Financial Constraints for Norwegian Non-Listed Firms

Date of submission: 01.09.2010

Campus: BI Oslo

Programme: Master of Science in Business and Economics
Major in Finance

Supervisor: Bogdan Stacescu

This thesis is a part of the MSc programme at BI Norwegian School of Management. The school takes no responsibility for the methods used, results found and conclusions drawn.
Acknowledgements

The work on this thesis has been a valuable learning experience. Working with this thesis has given us important knowledge and has been an interesting process.

We would like to thank our supervisor, Bogdan Stacescu, for important and helpful guidance throughout the process of writing this thesis. Additionally, we are thankful to the Centre of Corporate Governance Research for providing us access to their comprehensive CCGR- database on non-listed and listed firms.

Oslo, 01.09.2010

_________________________            ___________________________
Elise Botten                                           Marthe Kristine Hafsa hl Karset
Abstract

In this paper we investigate non-listed companies in the context of financial constraints. Our findings are varying, but we can find some tendencies.

We can observe that there are few indications that point towards some clear and common characteristics of firms that are facing financial constraints. However, it seems like smaller firms tend to be more financially constrained than larger firms, and that non-listed firms might as well be facing the problem of financial constraints. Dividend payout behavior seems to not be significantly related to the probability of being financially constrained. On the other hand, our findings indicate that firms considered as financially constrained tend to have more debt in their capital structure.
# Table of Content

Acknowledgements ............................................................................. i
Abstract ..................................................................................................... ii

1. Introduction ......................................................................................... 1

2. Literature Review ................................................................................ 3
   2.1 Characteristics of non-listed firms .................................................. 3
   2.2 Financial Constraints ................................................................. 5
   2.3 Previous research on financial constraints ................................. 6
   2.4 Financial constraints and capital structure ............................... 9
   2.5 Financial constraints and dividend theory .............................. 12
   2.6 Financial constraints and size .................................................... 13

3. Methodology ....................................................................................... 17
   3.1 The Cash Flow Sensitivity of Cash ............................................ 17
      3.1.1 The cash flow sensitivity of cash for listed vs. non-listed firms... 19
      3.1.2 The cash flow sensitivity of cash for firms who pay and do not pay out dividends ......................................................... 19
      3.1.3 The cash flow sensitivity of cash for the 20% smallest and the 20% largest firms ............................................................. 20
      3.1.4 The KZ-index for listed vs. non-listed firms .......................... 20
      3.1.5 Comparing the level of leverage for firms with high vs. low KZ-index value ................................................................. 22
      3.1.6 The cash flow sensitivity of cash for high leverage vs. low leverage firms ................................................................. 22
   3.2 Estimating Euler Equations for small vs. large firms .................. 23
   3.3 Testing for Heteroscedasticity ...................................................... 26

4. Data ..................................................................................................... 28
   4.1 Filtering ......................................................................................... 29
5. Results ............................................................................................................. 32

5.1 The Cash Flow Sensitivity of Cash ................................................................. 32
5.1.1 The cash flow sensitivity of cash for listed vs. non-listed firms .......... 32
5.1.2 The cash flow sensitivity of cash for firms who pay and do not pay out dividends ................................................................. 34
5.1.3 The cash flow sensitivity of cash for the 20% smallest and the 20% largest firms ......................................................................................... 36
5.1.4 The KZ-index for listed vs. non-listed firms ............................................ 38
5.1.5 Comparing the level of leverage for firms with high vs. low KZ-index value ............................................................................................... 39
5.1.6 The cash flow sensitivity of cash for high leverage vs. low leverage firms ......................................................................................... 40
5.2 Estimating Euler Equations for small vs. large firms ................................. 42
5.3 Testing for Heteroscedasticity ..................................................................... 42

6. Conclusion ....................................................................................................... 44

7. Discussions .................................................................................................... 46
7.1 The new tax reform ....................................................................................... 46
7.2 Using cash flow sensitivity of cash as a measure for financial constraints ................................................................................................. 47
7.3 Using a qualitative measure for financial constraints ................................. 48
7.4 Comments on the data used ......................................................................... 49

Reference List ..................................................................................................... 51
Attachments ........................................................................................................ 55
Preliminary Thesis Report ................................................................................... 102
1. Introduction

The purpose of this Master Thesis is to study Norwegian non-listed firms. As we have been introduced to during our master studies, non-listed firms represent a huge part of the economy, as 80-90% of Norwegian firms are non-listed (Berzins, Bøhren and Rydland. 2008). However, the research in this area is modest, as listed firms still are the subject of the majority of financial studies. These facts provide us with the incentive to study non-listed companies.

We have had a unique position in that we have had the possibility to access and extract variables from the Centre of Corporate Governance Research-database. This database consists of an interesting and comprehensive amount of data on Norwegian non-listed firms.

We want to investigate non-listed companies in the context of financial constraints. The importance of financial constraints has been discussed in several papers, starting with Fazzari, Hubbard and Petersen (1988). Definitions of financial constraints can be as follows: “A firm is considered more financially constrained as the wedge between its internal and external cost of funds increases” (Kaplan and Zingales. 1997, 172) and “frictions that prevent the firm from funding all desired investments” (Lamount, Polk and Saá-Requejo. 2001, 529).

To our best knowledge, today there exist no studies on financial constraints on non-listed companies in Norway. Furthermore, we do not find any research concerning this subject on an international level either. We therefore find it interesting to investigate non-listed companies in context with financial constraints, as we think that this might be an important relationship to study.

We want to investigate if the relationship between non-listed and listed companies in terms of financial constraints. We have chosen to focus on the hypothesis of that non-listed firms probably have less access to external capital than listed firms, and that they for this reason might be considered as more financially constrained than listed firms are.
Furthermore, our intention is to explore non-listed firms and financial constraints related to features like size, dividend-payout and leverage. According to previous studies, we would expect that; small firms, firm who do not pay out dividends and firms with high levels of leverage are most constrained.

We will test if these relationships give significant results, by applying the framework of Almeida, Campello and Weisbach (2003), by using cash-flow sensitivity of cash as a measure of financial constraints. Further, we applied the framework of Tony M. Whited (1992), by using Euler equations.

This paper is organized as follows. Section 2 provides the Literature Review where we give description of non-listed firms, definitions of financial constraints and presents findings from previous studies within the field of financial constraints and present financial theory that supports our further work and hypothesis. In section 3, we present the methodologies we have applied. Furthermore, in section 4 we describe the data we have used and how we have worked with the dataset in order to compute the required variables, while we in section 5, analyze the findings from our results. The outputs from our analysis are to be found in the attachments. In section 6, we conclude our results. Finally, in section 7 we have given a discussion concerning the results and tried to comment more upon our findings and factors that may have influenced our results.
2. Literature Review

2.1 Characteristics of Non-listed Firms

Today, previous research on non-listed firms in terms of corporate finance and governance in general is fairly modest compared to research on public firms. Reasons for this might be that in most countries there is limited access to and difficulties of collecting data on non-listed firms, and the fact that they do not have a market price. However, in Norway, non-listed companies with limited liability have to report full accounting statements (Berzins, Bøhren and Rydland 2008).

The importance of the economics of non-listed firms should not be overseen. Non-listed companies amount to a huge part of the overall economy. About 80-90% of all Norwegian firms are private firms, and they earn higher revenues, have more employees and have two times the assets of public firms (Berzins et al. 2008).

In terms of companies in other European countries, a study done by Claessens and Tzioumis (2006) in 19 European countries on ownership and financing structures of listed and large non-listed corporations, revealed that non-listed companies have higher returns on assets and equity compared to what listed companies have, and that the non-listed firms had lower margins.

Furthermore, it is important to realize that non-listed firms differ from public firms in many ways, and it is therefore need for separate research. To understand the ways non-listed firms differs from listed firms, it is important to identify the characteristics of non-listed firms compared to listed firms. The main obvious distinctions between listed firms and non-listed firms, is that non-listed have no market price, not for the firm nor for the equity of the firm. Non-listed firms do not need to report quarterly earnings, and are therefore not continuously priced as the listed companies are (Berzins et al. 2008).
Recent study on Norwegian listed and non-listed firms done by Berzins et al. (2008) gives some valuable findings regarding characteristics of non-listed firms compared to listed firms.

They find that non-listed firms have more and shorter maturity debt. Private firms operate in a less open equity market, which can hamper the stock liquidity for the owners. The less open equity market together with higher cost of capital of debt for non listed firms, can lead to under-investment by the firms, and eventually it might be harder for them to achieve equity finance.

Further, non-listed firms allocate a larger fraction of its earnings compared to listed firms, which may be because the firms want to reduce the conflict of interest between majority and minority owners.

In terms of economic performance, the paper states that non-listed firms have higher accounting returns on assets (ROA) relative to listed firms. One possible explanation for this might be that non-listed firms are more capital constrained, or it may be due to less value-destroying short-termism in non-listed companies.

In terms of ownership structure, the ownership concentration tends to be greater in non-listed firms.

Recent research by Berzins et al. (2008) also states that private and public firms vary in terms of regulation. Minority owners in private firms can experience to be less protected in private firms due to less regulation. Moreover, private firms are less transparent than public firms, especially in terms of information.

Further, the study by Berzins et al. (2008) found that private firms, compared to public firms, have more debt and shorter debt and higher dividends pr. unit of earnings. Moreover, non-listed firms are small and often much smaller than the public ones. However, the large firms tend to be private. 900 of Norway’s 1000 largest firms are in fact non-listed.

As one can see, there are distinct differences between the features of listed and non-listed companies. Thus, transformation of research done on listed firms cannot easily be transformed to count for non-listed firms as well. These differences make it interesting to investigate non-listed firms.
2.2 Financial Constraints

There are several definitions of Financial Constraints. Kaplan and Zingales (1995) give this definition: “A firm is financially constrained if the cost of availability of external funds precludes the company from making an investment it would have chosen to make had internal funds been available”. Furthermore, in 1997, Kaplan and Zingales (1997; 172) gave this definition; “A firm is considered more financially constrained as the wedge between its internal and external cost of funds increases”.

Almeida et al. (2003) also gives a definition of financial constraints which is interesting for the purpose of this thesis. Inspired by Keynes (1936;196), they write that if a firm has unrestricted access to external capital, the firm is financially unconstrained and there is no need to safeguard against future investment needs and corporate liquidity becomes irrelevant.

According to Korajczyk and Levy (2003, 76) financially constrained firms are defined as “firms that do not have sufficient cash to undertake investment opportunities and that face severe agency costs when accessing financial markets.”

Another definition given by Lamont, Polk and Saá-Requejo (2001, 529) describe financial constraints to be “frictions that prevent the firm from funding all desired investments.” These financial constraints may arise due to “credit constraints or inability to borrow, inability to issue equity, dependence on bank loans or illiquid assets.”

Summarizing these different definitions, one can say that financial constraints are frictions like; agency costs (due to information asymmetries), difficulties of getting loan, dependence of loans etc. that results in an arising wedge between internal and external cost of funds. These frictions or costs of available funds can prevent the firm from funding all the desired investment opportunities that it would have invested in, had they had the funds needed. This turning-down of
positive NPV projects hampers the potential for important future economic development and growth.

2.3 Previous research on financial constraints.

Over the past decades the role of financial constraints and how to capture the level and significance of it have diverged considerably from one study to the next during the years.

In terms of wanting to explore the relationship between effects of financial constraints on firm behavior, early research has been concentrated around corporate investment demand.

One of the first to do a study within the area of financial constraints was Fazzari, Hubbard and Petersen (1988). In order to group companies as financial constrained and not financial constrained, they categorized US companies according to their payout behavior.

The paper suggests that when a firm experience financing constraints, investment expenditures will tend to vary with the accessibility of internal finance, not only with the availability of positive net present value projects. This method is widely used in order to recognize the firms that are more affected by financing constraints and opposite. Their results show that financial factors affect investments, and that the link between financing constraints and investment varies by the type of firm. Therefore, they suggest that one could study the impact of financing frictions on corporate investment by comparing investment to cash flow sensitivities across groups of companies categorized by a proxy for financial constraint. Their results suggest that investment decisions of firms grouped as being more financially constrained are more sensitive to the availability of internal cash flows, relative to those grouped as being less constrained.

Number of subsequent studies has provided empirical evidence of the same.

However, this methodology of financially constrained firms being more investment-cash-flow sensitive than those being less constrained has been questioned. Kaplan and Zingales (1995) is one paper that questions the results of Fazzari et al. (1988) and other previous studies using this methodology.
This paper also studies the relationship between the financing constraints and investment-cash flow sensitivities, by investigating the Fazzari et al. (1988) sample of low-dividend manufacturing firms with positive real sales growth. Their main striking finding is that firms they categorize as being less financially constrained, exhibit significantly greater sensitivities than firms categorized as more financially constrained. They state that their findings point toward that higher sensitivity cannot necessarily be understood as proof that they are more financially constrained. They argue that this should not be so shocking, as they claim that there should be no strong theoretical reason for investment-cash flow sensitivities to increase monotonically with the degree of financing constraints.

However, the paper by Kaplan and Zingales (1995) has again been subject to criticism. Schiantarelli (1995) states that Kaplan and Zingales’ classifications of unconstrained and constrained companies are of subjective nature. Schiantarelli also criticizes Fazzari et al’s classifications, which uses prevalent dividend payout behavior as their basis.

Other studies finding contradicting result to and calls into question the findings of Fazzari et al. (1988) are Kadapakkam et al. (1998) and Cleary (1999 and 2006). Kadapakkam et al., investigates companies in Canada, France, Germany, Great Britain, Japan and the USA and find that large firms are more cash flow–investment sensitive than smaller firms, and conclude that cash flow–investment sensitivity is not an accurate measure of its access to capital markets (same as Kaplan et al 1997 did), Cleary’s findings also support the conclusions of Kaplan and Zingales (1997); companies with stronger financial positions tend to be more investment-cash flow sensitive than those companies with weaker financial positions. Further, findings point to that companies with higher payout-ratios are more investment-cash flow sensitive than those with lower ratios.

In the paper “Financial constraints and investment”, Fabio Schiantarelli (1995) investigates the methodological issues involved in testing for financial constraints on the basis of Q models of investments. He finds that the essential problem in using Q models in this matter is that average Q may be a very inaccurate alternative for the shadow value of an additional unit of new capital. He suggests addressing this problem by estimating the Euler equation for the capital stock.
derived from the underlying model. The benefit of the Euler equation approach is that it avoids relying on measures of profitability based on a firm’s market value.

Almeida et al. (2003) tests a sample of 3547 publicly traded manufacturing companies in the period 1971-2000. They used the link between financial constraints and a company’s demand for liquidity in order to develop an analysis of the impact of financial constraints on firm policies. Their starting point is that firms who are financially constrained need to save more of their incoming cash flows in order to be able to take on positive NPV projects as they appear. The effect of financial constraints can therefore be captured by a firm’s propensity to save cash out of incremental cash flows. They have called this effect “the cash flow sensitivity of cash”. Their main finding confirms this hypothesis; firms that are more likely to be financially constrained, exhibit a significantly positive cash flow sensitivity of cash, while the unconstrained companies do not.

Whited (1992) contributes with another important paper in the context of financial constraints (liquidity constraints). She investigates the investment behavior of firms when they maximize their value subject to borrowing constraints. The hypothesis is that due to the asymmetric information theory in debt markets, weak small firms with low liquid assets positions have limited access to debt markets. By using an Euler equation as an optimizing model of investment, the paper concentrates on the question of interdependence of finance and investment. By concentrating on debt finance, the paper expands the work of Fazzari et al (1988). Findings point towards that difficulties in achieving debt finance, do have an impact on investment behavior. Furthermore, the effect of financial constraints tends to be more binding for firms that do not participate in the bond market.

Whited further developed her work, together with Guojun Wu in 2003. In their article, “Financial Constraints Risk”, Whited and Wu (2003) also use investment Euler equations. Some of their findings are that the constrained companies tend to earn higher returns.
2.4 Financial Constraints and Capital Structure

Based on earlier mentioned definitions of financial constraints, one might say that financial constraints are highly related to the differences between the cost of internal- and external finance, and consequently also the composition of capital structure.

Thereby, in order to understand the relevance of financial constraint, one has to understand theories concerning capital structure. Capital structure is about how a firm finances its actions and prospective growth by the use of different finance sources, and it is the composition of a company's debt and equity. In addition it can contribute to maintain liquidity in case of investment opportunities (Mjøs 2008). Furthermore, capital structure choices differ across firms and over time.

The modern theory of capital structure has its origin in the Modigliani-Miller paper. According to the Modigliani Miller Irrelevance substitutes Theorem (1958), in perfect capital markets, a company’s capital structure should be unrelated to its value; it is irrelevant. Internal and external finances is therefore claimed to be perfect substitutes, and the company’s financing and investment decisions should not be affected by the firms’ capital structure. In other words; in perfect capital markets, the company’s financial composition should not have an effect on its value.

However evidence from studies done after Modigliani and Miller point towards the existence of imperfections like; informational asymmetries, agency problems, contract enforcement problems, transaction costs, tax advantages and costs of financial distress. Thus, the irrelevance hypothesis fails to perform; there are capital markets imperfections (Schiantarelli 1995). Access to new debt or equity finance, the accessibility to internal finance, dividend payment and the functioning of credit markets are factors that may affect investment behavior, thus also the capital structure of companies (Fazzari et al. 1988).

These imperfections results in that the costs of external and internal finance are not perfect substitutes. With the presence of this situation, one might say that financial constraints exists (Schiantarelli 1995).
In our context, based on the purpose of our analysis, we choose to elaborate on the imperfections of asymmetric information and agency problems.

The asymmetric information approach contributes in explaining the composition of a company’s capital structure and therefore also, the “imperfection” between external and internal finance. This approach relates to a situation where one party, say firm managers or insiders, are supposed to have private and better information about the characteristics of the firm’s return stream or/and investment opportunities, than the other party (Stiglitz and Weiss 1981; Myers 1984; Stulz 1990). This asymmetry leads to a costly and almost impossible assignment for suppliers of external finance to estimate the true worth of companies’ investment opportunities; therefore it can produce significant cost disadvantages of external finance for some types of companies. This asymmetric information can give rise to numerous problems. A special case of asymmetric information-problem is moral hazard. Moral hazard refers to a situation where agent may not act in the principals best interests. Extravagant investments, insufficient effort, self-dealing and entrenchment strategies are all actions labeled as moral hazard (Tirole 2006). These are activities where the manager may exploit the asymmetric information balance in a negative way for the firm, thereby creating costs disadvantages of external finance for the company (Stulz 1990).

In the context of information asymmetries and determinants of capital structure, principal-agent problems are relevant. Principal-agent problems refer to a situation where agency costs can arise. Agency costs can arise due to conflict of interest between different stakeholders of the company. This point of view is often referred to as the agency approach. Earlier research of Jensen and Meckling (1976) which build on previous studies by Fama and Miller, categorize the conflict into conflicts between equity holders and managers and conflicts between debt holders and equity holders. The conflict between equity holders and managers can arise if managers hold less than 100% of the residual claim. In this situation, the managers can capture the entire gain from profit enhancement activities, but do not take the entire cost of these activities. This might lead to personal benefits for the manager. This inefficiency can be reduced if a larger part of the firm’s equity is owned by the manager. (Harris and Raviv 1991)
The other type of conflict; between debt holders and equity holders can arise when the agent have superior information about its projects and possible investments and possible actions to take, relative to potential investors. If this superior information leads to the equity holder having incentives to invest suboptimal and derive incomplete debt contracts, agency cost of debt finance rises (Harris and Raviv 1991).

Moral hazard can be an explanation to the agency cost of debt. High levels of debt can tempt the managers and equity holders to choose excessively risky projects (Jensen and Meckling 1976; Whited 1992). The presence of limited liability of debt is features that can help explain why moral hazard problem and agency cost of debt arise. The limited liability feature of debt contracts refers to a situation where the borrower has limited liability relative to the lenders of funds. If the funded project/investment fails, debt holders will bear most of the costs/consequences. It can also lead the managers and equity holders to accept project with higher risk, thus higher possible returns. Therefore, this limited liability can create incentives for managers to behave counter the interests of creditors (Fazzari et al. 1988).

This problem will increase the cost of debt and might lead to credit rationing in the debt market. Credit rationing can occur due to “adverse selection” (Myers and Majulf 1984). If there is an asymmetric problem where managers have private information relative to the providers of the fund, lenders cannot distinguish between good and bad borrowers. It can lead to a situation where interest rate rise and loan size may be limited; thus, the company has to obtain the external finance at a premium. (Stigliz and Weiss 1981; Whited 1992)

However, having debt can also contain positive aspects. Having a proportion of debt forces the management to pay out a steady cash flow to its creditors. This obligation lowers investment in all natures of the world, and reduces investments when it else might have been too high and risky (Stultz 1990).

The Pecking-Order-Theory, as first described by Myers and Majulf (1984) can also help explain why different finance sources not are perfect substitutes. This theory categorizes the several forms of finance into a hierarchy. The theory states that
due to the information asymmetry, companies will choose this order of financing:
First use retained earnings and fund of current owners, then risk-free and risky
debt and last raising new equity (Mjøs 2008).

Capital structure is therefore a result of many different factors, and these factors
again depend on what type of company one talk about; whether it is a listed, non-listed, small, large, dividend paying company or not etc. The factors mentioned
(asymmetric info, agency cost) will affect and influence different types of
companies in different ways, therefore leading to various capital structures. These
differences are highly relevant for the explanation of why financial constraint may
appear and not. The theories above help enlighten the reasons why different types
of companies have different cap structures.

2.5 Financial Constraints and Dividend Theory

Paying dividend can serve many purposes, both negative and positive. Paying
dividend can be done in order to signal the company’s prospects or true worth. A
dividend payout larger than expected may for example indicate beliefs of the firm
doing better and of higher earnings in the future. This action can also signal that
the firm does not have any positive NPV projects to invest in.
Furthermore, paying dividends can indicate good news because it decreases the
amount of free cash flow in the firm, thus reducing potential agency costs. This
view is often referred to as the agency model of dividends.

A decrease in dividends may signal the opposite, namely indicate that firm is
doing worse and potential for lower earnings. Moreover, as a firm matures, it
might experience the investment opportunities shrinking, which again can lead to
a natural increase in dividends. Then investors possibly will consider this increase
as good news, while it in reality might be a sign of decreasing profitability.
Furthermore, the market tends to react positively to message of dividend increase,
while negatively to a decrease in dividends.
In periods when a company faces large growth opportunities, companies should
cut back or avoid paying dividends (Allen and Michaely 2002).
There exists three groups that are likely to be affected most by a firm’s dividend policy; shareholders, management and bondholders. Paying dividends can lead to interest conflicts between the groups and lead to agency costs for the firm. Allen and Michaely (2002) found that payout policies are in fact not driven by the desire to signal the value of the firm, rather they found evidence of that payout policy was influenced of wanting to avoid potential overinvestment by managers.

Mjøs (2008) characterize dividend- payment to be “a strong indicator of financial health”. Furthermore, he describes that dividend- payers tend to not be financially constrained and that these groups use a less amount of debt. He also states that these firms have total returns that are twice of those firms not paying dividend.

Almeida et al. (2003; 14) groups constrained firms as firms who have significantly lower payout rations than unconstrained firms. This is the same intuition as proposed by Fazzari et al. (1988).

However, Berzins and Bøhren (2008) found that private (non-listed) firms tend to have higher dividends per unit of earnings compared to public firms in the year 2005.

Summarizing the earlier findings presented her, one can see that the majority of the research point towards that firms who are paying dividend tend to show sign of being financially unconstrained. Moreover constrained firms seem to pay lower ratios of dividends than unconstrained companies do.

2.6 Financial Constraints and Size

Size is an important and thoroughly discussed variable in connection to financial constraints.

There are done several analysis on the connection between financial constraints and the variable size. Furthermore, size has often been used as an a priori measure in order to categorize companies into more or less constrained groups.
Hu and Schiantarelli’s (1994) study on quoted companies between 1978 and 1987, find that size is positively correlated to the likelihood of being financially constrained.

Results from studies done by Cleary (1999; 2006) point towards firms being categorized as not financially constrained according to financial strength, are likely to be larger and also have higher pay-out ratios, but the connection is not outstandingly strong.

Schiantarelli (1995) finds that size tends to be a useful criterion in order to recognize firms that are more probable to be financially constrained. Further he states that this is only when the sample used for estimation includes at least a part of the lower tail of the size distribution.

Korajczyk and Levy (2003) states that previous literature often use size and degree of bank dependence as proxies for the level of financial constraints, and that it is consistent with that facing greater financial constraints makes it difficult to borrow in order to smooth cash flows following negative shocks to the economy.

Whited and Wu (2003) find evidence of that firms that are classified as not financial constrained, typically are large and liquid.

However, Fazzari et al. (1988) claim that size is not a good measure for financial constraints relative to their categorizing of constrained and unconstrained firms (use the level of dividend distribution in order to categorize companies).

According to an Italian survey based research paper on Italian firm size distribution and financial constraints (Angelini and Generale 2005), companies stating to be financially constrained are smaller and younger than other companies. According to their results, they find a negative relation between financial constraints and company size, and that the amount of younger companies experiencing financial constraints is higher than compared to the rest of the companies.
Further, there exist studies on the link between size and access to financial markets.

Theories suggest that larger firms are assumed to have easier access to internal and external sources of funds. These firms tend to have better possibility to finance capital expenditures from internal resources, issuance of equity or debt. In comparison, smaller companies experience more limitations in the level of their internal earnings and the possibility for issuing equity. In addition, small companies are more probable to be subject to credit rationing. Moreover, according to earlier research, liquidity constraints seem to have a larger impact on smaller firms compared to larger firms (Fazzari et al. 1988; Audretsch et al. 2001).

Stiglitz and Weiss (1981) contributed with another key point; a company’s tendency to suffer from credit rationing done by the lenders in the credit market is not neutral with respect to the company’s size. As an outcome of adverse selection in a market with asymmetric information, the possibility of being credit rationed by the credit market tend to systematically increase as size decreases.

According to Whited (1992), one find indication of that firm size seems to be a vital, but not a dominant, variable in determining access to financial markets.

Schiantarelli (1995) point to that size tend to be positively correlated with age, since small and young companies have most probably not been able to develop a track record yet and that investors might have difficulties in separating the good firms from the bad.

Furthermore, Schiantarelli finds that small firms might have lower collateral relative to their liabilities, and therefore it can be harder for them to get loan. He also points to earlier research that states that smaller firms tend to face significantly more difficulties in accessing external funds.

Almeida et al. (2003), found that the majority of small companies in their test do not have bond ratings, while most of the large had such rating.
Trying to see an overall pattern in the context of financial constraints and size, one could point to the conclusion that a considerable part of the literature consider size to be an important variable in order to determine whether a company is financial constrained or not. It seems to be more difficult for smaller (often younger) firms to achieve outside finance, and these companies tend to suffer more from financial constraints, relative to their bigger companies.
3. Methodology

To be able to measure whether a firm can be considered as financially constrained or financially unconstrained, we need a framework for analyzing the different firms. Different studies have been done in order to find such a measure, but most studies have been done on listed firms. According to our intention to also investigate non-listed firms, we have decided to use a methodology that makes us able to compare the listed and non-listed firms, and also to investigate other features of the companies related to financial constraints.

3.1 The Cash Flow Sensitivity of Cash

Our methodology is mostly inspired by the framework presented in the article *The Cash Flow Sensitivity of Cash* by Heitor Almeida, Murillo Campello and Michael S. Weisbach written in 2003.

The theory behind this framework is inspired by the ideas of John Keynes (1936); that it is advantageous to have a liquid balance sheet in order to be able to take on projects with positive net present values as they arise. The ability to have a liquid balance sheet can be determined by the access the firm has to different sources of capital. If a firm knows that it will be able obtain external capital for all the projects it wants to take on in the future, there will be no need for the firm to save up cash flows today in order to have a liquid balance sheet in the future.

Almeida et al. (2003) therefore suggested that a way to measure whether a firm can be considered as financially constrained or financially unconstrained is to analyze whether the firm tend saves cash from today’s cash flows. They refer to the firm’s propensity to save cash out of cash inflows as the” cash flow sensitivity of cash”.

A financially constrained firm should display a positive relationship between the cash flows and the change in cash holdings, while there should be no such systematically relationship between the cash flows and the change in cash holdings for the unconstrained firms. In other words, firms facing financial constraints should display a significant positive cash flow sensitivity of cash,
while unconstrained firms should not display any significantly cash flow sensitivity of cash.

The model we have used for our analysis in this part is inspired by the model of Almeida et al. (2003). The model includes the dependent variable change in cash holdings and the independent variable cash flow, Tobin’s q and size. The basic empirical model looks like this:

\[
\Delta \text{CashHoldings}_{it} = \alpha_0 + \alpha_1 \text{CashFlow}_{it} + \alpha_2 Q_{it} + \alpha_3 \text{Size}_{it} + \varepsilon_{it}
\]

According to the article, the variable “cash holdings” is defined as the ratio of cash and marketable securities to total assets. We have used a variable from our dataset which includes bank deposits, cash on hand etc. divided by total assets in order to get a proxy for cash holdings. Further, we have computed the change from one year to another.

Cash Flow is defined in the article as the ratio of earnings before extraordinary items and depreciation minus dividends, divided by total assets. Our variable Cash Flow is calculated as operating profits + depreciation of fixed assets and intangible assets + write-down of fixed assets and intangible assets – Δ in inventories - Δ in accounts receivable + trade creditors – tax payable. Finally, the cash flows are divided by total assets in order to normalize the variable. As described earlier, we expect the sign of \( \alpha_1 \) to be positive for firms facing financial constraints and unsigned for firms that are unconstrained.

The variable Q or Tobin’s q, is defined as the market value of the firm divided by the book value of the assets. This variable is included to capture other unobservable information about the value of long term growth opportunities. However, this variable is not considered as useful and interesting as the cash flow variable.

Since non-listed firms have no market value, a standard Q cannot be used in this case, thus a problem arises in our study when it concerns the calculation of this Q for non-listed firms. However, using assets-to-sales ratio is a commonly used proxy for Q, and we will use this ratio, normalized by industry, in our analysis.
The last variable, size, is in the equation defined as the natural log of assets, which also will be our proxy for size. This term is included in order to control for economies of scale in cash management. However, compared to the effects of cash flows on change in cash holdings, this factor is not as an important nor very interesting factor to analyze.

In order to compare different firms to see whether they can be seen as constrained or not, we will divide the firms into different groups. Inspired by Almeida et al. (2003), we have used several different approaches in order to split firms into different groups. We have used some a priori hypotheses based on criteria that might affect the probability of a firm facing financial constraints or not, the groupings will follow in the next subsections. These hypotheses seem to be broadly confirmed by earlier research (see literature review).

3.1.1 Cash flow sensitivity of cash for listed vs. non-listed firms

Our first approach is to differentiate between those firms who are listed and those who are non-listed. This categorizing is added by us, since we believe there can be some differences in terms of financial constraints between these two types of companies. By splitting the firms in our analysis into these two groups and running the regression presented earlier, separately for each group. We expect to see that; the non-listed firms display a positive cash flow sensitivity to cash, while we expect that listed firms to not display a significant relationship between cash flows and change in cash holdings.

Proposition: Non-listed firms have a positive cash flow sensitivity to cash.

3.1.2 Cash flow sensitivity of cash for firms who pay and do not pay out dividends

Our second approach is inspired by Almeida et al. (2003). We divide the firms into two groups; those who do pay out dividends and those who do not pay out dividends. By this, we expect to see that those companies not paying any dividends to be more financially constrained, in terms of a positive cash flow
sensitivity of cash, relative to the companies paying dividends. As presented earlier in this thesis, there are several theories and studies done within this field, which tend to support this hypothesis.

Proposition: Firms who do not pay dividends have a positive cash flow sensitivity to cash.

### 3.1.3 Cash flow sensitivity of cash for the 20 % smallest and 20 % largest firms

In the next step, we have separated the firms into two groups in terms of size. Based on the natural logarithm of the total assets, we have computed a size-index and ranked the firms from the smallest ones to the largest ones depending on their measure of size. Further, we have extracted the 20% smallest and the 20% largest companies, and have run the same regressions as presented for both groups. There are, as presented in the literature review theories that indicate that size tend to be a good proxy for financial constraints, as smaller firms are often young and may struggle to get access to external finance. However, there also exist arguments that size may not be a good indicator for whether a firm is financially constrained or not. Anyhow, our a priori is that smaller firms have a positive cash flow sensitivity to cash, while larger firms will not display such a relationship.

Proposition: The 20 % smallest firms display a positive cash flow sensitivity to cash

### 3.1.4 The KZ-index for listed vs. non-listed firms

Finally, we have compared listed and non-listed firms by applying an index used in the article “*Do Investment-Cash Flow Sensitivities Provide Useful Measures of Financing Constraints*”? by Steven N. Kaplan and Luigi Zingales (1997). Even though their findings in this article indicate that firms that are unconstrained have significantly greater investment-cash flow sensitivity than firms who are financially constrained, we will try to implement their framework and index in the case of our dataset, to which results we get.
In their study, they have examined 49 firms which have a low dividend payout-ratio over the years 1970-1984. These are the same firms as Fazzari et al. (1988) have examined. Kaplan and Zingales separate the firms into five groups by using qualitative and quantitative criteria, obtaining information from annual reports, financial statements and other notes. The results shows that for those firms classified as financially unconstrained which amounts to a total of 85.3% of the firms in the study, the investment-cash flow sensitivity is greater than for those 14.7% of the firms who are grouped as financially constrained. They summarize these results to that a higher sensitivity cannot be used as an indicator of financial constraints. However, Kaplan and Zingales developed an alternative way to test for financial constraints; the KZ-index, which has been used in other studies within the field later on.

According to this index, firms with a higher KZ-number will most likely be more constrained than firms with a lower KZ-number.

In this thesis we will apply a model, inspired by the one used by Almeida et al. (2003) which is based on the original model by Kaplan and Zingales:

\[ KZ_{index} = -1.002 \times CashFlow + 0.283 \times Q + 3.139 \times Leverage \]
\[ -39.368 \times Dividends - 1.315 \times CashHoldings \]

The variable Cash Flow will be the same as used in the previous model (operating profits + depreciation of fixed assets + write-down of fixed assets and intangible assets – Δ in inventories - Δ in accounts receivable + trade creditors – tax payable, divided by total assets). Moreover, the variable Q will also be the same as computed in the previous model (an assets-to-sales ratio normalized by industries).

Leverage is computed as total debt to total assets, dividends are normalized by dividing them by total assets and finally, cash holdings are bank deposits, cash on hand etc. divided by total assets. 

The β values are the same as used by Almeida et al. (2003). Although these are values computed based on data from American listed firms, they will work as a proxy which we can use for our dataset of Norwegian listed and non-listed firms.
We expect that our non-listed firms will have a higher KZ-value than the listed ones, and therefore be considered as more financially constrained than the listed firms in our study.

Proposition: Non-listed firms have a higher KZ-index number than the listed firms

3.1.5 Comparing the level of leverage for firms with high vs. low KZ-index values

As presented earlier, and found by among others, Berzins and Bøhren (2008), non-listed firms tend to have more debt in their capital structure than listed firms.

Based on earlier studies presented in the literature review, we expect the non-listed firms to be more financially constrained than the listed ones, measured by a higher KZ-index number. It will because of these reasons, be interesting to investigate whether these non-listed firms have more debt in their capital structure compared to the listed companies.

We have chosen to compare the average level of leverage for the firms who in each year end up with the top and bottom 20 % KZ-index values. In other words, we have compared the average leverage for those firms who are grouped as the least and most constrained, measured by the KZ-index.

We expect to see that the firms with the highest values of the KZ-index, which is categorized as the financial constrained firms, will display the highest level of average leverage.

Proposition: Firms with the top 20 % highest KZ-index numbers have more debt in their capital structure.

3.1.6 The cash flow sensitivity of cash for high leverage vs. low leverage firms.

After having investigated the average level of debt among the constrained and unconstrained firms (non-liste and listed firms), we have chosen to use leverage as a last grouping criteria for the cash flow sensitivity to cash framework applied earlier. By dividing our firms into two groups for each year; those with the 20 %
highest level of leverage in one group, and those with the 20% lowest level of leverage in another group, we have one last way to test for the cash flow sensitivity of cash.

In this case, we will expect to see that the cash flow sensitivity of cash, as a measure for financial constraints, will be significant positive for those firms with the highest level of leverage and not significantly different from zero for firms with the lowest levels of leverage in each year.

Proposition: Firms with the highest levels of leverage have a positive cash flow sensitivity to cash

3.2 Estimating Euler equations for small vs. large firms

Another important work done on financial constraints is the article written by Toni M. Whited in 1992; Debt, Liquidity Constraints and Corporate Investments: Evidence from Panel Data. She further developed her work in 1998, together with Guojun Wu in 2003. We will use a framework mostly inspired by her work from 1992 in order to develop an additional way of finding financial constraints.

The focus in this article is the problem of asymmetric information in debt markets which affects the possibility for financial unhealthy firms to obtain enough external funding. A firm which is financially constrained will experience problems in obtaining enough finance from the capital markets, and may not have the possibility to take on all the investments it wants to. The basic assumption in this paper is that small firms with low liquid asset positions have limited access to debt markets, presumably because they lack the collateral necessary to back up their borrowing (Whited, 1992).

In order to separate firms into groups, we have chosen to go further with the idea of that smaller firms have less access to debt markets and therefore may be considered as financially constrained. We have chosen to extract randomly about 100 companies of the 20% largest companies and about 100 of the 20% smallest companies, where size again is measured as the natural logarithm of the firms’ total assets.
Our framework is a set of Euler equations based on standard assumptions of investments and finance, like risk neutral owners and managers, managers who are acting on the behalf of the stockholders in order to maximize the value of their shares, managers who have rational expectations etc.

A comprehensive derivation of the Euler equations can be found in the paper *Debt, Liquidity Constraints and Corporate Investments: Evidence from Panel Data* by Whited (1992).

Our first estimating equation is inspired by this equation:

\[
\left( \frac{1 - \Lambda_{it}}{1 + (1 - \tau) i_t - \pi^*_t} \right) \left( \frac{\eta Y_{it+1} - \mu_C_{it+1}}{K_{it}} \right) + \alpha \left( \frac{I_{it+1}}{K_{it}} \right)^2 - \nu \right) \\
+ \alpha (1 - \delta) \left( \frac{I_{it+1}}{K_{it}} \right) + (1 - \delta) \left( \frac{P_{it+1}}{K_{it}} \right)
\]

(Whited 1992)

Where \( Y_{it} \) is output, measured as total revenues, \( C_{it} \) is a proxy for costs, measured as the difference between revenues and operating result, \( K_{it} \) is the capital stock, measured as fixed assets and \( I_{it} \) is the investments, measured as the change in fixed assets. \( p_{it} \) can be seen as the relative price of capital goods, but we will set this ratio equal to one in this case. \( \pi^*_t \) is the inflation rate at time t, \( \delta \) is the rate of depreciation for each firm, \( i_t \) is the average nominal interest rate of a representative corporate bond and \( \tau \) is the corporate tax rate, set to 0,28 for all firms in this case. \( f_i \) and \( s_t \) will be eliminated in our example by differencing the equation.

\( \Lambda_{it} \) can be parameterized as a function of different variables measuring “financial health”, like a debt to assets ratio, sales growth, interest coverage ratio, cash flow to assets ratio etc. (For examples of more variables that can be included, see Whited (1992) or Whited and Wu (2003)).

If \( \Lambda = 0 \), the firms tested are considered as financially unconstrained. Our starting point will therefore be to estimate this equation with \( \Lambda \) constrained to zero.
Due to the initial construction of our dataset, it makes it difficult and time consuming to calculate change in variables for the same firm over years (we have to manually search through the dataset to find the observations for the same firms for different years), and with regard to the fact that estimating this equation requires computing change in different variables and computing lags in the variables \( Y_{it}, C_{it}, K_{it}, \) and \( I_{it} \), we have chosen to concentrate on calculating the data needed for only one year (being 2002) for each group in order to be able to compare the two groups of smallest and largest companies. Our sample will consist of 100 small and 100 large firms from 2002, by using data from 2000-2004 to compute the required variables and instruments.

By using the same nominal interest rate for all the firms in the same year of observations (as a proxy for this rate, we have used the interest rate paid on corporate bonds extracted from annual reports of Statoil), and setting the relative price of capital goods equal to one, some of the fractions in the equation will end up as constants. We will have to delete the last fraction since a separate constant term will be perfectly collinear with the constant term.

Our estimating equation will therefore end up like this:

\[
\left( \frac{1}{1 + (1 - \tau) l_{t}} - \frac{\pi_{t}}{K_{it}} \right) \left[ \frac{\eta Y_{it+1} - \mu C_{it+1}}{K_{it}} + \frac{\alpha}{2} \left( \frac{l_{it+1}}{K_{it}} \right)^2 + \alpha (1 - \delta) \frac{l_{it+1}}{K_{it}} 
\right.

\left. + (1 - \delta) \frac{1}{(1 - \tau)} \right] - \frac{\alpha}{K_{it-1}} = e_{it+1}
\]

We will estimate this equations as a system of equations with \( Y_{t+2}, C_{t+2}, K_{t+2}, \) and \( I_{t+2} \) as instrument variables with the General Method of Moments (GMM). An advantage of using GMM is that it does not require the model to be homoscedastic, which can be a problem in this case.

By using the GMM to estimate this system of equations, we will get a J-statistic. The J-statistic was introduced by L.P.Hansen (1982) in “Large sample properties of General Methods of Moments”. Hansen’s J-statistic can be used as a test statistic for model misspecification, where a large J-statistic will indicate that the model is misspecified. We can perform a J-test by comparing the test statistic
times the number of observations with values from a chi-square table, as the J-statistic is asymptotically chi-squared. The number of degrees of freedom will be the number of overidentifying restrictions.

The J-test is also a test for overidentifying restrictions. To check for overidentification is to check whether the model is correct or not. Our hypothesis in this case will be:

$$H_0: \text{the model is appropriate}$$
$$H_1: \text{the model is inappropriate},$$

or as in our case, to test whether the $\Lambda=0$ or not:

$$H_0: \Lambda=0$$
$$H_1: \Lambda\neq0$$

If we end up with keeping $H_0$, the overidentifying restriction cannot be rejected, and the firms in our sample are considered as financially unconstrained. If we have to reject $H_0$, we will estimate the original equation with $\Lambda\neq0$.

We would expect that the hypothesis is rejected for the group with the smallest firms, but kept for the group with the largest firms, as we would expect the smallest firms to be more financially constrained than the largest firms.

### 3.3 Testing for heteroscedasticity

Finally we have tested if the assumption of homoscedasticity is violated in our dataset, then especially concerning the analysis of the Cash Flow Sensitivity to Cash. By using Ordinary Least Squares (OLS) to estimate the equations concerning the cash flow sensitivity to cash, we assume that the variance in the disturbance terms is constant. If the variance is not constant, the coefficient estimates will no longer have minimum variance, which is one of the critical assumptions that have to be fulfilled in order to use OLS. This may lead to wrong standard errors and hence, any inferences made could be misleading. In general, the OLS standard errors will be too large for the intercept when the errors are
heteroscedastic (Brooks 2008). However, the coefficient estimates will still be unbiased and consistent even though there is evidence of heteroscedasticity.

We will test for heteroscedasticity in two ways. First, we have plotted the residuals in order to get a graphical illustration of whether it seems like there might be evidence of heteroscedasticity or not. The residuals are supposed to have a constant variance which can be seen as a graph that vary increasingly or decreasingly, or in another way that makes is look not constant.

Moreover, we have conducted a more formal test, by performing the White’s test. (For a technical and detailed description of the algebra behind this test, see Brooks, 2008;134). The test will provide us with a F-statistic and p-values.

As our dataset has been used for further calculation and separated into different groups, we will not test for heteroscedasticity in every sample throughout this thesis. We have chosen to perform the tests on the groups of the 20% smallest and 20% largest firms. This will include approximately 12 000- 18 000 firms for each year of observations, which probably will give us a good indication of whether this might be a problem for the whole dataset as well.
4. Data

We have been allowed to extract data of Norwegian non-listed and listed firms from the Centre for Corporate Governance Research (CCGR) database. The creators of this database have analyzed a wide range of corporate finance and corporate governance characteristics in all active Norwegian firms with limited liability from 1994-2005. The original sample includes about 77 000 non-listed firms and 135 listed firms on average from each year after filterings (Berzins et al. 2008). The filtering consists of e.g. consistency filtering, ignoring subsidiaries and ignoring firms with negative values for sales, assets and employees.

The main motivation for building such a comprehensive database was to be able to describe characteristics of this huge fraction of the non-listed firms in the Norwegian economy, and to analyze the differences between the non-listed and listed firms. Moreover, there are as mentioned few studies done within the fields of non-listed compared to studies done on listed firms today. The collection of data for this database has undoubtedly been challenging and extensive. However, collecting these data is possible because of the Norwegian rules of law who demand all firms with limited liability to deliver an annual report consisting of a profit and loss statement, a balance sheet with footnotes, a cash flow statement, the board of director’s report and the auditor’s report. The firm must also publish the identity of its CEO and its directors, and the fraction of equity held by every owner. (Berzins et al.2008).

The database is financed and operated by the Centre for Corporate Governance Research and is therefore named the CCGR database. We have been able to get access to 20 variables from this database from the years 1998-2004. In order to analyze our research questions, we have chosen these variables (variable numbers in parenthesis for later use in this thesis): Fixed assets (63), Current assets (78), current liabilities (109), Dividends (105), Revenue (9), Equity (87), Tangible fixed assets (51), Intangible assets (46), Operating profits (19), Depreciation of fixed assets (15), Trade creditors (102), Bank deposits, cash on hand etc. (76), OSE listing status (402), % Equity holder held by owner with rank #1 (211),
Industry codes at level two (11103), Operating profits after tax (35), First rating date (13501) and Founding year (13421). All the data extracted are from independent firms.

Furthermore, we needed the cash flows of the firms for the estimation models. However, computing the cash flows would have required us to get access to more than twenty variables. In order to solve this problem, we asked for an extraction of the Free Cash Flows. The Free Cash Flow is computed like this:

\[\text{Operating profits (19) + Depreciation of fixed assets (15) + Write-down of fixed assets and intangible assets (16) - } \Delta \text{ in Inventories (64- lag.1 64)} - \Delta \text{ in Accounts receivable (65- lag.1 65) + Trade creditors (102) - Tax payable (103).}\]

### 4.1 Filtering

Our original data sample consisted of more than 628,000 observations of these twenty variables with approximately 77,000 observations for each of the nine years. However, in order to be able to compute all the variables we needed for our analysis, we had to delete a huge part of the dataset. Fortunately, with such a great amount of observations, we will still be able to draw valid conclusions even after the filtering for the non-listed firms. When it concerns the listed firms, there might be some validity problems since there are few remaining observations for each year.

We started by deleting all the firms who had not reported their sales or had a negative value of sales. Moreover, we also deleted all the firms with no free cash flow, those with no registered industry code, firms with zero fixed assets, firms with zero current assets and those who had not reported whether they paid dividends or not. After these filtering, we ended up with deleting approximately 200,000 observations.

The main reason for having to delete so many variables was that we needed to compute the *change* in cash holdings. In order to be able to compute this variable, we had to have observations for the same firm continuously for more than one year. It turned out that a huge part of the firms in the CCGR database was firms who only existed for one year, or firms who had delivered their reports for one
year and thereafter had some years without reporting before they later had more years of reporting later on.

All the firms displaying this behaviour are deleted from our sample as we needed the change in cash holdings. Moreover, all the first year observations for firms which report for more than one year are deleted as well as we are not able to calculate the change in cash holdings for these first years of observations. Because of this filtering, we had to delete approximately 110,000 observations. Unfortunately there were very few listed firms for some years, relative to non-listed, remaining after this. We started with on average 135 listed firms per year, but had only about the half of them (with the reports we needed) left after the filtering. Consequently, except when comparing non-listed and listed, the samples for the other analysis will consist of mainly non-listed firms. We are therefore able to draw valid conclusions with regard to non-listed firms and the other grouping criteria used.

The next step was to group the observations into years. We ended up with most observations for the first two years, 1998 and 1999. The conclusions drawn later will maybe be most valid for these first two years, as we have the most observations from here. Moreover, we also have most of our listed firms in these first two years. Comparing the results for the listed and non-listed firms later on will maybe not give valid results for the years 2000-2004 as there are very few observations of listed firms for these years. However, running the regressions for the remaining non-listed firms in each year will at least make us see how these types companies have performed, and will make us able to investigate the characteristics of the non-listed firms which is the main purpose of our thesis.

An important issue when comparing the listed to the non-listed firms is that the listed firms are on average much bigger in terms of size (measured as the natural log of assets). In order to be able to compare listed and non-listed companies, we have decided to match the samples of these two groups. The listed firms have a average size measure of 8.63. We have decided to take out the non-listed firms with size of 7.5-11 in order to compare the cash flow sensitivity to cash for the listed and non-listed firms. This gives us approximately 1000-2500 non-listed firms for each year of observation.
However, we have not done any matching when comparing:
- those companies who paid out dividends and those who do not,
- when comparing the 20 % largest and the 20 % smallest firms and
- when dealing with the KZ-index,
as the data set for these analyses is a mix of listed and non-listed firms (i.e. mostly non-listed firms).

As described, when running the Euler Equations, the dataset will consist of 100 small and 100 large firms from 2002, by using data from 2000-2004 to compute the required variables and instruments.
5. Results

In this section, we will present the results from the analysis we described in the methodology part. The results will be presented in the same order as the methods were presented. The outputs from our analysis are to be found in the attachments.

5.1 The Cash Flow Sensitivity of Cash

5.1.1 Cash flow sensitivity of cash for listed vs non-listed firms

In our first approach, we have compared the cash flow sensitivity of cash for the listed and non-listed firms in our dataset. The methodology is, as described, inspired by Almeida et al. (2003). As also discussed, the amount of observations for listed firms are quite few, and for most of the years, not enough to make valid comparisons with. However bearing this is mind, we will try to see if the non-listed firms do display a positive cash flow sensitivity to cash or not.

We are most interested in the sign of the cash flow-variable. As described, we will expect this sign to be significantly positive for those firms we consider as financially constrained, in this case, the non-listed firms. With regard to the listed firms, we expect that the sign of this cash flow variable to not be significantly different from zero.

Looking at the first year of observations, 1998, for the non-listed companies, we can see that the sign of the variable cash flow is positive and has a p-value of 0.0399 (see attachment 1). This leads to a rejection of the null-hypothesis; \( \alpha_1 \) is significantly different from zero, and we can conclude that the non-listed firms in our sample display significantly positive cash flow sensitivity to cash. Comparing this result with the result for the listed firms in 1998 may not make much sense, as we have 1517 observations of non-listed firms for this year, and only 22 observations for listed firms for the same year. Anyway, we can see that
the sign of the cash flow variable is not significantly different from zero as the p-value for this variable is above our chosen level of significance of 0.05.

For the next year of observations for non-listed firms, 1999, we can also see that the sign of the cash flow variable is positive, indicating that the non-listed firms in 1999 have a positive cash flow sensitivity to cash and thereby are seen as financially constrained according to the theory. However, the result is not significant, as the p-value is 0.1141, which is above our chosen level. We can therefore not conclude that the non-listed firms in 1999 in our sample display a significant positive cash flow sensitivity to cash. However, we can see that there is a tendency towards non-listed firms having a positive sign on this variable.

For the listed firms in the same year, 1999, we can see that there are (like in 1998) still too few variables to make valid comparisons. However, we can see that the sign of the cash flow variable is negative and not significantly different from zero. This is at least according to our hypothesis, and we can see the tendency here too; the listed firms seem to have a cash flow sensitivity to cash which is not significantly different from zero. In other words, it does not seem like the listed firms save up cash out of cash inflows.

The results are mainly the same for our observations from 2000; the non-listed firms display a positive cash flow sensitivity to cash, but the results are not significant, so we cannot draw the conclusion that they are financially constrained, but we can still see that there is a tendency that the sign is positive. The results for the listed firms are also displaying the same signal; the sign is negative, but not significantly different from zero, and we can conclude that the listed firms do not display a positive cash flow sensitivity to cash.

For the year 2001, the sign of the cash flow variable for the non-listed firms is in fact negative, but not significantly different from zero.

For the years 2001-2004, there are quite few observations of listed firms in our sample (from 1-5 observations). Summing up, we can see that there are no tendency that the firms in these years display a different cash flow sensitivity to cash than the listed firms in the previous years, and we can conclude that it seems
like the sign of the cash flow variable is not significantly different from zero for the listed firms in any year in our sample.

For the non-listed firms in the period 2002-2004, we can see that the tendency is the same as for the years 1998-2000; they display a positive cash flow sensitivity to cash, but the results are not significant, and we can therefore not draw the conclusion that the non-listed firms are significantly financially constrained.

Summing up our sample period is for the years 1998-2004, one find that for six out of these seven years for the non-listed firms, the sign of the cash flow variable is positive. This means that there exists a positive cash flow sensitivity to cash for non-listed firms in our sample for six out of seven years. This result is according to our a priori hypothesis, and according to the conclusion by Almeida et al. (2003). However the result is only significant for the first year of observations. The results indicate that non-listed firms are to some extent considered as financially constrained since they tend to save cash out of cash inflows. For listed companies, there are not displayed a significant cash flow sensitivity to cash in any of the years, indicating that these firms do not tend to save up cash out of cash inflows.

5.1.2 Cash flow sensitivity of cash for firms who pay and do not pay out dividends

Our next approach is to compare the cash flow sensitivity of cash for firms who pay out dividends with the results for the firms who do not pay out dividends. Our sample includes from about 350 to 2500 independent firms in each group (those who pay dividends and those who don’t) for each year of observations (1998-2004).

In our first year of observations, 1998, we can see that the firms who pay out dividends display a cash flow sensitivity to cash which is not significantly different from zero. This is according to our a priori hypothesis that firms who pay out dividends is not financially constrained. If they were financially constrained, they may for example have wanted to spend money on other things than dividends or saved up cash for upcoming investment opportunities, and this could have led to a positive cash flow sensitivity of cash.
For the firms who do not pay out dividends, we can see that they in 1998 display a significant positive cash flow sensitivity to cash. This is also according to our a priori hypothesis, that firms who do not pay out dividends may have incentives to save up cash out of cash inflows instead of paying out dividends. We can conclude that the firms in our sample from 1998 that do not pay out dividends seem to be financially constrained.

In our next year of observations, 1999, we can see that the firms who pay out dividends display a negative, but not significantly different from zero cash flow sensitivity to cash. This is again according to our hypothesis that firms who pay out dividends do not have incentives to save up cash out of cash inflows. For the firms from 1999 who do not pay out dividends, we can see that the sign of the cash flow variable is positive as expected. However, the results are not significant (p-value of 0.1217), and we can not conclude that these firms are financially constrained.

For the next year of observations, 2000, we can see that the firms who pay out dividends do not display a significant positive cash flow sensitivity to cash, as expected. However, the firms who do not pay out dividends do not display a significant result either, and we can not conclude that they can be seen as financially constrained. But, we can once again see that the sign of the cash flow variable tend to be positive, which can give an indication of the relationship, and it seems like at least some of the firms who didn’t pay out dividends in 2000 saved up cash out of cash inflows.

The results for 2001 are quite different, but also interesting. In this year, the firms who paid out dividends in fact display a significantly positive cash flow sensitivity to cash, which means that they both paid out dividends and saved up cash out of cash inflows. The firms who did not pay out dividends in 2001 display on the other hand a significant negative cash flow sensitivity to cash, which also is the opposite of what we would expect. These rather different results might to some extent be explained by a new Norwegian tax reform who was introduced this year. In section 6, we will comment more upon this.
The results from 2002 are to some extent in the same way as the results from 2001. The firms who paid out dividends did in this year as well display a significant positive cash flow sensitivity to cash which again means that they both paid out dividends and saved up cash. For the firms who did not pay dividends, the sign of the cash flow variable is positive as expected, but the results are only almost significant at the 0,05 % level (p-value of 0,0666).

For the last two years of observations, 2003 and 2004, the results are the same; the firms who did not pay out dividends do not display a significant relationship between the cash flows and the change in the cash holdings, as expected. However, the firms who paid dividends did not display a significant relationship either, but the sign of the cash flow variable was positive as expected.

Summing up, the results for 1998 are as we expected. For the following years, the results are to some extent as expected with a positive cash flow sensitivity to cash for the firms who did not pay dividends. However, the relationship is not significantly different from zero for these last years. We would have expected this positive cash flow sensitivity of cash to be significant for all the years, but we can take away the fact that it at least seem to be a tendency that firms who do not pay out dividends display a positive cash flow sensitivity to cash.

5.1.3 Cash flow sensitivity of cash for the 20 % smallest and 20 % largest firms

Our third approach was to take out the 20 % smallest and 20 % largest firms in terms of size and compare the results to see if our hypothesis of that the smaller firms are more financially constrained than the larger firms is supported. Our sample includes from approximately 6000-9000 Norwegian firms in each year of our sample period (1998-2004). The firms are as mentioned, mostly non-listed.

For our first year of observations, 1998, we can see that the smallest firms display a positive and significant cash flow sensitivity to cash. This means that the smallest firms save up cash out of cash inflows, and they are considered as financially constrained according to our framework. This is as expected for this group.
For the largest firms in 1998, the relationship between the cash flow variable and the change in cash holdings is not significantly different from zero, as we would expect. This indicates that these larger firms tend to be financially unconstrained. After looking at this first year, it seems like the size of the firm might be a good indicator of whether the firm is financially constrained or not.

Looking at the results from 1999, we can see that the smallest firms also in this year display a significant positive cash flow sensitivity to cash, indicating that the smallest firms in 1999 also were financially constrained. For the 20% largest firms in 1999, we can see that the relationship is negative, but not significant, indicating that the cash flow sensitivity to cash is not significantly different from zero, and that it do not seem like the largest firms in this year on average was facing financial constraints.

In 2000, the smallest firms have a negative but not significant result, indicating that the smallest firms on average were not facing financial constraints this year. The largest firms, on the other hand, display a significant negative cash flow sensitivity to cash.

For the next year of observations, 2001, the results are more what we would expect. For the smallest firms, the sign of the cash flow variable is positive and significant on all levels (p-value of 0.0000). This indicates that the smallest firms were facing financial constraints this year, while the result was the opposite for the largest firms.

In 2002, the smallest firms were also having a highly significant positive cash flow sensitivity to cash (p-value = 0.0000), while the largest were not. Again, the conclusion is that the smallest firms seem to be facing financial constraints while the largest firms do not seem to be financially constrained.

The smallest group of firms in 2003, also displayed a positive cash flow sensitivity to cash, however, this relationship was not significant. For the largest firms, the relationship was significantly negative which indicates that these firms were not facing financial constraints.
In the last year of observations, the results are exactly the same as in 2002.

Summing up this approach, we can see that for the 20% smallest firms in our sample, observations for six out of seven years show that these smaller firms display a significantly positive cash flow sensitivity to cash. This indicates that smaller firms are facing financial constraints as they tend to save up cash out of cash inflows, probably in order to meet future needs of liquidity for upcoming projects.

The majority of the results for the 20% largest firms indicate that they have a cash flow sensitivity to cash which is not significantly different from zero. This means that they are not saving up cash out of cash inflows, and we can conclude that they seem to not face any financial constraints.

5.1.4 The KZ-index for listed vs. non-listed firms

Our fourth approach is to use the index developed by Kaplan and Zingales, called the KZ-index. We will use this index in order to test whether there are differences between listed and non-listed firms with regard to the values of this index.

As described, we would expect the firms facing financial constraints to exhibit a higher KZ-number than the firms who are not considered as financial constrained. According to our hypothesis, we would expect the non-listed firms to, on average, have a higher KZ-number than the listed ones.

This table shows the average KZ-index value of the listed and non-listed firms for each year of observations (1998-2004):

<table>
<thead>
<tr>
<th></th>
<th>1998</th>
<th>1999</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-listed</td>
<td>1,448377</td>
<td>1,268063</td>
<td>1,349688</td>
<td>0,509318</td>
<td>253,5427</td>
<td>0,583543</td>
<td>0,245609</td>
</tr>
<tr>
<td>Listed</td>
<td>1,335138</td>
<td>0,464471</td>
<td>0,888664</td>
<td>1,554391</td>
<td>1,010423</td>
<td>-0,93931</td>
<td>0,091984</td>
</tr>
</tbody>
</table>

As we can see from this table, the KZ-index numbers are higher for the non-listed firms for six out of seven of these years of observations.
To check whether the difference is significantly, we performed an independent sample t-test with the null hypothesis being that the means are equal. The output of the results from this test can be seen in the attachments.

From these outputs, we can see that the null hypothesis is not rejected (p-value of 0.528), and we can not conclude that the means are significantly different from each other.

However, this does not necessarily mean that the listed and non-listed firms face the same financial situations. We can see that there are results from 2001 and 2002 which probably have influenced the test and can have lead to keeping the null hypothesis of equal variance. 2002 seems to be a strange year with very many abnormally high observations.

Moreover, we have to bear in mind that there are quite few observations for listed firms in our sample for some of the last years, and this will also make it difficult to draw a clear and valid conclusion from this test.

However, the main take-away from this analysis is that it seems like there is a tendency that for most of the years, the non-listed firms have a higher KZ-index value which makes them considered as more financially constrained than the listed ones for the same year.

5.1.5 Comparing the level of leverage for firms with high vs. low KZ-index numbers

Our next approach is to compare for each year the average level of leverage for the firms who, ranked by the KZ-index values, end up in the top and bottom 20%. The firms among the top 20% should display a significantly higher KZ-value compared the ones in the bottom 20%; in other words the top 20% companies should be considered as more financially constrained than the ones with the lowest numbers. Our sample consists, in each group for each year, of from about 200-500 firms.

In this table, the average levels of leverage for the firms with the 20% highest and 20% lowest KZ-index values are shown:
As we can see, the level of leverage is higher for the firms with high KZ-index numbers for all these seven years. It seems like the firms who are considered as financially constrained (the firms with the 20% highest KZ-numbers) also have the highest level of leverage in their capital structure. This is as expected and according to the theory presented in the literature review.

To check whether the difference is significant, we have performed an independent sample t-test. The results form this test is to be found in the attachments.

We can see that the p-value is 0.003, which leads to rejecting the null hypothesis of equal means. This means that the firms with the top KZ-index values have on average a significantly higher level of debt than the firms with the lowest KZ-index values. According to the theory, this indicates that the firms who are facing financially constraints have on average more debt in their capital structure relative to the firms who are not facing this problem. This seems to support previous findings presented in the literature review.

5.1.6 The cash flow sensitivity of cash for high leverage vs. low leverage firms.

With the results from the last section in mind, we have turned to the framework of the cash flow sensitivity to cash again to check whether there are any differences in this measure for the firms with the highest and the lowest levels of leverage.

We have compared firms from two different groups; the ones with the 20% highest level of leverage with the ones with the 20% lowest level of leverage. The output from this analysis is in the attachments. Our sample includes from about 200-500 firms in each group in each year of observations (1998-2004).
Starting with the results from 1998, we can see that the firms with the highest levels of leverage display a positive cash flow sensitivity to cash as expected. However, the result is not significant. For the firms with the lowest levels of leverage for the same year, we can see that the relationship is negative, but not significantly different from zero, as expected.

For the next year of observations, we can see quite similar results. The firms with the highest level of leverage display a positive relationship between the cash flow variable and the change in cash holdings, but the result is not significant for these years either.

In 2000, we can see that the sign of the cash flow variable is negative, but not significant for both groups. This indicates that neither the firms with high level of leverage nor the firms with low level of leverage were facing any financial constraints this year. The results were the same for our sample from 2002, while for 2001, the firms in the group with the lowest level of leverage had a significant negative cash flow sensitivity to cash.

In 2003, the firms in the low-group had a negative but not significant cash flow variable, while the firms in the high-group had a positive sign of this variable as expected. However, the relationship was not significant for this year either.

The results from the last year of observations, 2004, also show that the cash flow variable was not significant for neither of the groups, indicating that the firms who both had the highest levels of leverage and the lowest levels of leverage in this year were not facing any financial constraints.

Summing up this approach, we can see that even though the firms who are considered as more financially constrained, according to the KZ-index, have more debt in their capital structure, the firms with the highest levels of leverage does not on average display a positive cash flow sensitivity to cash.
5.2 Estimating Euler equations for small vs. large firms

Our last approach in this thesis for testing for financial constraints was to use a quite different methodology, by estimating Euler equations for 100 small and 100 large firms in terms of size. As we have seen, separating firms into groups in terms of size seems to give some indications of that smaller firms are more constrained than larger firms.

The output for this test is to be found in the attachments.

What we are most interested about is, as described in the methodology- part, the J-statistic. In order to perform a test of overidentifying restrictions, the Hansen’s J-test, we have computed the j-statistic*the number of observations, and compared this number with numbers from a table for chi-square critical values with $\alpha=0.05$ and $v = 9$ degrees of freedom.

As we can see, the computed value is 3.756204 for the largest firms and 4.874774 for the smallest firms, which both are below the chi-square critical value of 16.919. This leads us to keep the null hypothesis of $\Lambda=0$; neither group seem to face any financial constraints. We can conclude that the model is valid and not misspecified, and the overidentifying restrictions cannot be rejected. Since the $\Lambda=0$, we will not proceed with estimating the second Euler equation where $\Lambda$ is parameterized and not equal to zero.

Summing up this section, we can conclude that by using Euler equations to compare small and large firms we do not find any evidence of problems with financial constraints for neither of the groups. This finding contradicts our expectations of rejecting the null hypothesis for the group of the smallest firms. However, the result confirms our expectations of keeping the null hypothesis for the largest firms.

5.3 Testing for Heteroscedasticity

We have tested whether the assumption of homoscedasticity is violated for the samples of the 20 % smallest and 20 % largest firms in our dataset. The output from our tests is in the attachments.
Starting with the first graph, the results for the 20% smallest firms in 1998, we can see that the variance is quite stable around the mean, but with some outliers. The test statistic supports this, with a p-value of 0.5087 which makes us keeping the null hypothesis of no heteroscedasticity.

Moving on to the next graph for the largest firms in 1998, we can see that the situation is quite different. The variance of the disturbance term is more spread away from the mean, and the test results also supports this view. A p-value of 0.0000 leads to rejecting the null hypothesis, and we can conclude that we have a problem of heteroscedasticity in our sample for this year.

We will not go through all the tests results in detail, but as we can see, it seems like there might be problems with heteroscedasticity in the dataset for some of the years, but not for all of them.

There are a few methodologies that can be applied to deal with this problem. One way is to use GLS (Generalized Least Squares) instead of OLS for the estimations, which means to minimize the weighted sum of the squared residuals, but this technique is usually not feasible in practice (Brooks 2008).

Another way to deal with heteroscedasticity is to use White’s modified standard error estimates. We have tried to apply this technique to the cash flow sensitivity of cash analysis for the first sample where the heteroscedasticity problem appeared, for the largest firms in 1998. However, the change in the p-value was marginal, and the conclusion was the same; the largest firms in this year did not display a significant cash flow sensitivity to cash, and was still considered as not financially constrained.
6. Conclusions

As we have seen, there are few highly significant results in our thesis work. For some years, it seems like there are firms in some of our groups that can have been facing financial constraints, while for other years, there are no results indicating that some of the groups were facing more constraints than the other groups.

We have found that for the first years of observations, the non-listed firms tended to be more financially constrained than the listed firms. For six out of seven years, the non-listed firms were having a positive cash flow sensitivity to cash. However, this result was only significant for some of the years.

By using the KZ-index as another approach to test for financial constraints, we could not conclude that there was significantly difference in the mean KZ-index value for the listed and non-listed firms. However, the results indicate that the non-listed firms at least seemed to have higher KZ-index numbers than the listed firms, and this might show that they tend to be a bit more constrained than the listed ones.

With regard to comparing the cash flow sensitivity to cash for firms who paid and did not pay dividends the main take-away is that even though the results are not very significant, it seems to be a tendency that firms who do not pay out dividends display a positive cash flow sensitivity to cash.

By comparing the level of leverage for the firms with the highest and lowest KZ-index numbers, findings indicate that firms with highest KZ-index value have significantly more debt in their capital structure than the firms with the lowest values. However, using leverage as a grouping criterion for the cash flow sensitivity of cash analysis indicated that the firms with the highest levels of leverage do not, on average, display a positive cash flow sensitivity to cash as we might would have expected.

Separating firms into groups in terms of size gave more interesting result, and we can see that for six out of seven years, the smallest firms display a significantly
positive cash flow sensitivity to cash. This indicates that smaller firms are facing financial constraints as they tend to save up cash out of cash inflows, probably in order to meet future needs of liquidity for upcoming projects.

However, using Euler Equations for detecting financial constraints in relation to size, did not give results that supported these findings. By using this alternative approach, we could not conclude that neither the smallest nor the largest firms seemed to be financially constrained.

Summing up, we can see that there are few indications that point towards some clear and common characteristics of firms that are facing financial constraints by using the methods we have applied. However, it seems like smaller firms tend to be more financially constrained than large firms, and that non-listed firms might as well be facing this problem, even though our results were varying and mostly not significant in these tests.
7. Discussion

In this section, we will give some discussions concerning the results found (and not revealed) and other issues concerning this Thesis.

7.1 The new tax reform

As mentioned, a change in the Norwegian taxation system from 2006 may have influenced the results of our estimations.

The Norwegian income taxation system is a dual income tax system. Versions of this system are implemented in many countries and are characterized by a progressive tax on earned income and a proportional tax on capital income (Alstadsæter and Fjærli 2009). The Norwegian version of the dual income tax involves a flat, basic tax at 28% that applies to both corporate income and to capital and labor income. In addition, labor income is taxed by a progressive surtax, which implies that top marginal tax rates for wage incomes are substantially higher than the marginal tax rate on capital income (Alstadsæter and Fjærli 2009).

In June 2000, the Norwegian government gave the first signals of that a new tax reform was about to be introduced. The Norwegian Government approved a temporary tax on capital gain in 2001 that was going to be replaced by a new system from 2002. This resulted in that firms started to take this new information into consideration. The system from 2001 was however not replaced by a new system before January 1st 2006, but already in March 2004, the government announced that this was going to happen.

Before 2006 (except from in 2001), the top marginal tax rate on individual dividend income was zero. Because of the different tax rates on capital income and labor income, there were incentives for business owners to take on tax minimizing actions i.e. to re-classify labor income to capital income. When announcing that this tax was about to be increased from zero to 28% from 2006,
we would expect to see this reflected in the data by the timing of dividend payments done by companies.

Alstadsæter and Fjærli (2009) have analyzed 75,433 Norwegian non-listed firms over 8 years from 1999-2006. They find strong timing effects in dividend payments prior to the introduction of the 2006 shareholder income tax.

As we have seen, in some of the years after 2000, when the news about the new tax reform was released, it seems like there might have been an increase in dividend payments. Firms who saved up cash out of cash inflows were also paying out dividends, even though we would expect the opposite to happen. As we have not dealt with the amount of dividend paid with regard to the cash flow sensitivity analysis, we have not investigated if there is evidence of timing effects in our dataset, but it is probably true and this might have affected our results.

7.2 Using cash flow sensitivity of cash as a measure for financial constraints

We have used a methodology inspired by the article Cash Flow Sensitivity of Cash by Almeida et al. (2003) in order to get a measure for financial constraints. There are both advantage and disadvantages of using this methodology.

As the authors of the article claim, there are reasons for firms who have limited access to capital markets to save up cash in order to be able to take on projects with positive net present value in the future. If they know that there is a possibility that they will be faced with such projects in the future, it is useful for these firms to start to save up cash today. The link between the change in cash holdings (i.e. what they have saved) and the cash flows is a good proxy for measuring what a firm is saving up from their incremental cash flows.

However, there are several reasons for why this might not be a good measure. It could be that well performing firms are saving up cash at the same time as they have cash inflows, but this behavior might not only be because they are facing financial constraints. There are more reasons for saving in addition to be available to take on more projects in the future. It could be that a firm just not has any other way to spend their cash inflows that year except from saving up the money after
having paid all their claimants. If a firm is in this situation with excess cash, but no new project for the moment, or too few to spend all their cash on, we would not have called this firm for financially constrained even though it would get a positive cash flow sensitivity to cash.

Another possibility is that a firm is young and growing, and therefore has to spend all their cash flows immediately. A firm like this might face financial constraints and have too little capital to take on all the projects they want, but they will not have the possibility to save up cash as the cash inflows are too low for saving. By spending all their cash flows and have savings equal to zero, firms like this will not have a positive cash flow sensitivity to cash, and according to this framework, not be considered as financially constrained.

As our results from the analysis of the cash flow sensitivity of cash for the firms with high and low leverage displayed, firms with high leverage was not considered as financially constrained even though we would have expected so. An explanation for this might be that this cash flow sensitivity to cash may not be the best measure for financial constraints for all grouping criteria. Firms with high leverage can be financially unconstrained, as they obviously have had enough collateral to get loans. On the other hand, it could be that they have high leverage and thereby claimants to pay when the cash flows in, and therefore no money left to save up. This will lead to the conclusion of no significant cash flow sensitivity to cash and group them as unconstrained, even though they might feel that they struggle to get enough money to take on all the projects they want to.

These are possible scenarios that might have affected our results.

7.3 Using a qualitative measure for financial constraints

The use of only qualitative measures (financial statements) in order to define if a firm is considered financially constrained or not, is another issue to discuss. It might be shortcomings in using only these kinds of measures in analyzing financial constraints of companies. If we had sent our thesis report to all of the firms we have analyzed and picked out each and every single firm and asked the
managers if they agreed upon what we have concluded about them, some of them would probably had protested.

Fazzari et al.(1988) and Kaplan and Zingales(1997) have analyzed only 49 manufacturing firms in their analysis. Kaplan and Zingales have used qualitative information from the annual reports, statements, notes or explicitly indications of whether a firm had more liquidity than it would need for investments in the future in order to classify these 49 firms into five groups of different degrees of facing financial constraints or not.

Using a more qualitative measure, like asking the managers of the company of how they feel their financial situation is, would probably give other and more correct results. However, this would have been extremely time consuming and probably also not possible, as many of the firms in our analysis no longer exits etc.

Anyhow, doing a smaller qualitative study of some firms in one year, would have been interesting in order to compare their own opinion of their financial situation with quantitative measures like size, dividend payment, listing status, leverage etc.

7.4 Comments on the data used

As our dataset not is constructed only for the purpose of our study, there are a few things that can have influenced our results.

In order to be able to calculate the change in cash holdings as required for our analysis, we needed contionously observations for more than one year from the same firm. One could say that non-listed firms who have survived for more than one year probably have overcome the problem of financial constraints, and it can be that there are fewer firms among these ones who face this problem. Firms who only have reported results for one year may not have survived just because of problems with access to enough capital. One therefore might have lost important data.

Our sample period is from 1998-2004. It could have been interesting to do another study with some of the same methods for a sample period of the last years before
and after the financial crisis. We all know that there have been firms who have struggled the years after the crisis, and this will probably give more extreme results than our study has. A recent paper that help enlighten the influence the financial crisis of 2008 might have had on financial constraints, is the survey-based paper “The real effect of financial constraints: Evidence from a financial crisis” by Campello, Graham and Harvey (2010). In their study they examine companies in the U.S, Europe and Asia, and their findings indicate that constrained firms planned deeper cuts in many areas, and that the lack of ability to borrow externally resulted in that many companies had to turn down attractive investment opportunities.
Reference List


**Electronic Sources:**

(accessed July 2010).

Statoil. 2010. Annual Reports.  
(accessed July 2010).
Comparing listed vs. non-listed firms (Results from Eviews)
CCH= Δ cash holdings, CF= cash holdings, Q= Q, S= size

1998 non-listed firms:

Dependent Variable: CCH  
Method: Least Squares  
Date: 07/07/10   Time: 11:03  
Sample: 1 1518  
Included observations: 1517

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.072358</td>
<td>0.056826</td>
<td>1.273331</td>
</tr>
<tr>
<td>CF</td>
<td>0.030389</td>
<td>0.014775</td>
<td>2.056717</td>
</tr>
<tr>
<td>Q</td>
<td>-0.000191</td>
<td>0.000251</td>
<td>-0.762460</td>
</tr>
<tr>
<td>S</td>
<td>0.000339</td>
<td>0.007157</td>
<td>0.047303</td>
</tr>
</tbody>
</table>

R-squared: 0.003162  
Adjusted R-squared: 0.001185  
S.E. of regression: 0.113677  
Sum squared resid: 19.55184  
Log likelihood: 1148.023  
Prob(F-statistic): 0.187594

1998 listed:

Dependent Variable: CCH  
Method: Least Squares  
Date: 07/07/10   Time: 11:57  
Sample: 1 22  
Included observations: 22

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.525850</td>
<td>0.186031</td>
<td>2.826685</td>
</tr>
<tr>
<td>CF</td>
<td>0.122872</td>
<td>0.070601</td>
<td>1.740369</td>
</tr>
<tr>
<td>Q</td>
<td>0.005413</td>
<td>0.008391</td>
<td>0.645096</td>
</tr>
<tr>
<td>S</td>
<td>-0.052880</td>
<td>0.021653</td>
<td>-2.442133</td>
</tr>
</tbody>
</table>

R-squared: 0.312516  
Adjusted R-squared: 0.197935  
S.E. of regression: 0.069999  
Sum squared resid: 0.088198  
Log likelihood: 29.49470  
Prob(F-statistic): 0.074419
### 1999 non-listed:

Dependent Variable: CCH  
Method: Least Squares  
Date: 07/07/10   Time: 11:10  
Sample: 1 2452  
Included observations: 2452

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.136196</td>
<td>0.035146</td>
<td>3.875101</td>
</tr>
<tr>
<td>CF</td>
<td>0.013239</td>
<td>0.008377</td>
<td>1.580478</td>
</tr>
<tr>
<td>Q</td>
<td>9.00E-05</td>
<td>0.000130</td>
<td>0.690684</td>
</tr>
<tr>
<td>S</td>
<td>-0.008625</td>
<td>0.004413</td>
<td>-1.954431</td>
</tr>
</tbody>
</table>

R-squared: 0.002718  
Adjusted R-squared: 0.001495  
S.E. of regression: 0.095118  
Sum squared resid: 22.14796  
Log likelihood: 2291.439

| Prob(F-statistic) | 0.083454 |

### 1999 listed:

Dependent Variable: CCH  
Method: Least Squares  
Date: 07/07/10   Time: 11:58  
Sample: 1 46  
Included observations: 46

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.376991</td>
<td>0.140904</td>
<td>2.675506</td>
</tr>
<tr>
<td>CF</td>
<td>-0.025605</td>
<td>0.077956</td>
<td>-0.328448</td>
</tr>
<tr>
<td>S</td>
<td>-0.035762</td>
<td>0.016057</td>
<td>-2.227167</td>
</tr>
<tr>
<td>Q</td>
<td>-0.000925</td>
<td>0.003408</td>
<td>-0.271371</td>
</tr>
</tbody>
</table>

R-squared: 0.114320  
Adjusted R-squared: 0.051057  
S.E. of regression: 0.068243  
Sum squared resid: 0.195596  
Log likelihood: 60.31677

| Prob(F-statistic) | 0.064364 |
### 2000 non-listed:

Dependent Variable: CCH  
Method: Least Squares  
Date: 07/07/10  Time: 11:12  
Sample: 1 1205  
Included observations: 1205

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.002756</td>
<td>0.067779</td>
<td>0.040665</td>
</tr>
<tr>
<td>CF</td>
<td>0.004762</td>
<td>0.012046</td>
<td>0.395277</td>
</tr>
<tr>
<td>Q</td>
<td>-0.000209</td>
<td>0.000289</td>
<td>-0.725219</td>
</tr>
<tr>
<td>S</td>
<td>0.010301</td>
<td>0.008604</td>
<td>1.197149</td>
</tr>
</tbody>
</table>

R-squared: 0.001756  
Adjusted R-squared: -0.000738  
S.E. of regression: 15.26203  
Sum squared resid: 15.26203  
Log likelihood: 922.4214  
Prob(F-statistic): 0.549665

### 2000 listed:

Dependent Variable: CCH  
Method: Least Squares  
Date: 07/07/10  Time: 12:00  
Sample: 1 5  
Included observations: 5

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>-2.904541</td>
<td>0.532934</td>
<td>-5.450093</td>
</tr>
<tr>
<td>CF</td>
<td>-0.944573</td>
<td>0.142876</td>
<td>-6.61127</td>
</tr>
<tr>
<td>Q</td>
<td>-0.238117</td>
<td>0.036212</td>
<td>-6.575640</td>
</tr>
<tr>
<td>S</td>
<td>0.375245</td>
<td>0.063957</td>
<td>5.867173</td>
</tr>
</tbody>
</table>

R-squared: 0.987530  
Adjusted R-squared: 0.950120  
S.E. of regression: 0.014614  
Sum squared resid: 0.000214  
Log likelihood: 18.05764  
Prob(F-statistic): 0.141886
### 2001 non-listed:

Dependent Variable: CCH  
Method: Least Squares  
Date: 07/07/10  Time: 11:14  
Sample: 1976  
Included observations: 975

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.152317</td>
<td>0.071852</td>
<td>2.119879</td>
</tr>
<tr>
<td>CF</td>
<td>-0.016209</td>
<td>0.009594</td>
<td>-1.689529</td>
</tr>
<tr>
<td>Q</td>
<td>-9.04E-05</td>
<td>0.000289</td>
<td>-0.313230</td>
</tr>
<tr>
<td>S</td>
<td>-0.009591</td>
<td>0.009134</td>
<td>-1.050078</td>
</tr>
</tbody>
</table>

- **R-squared**: 0.004366  
- **Mean dependent var**: 0.077510  
- **Adjusted R-squared**: 0.001289  
- **S.D. dependent var**: 0.101186  
- **S.E. of regression**: 0.101121  
- **Akaike info criterion**: -1.740903  
- **Sum squared resid**: 9.928922  
- **Schwarz criterion**: -1.720873  
- **Log likelihood**: 852.6904  
- **Hannan-Quinn criter.**: -1.733281  
- **F-statistic**: 1.419178  
- **Durbin-Watson stat**: 2.007125  
- **Prob(F-statistic)**: 0.235663

### 2001 listed:

Dependent Variable: CCH  
Method: Least Squares  
Date: 07/07/10  Time: 12:09  
Sample: 15  
Included observations: 5

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>-38.45499</td>
<td>5.875689</td>
<td>-6.544762</td>
</tr>
<tr>
<td>CF</td>
<td>-4.500299</td>
<td>0.693797</td>
<td>-6.486474</td>
</tr>
<tr>
<td>Q</td>
<td>-4.187223</td>
<td>0.658735</td>
<td>-6.356464</td>
</tr>
<tr>
<td>S</td>
<td>4.756258</td>
<td>0.725715</td>
<td>6.553894</td>
</tr>
</tbody>
</table>

- **R-squared**: 0.997470  
- **Mean dependent var**: 0.152852  
- **Adjusted R-squared**: 0.989879  
- **S.D. dependent var**: 0.087865  
- **S.E. of regression**: 0.008839  
- **Akaike info criterion**: -6.628613  
- **Sum squared resid**: 7.81E-05  
- **Schwarz criterion**: -6.941063  
- **Log likelihood**: 20.57153  
- **Hannan-Quinn criter.**: -7.467198  
- **F-statistic**: 131.4065  
- **Durbin-Watson stat**: 2.231496  
- **Prob(F-statistic)**: 0.064019
2002 non-listed:

<table>
<thead>
<tr>
<th></th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.185156</td>
<td>0.071450</td>
<td>2.591394</td>
<td>0.0097</td>
</tr>
<tr>
<td>CF</td>
<td>0.021243</td>
<td>0.011666</td>
<td>1.820962</td>
<td>0.0689</td>
</tr>
<tr>
<td>Q</td>
<td>-1.55E-07</td>
<td>2.23E-07</td>
<td>-0.695721</td>
<td>0.4868</td>
</tr>
<tr>
<td>S</td>
<td>-0.013910</td>
<td>0.009057</td>
<td>-1.535952</td>
<td>0.1249</td>
</tr>
</tbody>
</table>

R-squared | 0.006102 | Mean dependent var | 0.075231
Adjusted R-squared | 0.003016 | S.D. dependent var | 0.103135
S.E. of regression | 0.102979 | Akaike info criterion | 1.704470
Sum squared resid | 10.24410 | Schwarz criterion | 1.684357
Log likelihood | 830.6678 | Hannan-Quinn criter. | 1.696814
F-statistic | 1.976958 | Durbin-Watson stat | 2.000475
Prob(F-statistic) | 0.115779 |

2002 listed cannot be estimated
2003 non-listed:

Dependent Variable: CCH  
Method: Least Squares  
Date: 07/07/10   Time: 11:18  
Sample: 1 1143  
Included observations: 1142

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.257429</td>
<td>0.060567</td>
<td>4.250287</td>
</tr>
<tr>
<td>CF</td>
<td>0.014210</td>
<td>0.010737</td>
<td>1.323393</td>
</tr>
<tr>
<td>Q</td>
<td>-0.000200</td>
<td>0.000310</td>
<td>-0.644723</td>
</tr>
<tr>
<td>S</td>
<td>-0.023016</td>
<td>0.007688</td>
<td>-2.993857</td>
</tr>
</tbody>
</table>

R-squared    0.009713  Mean dependent var     0.075826  
Adjusted R-squared 0.007103  S.D. dependent var  0.095290  
S.E. of regression 0.094951  Akaike info criterion -1.867418  
Sum squared resid 10.25983   Schwarz criterion   -1.849763  
Log likelihood 1070.296  Hannan-Quinn criter.  -1.860751  
F-statistic 3.720651  Durbin-Watson stat   1.990712  
Prob(F-statistic) 0.011133

2003 listed: (too few observations)

Dependent Variable: CCH  
Method: Least Squares  
Date: 07/07/10   Time: 12:11  
Sample: 1 4  
Included observations: 4

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>-4.862014</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>CF</td>
<td>-0.057716</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Q</td>
<td>0.015831</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>S</td>
<td>0.605995</td>
<td>NA</td>
<td>NA</td>
</tr>
</tbody>
</table>

R-squared    1.000000  Mean dependent var     0.156961  
S.D. dependent var 0.153660  Sum squared resid  3.52E-27  
Durbin-Watson stat 1.625701
2004 non-listed:

Dependent Variable: CCH
Method: Least Squares
Date: 07/07/10 Time: 11:20
Sample: 1 1092
Included observations: 1092

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.111125</td>
<td>0.066829</td>
<td>1.662838</td>
</tr>
<tr>
<td>CF</td>
<td>0.015522</td>
<td>0.017602</td>
<td>0.881801</td>
</tr>
<tr>
<td>Q</td>
<td>-0.000245</td>
<td>0.000260</td>
<td>-0.943513</td>
</tr>
<tr>
<td>S</td>
<td>-0.002682</td>
<td>0.008471</td>
<td>-0.316634</td>
</tr>
</tbody>
</table>

R-squared 0.001671 Mean dependent var 0.089647
Adjusted R-squared -0.001082 S.D. dependent var 0.109625
S.E. of regression 0.109884 Akaike info criterion -1.578769
Sum squared resid 13.08928 Schwarz criterion -1.560470
Log likelihood 866.0081 Hannan-Quinn criter. -1.571844
F-statistic 0.607002 Durbin-Watson stat 2.002274
Prob(F-statistic) 0.610523

2004 listed:

Dependent Variable: CCH
Method: Least Squares
Date: 07/07/10 Time: 12:12
Sample: 1 5
Included observations: 5

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.955608</td>
<td>0.325834</td>
<td>2.932807</td>
</tr>
<tr>
<td>CF</td>
<td>0.970863</td>
<td>0.323297</td>
<td>3.003009</td>
</tr>
<tr>
<td>Q</td>
<td>0.006464</td>
<td>0.013658</td>
<td>0.473262</td>
</tr>
<tr>
<td>S</td>
<td>-0.106813</td>
<td>0.039286</td>
<td>-2.718873</td>
</tr>
</tbody>
</table>

R-squared 0.961372 Mean dependent var 0.040825
Adjusted R-squared 0.845488 S.D. dependent var 0.040557
S.E. of regression 0.015942 Akaike info criterion -5.449114
Sum squared resid 17.62279 Schwarz criterion -5.761564
Log likelihood 17.62279 Hannan-Quinn criter. -6.287698
F-statistic 8.295982 Durbin-Watson stat 1.947694
Prob(F-statistic) 0.248622
Output: Firms who pay or not pay dividends

1998 (pay dividend):

Dependent Variable: CCH
Method: Least Squares
Date: 07/06/10   Time: 13:44
Sample: 1 515
Included observations: 515

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.317035</td>
<td>0.083066</td>
<td>3.816677</td>
</tr>
<tr>
<td>CF</td>
<td>0.060599</td>
<td>0.032021</td>
<td>1.892477</td>
</tr>
<tr>
<td>Q</td>
<td>-0.000392</td>
<td>0.000466</td>
<td>-0.840629</td>
</tr>
<tr>
<td>S</td>
<td>-0.031035</td>
<td>0.010511</td>
<td>-2.952559</td>
</tr>
</tbody>
</table>

R-squared | 0.025358 Mean dependent var | 0.072509
Adjusted R-squared | 0.019636 S.D. dependent var | 0.098700
S.E. of regression | 4.880235 Akaike info criterion | -1.805562
Sum squared resid | 468.9323 Schwarz criterion | -1.772598
Log likelihood | 4.431604 Hannan-Quinn criter. | -1.792644
F-statistic | 4.431604 Durbin-Watson stat | 1.974796
Prob(F-statistic) | 0.004348 |

1998 (not div):

Dependent Variable: CCH
Method: Least Squares
Date: 07/06/10   Time: 14:06
Sample: 1 1540
Included observations: 1539

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.091105</td>
<td>0.054111</td>
<td>1.683675</td>
</tr>
<tr>
<td>CF</td>
<td>0.031698</td>
<td>0.014592</td>
<td>2.172232</td>
</tr>
<tr>
<td>Q</td>
<td>-0.000186</td>
<td>0.000250</td>
<td>-0.744532</td>
</tr>
<tr>
<td>S</td>
<td>-0.002030</td>
<td>0.006805</td>
<td>-0.298346</td>
</tr>
</tbody>
</table>

R-squared | 0.003479 Mean dependent var | 0.074121
Adjusted R-squared | 0.001531 S.D. dependent var | 0.113300
S.E. of regression | 0.097726 Akaike info criterion | -1.805562
Sum squared resid | 48.80235 Schwarz criterion | -1.772598
Log likelihood | 4.431604 Hannan-Quinn criter. | -1.792644
F-statistic | 1.786226 Durbin-Watson stat | 1.974796
Prob(F-statistic) | 0.147822 |
**1999 (pay div):**

Dependent Variable: CCH  
Method: Least Squares  
Date: 07/06/10   Time: 14:11  
Sample: 1 831  
Included observations: 831

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.217691</td>
<td>0.049081</td>
<td>4.435338</td>
</tr>
<tr>
<td>CF</td>
<td>-0.009214</td>
<td>0.015279</td>
<td>-0.603029</td>
</tr>
<tr>
<td>Q</td>
<td>7.38E-05</td>
<td>0.000118</td>
<td>0.625565</td>
</tr>
<tr>
<td>S</td>
<td>-0.019214</td>
<td>0.006145</td>
<td>-3.126572</td>
</tr>
</tbody>
</table>

R-squared 0.012099  Mean dependent var 0.064468  
Adjusted R-squared 0.008516  S.D. dependent var 0.083570  
S.E. of regression 0.083213  Akaike info criterion -2.130017  
Sum squared resid 5.726524  Schwarz criterion -2.107285  
Log likelihood 889.0221  Hannan-Quinn criter. -2.121300  
F-statistic 3.376223  Durbin-Watson stat 2.058778  
Prob(F-statistic) 0.017954

**1999 (not div):**

Dependent Variable: CCH  
Method: Least Squares  
Date: 07/06/10   Time: 14:18  
Sample: 1 2498  
Included observations: 2498

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.142215</td>
<td>0.033439</td>
<td>4.253005</td>
</tr>
<tr>
<td>CF</td>
<td>0.012871</td>
<td>0.008313</td>
<td>1.548358</td>
</tr>
<tr>
<td>Q</td>
<td>9.01E-05</td>
<td>0.000130</td>
<td>0.694944</td>
</tr>
<tr>
<td>S</td>
<td>-0.009372</td>
<td>0.004191</td>
<td>-2.236384</td>
</tr>
</tbody>
</table>

R-squared 0.003102  Mean dependent var 0.067600  
Adjusted R-squared 0.001903  S.D. dependent var 0.094777  
S.E. of regression 0.094687  Akaike info criterion -1.874889  
Sum squared resid 22.36008  Schwarz criterion -1.865564  
Log likelihood 2345.736  Hannan-Quinn criter. -1.871504  
F-statistic 2.586677  Durbin-Watson stat 2.017139  
Prob(F-statistic) 0.051482
### 2000 (pay div):

Dependent Variable: CCH  
Method: Least Squares  
Date: 07/06/10   Time: 14:22  
Sample: 1 388  
Included observations: 388

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.122710</td>
<td>0.113990</td>
<td>1.076492</td>
</tr>
<tr>
<td>CF</td>
<td>0.044474</td>
<td>0.035192</td>
<td>1.263756</td>
</tr>
<tr>
<td>Q</td>
<td>0.000301</td>
<td>0.001900</td>
<td>0.158290</td>
</tr>
<tr>
<td>S</td>
<td>-0.005009</td>
<td>0.014538</td>
<td>-0.344525</td>
</tr>
</tbody>
</table>

R-squared 0.004434  
Mean dependent var 0.085196  
S.D. of regression 0.106326  
Schwarz criterion -1.589326  
Log likelihood 320.2513  
Durbin-Watson stat 1.847982  
Prob(F-statistic) 0.635013

### 2000 (not div):

Dependent Variable: CCH  
Method: Least Squares  
Date: 07/06/10   Time: 14:24  
Sample: 1 1210  
Included observations: 1210

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.005629</td>
<td>0.067431</td>
<td>0.083483</td>
</tr>
<tr>
<td>CF</td>
<td>-0.003344</td>
<td>0.012026</td>
<td>0.387710</td>
</tr>
<tr>
<td>Q</td>
<td>-0.000210</td>
<td>0.000288</td>
<td>-0.727311</td>
</tr>
<tr>
<td>S</td>
<td>0.009923</td>
<td>0.008558</td>
<td>1.159560</td>
</tr>
</tbody>
</table>

R-squared 0.001673  
Mean dependent var 0.083349  
S.D. of regression 0.112523  
Schwarz criterion -1.510361  
Log likelihood 927.9653  
Durbin-Watson stat 1.964026  
Prob(F-statistic) 0.568277
### 2001 (pay div):

Dependent Variable: CCH  
Method: Least Squares  
Date: 07/06/10  
Time: 14:56  
Sample: 1 335  
Included observations: 335

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.055700</td>
<td>0.096651</td>
<td>0.576298</td>
</tr>
<tr>
<td>CF</td>
<td>0.068189</td>
<td>0.029415</td>
<td>2.318149</td>
</tr>
<tr>
<td>Q</td>
<td>0.007694</td>
<td>0.002870</td>
<td>2.681158</td>
</tr>
<tr>
<td>S</td>
<td>0.001731</td>
<td>0.012334</td>
<td>0.140358</td>
</tr>
</tbody>
</table>

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>R-squared</td>
<td>0.036838</td>
<td>Mean dependent var</td>
<td>0.075006</td>
</tr>
<tr>
<td>Adjusted R-squared</td>
<td>0.028109</td>
<td>S.D. dependent var</td>
<td>0.081443</td>
</tr>
<tr>
<td>S.E. of regression</td>
<td>0.080290</td>
<td>Akaike info criterion</td>
<td>-2.194482</td>
</tr>
<tr>
<td>Sum squared resid</td>
<td>2.133772</td>
<td>Schwarz criter.</td>
<td>-2.148940</td>
</tr>
<tr>
<td>Log likelihood</td>
<td>371.5757</td>
<td>Hannan-Quinn criter.</td>
<td>-2.176325</td>
</tr>
<tr>
<td>F-statistic</td>
<td>4.219942</td>
<td>Durbin-Watson stat</td>
<td>2.066298</td>
</tr>
<tr>
<td>Prob(F-statistic)</td>
<td>0.006012</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 2001 (not div):

Dependent Variable: CCH  
Method: Least Squares  
Date: 07/06/10  
Time: 15:01  
Sample: 1 981  
Included observations: 980

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.133466</td>
<td>0.071183</td>
<td>1.874988</td>
</tr>
<tr>
<td>CF</td>
<td>-0.019122</td>
<td>0.009405</td>
<td>-2.033217</td>
</tr>
<tr>
<td>Q</td>
<td>-9.35E-05</td>
<td>0.000289</td>
<td>-0.324093</td>
</tr>
<tr>
<td>S</td>
<td>-0.007163</td>
<td>0.009046</td>
<td>-0.791883</td>
</tr>
</tbody>
</table>

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>R-squared</td>
<td>0.005103</td>
<td>Mean dependent var</td>
<td>0.077895</td>
</tr>
<tr>
<td>Adjusted R-squared</td>
<td>0.002045</td>
<td>S.D. dependent var</td>
<td>0.101226</td>
</tr>
<tr>
<td>S.E. of regression</td>
<td>0.101123</td>
<td>Akaike info criterion</td>
<td>-1.740890</td>
</tr>
<tr>
<td>Sum squared resid</td>
<td>9.980387</td>
<td>Schwarz criter.</td>
<td>-1.720941</td>
</tr>
<tr>
<td>Log likelihood</td>
<td>857.0363</td>
<td>Hannan-Quinn criter.</td>
<td>-1.733301</td>
</tr>
<tr>
<td>F-statistic</td>
<td>1.668609</td>
<td>Durbin-Watson stat</td>
<td>2.036181</td>
</tr>
<tr>
<td>Prob(F-statistic)</td>
<td>0.172120</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### 2002 (pay div):

Dependent Variable: CCH  
Method: Least Squares  
Date: 07/06/10  Time: 15:04  
Sample: 1 329  
Included observations: 329

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.226482</td>
<td>0.116332</td>
<td>1.946870</td>
</tr>
<tr>
<td>CF</td>
<td>0.099840</td>
<td>0.037395</td>
<td>2.669918</td>
</tr>
<tr>
<td>Q</td>
<td>-1.73E-07</td>
<td>2.24E-07</td>
<td>-0.769490</td>
</tr>
<tr>
<td>S</td>
<td>-0.018651</td>
<td>0.014736</td>
<td>-1.265676</td>
</tr>
</tbody>
</table>

R-squared 0.028601  Mean dependent var 0.085218  
Adjusted R-squared 0.019634  S.D. dependent var 0.103684  
S.E. of regression 0.102661  Akaike info criterion -1.702681  
Sum squared resid 3.425280  Schwarz criterion -1.656529  
Log likelihood 284.0911  Hannan-Quinn criter. -1.684270  
F-statistic 3.189624  Durbin-Watson stat 2.010303  
Prob(F-statistic) 0.023922

### 2002 (not div):

Dependent Variable: CCH  
Method: Least Squares  
Date: 07/06/10  Time: 15:06  
Sample: 1 971  
Included observations: 971

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.185669</td>
<td>0.071413</td>
<td>2.599938</td>
</tr>
<tr>
<td>CF</td>
<td>0.021406</td>
<td>0.011656</td>
<td>1.836475</td>
</tr>
<tr>
<td>Q</td>
<td>-1.55E-07</td>
<td>2.23E-07</td>
<td>-0.695380</td>
</tr>
<tr>
<td>S</td>
<td>-0.013982</td>
<td>0.009052</td>
<td>-1.544651</td>
</tr>
</tbody>
</table>

R-squared 0.006181  Mean dependent var 0.075174  
Adjusted R-squared 0.003097  S.D. dependent var 0.103097  
S.E. of regression 0.102937  Akaike info criterion -1.705289  
Sum squared resid 10.24635  Schwarz criterion -1.685193  
Log likelihood 831.9179  Hannan-Quinn criter. -1.697640  
F-statistic 2.004591  Durbin-Watson stat 2.014775  
Prob(F-statistic) 0.111696
### 2003 (pay div):

Dependent Variable: CCH  
Method: Least Squares  
Date: 07/06/10  Time: 15:08  
Sample: 1 425  
Included observations: 425

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.212257</td>
<td>0.084104</td>
<td>2.523757</td>
</tr>
<tr>
<td>CF</td>
<td>0.042032</td>
<td><strong>0.025475</strong></td>
<td><strong>1.649915</strong></td>
</tr>
<tr>
<td>Q</td>
<td>0.001784</td>
<td>0.001514</td>
<td>1.178578</td>
</tr>
<tr>
<td>S</td>
<td>-0.017110</td>
<td>0.010704</td>
<td>-1.598438</td>
</tr>
</tbody>
</table>

R-squared: 0.015303  
Mean dependent var: 0.080811  
S.D. dependent var: 0.095568  
S.E. of regression: 0.095280  
Akaike info criterion: -2.124965  
Sum squared resid: 2.916616  
Schwarz criterion: -2.086827  
Log likelihood: 455.5550  
Hannan-Quinn criter.: -2.109898  
F-statistic: 2.180915  
Durbin-Watson stat: 1.954674

### 2003 (not div):

Dependent Variable: CCH  
Method: Least Squares  
Date: 07/06/10  Time: 15:11  
Sample: 1 1147  
Included observations: 1146

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.244068</td>
<td>0.060631</td>
<td>4.025456</td>
</tr>
<tr>
<td>CF</td>
<td><strong>0.014541</strong></td>
<td><strong>0.010759</strong></td>
<td><strong>1.351550</strong></td>
</tr>
<tr>
<td>Q</td>
<td>-0.000201</td>
<td>0.000311</td>
<td>-0.646521</td>
</tr>
<tr>
<td>S</td>
<td>-0.021277</td>
<td>0.007695</td>
<td>-2.765202</td>
</tr>
</tbody>
</table>

R-squared: 0.008617  
Mean dependent var: 0.076109  
S.D. dependent var: 0.095568  
S.E. of regression: 0.095280  
Akaike info criterion: -1.860507  
Sum squared resid: 10.36742  
Schwarz criterion: -1.842901  
Log likelihood: 1070.070  
Hannan-Quinn criter.: -1.853860  
F-statistic: 3.308756  
Durbin-Watson stat: 1.895184  
Prob(F-statistic): 0.019545
### 2004 (pay div):

Dependent Variable: CCH  
Method: Least Squares  
Date: 07/06/10  Time: 15:14  
Sample: 1 457  
Included observations: 457

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.035862</td>
<td>0.093372</td>
<td>0.384073</td>
</tr>
<tr>
<td>CF</td>
<td>0.020470</td>
<td><strong>0.034526</strong></td>
<td><strong>0.592903</strong></td>
</tr>
<tr>
<td>Q</td>
<td>-0.000171</td>
<td>0.000292</td>
<td>-0.584974</td>
</tr>
<tr>
<td>S</td>
<td>0.006275</td>
<td>0.011902</td>
<td>0.527174</td>
</tr>
</tbody>
</table>

R-squared: 0.002176  
Adjusted R-squared: 0.004432  
S.E. of regression: 0.099146  
Sum squared resid: 4.452959  
Log likelihood: 409.7548  
Prob(F-statistic): 0.804195

### 2004 (not div):

Dependent Variable: CCH  
Method: Least Squares  
Date: 07/06/10  Time: 15:20  
Sample: 1 640  
Included observations: 640

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.186688</td>
<td>0.093069</td>
<td>2.005922</td>
</tr>
<tr>
<td>CF</td>
<td>0.018609</td>
<td><strong>0.021403</strong></td>
<td><strong>0.869471</strong></td>
</tr>
<tr>
<td>Q</td>
<td>-0.000347</td>
<td>0.000464</td>
<td>-0.747480</td>
</tr>
<tr>
<td>S</td>
<td>-0.011817</td>
<td>0.011745</td>
<td>-1.006115</td>
</tr>
</tbody>
</table>

R-squared: 0.003795  
Adjusted R-squared: 0.000905  
S.E. of regression: 0.116428  
Sum squared resid: 8.621276  
Log likelihood: 470.1946  
Prob(F-statistic): 0.489955
Output: comparing the 20% smallest and 20% largest firms

1998 20% largest

Dependent Variable: CCH
Method: Least Squares
Date: 07/12/10  Time: 13:32
Sample: 1 6978
Included observations: 6978

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.685232</td>
<td>0.066122</td>
<td>10.36317</td>
</tr>
<tr>
<td>CF</td>
<td>0.003991</td>
<td>0.005621</td>
<td>0.709799</td>
</tr>
<tr>
<td>Q</td>
<td>6.05E-05</td>
<td>0.000285</td>
<td>0.212420</td>
</tr>
<tr>
<td>S</td>
<td>-0.097088</td>
<td>0.011863</td>
<td>-8.184303</td>
</tr>
</tbody>
</table>

R-squared: 0.009539
Adjusted R-squared: 0.009113
S.E. of regression: 0.243635
Akaike info criterion: 0.014286
Sum squared resid: 413.9643
Schwarz criterion: 0.018213
Log likelihood: -45.84257
Hannan-Quinn criter.: 0.015639
F-statistic: 22.38916
Durbin-Watson stat: 1.970424
Prob(F-statistic): 0.0000

1998 20% smallest

Dependent Variable: CCH
Method: Least Squares
Date: 07/12/10  Time: 13:39
Sample: 1 6979
Included observations: 6978

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.125323</td>
<td>0.021193</td>
<td>5.913572</td>
</tr>
<tr>
<td>CF</td>
<td>0.018277</td>
<td>0.005773</td>
<td>3.165826</td>
</tr>
<tr>
<td>Q</td>
<td>-1.86E-05</td>
<td>7.56E-05</td>
<td>-0.246038</td>
</tr>
<tr>
<td>S</td>
<td>-0.006353</td>
<td>0.002912</td>
<td>-2.181884</td>
</tr>
</tbody>
</table>

R-squared: 0.002194
Adjusted R-squared: 0.001765
S.E. of regression: 0.107526
Akaike info criterion: -1.621594
Sum squared resid: 80.63240
Schwarz criterion: -1.617667
Log likelihood: 5661.740
Hannan-Quinn criter.: -1.620240
F-statistic: 5.11323
Durbin-Watson stat: 1.980138
Prob(F-statistic): 0.001564
### 1999 20% largest

Dependent Variable: CCH  
Method: Least Squares  
Date: 07/12/10  Time: 13:45  
Sample: 1 8603  
Included observations: 8603

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.543886</td>
<td>0.034239</td>
<td>15.88483</td>
</tr>
<tr>
<td>CF</td>
<td>-0.001323</td>
<td>0.001079</td>
<td>-1.225376</td>
</tr>
<tr>
<td>Q</td>
<td>2.04E-05</td>
<td>0.000182</td>
<td>0.111843</td>
</tr>
<tr>
<td>S</td>
<td>-0.072917</td>
<td>0.006124</td>
<td>-11.90605</td>
</tr>
</tbody>
</table>

R-squared: 0.016775  
Mean dependent var: 0.136832

Adjusted R-squared: 0.016432  
S.D. dependent var: 0.142111

S.E. of regression: 0.140939  
Akaike info criterion: -1.080515

Sum squared resid: 170.8087  
Schwarz criterion: -1.077233

Log likelihood: 4651.836  
Hannan-Quinn criter.: -1.079396

F-statistic: 48.90433  
Durbin-Watson stat: 1.992090

Prob(F-statistic): 0.000000

---

### 1999 20% smallest:

Dependent Variable: CCH  
Method: Least Squares  
Date: 07/12/10  Time: 13:50  
Sample: 1 8604  
Included observations: 8604

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.166290</td>
<td>0.017658</td>
<td>9.417042</td>
</tr>
<tr>
<td>CF</td>
<td>0.012805</td>
<td>0.004860</td>
<td>2.634950</td>
</tr>
<tr>
<td>Q</td>
<td>-3.53E-07</td>
<td>4.70E-05</td>
<td>-0.007515</td>
</tr>
<tr>
<td>S</td>
<td>-0.012221</td>
<td>0.002388</td>
<td>-5.118143</td>
</tr>
</tbody>
</table>

R-squared: 0.003907  
Mean dependent var: 0.076147

Adjusted R-squared: 0.003559  
S.D. dependent var: 0.104023

S.E. of regression: 0.103839  
Akaike info criterion: -1.691506

Sum squared resid: 92.72789  
Schwarz criterion: -1.688224

Log likelihood: 7280.860  
Hannan-Quinn criter.: -1.690387

F-statistic: 11.24353  
Durbin-Watson stat: 1.997943

Prob(F-statistic): 0.000000
**2000 20% largest:**

Dependent Variable: CCH  
Method: Least Squares  
Date: 07/13/10  Time: 10:47  
Sample: 1 7631  
Included observations: 7631

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.719405</td>
<td>0.039692</td>
<td>18.12476</td>
</tr>
<tr>
<td>CF</td>
<td>-0.008353</td>
<td>0.002477</td>
<td>-3.372161</td>
</tr>
<tr>
<td>Q</td>
<td>-0.000141</td>
<td>0.000171</td>
<td>-0.827321</td>
</tr>
<tr>
<td>S</td>
<td>-0.103710</td>
<td>0.007141</td>
<td>-14.52365</td>
</tr>
</tbody>
</table>

R-squared 0.029530  Mean dependent var 0.144436  
Adjusted R-squared 0.029148  S.D. dependent var 0.155715  
S.E. of regression 0.153429  Akaike info criterion -0.910634  
Sum squared resid 179.5430  Schwarz criterion -0.906996  
Log likelihood 3478.525  Hannan-Quinn criter. -0.909386  
F-statistic 77.35959  Durbin-Watson stat 1.942705  
Prob(F-statistic) 0.000000

**2000 20% smallest:**

Dependent Variable: CCH  
Method: Least Squares  
Date: 07/13/10  Time: 11:04  
Sample: 1 7633  
Included observations: 7633

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.050403</td>
<td>0.022507</td>
<td>2.239433</td>
</tr>
<tr>
<td>CF</td>
<td>-0.002886</td>
<td>0.004740</td>
<td>-0.608790</td>
</tr>
<tr>
<td>Q</td>
<td>-2.13E-05</td>
<td>5.77E-05</td>
<td>-0.368961</td>
</tr>
<tr>
<td>S</td>
<td>0.004563</td>
<td>0.003138</td>
<td>1.454043</td>
</tr>
</tbody>
</table>

R-squared 0.000352  Mean dependent var 0.083126  
Adjusted R-squared -0.000041  S.D. dependent var 0.105967  
S.E. of regression 0.105969  Akaike info criterion -1.650808  
Sum squared resid 85.67003  Schwarz criterion -1.647171  
Log likelihood 6304.309  Hannan-Quinn criter. -1.649560  
F-statistic 0.895435  Durbin-Watson stat 1.973398  
Prob(F-statistic) 0.442610
### 2001 20% smallest:

Dependent Variable: CCH  
Method: Least Squares  
Date: 07/13/10   Time: 11:10  
Sample: 1 7636  
Included observations: 7636

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>CF</td>
<td>-0.007139</td>
<td>0.003483</td>
<td>-2.049636</td>
</tr>
<tr>
<td>C</td>
<td>0.607432</td>
<td>0.070297</td>
<td>8.640965</td>
</tr>
<tr>
<td>Q</td>
<td>-0.000250</td>
<td>0.000438</td>
<td>-0.571772</td>
</tr>
<tr>
<td>S</td>
<td>-0.083616</td>
<td>0.012617</td>
<td>-6.627182</td>
</tr>
</tbody>
</table>

R-squared | 0.006917  | Mean dependent var | 0.142960  |
Adjusted R-squared | 0.006526  | S.D. dependent var  | 0.270610  |
S.E. of regression | 0.269726  | Akaike info criterion | 0.217703  |
Sum squared resid | 555.2437  | Schwarz criterion   | 0.221338  |
Log likelihood | -827.1886 | Hannan-Quinn criter. | 0.218950  |
F-statistic | 17.71898  | Durbin-Watson stat  | 2.004581  |
Prob(F-statistic) | 0.000000  |                      |          |

### 2001 20% largest:

Dependent Variable: CCH  
Method: Least Squares  
Date: 07/13/10   Time: 11:26  
Sample: 1 7638  
Included observations: 7637

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.170523</td>
<td>0.022786</td>
<td>7.483809</td>
</tr>
<tr>
<td>CF</td>
<td>-0.009433</td>
<td>0.004153</td>
<td>-2.271454</td>
</tr>
<tr>
<td>Q</td>
<td>9.43E-07</td>
<td>4.35E-05</td>
<td>0.021654</td>
</tr>
<tr>
<td>S</td>
<td>-0.012041</td>
<td>0.003211</td>
<td>-3.749649</td>
</tr>
</tbody>
</table>

R-squared | 0.002433  | Mean dependent var | 0.085316  |
Adjusted R-squared | 0.002041  | S.D. dependent var  | 0.105458  |
S.E. of regression | 0.105351  | Akaike info criterion | -1.662523 |
Sum squared resid | 84.71665  | Schwarz criterion   | -1.658888 |
Log likelihood | 6352.345  | Hannan-Quinn criter. | -1.661276 |
F-statistic | 6.205451  | Durbin-Watson stat  | 1.957935  |
Prob(F-statistic) | 0.000332  |                      |          |
### 2002 20% largest:

Dependent Variable: CCH  
Method: Least Squares  
Date: 07/13/10   Time: 11:26  
Sample: 1 7638  
Included observations: 7637

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.170523</td>
<td>0.022786</td>
<td>7.483809</td>
</tr>
<tr>
<td>CF</td>
<td>-0.009433</td>
<td>0.004153</td>
<td>-2.271454</td>
</tr>
<tr>
<td>Q</td>
<td>9.43E-07</td>
<td>4.35E-05</td>
<td>0.021654</td>
</tr>
<tr>
<td>S</td>
<td>-0.012041</td>
<td>0.003211</td>
<td>-3.749649</td>
</tr>
</tbody>
</table>

R-squared 0.002433  
Adjusted R-squared 0.002041  
S.E. of regression 84.71665  
Sum squared resid 84.71665  
Log likelihood 6352.345  
F-statistic 6.205451  
Prob(F-statistic) 0.000332

### 2002 20% smallest:

Dependent Variable: CCH  
Method: Least Squares  
Date: 07/13/10   Time: 11:35  
Sample: 1 6734  
Included observations: 6734

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.170633</td>
<td>0.022977</td>
<td>7.426229</td>
</tr>
<tr>
<td>CF</td>
<td>0.020637</td>
<td>0.004853</td>
<td>4.252604</td>
</tr>
<tr>
<td>Q</td>
<td>0.000101</td>
<td>8.29E-05</td>
<td>1.217456</td>
</tr>
<tr>
<td>S</td>
<td>-0.012006</td>
<td>0.003218</td>
<td>-3.730458</td>
</tr>
</tbody>
</table>

R-squared 0.004960  
Adjusted R-squared 0.004517  
S.E. of regression 64.71665  
Sum squared resid 64.71665  
Log likelihood 5856.773  
F-statistic 6.205451  
Prob(F-statistic) 0.000332
### 2003 20% largest:

Dependent Variable: CCH  
Method: Least Squares  
Date: 07/13/10  Time: 11:46  
Sample: 1 7736  
Included observations: 7736

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.670846</td>
<td>0.046216</td>
<td>14.51554</td>
</tr>
<tr>
<td>CF</td>
<td>-0.016001</td>
<td>0.003020</td>
<td>-5.298396</td>
</tr>
<tr>
<td>Q</td>
<td>-0.000453</td>
<td>0.000293</td>
<td>-1.547864</td>
</tr>
<tr>
<td>S</td>
<td>-0.095129</td>
<td>0.008271</td>
<td>-11.50192</td>
</tr>
</tbody>
</table>

R-squared 0.023435  
Mean dependent var 0.141811

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.166398</td>
<td>0.022202</td>
<td>7.494801</td>
</tr>
<tr>
<td>CF</td>
<td>0.004439</td>
<td>0.004208</td>
<td>1.054944</td>
</tr>
<tr>
<td>Q</td>
<td>3.93E-05</td>
<td>6.28E-05</td>
<td>0.625868</td>
</tr>
<tr>
<td>S</td>
<td>-0.011443</td>
<td>0.003100</td>
<td>-3.691030</td>
</tr>
</tbody>
</table>

R-squared 0.001979  
Mean dependent var 0.084644

### 2003 20% smallest:

Dependent Variable: CCH  
Method: Least Squares  
Date: 07/13/10  Time: 11:51  
Sample: 1 7737  
Included observations: 7736

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.116398</td>
<td>0.022202</td>
<td>7.494801</td>
</tr>
<tr>
<td>CF</td>
<td>0.004439</td>
<td>0.004208</td>
<td>1.054944</td>
</tr>
<tr>
<td>Q</td>
<td>3.93E-05</td>
<td>6.28E-05</td>
<td>0.625868</td>
</tr>
<tr>
<td>S</td>
<td>-0.011443</td>
<td>0.003100</td>
<td>-3.691030</td>
</tr>
</tbody>
</table>

R-squared 0.001979  
Mean dependent var 0.084644

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.116398</td>
<td>0.022202</td>
<td>7.494801</td>
</tr>
<tr>
<td>CF</td>
<td>0.004439</td>
<td>0.004208</td>
<td>1.054944</td>
</tr>
<tr>
<td>Q</td>
<td>3.93E-05</td>
<td>6.28E-05</td>
<td>0.625868</td>
</tr>
<tr>
<td>S</td>
<td>-0.011443</td>
<td>0.003100</td>
<td>-3.691030</td>
</tr>
</tbody>
</table>

R-squared 0.001979  
Mean dependent var 0.084644
### 2004 20% largest:

Dependent Variable: CCH  
Method: Least Squares  
Date: 07/13/10   Time: 11:58  
Sample: 1 5976  
Included observations: 5975

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.771308</td>
<td>0.048633</td>
<td>15.85991</td>
</tr>
<tr>
<td>CF</td>
<td>-0.008088</td>
<td>0.003239</td>
<td>-2.497470</td>
</tr>
<tr>
<td>Q</td>
<td>4.88E-05</td>
<td>0.000243</td>
<td>0.201163</td>
</tr>
<tr>
<td>S</td>
<td>-0.108570</td>
<td>0.008608</td>
<td>-12.61244</td>
</tr>
</tbody>
</table>

R-squared 0.028371  
Adjusted R-squared 0.027883  
S.E. of regression 0.160701  
Sum squared resid 154.1992  
Log likelihood 2447.410  
Prob(F-statistic) 0.000000

### 2004 20% smallest:

Dependent Variable: CCH  
Method: Least Squares  
Date: 07/13/10   Time: 12:03  
Sample: 1 5978  
Included observations: 5978

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.174775</td>
<td>0.027401</td>
<td>6.378494</td>
</tr>
<tr>
<td>CF</td>
<td>0.040181</td>
<td>0.007062</td>
<td>5.689950</td>
</tr>
<tr>
<td>Q</td>
<td>-3.26E-05</td>
<td>6.19E-05</td>
<td>-0.525610</td>
</tr>
<tr>
<td>S</td>
<td>-0.010647</td>
<td>0.003785</td>
<td>-2.813351</td>
</tr>
</tbody>
</table>

R-squared 0.007138  
Adjusted R-squared 0.006640  
S.E. of regression 0.113175  
Sum squared resid 76.51792  
Log likelihood 4544.593  
Prob(F-statistic) 0.000000
KZ-output

Average KZ-index number for the listed and non-listed firms for each year:

1998 non-listed: 1,448377
1998 listed: 1,335138
1999 non-listed: 1,268063
1999 listed: 0,464471
2000 non-listed: 1,349688
2000 listed: 0,888664
2001 non-listed: 0,509318
2001 listed: 1,554391
2002 non-listed: 253,5427
2002 listed: (1 firm): 1,010423
2003 non-listed: 0,583543
2003 listed: -0,93931
2004 non-listed(5 firms): 0,091984
2004 listed: 0,245609
Output from independent sample t-test.

Testing whether the difference in average KZ-index number is significant.

<table>
<thead>
<tr>
<th>firmtype</th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Std. Error Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>KZ 1</td>
<td>6</td>
<td>.873194</td>
<td>.5530792</td>
<td>.2257937</td>
</tr>
<tr>
<td>2</td>
<td>6</td>
<td>.591494</td>
<td>.8997354</td>
<td>.3673155</td>
</tr>
</tbody>
</table>

(1= non-listed, 2=listed firms)

<table>
<thead>
<tr>
<th></th>
<th>Levene's Test for Equality of Variances</th>
<th>t-test for Equality of Means</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F</td>
<td>Sig.</td>
</tr>
<tr>
<td>KZ</td>
<td>Equal variances assumed</td>
<td>.706</td>
</tr>
<tr>
<td></td>
<td>Equal variances not assumed</td>
<td></td>
</tr>
</tbody>
</table>
KZ-index
Average debt for top 20% and bottom 20% in terms of the KZ-index value.

1998
Bottom: 0.477608
Top: 0.907244

1999
Bottom: 0.0015
Top: 0.6563

2000
Bottom: 0.458212
Top: 0.954039

2001
Bottom: 0.578216
Top: 0.977288

2002
Bottom: 0.512002
Top: 0.649048

2003:
Bottom: 0.636005
Top: 0.920935

2004:
Bottom: 0.709898
Top: 0.911527
Output for the independent sample t-test.

Testing whether the difference in leverage among the firms with the top and bottom 20% KZ-index numbers are significantly different.

H₀: means are equal
H₁: means are unequal

Group Statistics

<table>
<thead>
<tr>
<th></th>
<th>high</th>
<th>low</th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Std. Error Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>leverage</td>
<td>7</td>
<td>7</td>
<td></td>
<td>.853769</td>
<td>.1395962</td>
<td>.0527624</td>
</tr>
<tr>
<td></td>
<td>.481920</td>
<td>.2299558</td>
<td>.0869151</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Independent Samples Test

<table>
<thead>
<tr>
<th></th>
<th>Levene's Test for Equality of Variances</th>
<th>t-test for Equality of Means</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F</td>
<td>Sig.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>leverage</td>
<td>.199</td>
<td>.663</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Output for testing the change in cash holdings for firms with the top and bottom 20% of leverage.

1998 bottom 20%:

Dependent Variable: CCH
Method: Least Squares
Date: 08/03/10   Time: 14:42
Sample: 1 308
Included observations: 308

<table>
<thead>
<tr>
<th></th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.280448</td>
<td>0.115879</td>
<td>2.420188</td>
<td>0.0161</td>
</tr>
<tr>
<td>CF</td>
<td>-0.025443</td>
<td>0.058534</td>
<td>-0.434678</td>
<td>0.6641</td>
</tr>
<tr>
<td>Q</td>
<td>0.001099</td>
<td>0.001382</td>
<td>0.795315</td>
<td>0.4271</td>
</tr>
<tr>
<td>S</td>
<td>-0.023671</td>
<td>0.014575</td>
<td>-1.624066</td>
<td>0.1054</td>
</tr>
</tbody>
</table>

R-squared 0.011044  Mean dependent var 0.093787
Adjusted R-squared 0.001285  S.D. dependent var 0.115466
S.E. of regression 0.115392  Akaike info criterion -1.468069
Sum squared resid 4.047825  Schwarz criterion -1.419626
Log likelihood 230.0826  Hannan-Quinn criter. -1.448699
F-statistic 1.131626  Durbin-Watson stat 1.529994
Prob(F-statistic) 0.336445

1998 top 20%:

Dependent Variable: CCH
Method: Least Squares
Date: 08/03/10   Time: 14:43
Sample: 1 308
Included observations: 308

<table>
<thead>
<tr>
<th></th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>-0.019620</td>
<td>0.151523</td>
<td>-0.129482</td>
<td>0.8971</td>
</tr>
<tr>
<td>CF</td>
<td>0.011420</td>
<td>0.029564</td>
<td>0.386278</td>
<td>0.6996</td>
</tr>
<tr>
<td>Q</td>
<td>-0.000236</td>
<td>0.000332</td>
<td>-0.709389</td>
<td>0.4786</td>
</tr>
<tr>
<td>S</td>
<td>0.012149</td>
<td>0.019144</td>
<td>0.634607</td>
<td>0.5262</td>
</tr>
</tbody>
</table>

R-squared 0.003032  Mean dependent var 0.075276
Adjusted R-squared -0.006806  S.D. dependent var 0.128678
S.E. of regression 0.129116  Akaike info criterion -1.243316
Sum squared resid 5.067932  Schwarz criterion -1.194873
Log likelihood 195.4706  Hannan-Quinn criter. -1.223946
F-statistic 1.31626  Durbin-Watson stat 1.529994
Prob(F-statistic) 0.336445
### 1999 bottom 20 %:

Dependent Variable: CCH  
Method: Least Squares  
Date: 08/03/10   Time: 14:44  
Sample: 1 500  
Included observations: 500

<table>
<thead>
<tr>
<th></th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.169091</td>
<td>0.084402</td>
<td>2.003397</td>
<td>0.0457</td>
</tr>
<tr>
<td>CF</td>
<td>0.009949</td>
<td>0.023263</td>
<td>0.427693</td>
<td>0.6691</td>
</tr>
<tr>
<td>Q</td>
<td>-0.000106</td>
<td>0.000700</td>
<td>-0.151323</td>
<td>0.8798</td>
</tr>
<tr>
<td>S</td>
<td>-0.010165</td>
<td>0.010509</td>
<td>-0.967248</td>
<td>0.3339</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>R-squared</td>
<td>0.002419</td>
<td>Mean dependent var</td>
<td>0.087463</td>
<td></td>
</tr>
<tr>
<td>Adjusted R-squared</td>
<td>-0.003615</td>
<td>S.D. dependent var</td>
<td>0.117250</td>
<td></td>
</tr>
<tr>
<td>S.E. of regression</td>
<td>0.117462</td>
<td>Akaike info criterion</td>
<td>-1.437440</td>
<td></td>
</tr>
<tr>
<td>Sum squared resid</td>
<td>6.843440</td>
<td>Schwarz criterion</td>
<td>-1.403724</td>
<td></td>
</tr>
<tr>
<td>Log likelihood</td>
<td>363.3601</td>
<td>Hannan-Quinn criter.</td>
<td>-1.424210</td>
<td></td>
</tr>
<tr>
<td>F-statistic</td>
<td>0.400941</td>
<td>Durbin-Watson stat</td>
<td>2.090190</td>
<td></td>
</tr>
<tr>
<td>Prob(F-statistic)</td>
<td>0.752386</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 1999 top 20 %:

Dependent Variable: CCH  
Method: Least Squares  
Date: 08/03/10   Time: 14:45  
Sample: 1 500  
Included observations: 500

<table>
<thead>
<tr>
<th></th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.163249</td>
<td>0.088909</td>
<td>1.836142</td>
<td>0.0669</td>
</tr>
<tr>
<td>CF</td>
<td>0.015094</td>
<td>0.015231</td>
<td>0.991003</td>
<td>0.3222</td>
</tr>
<tr>
<td>Q</td>
<td>-0.000108</td>
<td>0.000700</td>
<td>-0.039315</td>
<td>0.9687</td>
</tr>
<tr>
<td>S</td>
<td>-0.012754</td>
<td>0.011239</td>
<td>-1.134745</td>
<td>0.2570</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>R-squared</td>
<td>0.004476</td>
<td>Mean dependent var</td>
<td>0.061672</td>
<td></td>
</tr>
<tr>
<td>Adjusted R-squared</td>
<td>-0.001545</td>
<td>S.D. dependent var</td>
<td>0.096872</td>
<td></td>
</tr>
<tr>
<td>S.E. of regression</td>
<td>0.096947</td>
<td>Akaike info criterion</td>
<td>-1.821336</td>
<td></td>
</tr>
<tr>
<td>Sum squared resid</td>
<td>4.661769</td>
<td>Schwarz criterion</td>
<td>-1.787619</td>
<td></td>
</tr>
<tr>
<td>Log likelihood</td>
<td>459.3340</td>
<td>Hannan-Quinn criter.</td>
<td>-1.808106</td>
<td></td>
</tr>
<tr>
<td>F-statistic</td>
<td>0.743378</td>
<td>Durbin-Watson stat</td>
<td>1.957031</td>
<td></td>
</tr>
<tr>
<td>Prob(F-statistic)</td>
<td>0.526576</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### 2000 bottom 20%:

Dependent Variable: CCH  
Method: Least Squares  
Date: 08/03/10   Time: 14:46  
Sample: 1 242  
Included observations: 242

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.116904</td>
<td>0.165096</td>
<td>0.708098</td>
</tr>
<tr>
<td>CF</td>
<td>-0.008872</td>
<td>0.037024</td>
<td>-0.239627</td>
</tr>
<tr>
<td>Q</td>
<td>0.001026</td>
<td>0.001119</td>
<td>0.916420</td>
</tr>
<tr>
<td>S</td>
<td>-0.001448</td>
<td>0.020909</td>
<td>-0.069275</td>
</tr>
</tbody>
</table>

R-squared 0.003857  Mean dependent var 0.106936  
Adjusted R-squared -0.008699  S.D. dependent var 0.126988  
S.E. of regression 0.127539  Akaike info criterion -1.264396  
Sum squared resid 3.871364  Schwarz criterion -1.206728  
Log likelihood 156.9919  Hannan-Quinn criter. -1.241165  
F-statistic 0.307173  Durbin-Watson stat 2.072968  
Prob(F-statistic) 0.820196

### 2000 top 20%:

Dependent Variable: CCH  
Method: Least Squares  
Date: 08/03/10   Time: 14:47  
Sample: 1 242  
Included observations: 242

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>-0.274394</td>
<td>0.164857</td>
<td>-1.664437</td>
</tr>
<tr>
<td>CF</td>
<td>-0.004381</td>
<td>0.019448</td>
<td>-0.225261</td>
</tr>
<tr>
<td>Q</td>
<td>-0.000348</td>
<td>0.000629</td>
<td>-0.553911</td>
</tr>
<tr>
<td>S</td>
<td>0.045572</td>
<td>0.020945</td>
<td>2.175768</td>
</tr>
</tbody>
</table>

R-squared 0.022208  Mean dependent var 0.084436  
Adjusted R-squared 0.009883  S.D. dependent var 0.124274  
S.E. of regression 0.123658  Akaike info criterion -1.326202  
Sum squared resid 3.639336  Schwarz criterion -1.268533  
Log likelihood 164.4704  Hannan-Quinn criter. -1.302971  
F-statistic 1.801843  Durbin-Watson stat 2.231892  
Prob(F-statistic) 0.147494
### 2001, bottom 20%:

Dependent Variable: CCH  
Method: Least Squares  
Date: 08/03/10  Time: 14:48  
Sample: 1 196  
Included observations: 196

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.091352</td>
<td>0.168386</td>
<td>0.542512</td>
</tr>
<tr>
<td>CF</td>
<td>-0.084337</td>
<td>0.037716</td>
<td>-2.236110</td>
</tr>
<tr>
<td>Q</td>
<td>-0.000592</td>
<td>0.000655</td>
<td>-0.903235</td>
</tr>
<tr>
<td>S</td>
<td>-0.000782</td>
<td>0.021296</td>
<td>-0.036735</td>
</tr>
</tbody>
</table>

R-squared: 0.027805  Mean dependent var: 0.087914  
Adjusted R-squared: 0.012615  S.D. dependent var: 0.118627  
S.E. of regression: 0.117876  Akaike info criterion: -1.418163  
Sum squared resid: 2.667811  Schwarz criterion: -1.351263  
Log likelihood: 142.9800  Hannan-Quinn criter.: -1.391079  
F-statistic: 1.830427  Durbin-Watson stat: 1.934507

### 2001, top 20%:

Dependent Variable: CCH  
Method: Least Squares  
Date: 08/03/10  Time: 14:49  
Sample: 1 196  
Included observations: 196

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.136992</td>
<td>0.214733</td>
<td>0.637963</td>
</tr>
<tr>
<td>CF</td>
<td>-0.021233</td>
<td>0.037198</td>
<td>-0.570820</td>
</tr>
<tr>
<td>Q</td>
<td>-3.99E-05</td>
<td>0.000394</td>
<td>-0.101242</td>
</tr>
<tr>
<td>S</td>
<td>-0.007420</td>
<td>0.027536</td>
<td>-0.269477</td>
</tr>
</tbody>
</table>

R-squared: 0.002025  Mean dependent var: 0.080514  
Adjusted R-squared: -0.013568  S.D. dependent var: 0.113709  
S.E. of regression: 0.114477  Akaike info criterion: -1.476681  
Sum squared resid: 2.516177  Schwarz criterion: -1.409780  
Log likelihood: 148.7147  Hannan-Quinn criter.: -1.449596  
F-statistic: 1.129877  Durbin-Watson stat: 2.009195

Prob(F-statistic): 0.942250
### 2002, bottom 20 %:

Dependent Variable: CCH  
Method: Least Squares  
Date: 08/03/10  Time: 14:51  
Sample: 1 194  
Included observations: 194

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.325856</td>
<td>0.181728</td>
<td>1.793101</td>
</tr>
<tr>
<td>CF</td>
<td>-0.007367</td>
<td>0.030092</td>
<td>-0.244819</td>
</tr>
<tr>
<td>Q</td>
<td>-3.07E-07</td>
<td>1.62E-06</td>
<td>-0.189534</td>
</tr>
<tr>
<td>S</td>
<td>-0.029008</td>
<td>0.022906</td>
<td>-1.266420</td>
</tr>
</tbody>
</table>

R-squared 0.009185  Mean dependent var 0.095470  
Adjusted R-squared -0.006460  S.D. dependent var 0.132915  
S.E. of regression 0.133343  Akaike info criterion -1.171379  
Sum squared resid 3.378275  Schwarz criterion -1.104000  
Log likelihood 117.6238  Hannan-Quinn criter. -1.144095  
F-statistic 0.587104  Durbin-Watson stat 1.884901  
Prob(F-statistic) 0.624161

### 2002, top 20%:

Dependent Variable: CCH  
Method: Least Squares  
Date: 08/03/10  Time: 14:52  
Sample: 1 194  
Included observations: 194

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>-0.212978</td>
<td>0.207661</td>
<td>-1.025605</td>
</tr>
<tr>
<td>CF</td>
<td>-0.008050</td>
<td>0.035456</td>
<td>-0.227047</td>
</tr>
<tr>
<td>Q</td>
<td>1.16E-07</td>
<td>2.54E-07</td>
<td>-0.457967</td>
</tr>
<tr>
<td>S</td>
<td>0.306613</td>
<td>0.026499</td>
<td>1.381683</td>
</tr>
</tbody>
</table>

R-squared 0.011904  Mean dependent var 0.073686  
Adjusted R-squared -0.003697  S.D. dependent var 0.114312  
S.E. of regression 0.114523  Akaike info criterion -1.475674  
Sum squared resid 2.491961  Schwarz criterion -1.408295  
Log likelihood 147.1404  Hannan-Quinn criter. -1.448391  
F-statistic 0.763018  Durbin-Watson stat 1.992314  
Prob(F-statistic) 0.516104
### 2003, bottom 20%:

Dependent Variable: CCH  
Method: Least Squares  
Date: 08/03/10   Time: 14:53  
Sample: 1 229  
Included observations: 229

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.364598</td>
<td>0.141577</td>
<td>2.575262</td>
</tr>
<tr>
<td>CF</td>
<td>-0.039845</td>
<td>0.042948</td>
<td>-0.927749</td>
</tr>
<tr>
<td>Q</td>
<td>-0.000284</td>
<td>0.000484</td>
<td>-0.588283</td>
</tr>
<tr>
<td>S</td>
<td>-0.033865</td>
<td>0.017794</td>
<td>-1.903206</td>
</tr>
</tbody>
</table>

R-squared: 0.020746  
Mean dependent var: 0.095233

Adjusted R-squared: 0.007690  
S.D. dependent var: 0.122290

S.E. of regression: 0.000507  
Schwarz criterion: -1.295279

Sum squared resid: 3.338940  
F-statistic: 1.588942

Durbin-Watson stat: 2.109118

Prob(F-statistic): 0.192875

### 2003, top 20%:

Dependent Variable: CCH  
Method: Least Squares  
Date: 08/03/10   Time: 14:54  
Sample: 1 229  
Included observations: 229

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.145174</td>
<td>0.129807</td>
<td>1.118381</td>
</tr>
<tr>
<td>CF</td>
<td>0.016474</td>
<td>0.021170</td>
<td>0.778191</td>
</tr>
<tr>
<td>Q</td>
<td>-0.000507</td>
<td>0.000485</td>
<td>-1.044151</td>
</tr>
<tr>
<td>S</td>
<td>-0.010677</td>
<td>0.016629</td>
<td>-0.642065</td>
</tr>
</tbody>
</table>

R-squared: 0.008568  
Mean dependent var: 0.060409

Adjusted R-squared: -0.004651  
S.D. dependent var: 0.077737

S.E. of regression: 0.077917  
Akaike info criterion: -1.355257

Sum squared resid: 1.365992  
Schwarz criterion: -1.295279

Log likelihood: 159.1769  
F-statistic: 0.648128

Durbin-Watson stat: 2.138251

Prob(F-statistic): 0.584885
### 2004, bottom 20 %:

Dependent Variable: CCH  
Method: Least Squares  
Date: 08/03/10   Time: 14:55  
Sample: 1 219  
Included observations: 219

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.393538</td>
<td>0.124771</td>
<td>3.154076</td>
</tr>
<tr>
<td>CF</td>
<td>0.088850</td>
<td>0.047676</td>
<td>1.863635</td>
</tr>
<tr>
<td>Q</td>
<td>-0.000514</td>
<td>0.000591</td>
<td>-0.868992</td>
</tr>
<tr>
<td>S</td>
<td>-0.036748</td>
<td>0.015606</td>
<td>-2.354715</td>
</tr>
</tbody>
</table>

R-squared 0.041485, Mean dependent var 0.099761
Adjusted R-squared 0.028110, S.D. dependent var 0.118024
S.E. of regression 0.116354, Akaike info criterion -1.446269
Sum squared resid 2.910709, Schwarz criterion -1.384367
Log likelihood 162.3664, Hannan-Quinn criter. -1.421268
F-statistic 3.101769, Durbin-Watson stat 2.028931
Prob(F-statistic) 0.027603

### 2004, top 20 %:

Dependent Variable: CCH  
Method: Least Squares  
Date: 08/03/10   Time: 14:56  
Sample: 1 219  
Included observations: 219

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.191256</td>
<td>0.197869</td>
<td>0.966576</td>
</tr>
<tr>
<td>CF</td>
<td>-0.060724</td>
<td>0.038952</td>
<td>-1.558951</td>
</tr>
<tr>
<td>Q</td>
<td>-0.004966</td>
<td>0.005036</td>
<td>-0.986106</td>
</tr>
<tr>
<td>S</td>
<td>-0.013659</td>
<td>0.025418</td>
<td>-0.537358</td>
</tr>
</tbody>
</table>

R-squared 0.016657, Mean dependent var 0.083672
Adjusted R-squared 0.002936, S.D. dependent var 0.106507
S.E. of regression 0.106351, Akaike info criterion -1.626056
Sum squared resid 2.431744, Schwarz criterion -1.564155
Log likelihood 182.0531, Hannan-Quinn criter. -1.601056
F-statistic 1.213972, Durbin-Watson stat 2.131278
Prob(F-statistic) 0.305556
Output for Euler Equations

100 smallest firms:

System: UNTITLED
Estimation Method: Generalized Method of Moments

Sample: 1 79
Included observations: 79
Total system (balanced) observations 79
White Covariance
Linear estimation after one-step weighting matrix

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C(1)</td>
<td>17995.15</td>
<td>8862.581</td>
<td>2.030464</td>
</tr>
<tr>
<td>C(2)</td>
<td>18603.06</td>
<td>8851.964</td>
<td>2.101574</td>
</tr>
<tr>
<td>C(3)</td>
<td>1.614001</td>
<td>0.433642</td>
<td>3.721961</td>
</tr>
</tbody>
</table>

Determinant residual covariance 4.13E+08
J-statistic 0.061706

S.E. of regression 20714.22
Durbin-Watson stat 2.045280

J-statistic*observations = 0.061706*79 = 4,87477

100 largest firms:

System: UNTITLED
Estimation Method: Generalized Method of Moments

Sample: 1 104
Included observations: 103
Total system (balanced) observations 103
White Covariance
Linear estimation after one-step weighting matrix

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C(1)</td>
<td>-402671.4</td>
<td>264202.1</td>
<td>-1.524104</td>
</tr>
<tr>
<td>C(2)</td>
<td>-227541.3</td>
<td>190502.5</td>
<td>-1.194426</td>
</tr>
<tr>
<td>C(3)</td>
<td>21.93527</td>
<td>9.746949</td>
<td>2.250476</td>
</tr>
</tbody>
</table>

Determinant residual covariance 1.24E+14
J-statistic 0.036468

S.E. of regression 11280721
Durbin-Watson stat 2.032940

J-statistic*observations = 0.036468*103 = 3,756204
Output for Heteroscedasticity testing

For 1998, 20% smallest firms:

Heteroskedasticity Test: White

<table>
<thead>
<tr>
<th></th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.727983</td>
<td>0.440597</td>
<td>1.652265</td>
<td>0.0985</td>
</tr>
<tr>
<td>CF^2</td>
<td>-0.004553</td>
<td>0.017089</td>
<td>-0.266429</td>
<td>0.7899</td>
</tr>
<tr>
<td>O^2</td>
<td>1.82E-08</td>
<td>6.12E-06</td>
<td>0.002978</td>
<td>0.9976</td>
</tr>
<tr>
<td>S^2</td>
<td>-0.021523</td>
<td>0.014133</td>
<td>-1.522930</td>
<td>0.1278</td>
</tr>
</tbody>
</table>

R-squared       | 0.000333    | Mean dependent var | 0.059324 |
Adjusted R-squared | -0.00097  | S.D. dependent var | 3.126579 |
S.E. of regression | 3.126731   | Akaike info criterion | 5.118427 |
Sum squared resid | 68180.96   | Schwarz criterion | 5.122353 |
Log likelihood   | -17854.19   | Hannan-Quinn criter. | 5.119780 |
F-statistic      | 0.773475    | Durbin-Watson stat | 2.001114 |
Prob(F-statistic)| 0.508661    |                     |          |

![Residual, Actual, Fitted graph]
1998 20% largest

Heteroskedasticity Test: White

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>F-statistic</td>
<td>45.42115</td>
<td>Prob. F(3,6974)</td>
<td>0.0000</td>
<td></td>
</tr>
<tr>
<td>Obs*R-squared</td>
<td>133.7287</td>
<td>Prob. Chi-Square(3)</td>
<td>0.0000</td>
<td></td>
</tr>
<tr>
<td>Scaled explained SS</td>
<td>994.2248</td>
<td>Prob. Chi-Square(3)</td>
<td>0.0000</td>
<td></td>
</tr>
</tbody>
</table>

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 08/03/10  Time: 12:01
Sample: 1 6979
Included observations: 6978

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.002973</td>
<td>0.004159</td>
<td>0.714851</td>
</tr>
<tr>
<td>CF^2</td>
<td>0.012924</td>
<td>0.001121</td>
<td>11.52618</td>
</tr>
<tr>
<td>Q^2</td>
<td>-2.05E-08</td>
<td>4.42E-08</td>
<td>-0.462395</td>
</tr>
<tr>
<td>S^2</td>
<td>0.000150</td>
<td>7.78E-05</td>
<td>1.925744</td>
</tr>
</tbody>
</table>

R-squared 0.019164  Mean dependent var 0.011555
Adjusted R-squared 0.018742  S.D. dependent var 0.044587
S.E. of regression 0.044167  Akaike info criterion -3.401117
Sum squared resid 13.60418  Schwarz criterion -3.397190
Log likelihood 11870.50  Hannan-Quinn criter. -3.399763
F-statistic 45.42115  Durbin-Watson stat 2.013634
Prob(F-statistic) 0.000000
Heteroskedasticity Test: White

<table>
<thead>
<tr>
<th></th>
<th>F-statistic</th>
<th>Prob. F(3,8599)</th>
<th>Obs*R-squared</th>
<th>Prob. Chi-Square(3)</th>
<th>Scaled explained SS</th>
<th>Prob. Chi-Square(3)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>13.04764</td>
<td>0.0000</td>
<td>38.98366</td>
<td>0.0000</td>
<td>171.2535</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 08/03/10   Time: 12:14
Sample: 1 8603
Included observations: 8603

<table>
<thead>
<tr>
<th></th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.065442</td>
<td>0.007365</td>
<td>8.885309</td>
<td>0.0000</td>
</tr>
<tr>
<td>CF^2</td>
<td>2.69E-06</td>
<td>4.96E-06</td>
<td>0.541200</td>
<td>0.5884</td>
</tr>
<tr>
<td>Q^2</td>
<td>2.04E-08</td>
<td>0.47E-07</td>
<td>0.082506</td>
<td>0.9342</td>
</tr>
<tr>
<td>S^2</td>
<td>-0.001459</td>
<td>0.000235</td>
<td>-6.213616</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

R-squared        | 0.004531    | Mean dependent var | 0.019855 |
Adjusted R-squared| 0.004184    | S.D. dependent var  | 0.058882 |
S.E. of regression| 0.058758    | Akaike info criterion | -2.830299 |
Sum squared resid | 29.68851    | Schwarz criterion    | -2.827017 |
Log likelihood    | 12178.53    | Hannan-Quinn crter.  | -2.829180 |
F-statistic       | 13.04764    | Durbin-Watson stat   | 1.969401 |
Prob(F-statistic) | 0.000000    |                        |          |
Heteroskedasticity Test: White

<table>
<thead>
<tr>
<th></th>
<th>F-statistic</th>
<th>Prob. F(3,8600)</th>
<th>Obs*R-squared</th>
<th>Prob. Chi-Square(3)</th>
<th>Scaled explained SS</th>
<th>Prob. Chi-Square(3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>F-statistic</td>
<td>2.533506</td>
<td>0.0551</td>
<td>7.597338</td>
<td>0.0551</td>
<td>48.32480</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 08/03/10  Time: 12:20
Sample: 1 8604
Included observations: 8604

<table>
<thead>
<tr>
<th></th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.016146</td>
<td>0.003121</td>
<td>5.173948</td>
<td>0.0000</td>
</tr>
<tr>
<td>CF^2</td>
<td>0.002276</td>
<td>0.001102</td>
<td>2.064114</td>
<td>0.0390</td>
</tr>
<tr>
<td>Q^2</td>
<td>-4.32E-09</td>
<td>1.47E-08</td>
<td>-0.294195</td>
<td>0.7686</td>
</tr>
<tr>
<td>S^2</td>
<td>-0.000100</td>
<td>5.65E-05</td>
<td>-1.774570</td>
<td>0.0760</td>
</tr>
</tbody>
</table>

R-squared | 0.000883 | Mean dependent var | 0.010777 |
Adjusted R-squared | 0.000534 | S.D. dependent var | 0.038460 |
S.E. of regression | 0.038449 | Akaike info criterion | -3.678479 |
Sum squared resid | 12.71391 | Schwarz criterion | -3.675197 |
Log likelihood | 15828.82 | Hannan-Quinn criter. | -3.677359 |
F-statistic | 2.533506 | Durbin-Watson stat | 2.014943 |
Prob(F-statistic) | 0.055103 |                     |           |
2000 20 % smallest

Heteroskedasticity Test: White

<table>
<thead>
<tr>
<th></th>
<th>F-statistic</th>
<th>Prob. F(3,7627)</th>
<th>Obs*R-squared</th>
<th>Prob. Chi-Square(3)</th>
<th>Scaled explained SS</th>
<th>Prob. Chi-Square(3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>F-statistic</td>
<td>12.19987</td>
<td>0.0000</td>
<td>36.44393</td>
<td>0.0000</td>
<td>2753.914</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 08/03/10   Time: 12:26
Sample: 1 7631
Included observations: 7631

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.230295</td>
<td>0.038768</td>
<td>5.940384</td>
<td>0.0000</td>
</tr>
<tr>
<td>CF^2</td>
<td>0.000732</td>
<td>0.000317</td>
<td>2.308179</td>
<td>0.0210</td>
</tr>
<tr>
<td>Q^2</td>
<td>-5.03E-08</td>
<td>8.03E-07</td>
<td>-0.062709</td>
<td>0.9500</td>
</tr>
<tr>
<td>S^2</td>
<td>-0.006710</td>
<td>0.001251</td>
<td>-5.364486</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

R-squared   | 0.004776    | Mean dependent var | 0.023528|
Adjusted R-squared | 0.004384 | S.D. dependent var  | 0.289415|
S.E. of regression     | 0.288780 | Akaike info criterion | 0.354218|
Sum squared resid      | 636.0435 | Schwarz criterion    | 0.357856|
Log likelihood         | -1347.520 | Hannan-Quinn criter. | 0.355466|
F-statistic            | 12.19987  | Durbin-Watson stat   | 2.025330|
Prob(F-statistic)      | 0.000000  |                     |          |

![Graph showing residuals, actual, and fitted values]
2000 20 % largest

Heteroskedasticity Test: White

<table>
<thead>
<tr>
<th></th>
<th>Value</th>
<th>Prob.</th>
<th>F-statistic</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>F-statistic</td>
<td>11.53078</td>
<td>0.0000</td>
<td>11.53078</td>
<td></td>
</tr>
<tr>
<td>Obs*R-squared</td>
<td>34.45426</td>
<td>0.0000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scaled explained SS</td>
<td>199.8546</td>
<td>0.0000</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 08/03/10   Time: 12:32
Sample: 1 7633
Included observations: 7633

<table>
<thead>
<tr>
<th></th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>-0.002229</td>
<td>0.003878</td>
<td>-0.574924</td>
<td>0.5654</td>
</tr>
<tr>
<td>CF^2</td>
<td>0.003921</td>
<td>0.000834</td>
<td>4.704072</td>
<td>0.0000</td>
</tr>
<tr>
<td>Q^2</td>
<td>-5.35E-09</td>
<td>1.87E-08</td>
<td>-0.285857</td>
<td>0.7750</td>
</tr>
<tr>
<td>S^2</td>
<td>0.000256</td>
<td>7.49E-05</td>
<td>3.424230</td>
<td>0.0006</td>
</tr>
</tbody>
</table>

R-squared       0.004514 Mean dependent var 0.011224
Adjusted R-squared 0.004122 S.D. dependent var 0.038251
S.E. of regression 0.038172 Akaike info criterion -3.692912
Sum squared resid 11.11615 Schwarz criterion -3.689275
Log likelihood 14098.00 Hannan-Quinn criter. -3.691664
F-statistic 11.53078 Durbin-Watson stat 1.988336
Prob(F-statistic) 0.000000
Heteroskedasticity Test: White

<table>
<thead>
<tr>
<th></th>
<th>Value</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>F-statistic</td>
<td>0.150562</td>
<td>Prob. F(3,7632)</td>
</tr>
<tr>
<td>Obs*R-squared</td>
<td>0.451895</td>
<td>Prob. Chi-Square(3)</td>
</tr>
<tr>
<td>Scaled explained SS</td>
<td>878.6389</td>
<td>Prob. Chi-Square(3)</td>
</tr>
</tbody>
</table>

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 08/03/10   Time: 12:37
Sample: 1 7636
Included observations: 7636

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.480422</td>
<td>0.609991</td>
<td>0.787589</td>
</tr>
<tr>
<td>CF^2</td>
<td>-0.000124</td>
<td>0.002253</td>
<td>-0.055183</td>
</tr>
<tr>
<td>Q^2</td>
<td>-1.29E-06</td>
<td>3.46E-05</td>
<td>-0.037278</td>
</tr>
<tr>
<td>S^2</td>
<td>-0.013148</td>
<td>0.019602</td>
<td>-0.670715</td>
</tr>
</tbody>
</table>

R-squared: 0.000059
Adjusted R-squared: -0.000334
S.E. of regression: 4.537823
Log likelihood: -22382.06
Durbin-Watson stat: 2.000515

Residual, Actual, Fitted
Heteroskedasticity Test: White

- **F-statistic**: 15.13847, Prob. F(3,7633) = 0.0000
- **Obs*R-squared**: 45.17045, Prob. Chi-Square(3) = 0.0000
- **Scaled explained SS**: 237.5810, Prob. Chi-Square(3) = 0.0000

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 08/03/10   Time: 12:42
Sample: 1 7638
Included observations: 7637

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.014066</td>
<td>0.003720</td>
<td>3.780919</td>
</tr>
<tr>
<td>CF^2</td>
<td>0.002937</td>
<td>0.000439</td>
<td>6.688589</td>
</tr>
<tr>
<td>Q^2</td>
<td>-1.19E-09</td>
<td>8.57E-09</td>
<td>-0.138299</td>
</tr>
<tr>
<td>S^2</td>
<td>-6.40E-05</td>
<td>7.34E-05</td>
<td>-0.870954</td>
</tr>
</tbody>
</table>

- **R-squared**: 0.005915
- **Adjusted R-squared**: 0.005524
- **S.E. of regression**: 0.035900
- **Akaike info criterion**: -3.815643
- **Sum squared resid**: 9.837412
- **Schwarz criterion**: -3.812008
- **Log likelihood**: 14574.03
- **Durbin-Watson stat**: 1.973637
- **Prob(F-statistic)**: 0.000000

![Graph of residuals, actual, and fitted values]
Heteroskedasticity Test: White

<table>
<thead>
<tr>
<th></th>
<th>F-statistic</th>
<th>Prob. F(3,6729)</th>
<th>Obs*R-squared</th>
<th>Prob. Chi-Square(3)</th>
<th>Scaled explained SS</th>
<th>Prob. Chi-Square(3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>F-statistic</td>
<td>3.579973</td>
<td>0.0133</td>
<td>10.72918</td>
<td>0.0133</td>
<td>2155.121</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 08/03/10   Time: 12:48
Sample: 1 6733
Included observations: 6733

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.270019</td>
<td>0.078639</td>
<td>3.433656</td>
</tr>
<tr>
<td>CF^2</td>
<td>0.000493</td>
<td>0.000567</td>
<td>0.870021</td>
</tr>
<tr>
<td>Q^2</td>
<td>-2.00E-07</td>
<td>4.68E-06</td>
<td>-0.042624</td>
</tr>
<tr>
<td>S^2</td>
<td>-0.007845</td>
<td>0.002527</td>
<td>-3.104644</td>
</tr>
</tbody>
</table>

R-squared 0.001594  Mean dependent var 0.027058
Adjusted R-squared 0.001148  S.D. dependent var 0.542683
S.E. of regression 0.542371  Akaike info criterion 1.614860
Sum squared resid 1979.444  Schwarz criterion 1.618909
Log likelihood -5432.427  Hannan-Quinn criter. 1.616258
F-statistic 3.579973  Durbin-Watson stat 2.003035
Prob(F-statistic) 0.013266
2002 20 % largest

Heteroskedasticity Test: White

<table>
<thead>
<tr>
<th></th>
<th>Value</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>F-statistic</td>
<td>4.798795</td>
<td>0.0024</td>
</tr>
<tr>
<td>Obs*R-squared</td>
<td>14.37419</td>
<td>0.0024</td>
</tr>
<tr>
<td>Scaled explained SS</td>
<td>69.68164</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 08/03/10 Time: 12:52
Sample: 1 6734
Included observations: 6734

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.010418</td>
<td>2.998726</td>
<td>0.0027</td>
</tr>
<tr>
<td>CF^2</td>
<td>0.002935</td>
<td>3.672526</td>
<td>0.0002</td>
</tr>
<tr>
<td>Q^2</td>
<td>3.13E-08</td>
<td>0.956812</td>
<td>0.3387</td>
</tr>
<tr>
<td>S^2</td>
<td>-6.54E-06</td>
<td>-0.096599</td>
<td>0.9230</td>
</tr>
</tbody>
</table>

R-squared       | 0.002135 | Mean dependent var | 0.010282|
Adjusted R-squared | 0.001690 | S.D. dependent var  | 0.032038|
S.E. of regression | 0.032010 | Akaike info criterion | -4.044915|
Sum squared resid | 6.896023 | Schwarz criterion    | -4.040867|
Log likelihood   | 13623.23  | Hannan-Quinn criter. | -4.043517|
F-statistic      | 4.798795  | Durbin-Watson stat  | 2.020234|
Prob(F-statistic)| 0.002429 |                           |        |

Residual vs. Actual vs. Fitted Graph
Heteroskedasticity Test: White

<table>
<thead>
<tr>
<th></th>
<th>Value</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>F-statistic</td>
<td>18.91214</td>
<td>0.0000</td>
</tr>
<tr>
<td>Obs*R-squared</td>
<td>56.35226</td>
<td>0.0000</td>
</tr>
<tr>
<td>Scaled explained SS</td>
<td>13074.34</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 08/03/10  Time: 12:58
Sample: 1 7736
Included observations: 7736

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.364518</td>
<td>0.087447</td>
<td>4.168450</td>
</tr>
<tr>
<td>CF^2</td>
<td>0.005587</td>
<td>0.000922</td>
<td>6.060575</td>
</tr>
<tr>
<td>Q^2</td>
<td>-4.01E-07</td>
<td>5.00E-06</td>
<td>-0.080159</td>
</tr>
<tr>
<td>S^2</td>
<td>-0.010835</td>
<td>0.002797</td>
<td>-3.874257</td>
</tr>
</tbody>
</table>

R-squared     | 0.007284   | Mean dependent var | 0.029485 |
Adjusted R-squared | 0.006899 | S.D. dependent var | 0.635510 |
S.E. of regression   | 0.633314  | Akaike info criterion | 1.924816 |
Sum squared resid    | 3101.202  | Schwarz criterion | 1.928412 |
Log likelihood       | -7441.190 | Hannan-Quinn criter. | 1.926049 |
F-statistic         | 18.91214  | Durbin-Watson stat | 2.009165 |
Prob(F-statistic)   | 0.000000  |                |       |
Heteroskedasticity Test: White

<table>
<thead>
<tr>
<th></th>
<th>F-statistic</th>
<th>Prob. F(3,7732)</th>
<th>Obs*R-squared</th>
<th>Prob. Chi-Square(3)</th>
<th>Scaled explained SS</th>
<th>Prob. Chi-Square(3)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10.35129</td>
<td>0.0000</td>
<td>30.94566</td>
<td>0.0000</td>
<td>158.4194</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 08/03/10   Time: 13:03
Sample: 1 7737
Included observations: 7736

<table>
<thead>
<tr>
<th></th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.015774</td>
<td>0.003484</td>
<td>4.527776</td>
<td>0.0000</td>
</tr>
<tr>
<td>CF^2</td>
<td>0.001118</td>
<td>0.000209</td>
<td>5.338528</td>
<td>0.0000</td>
</tr>
<tr>
<td>Q^2</td>
<td>-1.84E-09</td>
<td>1.98E-08</td>
<td>-0.093118</td>
<td>0.9258</td>
</tr>
<tr>
<td>S^2</td>
<td>-0.000104</td>
<td>6.75E-05</td>
<td>-1.541588</td>
<td>0.1232</td>
</tr>
</tbody>
</table>

R-squared | 0.004000 | Mean dependent var | 0.010521 |
Adjusted R-squared | 0.003614 | S.D. dependent var | 0.033685 |
S.E. of regression | 0.033624 | Akaike info criterion | -3.946624 |
Sum squared resid | 8.741699 | Schwarz criterion | -3.943029 |
Log likelihood | 15269.54 | Hannan-Quinn criter. | -3.945392 |
F-statistic | 10.35129 | Durbin-Watson stat | 2.024864 |
Prob(F-statistic) | 0.000001 |
### Heteroskedasticity Test: White

<table>
<thead>
<tr>
<th>Statistic</th>
<th>Value</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>F-statistic</td>
<td>12.91841</td>
<td><strong>0.0000</strong></td>
</tr>
<tr>
<td>Obs*R-squared</td>
<td>38.53110</td>
<td>0.0000</td>
</tr>
<tr>
<td>Scaled explained SS</td>
<td>585.7590</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

**Test Equation:**
- **Dependent Variable:** RESID^2
- **Method:** Least Squares
- **Date:** 08/03/10  **Time:** 13:08
- **Sample:** 1 5976
- **Included observations:** 5975

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.150156</td>
<td>0.022156</td>
<td>6.777141</td>
</tr>
<tr>
<td>CF^2</td>
<td>0.000603</td>
<td>0.000284</td>
<td>2.125458</td>
</tr>
<tr>
<td>Q^2</td>
<td>-6.51E-08</td>
<td>7.12E-07</td>
<td>-0.091463</td>
</tr>
<tr>
<td>S^2</td>
<td>-0.003907</td>
<td>0.000692</td>
<td>-5.645454</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Statistic</th>
<th>Value</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>R-squared</td>
<td>0.006449</td>
<td>0.025807</td>
</tr>
<tr>
<td>Adjusted R-squared</td>
<td>0.005950</td>
<td>0.142410</td>
</tr>
<tr>
<td>S.E. of regression</td>
<td>0.141986</td>
<td>-1.065512</td>
</tr>
<tr>
<td>Sum squared resid</td>
<td>120.3749</td>
<td>-1.061030</td>
</tr>
<tr>
<td>Log likelihood</td>
<td>3187.217</td>
<td>-1.063955</td>
</tr>
<tr>
<td>F-statistic</td>
<td>12.91841</td>
<td>1.997402</td>
</tr>
</tbody>
</table>

**Graph:**
- **Axes:**
  - X-axis: 1000, 2000, 3000, 4000, 5000
  - Y-axis: Residual, Actual, Fitted

**Legend:**
- Residual
- Actual
- Fitted
2004 20% largest

Heteroskedasticity Test: White

<table>
<thead>
<tr>
<th></th>
<th>Value</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>F-statistic</td>
<td>4.969625</td>
<td>0.0019</td>
</tr>
<tr>
<td>Obs*R-squared</td>
<td>14.88172</td>
<td>0.0019</td>
</tr>
<tr>
<td>Scaled explained SS</td>
<td>62.28888</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 08/03/10   Time: 13:12
Sample: 15978
Included observations: 5978

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.014440</td>
<td>0.004271</td>
<td>3.380670</td>
</tr>
<tr>
<td>CF^2</td>
<td>0.005257</td>
<td>0.001385</td>
<td>3.795772</td>
</tr>
<tr>
<td>Q^2</td>
<td>-9.60E-09</td>
<td>1.98E-08</td>
<td>-0.485711</td>
</tr>
<tr>
<td>S^2</td>
<td>-3.56E-05</td>
<td>8.10E-05</td>
<td>-0.439064</td>
</tr>
</tbody>
</table>

R-squared 0.002489  Mean dependent var 0.012800
Adjusted R-squared 0.001988  S.D. dependent var 0.037062
S.E. of regression 0.037025  Akaike info criterion -3.753775
Sum squared resid 8.189488  Schwarz criterion -3.749294
Log likelihood 11224.03  Hannan-Quinn criter. -3.752219
F-statistic 4.969625  Durbin-Watson stat 1.998569
Prob(F-statistic) 0.001912

![Residual vs Actual vs Fitted Plot]

---

Page 101
BI Norwegian School of Management

GRA 19002 - Preliminary Thesis Report

Financial Constraints for Norwegian Private Firms

Hand-in date: 15.01.2010

Campus: BI Oslo

Programme: Master of Science in Business and Economics

Supervisor: Bogdan Stacescu
# Table of Content

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summary</td>
<td>ii</td>
</tr>
<tr>
<td>4. Introduction</td>
<td>1</td>
</tr>
<tr>
<td>5. Literature Review</td>
<td>2</td>
</tr>
<tr>
<td>2.1 Characteristics of private firms</td>
<td>2</td>
</tr>
<tr>
<td>2.2 Financial Constraints</td>
<td>3</td>
</tr>
<tr>
<td>2.3 The determinants of Financial Constraints</td>
<td>5</td>
</tr>
<tr>
<td>2.4 Financial Constraints and a firm’s dividend policy and capital structure</td>
<td>7</td>
</tr>
<tr>
<td>2.4.1 Dividend Policy</td>
<td>7</td>
</tr>
<tr>
<td>2.4.2 Capital Structure</td>
<td>8</td>
</tr>
<tr>
<td>3. Methodology</td>
<td>9</td>
</tr>
<tr>
<td>4. Data</td>
<td>12</td>
</tr>
<tr>
<td>5. Research Question</td>
<td>13</td>
</tr>
<tr>
<td>Reference List</td>
<td>14</td>
</tr>
</tbody>
</table>
Summary

This preliminary thesis report aims to be an introduction and starting point to our master thesis where we aspire to investigate Norwegian Private Firms (Non-listed firms). The purpose of our paper is to find a measure for financial constraints and examine if there are differences between private and public firms with regard to this measure. Finally, we will explore the relationship between those constraints and firm specific variables like dividend payment and capital structure.

In section 1, we give an introduction to the subject.

In section 2, we present an extensive review of previous research and findings within our field of study in order to develop a knowledge base concerning our research questions.

In section 3, contains a description and explanation of the methodology of using Euler Equations in order to find a measure for financial constraints.

In section 4, we briefly explain how we will start the process of gathering and analyzing our data.

In section 5, our research questions are presented. These propositions are to some extent confirmed by findings in the literature we have reviewed in section 2. We would like to investigate these propositions:

*Proposition 1*: Non-listed firms are more financially constrained than listed firms.

*Proposition 2*: Firms facing financial constraints pay out less dividends than unconstrained firms.

*Proposition 3*: Firms facing financial constraints have more debt than unconstrained firms.

In addition we may want to extend our work with more research questions as we dig deeper into the subject.
1. Introduction

The purpose of this thesis is to examine non-listed firms. Our staring point is that non-listed firms do not have access to capital markets, thus this firms cannot easily issue new equity compared to listed firms. Based on this, one might expect that non-listed firms are more financially constrained than listed firms are.

In this thesis we want to find a measure for financial constraints and examine the existence of financial constraints for non-listed firms and listed firms. Then we will compare these results and analyze whether or not the difference is statistically significant.

In order to find a measure for financial constraints, we would to like to use the Euler equation approach, based on the framework established in the article *Financial Constraints Risk* by Whited and Wu (2003).

Additionally, we would like to study the relationship between financial constraints a firm’s dividend payout policy, capital structure and possible other firm specific variables.
2. Literature Review

2.1 Characteristics of private firms

Private firms amount to a huge part of the overall economy. About 80-90% of all Norwegian firms are private firms. (Berzins and Bøhren 2008). The research on private firms, in terms of finance and governance, are fairly modest. One explanation could be the limited access to data on private firms and the fact that they do not have a market price.

Non-listed firms differ from public firms in many ways, thus there is need for separate research. Compared to listed firms, private firms have no market price, not for the firm nor for the equity of the firm. Private firms operate in a less open equity market, thus it can be harder for them to achieve equity finance. However, this can make the danger of takeovers lower for private firms. Recent research by Berzins and Bøhren (2008) also states that private and public firms vary in terms of regulation. Minority owners in private firms can experience to be less protected in private firms due to less regulation. Moreover, private firms are less transparent than public firms, especially in terms of information. Finally, the stock-liquidity of private firms is to a greater extent lower than of public firms. This can lead to less short term earnings pressure.

Transformation of research done on public firms cannot easily be transformed to count for private firms as well. These differences make it interesting to do research on financial constraints on both sectors and comparing them, to study to what extent these differences are related with financial constraints.

Research done by Berzins and Bøhren (2008) discovered that private firms, compared to public firms, have more debt and shorter debt and higher dividends pr unit of earnings. Moreover, private firms are small and often much smaller than public. However, large firms tend to be private. 900 of Norway’s 1000 larges firms are in fact private.
With regard to these findings our intuition that non-listed firms are more financially constrained seems to be reasonable.

2.2 Financial Constraints

There are several definitions of Financial Constraints. Kaplan and Zingales (1995) give this definition: “A firm is financially constrained if the cost of availability of external funds precludes the company from making an investment it would have chosen to make had internal funds been available”.

Almeira et al. (2003) also gives a definition of financial constraints which is interesting for the purpose of this thesis. Inspired by Keynes (1936;196), they writes that if a firm has unrestricted access to external capital, the firm is financially unconstrained and there is no need to safeguard against future investment needs and corporate liquidity becomes irrelevant. With regard to the intuition that private firms not have unrestricted access to external capital, the hypothesis that private firms may be more financially constrained than public firms, seems reasonable.

Several studies have revealed that the significance of financial constraints is most likely to fluctuate over the business cycle and with the position of monetary policy. Structural changes in financial markets can change the degree of the importance of the composition of internal and external finance. These changes may influence the impact of financial constraints over time (Schiantarelli 1995).

One of the first to do a study within the area of financial constraints was Fazzari et al. (1988). They pointed out the fact that in perfect capital markets, a firm’s investment decisions are independent of its financial condition. However, firms are mostly not facing perfect capital markets and external funds are not always a perfect substitute for internal capital, particularly in the short run. In this paper, Fazzari et al. analyzed differences in investment in firms classified according to their earnings retention practices. Their results show that financial factors affect investments, and that the link between financing constraints and investment varies by type of firm.
Almeida et al. (2003) used the link between financial constraints and a firm’s demand for liquidity to develop a new test of the effect of financial constraints on firm policies. Theirs starting point is that firms who are financially constrained needs to save more of their incoming cash flows in order to be able to take on positive NPV projects as they appear. The effect of financial constraints can therefore be captured by a firm’s propensity to save cash out of incremental cash flows. They have called this effect the cash flow sensitivity of cash.

While constrained firms should have a positive cash flow sensitivity of cash, unconstrained firms’ cash savings should not be systematically related to cash flow. Their main finding confirms this hypothesis; firms that are more likely to be financially constrained, display a significantly positive cash flow sensitivity of cash, while unconstrained firms do not.

These findings imply that financial constraints are an important determinant of firm’s behavior. To be able to take on positive NPV projects in the future, firms anticipating financial constraints in the future respond to those potential constraints by hoarding cash today.

As originally proposed by Keynes (1936), a major advantage of a liquid balance sheet is that it allows firms to undertake valuable projects when they arise (Almeida et al. 2003;1).

The article giving the main framework for our thesis is Financial Constraints Risk, written by Toni M. Whited and and Guojun Wu (2003). Inspired by among others Fazzari et al. (1988), their starting point is that firms facing finance constraints will have investments who strongly respond to movements in cash flow (holding investment opportunities constant).

Tobin’s q has usually been used as a proxy for investment opportunities. Tobin’s q is a Q ratio defined as a ratio between two valuations of the same physical asset; market value over replacement value.

However, there are several difficulties in measuring q and using this as a proxy for financial constraints.
In the paper “Financial constraints and investment”, Fabio Schiantarelli investigates the methodological issues involved in testing for financial constraints on the basis of Q models of investments. He finds that the essential problem in using Q models in this matter is that average Q may be a very inaccurate alternative for the shadow value of an additional unit of new capital. He suggests addressing this problem by estimating the Euler equation for the capital stock derived from the underlying model. The benefit of the Euler equation approach is that it avoids relying on measures of profitability based on firm’s market value. The Euler equation approach addresses the same maximization problem as Q equations, but it reorganizes the first order condition in a different way.

Like in the paper by Whited and Wu, we will use Euler Equations in order to avoid the difficulties of measuring q. Using Tobin’s q is not feasible for analyzing non-listed firms. Since our thesis will include an examination of non-listed firms, using Euler Equations is an interesting alternative approach.

2.3 The determinants of financial constraints

Based on earlier mentioned definitions, one might say that financial constraints are highly related to the differences between the cost of internal- and external finance.

In order to understand relevance of financial constraint, one has to understand theories concerning capital structure. Capital structure can be defined as “a mix of a company’s long-term debt, specific short-term debt, common equity and preferred equity. The capital structure is how a firm finances its overall operations and growth by using different sources of funds” (Investopedia.com). Choosing an optimal capital structure may help to reallocate risk more efficiently. In addition it contributes to maintain liquidity in case of investment opportunities (Mjøs 2008).

The modern theory of capital structure has it’s origin in the Modigliani- Miller paper. According to the Modigliani Miller irrelevance substitutes Theorem (1958), a company’s capital structure should be unrelated to its value; it is irrelevant. Internal and external finances is therefore claimed to be perfect, and the company’s financing and investment decisions should not be affected by the
firms’ capital structure. However, with the existence of informational asymmetries and contract enforcement problems, the irrelevance hypothesis fails to perform, resulting in that the cost of external and internal finance are not perfect substitutes. With the presence of this situation, one might say that financial constraints exists (Schiantarelli 1995).

To recognize why internal and external financing sources may not be perfect substitutes, one might look at different factors that affect capital structure. Many theories states that that agency costs (costs due to conflicts of interests) determine the capital structure of companies (Harris and Raviv 1991). One might say that there are two main types of possible conflicts that can arise; between managers and equity holders, and between debt holders and equity holders.

Other theories use asymmetric information as explanation of capital structure. (Harris and Raviv 1991). Managers of the firm are assumed to have information that the firm’s return and investment opportunities that outsiders do not possess. This can for example lead to managerial discretion, where the manager exploits the asymmetric information balance in a negative way for the firm, thereby creating costs disadvantages of external finance/for the company (Stulz 1990).

The Pecking-order-theory can also help explain why different finance sources not are perfect substitutes. This theory categorizes the several forms of finance into a hierarchy. The theory states that due to the information asymmetry, companies will choose this order of financing; First use retained earnings and fund of current owners, then risk-free and risky debt and last raising new equity (Mjøs 2008).

Private and public firms have as mentioned in part 2.1, different capital structures. These differences are highly relevant for the explanation of why financial constraint may appear and not. The theories above help enlighten the reasons why they have different cap structure.
2.4 Financial Constraints and a firm’s Dividend Policy and Capital Structure

2.4.1 Dividend Policy

Paying dividend can serve many purposes, both negative and positive. This action can signal that the firm does not have any positive NPV projects to invest in or it can be used to signal their true worth to the market. It can signal good news because it decreases the amount of free cash flow in the firm, thus reducing agency costs. There exists three groups that are likely to be affected most by a firm’s dividend policy; shareholders, management and bondholders. Therefore, this action can lead to interest conflicts between the groups, at the worst leading to agency costs for the firm.

Dividend- payout is an important factor to take in consideration. Allen and Michaely (2002) found that payout policies are in fact not driven by the desire to signal the value of the firm, rather they found evidence of that payout policy was influenced of wanting to avoid potential overinvestment by managers. A challenge is to develop a payout- policy that maximizes firm value, and at the same time maximize the utility of the investors. (Allen and Michaely 2002)

Mjøs (2008) characterize dividend- payment to be “a strong indicator of “financial health”. Furthermore, he describes that dividend- payers tend to not be financially constrained and that these groups use a less amount of debt. He also states that these firms have total returns, that is twice of those firms not paying dividend.

Almeira et al. (2003; 14) groups constrained firms as firms who have significantly lower payout rations than unconstrained firms. This is the same intuition as proposed by Fazzari et al. (1988).

However, Berzins and Bøhren (2008) found that private firms tend to have higher dividends per unit of earnings compared to public firms. This finding contradicts our intuition.
2.4.2 Capital Structure

In this thesis, we will sort the firms into constrained and unconstrained firms by suggesting that non-listed firms cannot easily issue new equity and are therefore more financially constrained than listed firms. This assumption is supported by previous studies like e.g. Kaplan and Zingales (1997) who demonstrates that financially constrained firms have high debt to capital ratio, which is one of the characteristics of non-listed firms (see section 2.1).

Theories examined by Schiantarelli (1995) suggest that “internal funds are less costly than external finance” (Which also is supported by the Pecking-order theory). In addition it is important to highlight that outside finance can lead to losses or increased risk (Mjøs 2008). Schiantarelli thereafter states that an increase in liquidity is likely to lead to greater investment. These statements together indicates that a private firm, which tend to be more dependent on the external finance debt (which is more expensive), can experience lower liquidity and therefore loose opportunities to invest in positive NPV project. One of the reasons for this is that funds are needed to pay interest bearing debt, instead of being used to invest in new projects. This may support our intuition that Financial Constrained firms have a capital structure with more debt.

We will develop a framework for analyzing the relationship between these firm specific variables and financial constraints in the further steps of our thesis work.
3. Methodology

To find a measure for financial constraints, we will use an Euler Equation based on the framework developed by Whited and Wu (2003; 5-8), based on the work by Whited (1992, 1998).

The starting point is a partial-equilibrium investment model, where the firm maximizes the expected present discounted value of future dividends:

\[ V_{t0} = E_{t0} \sum_{t=0}^{\infty} \left[ \prod_{j=0}^{t} \beta_j \right] (d_{it}) \]

\( V_{t0} \) is the value of firm \( i \) at time zero, \( E_{t0} \) is the expectation operator conditional on firms \( i \)'s time zero information set, \( \beta_j \) is the one period discount factor common to all firms and \( d_{it} \) is the form’s dividend.

The firm maximizes \( V_{t0} \) with respect to dividends (a) and capital stock accumulation (b):

\[ a: \quad d_{it} = \pi(K_{it}, v_{it}) - \psi(l_{it}, K_{it}) - I_{it} \]

\[ b: \quad K_{i,t+1} = I_{it} + (1 - \delta_t)K_{it} \]

In a, we can see that the dividend is expressed by a profit function, \( \pi(K_{it}, v_{it}) \); the real cost of capital, \( \psi(l_{it}, K_{it}) \); and investments, \( I_{it} \) during time \( t \). \( K_{it} \) is the beginning-of-period capital stock, \( v_{it} \) is a shock to the profit function observed by the firm at time \( t \).

In b, the capital stock in one period is expressed by the investments plus the discounted capital stock which depreciates because of expected inflation.

The Euler condition for \( K_{it} \) is:

\[ E_{i,t-1} \left[ \beta_t \left( \frac{1 + \lambda_{i,t+1}}{1 + \lambda_{it}} \right) \left( \pi_K(K_{it}, v_{it}) - \psi_K(I_{it}, K_{it}) + (1 - \delta_t)(\psi_l(I_{it}, K_{it}) + 1) \right) \right] = \psi_l(I_{i,t-1}, K_{i,t-1}) + 1 \]

The right hand side of this equation represents the marginal adjustment and purchasing cost of investing today. The left hand side represents the expected discounted cost of waiting to invest until tomorrow. \( \lambda_{it} \) is the Lagrange multiplier associated with a constraint on outside finance:
If the outside equity is binding, the effects of external finance constraints will show up in the term \( \Lambda_{it} = \frac{1+\lambda_{it+1}}{1+\lambda_{it}} \) which is the relative shadow cost of external financing. For a financially constrained firm, \( \Lambda_{it} < 1 \). For an unconstrained firm, the term will be zero. In other words, this means that a constrained firm will act like it has a higher discount rate and will avoid investing today and prefer investing in the next period instead.

To make the model possible to estimate, the \( E_{i,t-1} \) is replaced by an expectation error term where \( E_{i,t-1}(e_{it}) = 0 \) and \( E_{i,t-1}(e_{it}^2) = \sigma_{it}^2 \).

The main equation will then look like this:

\[
\beta_t \Lambda_{it} \left( \pi_K(K_{it}, v_{it}) - \psi_K(I_{it}, K_{it}) + (1 - \delta_t)(\psi_l(I_{it}, K_{it}) + 1) \right) = \psi_l(I_{i,t-1}, K_{i,t-1}) + 1 + \epsilon_{it}
\]

Constant return to scale implies that \( \pi_K(K_{it}, v_{it}) = \frac{Y_{it} - \mu c_{it}}{K_{it}} \), where \( Y_{it} \) is output and \( C_{it} \) is variable costs.

The adjustment cost function is parameterized like this:

\[
\psi_K(I_{it}, K_{it}) = \left( \alpha_0 + \sum_{m=2}^{M} \frac{1}{m} \alpha_m \left( \frac{I_{it}}{K_{it}} \right)^m \right) K_{it}
\]

Where \( \alpha_m, m=2,\ldots, M \) are coefficients to be estimated and \( M \) is a truncation parameter that sets the highest power of \( I_{it}/K_{it} \).

By substituting \( \pi_K(K_{it}, v_{it}) = \frac{Y_{it} - \mu c_{it}}{K_{it}} \) into the main equation and differentiating the parameterized adjustment cost function with respect to \( K_{it} \) and \( I_{it} \) and substituting the derivatives into the main equation, gives us the final estimating equation:
In this model is unobservable, but possible to estimate by using observable firm characteristics. In fact, this parameter will be the main interesting parameter for us, as this will be the index of financial constraints. The lower the value of $\Lambda_{it}$, the greater the financial constraint for the firms is.

$\Lambda_{it}$ can be estimated both for listed and non-listed firms. Whited and Wu (2003) specifies $\Lambda_{it}$ like this:

$$\Lambda_{it} = b_0 + b_1 TLTD_{it} + b_2 DIVPOS_{it} + b_3 SG_{it} + b_4 LNTA_{it} + b_5 ISG_{it} + b_6 CASH_{it} + b_7 CF_{it} + b_8 NA_{it} + b_9 IDAR_{it}$$

Where $TLTD_{it}$ is the ratio of the long term debt to total assets, $DIVPOS_{it}$ is an indicator that takes the value of one if the firm pays cash dividends, $SG_{it}$ is a firms sales growth, $LNTA_{it}$ is the natural log of total assets, $ISG_{it}$ is the firm’s three-digit industry sales growth, $CASH_{it}$ is the ratio of liquid assets to total assets, $CF_{it}$ is the ratio of cash flow to total assets, $NA_{it}$ is the number of analysts following the firm and $IDAR_{it}$ is the three-digit industry debt to assets ratio.

One of the advantages of this model is that it takes variables like sales growth and industry sales growth, which is a good thing since our intuition is that only firms with good investment opportunities are likely to want to invest enough to be constrained. These firms are expected to belong to industries which have a high industry growth, but low industrial sales growth.

One of the purposes of our study is to examine the existence of financial constraints for non-listed firms and comparing this with the results for listed firms. Using a framework inspired by the one presented above, will makes us able to get a measure for financial constraints for both listed and non-listed firms.
However, we will have to make adjustments to this framework. This will be one of the next steps in our thesis work.

4. Data

We will provide our data of Norwegian non-listed firms from the CCGR (Centre for Corporate Governance Research) database. The statements extracted will be annual. We want to use data samples from as many years as possible. With regard to Norwegian listed firm-data, we will most likely use Datastream and other databases to collect data.

Concerning criteria for selecting our observations, this will be one our next steps in our thesis work.

In process of editing our data set, we will firstly eliminate firms that do not have our required variables.

Our procedure will consist of the Euler equation as the starting point; see section 3 for detailed steps.

Thereafter we will use the program SAS in order to get our sample and data management. Further we will use the estimation program Eviews to do econometric analysis on our data material and models.
5. Research Question

With regard to our work so far, we have defined these research questions which our thesis work will concentrated about:

*Proposition 1*: Non-listed firms are more financially constrained than listed firms.

*Proposition 2*: Firms facing financial constrains pay out less dividends than unconstrained firms.

*Proposition 3*: Firms facing financial constraints have more debt than unconstrained firms.

In addition we may want to extend our work with more research questions as we dig deeper into the subject.
Reference List


**Web-pages:**

[www.investopedia.com](http://www.investopedia.com)