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PECKING ORDER THEORY IN A BANK-CENTERED LENDING ENVIRONMENT – EVIDENCE FROM NORTH EUROPEAN ECONOMIES

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ABSTRACT

The purpose of this study is to find out whether North European firms follow the pecking order theory in their annual financing decisions. The hypotheses propose that the pecking order behavior is strong but weakens after the financial crisis. The effect of tightening financial regulation and various sub groups of firms are studied separately. North European economies differ from other developed economies in having a bank-centered financing environment which provides a relatively new and interesting environment to study firms' annual financing decisions.

The sample data from 2005 to 2014 consists of all publicly listed Finnish, Swedish, Norwegian, Danish and Icelandic firms with sufficient financial data available. Sufficient financial data enables studying annual financing decisions with various proxies for changes in firm capital structure and on various sub groups of firms. All regressions are adjusted for year and firm fixed effects in order to control for the effects of corporate restructurings and to reduce potential endogeneity problems

The results show strong support for pecking order behavior in Nordic firms' annual financing decisions. Previous studies have found evidence both for and against which implies that time period and market characteristics have an effect on firm financing decisions. Despite studying a variety of sub groups, the evidence is strong for all types of firms in the North European economies. The main implication is that all listed firms in the North Europe behave similarly in terms of their financing decisions.

One of the main purposes of this paper is studying the effect of tightening financial regulation. Utilising a dummy variable to study differences between two periods, the results are able to find positive and significant yet only a small difference in firm financing decisions. The results indicate that firms have begun to more diversify their funding after the financial crisis.

KEYWORDS: Pecking order, capital structure, North Europe, financial crisis

1. INTRODUCTION

Modigliani and Miller (1958) suggest that firm capital structure and thus financing decisions are irrelevant in perfect and efficient markets. Relaxing their assumptions brings up two important questions, what is the optimal choice between equity and debt financing and what is the optimal capital structure for firm? The pecking order theory is considered to be one of the most influential theories of firm capital structure decisions. The idea of a pecking order on financing instruments is widely studied but also a topic subject to controversy.

Myers (1984) argues that adverse selection and information asymmetry cause firms to prefer internal financing over external financing. When internal financing is insufficient, firms choose debt over equity due to lower information costs. Information costs can be addressed as possible mispricing of equity while debt is generally associated with a lower probability of mispricing. Equity financing is seen as a less cost efficient financing instrument and is thus used only when firms are debt constraint. Shyam-Sunder and Myers (1999) process the ideas of Myers (1984) into testable model, close to the one utilised in this paper.

Much research has been published related to pecking order theory. Various tests have been conducted on different markets and time periods with the model proposed by Shyam-Sunder and Myers (1999). In addition numerous researchers have tested the implications arising from the pecking order theory. Yet the evidence is relatively scattered and no clear consensus exists. For example papers studying solely US based firms find evidence both against and in favor of pecking order theory (see e.g. Lemmon and Zender, 2010; Frank and Goyal, 2003). Most of the research has been conducted on a broad sample of firms without any clear effort to isolate non-debt constraint firms. Therefore the mixed results achieved during the past 15 years are more or less expectable.

The generalised empirical model of pecking order theory, as suggested by Shyam-Sunder and Myers (1999), tests whether firm financing deficit is matched with an equal change in firm balance sheet interest bearing debt. The financing deficit item is supposed to include all cash flows and therefore function as a good proxy for external financing requirement. Thus if all observed firms follow pecking order theory a unit slope coefficient is found. A lower coefficient would mean that some part of annual financing deficit is financed with equity and a higher coefficient would mean that firms are gathering slump sums of cash by issued additional debt. Previous research has found the

coefficient to vary between 0.2 and 0.8 which clearly indicates both weak and strong support for the pecking order theory.

De Haan and Hinloopen (2003) find a slightly differing pecking order of bank debt over equity but equity over bond financing. This raises a question whether the differences of previous research could be explained by the differences in available debt instruments? Interestingly Modigliani and Perotti (1997) find that the level of legal enforcement, especially in financial market regulation, appears to explain some differences of firms' financing decisions between different countries. Most of the previous research has studied US market which is highly bond financing based. This rises the demand for further studies of pecking order theory in different markets.

This paper extends the work of Shyam-Sunder and Myers (1999) and Frank and Goyal (2003) by studying a highly bank-centered lending environment in Northern Europe. The data sample consists of publicly traded firms in Finland, Sweden, Norway, Denmark and Iceland over the 2005 to 2014 period. As the aftermath of financial crisis introduced changes to financial market regulation, the effect of regulatory reforms on firm financing decisions is also studied.

The financing deficit component is constructed of annual dividend payments, net investments, changes in working capital and operative cash flow. Thus the only requirement for Nordic firms is to have sufficient information available of these items. The evidence of 547 Nordic firms generally supports the pecking order theory as a vast majority of annual financing deficit is covered with debt issues, both bank and bond debt. The empirical evidence is in line with or even stronger than most of the other studies conducted on European firms.

The thesis is constructed in the following way. The theoretical part is included in chapters 2 and 3. The second chapter gives an introduction to common capital structure theories. In the third chapter a general overview of corporate financing environment in the studied countries is given. The fourth chapter presents data, hypotheses and methodologies. The results are presented in the fifth chapter and the sixth chapter discusses and compares the results to selected comparable studies. The seventh chapter concludes.

2. LITERATURE REVIEW

In this chapter general capital structure theories are presented. The most relevant capital structure theories for this study are presented more closely in sections 2.1-2.3. Theory of adverse selection and asymmetric information serves as the main theoretical background for this study. It creates the basis for understanding firms' choice of financing operative cash flow deficit. Trade-off theory on the other hand tries to explain the choice of capital structure rather than how financing deficit is financed. Section 2.4 presents a brief introduction to other relevant capital structure theories such as agency costs, relationship between firm capital structure and growth as well as firm operative strategy as a capital structure determinant.

The empirical tests in this study test the applicability of pecking order theory which stems from adverse selection and asymmetric information. Other theories help to understand the differences of pecking order theory's applicability between countries which is also a major part of this study. Thus a general introduction to other important theories such as trade-off theory and agency cost theory is justified. A closer introduction to some of the most noteworthy empirical studies of pecking order theory is presented in section 2.2. The empirical tests in this paper closely follow studies from Shyam-Sunder and Myers (1999) and Frank and Goyal (2003). Also in order to provide perspective some selected empirical results for other theories are briefly presented in their respective sections.

It shoud also be noted that multiple capital structure theories can apply to financial markets at the same time. Some theories are focused on annual financing decisions while some on optimal capital structure. Therefore firms can follow one theory in annual financing decisions but also adjust their capital structure in the long-run. Thus small violations in empirical results from one theory do not mean that the theory does not apply but rather that there might exists other factors or reasons which also determine firms' behavior.

2.1. THE MODIGLIANI-MILLER THEOREM OF CAPITAL STRUCTURE IRRELEVANCY

The foundation of the theory of firm's average cost of capital and thus the firm's capital structure can be traced back to Modigliani-Miller theorem of capital structure. The original paper (Modigliani & Miller 1958) makes three proposals concluding that firms' capital structure is irrelevant in a world without taxes, bankruptcy costs, agency costs or

information asymmetries. This obviously implies that if these factors exist then firm capital structure choice is driven by these or some other factors. The paper proposes that in efficient capital markets arbitrageurs correct any price differences resulting from differences in the asset's financing structure. The theorem thus creates a basis for observing the effects of violating these assumptions.

The first proposal states that in equilibrium the value of an asset is independent of its capital structure. The proposition suggests that it is irrelevant whether a stream of income is generated from equity or debt if they are similar in all meaningful aspects. Therefore two equivalent income streams of a firm must also be equally priced or an arbitrageur could exploit the discrepancy by for example buying lower priced stock and selling higher priced bond (Modigliani et al. 1958: 271). Hence a firm cannot change the value of its businesses by changing debt to equity or vice versa.

The second proposal states that a firm's average cost of capital is a linear function of the firm's leverage ratio. Given that the cost of debt is constant at all levels of leverage, the average cost of capital of a firm is the relative combination of its levered cost of equity and its cost of debt with respect to its current capital structure. Therefore the average cost of capital is constant at different levels of debt as the levered cost of equity increases with higher leverage. (Modigliani et al. 1958: 269)

The third proposal concludes the first and second proposals. In the third proposal a firm should always execute an investment opportunity if the rate of return on the investment is equal or higher than the firm's average cost of capital. As suggested earlier, firm's average cost of capital is independent on its capital structure. As a consequence the choice of investing is independent on the type of security it is financed with.

Modigliani et al. note that actual capital markets have various inefficiencies. Practically every legislation allows interest payments to be deducted from taxable income. Therefore as an extension to the basic theorem of capital structure irrelevancy, Modigliani et al. (1958: 272-281) revise some of the assumptions to illustrate market conditions more realistically. Firstly, corporate taxation is accounted in the theory. Interest payment deductibility alters the basic propositions as the average cost of capital is no longer identical with different levels of leverage. As leverage lowers tax payments, the average cost of capital decreases with higher leverage. Therefore the value of a levered firm equals the value of an unlevered firm and the value of tax shield generated by debt. Furthermore this implies that an optimal capital structure for a firm is achieved by being completely

financed with debt if bankruptcy costs are excluded. In other words bankruptcy costs combined with leverage determine the optimal capital structure for a firm.

Secondly, due to the existence of variation in interest rates the interest expenses of a firm tend to increase with higher leverage. The cost of borrowing additional funds increases with leverage but is evened out by an equivalent decrease in firm's cost of equity funding. Therefore the average cost of capital from all sources of funding is still independent of the firm's capital structure with the exception of the tax effect. (Modigliani et al. 1958: 272- 274)

Despite the Modigliani-Miller propositions being criticised and subject to controversy (see e.g. Durand 1989; Rose 1959; Stiglitz 1967) they have been accepted as an implication of equilibrium in perfect capital markets (Miller 1988). In order to illustrate capital structure decisions in real world capital markets several additional theories with relaxed MM assumptions have been developed. As a result it has been argued that the Modigliani-Miller theorem of capital structure irrelevancy does not describe a realistic image of firm financing but instead provides a basis for examining why the way of financing may matter (Frank & Goyal 2005: 7). Broad studies of Harris and Raviv (1991) and Feld, Heckemeyer and Overesch (2011) show that theories of agency costs, corporate control, information asymmetry, utilisation of tax benefits and product-input markets as capital structure determinants have been empirically successful in describing firm financing behavior and chosen leverage level.

2.2. ADVERSE SELECTION AND ASYMMETRIC INFORMATION

In his book Donaldson (1961) studies financing patterns of large firms and observes that firms favor internal financing over external financing. In a financing deficit firms' issue debt over equity which implies a pecking order of internal over external financing and debt over equity financing. Later Myers (1984) and Myers and Majluf (1984) follow that the pecking order of financing derives from information asymmetry between existing stockholders and firm management. Myers (1984) and Myers and Majluf (1984) argue that due to information asymmetry raising equity to finance a positive net present value (NPV) project involves uncertainty of the price of the issued equity. Thus raising overpriced equity might turn a positive net present value project negative. Therefore firms with insufficient internal financing and investment opportunities with positive NPV sometimes rather forego the opportunity than issue undervalued risky securities. It is therefore generally preferable to issue safe than risky securities as safe securities are

considered to involve less undervaluation. Debt is considered safer than equity as debt securities have generally higher protection against bankruptcy.

In their paper Myers and Majluf (1984: 46-47) conclude that stockholders are better off when firms build excess cash through restricting dividend payment. This derives from being able to execute positive NPV investment opportunities when they rise compared to being forced to use external financing. This is obviously more evident for more profitable companies. Therefore more profitable firms should have lower leverage ratio (see e.g. Hovakimian, Opler & Titman 2001; Titman & Wessels 1988).

Many researchers have further studied the choice between debt and equity financing and whether the choice is as simple as stated by Myers (1984). For example Cadsby, Frank and Maksimovic (1998) and Noe (1989) examine the possibility of several equilibriums of the debt-equity choice of financing due to asymmetric information between investors and management. They conclude that there in fact exist multiple equilibriums and factors such as signaling opportunity, learning and path dependence dominate over formal equilibrium selection. Investors seem to pay more attention to market prices than theoretical prices. (Cadsby et al. 1998: 226). Also if debt financing options which have equity characteristics (e.g. convertible or hybrid bonds) are available then firms' preference for debt over equity may not be as simple as previously stated (Cadsby et al. 1998).

Halov and Heider (2004) argue that if firm issues debt with default risk then it is not evident that asymmetric information leads to preference of debt over equity. They show that there in fact exists two extremes as if there is no asymmetric information of the firm's risk then debt is preferred. And vice versa if there is only asymmetric information of the firm's riskiness then equity is preferred. Therefore there exists a relationship between investors acknowledging the firm's riskiness and the debt-equity preference (Halov & Heider 2004: 2)

In order to counter the adverse selection issue of equity financing Eckbo and Masulis (1992) and later Eckbo and Norli (2004) have studied the effects of allowing current shareholders to participate in new equity financing. In their paper Eckbo and Norli (2004) observe a pecking order of equity floatation method choices meaning that firms anticipating active participation of current shareholders face low adverse selection and thus prefer to issue uninsured rights. On the other hand firms that expect low participation

from current shareholders generally issue underwritten equity rights. (Eckbo and Norli 2004: 29-31)

Fama and French (2002) observe that larger and financially stable firms (i.e. dividend paying firms) prefer debt financing when retained earnings are insufficient without reducing dividend payments. Smaller firms (i.e. those which do not pay dividends) also prefer debt for short-term financing requirement while equity is preferred for long-term financing requirement. Equity preference for financially weaker firms is in line with pecking order through the risk factor however Fama and French (2002: 30) find that in fact lower leverage has historically correlated with larger equity issues for firms with no annual dividend payments. In their broad study Harris and Raviv (1991) list various complementing results of leverage increasing with decreasing profitability and with firm value.

One of the most renowned empirical tests on Myers and Majluf's (1986) pecking order theory is Shyam-Sunders and Myers (1999) paper. They studied 157 large US firms which had continuous data available from 1971 to 1989. Shyam-Sunder and Myers (1999) tested both the static trade-off theory and the pecking order theory. First they build a model in which a unit of financing deficit should result in an even change in firm debt. Thus the slope coefficient in pecking order theory should be one. Financing deficit derives from firm cash flows being inadequate to finance annual dividends, investments and change sin working capital. Shyam-Sunder and Myers (1999) find the slope coefficient to vary between 0.69 and 0.85 with coefficient of determination varying between 0.68 and 0.86 (table 2 on page 230 in Shyam-Sunder and Myers 1999). They show that firms' financing deficit is mostly financed with debt which they interpret as supportive evidence for pecking order theory.

Shyam-Sunder and Myers' (1999) paper invoked discussion and studies of pecking order theory. Similar paper from Frank and Goyal (2003) studies pecking order theory on a broader range of firms and longer period. Their sample consists of 768 firms operating from 1971 to 1998. They show results which are contrary to those from Shyam-Sunder and Myers (1999). While firms do use external financing the preferance for debt is not evident. With the same model, restrictions and time period (as used in Shyam-Sunder and Myers 1999) Frank and Goyal (2003) find the beta coefficient and coefficient of determinations to be lower for their broader range of firms. They report that the pecking order theory performs best among the largest firms. Also a sub-sample of firms with strictly positive dividends receives relatively high beta coefficient and explanatory power.

Frank and Goyal (2003) also find that pecking order theory performs even weaker with the 1990s data: The explanatory power seems to decay over time. This was also suggested by Shyam-Sunder and Myers (1999) who argued that low R^2 in 1980s is explained by firms undertaking leveraged restructurings. Thus it seems that the pecking order theory does well among large and stable firms but other factors have begun to drive firm financing decisions. Bharath, Pasquariello and Wu (2009) study financing behavior of US firms over the period of 1973-2002. They used an information asymmetry index as an additional variable in the standard financial deficit based model. Bharath et al. (2009) find that information asymmetry does enhance the explanatory power of the standard pecking order model.

Myers (1984) also notes that firms should prefer negotiable bank debt over public debt which is usually issued in standard terms. De Haan and Hinloopen (2003) study financing decisions of 153 firms from 1984 to 1997. They estimate ordered probit models for each possible financing hierarchies between internal financing, bank debt, public bonds and equity issues. Results support pecking order theory but face an unexpected difference between equity issues and bonds. Bank financing is preferred over equity issues but equity issues are preferred over bonds. They propose that the difference originates from relative underdevelopment of Dutch bond market. The level of developed of corporate lending market in a particular country seems to play an important role in firm financing decisions. Esho, Sharpe and Wu (2001) find that firms from countries with developed corporate lending market are more likely to be able to access international lending markets. They also find significant differences in the determinants of financing instruments between countries with different levels of corporate lending market development.

La Porta, Lopez-de-Silanez, Schleifer and Vishny (1997) show that legal environment of corporate finance and quality of its enforcement vary significantly between countries. They show that the legal environment (French, English, German or Scandinavian) has an important role in determining the relative indebtedness of firms and size of external equity market. Modigliani and Perotti (1997) stress the same issues through enforcement of regulation. They argue that the level of enforcement is an important determinant in firm's choice between equity and bank debt financing.

De Fiore and Uhlig (2005) present differences between US and European corporate lending market. Generally corporate lending market is divided between bond and bank financing. Bank financing includes both bilateral and syndicated loans while bond

financing consists of all types of publicly traded corporate bonds. De Fiore and Uhlig (2005) report that in the early 2000s bank to bond finance ratio was approximately 0.7 in US and 5.5 in Europe while debt to equity ratio was on average 0.4 in US and 0.6 in Europe. De Haan and Hinloopen (2003) argue that the pecking order between equity financing, bonds and bank debt seems to be dependent on the local financing market. As a conclusion the results from De Fiore and Uhlig (2005) and De Haan and Hinloopen raise an interesting question whether the applicability of pecking order theory actually depends on the characteristics of the local financing market. Since empirical studies have been mostly executed with US based firms. The latest conclusion among researchers is that the pecking order theory is not the driving factor in firm financing decisions. The possibility of the underlying market conditions affecting the applicability of the pecking order theory creates a demand to conduct further tests in a bank concentrated lending market.

2.3. TRADE-OFF THEORY

Trade-off theory derives from Modigliani-Miller capital structure irrelevancy theorem and particularly from the tax-added model which implies that an optimal capital structure for a firm is achieved by being completely financed with debt if bankruptcy costs are excluded. According to the theory an optimal capital structure for a firm, in a world where bankruptcy costs exist, derives from a trade-off between the value of interest tax shields and the costs of bankruptcy. The classical trade-off theory (see e.g. Baxter 1967, Kraus and Litzenberger 1973, Scott 1976) proposes that firms set a target leverage ratio which maximises interest tax shields while minimising costs of bankruptcy thus resulting in an optimal capital structure. After setting the optimal leverage ratio firms then gradually move towards the target. Dynamic trade-off theory on the other hand considers capital structure policy as a continuous process. The theory is based on firms refinancing periodically, generating equity continuously and distributing funds periodically. Thus their leverage ratios can be expected to fluctuate and deviate from theoretical optimal level (Goldstein, Ju & Leland 2001).

2.3.1. STATIC TRADE-OFF THEORY

A simple presentation of the static trade-off theory is illustrated in figure 1. And a more advanced presentation of the static trade-off theory is presented by Bradley, Jarrell and Kim (1984). Their single-period model accounts for the trade-off between the benefits and costs of debt, the agency costs of debt as presented by Jensen and Meckling (1976)

and the effects of non-debt tax shields as well as the differences between personal and corporate taxation presented by DeAngelo and Masulis (1980). However an illustration of Bradley et al. (1984) model is close to that in figure 1. The empirical evidence is somewhat mixed on the static trade-off theory. For example Bradley et al. (1984) find that optimal leverage ratio is negatively related to bankruptcy costs and to the amount of non-debt tax shields. They also find that if bankruptcy costs are substantial then optimal leverage ratio is also negatively related to volatility of firm profitability. The results generally support the theory of firms setting optimal leverage ratio and gradually moving towards it apart from the negative relationship between leverage and non-debt tax shields. On the contrary for example Titman and Wessels (1988) have found less promising results of relation between debt tax shields and bankruptcy costs by using different proxies for leverage, bankruptcy costs and profitability.

Frank and Goyal (2005) present some valid critique on Bradley et al. (1984) paper. Firstly, most of the model's factors are not observable and thus proxies must be used. Frank and Goyal (2005) argue that the negative relationship between leverage and non-debt tax shields could in fact stem from the use of wrong proxies. Lastly they argue that the model lacks some key factors such as retained earnings and does not take into account possible mean reversion of capital structure. Some other relevant static trade-off studies such as ones from Opler and Titman (1994) and Jalilvand and Harris (1984) find clear evidence that firms do adjust towards target debt ratios.

Interestingly, Shyam-Sunder and Myers (1999: 221-223) provide an alternative conclusion, arguing that many earlier researchers have misinterpreted their results. They argue that the supportive results could as well derive from mean reversion in debt ratios. Thus empirical results have not been able to confirm whether a firm's adjusting behavior is a result of trade-off between costs and benefits of debt or reversion towards industry mean. They point out that e.g. results from Masulis (1980) of firm equity issues resulting in negative changes in firm's security prices do not support static trade-off theory. Also for example Titman and Wessels (1988) have found negative relationship between firm profitability and leverage ratios which should, according to trade-off theory, be positive. Thus it seems that despite a static tradeoff model yielding supportive results other studies testing the underlying assumptions of the theory show less promising results. As a conclusion static trade-off theory has received relatively contradictive results depending on theoretical approach and estimation methods as presented by Harris and Raviv (1991).

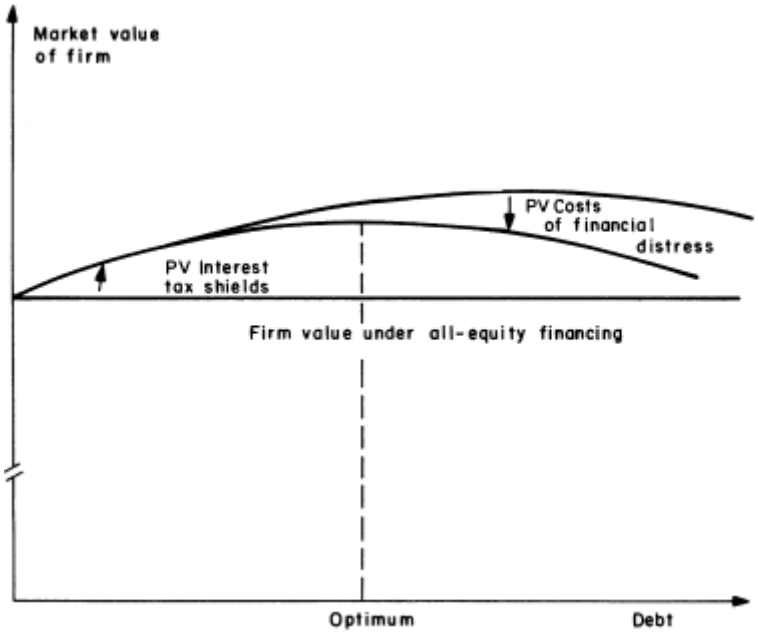

Figure 1. Firms choose a debt level which maximises the market value. Shyam-Sunders & Myers (1999: 220)

2.3.2. DYNAMIC TRADE-OFF THEORY

Empirical evidence shows that actual firm debt ratios seem to vary relatively widely between firms in same industry. Therefore firms either deviate from target capital structure on purpose or targets are misunderstood by researchers. Myers (1984) argues that relatively low determination coefficients of static trade-off theory derive from adjustment costs firms face when adjusting their capital structure. The classical static trade-off theory excludes adjustment costs, market expectations and uncertainty. These presented factors usually develop continuously and therefore in order to account for these factors static model has to be developed into a dynamic model. Kane, Marcus and McDonald (1984), Brennan and Schwartz (1984) and Fischer, Heinkel and Zechner (1989) have been major contributors to the dynamic trade-off theory.

First versions of dynamic models (e.g. Kane et al. 1984; Brennan & Schwartz 1984) suggested that optimal leverage includes a dynamic aspect (Brennan and Schwartz 1984) and that the trade-off between costs and benefits of debt has a minor role in firm financial policy (Kane et al. 1984). These contradicting results were later analysed by Fischer et al. (1989) and further developed into an advanced model in which firms were able to recapitalise but faced transaction costs while doing so. Fischer et al. (1989) argue that firms do not have a single optimal leverage ratio but an optimal range deriving from

adjustment costs. Their main contribution is to *"determine the critical upper and lower financial leverage ratios at which transaction costs are incurred to rebalance the firm's financial structure"* (Fischer et al. 1989: 20).

Fischer et al. (1989) suggest that transaction costs lead to lag in firm financial policy execution which in turn explains differences in intra-industry leverage levels. Their results provide evidence of transaction costs having great importance in firm rebalancing behavior. They show that benefits of debt are greater with higher corporate tax rate and lower with personal tax rate (which is consistent with DeAngelo & Masulis 1980). Volatility of earnings negatively correlates with industry mean leverage ratio and higher volatility firms also let their leverage ratios fluctuate more heavily. The results imply that firms which are smaller, riskier, have lower tax rate and lower bankruptcy costs experience larger variation in their leverage ratios over time.

Goldstein et al. (2001) show that since in reality firms refinance periodically, generate equity continuously and distribute funds periodically then their leverage ratios can be expected to fluctuate and deviate from theoretical optimal level. Empirical findings generally support their predictions (see figure 2) however they note that the model biases the optimal capital structure downward. Thus one should be careful when modeling downward recapitalisations which take place when firms face financial distress and break debt covenants. Issues affecting downward recapitalisations comprise equity related

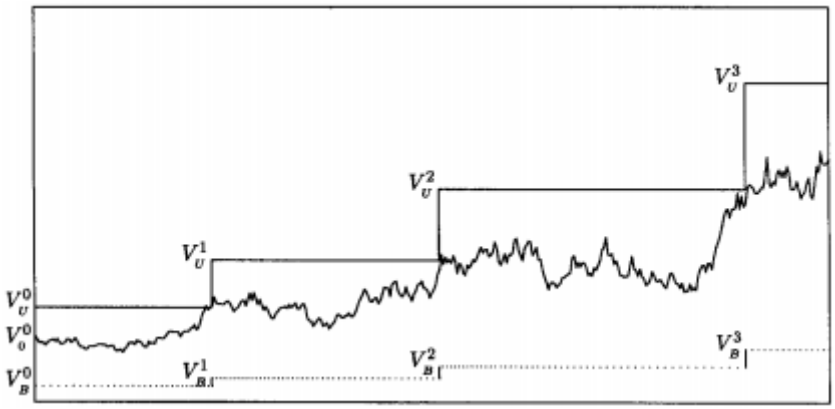

Figure 2. A typical sample path of firm value with log-normal dynamics. Goldstein et al. (1980: 500)

Figure 2 shows that initially, firm value is $\boldsymbol{V_O^0}$. Period 0 ends either by firm value reaching $\boldsymbol{V_B^0}$, at which point the firm declares bankruptcy, or by firm value reaching $\boldsymbol{V_U^0}$, at which point the debt is recalled and the firm again chooses an optimal capital structure. Note that the initial firm value at the beginning of period 1 is $\boldsymbol{V_O^1} = \boldsymbol{V_U^0} = \boldsymbol{\gamma V_O^0}$. Due to log-normal firm dynamics, it will be optimal to choose $\boldsymbol{V_U^n} = \boldsymbol{\gamma^n V_U^0}$, $\boldsymbol{V_B^n} = \boldsymbol{\gamma V_U^0}$.

concessions in financial distress, asset substitution, U.S. Chapter 11 protection (and similar bankruptcy related laws in other countries) and asymmetric information. (Goldstein et al. 1980)

2.4. BRIEF OVERVIEW OF OTHER CAPITAL STRUCTURE THEORIES

Capital structure theories based on agency costs, leverage and growth, and strategic choices on capital structure determination are presented in this section.

2.4.1. AGENCY COSTS AND BENEFITS OF DEBT

Agency costs associated with debt are considered an alternative theory of capital structure determination. Traditional agency theory of ownership structure was first proposed by Jensen and Meckling (1976) by combining the theories of agency costs, property rights and finance. They argue that empirical findings of suboptimal debt levels derive from agency costs associated with debt. These agency costs consist of value decreasing impact of debt as managers undertake risky value decreasing investments, monitoring expenses caused by bondholders and managers, and bankruptcy and liquidation costs (Jensen & Meckling 1976: 51).

Jensen and Meckling (1976) point out that agency costs discourage the use of debt but on the other hand tax deductibility of interest payments encourages the use of debt. In other words according to agency theory, the optimal use of debt derives from a trade-off between tax deductibility of interest expenses and agency costs. Thus it can be considered as a revised version of the static trade-off theory. For example Lubatkin and Chatterjee (1994) and Pinegar and Wilbricht (1989) empirically find that increasing leverage protects firm shareholders from excessive monitoring expenses. Similarly Vos and Forlong (1996) find that both agency costs and agency benefits of debt are significant for more mature firms. Their study shows that there is variation between small and mature firms as small firms experience negative agency benefits of debt. Thus it appears that agency costs and agency benefits of debt strengthen during the life cycle of a firm (Vos & Vorlong 1996: 209).

2.4.2. RELATIONSHIP BETWEEN FIRM LEVERAGE AND GROWTH OPPORTUNITIES

When firms generate free cash flows they have the opportunity to either distribute the funds to their shareholders or invest to new projects. Jensen (1989) argues that managers tend to rather invest in projects with negative NPV as manager compensation tends to increase with firm size. Investments to negative NPV projects might increase firm size but not its value since they possess negative expected value. Similarly Lang, Stulz and Ofek (1996) find evidence that there exists a negative relation between firm leverage and growth. They argue that highly levered companies are not able to finance new projects and firms with negative NPV growth opportunities are likely to be prohibited from engaging in new projects.

Correlation of leverage ratio and growth opportunities also varies between high- and low-growth firms. Firms with low amount of future growth opportunities (measured by Tobin's q) in fact face negative relation between firm leverage and growth. Lang et al. (1996: 22) point out that firms which face high amount of future growth opportunities are recognised by investors and thus explaining the results of insignificant correlation coefficient.

2.4.3. FIRM PRODUCT MARKET INTERACTIONS AND OTHER STRATEGIC CHOICES ON CAPITAL STRUCTURE DECISIONS

New scientific literature links firm capital structure decisions and product market strategy together. Firm leverage ratio affects equity's rate of return which is also implicitly affected by firm product strategies. Product market strategy and leverage relationship idea was originally presented by Brander and Lewis (1986) and is based on Jensen and Meckling (1976) idea of higher debt levels influencing managers to undertake riskier projects. Brander and Lewis (1986) present a Cournot competition model (duopoly model in which firms can only compete in quantities) where firms increase risk through aggressive product strategy and thus choose higher debt level. Shareholders of levered companies receive positive rate of return only when firms are profitable (due to limited liability). As a consequence higher debt level induces firms to increase production. In the model firms have incentives to produce more since it causes their competitor to produce less. As a result both firms choose an equilibrium which includes positive debt levels and increased output. Brander and Lewis (1986) point out that firms in monopoly position or in highly competitive industries choose lower debt levels and lower output.

These implications of industry effects on firm capital structure decisions are noteworthy and might further explain variation between firm leverage ratios. Titman and Wessels

(1988) suggest that firms with specialised product offering have lower leverage ratios than those with generalised offering. They further note that firm uniqueness within it's industry measured by research and development expenses, marketing expenses and employee turnover seems to result in these firms choosing below industry-median debt levels. However for example Bowen, Daley and Huber Jr. (1982) note that tax shelters (resulting from e.g. investment tax credit, depreciation and operating loss carryforwards) have a significant role in explaining differences between intra-industry leverage ratios.

It can also be argued that the relationships between firm product strategy, uniqueness, tax shelters and leverage ratios are not entirely evident. Harris and Raviv (1998) further note that strategic factors other than product prices and output have not been studied. These other strategic factors include e.g. targets of research and development expenses, firm production location, other product characteristics and advertising strategy. Also for example Showalter (1995) argues that in the duopoly model (by Brander and Lewis 1986) firm's strategic debt choice depends on the uncertainty it faces. Despite of the above-mentioned duopoly model being overly simplified, it is likely that debt can serve as a strategic tool. The magnitude of those strategic decisions can vary between different industries and thus industry effects in empirical research are worthy of noticing and controlling for.

3. CORPORATE FINANCING IN THE NORTHERN EUROPE

There exists notable differences in firms' capital structure choices and leverage ratios between different countries. Capital market development, legal environment and other factors help to explain these differences. This chapter aims to provide a general understanding of capital market development, legal environment, firms' capital structure choices and other relevant characteristics in Sweden, Finland, Norway, Denmark and Iceland.

Corporate lending environment has changed notably during the last five years as the aftermath of the financial crisis in 2009 created a demand for regulatory reforms. Implementation of Basel III, particularly through stricter capital requirements, is estimated to increase lending rates (Cosimano & Hakura 2011). Thus firms have begun to diversify their funding which has resulted in a clear increase in the use of bonds. As a result, albeit not being the only factor, the Nordic debt security market has developed significantly since 2009.

The Nordic countries are relatively integrated and are thus similar in many aspects. Corporate lending is still very bank concentrated in all Nordic countries. The Nordics countries share a Scandinavian legislation principle and the financial market legislation is similar. Same large Nordic banks have significant presence in all Nordic countries and the countries share a common stock exchange with the exception of Norway. Thus also the corporate bond market is under the same stock market (i.e. Nasdaq OMX).

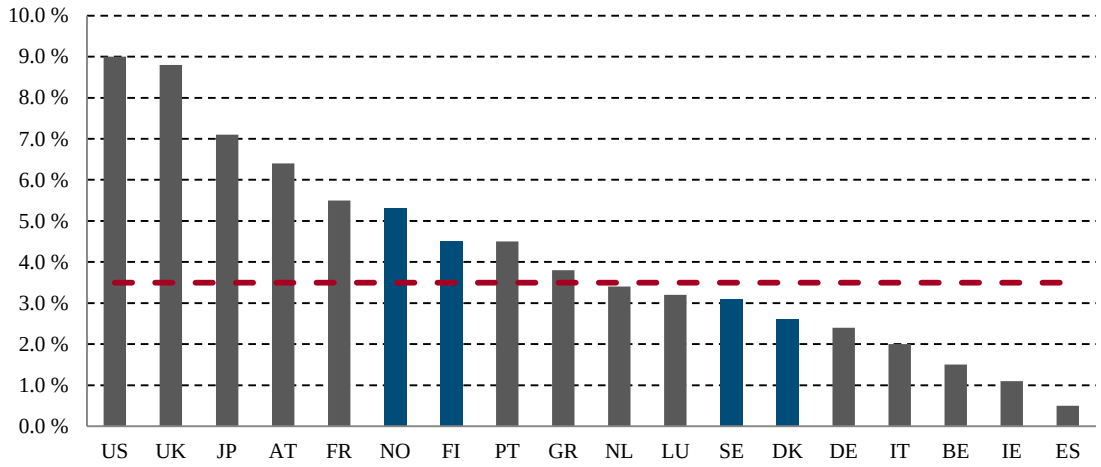

Figure 3. Percentage of bonds of total assets. Abildgren, Jensen, Kristoffersen, Kuchler, Stroger Hansen and Skakoun 2014: 74

Averages for firms with quoted shares from the 1st quarter of 1999 to the 4th quarter of 2013. Red line presents the EU15 average for the same period

Figure 3 presents the average percentage of bonds in firm's balance sheet from 1999 to 2013. The figure shows that there exists notable differences in the usage of bonds between different countries. The difference can be explained by either differences in firms' leverage ratios or in the usage of bank financing. Nevertheless the Nordic firms differ from more widely studied US firms which creates an opportunity to study pecking order among firms with different financing structure. The Nordic countries are generally considered as developed markets meanwhile their bond markets are rather underdeveloped (see e.g. Dow Jones or MSCI classification for developed markets). In order to achieve a better understanding of the Nordic corporate financing market each studied country is briefly explained in the next sections.

3.1. SWEDEN

Swedish corporate financing market has generally been dominated by bank loans. Equity has been the second most used instrument and bonds are the third. Bilateral bank loans constitute the majority and syndicated bank loans only a minor portion of the total financing. Today approximately 80% of loan-based funding of firms originates from banks while the remainder constitutes of foreign and local corporate bonds and commercial papers. However debt securities (i.e. commercial papers and bonds) have been outperforming bank loans continuously from 2011. Issues of debt securities have been growing over 10% annually for the past 5 years while bank lending has seen a relatively modest growth of circa 5% p.a. (Bonthron 2014)

Annual statistics from Sveriges Riksbank (2014) show that the debt security issue volumes in Sweden grew moderately in the beginning of 21th century but saw a sharp decline in 2008. Since 2010 then the volumes rebounded and have been growing rapidly. At the same time the first high-yield corporate bonds were introduced to the Swedish market. Followed by the high-yield issues also the amount of firms without a credit rating have gained an increasing share of the annual issue volumes. Therefore it seems that investment grade bonds market has seen more steady growth while the total issues growth has been driven by new firms.

According to the central bank of Sweden, Sveriges Riksbank (2014), corporate debt security issues have increased by approximately 25% since 2011. The vast growth stems from various changes in the corporate lending market. Banks face increasing regulation in terms of capital requirements and liquidity requirements. For example Bonthron (2014) argues that Swedish debt securities market growth derives from decline in banks'

willingness to lend. As a result firms might not be able to acquire sufficient funding from banks and have switched to bond markets. Also demand side has changed greatly as interest rates have dropped down to historically low rates. Investors are seeking higher-risk securities to meet yield targets and corporate debt securities offer an alternative. Bonthron (2014) argues that these factors assure that the Swedish bond securities market to continues to grow at a faster pace than the bank lending volumes.

Swedish equity and debt markets are relatively developed and closely regulated. However the secondary market for debt securities is nonexistent as a vast majority of trading takes place over-the-counter (Riksbank 2014). The largest Swedish banks, Handelsbanken, Nordea, SEB, Swedbank and Danske Bank, handle most of the primary and secondary market transactions. According to Gunnarsdottir and Lindh (2011) numerous initiatives have been taken by the market participants to develop secondary markets for debt securities. Increased transparency, implementation of Basel III and Solvency II as well as continuing low interest rates are expected to be essential for the Swedish debt securities market to outperform the bank lending market.

3.2. FINLAND

Market capitalisation of quoted shares in Finland has varied around EUR 150bn during the past few years while the amount of outstanding debt has been growing steadily. Finnish corporate lending market is relatively bank centered as today only approximately 30% of firm lending generates from debt securities. Nevertheless debt securities have been growing while bank lending stock has remained stable for the past five years according to the Bank of Finland statistics. The Bank of Finland reports annual growth rates for all bonds issued in Finland which therefore includes also bonds from financial firms and the central government. Annual growth rate has been around 6% while the corresponding rate for other euro countries has been around 1%.

Non-financial firms account for around 15% of debt security issues in Finland. The debt security market in Finland has been growing faster than the EU has on average. A vast majority of bonds are issued by large firms while only a few of these have credit ratings. Similarly as in Sweden, Finnish bond market has been relatively underdeveloped but has shown signs of development during the past few years. According to the Bank of Finland's report (2013) the total firm lending in Finland has been increasing steadily through debt securities which signals increases in leverage.

Finnish banking market is similar to Swedish as Nordea, SEB, Danske Bank and Handelsbanken handle most of the issuances. Also the local OP Group is a significant operator in Finland. Basel III and Solvency II are also implemented in Finland (Bank of Finland 2013). According to Gunnarsdottir and Lindh (2011) the implementation of these regulatory initiatives are expected to contribute positively to debt securities market's growth. Finnish and Swedish banking markets appear to be relatively integrated and therefore can be expected to share similar development in the future.

3.3. DENMARK

Similar to it's Nordic counterparts in the EU, Danish firms have historically preferred bank loans over debt securities. According to data from the National Bank of Denmark the Danish bond market grew over 10% annually. A comprehensive study by Abildgren, Jensen, Kristoffersen, Kuchler, Stroger Hansen and Skakoun (2014) describes the Danish corporate lending market. The study shows that Danish firms use debt as the primary financing instrument. Nevertheless while Danish firms are close to EU average leverage ratio the share of bonds in firm balance sheets is notably lower than the EU average.

Danish firms were on average more levered in 2009 than they are today. Average leverage ratio rose steadily in the early 2000s but has since then decreased. Firms have been halting investments in order to pay down loans which is shown as a savings surplus. 2009 showed a notable change in Danish corporate lending behavior as mortgage backed bank lending surpassed traditional bank lending. For the past five years the development has continued as mortgage bank lending has continued to increase while traditional lending has been decreasing at the same time. (Danmarks Nationalbank 2015)

Nykredit, Nordea and Danske Bank are the largest banks in Denmark of which Danske Bank is the largest. Smaller local listed banks Jyske Bank and Sydbank are also noteworthy lenders. Similar to other Nordic countries, Basel III and Solvency II are also being implemented in Denmark (Abildgren 2014). Therefore the Danish corporate lending market seems to follow the same pattern as Finnish and Swedish counterparts. Debt securities market can be expected to continue growing as banks face tighter regulation. (Gunnarsdottir and Lindh 2011)

3.4. NORWAY

Norway differs slightly from other Nordic countries. Firms have historically been more levered and have also historically used more bonds in their financing (Abildgren et al. 2014). Also the local debt security market is generally considered more developed than in other Nordic countries. Althought Norwegian non-financial firms have access to a developed bond market they still prefer bank financing as approximately 70% of debt is raised from banks (as of 2012 according to Statistics Norway).

Net issuance of debt securities by non-financial Norwegian firms has been positive each year for over 10 years (with the exception of 2008). Thus it seems that average leverage ratios have been increasing during the last decade. A major contributor has been bonds as the total outstanding volume of corporate bonds has almost quintupled from 2002 to 2012 according to Norges Bank's statistics. Non-financial firms have accounted for around 20% of total outstanding volume. On the other hand the growth has been faster among non-financial firms thus increasing their portion year-by-year. Similar to other Nordic countries, companies without credit rating and those categorised as high-yield firms account for a significant portion of the total outstanding amount. Also most of the growth has generated from these firms during the past five years.

According to Norges Banks' statistics (as of June 2014) the largest corporate lender in Norway is DNB Bank which handles circa 33% of gross lending to corporate sector. The large Nordic banks mentioned in previous sections, Nordea, Handlesbank and Danske Bank, have a total of c. 33% while smaller local savings banks and commercial banks constitute the rest (such as SpareBank and Eika). Local legislation is fairly similar to other Nordic countries as Basel III was implemented in 2013. Norway has also begun to impelement bank-related EU rules in Norwegian legislation in order to align financial market legislation with other European countries. (Norges Bank 2012)

3.5. ICELAND

Icelandic firms' leverage ratios have been decreasing significantly since 2009. Local banking sector went through a major overhaul between 2008-2011 and thus, since the figures include all firms, the figures provided by the Central Bank of Iceland (2015) give somewhat a biased image. However the net lending from banks to non-financials firms has been positive for the past few years, indicating increases in leverage ratios for non-financial firms.

Debt securities had a major role in corporate financing from early 2000s till the Icelandic banking crisis in 2008. The outstanding volumes have since then dropped but have shown some signs of recovery according to the Central Bank of Iceland (2015). Bonds issued by non-financial corporations account to approximately 10% of total outstanding volumes which constitute majorly of housing bonds and treasury bonds. Thus bank lending is the dominant financing instrument for non-financial corporations.

The three largest Icelandic banks Arion Bank, Islandsbanki and Landsbankinn constitute approximately 98% of total assets of all commercial banks in Iceland (Bank of Iceland 2015). Hence the banking sector differs from it's counterparts as it is far less integrated to other Nordic countries. The Icelandic banking sector has implemented Basel III regulatory reforms and is in that sense similar to other Nordic countries.

4. DATA, HYPOTHESES AND METHODOLOGY

The data, descriptive statistics and correlation coefficients are presented below in section 4.1. In section 4.2 hypotheses are stated and in section 4.3 the utilised methodologies are presented.

4.1. DATA AND DESCRIPTIVE STATISTICS

The study is conducted with data consisting of firms from Northern Europe. The featuring firms were publicly listed on Nasdaq OMX Nordic stock exchange, Oslo Bors or some other local stock exchange list in 2014. The stock exchanges comprise firms headquartered in Denmark, Norway, Sweden, Finland and Iceland (refered as *"the Nordic states"* or *"the Nordics"*). The data is obtained from Orbis database and it includes 547 firms of which 278 have continuous data available from 2005 to 2014. Each firm in the sample has detailed balance sheet, income statement and flow of funds data.

The standard practice in capital structure studies is to exclude financial firms and regulated utilities. NACE Rev. 2 codes from 6400 to 6699 comprise firms engaged in financial and insurance activities and are thus excluded. Electricity, gas, steam and air conditioning supply firms are under codes 3500-3599 and are also excluded. Also firms that have delisted have been excluded from the sample. As the study attemps to closely follow the selection criterias of Shyam-Sunder and Myers (1999) and Frank and Goyal (2003), the study excludes firms with insufficient financial data, particularly those with gaps in or otherwise inadequate flow of funds data or data of debt amounts. These firms are generally small firms with less than 10m€ of assets.

Table 1 presents descriptive statistics for those variables that are essential for the pecking order model for full sample period. The total net debt of firms experiences only minor negative skewness which means it is right modal. The distribution is also slightly leptokurtic which means that the distribution has fat tails and a higher peak. Investments items has also negative skewness and is leptokurtic. It should be noted that negative investments (minimum is -3.13) mean that the firm has sold more assets than it has invested in.

Dividends items has positive skewness and kurtosis. Positive skewness means that the distribution is left modal which in turn indicates that there exists numerous firms with no annual dividend payments. Change in working capital and operating cash flow share

Descriptive statistics	Total net debt	Investments	Dividends	Δ working capital	Oper. cash flow
Mean	0.16	0.06	0.02	0.02	0.08
Median	0.17	0.04	0.01	0.01	0.08
Maximum	1.93	0.96	2.79	1.92	1.94
Minimum	-0.99	-3.13	0.00	-1.69	-1.09
Std. Dev.	0.26	0.13	0.07	0.09	0.12
Skewness	-0.44	-4.44	25.67	1.90	1.01
Kurtosis	5.02	108.21	942.45	143.42	40.49
Observations	4324	4324	4324	4324	4324

Table 1. Descriptive statistics

Table presents descriptive statistics of those variables that are essential for pecking order model for all listed companies for full sample period. Financial firms and regulated utilities are excluded from the data set. Values are calculated as a portion of total assets (book value)

similar distribution characteristics. Both items have positive skewness and excess kurtosis.

4.1.1. GENERAL DEVELOPMENT OF FINANCIAL ACCOUNTS

Average balance sheet items as percentages of total assets are presented in tables 1 and 2. The balance sheet data is relatively consistent over the period and varies only slightly between different countries. Percentages of some items have changed as in the whole sample the amount of intangible assets increased from 16.7% to 26.1% meanwhile the fraction of tangible assets decreased from 24.5% to 19.6%. On the other hand retained earnings and other equity item and interest-bearing debt items have remained stable throughout the period, indicating that firm capital structures have remained relatively unchanged.

Data sets for Denmark, Norway and Finland each comprise of approximately 100 firms. Sweden's sample is the largest with 297 observations in 2014. Iceland is at the same time significantly smaller market and featuring only 10 firms in the data sample. There are some differences in average balance sheets between different countries. This might be partially explained by industry differences. For example Norwegian stock market includes a vast amount of oil related companies which generally have below median working capital ratios (see e.g. Damodaran 2015).

There exist notable differences in Nordic data sample compared to the US sample used by Frank and Goyal (2003). In their data of US-based firms they reported tangible assets to account for c. 30% and intangible assets approximately 8% of total assets. The Nordic firms appear to be less asset heavy and have more intangible assets in their balance sheet. The amount of long term debt is relatively even between the two data sets. The amount of equity is slightly higher in the Nordic sample.

Tables 3 and 4 present average dividends, net investments, changes in working capital, internal cash flow and net profit as percentages of total assets. Firm financing deficit is calculated as sum of paid dividends, net investment expenditures and change in working capital subtracted by internal cash flow. Global financial turmoil is clearly shown as lower average net profits and internal cash flows. However financial deficit actually decreased due to changes in dividend, investment and working capital policies. Firms seem to have lowered their dividend payouts, halted investments and freed up working capital.

Country	**Denmark**			**Norway**			**Sweden**		
Year	2005	2009	2014	2005	2009	2014	2005	2009	2014
Fixed assets									
Intangible assets	10.5 %	15.5 %	21.5 %	14.1 %	17.8 %	21.1 %	21.4 %	28.4 %	30.1 %
Tangible assets	31.6 %	30.7 %	23.8 %	31.2 %	28.6 %	30.8 %	18.0 %	17.0 %	13.8 %
Other fixed assets	8.8 %	10.5 %	13.4 %	11.5 %	12.3 %	12.7 %	11.6 %	10.3 %	14.2 %
Current assets									
Inventories	13.6 %	13.2 %	12.0 %	7.9 %	7.3 %	8.6 %	13.1 %	11.6 %	13.2 %
Account receivables	17.3 %	14.0 %	13.0 %	12.3 %	9.6 %	11.1 %	16.4 %	15.6 %	15.1 %
Other current assets	22.7 %	21.8 %	23.4 %	26.7 %	27.1 %	22.8 %	26.0 %	22.1 %	22.0 %
Cash	15.2 %	13.5 %	13.8 %	19.4 %	18.2 %	14.0 %	18.9 %	13.8 %	14.3 %
Total assets	**100 %**	**100 %**	**100 %**	**100 %**	**100 %**	**100 %**	**100 %**	**100 %**	**100 %**
Equity									
Capital	13.5 %	13.8 %	14.6 %	17.6 %	12.0 %	7.3 %	12.4 %	10.9 %	8.9 %
Retained earnings and other equ	33.3 %	33.0 %	36.1 %	24.1 %	32.9 %	37.2 %	37.9 %	37.5 %	41.5 %
Non-current liabilities									
Long term debt	16.2 %	19.0 %	17.7 %	24.5 %	23.5 %	25.1 %	15.0 %	15.6 %	16.9 %
Other non-current liabilities	5.7 %	4.8 %	4.8 %	6.1 %	6.6 %	6.0 %	5.6 %	5.7 %	5.6 %
Current liabilities									
Short term debt	9.4 %	10.4 %	8.3 %	8.9 %	9.5 %	7.5 %	7.1 %	6.8 %	8.4 %
Account payables	8.5 %	6.7 %	8.5 %	8.4 %	6.5 %	7.1 %	9.1 %	8.7 %	8.4 %
Other current liabilities	14.6 %	14.5 %	13.9 %	15.7 %	13.1 %	16.0 %	16.0 %	17.8 %	16.4 %
Total equity and liabilities	**100 %**	**100 %**	**100 %**	**100 %**	**100 %**	**100 %**	**100 %**	**100 %**	**100 %**
Number of observations	87	96	87	69	87	104	187	246	297

Table 2. Averages of balance sheet item as a percentage of total assets (1/2)

Table presents average balance sheets for Danish, Norwegian and Swedish listed companies for selected years. Financial firms and regulated utilities are excluded from the data set. Values are calculated as a portion of total assets (book value) and then averaged across all firms with adequate financial data in that year.

Country	Iceland			Finland			Total		
Year	2005	2009	2014	2005	2009	2014	2005	2009	2014
Fixed assets									
Intangible assets	32.6 %	32.1 %	33.3 %	14.5 %	21.1 %	22.2 %	16.7 %	23.1 %	26.1 %
Tangible assets	25.9 %	27.7 %	28.1 %	25.9 %	23.1 %	20.3 %	24.5 %	22.6 %	19.6 %
Other fixed assets	9.1 %	5.4 %	5.6 %	9.4 %	9.9 %	10.2 %	10.5 %	10.5 %	13.0 %
Current assets									
Inventories	11.6 %	12.0 %	12.2 %	15.1 %	14.1 %	15.5 %	12.7 %	11.7 %	12.6 %
Account receivables	16.4 %	10.1 %	11.9 %	18.4 %	15.6 %	16.4 %	16.3 %	14.3 %	14.3 %
Other current assets	4.4 %	12.6 %	12.9 %	18.5 %	18.2 %	18.6 %	23.7 %	22.0 %	21.7 %
Cash	2.8 %	5.0 %	8.6 %	12.5 %	12.1 %	11.7 %	16.8 %	14.0 %	13.6 %
Total assets	**100 %**	**100 %**	**100 %**	**100 %**	**100 %**	**100 %**	**100 %**	**100 %**	**100 %**
Equity									
Capital	5.0 %	3.5 %	6.0 %	11.0 %	12.4 %	11.4 %	13.1 %	11.8 %	9.8 %
Retained earnings and other equ	31.2 %	23.5 %	45.2 %	34.9 %	29.5 %	26.8 %	34.1 %	34.3 %	37.6 %
Non-current liabilities									
Long term debt	34.7 %	33.2 %	20.9 %	15.5 %	20.6 %	18.5 %	17.0 %	18.7 %	18.9 %
Other non-current liabilities	6.4 %	3.5 %	3.2 %	5.4 %	5.5 %	6.3 %	5.7 %	5.6 %	5.6 %
Current liabilities									
Short term debt	8.0 %	16.7 %	4.7 %	7.4 %	8.4 %	9.8 %	8.0 %	8.4 %	8.4 %
Account payables	13.5 %	7.7 %	7.6 %	8.8 %	7.2 %	10.0 %	8.9 %	7.7 %	8.4 %
Other current liabilities	1.3 %	12.0 %	12.5 %	17.9 %	16.8 %	18.6 %	15.9 %	16.2 %	16.3 %
Total equity and liabilities	**100 %**	**100 %**	**100 %**	**100 %**	**100 %**	**100 %**	**100 %**	**100 %**	**100 %**
Number of observations	4	7	10	87	95	95	434	531	593

Table 3. Averages of balance sheet item as a percentage of total assets (2/2)

Table presents average balance sheets for Icelandic, Finnish and all listed companies for selected years. Financial firms and regulated utilities are excluded from the data set. Values are calculated as a portion of total assets (book value) and then averaged across all firms with adequate financial data in that year.

There exist some noteworthy differences between the Nordic countries. For example the average net profit of Norwegian firms was negative in 2014 compared to positive figures in other Nordic countries. Recent downturn in oil price and oil investments appear to have an effect on the figures as the Norwegian data sample is relatively dominanted by the local offshore and onshore industries.

In their data sample Frank and Goyal (2003) observed cash dividends varying on average between 5% and 15% of total assets from 1971 to 1998. Average investments varied between 8% and 12% while changes in working capital were c. 2%. Internal cash flows were on average c. 10% of total assets between 1971 and 1980. However cash flows decreased relatively linearily being -0.3% in 1998. Financing deficits increased from 4% in 1971 up to 13.5% in 1998. In the Northern Europe firms appear on average to have lower dividend payments and investments. Internal cash flow shows similar variation depending on the underlying economic situation.

Country	Denmark			Norway			Sweden		
Year	2005	2009	2014	2005	2009	2014	2005	2009	2014
Cash dividends (1)	3.0 %	1.0 %	2.1 %	4.9 %	2.0 %	1.8 %	2.3 %	2.4 %	3.1 %
Investments (2)	7.4 %	6.4 %	4.4 %	10.6 %	5.2 %	7.0 %	8.6 %	4.6 %	6.5 %
Δ working capital (3)	3.2 %	-1.6 %	2.5 %	1.5 %	-2.1 %	1.2 %	2.5 %	-2.2 %	1.2 %
Internal cash flow (4)	11.2 %	3.1 %	9.6 %	6.1 %	-0.7 %	6.5 %	3.9 %	2.1 %	4.9 %
Financial deficit (1+2+3-4)	2.1 %	1.4 %	-3.9 %	11.1 %	2.7 %	2.2 %	7.9 %	1.2 %	3.2 %
Net profit	10.0 %	-1.2 %	2.3 %	5.0 %	-6.0 %	-1.1 %	1.8 %	-5.2 %	1.6 %

Table 4. Averages of financial requirement and profitability item as a percentage of total assets (1/2)
Table presents average balance sheets for Danish, Norwegian and Swedish listed companies for selected years. Financial firms and regulated utilities are excluded from the data set. Values are calculated as a portion of total assets (book value) and then averaged across all firms with adequate financial data in that year.

Country	Iceland			Finland			Total		
Year	2005	2009	2014	2005	2009	2014	2005	2009	2014
Cash dividends (1)	0.7 %	0.0 %	1.7 %	3.9 %	2.6 %	2.7 %	3.2 %	2.1 %	2.6 %
Investments (2)	17.6 %	3.0 %	6.4 %	3.5 %	4.1 %	2.5 %	7.7 %	4.9 %	5.6 %
Δ working capital (3)	1.4 %	-0.4 %	1.0 %	4.9 %	-0.6 %	2.5 %	2.9 %	-1.7 %	1.6 %
Internal cash flow (4)	4.6 %	6.1 %	13.9 %	14.2 %	7.6 %	7.6 %	7.7 %	2.9 %	6.5 %
Financial deficit (1+2+3-4)	15.9 %	-1.8 %	-4.5 %	-1.9 %	-1.6 %	-0.1 %	5.3 %	0.9 %	1.3 %
Net profit	3.4 %	-1.7 %	8.5 %	11.5 %	1.8 %	1.1 %	5.9 %	-3.3 %	1.3 %

Table 5. Averages of financial requirement and profitability item as a percentage of total assets (2/2)
Table presents average balance sheets for Icelandic, Finnish and All listed companies for selected years. Financial firms and regulated utilities are excluded from the data set. Values are calculated as a portion of total assets (book value) and then averaged across all firms with adequate financial data in that year.

As discussed earlier, the economic downturn period of 2008-2009 showed decreases in firms' internal cash flows. The US economy experienced similar downturns in 1980s and 1990s which help to explain increases in financing deficit. The data set used by Frank and Goyal (2003) experiences similar variation as the data set used in this study and will thus provide a convincing comparison point for the results.

4.1.2. CORRELATION COEFFICIENTS

Table 5 presents Pearson correlation coefficients between total gross debt issued, investments, dividends, change in working capital and operating cash flow. Damodar (2004) defines sample Pearson correlation coefficient in the following way. The definitions are commonly used in econometric literature, $\bar{y}$ and $\bar{x}$ are are the sample means for y and x.

(1) $$r_{xy} = \frac{\sum_{i=1}^{n}(x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum_{i=1}^{n}(x_i - \bar{x})^2}\sqrt{\sum_{i=1}^{n}(y_i - \bar{y})^2}}$$

Investments appear to have a high and statistically significant correlation with debt issued. This follows closely the theory presented by Myers (1984) in which firms primarily finance investment opportunities with safe securities and rather forego investments opportunities if only risky financing options are available. Also changes in working capital shows notable correlation with debt issued. This implies that firm growth is in many cases financed with debt.

Low correlation coefficients between changes in working capital and dividends and investments are expected since working capital is generally considered as a part of present business operations rather than correlating with dividends or investments. Thus as expected changes in working capital correlate quite heavily with operative cash flow.

Myers (1984) also argues that dividends are sticky which means that firms do not alter their annual dividend payments based on their profits or investment opportunities. However the correlation between dividends and operating cash flow is 0.23 and statistically significant at 5% level.

Pairwise correlation: Total gross debt issued and independent financing deficit factors	Debt issued	Investments	Dividends	Δ working capital	Oper. cash flow
Debt issued	1.00				
Investments	0.42 *	1.00			
Dividends	-0.02	-0.29 *	1.00		
Δ working capital	0.14 *	-0.07 *	0.04 *	1.00	
Oper. cash flow	0.02	0.14 *	0.23 *	0.36 *	1.00

* Indicates significance at 5% level
** Indicates significance at 10% level

Table 6. Pairwise correlation of variables

Table presents pairwise correlations and their statistical significance for total gross debt issued, investments, dividends, change in working capital and operating cash flow. Financial firms and regulated utilities are excluded from the data set. Values are calculated as a portion of total assets (book value) and then averaged across all firms with adequate financial data for all variables.

There exists a clear positive correlation which implies that firms in fact increase (decrease) their dividends when they achieve higher (lower) profits. Also opposite to Myers (1984) arguments, dividends and investments show significant negative correlation which implies that firms somewhat choose between investment opportunities and dividend payments.

4.2. RESEARCH HYPOTHESES

The hypotheses are based on the theoretical framework of pecking order theory and prior empirical studies. Especially studies from Shyam-Sunder and Myers (1999) and Frank and Goyal (2003) have an important role and are closely followed in the hypotheses. The hypotheses are presented and briefly commented below.

> H1: Firms follow pecking order behavior in financing – a unit change in debt is explained by an equal amount of financing deficit

This hypothesis is the primary hypothesis of the pecking order theory. It originates from Donaldson (1961) whose study suggests that firms favor internal financing over external financing. When internal financing is insufficient firms issue debt over equity which implies a pecking order of internal over external financing and debt over equity financing. The theoretical framework for pecking order theory was constructed by Myers (1984) and Myers and Majluf (1984) who show that the pecking order of financing derives from information asymmetry between existing stockholders and firm management. The first hypothesis was first presented in a study by Shyam-Sunder and Myers (1999) and later followed by many researchers. In the aggregated pecking order model the slope coefficient is one and intercept term is zero.

> H2: The individual factors used to construct the aggregated model are equally important in explaining firms' debt issued

The aggregated pecking order model is constructed by combining dividends, investments, internal cash flow and change in working capital into a single financing deficit factor. Pecking order theory explains firm financing behavior only if each of these factors follow pecking order theory. Disaggregating the model would reveal if firms for example use debt to finance dividends but equity to finance working capital. Thus for pecking order theory to be relevant $\beta_{DIV} = \beta_{INV} = \beta_{\Delta WC} = \beta_C = 1$. If this holds then aggregated model is justified but in the other case an alternative model would be required.

H3: The pecking order theory performs equally well when including all currently publicly listed firms

Originally Shyam-Sunder and Myers (1999) use data set which excludes firms without continuous financial data for the full sample period. Later Frank and Goyal (2003) argue that the pecking order theory does not require continuous data as the model is static. The only variable which requires data from two consecutive year is the change in debt in firm's balance sheet. The tests are repeated for both the full data sample and firms with continuous financial data. For the third hypothesis to hold, the results should be equal for both data samples.

H4: Implementation of stricter bank financial regulation has resulted in decrease in firms' debt based financing

De Haan and Hinloopen (2003) argue that firms follow a financing sequence of internal cash flows, bank debt, equity and then bonds. As a result pecking order should perform better in countries with bank centered lending environment and vice versa. Tightening financial market regulation has played an important role in the recent development of Nordic bond market. Thus the fourth hypothesis states that pecking order performs better before the financial crisis than it does after it.

4.3. METHODOLOGY

In this section the variables and methodologies are described. Microsoft Excel 2007 and EViews 7 are used to analyse and present the data.

4.3.1. AGGREGATED MODEL OF PECKING ORDER THEORY

Pecking order model suggests that if firm's cash flows are insufficient to finance annual dividend payments, investments and changes in working capital the firm will issue debt. In order to test the pecking order the following variables and notations are defined:

C_t = cash flow after interest and tax payments
DIV_t = cash dividends

$INV_t =$ net investments in fixed assets
$\Delta WC_t =$ change in working capital
$\Delta D_t =$ change in book debt
$\Delta E_t =$ change in net equity issued

With these notations the following aggregation of financing deficit is formed:

(2) $$DEF_t = DIV_t + INV_t + \Delta WC_t - C_t$$

The financing deficit can then be financed with either debt or equity. Therefore to test the pecking order theory, the following empirical model is specified

(3) $$\Delta D_t = \alpha + \beta_1 DEF_t + e_{it}$$

Hence the pecking order theory hypothesis is that $\alpha = 0$ and $\beta_1 = 1$. This would imply that the financing deficit is fully financed with long term debt. Both Frank and Goyal (2003) and Shyam-Sunder and Myers (1999) use the respective model.

4.3.2. DISAGGREGATED MODEL OF PECKING ORDER THEORY

Frank and Goyal (2003) point out that there might be information in one or more of the factors forming financing deficit. Therefore running an alternative regression with individual variables is justified. Changes in issued debt might be driven by individual factors. However in order for the pecking order theory to perform each variable's coefficient should be the same $\beta_{DIV} = \beta_{INV} = \beta_{\Delta WC} = \beta_C = 1$. If it holds then aggregated model is justified but in the other case an alternative model is required.

(4) $$\Delta D_t = \alpha + \beta_{DIV} DIV_t + \beta_{INV} INV_t + \beta_{\Delta WC} \Delta WC_t - \beta_C C_t + e_{it}$$

4.3.3. CONTROLLING FOR CHANGES IN FIRM OPERATIONS

Year fixed effects are included to control for variation in firm operations over time. Shyam-Sunder and Myers (1999) and Frank and Goyal (2003) posses data which allows them to exclude firms that have taken major restructurings, mergers or other corporate deals. Orbis database does not provide information for corporate restructurings, mergers and other corporate deals and thus it is not possible to eliminate these from the data sample. Adding year fixed effects minimises the effects of corporate deals.

There might also exist unobserved heterogeneity due to one or more omitted firm specific characteristics. These characteristics might be related to debt constrains which might can result in firms to prefer equity over debt and lead to bias in results. As a result firm fixed effects are justified to reduce potential endogeneity problems.

As a result aggregated pecking order model transforms into the following two-way fixed effects regression specification:

$$\Delta D_{it} = \alpha + \beta_1 DEF_{it} + \sum_{k=1}^{n-1} \alpha_k FIRM_i^k + \sum_{y=2005}^{2014} \omega_y YEAR_i^y + e_{it} \quad (5)$$

4.3.4. ADDITIONAL TESTS

There also exists different methods for proxying the changes of debt. Therefore the tests are replicated for total debt issuance, total net debt issuance, long term net debt issuance and changes in leverage ratio. Frank and Goyal (2003) point out that cash could be correlated with the amount of debt issued as firms might hold excess cash gained from either debt or equity issuances. Therefore, as Frank and Goyal (2003) argue, a robustness check separating cash is justified. This is conducted by using net debt instead of gross debt. This approach is ignored by Shyam-Sunder and Myers (1999) but is used in Frank and Goyal (2003) and is thus tested separately.

In most of the tests Nordic countries are merged into a single data sample. Nordic countries are relatively similar in many relevant ways, common legislative framework, accelerating development of financial markets and bank concentrated lending environment. As a result Nordic countries are merged into a single data sample to study financing patterns. However some Nordic country might lack statistical significance or results might deviate significantly from other Nordic countries. In this case results for the combined data set might be driven by some individual countries. Thus merging would not be justified and there might exist country specific unobservable variables which drive the results for joint data sample. Merging is tested in section 5.3

The corporate lending market has developed notably after the financial crisis in 2009. Regulatory reforms have shifted firm financing from banks to bond market. De Haan and Hinloopen (2003) show that there is a clear preference among firms to chooce bank debt over equity financing but equity financing over bond financing. Also for example Cosimano and Hakura (2003) show that implementation of Basel III has resulted in

stricter capital requirements and has thus increased lending rates. Therefore additional tests on with a period dummy variable are tested.

5. RESULTS AND ANALYSIS

In this chapter the results are presented. Firstly primary results for pecking order theory for the full sample period are presented in section 5.1. In section 5.2 additional tests on alternative selection criterias are presented. Section 5.3. includes regressions on individual Nordic countries. Lastly in section 5.4 results for changes in firm lending behavior after tightening financial regulation are presented.

5.1. TESTS ON PECKING ORDER THEORY FOR THE FULL SAMPLE PERIOD

This section includes results on aggregated and disaggregated pecking order model.

5.1.1. REGRESSIONS ON AGGREGATED MODEL

Tests on aggregated pecking order model with restriction for including only firms with continuous data are presented in table 5. Table 5 summarizes the results of ordinary least squares tests with fixed effects. The dependent variables are presented in columns 1-5. Values for the constant (α) are presented in the first row, coefficients for financing deficit (β_1) in the second row, number of firms in the sample in the third and coefficient of determination (R^2) in the last row.

Regressions on long term gross debt issued and total gross debt issued show values for constant extremely close to zero. However neither is significant at 5% level and only the constant on long term gross debt issued is statistically significant at 10% level. Coefficients for financing deficit are around 0.4 and 0.6. The coefficient for total gross debt issued is in the right order of magnitude while long term. The coefficient of determination is 0.31 and 0.43 for long term gross debt and total gross debt issued, respectively. For both dependent variables the coefficients for financing deficit are significant at 5% level. Considering the simplicity of the model it performs decently. Hence these results for gross debt issuance indicate cautious support for the pecking order theory.

Results in columns 3 and 4 use similar dependent variables but take into account firms' cash and cash equivalent items. Again the values for constant are close to zero but neither is significant at 10% level. Coefficients for financing deficit are slightly higher than in the previous models and both are significant at 5%. Coefficients of determination are

slightly higher (0.43 and 0.57), implying a better fit for the model. Thus the model performs relatively well with net debt as dependent variable.

The results are fairly similar with change in leverage ratio as a dependent variable. Again the value for the intercept term is not statistically significant while coefficient for financing deficit is approximately 0.6 and statistically significant at 5% level. However the coefficient of determination is slightly lower than with net debt. This could derive from the fact that change in leverage ratio also implicitly includes changes in both book debt and book equity. Book profits have an effect on changes in leverage ratio and can thus bias the results. However R^2 is still at tolerable level considering the simplicity of the model and thus the model again performs decently.

	Long term debt issued	Total debt issued	Net long term debt issued	Net total debt issued	Change in leverage ratio
	(1)	(2)	(3)	(4)	(5)
Constant	0.00 **	0.00	0.00	0.00	0.00
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Financing deficit	0.42 *	0.62 *	0.70 *	0.89 *	0.59 *
	(0.016)	(0.018)	(0.019)	(0.018)	(0.018)
Number of firms	278	278	278	278	278
R^2	0.31	0.43	0.43	0.57	0.38

* Indicates significance at 5% level

** Indicates significance at 10% level

Table 7. Tests on aggregated balanced pecking order model for the time period 2005-2014

The sample consists firms with no gaps in financial data for the tested period of 2005-2014. Financials firms and regulated utilities are excluded. The following regression is estimated: $\boldsymbol{\Delta D_t = \alpha + \beta_1 DEF_t + e_{it}}$, in which $\boldsymbol{\Delta D_t}$ is the amount of debt issued and $\boldsymbol{DEF_t}$ is the financing deficit. Financing deficit is the sum of dividends, investments and the change in working capital minus the operating cash flow. All variables are scaled by firm's total assets. The dependent variable is presented in colums 1 to 5. Leverage ratio is defined as total net debt to total assets. Standard errors are reported in parentheses.

The results are highly similar to those from Shyam-Sunder and Myers (1999). They apply similar restrictions and study firms over 1971-1989 in the US. They find pecking order coefficients to vary between 0.75 and 0.85 depending whether the dependent variable is gross debt, net debt or change in debt ratio. Coefficient of determination is high for all tests in Shyam-Sunder and Myers (1999). Frank and Goyal (2003) find similar results for net debt issued. However their findings for gross debt issued and change in leverage ratio slightly deviate from those of Shyam-Sunder and Myers (1999).

	Long term debt issued	Total debt issued	Net long term debt issued	Net total debt issued	Change in leverage ratio
	(1)	(2)	(3)	(4)	(5)
Constant	0.00	0.00	-0.01 *	-0.01 *	-0.01 *
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Financing deficit	0.29 *	0.44 *	0.62 *	0.74 *	0.56 *
	(0.014)	(0.015)	(0.017)	(0.016)	(0.016)
Number of firms	581	547	581	547	547
R^2	0.23	0.35	0.38	0.49	0.35

* Indicates significance at 5% level
** Indicates significance at 10% level

Table 8. Tests on aggregated unbalanced pecking order model for the time period 2005-2014
The sample consists firms with financial data for the tested period of 2005-2014. Financials firms and regulated utilities are excluded. The following regression is estimated: $\boldsymbol{\Delta D_t = \alpha + \beta_1 DEF_t + e_{it}}$, in which $\boldsymbol{\Delta D_t}$ is the amount of debt issued and $\boldsymbol{DEF_t}$ is the financing deficit. Financing deficit is the sum of dividends, investments and the change in working capital minus the operating cash flow. All variables are scaled by firm's total assets. The dependent variable is presented in colums 1 to 5. Leverage ratio is defined as total net debt to total assets. Standard errors are reported in parentheses.

The most significant difference originates from the requirement for firms to report continuous data. Frank and Goyal (2003) argue that the pecking order theory does not in theory require the use of continuous data. They show that the model loses a vast amount of statistical significance when examining a broader set of data. Similar behavior can be seen in table 6 which shows the same tests as in table 5 but without the requirement for firms to report continuous data for the sample period.

The number of firms grows from 278 to 581 (and 34 firms either do not have or do not report short term debt in Orbis database) when continuous data requirement is removed. The pecking order theory performs best with long term net debt and total net debt issued. A broader pool of firms is found when firms are required to only report financing deficit and long term debt. Statistically the results for long term gross debt and total gross debt debt issued do not support the pecking order theory as the coefficient for financing deficit is relatively low. Also the R^2 drops significantly when a broader pool of firms is tested.

The results for net debt issued are more supportive. Financing deficit appears to predict a major portion of changes in net debt. Intercept terms are practically zero and statistically significant at 5% level. Considering the high number of firms, statistical fit for the model is satisfactory (R^2 is 0.38 and 0.49 for net debt issued).

Frank and Goyal (2003) argue that the difference between the results of table 5 and 6 stems from the fact that those firms that report continuous data are generally large and stable firms. Arguably large and stable firms are not as likely to be financially constraint as small and volatile firms. As Myers (1984) states that firms issue equity only if they are debt constraint. The data sample of table 6 potentially includes more firms that can be considered as debt constraint. For example the Nasdaq OMX First North market includes firms which can be, on average, considered as high growth, volatile and risky firms.

As a conclusion the pecking order theory appears to perform well among more stable firms (based on continuous data requirement). The results are not dependent on which dependent variable is used however stronger when accounting for net debt issued. The lack of statistical significance for the intercept term is somewhat unexpected. One possibility is that there are firms which issue debt even if their cash flow generation does not require them to do so. For a broader set of firms the results are not as simple to conclude. The intercept terms are statisticall significant at 5% level for tests 3-5 and close to zero. For those firms that report both short and long term the pecking order theory predicts financing behavior well. However for an even broader set of 581 firms the results are less convincing. As discussed earlier, a possible solution is that there exists more noise in the results as the portion of smaller and more volatile firms increases in the sample.

5.1.2. REGRESSIONS ON DISAGGREGATED MODEL

For the following tests on disaggregated pecking order model the same restrictions as in table 5 are applied, meaning that only firms with continuous data are included. The results are presented in table 7. The financing deficit is dismantled into individual components. Similar to the aggregated model, the pecking order theory predicts that coefficients for investments, dividends and change in working capital are equal to one. Operating cash flow should have negative and an unit coefficient and the constant should be equal to zero. Disaggregation is tested to justify the aggregation of pecking order model's financing deficit variable.

Issuance of long term gross debt and total gross debt as dependent variables are tested in columns 1 and 2, respectively. In the first test the constant is close to zero and is statistically significant at 5% level. Coefficients for investments, dividends, change in working capital and operating cash flow are all statistically significant at 5% level. Neither of the variables are very close to their predicted values. Working capital and

	Long term debt issued	Total debt issued	Net long term debt issued	Net total debt issued	Change in leverage ratio
	(1)	(2)	(3)	(4)	(5)
Constant	-0.02 *	-0.03 *	-0.01 *	-0.02 *	0.0
	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)
Investments	0.56 *	0.77 *	0.73 *	0.94 *	0.55 *
	(0.019)	(0.021)	(0.023)	(0.022)	(0.022)
Dividends	0.57 *	0.77 *	0.71 *	0.92 *	0.49 *
	(0.037)	(0.042)	(0.046)	(0.044)	(0.043)
Δ working capital	0.17 *	0.36 *	0.67 *	0.86 *	0.69 *
	(0.028)	(0.032)	(0.034)	(0.033)	(0.033)
Operating cash flow	-0.19 *	-0.33 *	-0.59 *	-0.73 *	-0.62 *
	(0.029)	(0.033)	(0.035)	(0.034)	(0.034)
Number of firms	278	278	278	278	278
R^2	0.36	0.47	0.43	0.57	0.38

* Indicates significance at 5% level
** Indicates significance at 10% level

Table 9. Tests on disaggregated balanced pecking order model for the time period 2005-2014
The sample consists firms with no gaps in financial data for the tested period of 2005-2014. Financials firms and regulated utilities are excluded. The following regression is estimated: $\boldsymbol{\Delta D_t = \alpha + \beta_{DIV} DIV_t + \beta_{INV} INV_t + \beta_{\Delta WC} \Delta WC_t - \beta_C C_t + e_{it}}$, in which $\boldsymbol{\Delta D_t}$ is the amount of debt issued and $\boldsymbol{\alpha + \beta_{DIV} DIV_t + \beta_{INV} INV_t + \beta_{\Delta WC} \Delta WC_t - \beta_C C_t}$ is the financing deficit comprising of dividends, investments, the change in working capital and the operating cash flow. All variables are scaled by firm's total assets. The dependent variable is presented in colums 1 to 5. Leverage ratio is defined as net debt to total assets. Standard errors are reported in parentheses.

operating cash flow in fact diverge notably from the predicted unit coefficient. Regression in column 2 with total gross debt issued as a dependent variable finds slightly higher values. However coefficients for working capital and operating cash flow are still relatively far away from their predicted values. The intercept term is again close to zero and statistically significant at 5% level. Coefficient of determination is fairly moderate (0.36 and 0.47) in both tests.

In both gross debt regressions the coefficients for changes in working capital and operating cash flow are statistically significant at 5% level but notably below their predicted values. Both variables appear to have a relatively small effect on firms' financing decisions. The lack of all variables being in the right order of magnitude implies that there might exists alternative coefficient patterns as suggested by Frank and Goyal (2003). The results from aggregated model might be driven by individual components rather than the combined financing deficit.

Similar to the results from aggregated model, columns 3 and 4 take into account cash and cash equivalents by using net debt as a dependent variable. All variables and the intercept term are significant at 5% level. The constant term and each coefficient is in the right order of magnitude. Especially the fourth tests performs exceptionally well considering the simplicity of the model. The data fits the statistical model fairly well, R^2s is 0.43 and 0.57 for net long term debt issued and net total debt issued, respectively.

Change in leverage ratio as a dependent variable performs slightly weaker than net debt regressions. The coefficient of determination is lower but coefficients are relatively high and statistically significant at 5% level. However the intercept term is not statistically significant at 10% level while being zero. R^2 is at tolerable level and hence the model performs decently.

There exists few possible explanations for interpreting diverging results from disaggregation. Relatively low coefficients for working capital can stem from it being financed with for example overdraft facility or factoring financing which might not be reported under short term interest-bearing debt in Orbis database. Quite unexpectedly operating cash flow explains changes in gross debt weakly and below investments and dividends. A possible explanation is that profits and gross debt do not correlate as heavily as is expected. Trade off theory predicts that more profitable firms should be more levered. On the other hand e.g. Titman and Wessels (1988) show that profitability and debt are negatively correlated. However neither expects the relationship to be close to a unit coefficient.

North European firms appear to differ from US firms in dividends. Frank and Goyal (2003) find the coefficient for dividend negative for gross debt issued and positive for net debt issued. They argue that the diverging results between net and gross debt issued generate from differences between dividend paying and non-dividend paying firms. They propose that dividend paying firms issue on average less long term debt and thus also redeem less debt as non-dividend paying firms. Dividend paying firms are also on average larger and more profitable firms with smaller growth opportunities (i.e. smaller investment requirements). Frank and Goyal (2003) argue that firms do not directly issue long term debt to pay out dividends but use cash instead. Clearly results in table 7 show otherwise.

The reason for disaggregating the pecking order model is to determine whether aggregation of financing deficit is justified. Other possibility is that aggregated model are driven by individual components and thus another model should be used. The results in table 7 support aggregation although the coefficients for working capital and operating cash flow are slightly lower than what the theory predicts.

5.2. ALTERNATIVE SELECTION CRITERIAS

Frank and Goyal (2003) argue that pecking order theory does not explain financing patterns for a broad set of US firms. Therefore they try to identify sub samples of firms that would follow pecking order behavior more closely than their full sample does. They approach the problem through theory which suggests that firms facing adverse selection problems should follow pecking order theory more closely. Frank and Goyal (2003) then argue that smaller, more volatile and risky firms are more likely to face more severe adverse selection issues. Empirically they find that size is critical however results are opposite as large firms show support for pecking order theory while small firms do not.

Frank and Goyal (2003) attempt to find alternative sub samples which could proxy for adverse selection problems and thus enhance pecking order behavior for US firms. Leverage or isolating firms that strictly pay dividends each year does not change the outcome in their findings. It is also possible that these factors are unable to proxy adverse selection and thus diverging results could stem from sub sample restrictions actually proxying debt constraint. Otherwise it would be concluded that US firms do not follow pecking order and some of the supporting results stem from e.g. trade off theory.

In this study the pecking order theory performs better among more stable firms based on continuous data requirement. This is consistent with the results from Frank and Goyal (2003). The results for Nordic firms are not dependent on which dependent variable is used. However using net debt instead of gross debt enhances the performance of pecking order theory. Earlier it was suggested that a possible solution for the difference between balanced and unbalanced data sets is that there exists more noise in the results as the portion of smaller and more volatile firms increases with the unbalanced sample. To gain confirmation on this intuition and identify differences between the same sub samples as in Frank and Goyal (2003) similar tests are performed. There is also possibility that earlier results are driven by some sub samples which is also tested in this section. Table 8 presents results on six different sub samples on both balanced and unbalanced data sets.

Pecking order is tested on aggregated model with total gross debt and total net debt issued, marked with (1) and (2) respectively.

No gaps in financial data

	Strictly positive dividends		Low leverage		Moderate leverage		High leverage		Total assets < 1 000m€		Total assets > 1 000m€	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Constant	0.01 *	0.01 *	0.00	0.00	0.00	0.00	0.00	0.00	0.00 *	-0.01 *	0.01 *	0.01 *
Financing deficit	0.69 *	0.89 *	0.34 *	0.79 *	0.52 *	0.91 *	0.81 *	0.91 *	0.61 *	0.90 *	0.67 *	0.82 *
Number of firms	106	106	70	70	138	138	70	70	186	186	92	92
R^2	0.55	0.65	0.31	0.48	0.30	0.56	0.63	0.62	0.42	0.57	0.51	0.57

Gaps in financial data allowed

	Strictly positive dividends		Low leverage		Moderate leverage		High leverage		Total assets < 1 000m€		Total assets > 1 000m€	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Constant	0.01 *	0.01 *	0.00 **	-0.01 *	0.00	-0.01 *	0.00	0.00	-0.01 *	-0.01	0.01 *	0.01 *
Financing deficit	0.39 *	0.51 *	0.19 *	0.70 *	0.53 *	0.87 *	0.47 *	0.61 *	0.42 *	0.73 *	0.72 *	0.86 *
Number of firms	167	167	137	137	273	273	137	137	424	424	123	123
R^2	0.40	0.44	0.24	0.42	0.36	0.57	0.42	0.47	0.34	0.48	0.53	0.59

* Indicates significance at 5% level

** Indicates significance at 10% level

Table 10. Tests on aggregated pecking order model for sub samples

Firms are sorted into quartiles based on leverage ratio, moderate leverage sub sample includes half of the firms. Strictly positive dividends includes firms which have paid dividends each year. Firms are also categorised based on balance sheet size. Financials firms and regulated utilities are excluded. The following regression is estimated: $\boldsymbol{\Delta D_t = \alpha + \beta_1 DEF_t + e_{it}}$, in which $\boldsymbol{\Delta D_t}$ is the amount of debt issued and $\boldsymbol{DEF_t}$ is the financing deficit. All variables are scaled by firm's total assets. The dependent variable is total gross debt and total net debt issued in columns 1 and 2 respectively.

The upper half of table 8 presents tests on aggregated pecking order model for firms with continuous financial data for full sample period. As a point of comparison, same tests with total gross and net debt issued show 0.62 and 0.89 coefficients for financing deficit, respectively. Both figures are statistically significant at 5% level while the intercept terms, despite being close to their predicted value of zero, are not statistically significant at 10% level. R^2 is 0.43 and 0.57 for total gross debt and net debt, respectively.

Total net debt appears to support pecking order theory better than gross debt issued which is consistent between all six tests on sub samples. Using net debt includes slump sums of cash in firms' balance sheets. A firm has an option to either issue debt to finance it's financing deficit or use cash reserves. According to pecking order theory negative financing deficit (i.e. financing surplus) is used to pay down debt. Using net debt also implicitly includes the possibility that a firm keeps the surplus cash flow for future. Possible reasons to gather excessive cash, such as market frictions and transaction costs, are thus negated when using net debt instead of gross debt.

Isolating firms which have strictly positive dividends each year does not enhance the performance of the model. Dividing firms into three categories based on their relative indebtness shows differing results for pecking order theory. It appears that high leverage firms follow pecking order model more closely than firms with low indebtness. On the other hand size does not seem to play significant role for firms' financing behavior in terms of pecking order theory. These results contradict with the findings from Frank and Goyal (2003) and are robust on the dependent variable used.

The bottom half of table 8 includes all Nordic firms which were publicly listed in 2014 (with the exception of financial firms and public utilities). Results for aggregated model, as presented in table 6, are as follows. Coefficient for financing deficit is 0.44 and 0.86 for total gross and total net debt issued, respectively. Intercept terms are close to zero. All values are statistically significant at 5% level with the exception of intercept term with total gross debt issued as dependent variable. Coefficient of determination is 0.35 and 0.49, respectively. Similar to continuous data sample, regressions on total net debt follow pecking order theory more closely than on gross debt issued.

Financing behavior of dividend paying firms does not differ from the full sample even if continuous data restriction is removed. It should be noted that the number of dividend paying firms increases by only 61 when continuous data restriction is removed (while total number increases by 269 firms). Suprisingly neither leverage nor size is able to

differentiate results for broader set of firms. It appears that none of the sub samples are able to significantly isolate groups of firms which would either follow pecking order theory more closely or deviate significantly from it. Therefore there exists two possible explanations, firsly these sub samples are unable to identify debt constraint firms or firms which are subject to more severe adverse selection problems. Secondly there might not exists a noteworthy amount of listed firms which are debt constraint or subject to severe adverse selection problems.

The applied 1 000m€ total assets level might be too high to categorise Nordic firms between large and small. In fact there exists 220 Nordic firms with a maximum of 100m€ of total equity and liabilities of which 75 report continuous data. The tests in table 8 are duplicated for these firms and reported in table 9. The results do not notably deviate from larger firms or from the full sample. In fact for those 75 firms that report continuous data the pecking order theory performs extremely well. Frank and Goyal (2003) suggest that smaller firms are subject to more severe adverse selection problems and should therefore prefer debt over equity. Thus results in table 9 cautiously indicate that these 75 firms could in fact be subject to more severe adverse selection issues. However as most of the tests on alternative selection criterias support pecking order theory this conclusion should be considered only highly indicative.

	No gaps in financial data		**Gaps in financial data allowed**	
	Total debt issued	Net total debt issued	Total debt issued	Net total debt issued
	(1)	(2)	(1)	(2)
Constant	-0.02 *	-0.03 *	-0.01 *	-0.02 *
Financing deficit	0.60 *	0.95 *	0.31 *	0.78 *
Number of firms	75	75	220	220
R^2	0.38	0.58	0.27	0.49

* Indicates significance at 5% level

** Indicates significance at 10% level

Table 11. Tests on aggregated pecking order model for the smallest firms

Sample includes firms with total equity and liabilities lower than 100m€. Financials firms and regulated utilities are excluded. The following regression is estimated: $\boldsymbol{\Delta D_t = \alpha + \beta_1 DEF_t + e_{it}}$, in which $\boldsymbol{\Delta D_t}$ is the amount of debt issued and $\boldsymbol{DEF_t}$ is the financing deficit. All variables are scaled by firm's total assets. The dependent variable is total gross debt and total net debt issued in columns 1 and 2 respectively.

5.3. REGRESSIONS ON INDIVIDUAL NORDIC COUNTRIES

In previous regressions all Nordic countries were merged into a single data sample. Nordic countries share common legislative framework, similar development of financial markets, similar bank concentrated lending environment and relatively integrated economies. Therefore merging countries into a single data sample was justified. However if some Nordic countries lack of statistical significance for financing deficit or the variable is not in the right order of magnitude then the results might be driven by some countries individually. In this case merging would not be justified and there might exist country specific unobservable variables which drive the results for joint data sample.

Table 8 presents results for aggregated pecking order model with firms which report continuous financial data for the full sample period of 2005-2014. Financial firms and public utilities are excluded. There are only 3 Icelandic firms which fill these restrictions and therefore results for Iceland are not available. The dependent variables are presented in columns 1-5. Values for the constant (α) are presented in the first row, coefficients for financing deficit (β_1) in the second row, number of firms in the sample in the third and coefficient of determination (R^2) in the last row.

A data sample of 57 Danish firms shows financing behavior close to what pecking order theory predicts. Net long term and net total debt issued show financing deficit coefficient close to a unit and relatively high R^2. The coefficients are statistically significant at 5% level. Regressions on long term gross debt issued show lower value for the coefficient and moderate R^2. Regressions using leverage ratio show close to a unit coefficient and also moderate R^2. Intercept term is close to zero for each different dependent variable but are not statistically significant at 10% level.

42 Norwegian firms reports continuous financial data for the full sample period. Estimations for financing deficit support the pecking order theory for each different dependent variable. However the intercept terms are not statistically significant at 10% level but are close to zero with the exception of leverage ratio. Coefficient of determination is varies between c. 0.4 and 0.5 for all tests.

Sweden is notably larger market as there are 113 firms which report continuous data from 2005 to 2014. Results for Swedish firms support the pecking order theory the slightly weaker than with Danish and Norwegian firms. Coefficients for financing deficit are in the right order of magnitude and statistically significant at 5% level for both regressions

using net debt issued. Test on gross debt issued and leverage ratio show coefficients close to 0.5 at highest. R^2 is at moderate level or at least at tolerable level for each test. Intercept terms are close to zero for each regression but only statistically significant for gross debt issued.

Results for Finnish firms show similar pattern with other Nordic countries. Estimated values for financing deficit differ from their predicted values when using gross debt issued as the dependent variable. Both regressions on net debt issued show values which are in the right order of magnitude. Values for the constant term are again close to zero but are not statistically significant at 10% level. Coefficients of determination are at the same level with other Nordic countries.

Coefficient of determination is similar for each Nordic country. For the merged data sample R^2 varies between 0.36 and 0.57. R^2 on Nordic data can be considered to be on a high level when comparing to other empirical studies from e.g. Shyam-Sunder and Myers (1999) and Frank and Goyal (2003). It should be noted that Swedish firms account for nearly half of the merged data sample's firms. This implies that the results for the merged data sample are somewhat driven by Swedish firms although each country shows similar statistical fit for the model.

Apart from few exceptions the evidence from individual Nordic countries is consistent with results from the merged data sample. A majority of the results shown in table 8 support the pecking order theory. Thus as both the market characteristics and firm financing behavior are consistent across Nordic countries, merging Denmark, Norway, Sweden, Finland and Iceland into a single data set is justified. Supportive results justify performing additional, more detailed, regressions on the merged data sample.

	Denmark					Norway				
	Long term debt issued	Total debt issued	Net long term debt issued	Net total debt issued	Change in leverage ratio	Long term debt issued	Total debt issued	Net long term debt issued	Net total debt issued	Change in leverage ratio
	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
Constant	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00 *
	(0.005)	(0.006)	(0.006)	(0.005)	(0.005)	(0.006)	(0.006)	(0.006)	(0.006)	(0.005)
Financing deficit	0.55 *	0.81 *	0.78 *	1.04 *	0.54 *	0.61 *	0.78 *	0.77 *	0.94 *	0.86 *
	(0.034)	(0.040)	(0.042)	(0.033)	(0.032)	(0.056)	(0.057)	(0.058)	(0.058)	(0.051)
Number of firms	57	57	57	57	57	42	42	42	42	42
R^2	0.43	0.54	0.48	0.72	0.46	0.36	0.48	0.40	0.51	0.50

	Sweden					Finland				
	Long term debt issued	Total debt issued	Net long term debt issued	Net total debt issued	Change in leverage ratio	Long term debt issued	Total debt issued	Net long term debt issued	Net total debt issued	Change in leverage ratio
	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
Constant	0.00 **	0.01 *	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	0.00
	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Financing deficit	0.33 *	0.49 *	0.63 *	0.79 *	0.49 *	0.25 *	0.42 *	0.66 *	0.83 *	0.78 *
	(0.021)	(0.024)	(0.026)	(0.029)	(0.028)	(0.037)	(0.036)	(0.044)	(0.040)	(0.043)
Number of firms	113	113	113	113	113	63	63	63	63	63
R^2	0.32	0.41	0.46	0.52	0.30	0.18	0.34	0.36	0.52	0.46

* Indicates significance at 5% level

** Indicates significance at 10% level

Table 12. Tests on aggregated balanced pecking order model for each country

The sample consists firms with no gaps in financial data for the tested period of 2005-2014. Financials firms and regulated utilities are excluded. The following regression is estimated: $\boldsymbol{\Delta D_t = \alpha + \beta_1 DEF_t + e_{it}}$, in which $\boldsymbol{\Delta D_t}$ is the amount of debt issued and $\boldsymbol{DEF_t}$ is the financing deficit. Financing deficit is the sum of dividends, investments and the change in working capital minus the operating cash flow. All variables are scaled by firm's total assets. The dependent variable is presented in colums 1 to 5. Leverage ratio is defined as net debt to total assets. Standard errors are reported in parentheses.

5.4. EFFECTS OF TIGHTENING FINANCIAL REGULATION

In chapter 3 it was presented that the Nordic corporate lending environment has changed notably during the last five years in the aftermath of the financial crisis in 2008-2009. The crisis created a demand for regulatory reforms in Europe and in the US. As a result Basel III was implemented, resulting in stricter capital requirements: This in turn was estimated to increase lending rates (Cosimano & Hakura 2011) and thus result in firms to diversify their funding. Due to diversification firms have increased bond financing.

Frank and Goyal (2003) study financing behavior of US firms and find results which do not support pecking order theory. At the same time the US corporate financing market is significantly less bank concentrated than the Nordic market. De Haan and Hinloopen (2003) show that there is a preference among firms to choose bank debt over equity but equity over bond financing. Creating a dummy variable for pre-financial crisis period enables studying whether the increased usage of bond financing has had an impact on firm choices between debt and equity financing. The results are presented in table 11 for firms with no gaps in financial data and also for the whole data sample. Column (1) shows tests with total gross debt issued and column (2) with total net debt issued.

The regressions are adjusted for cross-sectional fixed effects while period fixed effects have been dropped due to using period dummy. Dummy approach can be used in econometrics to capture possible differences between the two time periods which in this case includes the implementation of stricter financial regulation. 2010 was chosen to be the year when a stricter financial regulation was implemented. Similarly Frank and Goyal (2003) study the pecking order theory in 1971-1989 and 1990-1998. However they choose to simply compare the coefficients instead of testing whether the differences are statistically significant. The results in table 11 provide a more statistical approach for the comparison of two time periods.

Firstly, the results for those 278 that have no gaps in financial data are fairly similar for both dependent variables. Similarly to previous tests the coefficient for financing deficit is higher when including cash and cash equivalents. The intercept terms are close to zero. All variables are statistically significant at 5% level. The year-dummy is slightly above zero and statistically significant at 5% level. The lack of magnitude on the dummy variable means that there is only a minor change in firm financing behavior after the financial crisis. The coefficients of determination show decent statistical fit for the models.

	No gaps in financial data		Gaps allowed in financial data	
	(1)	(2)	(1)	(2)
Constant	-0.01 *	-0.01 *	-0.01 *	-0.01 *
Financing deficit	0.62 *	0.89 *	0.46 *	0.75 *
Year-dummy	0.02 *	0.01 *	0.02 *	0.01 **
Number of firms	278	278	547	547
R^2	0.42	0.56	0.34	0.48

* Indicates significance at 5% level

** Indicates significance at 10% level

Table 13. Tests on aggregated balanced pecking order model with periodical dummy

The sample consists firms with financial data for the period presented on top row. Financials firms and regulated utilities are excluded. The following regression is estimated: $\boldsymbol{\Delta D_t = \alpha + \beta_1 DEF_t + \eth Year_1 + e_{it}}$, in which $\boldsymbol{\Delta D_t}$ is the amount of debt issued and $\boldsymbol{DEF_t}$ is the financing deficit. Financing deficit is the sum of dividends, investments and the change in working capital minus the operating cash flow. $\eth\boldsymbol{Year_1}$ is a dummy variable which divides the sample period into two periods. All variables are scaled by firm's total assets. The dependent variable is total gross debt issued in column 1 and total net debt issued in column 2.

Secondly, the results for the full sample of firms do not deviate significantly from the first set of tests. The coefficients for financing deficit are slightly lower and show a similar difference between gross and net debt issued as the dependent variable. For both tests the beta coefficients are statistically significant at 5% level. The intercept terms are also close to zero and statistically significant at 5% level. The year-dummy variables are also slightly above zero and statistically significant at 5% and 10% level for total gross debt issued and total net debt issued, respectively. Also the R^2's show decent statistical fit for both models.

A positive figure for the year-dummy is necessary for being able to state that the pecking order theory performs stronger before the financial crisis. However the lack of magnitude on the dummy variable casts doubt on pecking order behavior diminishing after the financial crisis. Additional robustness checks were made in which the year of implementing stricter financial regulation was changed. The results are not dependent on the year proxying the implementation of stricter regulation as tests with year-dummy values ending in 2008, 2009 or 2010 show similar slightly positive and statistically significant values.

6. ANALYSIS OF THE RESULTS

In this chapter the results presented in previous chapter are summarised, analysed and compared against main pecking order theory studies.

6.1. SUMMARY OF THE RESULTS

Generally the pecking order theory performs fairly well and shows decent statistical fit. The relation between debt issued and financing deficit is clear and is on average near to a unit coefficient. Net debt as the dependent variable proxies debt issued more strongly than gross debt issued or change in leverage ratio. Also tests on total interest bearing debt issued outperform tests on long term interest bearing debt issued. The results are not dependent on the continuous data requirement while are however slightly stronger for these firms. Thus the first and the third hypotheses are accepted.

These observations imply that it is important to account for both long and short term debt while also accounting for changes in firm cash reserves. Nordic firms appear to use both long and short term bank debt to finance their dividends, investments and working capital requirements. Nordic firms also seem to keep notable cash reserves which they later use for either investments, dividends or other operative requirements. It is also important to note that the pecking order theory does not only try to explain how firms finance negative cash flows but also implies that positive cash flows are used directly to pay down debt.

Disaggregated pecking order model tests whether the individual factors used to construct the proxy for financing deficit are all equally important. As an example positive results would imply that aggregation of financing deficit factor is justified. On the contrary negative results would suggest that alternative patterns might be available or firms use equity to finance some of the individual factors. The results show that tests with net debt as the dependent variable support the aggregation of the pecking order model while gross debt and change in leverage ratio do not fully. Cash reserves appear to play an important role in the disaggregated model. Thus the second hypothesis is accepted on the condition of using net debt as the dependent variable.

So far merging the Nordic countries into a single data set has remained unquestioned. Danish, Finnish, Swedish, Norwegian and Icelandic firms have been assumed to follow the same type of financing behavior since their underlying legislative framework is similar and the financial markets are integrated. The results support merging the Nordics

into a single data sample and are robust on most of the different dependent variables. The only exception is long term gross debt issued and particularly Finnish and Swedish firms. They show weak support for the pecking order theory. However since most of the tests support pecking order theory, merging the Nordics is justified.

The last hypothesis suggests stronger support for pecking order theory for the period of 2005 to 2009 than for 2010 to 2014. The difference between the two time periods is tested with a dummy variable. The dummy variable receives positive yet small values for all performed tests and is also statistically significant in all performed tests. Additional robustness checks do not alter the results. There exists only a marginal change in average lending behavior after the financial crisis. Therefore the fourth hypothesis is rejected.

It should be noted that the coefficient for financing deficit is constantly below one which is an interesting observation since it implies that either a number of firms do not follow pecking order behavior closely or that firms also consider equity financing to e.g. adjust their optimal capital structure.

6.2. PRIOR PECKING ORDER STUDIES

In this section a summary of some selected prior pecking order studies is presented. Also a brief comparison to the results of this study is showed. Table 13 shows some selected prior pecking order studies. The scope of the table is to provide a brief overview of prior studies and therefore some of the most famous studies for and against pecking order theory are presented. Thus the table should be considered only as an comparison point and not as a broad meta-study on the matter.

Tests of pecking order theory on US firms show highly mixed results. Generally studies conducted on earlier time period and on a more assorted data support pecking order theory more strongly than studies on a wide data sample. Some of the studies presented in table 13 are not conducted directly to study pecking order theory. For example in Leary & Roberts (2005), they study tradeoff theory but find evidence for pecking order behavior. The US corporate lending market is more bond financing based and thus there should be a more limited support for pecking order theory.

Lemmon and Zender (2010) provide an interesting approach as they propose that debt capacity is a highly important factor to control for in order to find support for pecking order theory. They note that previous researchers unsuccesfully use leverage ratio and

size as proxy for debt constrain. Then these results are generally interpreted to not support pecking order theory. Lemmon and Zender (2010) are succesful in separating debt and equity financing prefering firms with proxied debt capacity and bond ratings. It appears that while pecking order theory is unable to explain short term financing patterns for broad range of US firms there exists sub samples which follow pecking order behavior closely.

Tests of pecking order theory on European firms show generally more supportive results than studies conducted on US firms. This deviation likely derives from European market being more bank lending centered. However for example the UK corporate lending market is relatively bond centered and therefore for example Tucker and Stoja (2011) are able to find only a limited number of listed UK firms which follow the pecking order behavior of financing. The US and UK lending markets are fairly similar and thus similar financing patterns are logical.

Watson and Wilson (2003) study the same market but use only small and medium sized firms which can be assessed as ones with limited access to bond and equity markets. They find strong evidence for pecking order theory from UK SMEs. Gaud et al. (2005) study financing behaviors across 15 European countries as a combined sample and are thus unable to control for differences between local lending markets. Their study shows poor support for the pecking order theory. On the other hand studies by Burlacu (2000) and De Haan and Hinloopen (2003) on Dutch and French firms show clear support for pecking order theory.

The results from Nordic markets align with those from De Haan and Hinloopen (2003), Watson and Wilson (2003) and Burlacu (2000). Pecking order theory appears to quite well explain annual financing behavior in bank concentrated lending environments. However a noteworthy point of view is that not all firms are equally positioned to acquire equity or bond based funding. Therefore studies such as Burlacu (2000) which study a limited pool of firms shed new light to the pecking order behavior.

Contributor	Time period	Avg. nr. of firms	Country of origin	Supports pecking order?	Brief overview of results on pecking order theory
Shyam-Sunder & Myers (1999)	1971-1989	157	US	Yes	Results show strong support for pecking order theory with high statistical fit
Frank & Goyal (2003)	1971-1989	768	US	Yes	Decent support with tolerable statistical fit. Results are dependent on no gaps in financial data requirement
Frank & Goyal (2003)	1990-1998	2025	US	No	Poor support with low statistical fit. Consistent with no gaps and gaps permitted in financial data
Leary & Roberts (2005)	1984-2001	3494	US	Yes	Find consistent evidence of pecking order behavior. However tests were conducted to study tradeoff theory
Leary & Roberts (2010)	1971-2001	1160	US	No	Results show that firms often violate the pecking order hierarchy in both internal vs external and debt vs equity financing
Lemmon & Zender (2010)	1971-2001	720	US	Yes	Pecking order theory performs strongly for high debt capacity firms. Results are not consistent for low debt capacity firms
Gaud et al. (2005)	1988-2000	5000	EU	No	Results show that neither tradeoff, agency nor pecking order models are able to explain firm lending behavior
Watson & Wilson (2003)	1990-1995	629	UK	Yes	Results show strong evidence of pecking order behavior for UK SMEs
Tucker & Stoja (2011)	1968-2006	2427	UK	Mixed	Results support target gearing ratio behavior in long run and pecking order in short run for some firms
Burlacu (2000)	1981-1998	141	French	Yes	Results show that convertible bond issues resulted in negative market responses which supports pecking order theory
De Haan & Hinloopen (2003)	1984-1997	150	Dutch	Yes	Results show clear pecking order behavior of bank debt over equity and equity over bond financing

Table 14. Brief overview of other pecking order studies

The table presents results from some noteworthy publications on pecking order theory. For each study the studied timperiod, average number of firms, country of origin, a conclusions of the results and a brief overview of the study are presented.

6.3. DISCUSSION ON THE RESULTS

The study in this paper is a general approach to pecking order theory and thus studies from Shyam-Sunder and Myers (1999) and Frank and Goyal (2003) are closely comparable. As discussed earlier, the two studies find highly differing results for pecking order theory despite using data from same time period (Frank and Goyal, 2003 also extend the study to newer. Shyam-Sunder and Myers (1999) argue that firms follow pecking order behavior closely while Frank and Goyal (2003) argue that only a limited number of firms follow pecking order and the behavior is less evident with more recent data. On the other hand Lemmon and Zender (2010) find less debt constraint firms from the same period to follow pecking order pattern of financing. Therefore it seems that in the US only some firms, those generally considered as large and stable firms and those considered less credit constraint, follow pecking order behavior of financing.

The Nordic countries serve as a somewhat ideal environment for pecking order theory as there exists a notable amount of stable industrial firms and the local corporate lending market is bank concentrated. Therefore as expected the support for pecking order theory is strong in these countries. The local lending culture and the characteristics of the market appear to play an important role in firm financing decisions and firms appear to adapt to current conditions in a way which they believe to maximise their value.

In various studies of pecking order theory size is seen as a critical factor. However different researchers interpret size to proxy different things. For Nordic firms size appears to proxy asymmetric information as debt is highly preferred for firms with less than 100 million euro in assets. Size is also a difficult concept to compare in different markets as a firm considered small in one market might be considered medium sized in another market. For example the higher limit for small cap firms in Finland is 150 m€ in market capitalisation while the same limit in the US is approximately 2 bn$ (Nasdaq, 2015).

6.4. LIMITATIONS AND SUGGESTIONS FOR FURTHER RESEARCH

The results presented in this study should only be considered to hold for the used sample of Nordic firms. As stated in previous chapter, this study finds supportive results for pecking order theory in all used sub groups while previous researchers have been somewhat succesful in isolating firms subject to more severe adverse selection issues and more debt constraint firms. Thus additional research conducted with different proxies for adverse selection and debt constrain could yield interesting results. Basic classifications

such as size and leverage ratios could be replaced with more advanced classifications such as debt ratings. Since Orbis database does not provide debt ratings for firms, using those in this study is not an option. Also industry effects are widely excluded in pecking order theory studies but argued to affect optimal capital structure. Due to the lack of literature on the matter, industry effects are not in the scope of this paper.

Orbis database provides financial data for the last 10 years. Therefore a study conducted with a longer data set would enable using additional subperiods and further studying effects of financial market development in the Nordics. For example the Dot-Com bubble and economic crises in the 90s would be interesting periods to study. Also a study concentrating solely on firm financing decisions in periods of economic expansion and downturn could be conducted with a longer data set. For example firms experience higher probability of bankruptcy in recession and more investment opportunities in expansion period which both can be expected to alter financing patterns.

The study conducted in this paper provides a clear evidence of pecking order behavior. However the model used is a simplification of the real world financing patterns and excludes various factors effecting firm financing decisions. Therefore alternative approaches to create a more realistic and detailed picture of the choice between debt and equity financing would be beneficial. Understanding annual financing patterns is crucial to understand firms' long term optimal capital structure choices. Different capital structure theories are often seen as competitors while the possibility of multiple applicable theories is often forgotten.

The pecking order theory of financing has a stable position in applicable capital structure theories. It is often seen as a rather simplified model of real world corporate financing but contains multiple academically recognised features. Thus it can be expected to remain as one of the most studied theories in the field of corporate financing and to deserve additional research on unanswered questions.

7. CONCLUSIONS

This thesis studies the pecking order theory of corporate financing in North European economies. The main purpose is to find out whether listed Nordic firms follow pecking order behavior in their annual financing decisions. The second purpose is to investigate possible sub groups which deviate from the full sample in their annual financing decisions. Lastly the paper also studies whether the pecking order behavior loses strength after the financial reforms were applied in the aftermath of the financial crisis.

The empirical results of this paper show strong evidence of pecking order behavior in listed North European firms. The results are robust for different measures of changes in firm debt levels. However it appears to be important to account for both long and short term interest bearing debt and also include cash reserves when measuring changes in firm debt levels. Nordic firms use both long and short term debt to finance their operations while also holding notable cash reserves.

As the theory suggests, pecking order behavior should be more evident for firms subject to more severe adverse selection problems. At the same time, firms which are debt constraint are expected to deviate from pecking order behavior. The results in this paper are not truly able to isolate sub groups which notably deviate from the full sample. Size appears to be the only factor which has a significant role in the Nordic data sample as the smallest listed firms prefer debt over equity more strongly than the full sample. From publicly available accounting data, firm size is the most used proxy for adverse selection. As seen from this paper and various earlier studies, firm size is not able to strengthen findings of pecking order behavior.

This paper uses a dummy variable for pre-financial crisis period which enables studying the effects of increased lending rates due to the implementation of Basel III. Increased lending rates are expected to result in firms starting to diversify their funding, increasing both equity and bond based financing. The results show positive yet marginal values for the dummy variable which implies only a marginal change in average lending behavior for Nordic firms after the financial crisis.

This study covers the past 10 years of accounting information from North European firms which provides the latest available data for studying pecking order behavior. Thus the implications are timely and relevant for other researchers to compare to. Future research should be able to more accurately study the effects of tightening financial regulation as a

broader data of post-financial crisis becomes available. This study provides a noteworthy basis for extending the research of pecking order theory on both post-financial crisis period as well as on bank-centered lending environment.

As a conclusion pecking order theory provides a noteworthy viewpoint at studying firm lending behavior. Among other capital structure theories it is based on simple assumptions but on the other hand it is not strictly dependent on any real world simplifications. Pecking order theory deserves a solid position among main capital structure theories and thus requires additional research. Especially novel financing instruments which shake up traditional border lines of debt and equity require additional research. Also the development and characteristics of national capital markets require to be noted and studied separately in order to develop new views of firm capital structure. Despite of development in financial markets since the work of Myers (1984), the original pecking order theory appears to still be a relevant theory in explaining firm financing decisions.

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