownership

The second part of this research focuses on the effect of managerial and institutional shareholdings on the leverage-investment relationship and on the presence and magnitude of agency problems. No evidence is found that in the presence of low growth opportunities managerial shareholdings affect the strength of the leverage-investment relationship. In the sample managerial shareholdings do not align the interests of managers and (external) shareholdings resulting in a reduction of the overinvestment problems. The median managerial share ownership is 1.1% of all company shares and therefore relatively small. This might explain why insider shareholdings do not affect the leverage-investment relationship and the agency problems. The interviewed managers have indicated that managerial share ownership marginally affect investment decisions because managerial share ownership is only a small part of the bonus structure. No evidence is found that managers expropriate the rights of minority shareholders when managerial shareholdings increase. Qualitative analysis indicate that companies

have no internal legislation to protect the minority shareholders. But because no evidence is found of expropriation of minority shareholders, the protective external recommendations and legislation such as recommendations made by the Danish Corporate Governance Committee and legislation in the Danish Company Act and the EU Shareholders Right Directive seems to be effective.

In the presence of high growth opportunities insider share ownership affects the leverage-investment relationship. In the highest cumulative share ownership group insider share ownership decreases the magnitude of the leverage-investment relationship. This indicates that (solely in the presence of high growth opportunities) managerial ownership reduces underinvestment problems by aligning the interests of managers and external shareholders. No evidence is found that managerial shareholdings increase the underinvestment problem due to increasing risk of declining share price combined with the risk of default when the debt level rises. Results imply that only when managers own a relatively large stake of the company shares the interests of managers and shareholders are aligned and reduce agency problems.

5.2.2 Institutional shareholdings

Institutional shareholders own on average the largest part (28.9%) of the company shares. Institutional share ownership is significantly related to investment. Because the negative leverage-investment relationship disappears when institutional ownership affects investment results indicate that institutional ownership decreases agency problems. This result is only found in the subsample of companies with high growth opportunities. Therefore institutional share ownership is an effective mechanism to decrease the underinvestment problem by monitoring and controlling the company and its managers. This result is acknowledged by the qualitative findings. Institutions are active shareholders who regularly take positions in the company board. Institutions intervene in management when they recognize mismanagement and value-destroying activities. This active involvement makes the presence of information asymmetry between providers of external capital and the company unlikely. The financial managers claimed that external shareholders only intervene in management when their part of the company shares is sufficiently large. Small external shareholders with diversified portfolios have diversified the individual company risk out of their portfolio and monitoring the company seems to have more costs that benefits for those shareholders.

5.3 Feasibility of the leverage-investment relationship

The results have shown that leverage is related to investment with the direction and strength of the relationship depending on different sectors and years. Debt is an effective way to decrease the overinvestment problem while managerial and institutional shareholdings seem effective in decreasing the underinvestment problem. The outcomes of the correlation analysis, regression analysis, residual analysis and the four qualitative semi-structured interviews resemble. Therefore examining the extent of agency problems by analyzing the relationship between leverage and investment seems to be an appropriate technique. But this method might not capture the true extent of the agency problems. The relationship between leverage and investment does not isolate the overinvestment and underinvestment problem. Overinvestment and underinvestment might as well appear when firms have sufficient internal cash flow and fund projects with internal resources (Pawlina & Renneboog, 2005; De Gryse & De Jong, 2006). Investment is influenced by more factors than solely leverage such as company strategy. Results in this research show that firms might adjust their leverage level to anticipate on future investment opportunities. Therefore residual analysis and qualitative analysis are a valuable contributing to examine the extent of agency problems. Combining the three different research methods increases the validity of the study.

6. Discussion

In this chapter the findings of the research are discussed. In paragraph 6.1 the research findings are compared to similar research of several authors. The practical implications of the research are addressed in paragraph 6.2. In paragraph 6.3 methodological issues are discussed. Limitations of the research are described in paragraph 6.4 and finally paragraph 6.5 includes suggestions for future research.

6.1 Theoretical Implications

6.1.1 Implications regarding agency theory

This research shows that leverage influences investment decisions with its direction and magnitude depending on the measurement for leverage, sector and year. The findings support the overinvestment theory, the theory that debt plays an important control mechanism against overinvestment and the underinvestment theory.

The results imply that when firms are facing low growth opportunities debt plays a protective role in mitigating the overinvestment problems. This result is also found by Aivazian et al. 2005, Odit & Chittoo 2008 and Zhang 2009. However the conclusions drawn by these authors were not specific. The authors did not distinguish between the overinvestment problem and underinvestment problem and concluded that the negative relationship between leverage and investment is solely due to agency problems in general. Both Aivazian et al. and Odit & Chittoo did not take into account that share ownership and net working capital might affect the leverage-investment relationship. Also the authors did not mention that firms might adjust leverage to anticipate on future growth opportunities or fund projects internally. The authors simply followed the theory that a relationship between leverage and debt indicated agency problems. Therefore comparing the comprehensive and relative detailed results of this research to results found by the aforementioned authors seems not completely appropriate. The general theories regarding agency problems are not specific enough because they imply that demonstrating the presence of agency problems can be done by solely examining the leverage-investment relationship. The measurement of the theories regarding agency problems are too simplistic. Therefore the theory should be expanded by including the role of net working capital, the possibility of funding projects internally and the possibility that firms might adjust their debt level to anticipate on future growth prospect. Empirical research regarding agency theory should include all these factors to capture the true extent of agency problems.

Both Aivazian et al. (2005) and Odit & Chittoo (2008) found that leverage is insignificant related to investment in the presence of high growth opportunities. The results in this thesis contradict these findings because they imply that in the presence of high growth opportunities leverage is significant related to growth opportunities. There are several factors that can explain the differences in results found. First of all the research of Aivazian et al. and Odit & Chittoo was conducted in a different time frame (respectively 1982-1999 and 1990-2004). This research is conducted in the time frame of 2006-2010 which might include effects of the financial crisis affecting the leverage-investment relationship and the agency problems. In the research of Aivazian et al and Odit & Chittoo access to the financial market might be easier and the stock exchanges reflecting the market value of companies might be more optimistic. This is recognized by Pawlina & Renneboog (2005) and Goergen & Renneboog (2006). They conducted the same research regarding the presence of agency problems in the same setting. Their results differed due to macro-economic effects affecting the presence and extent of agency problems such as access to the financial market and the cost of capital. Second, the difference

in results found can also be explained by the cut-off score for high and low growth opportunities. The authors solely used Q<1 and Q>1 while this research uses two cut-off scores. The cut off score of Q<1 and Q>1 might not be homogeneous across countries or time-frames. Whether the cut-off score truly measures the difference between high and low growth opportunities remains a question. It can be argued that theory lacks a reliable cut-off score to distinguish between high and low growth opportunities. Finally the differences in the relationship between leverage and investment in the presence of high growth opportunities might be explained by proxies used for leverage. Both Aivazian et al. and Odit & Chittoo used total liabilities divided by total assets. This research has shown that in the presence of long-term debt the leverage-investment relationship hardly exists (depending on year and sector) while in the presence of interest-bearing debt leverage and investment is significantly related to investment in all sectors and years. Measuring leverage by total/liabilities creates measurement bias as the extent to which debt serves a protective role against agency problems and the extent of underinvestment differs per type (long-term, short-term, interest-bearing) of debt. This can also be acknowledged as a weakness of agency theory, because the theory focuses on debt in general and does not make a distinction between types of debt.

Compared to the aforementioned research this research finds a positive relationship between leverage and investment. This finding is supported by the residual analysis. According to the overinvestment theory this suggests that the companies have overinvestment problems. But the overinvestment theory does not take into account that the positive relationship might not necessarily indicate overinvestment problems. The positive relations between leverage and investment is found in the Industrials & Materials sector. The nature of the investments in this sector is different than the nature of investments in for example the Health care sector and Consumer Discretionaries and Staples sector. Using information of the company annual accounts, investments in the sector Industrials & Materials sector are mainly investments in large and expensive machinery such as vessels. These investments are in general funded with long-term debt while investments in for example the sector Health Care are mainly intangibles such as patents. Because the nature of the investment differ per sector, this might contribute to the explanation of the positive relationship between long-term debt and investment in the Industrials & Materials sector.

Finally, in the research empirical evidence is found that (interest-bearing) debt serves as a protection mechanism against overinvestment in the Industrials & Materials sector and in the Health Care sector. However the extent to which debt limits overinvestment remains unclear. On the one hand overinvestment hardly occurs, which might be explained by the protective role of debt. On the other hand, the explained variance of investment caused by leverage is relatively low, indicating that debt is not the only factor that influences investment. No evidence has been found that long-term debt is a protective mechanism against overinvestment, nor does debt decrease overinvestment in the Consumer Discretionaries & Staples sector and IT, Telecommunication services and Energy sector. This is supported by the four financial managers who state that they want to keep (long-term debt) as low as possible because long-term debt decreases financial flexibility. This results indicate that the overinvestment and underinvestment theory and the role of debt in those theories might be overrated. A possible explanation for this might be the interest rates of debt. The agency theories were developed during 1980. During 1980 the interest rates were substantially higher than the interest rates of the last three years. Van Zanden (1991) compared the base interest rates of the US, UK, Germany and the Netherlands and found that during 1980 the base rates for all those countries were higher than 10%, with its peak in 1985 when the interest rates were higher than 13%. During the last three years the interest rates are substantially lower. In the US the base rate is lower than 1% during the last three years (FED, 2011) and in Europe the base rate in this time period is lower than 4% (ECB, 2011). This

decrease in interest rate might explain why debt does not play a substantial role in mitigating the overinvestment problem. The protective role of debt seems partially offset by the relatively low interest rate. It seems that debt does not reduce (free) cash flow to the same extent as it did in 1980, the time when the agency theories were developed.

6.1.2 Implications regarding share ownership theory

This research has found no evidence that in the presence of low growth opportunities share ownership aligns the interests of managers and shareholders and so decreases overinvestment problems. Nor evidence is found that managers expropriate the rights of minority shareholders when managers' shareholdings increase. This finding is supported by Rose (2005) and Kanagarethman & Sarkari (2011) who both state that in general managerial shareholdings are too small compared to the total compensation package to affect investment spending. The results in this thesis do not coincide with results obtained by Morck et al. (2005) and Pindado & De La Torre (2009). Both authors found evidence that shareholdings align the interests of managers and shareholders but when managerial share ownership rises manager expropriate the rights of minority shareholders. The difference in results may be explained by the setting in which the research is conducted. The research of Morck et al. focuses on the US setting which is characterized by a market-oriented setting. In this setting managerial shareholding are more usual ands higher than in the Danish network-oriented setting (Rose & Mejer, 2003), leading to an alignment of interests between managers and external shareholders, but at the same time increasing power of management and the probability of expropriation of minority shareholders. Pindado & De La Torre (2009) examined the effects of shareholdings on the relationship between cash flow and investment and thereby examining agency problems when projects are funded internally. This research focuses on the relationship between leverage and investment and so focuses on external funding of projects. No conclusions can be made about which method is more precise or correct. Projects can fund projects internally and externally at the same time. Therefore when testing the agency theory, researchers should include both possibilities.

This research has found that managerial share ownership decreases underinvestment problems when the ownership stake is sufficiently high. This result is also found by Pindado & De La Torre and indicates that managerial shareholdings align the interests of managers and external shareholders. Pawlina & Renneboog (2005) found opposite results. They found that with increasing share ownership the sensitivity of cash flow increases which might indicate that with increasing share ownership managers might become even more reluctant to be exposed by a decline in share price combined with the risk of default. Again the difference can be explained by the fact that Pawlina & Renneboog focused on cash flow sensitivity and internally funding projects and not on externally funding projects by examining the leverage-investment relationship. Furthermore the market-oriented setting in which the research of Pawlina & Renneboog was conducted might explain the difference, because compensations in the UK setting are more share-related than in Denmark. Comparing this research to others has implications because aforementioned research did not make a distinction between low and high growth opportunities (except for Pawlina & Renneboog) and thereby did not indicate which agency problem is addressed by increasing managerial ownership.

This research has found evidence that institutional shareholdings decrease underinvestment because institutions effectively monitor and control the company. This finding is supported by Pawlina & Renneboog who state that institutions folding an equity block appear to reduce the information asymmetry between the firm and capital markets (pp. 31). Goergen & Renneboog (2006) also support this finding. The findings in this thesis support previous conducted studies.

6.2 Practical implications

The findings showed that overinvestment and underinvestment are not a severe issues among Danish listed companies. This is positive for the companies, because it shows that the managers are putting effort in increasing the value of the company and thereby contributing to a good image, profitability and a guarantee of the continuity of the company. The lack of severe agency problems benefits the trustworthiness of management. As has been stated in the introduction of this research there are many examples of managers not acting in the best way of the company. This research highlights the opposite, because results imply that managers do act in the best way of the company and might reduce the negative tone against management. Although not empirically examined it can be assumed that the positive outcomes of this research for the companies and management can only contribute to (international) business trade of Danish listed companies.

Although agency problems found in this research are not severe, some signs of overinvestment in the Industrials & Materials sector and underinvestment in all sectors is present. Stakeholders of the company should act upon this result. For example in the Industrials & Materials sectors stakeholders such as the management and institutional shareholders must find a balance between controlling the company and responsibility of management.

No evidence is found that managers are expropriating the rights of minority shareholders. The law and recommendations towards protection of shareholders seem effective and sufficient. Because the Danish government by law and professionals by recommendations urge the need for a market-oriented corporate governance structure to increase globalization and competitiveness it is the questions whether the rights of shareholders are continued to be sufficiently protected. Increased competition might neglect the rights of minority shareholders. Past research has found that companies in countries such as the US and Canada who are characterized by a market-oriented setting are to some extent expropriation minority shareholders (Pawlina & Renneboog, 2005). It is up to the government and the professionals involved in corporate governance to produce laws and recommendations to keep protecting the rights of (minority) shareholders.

6.3 Methodological issues

During this research and prior research by other authors methodological issued arose. No research has managed to isolate the agency problems and capture the true extent of overinvestment and underinvestment. Many authors used a single analysis method to analyze agency problems. Aivazian et al. (2005), Pawlina & Renneboog (2005) and Odit & Chittoo (2008) used quantitative analysis to determine the agency problems by analyzing respectively the leverage-investment relationship and the cashflow-investment relationship. Because this method misses specificy and does not capture the true extent of agency problems the quantitative analysis alone are not sufficient. By analyzing the relationship between solely two variables research only focuses on internal or external funding projects which might not be the case in firms, because project funding can occur internally and externally. Richardson (2006) and Zhang (2009) used residual analysis to determine the extent of agency problems but made the assumption that the mean investment level is equal to zero agency problems. Therefore the true extent of agency problems might not be captured. Qualitative analysis might decrease the disadvantages of the quantitative research. Qualitative research can shed light on which aspects influence investment decisions that cannot be found by studying annual reports or other secondary data. It might reveal why investment decisions are made instead of contributing a relationship between leverage and debt directly to agency problems.

6.4 Limitations

Every research has its limitations. In this paragraph the main limitations are discussed. Due to time constraints it was not possible to analyze annual reports of companies prior to 2005. Due to the convenience sampling technique only the companies were included who's annual report were available on the website and were published in English. This resulted in a sample of 68 Danish companies with 312 year-based observations. This relative small sample size might affect the validity of statistical inferences. A single observation influences the data relatively strong which might result in a Type II error; Hypotheses are rejected while in reality no relationship exists. The results might be false positive (De Veaux et al., 2008) Sample size issues are also present at the qualitative analysis. Only four interviews were conducted which might not give a representative image of the internal dynamics of the companies. This research also has generalizability issues. First of all results might not be generalizable to other countries. Differences exist in a country's financial markets and access to financial markets, corporate governance structures and leverage. Second generalizability of the results might even be limited to public companies. Private companies are different in the nature of shareholdings (which are not public) and obtaining finance. This research is conducted in retrospect because agency problems were investigated during the years 2006-2010. Managers and stakeholders cannot change investment decisions that have already occurred. But nevertheless this research can limit future agency problems due to the awareness created in this research.

This research has also some limitations regarding definitions of variables. In agency theory free cash flow is defined as cash in excess of that is required to fund positive NPV projects (Jensen, 1986). It is impossible to determine by solely using the annual reports which part of the cash flow from investments can be contributed to 'normal' investment, and underinvestment or overinvestment. Therefore an alternative measure of cash flow is maintained. The variable cash flow is measured using the value of net cash flow from operations divided by total assets. This definition shows the amount of cash that is left after the regular investments in production and sales. Although this definition does not measure the 'true' free cash flow it is a definition that comes close to it. The cut-off score to distinguish between low and high growth opportunities maintained in this research is arbitrary. No statistical evidence exists whether the cut-off score is correct. This issue is tried to solve by using two cut-off scores for growth opportunities.

Difficulties arise when isolating the pure effects of agency problems in the relationship between leverage and investment. Results have indicated that the leverage-investment relationship might as well be influenced by internal funding of projects or by firms lowering their debt level in anticipation on future growth prospects. To what extent these (or even different unknown) factors influence the leverage-investment relationship cannot be determined in this research. Finally the study might be limited by time-order issued. Cause and effect might not be bounded to one year. An agency problem detected in a certain year might not be caused in that year, or effects of agency problems might become visible after several years.

6.5 Future research

Implications regarding theory have pointed out that solely investigating the relationship between leverage and investment is not sufficient to detect agency problems and the extent of agency problems. Other factors such as internal cash flow, project return, net working capital, adjustment of debt level, type of debt and macro-economic conditions such as access to the financial markets and interest rates should be taken into account in future research. These factors might affect the leverage-investment relationship and the agency problems. Because the aforementioned factors might not be the only factors affecting investment, additional research should be performed which addresses the

determinants of investment decisions. Based on the outcomes of such studies the more than three decade year old agency theories should be adjusted. By empirical research, researchers should test the agency theory including the aforementioned factors. This research should be performed in different settings and time frames to make agency theory more specific. By performing the study in different time frames and settings conclusions can be made regarding the generalizability of agency theory and whether the agency theories are still valid.

In this chapter it has been mentioned that previous research suffers on methodological issued by using a single method research which might not capture the true extent of agency problems. Future research should use several research methods to overcome the disadvantages of a single-method research. Both qualitative and quantitative research should be combined. Qualitative research could be used prior to quantitative research to determine which factors affect investment expenditure and the agency problems. Based on the outcomes of qualitative research quantitative research should be performed. This research should not only focus on the leverage-investment relationship nor the cashflow-investment relationship but combine them. Project funding can happen internally and/or externally.

An important feature of the agency theories is the distinction between low and high growth opportunities. In this study and in other studies (Aivazian et al., 2005; Goergen & Renneboog, 2006; Zhang, 2009) the cut-off score to distinguish between low and high growth opportunities is defined as Tobin's Q larger and smaller than 1. Because no empirical evidence exists that this is the proper cut-off score additional research is needed to determine the cut-off score. A empirically supported cut-off score increases the validity of the studies regarding agency theory by making a proper distinction between samples that might be influenced by overinvestment and underinvestment.

While this research distinguishes between agency problems in different sectors future research should focus on agency problems in individual companies. Both Aivazian et al. (2005) and Serrasquiero and Nunes (2010) mention that the agency problems are affected by firm-specific characteristics such as profitability and size. In this research no such study is performed due to the relatively low sample size and time constraints. Ahn et al. (2010) emphasize that the disciplining role of debt is partially offset by the power of management in allocating debt to different business segments that results from the diversified organizational structure. Because managers can assign the type of funding (internal or external) per business segment the existence and extent of agency problems might differ per business segment. Finally when performing a case study of the existence of agency problems one might have access to different types of (internal) information such as information regarding the net present value of projects and which aspects influence the investment decisions. This might lead to more precise specifications of agency problems.

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List of appendices

Appendix 1 Overview of the hypotheses

Table 19 Overview of the hypotheses

Area	Hypothesis	Hypothesis explanation
Overinvestment	H1A	In the presence of low growth opportunities the relationship between leverage and investment is positive due to overinvestment caused by managers expropriating resources of the company for their own benefits
Protective role of debt	H1B	In the presence of low growth opportunities the relationship between leverage and debt is negative because of the protective role of debt limiting overinvestment caused by the obligation to pay interest and principal
Underinvestment	H1C	In the presence of high growth opportunities the relationship between leverage and investment is negative due to underinvestment caused by risk of default
Managerial share ownership	H2A	In the presence of low growth opportunities increasing managerial share ownership decreases the magnitude of the leverage-investment relationship because of the alignment of interests between managers and shareholders.
	H2B	In the presence of low growth opportunities increasing managerial share ownership increases the magnitude of the leverage-investment relationship due to expropriation of minority shareholders
	H3A	In the presence of high growth opportunities increasing managerial share ownership increases the magnitude of the leverage-investment relationship due to the risk of default and the risk of declining share price
External share ownership	H4A	Increasing external share ownership decreases the magnitude of the leverage-investment relationship because of effective monitoring
Extent of agency problems	H5A	The magnitude of the overinvestment problem differs from the magnitude of the underinvestment problem

Appendix 2 Email to Danish listed companies

Dear mr, mrs,

Following our telephone conversation yesterday I am mailing about an appointment.

My name is Evelyn Tempel and I study Business Administration at the University of Twente in The Netherlands. For my master thesis, I investigate investment behaviour and the influence of debt on investment behaviour of Danish listed companies.

To complete my research and gain a deeper understanding about investment behaviour I would like to make an appointment between the 18th of June and the 4th of July to ask you some questions about my research. This appointment will only take about 20 minutes.

Needless to say that your company and the answers given will stay anonymous.

I have established a list of indicative questions that I would like to ask during the appointment. This list can be found in the attachment.

For further questions please contact me by mail or by phone. My emailadress is g.e.tempel@student.utwente.nl and my phone number is +316 225 74 775

You can also contact my supervisor Henk Kroon at the University of Twente. His emailadress is h.kroon@utwente.nl and his phone number is +3153 489 3510.

Thanks in advance,

Evelyn Tempel

Appendix 3 Histogram of net investment expenditure

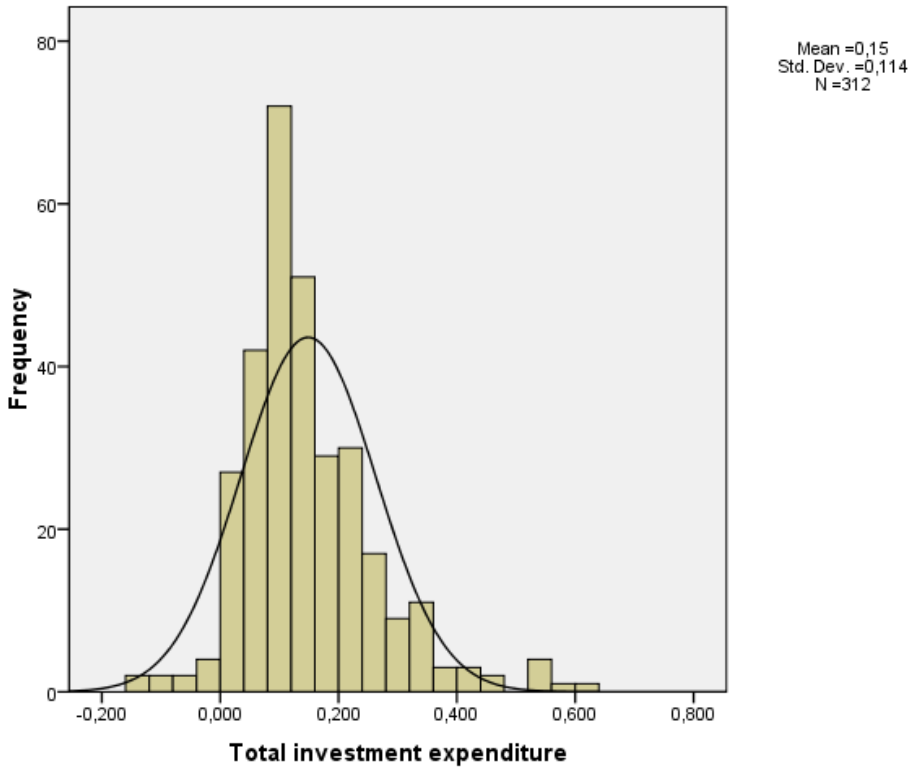

Figure 2. **Histogram of dependent variable net investment expenditure**

Appendix 4 Interview questions

Q1. Which aspects influence investment decisions?

Q2. Which sources of financing does the company have

Q3. How flexible is the company's current bank when financing is needed in financial distressed times?

Q4. To what extent does an increasing cost of external capital limit investment

Q5. To what extent do the providers of external capital recognize the potential of your investment projects?

Q6. To what extent are investments in negative NPV projects allowed?

Q7. Do you scale investment projects with a different risk in a different category

Q8. Which persons/institutions possess the company shares?

Q9. How active are the company's shareholders?

Q10. How many shares does management own?

Q11. To what extent does managerial ownership of company shares aligns the interest of managers and shareholders?

Q12. How do you keep in contact with your shareholders?

Q13. How do you protect the right of your minority shareholders?

Q14. Who is the largest outside shareholder?

Q15. To what extent do such outside shareholders influence or even control the company?

Appendix 5 Scatterplot bivariate relationship leverage and investment

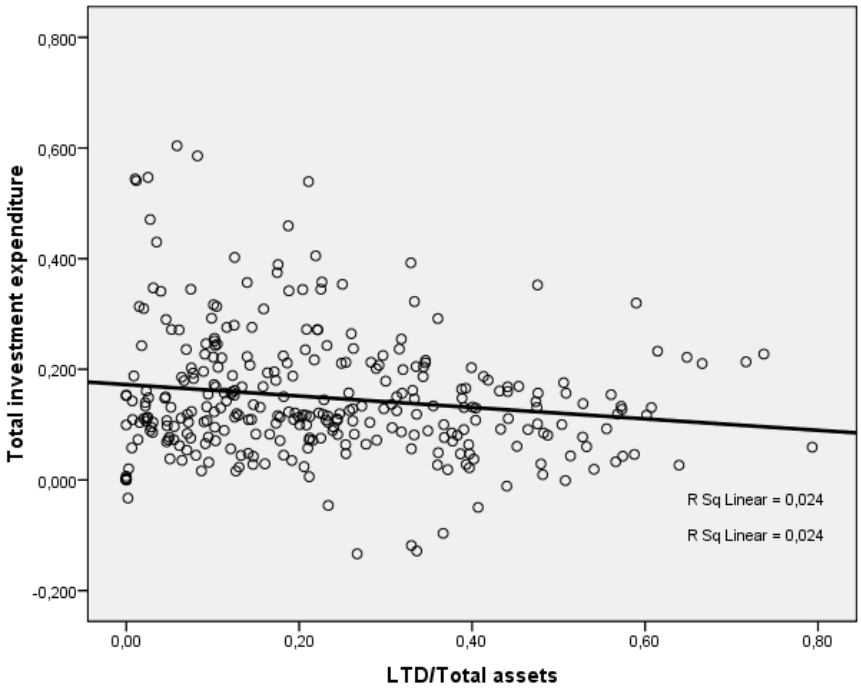

***Figure 3*. Scatterplot of bivariate relationship long-term debt and net investment expenditure**

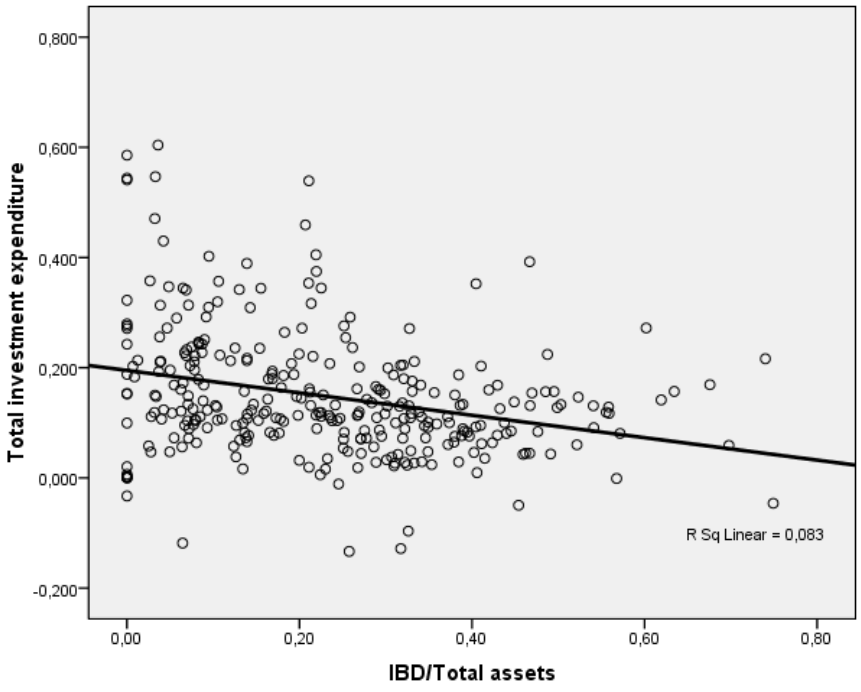

***Figure 4*. Scatterplot bivariate relationship interest-bearing debt and net investment expenditure**

Appendix 6 Correlation analysis leverage and investment split by sector and by year

Table 20 Correlation analysis between leverage and investment split by sector

Net investment expenditure $_t$/Total assets$_{t-1}$	Industrials & Materials		Health Care		Consumer discretionary and Consumer staples		IT & Telecommunication Services & Energy	
	Corr.	Sig.	Corr.	Sig.	Corr.	Sig.	Corr.	Sig.
(Long-term debt/Total assets)$_{t-1}$	0.102	0.104	-0.338***	0.005	-0.125	0.167	-0.227*	0.079
(Interest-bearing debt/Total assets)$_{t-1}$	-0.221***	0.03	-0.325***	0.007	-0.177*	0.085	-0.09	0.261
No of Obs.	155		56		62		40	

***. Correlation is significant at the 0.01 level (1-tailed).

*. Correlation is significant at the 0.10 level (1-tailed).

Table 21 Correlation analysis between leverage and investment split by year

Net investment expenditure $_t$/Total assets$_{t-1}$	2006		2007		2008		2009		2010	
	Corr.	Sig.	Corr.	Sig.	Corr.	Sig.	Corr.	Sig.	Corr.	Sig.
(Long-term debt/Total assets)$_{t-1}$	-0.216*	0.050	-0.151	0.129	-0.038	0.383	-0.184**	0.068	-0.231***	0.031
(Interest-bearing debt/Total assets)$_{t-1}$	-0.229***	0.04	-0.088	0.256	-0.209***	0.050	-0.340***	0.002	-0.304***	0.007
No of Obs.	59		58		63		67		66	

***. Correlation is significant at the 0.01 level (1-tailed).

**. Correlation is significant at the 0.05 level (1-tailed)

*. Correlation is significant at the 0.10 level (1-tailed).

Appendix 7 Correlation analysis between leverage and investment controlled for growth opportunities

Table 22 Correlation analysis between leverage and investment for low-q firms

Net investment expenditure$_t$/Total assets$_{t-1}$	**(Q < 1)**		**(Q < median)**	
	Corr.	**Sig.**	**Corr.**	**Sig.**
(Long-term debt/Total assets)$_{t-1}$	0.159**	0.08	-0.051*	0.093
(Interest-bearing debt/Total assets)$_{t-1}$	-0.236***	0.018	-0.295***	0.000
No of Obs.	79		156	

***. Correlation is significant at the 0.01 level (1-tailed).

**. Correlation is significant at the 0.05 level (1-tailed)

*. Correlation is significant at the 0.10 level (1-tailed).

Table 23 Correlation analysis between leverage and investment for high-q firms

Net investment expenditure$_t$/Total assets$_{t-1}$	**(Q > 1)**		**(Q > median)**	
	Corr.	**Sig.**	**Corr.**	**Sig.**
(Long-term debt/Total assets)$_{t-1}$	-0.197**	0.01	-0.189***	0.009
(Interest-bearing debt/Total assets)$_{t-1}$	-0.280***	0.001	-0.212***	0.004
No of Obs.	233		157	

***. Correlation is significant at the 0.01 level (1-tailed).

**. Correlation is significant at the 0.05 level (1-tailed)

*. Correlation is significant at the 0.10 level (1-tailed).

Appendix 8a Correlation analysis between leverage and investment for low-q firms split by sector

Table 24 Correlation analysis between leverage and investment for low-q (Q<1) firms split by sector

Net investment expenditure $_t$/Total assets$_{t-1}$	Industrials & Materials		Health Care		Consumer discretionary and Staples		IT, Telecommunication services and Energy	
	Corr.	Sig.	Corr.	Sig.	Corr.	Sig.	Corr.	Sig.
(Long-term debt/Total assets)$_{t-1}$	0.211*	0.059	-0.643***	0.005	0.093	0.293	-0.136	0.354
(Interest-bearing debt/Total assets)$_{t-1}$	-0.312**	0.01	-0.754***	0.002	0.393	0.347	-0.195	0.295
No of Obs.	56		4		11		10	

***. Correlation is significant at the 0.01 level (1-tailed).

**. Correlation is significant at the 0.05 level (1-tailed)

*. Correlation is significant at the 0.10 level (1-tailed).

Table 25 Correlation analysis between leverage and investment for low-q (Q<median) firms split by sector

Net investment expenditure $_t$/Total assets$_{t-1}$	Industrials & Materials		Health Care		Consumer discretionary and Staples		IT, Telecommunication services and Energy	
	Corr.	Sig.	Corr.	Sig.	Corr.	Sig.	Corr.	Sig.
(Long-term debt/Total assets)$_{t-1}$	0.207**	0.018	-0.840***	0.009	-0.127	0.256	-0.281	0.137
(Interest-bearing debt/Total assets)$_{t-1}$	-0.212**	0.016	-0.714**	0.036	-0.127	0.256	-0.421	0.146
No of Obs.	103		7		29		17	

***. Correlation is significant at the 0.01 level (1-tailed).

**. Correlation is significant at the 0.05 level (1-tailed)

*. Correlation is significant at the 0.10 level (1-tailed).

Appendix 8b Correlation analysis between leverage and investment for low-q firms split by year

Table 26 Correlation analysis between leverage and investment for low-q (Q<1) firms split by year

Net investment expenditure $_t$/Total assets$_{t-1}$	2006		2007		2008		2009		2010	
	Corr.	Sig.	Corr.	Sig.	Corr.	Sig.	Corr.	Sig.	Corr.	Sig.
(Long-term debt/Total assets)$_{t-1}$	0.010	0.49	0.887*	0.057	-0.554	0.109	0.244	0.105	0.196	0.146
(Interest-bearing debt/Total assets)$_{t-1}$	0.121	0.378	0.326	0.337	-0.768**	0.022	-0.359**	0.039	-0.237*	0.099
No of Obs.	9		4		7		28		31	

***. Correlation is significant at the 0.01 level (1-tailed).

**. Correlation is significant at the 0.05 level (1-tailed)

*. Correlation is significant at the 0.10 level (1-tailed).

Table 27 Correlation analysis between leverage and investment for low-q (Q<median) firms split by year

Net investment expenditure $_t$/Total assets$_{t-1}$	2006		2007		2008		2009		2010	
	Corr.	Sig.	Corr.	Sig.	Corr.	Sig.	Corr.	Sig.	Corr.	Sig.
(Long-term debt/Total assets)$_{t-1}$	0.149	0.253	0.133	0.283	-0.154	0.247	-0.200	0.108	0.075	0.313
(Interest-bearing debt/Total assets)$_{t-1}$	0.346	0.257	-0.236	0.151	-0.487**	0.011	-0.471***	0.000	-0.284**	0.029
No of Obs.	22		21		22		46		45	

***. Correlation is significant at the 0.01 level (1-tailed).

**. Correlation is significant at the 0.05 level (1-tailed)

*. Correlation is significant at the 0.10 level (1-tailed).

Appendix 9a Correlation analysis between leverage and investment for high-q firms split by sector

Table 28 Correlation analysis between leverage and investment for high-q (Q>1) firms split by sector

Net investment expenditure $_t$/Total assets$_{t-1}$	Industrials & Materials		Health Care		Consumer discretionary and Staples		IT, Telecommunication services and Energy	
	Corr.	Sig.	Corr.	Sig.	Corr.	Sig.	Corr.	Sig.
(Long-term debt/Total assets)$_{t-1}$	0.039	0.353	-0.355***	0.007	-0.140	0.166	-0.139	0.237
(Interest-bearing debt/Total assets)$_{t-1}$	-0.177**	0.04	-0.330***	0.007	-0.214*	0.068	-0.317**	0.047
No of Obs.	99		54		50		29	

***. Correlation is significant at the 0.01 level (1-tailed).

**. Correlation is significant at the 0.05 level (1-tailed)

*. Correlation is significant at the 0.10 level (1-tailed).

Table 29 Correlation analysis between leverage and investment for high-q (Q>median) firms split by sector

Net investment expenditure $_t$/Total assets$_{t-1}$	Industrials & Materials		Health Care		Consumer discretionary and Staples		IT, Telecommunication services and Energy	
	Corr.	Sig.	Corr.	Sig.	Corr.	Sig.	Corr.	Sig.
(Long-term debt/Total assets)$_{t-1}$	-0.071	0.307	-0.239**	0.049	-0.037	0.421	-0.006	0.49
(Interest-bearing debt/Total assets)$_{t-1}$	-0.320**	0.010	-0.248**	0.043	-0.233*	0.099	-0.195	0.192
No of Obs.	52		49		32		22	

***. Correlation is significant at the 0.01 level (1-tailed).

**. Correlation is significant at the 0.05 level (1-tailed)

*. Correlation is significant at the 0.10 level (1-tailed).

Appendix 9b Correlation analysis between leverage and investment for high-q firms split by year

Table 30 Correlation analysis between leverage and investment for high-q (Q>1) firms split by year

Net investment expenditure$_t$/Total assets$_{t-1}$	2006		2007		2008		2009		2010	
	Corr.	Sig.	Corr.	Sig.	Corr.	Sig.	Corr.	Sig.	Corr.	Sig.
(Long-term debt/Total assets)$_{t-1}$	-0.219*	0.063	-0.099	0.239	-0.012	0.465	-0.291**	0.036	-0.464***	0.003
(Interest-bearing debt/Total assets)$_{t-1}$	-0.240**	0.046	-0.407***	0.001	-0.185*	0.086	-0.274**	0.045	-0.292**	0.047
No of Obs.	50		53		56		39		34	

***. Correlation is significant at the 0.01 level (1-tailed).

**. Correlation is significant at the 0.05 level (1-tailed)

*. Correlation is significant at the 0.10 level (1-tailed).

Table 31 Correlation analysis between leverage and investment for high-q (Q>median) firms split by year

Net investment expenditure$_t$/Total assets$_{t-1}$	2006		2007		2008		2009		2010	
	Corr.	Sig.	Corr.	Sig.	Corr.	Sig.	Corr.	Sig.	Corr.	Sig.
(Long-term debt/Total assets)$_{t-1}$	-0.298**	0.037	-0.128	0.228	-0.003	0.494	0.030	0.450	-0.498**	0.011
(Interest-bearing debt/Total assets)$_{t-1}$	-0.314**	0.029	-0.399***	0.008	0.114	0.239	0.054	0.410	-0.185	0.21
No of Obs.	37		36		41		20		21	

***. Correlation is significant at the 0.01 level (1-tailed).

**. Correlation is significant at the 0.05 level (1-tailed)

*. Correlation is significant at the 0.10 level (1-tailed).

Appendix 10a Normality assumption regression analysis

To perform a regression analysis the regression model should follow a normal pattern. To investigate whether the data is normally distributed a histogram of the standardized residuals is made for both regression models. Although for both models six observations lie more than three standard deviations away from the predicted values and those values might affect the outcome of the regression analysis both histograms show a normal pattern. The normality assumption is fulfilled.

Appendix 10b Equal variance assumption and linearity assumption regression analysis

The data might also be biased due to heteroscedasiticity which indicates that the spread of the residuals is not uniform. (De Veaux et al., 2008) For both regression models the standardized residuals are plot against the standardized predicted values. Although the residuals are at some point a bit clustered around the zero-line no clear pattern can be distinguished. The unclear cluster that is visible in the scatterplot can be explained by the six residuals that lie more than three standard deviations from the predicted values. The equal-variance assumption is fulfilled. Because the residuals do not show a clear pattern such as a parabola or a bend curve the linearity assumption is also fulfilled.

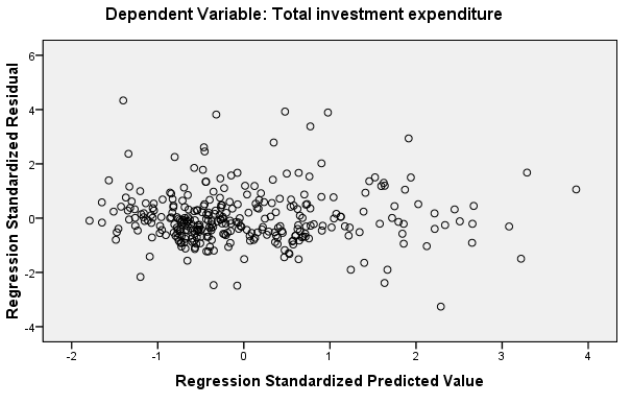

Figure 5. P-P plot of regression model 1 (including long-term debt)

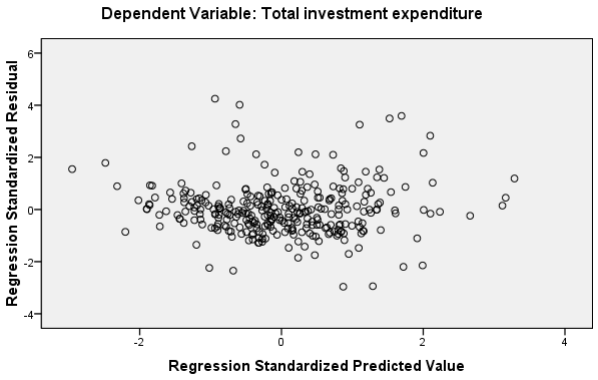

Figure 6. P-P plot regression model 2 (including interest-bearing debt)

Appendix 10c Multicollinearity

Multicollinearity can be defined as the presence of high correlations among the latent exogenous constructs (Grewal et al., 2004). Grewal et al. state that multicollinearity leads to inaccurate estimates of coefficients, standard errors and inference errors resulting in a Type II error. A type II error occurs when the null hypothesis is false but is not rejected, or is false negative (De Veaux et al., 2008). Multicollinearity can be detected by generating a correlation matrix of the predictor variables. According to Saunders et al. (2009) multicollinearity is present when the strength of the correlations between the independent variable is 0.9 or higher. Anderson et al. (2009) on the other hand state that a correlation of 0.7 or higher between the independent variables indicates multicollinearity. Table x shows that none of the correlations between the independent variables of the two regression models used in this thesis have coefficients stronger than 0.4 or -0.4. This indicates that multicollinearity is not present in the sample. Alternative ways to control for multicollinearity exist. Tolerance is an indication of the percent of variance that cannot be explained by other independent variables. The Variance Inflation Factor can also be used to control for multicollinearity. No statistically cut-off scores for tolerance and VIF are determined to detect multicollinearity. Grewal et al. argue that it is a rule of thumb that the tolerance is larger than 0.1 and the VIF should be smaller than 10 to have a sample low on multicollinearity. When checking the regression models model for multicollinearity the minimum tolerance is 0.801 and the maximum VIF is 1.248. To conclude the sample is not biased towards multicollinearity.

Table 32 Correlation analysis between the independent variables of regression model 1

Net investment expenditure $_t$/Total assets$_{t-1}$	**1**	**2**	**3**
1. (Long-term debt/total assets)$_{t-1}$	1	0.046	-0.209***
2. Cash flow$_t$/total assets$_{t-1}$		1	0.384***
3. (Tobin's Q)$_{t-1}$			1
No. of obs.	312		

***. Correlation is significant at the 0.01 level (1-tailed).
**. Correlation is significant at the 0.05 level (1-tailed).
*. Correlation is significant at the 0.10 level (1-tailed).

Table 33 Correlation analysis between the independent variables of regression model 2

Net investment expenditure $_t$/Total assets$_{t-1}$	**1**	**2**	**3**
1. (Long-term debt/total assets)$_{t-1}$	1	-0.098**	0.064
2. Cash flow$_t$/total assets$_{t-1}$		1	0.084
3. (Tobin's Q)$_{t-1}$			1
No. of obs.	312		

***. Correlation is significant at the 0.01 level (1-tailed).
**. Correlation is significant at the 0.05 level (1-tailed).
*. Correlation is significant at the 0.10 level (1-tailed).

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Appendix 11a Regression analysis with net investment as dependent variable split by sector

Table 34 Regression analyses with net investment as dependent variable for the sector Industrials & Materials

Net investment expenditure $_t$/Total assets$_{t-}$	Model 1			Model 2		
	B	SE	t-value	B	SE	t-value
Constant	0.082***	0.016	4.999	0.118***	0.015	7.821
(Long-term debt/Total assets)$_{t-1}$	0.022	0.035	0.611			
Cash flow$_t$/total assets$_{t-1}$	0.240**	0.105	2.288			
(Tobin's Q)$_{t-1}$	0.005	0.009	0.551			
(Interest-bearing debt/Total assets)$_{t-1}$				-0.087**	0.038	-2.319
Cash flow$_t$/total assets$_{t-1}$				0.237**	0.097	2.430
(ΔSales)$_{t-1}$				-0.006	0.027	-0.216
No. of obs.	155			155		
R^2	0.054			0.085		
F	2.892**			4.674***		

***. Correlation is significant at the 0.01 level (1-tailed).

**. Correlation is significant at the 0.05 level (1-tailed).

*. Correlation is significant at the 0.10 level (1-tailed).

Table 35 Regression analyses with net investment as dependent variable for the sector Health Care

Net investment expenditure $_t$/Total assets$_{t-}$	Model 1			Model 2		
	B	SE	t-value	B	SE	t-value
Constant	0.286***	0.049	5.850	0.240***	0.035	6.858
(Long-term debt/Total assets)$_{t-1}$	-0.343***	0.126	-2.714			
Cash flow$_t$/total assets$_{t-1}$	0.362**	0.176	2.059			
(Tobin's Q)$_{t-1}$	-0.024	0.016	-1.484			
(Interest-bearing debt/Total assets)$_{t-1}$				-0.287***	0.105	-2.724
Cash flow$_t$/total assets$_{t-1}$				0.259	0.171	1.515
(ΔSales)$_{t-1}$				-0.093	0.056	-1.647
No. of obs.	56			56		
R^2	0.193			0.202		
F	4.145**			4.380***		

***. Correlation is significant at the 0.01 level (1-tailed).

**. Correlation is significant at the 0.05 level (1-tailed).

*. Correlation is significant at the 0.10 level (1-tailed).

Appendix 11a (Continued)

Table 36 Regression analyses with net investment as dependent variable for the sector Consumer Discretionaries & Consumer Staples

Net investment expenditure $_t$/Total assets$_{t-}$	Model 1			Model 2		
	B	SE	t-value	B	SE	t-value
Constant	0.091**	0.041	2.244	0.172***	0.030	5.654
(Long-term debt/Total assets)$_{t-1}$	-0.031	0.113	-0.273			
Cash flow$_t$/total assets$_{t-1}$	-0.074	0.258	-0.287			
(Tobin's Q)$_{t-1}$	0.043**	0.017	2.583			
(Interest-bearing debt/Total assets)$_{t-1}$				-0.203**	0.109	-1.864
Cash flow$_t$/total assets$_{t-1}$				0.279	0.231	1.206
(ΔSales)$_{t-1}$				-0.205***	0.074	-2.780
No. of obs.	62			62		
R^2	0.127			0.163		
F	2.813**			3.754**		

***. Correlation is significant at the 0.01 level (1-tailed).

**. Correlation is significant at the 0.05 level (1-tailed).

*. Correlation is significant at the 0.10 level (1-tailed).

Table 37 Regression analyses with net investment as dependent variable for the sector IT & Telecommunication Services & Energy

Net investment expenditure $_t$/Total assets$_{t-}$	Model 1			Model 2		
	B	SE	t-value	B	SE	t-value
Constant	0.058	0.055	1.051	0.163***	0.044	3.691
(Long-term debt/Total assets)$_{t-1}$	-0.031	0.119	-0.260			
Cash flow$_t$/total assets$_{t-1}$	0.467**	0.216	2.160			
(Tobin's Q)$_{t-1}$	0.043**	0.020	2.112			
(Interest-bearing debt/Total assets)$_{t-1}$				-0.204*	0.122	-1.664
Cash flow$_t$/total assets$_{t-1}$				0.641**	0.240	2.671
(ΔSales)$_{t-1}$				-0.089	0.099	-0.808
No. of obs.	39			9		
R^2	0.288			0.258		
F	4.730***			4.061**		

***. Correlation is significant at the 0.01 level (1-tailed).

**. Correlation is significant at the 0.05 level (1-tailed).

*. Correlation is significant at the 0.10 level (1-tailed).

Appendix 11b Regression analysis with net investment as dependent variable split by year

Table 38 Regression analyses with net investment as dependent variable for the year 2010

Net investment expenditure $_t$/Total assets$_{t-}$	Model 1			Model 2		
	B	SE	t-value	B	SE	t-value
Constant	0.092***	0.034	2.740	0.160***	0.029	5.598
(Long-term debt/Total assets)$_{t-1}$	-0.119	0.080	-1.495			
Cash flow$_t$/total assets$_{t-1}$	0.312*	0.166	1.875			
(Tobin's Q)$_{t-1}$	0.041**	0.016	2.512			
(Interest-bearing debt/Total assets)$_{t-1}$				-0.264***	0.091	-2.915
Cash flow$_t$/total assets$_{t-1}$				0.417**	0.162	2.567
(ΔSales)$_{t-1}$				0.103	0.086	1.196
No. of obs.	66			66		
R^2	0.249			0.228		
F	6.868***			6.116***		

***. Correlation is significant at the 0.01 level (1-tailed).

**. Correlation is significant at the 0.05 level (1-tailed).

*. Correlation is significant at the 0.10 level (1-tailed).

Table 39 Regression analyses with net investment as dependent variable for the year 2009

Net investment expenditure $_t$/Total assets$_{t-}$	Model 1			Model 2		
	B	SE	t-value	B	SE	t-value
Constant	0.118***	0.040	2.961	0.180***	0.034	5.359
(Long-term debt/Total assets)$_{t-1}$	-0.087	0.087	-0.993			
Cash flow$_t$/total assets$_{t-1}$	0.198	0.215	0.923			
(Tobin's Q)$_{t-1}$	0.031	0.023	1.335			
(Interest-bearing debt/Total assets)$_{t-1}$				-0.238**	0.089	-2.660
Cash flow$_t$/total assets$_{t-1}$				0.309*	0.179	1.728
(ΔSales)$_{t-1}$				-0.008	0.064	-0.126
No. of obs.	67			67		
R^2	0.114			0.156		
F	2.691*			3.877**		

***. Correlation is significant at the 0.01 level (1-tailed).

**. Correlation is significant at the 0.05 level (1-tailed).

*. Correlation is significant at the 0.10 level (1-tailed).

Appendix 11b (Continued)

Table 40 Regression analyses with net investment as dependent variable for the year 2008

Net investment expenditure $_t$/Total assets$_{t-}$	Model 1			Model 2		
	B	SE	t-value	B	SE	t-value
Constant	0.117***	0.043	2.715	0.205	0.031	6.711
(Long-term debt/Total assets)$_{t-1}$	-0.012	0.102	-0.121			
Cash flow$_t$/total assets$_{t-1}$	0.062	0.225	0.274			
(Tobin's Q)$_{t-1}$	0.020*	0.016	1.239			
(Interest-bearing debt/Total assets)$_{t-1}$				-0.187*	0.095	-1.976
Cash flow$_t$/total assets$_{t-1}$				0.189	0.187	1.012
(ΔSales)$_{t-1}$				-0.235***	0.061	-3.861
No. of obs.	63			63		
R^2	0.035			0.242		
F	1.328*			6.279*		

***. Correlation is significant at the 0.01 level (1-tailed).

**. Correlation is significant at the 0.05 level (1-tailed).

*. Correlation is significant at the 0.10 level (1-tailed).

Table 41 Regression analyses with net investment as dependent variable for the year 2007

Net investment expenditure $_t$/Total assets$_{t-}$	Model 1			Model 2		
	B	SE	t-value	B	SE	t-value
Constant	0.052*	0.028	1.881	0.111***	0.026	4.363
(Long-term debt/Total assets)$_{t-1}$	-0.055	0.063	-0.868			
Cash flow$_t$/total assets$_{t-1}$	0.484***	0.174	2.781			
(Tobin's Q)$_{t-1}$	0.021*	0.012	1.742			
(Interest-bearing debt/Total assets)$_{t-1}$				-0.133**	0.060	-2.217
Cash flow$_t$/total assets$_{t-1}$				0.589***	0.156	3.780
(ΔSales)$_{t-1}$				-0.062	0.046	-1.350
No. of obs.	57			57		
R^2	0.289			0.323		
F	7.186***			8.430***		

***. Correlation is significant at the 0.01 level (1-tailed).

**. Correlation is significant at the 0.05 level (1-tailed).

*. Correlation is significant at the 0.10 level (1-tailed).

Appendix 11b (Continued)

Table 42 Regression analyses with net investment as dependent variable for the year 2006

Net investment expenditure $_t$/Total assets$_{t-}$	**Model 1**			**Model 2**		
	B	**SE**	**t-value**	**B**	**SE**	**t-value**
Constant	0.092***	0.034	2.716	0.104***	0.028	3.761
(Long-term debt/Total assets)$_{t-1}$	-0.123	0.070	-1.164			
Cash flow$_t$/total assets$_{t-1}$	0.612***	0.170	3.592			
(Tobin's Q)$_{t-1}$	0.010	0.014	0.698			
(Interest-bearing debt/Total assets)$_{t-1}$				-0.105*	0.072	-1.450
Cash flow$_t$/total assets$_{t-1}$				0.623***	0.159	3.928
(ΔSales)$_{t-1}$				-0.005	0.050	-0.092
No. of obs.	59			59		
R^2	0.297			0.265		
F	7.728***			6.618***		

***. Correlation is significant at the 0.01 level (1-tailed).

**. Correlation is significant at the 0.05 level (1-tailed).

*. Correlation is significant at the 0.10 level (1-tailed).

Appendix 12 Regression analysis with net investment as dependent variable for low-q firms

Table 43 Regression analyses with net investment as dependent variable for low-q firms

Net investment expenditure $_t$/Total assets$_{t-}$		**(Q<1)**			**(Q<median)**		
		B	**SE**	**t-value**	**B**	**SE**	**t-value**
1.	Constant	0.100*	0.058	1.776	0.033	0.044	0.759
	(Long-term debt/Total assets)$_{t-1}$	0.057	0.045	1.256	-0.044	0.044	-0.991
	Cash flow$_t$/total assets$_{t-1}$	0.433***	0.140	3.087	0.535***	0.132	4.060
	(Tobin's Q)$_{t-1}$	-0.047	0.069	-0.690	0.062*	0.040	1.564
	No. of obs.	79			156		
	R^2	0.140			0.109		
	F	4.082**			6.197***		
2.	Constant	0.102***	0.020	5.071	0.131***	0.019	7.085
	(Interest-bearing debt/Total assets)$_{t-1}$	-0.081*	0.049	-1.679	-0.145***	0.045	-3.252
	Cash flow$_t$/total assets$_{t-1}$	0.414***	0.140	2.950	0.437***	0.130	3.372
	(ΔSales)$_{t-1}$	-0.016	0.034	-0.474	-0.011	0.032	-0.351
	No. of obs.	79			156		
	R^2	0.155			0.151		
	F	4.587***			6.031***		

***. Correlation is significant at the 0.01 level (1-tailed).

**. Correlation is significant at the 0.05 level (1-tailed).

*. Correlation is significant at the 0.10 level (1-tailed).

Appendix 13 Regression analysis with net investment as dependent variable for high-q firms

Table 44 Regression analyses with net investment as dependent variable for high-q firms

Net investment expenditure $_t$/Total assets$_{t-}$		**Q>1**			**(Q>median)**		
		B	**SE**	**t-value**	**B**	**SE**	**t-value**
1.	Constant	0.121***	0.021	5.733	0.122***	0.029	4.260
	(Long-term debt/Total assets)$_{t-1}$	-0.139***	0.047	-2.988	-0.413**	0.059	-2.425
	Cash flow$_t$/total assets$_{t-1}$	0.356***	0.098	3.632	0.289**	0.112	2.583
	(Tobin's Q)$_{t-1}$	0.016*	0.008	1.908	0.019*	0.010	1.847
	No. of obs.	233			156		
	R^2	0.140			0.125		
	F	12.418***			7.165***		
2.	Constant	0.165***	0.016	10.354	0.172***	0.019	9.087
	(Interest-bearing debt/Total assets)$_{t-1}$	-0.191***	0.047	-4.071	-0.192***	0.067	-2.842
	Cash flow$_t$/total assets$_{t-1}$	0.405***	0.088	-4.597	0.380***	0.103	3.692
	(ΔSales)$_{t-1}$	-0.082**	0.032	-2.578	-0.108***	0.039	-2.748
	No. of obs.	233			156		
	R^2	0.174			0.155		
	F	15.966***			9.252***		

***. Correlation is significant at the 0.01 level (1-tailed).

**. Correlation is significant at the 0.05 level (1-tailed).

*. Correlation is significant at the 0.10 level (1-tailed).

Appendix 14a Regression analysis insider ownership for low-q firms

Table 45 Regression analysis insider share ownership with net investment as dependent variable for low-q firms

Net investment expenditure $_t$/Total assets$_{t-}$		Cum 1 (0-0.25)			Cum 2 (>0.25-0.50)			Cum 3 (>0.50-0.75)			Cum 4 (>0.75-1.00)		
		B	**SE**	**t-value**	**B**	**SE**	**t-value**	**B**	**SE**	**t-value**	**B**	**SE**	**t-value**
1.	Constant	0.106	0.082	1.295	0.206**	0.084	0.021	0.001	0.114	0.011	-0.057	0.091	-0.625
	(Long-term debt/Total assets)$_{t-1}$	-0.153*	0.087	-1.745	-0.064	0.090	0.481	0.009	0.125	0.076	-0.022	0.073	-0.297
	Cash flow$_t$/total assets$_{t-1}$	0.652*	0.326	2.000	0.735**	0.273	0.011	0.261	0.33	0.791	0.519***	0.189	2.752
	(Tobin's Q)$_{t-1}$	-0.016	0.079	-0.208	-0.101*	0.072	0.174	0.147*	0.092	1.603	0.155*	0.079	1.965
	Insider	98.797	83.350	1.185	-3.605	9.287	0.701	-1.764	1.062	-1.397	-0.088	0.096	-0.916
	No. of obs.	39			35			42			40		
	R^2	0.213			0.259			0.157			0.242		
	F	0.295*			2.617*			1.726*			2.793**		
2.	Constant	0.124***	0.041	2.995	0.108**	0.046	0.027	0.274***	0.049	5.539	0.096**	0.044	2.173
	(Interest-bearing debt/Total assets)$_{t-1}$	-0.213**	0.085	-2.510	-0.073*	0.099	0.092	-0.412***	0.113	-3.633	0.015**	0.076	2.197
	Cash flow$_t$/total assets$_{t-1}$	0.515*	0.322	1.597	0.679**	0.303	0.032	0.164	0.269	0.608	0.446**	0.199	2.243
	(ΔSales)$_{t-1}$	0.078	0.077	1.024	-0.032	0.078	0.682	0.017	0.068	0.545	-0.052	0.049	-1.074
	Insider	81.419	75.343	1.081	-2.791	9.418	0.769	-1.871	1.129	-1.57	-0.068	0.098	-0.698
	No. of obs.	39			35			42			40		
	R^2	0.275			0.216			0.335			0.184		
	F	3.232**			2.868*			4.665***			2.072*		

***. Correlation is significant at the 0.01 level (1-tailed).

**. Correlation is significant at the 0.05 level (1-tailed).

*. Correlation is significant at the 0.10 level (1-tailed).

Appendix 14b Regression analysis insider ownership for high-q firms

Table 46 Regression analysis insider share ownership with net investment as dependent variable for high-q firms

Net investment expenditure $_t$/Total assets$_{t-}$		Cum 1 (0-0.25)			Cum 2 (>0.25-0.50)			Cum 3 (>0.50-0.75)			Cum 4 (>0.75-1.00)		
		B	**SE**	**t-value**	**B**	**SE**	**t-value**	**B**	**SE**	**t-value**	**B**	**SE**	**t-value**
1.	Constant	0.010	0.038	0.795	0.394***	0.081	4.853	0.159*	0.085	1.873	0.154	0.059	2.623
	(Long-term debt/Total assets)$_{t-1}$	-0.056	0.070	0.430	-0.495	0.124	-1.089	-0.229	0.175	-1.306	-0.121	0.114	-1.066
	Cash flow$_t$/total assets$_{t-1}$	0.398**	0.155	0.015	-0.387	0.347	-1.114	0.142	0.268	0.531	0.538	0.195	2.755
	(Tobin's Q)$_{t-1}$	0.040***	0.014	0.007	-0.021	0.021	-0.975	0.007	0.031	0.228	0.019	0.016	1.221
	Insider	60.977	36.327	0.103	-10.474*	6.337	-1.653	1.723*	0.983	1.752	-0.187*	0.115	-1.624
	No. of obs.	38			38			41			39		
	R^2	0.479			0.339			1.237			0.277		
	F	7.574***			4.226***			1.237			4.632***		
2.	Constant	0.090**	0.033	2.709	0.272***	0.065	4.156	0.124	0.068	1.817	0.214	0.036	5.977
	(Interest-bearing debt/Total assets)$_{t-1}$	-0.143*	0.085	-1.676	-0.442**	0.182	-2.428	0.117	0.211	0.553	0.170	0.085	-2.012
	Cash flow$_t$/total assets$_{t-1}$	0.624***	0.144	4.328	0.036	0.330	0.109	0.096	0.264	0.362	0.603	0.152	3.964
	(ΔSales)$_{t-1}$	-0.101	0.072	-1.402	-0.243**	0.098	-2.491	-0.054	0.117	-0.463	-0.100	0.046	-2.163
	Insider	90.073	38.739	1.325	-5.519	6.387	-0.864	1.440*	0.945	1.525	-0.222*	0.104	-2.146
	No. of obs.	38			38			41			39		
	R^2	0.424			0.317			0.210			0.441		
	F	6.075***			3.825**			1.857*			6.694***		

***. Correlation is significant at the 0.01 level (1-tailed).

**. Correlation is significant at the 0.05 level (1-tailed).

*. Correlation is significant at the 0.10 level (1-tailed).

Appendix 15a Regression analysis institutional ownership for low-q firms

Table 47 Regression analysis institutional share ownership with net investment as dependent variable for low-q firms

Net investment expenditure $_t$/Total assets$_{t-}$		Cum 1 (0-0.25)			Cum 2 (>0.25-0.50)			Cum 3 (>0.50-0.75)			Cum 4 (>0.75-1.00)		
		B	**SE**	**t-value**	**B**	**SE**	**t-value**	**B**	**SE**	**t-value**	**B**	**SE**	**t-value**
1.	Constant	0.030	0.084	0.358	0.034	0.127	0.269	-0.021	0.124	-0.171	-0.158*	0.113	-1.401
	(Long-term debt/Total assets)$_{t-1}$	-0.044	0.071	-0.622	-0.020	0.098	-0.199	-0.082	0.087	-0.947	0.048	0.103	0.470
	Cash flow$_t$/total assets$_{t-1}$	0.484**	0.220	2.197	0.869***	0.271	3.200	0.895***	0.273	3.277	-0.409*	0.285	-1.438
	(Tobin's Q)$_{t-1}$	0.017	0.082	0.206	-0.017	0.089	-0.190	0.126*	0.076	1.651	0.090	0.075	1.190
	Institutions	0.796	0.413	0.927	0.323	0.445	0.726	-0.103	0.290	-0.355	0.332***	0.125	2.652
	No. of obs.	36			41			39			40		
	R^2	0.192			0.223			0.273			0.234		
	F	1.844*			2.583*			3.187***			2.668**		
2.	Constant	0.059**	0.031	1.880	0.130*	0.090	1.440	0.117	0.101	1.160	-0.088	0.103	-0.853
	(Interest-bearing debt/Total assets)$_{t-1}$	-0.075	0.067	-1.120	-0.304	0.125	-1.439	-0.165	0.096	-1.723	0.020	0.106	0.190
	Cash flow$_t$/total assets$_{t-1}$	0.043**	0.209	2.079	0.504**	0.287	1.760	0.629	0.291	2.160	-0.470	0.282	-1.662
	(ΔSales)$_{t-1}$	-0.001	0.053	-0.019	-0.146*	0.092	-1.580	0.023	0.072	0.327	0.059	0.059	1.011
	Institutional	0.742	0.392	1.890	0.152	0.401	0.379	0.037*	0.290	2.129	0.371*	0.138	2.693
	No. of obs.	36			41			39			40		
	R^2	0.213			0.347			0.264			0.220		
	F	2.098*			4.786***			3.051**			2.475		

***. Correlation is significant at the 0.01 level (1-tailed).

**. Correlation is significant at the 0.05 level (1-tailed).

*. Correlation is significant at the 0.10 level (1-tailed).

Appendix 15b Regression analysis institutional ownership for high-q firms

Table 48 Regression analysis institutional share ownership with net investment as dependent variable for high-q firms

	Net investment expenditure $_t$/Total assets$_{t-}$	Cum 1 (0-0.25)			Cum 2 (>0.25-0.50)			Cum 3 (>0.50-0.75)			Cum 4 (>0.75-1.00)		
		B	SE	t-value	B	SE	t-value	B	SE	t-value	B	SE	t-value
1.	Constant	0.050	0.061	0.820	-0.121	0.102	-1.189	0.037	0.138	0.267	0.208***	0.070	2.975
	(Long-term debt/Total assets)$_{t-1}$	-0.296***	0.102	-2.915	0.076	0.116	0.657	-0.105	0.143	-0.737	-0.385***	0.110	-3.490
	Cash flow$_t$/total assets$_{t-1}$	0.423**	0.219	1.933	0.485**	0.273	1.777	0.019	0.221	0.087	0.196	0.167	1.177
	(Tobin's Q)$_{t-1}$	0.423*	0.219	1.585	0.017	0.023	0.769	0.027*	0.020	1.338	-0.010	0.012	-0.778
	Institutions	0.041	0.026	0.327	0.215**	0.496	2.452	0.476*	0.360	1.324	0.064*	0.081	1.793
	No. of obs.	36			42			38			39		
	R^2	0.446			0.205			0.139			0.338		
	F	6.251***			2.386*			1.332*			4.332***		
2.	Constant	0.176***	0.044	4.048	-0.050	0.086	-0.579	0.024	0.124	0.190	0.099**	0.055	1.790
	(Interest-bearing debt/Total assets)$_{t-1}$	-0.441***	0.135	-3.258	-0.082	0.148	-0.558	-0.117	0.165	-0.711	-0.268	0.103	-0.611
	Cash flow$_t$/total assets$_{t-1}$	0.580***	0.203	2.850	0.558**	0.298	1.872	0.223	0.228	0.980	0.162	0.186	0.870
	(ΔSales)$_{t-1}$	-0.125*	0.083	-1.499	-0.074	0.067	-1.098	-0.143*	0.088	-1.617	-0.095	0.098	-0.967
	Institutions	-0.182	0.597	-0.306	1.120**	0.493	2.272	0.699**	0.353	1.979	0.179**	0.089	2.005
	No. of obs.	36			42			38			39		
	R^2	0.443			0.217			0.177			0.291		
	F	6.167***			2.564*			1.769*			3.494**		

***. Correlation is significant at the 0.01 level (1-tailed).

**. Correlation is significant at the 0.05 level (1-tailed).

*. Correlation is significant at the 0.10 level (1-tailed).