With the financial crisis came an increased awareness and interest in companies’ capital structures. Numerous studies have conducted empirical investigations of this topic, yet no research exists on the determinants of capital structure in Danish companies.

This thesis conducts an analysis of the determinants of capital structure on a dynamic panel data set from a sample of 106 Danish listed companies in the period 2001-2011. Support for the pecking order theory and trade-off theory are examined and the analysis find support for the trade-off theory, but no support for the pecking order theory. A dynamic partial adjustment model is estimated using Blundell-Bond’s two-step system GMM estimator as the primary estimator.

The results show that Danish listed companies adjust towards their target capital structure with 26,3 % a year using a book measure of leverage and 36,0 % using a market measure of leverage. Underleveraged and overleveraged companies adjust towards their target capital structure faster than the full sample of companies, suggesting they suffer costs from deviating from their target. Interestingly, underleveraged companies adjust much faster than overleveraged, indicating higher costs of deviating below the target. Company characteristics appear to have significant impact of adjustments speeds.

‡ The author is grateful for the useful comments and advice from his supervisor, Baran Siyahhan.
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PART ONE: INTRODUCTION

CHAPTER 1: INTRODUCTION

Since Modigliani and Miller published their paper on the cost of capital, corporate finance and investment theory in 1958, and hence the development of their capital structure irrelevance theorem, a vast amount of research has focused on companies’ capital structure. (Modigliani & Miller, 1958) Several theories have been developed in the attempt to arrive at one that is able to explain the financing behaviour of companies as well as establishing whether an optimal capital structure exists. Theories such as agency theory (Jensen & Meckling, 1976), trade-off theory (Modigliani & Miller, 1963) and pecking order theory (Myers & Majluf, 1984; Myers, 1984), with the latter two being the most dominant, have been developed and used in the attempt to explain companies’ capital structure. The trade-off theory advances that the choice of capital structure in a firm is a result of a trade-off between the benefits of debt, such as those arising from interest debt tax shield, and the costs of debt, such as indirect and direct bankruptcy costs (Myers, 1984), whereas the pecking order theory states that companies prefer the cheapest source of funding, which due to information asymmetry, means companies prefer internal to external funding as well as debt to equity funding. (Myers & Majluf, 1984)

Numerous studies have carried out empirical tests of capital structure theories, trying to establish whether they could explain the capital structure of companies as well as figuring out which determinants were important when considering companies’ capital structure. However, despite the immense amount of existing research, the ability of the theories to explain the capital structures of firm remain limited. (Graham & Leary, 2011) The continued focus on companies’ capital structure highlights the importance and relevance of this area of study as researchers continue to arrive at new possible directions and views to implement in future research.

The financial crisis also contributes to the continued focus on companies’ capital structure, as a high increase in company bankruptcies have followed in the wake of the financial crisis. The focus of capital structure is not merely of interest for academics but is equally, if not more, important for the practitioners working in the financial
management of every company. The financial crisis has generated a renewed focus and need for companies to critically evaluate on, and deal with, the financing decisions of their companies. In the financial markets insecurities were created when Lehman Brothers collapsed in September 2008. The insecurities in the financial markets and the sudden bankruptcy of large companies made investors doubt the credit quality of companies, and this resulted in both a credit tightening by banks and less willingness for investors to invest in companies. Ultimately the consequence was that all companies faced significant barriers and difficulties when trying to attract capital both from banks and from investors.

In Denmark, where companies rely more heavily on bank lending, companies also suffered under what was termed the banking crisis, where several banks in Denmark defaulted due to bad loans given to especially real estate companies. As a result banks in Denmark tightened their lending policies, which meant that many Danish companies experienced difficulties in attracting the money they needed. (Flensborg, 2009)

Overall, the development in recent years has highlighted the relevance and importance of companies’ capital structure. Which factors influences companies’ choice of capital structure? Do managers of companies strive for fixed, optimal capital structure? Do companies prefer debt financing to equity financing? All these questions still remain largely unresolved and although concurrent views exist on some of the questions, it has yet proven difficult to establish theories that are able to explain the capital structures of companies. This study set forth to provide additional knowledge on the area by providing an analysis of capital structure in Danish companies.

1.1 RESEARCH FOCUS AND OBJECTIVES

Many questions still emerge when considering companies’ capital structure even though researchers have been studying the subject for over 50 years, and the relevance of the subject is still very much existing.

Several studies have examined capital structures of companies on the basis of especially the pecking order theory and the trade-off theory, so the topic and research method are not new. However, most studies so far have focused on US companies (Titman & Wessels, 1988; Fischer, et al., 1989; Shyam-Sunder & Myers, 1999), cross-country (Rajan & Zingales, 1995; Jong et. al., 2008; Alves & Ferreira, 2011), Swiss companies
(Gaud et. al, 2005) etc. Two of the studies includes Danish companies (Jong et. al., 2008; Alves & Ferreira, 2011), but only as a part of a cross-country comparison and hence the samples were not large, nor covered in detail. Through the empirical studies conducted on the topic it has been established that a number of company characteristics consistently influence company capital structure. However, the cross country studies have revealed that institutional differences across companies have an impact of capital structure choices as well. (Alves & Ferreira, 2011) Differences in the development of financial markets along with the preferred external financing sources have been shown to influences the capital structure choices of companies. (Öztekin & Flannery, 2012) US and UK companies rely heavily on bond and equity markets for their external financing, where Danish companies rely on bank financing. These differences suggest that determinants of capital structure may change across countries, and as no study on Danish companies’ capital structure has taken place, an analysis of the determinants of capital structure in Danish companies provides a gap in the existing literature, and provides the overall research aim:

**Examine the determinants of capital structure in Danish listed companies.**

An examination of the determinants of capital structure in Danish listed companies includes several research tasks. Firstly, it is necessary to determine the relevant theories of capital structure. Hence the first research task is the following.

*Identify the dominant theories of capital structure.*

The findings obtained through the analysis of Danish listed companies’ capital structure needs to be evaluated against and compared to existing literature, in order to clearly show the results in context and to illustrate the value of the study to the research area. This constitutes research task number two.

*Compare and discuss the findings on the determinants of capital structure in Danish listed companies in relation to existing literature and empirical research from other countries.*

Taken together the two research tasks provide the basics necessary to answer the overall research aim.
1.2 DELIMITATIONS

This thesis examines the determinants of capital structure of Danish listed companies and hence it explains and investigates only those areas and aspects that are most important for the subject. Multiple theories of capital structure have evolved since the topic originated, however, only the pecking order theory and trade-off theory will be covered as these are the predominantly used in empirical research, and therefore provide the opportunity to compare results to a large amount of existing research. This means that a theory such as the market timing hypothesis will not be included. Similarly, only the most relevant empirical research will be included and discussed. A thorough literature review would require, and deserve, a paper in itself. Furthermore, the focus of this dissertation is on the determinants that explain the debt-equity structure of companies. In this regard, no special attention will be given to the dividend policy of companies and hence the capital structure theories will be used only to explain the amount of debt in the capital structure of companies.

1.3 OUTLINE STRUCTURE

The thesis is organised as follows. Part Two provides the literature review. Chapter 2 identifies and presents the pecking order theory and the trade-off theory. Chapter 3 presents and discuss the empirical results obtained in other countries. Chapter 4 focus on capital structure in Denmark by highlighting the effect of institutional differences between countries and presents empirical results from papers where Danish companies have constituted a small part of the samples. Part Three contains the analysis. Chapter 5 discuss the determinants of capital structure in relation to the earlier empirical results and develops hypotheses regarding the effect of these determinants in Danish listed companies. Chapter 6 presents and discusses the research methods used in order to conduct the econometric analysis of Danish listed companies’ capital structures. This involves a discussion of valid econometric estimators as well potential econometric problems. Chapter 7 presents, discuss and evaluates the findings. Part Four concludes the thesis and offers a critical evaluation of the findings and provide recommendations for future research.

2 If the reader is interested in papers that thoroughly reviews the literature and research on capital structure, the following papers are recommended: (Harris & Raviv, 1991; Graham & Leary, 2011)
PART TWO: LITERATURE REVIEW

In order to determine and discuss the determinants of capital structure in Danish listed companies this part presents the relevant capital structure theories and their implication. Earlier empirical results are examined and discussed and together with the capital structure theories, they provide the foundation of the analysis.

CHAPTER 2: CAPITAL STRUCTURE THEORY

The introduction highlighted the need for empirical research of Danish companies. As a prerequisite, this section establishes the main developments in capital structure research since it originated as a topic. This involves a review of the two most influential capital structure theories and their main contributions to the area of study.

This section starts by reviewing the progress in capital structure theory since Modigliani and Miller’s famous paper in 1958 and presents the main capital structure theories. The amount of research and articles on capital structure research is vast and it is therefore out of the scope of this dissertation to do a comprehensive review of all the contributions made by researchers to capital structure theory, neither is it necessary. However, the most recent and influential contributions will be included. Initially, capital structure is defined below.

2.1 DEFINING CAPITAL STRUCTURE

As companies’ capital structure constitutes the core element in this dissertation it is suitable to define what the concept of company capital structure actually is. Different definitions have been used in the capital structure literature. Brealey, Myers, & Marcus (2009, p. 366) defines capital structure as the ‘mix of long-term debt and equity financing’. However, as capital structure relates to the way that companies finance their assets it is inadequate only to include long term debt and equity in the capital structure definition, as they can just as readily issue short term debt or convertible debt to provide financing. The choice will ultimately relate to company preferences, as well as the nature of the asset being financed. Similarly, Welch (2011) challenges the use of only
including financial debt and equity into the capital structure measure and advances instead a measure including total liabilities to total assets. Using this leverage measure indicates that capital structure consists of all liabilities, both financial and non-financial, and equity. For the purpose of the literature review and the capital structure theories treated it is sufficient to use a definition of capital structure between the two above mentioned. As such capital structure is defined as the mix of financial debt, including long- and short-term debt and convertible debt, and equity. This definition is able to capture the implications of the capital structure theories examined in the following sections.

2.2 CAPITAL STRUCTURE THEORY

Capital structure theory, as known today, originates from the work of Modigliani and Miller, hereafter named MM, who published their famous article in 1958. Many, if not all business and finance academics have heard and know about MM’s capital structure irrelevance proposition and several textbooks within corporate finance begin their explanations of capital structure and cost of capital with the work of MM. (Berk & DeMarzo, 2011; Brealey, et al., 2009; Hillier, et al., 2008) Basically, the main finding by MM was that, given a set of assumptions, the cost of capital and the value of a given company were independent of the financing choice, also known as the debt irrelevancy theorem.

The conclusions by MM, which was a break with the conventional view on corporate finance at the time, triggered much debate and criticism and countless articles was published on the subject in the following periods. Durand was one of the first to express criticism of the work of MM. (Durand, 1959) His criticism dealt primarily with the assumptions underlying the MM propositions and stated that in the real world the conclusions that MM arrive at were faulty at best. Durand’s comments highlighted the major stream of thoughts by critics, as most discussed the problems resulting from MM’s strong assumptions that would never resemble the real circumstances that companies and investors were operating in. Especially the assumption concerning perfect markets or no market imperfections are a strong assumption, as this excludes taxes, bankruptcy costs, agency costs etc. and requires that all information is reflected in the market immediately and that all participants in the market have equal access to act
on the information. However, despite the criticism of MM’s framework and propositions their work still stands as a cornerstone of corporate finance. The reason for this is that they with their model and propositions from 1958 provided the area of corporate finance with a tool to systematically analyse the factors influencing the effect of capital structure choices. By assuming perfect markets and thereby excluding factors such as taxes, bankruptcy costs, asymmetric information, agency costs etc., they essentially highlighted which factors made capital structure relevant. The assumptions could then be tested systematically in a structured way and this facilitated the development of several theories of capital structure.

2.3 TRADE-OFF THEORY

Taking modern corporate finance theory into consideration, the existing views prior to MM’s proposition in regards to cost of capital and optimal capital structure, does not seem far from what is taught to many academics today. However, the difference should be found in the factors causing the changes in the average cost of capital and the value of the company, where the positive effect on firm value and cost of capital stems from the tax advantage of including debt into the company’s capital structure and the mitigating effect of interest payments on the agency costs arising from the free cash-flow problem. (Jensen, 1986) However, an increase in leverage causes increased risk of financial distress and bankruptcy costs so the benefits from debt should be measured against the potential costs associated with debt. This is the essence of the trade-off theory.

The fact that debt has a positive effect on firm valuation and cost of capital was already discussed by MM, but the authors end up concluding that;

“...with a corporate income tax under which interest is a deductible expense, gains can accrue to stockholders from having debt in the capital structure, even when capital markets are perfect. The gains however are small...” (Modigliani & Miller, 1958, p. 294:5)

According to MM in their original article the benefits of including debt into the capital structure was insignificant. However, MM (1963) corrects their initial conclusion on the advantage of debt when interests are tax deductible at the corporate tax rate, and states that the value of including debt into the capital structure is higher than their original
paper suggested. The value of a levered company, $V_L$, is equal to the value of the
company unlevered, $V_U$, plus the present value of the interest tax shield, $\tau D_i$:
(Modigliani & Miller, 1963, p. 436)

$$V_L = V_U + \tau D_i$$ (2.1)

Critically though, MM (1963) omits any notion on the potential costs involved with
increased debt, which has the consequence that in their corrected model companies
would gain by increasing their leverage as much as possible, as high as full debt
financing. Miller (1977) argues that the cost of bankruptcy is very low compared to the
advantage of debt and induces that if the tax advantage when considering both personal
and corporate taxes was of high value, there should be higher changes in capital
structures over periods with changes in tax rates. (Miller, 1977) In his paper Miller
contradicts the findings and statements developed by Baxter (1967) and Kraus and
Litzenberger (1973), amongst others. Baxter (1967) focuses on the costs associated with
bankruptcy costs and the effect it has on the cost of capital. Baxter notes that the cost of
capital decreases with low to moderate levels of debt, but rises quickly when the debt-
equity ratio becomes so high that there is an increasing risk the company defaults and
suffer the associated direct and indirect costs. Direct costs are often associated with the
legal and administrative cost incurred when the company defaults. Indirect costs,
however, are more broad and not as easily determined nor measured. They extend over
a wide variety of costs, such as losses on operating sales due to mistrust from
customers, loss of credit availability from suppliers, inability to keep or attract
employees etc. These costs suggests a convex function of cost of capital with different
levels of debt-equity ratios similar to the existing views, prior to MM’s irrelevance
theorem, and similar to the present perception of the cost of capital or weighted average
cost of capital, WACC, as it is more generally known as.

2.3.1 STATIC TRADE-OFF THEORY

The trade-off model deals with the benefits and costs associated with the issuance of
debt. The model is often traced back to Krauss and Litzenberger (1973) who developed
a single period company valuation model that took into account both the value of the tax
advantage to debt and the potential bankruptcy costs. According to Kraus and
Litzenberger (1973) the value of a levered company can be divided into three components; the value of the company unlevered, the benefits from the tax advantage of debt and finally, the after tax costs of bankruptcy. Seeing that the value of a levered company consist of these three components, where the unlevered value of the company is one, it suggest that companies can increase the value of the levered company by balancing the last two component, the tax advantage and the cost of bankruptcy. This indicate that there for a given company is an optimal capital structure where companies can increase the value of the company by issuing more debt until it reaches a point where the tax advantage of issuing more debt is offset by an increase in bankruptcy costs.

The model as presented by Kraus & Litzenberger (1973) and Myers (1984) suggest that companies will always be at their optimal debt-equity ratio. This constant debt-equity equilibrium would imply that companies would change their capital structure whenever their market values of equity were subject to sudden changes or shocks. Realistically this seems unlikely as issuance or repurchasing of debt or equity will inevitably be associated with transaction costs and it is therefore more likely that companies adjust their capital structures only infrequently, reflecting the imposed transaction costs. These transaction costs is not mentioned in the original model developed by Kraus and Litzenberger but Myers (1984) mentions such costs as a possible explanation why capital structure changes didn’t occur as often as the static trade-off model would predict.

The model is, as previously mentioned, a one period model so that it deals with a company’s capital structure in isolation of all other periods. This static approach to modelling a company’s capital structure is flawed as companies operate over several periods. Each period’s capital structure will inevitably be, at least partly, correlated with the preceding period’s capital structure and companies are likely to take into account future expectations when deciding on capital structure in one period.

Numerous empirical examinations of determinants of capital structure have been conducted the last two-three decades and have resulted in a number of stylized findings of the relationship between a company’s leverage ratio and certain firm characteristics.³

³ E.g. company size and asset tangibility is positively related to leverage while profitability and growth opportunities are negatively related to leverage. See Titman and Wessels (1988), Harris and Raviv (1991) and Frank and Goyal (2009) for a more thorough examination of the empirical literature and results.
One of the most consistent findings in empirical capital structure research is that higher profitability is associated with lower leverage for a given company, a result that is inconsistent with the static trade-off theory, as it posits that higher profitability would increase leverage to take advantage of a higher interest tax shield. (Fama & French, 2002) Furthermore, the static nature of the model suggests that companies are always at their optimal capital structure meaning that they adjust to sudden changes immediately, which is also inconsistent with empirical results. (Flannery & Rangan, 2006)

The inconsistencies between the empirical results and the static trade-off theory combined with the inadequacy of static models to analyse companies that operate in dynamic, multi-period settings have led to the development of dynamic trade-off theories that yield promising results.

2.3.2 DYNAMIC TRADE-OFF THEORY

Dynamic trade-off theory can be traced back to Fischer, Heinkel and Zechner (1989), FHZ, who was one of the first to develop a model in which companies may deviate from their optimal capital structure. The increasing dissatisfaction with the static trade-off model has led to many contributions to dynamic trade-off theory since the FHZ’s paper, especially within the last ten years. Dynamic trade-off theory treats companies’ capital structure as a continuous decision that involves consideration not only of the trade-off between the tax advantage of debt and potential cost of financial distress, but also about investment decisions and restructuring costs. In contrast to the static trade-off model, costs associated with adjusting capital structure may cause companies to move away from their optimal capital structure for longer periods of time.

Fischer, Heinkel and Zechner (1989) developed a model in which they suggested that instead of an optimal capital structure companies have an optimal capital structure range in which they let the capital structure fluctuate. The basic idea is that companies do not adjust their capital structure immediately when sudden changes in their asset values occur. Instead companies let their capital structure vary within a range as the costs of adjusting within this range exceed the benefits of doing so. Only at company specific upper and lower debt-equity ratios is it advantageous for companies to adjust their capital structure. Figure 1 illustrates the fundamental idea behind the model.
Figure 1: Dynamic Capital structure with Adjustment Costs

Companies will let their capital structure vary within the boundary conditions of $\frac{D}{E}_{upper}$ and $\frac{D}{E}_{lower}$, represented by the shaded area, as the costs of adjusting the debt-equity ratio within these boundaries would exceed the benefits of adjusting. If the company has a debt-equity ratio above $\frac{D}{E}_{upper}$, the company will adjust as the cost of financial distress and potential bankruptcy becomes higher than the costs of adjustment. At the lower limit this is the case when the benefits of increasing the debt, due to the interest tax deductibility, exceeds the costs of adjusting.

The model developed by Fischer, Heinkel and Zechner offers an appealing multi-period dynamic perspective to the financial decisions made in companies, but doesn’t offer much perspective on what implications it might have to empirical research. Strebulaev (2007) developed a dynamic trade-off model that incorporates costs associated with capital structure adjustments and shows by simulation that the model generates results that are consistent with observed capital structures. An important part of Strebulaev’s findings are the distinction between companies’ capital structure at refinancing points and their actual capital structure when data is collected. Similar to FHZ, Strebulaev argue that due to adjustment costs companies will only be at their optimal capital structures when they reach their individual refinancing points. When examining a cross-section of companies it is therefore unlikely that the companies are at their refinancing points when the data is collected, and furthermore each company will be at different
distances away from their optimal capital structures, which makes cross-section analysis using static models inaccurate and may lead to wrong conclusions. An example of this is the negative relationship between profitability and leverage that has been interpreted by many researchers, using static models, as a confirmation of pecking order behaviour and hence a rejection of the trade-off theory.\(^4\) However, Strebulaev (2007) shows how a dynamic trade-off model can explain this relationship. When companies experience an increase in profitability it will have a positive effect on company value as the expectation of future profitability improves, however, companies will not adjust immediately due to adjustment costs so the leverage ratio increases.\(^5\)

The models developed by FHZ and Strebulaev offer appealing characteristics, but the models look only at costs associated with the act of adjusting the capital structure and treats companies investment decisions as exogenous and independent of their financing choice, which is a seemingly strong assumption, e.g. companies likely take future investment decisions into consideration when deciding on present financing decisions.

Other researchers have developed alternative dynamic models that include more factors in their models such as investment decisions. Hennessy and Whited (2005) developed a model that combines companies’ investment decisions with their financing decisions in a continuous framework. In their dynamic model companies make investment and financing decisions jointly every period, which implies that companies are always at a restructuring point or refinancing point, cf. Strebulaev (2007). A debatable finding of Hennessy and Whited’s is that companies do not have a target capital structure but leverage being a result of a given company’s earlier results and their expectations for the future. A finding that is inconsistent with the finding of Graham and Harvey (2001; fig. 1) that 71 % of the surveyed companies have a flexible or tight target debt ratio.\(^6\)

Recent theoretical developments in dynamic trade-off theory as well as much of the recent empirical research have focused on companies’ target capital structure and at which speed companies adjust towards their capital structure target.

\(^4\) Fama and French (2002), Titman and Wessels (1988) and Frank and Goyal (2009) is only a few examples of researchers who make this interpretation of the negative relationship between leverage and profitability.

\(^5\) A similar argument is that increased profitability increases retained earnings and hence the value of equity and once again, when companies do not adjust to changes in value immediately it will result in a decreasing leverage ratio. An interpretation that is consistent with the results found by Baker and Wurgler (2002) who find that the negative relationship between leverage and profitability arise from increases in retained earnings.

\(^6\) Based on a survey of 392 CFOs from US companies.
Titman and Tsyplakov (2007) develop a model that considers many of the same factors as Hennesy and Whited (2005) and find that companies do have a target capital structure to which they adjust. The speed of adjustment is slow but varies between companies factors such as financial distress costs and agency costs have an effect on companies’ incentive to adjust. Both DeAngelo et al. (2011) and Strebulaev and Whited (2012) also find slow adjustment speeds and explain this by companies conservative debt use in order to preserve financial flexibility. DeAngelo et al. (2011) state that companies use transitory debt to fund investment and that they often stay below their debt capacities in order to keep the option of using transitory debt in the future open. Similarly, Strebulaev and Whited (2012) introduce the importance of financial flexibility into their model and find that the value of keeping the option of making capital structure adjustments is valuable to companies, which has the effect that companies optimal capital structures are lower and that their adjustments speeds are slower. Taking financial flexibility into consideration in a dynamic model is relevant and the models incorporating this is supported by survey evidence from Graham and Harvey (2001; table 6) and Bancel and Mittoo (2004; Table 3) who find that 59 % and 91 %, respectively, of CFO’s rate financial flexibility as important.

The dynamic trade-off models discussed above demonstrate promising properties in relation to the stylized findings from earlier empirical research. The increasing amount of research and development within dynamic trade-off theory also suggest that this is where capital structure theory is headed. However, the models base their results and conclusions on simulated data which likely yield more theoretical promising results. The underlying theoretical development help improve the foundation on which empirical research can be interpreted and further empirical research in this direction will strengthen the theory. The developments in dynamic capital structure theory have resulted in developments in empirical research. Empirical research are increasingly focusing on companies’ capital structure adjustments, trying to determine the speed by which they adjust.

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7 The authors use transitory debt in the same way as other researchers, meaning that it indicates the difference between a company’s optimal capital structure, or target capital structure, and the company’s actual capital structure.
2.4 PECKING ORDER THEORY

The pecking order theory as presented by Myers (1984) and Myers and Majluf (1984), originates from the problem of uncertainty about the quality of a given investment or product. The idea of adverse selection is attributed to the well-known ‘Market for Lemons’ article by Akerlof (1970) in which he discusses the problem in relation to the used car market and the asymmetric information between buyers and sellers about the quality of a given car. The problem of adverse selection is similarly present in the capital markets in the relationship between the individual companies and their potential investors. Information asymmetry occurs as managers have full information of the quality of their company and its investments whereas investors have less information and therefore may have difficulties in separating good quality companies from bad quality companies. Hence investors will account for this quality uncertainty by requiring a higher rate of return and thereby making the funding more expensive for companies. So ‘good quality’ companies will choose different funding alternatives if they have the possibility. This is the basic idea behind the pecking order theory as presented by Myers (1984) and developed by Myers and Majluf (1984).

The pecking order theory states that companies will choose the cheapest source of funding when they need financing for investments. Companies will prefer internal funding such as retained earnings and if they require external funding companies will issue debt, convertible bonds etc. before issuing equity. (Myers, 1984) This is the pecking order of financing companies follow due to adverse selection, and according to Myers and Majluf (1984) the associated costs of issuing either debt or equity can result in companies rejecting positive NPV investments if the costs to existing shareholders become too unfavourable. This implies that companies can increase the value of their company by keeping sufficient funding internally in the corporation such that it will never have to pass up positive NPV investments.

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8 The idea behind the example is that there are good quality cars and bad quality cars. If the price of the good quality cars is $15,000 and the price of bad quality cars is $5,000, then the problem occurs as the buyers is unable to distinguish between the quality of cars, and hence is not willing to pay the $15,000 for a car. If there are equal amounts of bad and good cars, the buyer will pay $10,000 for a car, however, the seller of a good car is unwilling to sell at this price in which case the buyer only attracts the bad quality cars. For full discussion see the article by Akerlof (1970).

9 For a thorough discussion of how this can occur the reader is advised to read Myers and Majluf (1984) or Frank and Goyal (2007).
Contrary to the trade-of theory, the pecking order theory does not imply a target or optimal capital structure. Instead its implications are that companies will issue and retire debt and equity in accordance to its funding requirements. Empirical researchers have tested this by examining the relation between companies financing deficits in one period against their capital structure changes in the same and following periods. (Frank & Goyal, 2003; Shyam-Sunder & Myers, 1999)

The results of the tests differ as Shyam-Sunder and Myers find evidence that companies the pecking order theory behaviour of financing choices in large listed companies, whereas Frank and Goyal reach the different conclusion for a bigger sample of publicly traded American companies.

As all other theories the pecking order theory rests on simplifying assumptions that in the real world of business cannot fully be satisfied. A critical aspect of the pecking order theory is that it assumes that managers act in the interest of existing shareholders and that these existing shareholders will remain passive. The latter could to some degree be true in public companies that have many small and diversified equity holders, but in cases where there are shareholders holding a substantial amount of shares this assumption is not satisfied. In Danish listed companies many have shareholders with larger holding, such as financial institutions or family holdings, and they likely have an more active role.

2.5 SUMMARY OF CAPITAL STRUCTURE THEORIES

This chapter have discussed and presented the pecking order theory and the trade-off theory as the most dominant and influential theories of capital structure. The theories each provide alternative views and explanations on why companies choose their capital structures as they do. The pecking order theory and trade-off theory is often depicted as the two main competing theories. The next two chapters elaborate on the empirical findings and the support they offer for the two theories.
Empirical researchers have tried to determine which of the capital structure theories companies follow. Initially this was done by examining which factors determined companies’ capital structure and the relationships between these determinants of capital structure and leverage was interpreted in relation to existing capital structure theories. (Titman & Wessels, 1988; Harris & Raviv, 1991; Rajan & Zingales, 1995; Frank & Goyal, 2009) The inferences made between the determinants and capital structure theories were possible due to the static frameworks for which many of the empirical tests were conducted. The relationship between the determinants and leverage is then interpreted in favour of a given capital structure theory, often a contest between the pecking order theory and the trade-off theory. As such the main goal of these studies was to explain the degree of leverage in companies by using company specific characteristics as proxies for factors that theoretically should have an impact on capital structure decisions, such as bankruptcy costs, tax-advantages of debt, agency costs etc.

More recent empirical research focus on explaining changes in leverage as well as explaining the level of leverage. This development comes naturally from the development of the dynamic theories and the notions that factors such as adjustment costs may cause companies to deviate from their optimal capital structures.\(^\text{10}\) Again the pecking order theory and the trade-off theory are the opposing theories, where tests of the pecking order theory looks at the relationship between changes in leverage and companies’ financing deficits and the trade-off theory uses target adjustment models to measure the speed at which companies adjust toward their capital structure. Table 1 presents the empirical results from the studies reviewed in this paper, showing the relationship between selected determinants and leverage as well as the speed of adjustment. As shown, four determinants show consistency in the results viz. profitability and growth opportunities are consistently negative, whereas size and asset tangibility are consistently positive.

\(^{10}\) As discussed in earlier sections, adjustment costs aren’t the only factor that may cause companies to deviate from their target capital structure. The effect of financial flexibility, investment decisions etc., could also cause companies to deviate. However, these considerations are recent contributions to dynamic trade-off theory and none of the empirical papers considers these factors in their interpretations of results.
**Table 1: Empirical Research Results**
The table shows the results for the six most often tested determinants of capital structure and the speed of adjustment for examined empirical papers. It is clear from the table that profitability, growth opportunities, size and asset tangibility provides consistent results. Furthermore it is seen from the target adjustment papers, the variations occur in the estimated speed of adjustment, SOA, ranging from 5-39%. Blank spots means that the current determinant was not examined in the paper. a: The studies is both a cross-sectional and a cross-country analysis. So it includes data ranging from 7-42 countries. b: Difference in prediction when looking at book-versus market value of leverage. The first sign is the relationship between the variable and book leverage, whereas the second is a market leverage measure. c: The result was positive and statistically significant for only 14 out of 42 countries examined.

<table>
<thead>
<tr>
<th>Firm Variable</th>
<th>Profitability</th>
<th>Size</th>
<th>Growth Opportunities</th>
<th>Volatility</th>
<th>Asset Tangibility</th>
<th>Non-debt-tax shield</th>
<th>SOA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Titman &amp; Wessels (1988)</td>
<td>-</td>
<td>-</td>
<td>*</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Harris &amp; Raviv (1991)</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Rajan &amp; Zingales (1995)†</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>30 %</td>
</tr>
<tr>
<td>Shyam-Sunder &amp; Myers (1999)</td>
<td>-</td>
<td>-</td>
<td>*</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Fama &amp; French (2002)</td>
<td>-</td>
<td>+</td>
<td>+/b</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Frank &amp; Goyal (2003)</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>17%</td>
</tr>
<tr>
<td>Gaud, et al. (2005)</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>27,3 %</td>
</tr>
<tr>
<td>Jong, et al. (2008) ‡</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>+c</td>
<td>+</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Frank &amp; Goyal (2009)</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Alves &amp; Ferreira (2011) †</td>
<td>-</td>
<td>+</td>
<td>+/b</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Flannery &amp; Rangan (2006)</td>
<td>-</td>
<td>+</td>
<td>0*</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>34,4%</td>
</tr>
<tr>
<td>Hovakimian &amp; Li (2011)</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>5-8%</td>
</tr>
<tr>
<td>Baker &amp; Wurgler (2002)</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Lemmon, Roberts &amp; Zender (2008)</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>22-25%</td>
</tr>
<tr>
<td>Huang &amp; Ritter (2009)</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>13-17%</td>
</tr>
</tbody>
</table>

Source: Own contribution.
Shyam-Sunder and Myers (1999) tests the two theories on a balanced panel of 157 US companies and find that the pecking order theory is better at explaining capital structure behaviour of companies than the trade-off theory. Their results are corroborated by similar findings of Lemmon and Zender (2010), who find that companies who have excess debt capacity primarily use debt when a need for external financing occurs. Frank and Goyal (2003) reach the opposite conclusion when examining a large sample of US companies and state that the pecking order theory performs poorly at explaining capital structure. They show that the pecking order model is extremely sensitive to the sample properties and by using a balanced panel similar to Shyam-Sunder and Myers, they also find support for the pecking order model but when using an unbalanced panel, the coefficient of the pecking order model dramatically decreases. Contrary to what is suggested by the pecking-order theory, Frank and Goyal (2003) find that the pecking model does a much better job at explaining large companies leverage ratios, than it does small companies. A finding that is found in many other studies as well. (Fama & French, 2002; Seifert & Gonenc, 2008) Seifert and Gonenc (2008) conduct one of the only cross-country examinations of the pecking order model and find that it does a poor job at explaining capital structure in Germany, US and UK, but performs well on companies in Japan, although best on data prior to 1990.

Fama and French (2002) use an alternative approach, looking at the capital structure theories predictions about company dividend behaviour as well as debt. The authors’ results do not favour either theory and as such they conclude:

“In sum, we identify one scar on the trade-off model (The negative relation between leverage and profitability), one deep wound on the pecking order (the large equity issues of small low-leverage growth companies), and one area of conflict (the mean reversion of leverage) on which the data speak softly.” (Fama & French, 2002, p. 30)

The conclusion from Fama and French highlight two interesting and important discussions viz. the negative relationship between leverage and profitability as well as the interpretation of the adjustment speed, or mean reversion as noted in Fama and French (2002). First, common for the empirical papers reviewed, even the most recent ones, is the interpretation of the negative relationship between leverage and profitability as contradicting the trade-off theory. In section 2.3.2 on dynamic trade-off theory it was established that this negative relationship could be explained by various factors such as
adjustment costs and company willingness to preserve financial flexibility. The conclusions drawn from the cross-sectional analysis in the empirical papers is often drawn from a static trade-off perspective or based on the assumption that all companies in the sample is at their refinancing points.

Second, the interpretation of the adjustment speeds also provides interesting and conflicting results. Adjustment speeds of 100 % indicate that companies adjust immediately to changes in their leverage levels, whereas a speed of adjustment of 0 % indicate that other factors than a target capital structure are important for companies. Slow adjustment speeds as those reported in Fama and French (2002) and Hovakimian and Li (2011) have often been interpreted as contradicting the trade-off theory, suggesting that target capital structure was not of first order importance.\footnote{11} However, recent research by Strebulaev and Whited (2012) as well as DeAngelo, et al. (2011) explain that such slow adjustment speeds is not in contrast with the dynamic trade-off theory, but simply a result of companies wanting to maintain financial flexibility. As shown, four determinants show consistency in the results viz. profitability and growth opportunities are consistently negative, whereas size and asset tangibility are consistently positive.

\footnote{11} It will be shown later that the slow adjustment speeds of Fama and French (2002) have other causes.
Table 1 shows the adjustment speeds varies a great deal between the individual studies, ranging from 5-39 % even though most of the researchers base their studies on samples of US companies. This indicates sensitivity to the model specification used in the individual studies.  

Three of the papers conduct a cross-country analysis of capital structure determinants. (Rajan & Zingales, 1995; Alves & Ferreira, 2011; Jong, et al., 2008) The studies take into consideration several country factors that might have an impact of companies’ choice of capital structures in those companies. Rajan and Zingales (1995) examines determinants of capital structures across G-7 countries and find that overall the signs and the relationships between the determinants and leverage are the same, although interestingly Germany shows the opposite sign for both size and leverage. An explanation of this could be the heavier reliance on bank lending in this country. Jong, et al. (2008) confirms the results of Rajan and Zingales in their pooled sample of companies, but find that determinants of leverage differ across countries. They state that the development of bond markets in the individual countries is an important factor for companies leverage ratios. Similarly, Alves and Ferreira (2011) also find cross-country differences in leverage determinants but cite shareholder rights as the most important cause of this cross-country difference. Gaud, et al. (2005) analyses a sample of Swiss companies and achieves similar results as the US counterparts and a SOA of 27.3 % which is also in the range of the US results.

The next section explores deeper the empirical results made in cross-country studies and discusses potential country factors that might influence the capital structure choices of companies.

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12 This problem of model misspecification will be covered more extensively later in the thesis.
CHAPTER 4: CROSS-COUNTRY DIFFERENCES - DENMARK

As presented in the previous section much empirical research has been done on company capital structure, however studies so far has focused primarily on US companies (Fama & French, 2002; Flannery & Rangan, 2006; Huang & Ritter, 2009) or cross-country studies (Alves & Ferreira, 2011; Jong, et al., 2008; Öztekin & Flannery, 2012; Rajan & Zingales, 1995). This leaves a gap in relation to knowledge concerning the capital structure of Danish companies besides a very limited number of cross-country studies that include subsamples of Danish companies. Institutional differences between countries may cause determinants of capital structure to differ so an empirical analysis of Danish companies will help determine which factors are important when deciding upon capital structure in Denmark as well as exploring potential differences in results related to prior research. La Porta, et al. (1997; 2008) find that the quality of legal environment is important for the development of financial markets and the ease with which companies can raise external capital. Differences in shareholder rights, creditor rights, quality of law enforcement, bankruptcy law etc. have been shown to have significant impact upon capital structure decisions. Capital markets in common law countries, such as US and UK, has better investor protection and hence provides easier access for companies to external finance. Findings from La Porta, et al. (1997) shows that US have better shareholder rights than Denmark, whereas Denmark provides better creditor rights, indicating that the debt markets in Denmark should be more developed and a higher leverage ratio would be expected. Similar, countries have been divided into bank-based or market-based financial systems, where US has a market-based financial system as opposed to Denmark’s bank-based financial systems. (Demirgüç-Kunt & Maksimov, 2002) The question is whether country specific factors materialize in differences in the determinants of capital structure and adjustment speeds?

Companies in bank based countries are often predicted as having higher leverage ratios and having a larger use of short-term debt. When companies increasingly rely on banks for financing, less asymmetric information is likely to be present as companies are able

13 These findings are 15 years old and should thus be treated with caution as the increasing globalization likely has reduced the differences.
to share more information with their banks and often develop long-term relationships. Leverage in companies from bank-based countries might therefore be more sensitive to a determinant such as asset tangibility as banks often require collateral for their loans, whereas a determinant such as size might be of less importance as banks will have more inside information about a given company. Table 2 compares results from four empirical papers that examines both institutional differences effects on capital structure and include sub-samples of Danish companies. The signs of the relationship between the company-specific variables are consistent with previous findings from other papers. The results provide some support for the notion that leverage is more sensitive to asset tangibility in countries where companies are more reliant on bank financing. Danish and German companies’ leverage is consistently more sensitive to tangibility than companies from the UK. Alves and Ferreira (2011) find that size is a consistently important determinant across countries, but to a lesser extent in Scandinavian countries, although Table 2 shows that the results from Danish companies in comparison to the other countries are mixed. Bancel and Mittoo (2004) discover in their survey of European CFOs that financial flexibility is considered the most important factor when considering their companies’ debt policy. 91 % of the CFOs rank financial flexibility as important compared to only 59 % of the US CFOs in Graham and Harvey’s (2001) survey. This would suggest that European companies would keep a lower leverage ratio in order to preserve financial flexibility. The results from Table 2 offer mixed results in this respect. Danish companies exhibit higher leverage ratios, but the leverage ratios differ substantially across the studies due to different leverage definitions so comparisons are difficult to make.

Institutional differences across countries are also likely to affect the adjustment speeds of companies capital structure, as different adjustment costs and benefits will cause companies to adjust accordingly. Öztekin and Flannery (2012) test companies’ adjustment speeds in several countries and discuss those in relation to selected factors that affect adjustment costs and benefits for companies. Companies from common-law countries, such as the UK and US, are often attributed with larger and more developed financial markets which provide companies with easier access to capital markets, less information asymmetry and less financial constraints indicating higher adjustment speeds due to lower adjustment costs. Similarly, higher bankruptcy costs and tax rates will also increase the benefits of adjusting the capital structure and thereby increase
adjustment speeds. (Öztekin & Flannery, 2012) They find that companies from bank-based countries have slower adjustment speeds than their market-based counterparts yet companies from Denmark and Germany have faster adjustment speeds that companies from US. The faster adjustment speeds for UK companies are consistent with the assumption of better developed financial markets.

Table 2: Comparison of cross-country results from papers including Danish firm
The table shows results from four empirical papers that include a sub-sample of Danish companies and similar results for companies from Germany (DE), United Kingdom (UK) and the United States (US). *, ** and *** indicate a significance level of 1%, 5% and 10 % respectively. Blank spots indicate that the specific characteristic was not examined in the paper.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Profitability</strong></td>
<td>DK: β = -0.753***</td>
<td>DK: β = -0.102***</td>
<td>DK: β = -0.7031***</td>
<td>DK: β = -0.7031***</td>
</tr>
<tr>
<td></td>
<td>DE: β = -0.365***</td>
<td>DE: β = 0.003</td>
<td>DE: β = -0.6412***</td>
<td>DE: β = -0.6412***</td>
</tr>
<tr>
<td></td>
<td>UK: β = -0.347***</td>
<td>UK: β = -0.086***</td>
<td>UK: β = -0.4122***</td>
<td>UK: β = -0.4122***</td>
</tr>
<tr>
<td></td>
<td>US: β = -0.142</td>
<td>US: β = -0.142</td>
<td>US: β = -0.142</td>
<td>US: β = -0.142</td>
</tr>
<tr>
<td><strong>Size</strong></td>
<td>DK: β = 0.030***</td>
<td>DK: β = 0.008***</td>
<td>DK: β = 0.0365***</td>
<td>DK: β = 0.0365***</td>
</tr>
<tr>
<td></td>
<td>DE: β = 0.020***</td>
<td>DE: β = 0.001</td>
<td>DE: β = 0.0093***</td>
<td>DE: β = 0.0093***</td>
</tr>
<tr>
<td></td>
<td>UK: β = 0.015***</td>
<td>UK: β = 0.012***</td>
<td>UK: β = 0.0173***</td>
<td>UK: β = 0.0173***</td>
</tr>
<tr>
<td></td>
<td>US: β = 0.008***</td>
<td>US: β = 0.008***</td>
<td>US: β = 0.0202***</td>
<td>US: β = 0.0202***</td>
</tr>
<tr>
<td><strong>Growth Opportunities</strong></td>
<td>DK: β = -0.049***</td>
<td>DK: β = -0.017***</td>
<td>DK: β = -0.1653***</td>
<td>DK: β = -0.1653***</td>
</tr>
<tr>
<td></td>
<td>DE: β = -0.060***</td>
<td>DE: β = -0.001***</td>
<td>DE: β = -0.194***</td>
<td>DE: β = -0.194***</td>
</tr>
<tr>
<td></td>
<td>UK: β = 0.040***</td>
<td>UK: β = -0.004***</td>
<td>UK: β = -0.0934***</td>
<td>UK: β = -0.0934***</td>
</tr>
<tr>
<td></td>
<td>US: β = -0.012***</td>
<td>US: β = -0.012***</td>
<td>US: β = -0.0961***</td>
<td>US: β = -0.0961***</td>
</tr>
<tr>
<td><strong>Volatility / Risk</strong></td>
<td>DK: β = -0.039***</td>
<td>DK: β = 0.004***</td>
<td>DK: β = -0.037***</td>
<td>DK: β = -0.037***</td>
</tr>
<tr>
<td></td>
<td>DE: β = -0.030***</td>
<td>DE: β = -0.053</td>
<td>DE: β = -0.053</td>
<td>DE: β = -0.053</td>
</tr>
<tr>
<td></td>
<td>UK: β = -0.037***</td>
<td>UK: β = -0.033</td>
<td>UK: β = -0.033</td>
<td>UK: β = -0.033</td>
</tr>
<tr>
<td></td>
<td>US: β = -0.181***</td>
<td>US: β = -0.181***</td>
<td>US: β = -0.181***</td>
<td>US: β = -0.181***</td>
</tr>
<tr>
<td><strong>Asset Tangibility</strong></td>
<td>DK: β = 0.203***</td>
<td>DK: β = 0.297***</td>
<td>DK: β = 0.1672***</td>
<td>DK: β = 0.1672***</td>
</tr>
<tr>
<td></td>
<td>DE: β = 0.253***</td>
<td>DE: β = 0.266***</td>
<td>DE: β = 0.0212</td>
<td>DE: β = 0.0212</td>
</tr>
<tr>
<td></td>
<td>UK: β = 0.066***</td>
<td>UK: β = 0.170***</td>
<td>UK: β = -0.1029***</td>
<td>UK: β = -0.1029***</td>
</tr>
<tr>
<td></td>
<td>US: β = 0.239***</td>
<td>US: β = 0.239***</td>
<td>US: β = 0.333***</td>
<td>US: β = 0.333***</td>
</tr>
<tr>
<td><strong>Target Adjustment (Market Leverage)</strong></td>
<td>DK: β = 0.135***</td>
<td>DK: β = -0.036</td>
<td>DK: β = -0.036</td>
<td>DK: β = -0.036</td>
</tr>
<tr>
<td></td>
<td>DE: β = 0.135***</td>
<td>DE: β = -0.036</td>
<td>DE: β = -0.036</td>
<td>DE: β = -0.036</td>
</tr>
<tr>
<td></td>
<td>UK: β = -0.037</td>
<td>UK: β = -0.037</td>
<td>UK: β = -0.037</td>
<td>UK: β = -0.037</td>
</tr>
</tbody>
</table>

| Source | Own contribution. |

- 23 -
The greater reliance on bank financing in Denmark could explain part of the faster adjustment speeds. As previously mentioned the relationship between banks and companies suffer from by information asymmetry problems, which decreases the costs of adjustments and increases the speed of adjustment. Furthermore, the use of bank covenants in relation to bank loans put limits to the debt capacities of companies and therefore it provides companies with incentive to adjust their capital structure when they reach their upper limits thereby increasing adjustment speeds. Contradicting these fast adjustment speeds is the importance of financial flexibility, which according to Strebulaev and Whited (2012) and DeAngelo, et al. (2011) slows companies’ speeds of adjustment. This indicates a faster adjustment speeds for companies reaching their upper leverage limit and slow adjustments speeds when companies are at their lower leverage limit.

Overall, the results show that the same company characteristics influence leverage choices across countries although institutional differences cause changes in the sensitivities of the individual factors. The same applies to the initial findings on Danish companies. However, the results on Danish companies are based on small subsamples in broad cross-country studies and a detailed analysis of the determinants of capital structure in Danish companies is therefore needed. There is also a need of a unifying analysis of both the determinants of capital structure and adjustment speeds in Danish companies. Part Three provide the analysis capital structure choice in Danish listed companies.
PART THREE: ANALYSIS

The previous chapters have reviewed and discussed theories of capital structure and empirical results from a large amount of research on the factors determining companies financing choices. This review has highlighted which determinants are commonly found to be determinants of capital structure in companies around the world, although some differences across countries occur. This part contains the analysis. Chapter 5 discusses the determinants of capital structure and develops hypotheses regarding these in Danish listed companies based on theoretical predictions of these determinants and as well as a discussion of the predictions when taking earlier empirical results and Danish institutional characteristics into account. Chapter 6 discusses the model specifications of the pecking order model and trade-off model, along with appropriate research methods and econometric estimators and issues. Finally, chapter 7 presents the results obtained from estimating the pecking order model and trade-off model. Furthermore, it discusses and evaluates these results in comparison to the theories and earlier empirical results discussed and presented in part two.

CHAPTER 5: CAPITAL STRUCTURE DETERMINANTS – HYPOTHESES

The empirical results presented in the previous chapters have highlighted common determinants of capital structure used in the examination of companies’ choice of capital structure. This chapter elaborates on these determinants and develops hypotheses on their effect on Danish listed companies’ capital structures. The measures of each determinant are mentioned, but for specific variable definition see appendix D.

5.1 PROFITABILITY

Profitability is one of the most tested company characteristics in empirical research regarding companies’ choice of capital structure. The trade-off theory predicts that higher profitability is associated with increased debt levels and the reason for this is twofold. First, companies achieving high profitability have less risk of financial distress and bankruptcy, so the cost of debt is lower. Second, higher profitability means that companies can achieve higher utilization of the interest tax shield by increasing the
amount leverage and hence the promised interest payments each period. Similarly, increased debt will serve as a disciplinary factor for managers when free cash flow likely increase with increased profitability. However, as dynamic trade-off theory predicts adjustment costs will prevent companies from adjusting the capital structure immediately and the unlikelihood of companies being at their refinancing points at the time of measurement causes the prediction of the found relationship between leverage and profitability to be negative due to the static nature of the determinant analysis.

Retained earnings are the favoured financing according to the pecking order theory which contradicts the predictions made by trade-off theory. Higher profitability should enable the company to retain more earnings which is the preferable source of funding, and as such, the amount of leverage needed by the company should decrease. (Myers, 1984)

Empirically, profitability is consistently found to be negatively related to leverage, as predicted by both theories. Therefore the following hypothesis is made:

**H1: A negative relationship between leverage and profitability is expected in Danish listed companies.**

Measures of profitability used in earlier empirical research differ slightly as some use EBIT to total assets (Fama & French, 2002; Flannery & Rangan, 2006) or EBITDA to total assets (Rajan & Zingales, 1995; Alves & Ferreira, 2011) while others use operating income to total assets (Titman & Wessels, 1988; Frank & Goyal, 2003). This paper tests initially for both proxies for profitability, but as there is differences in the legal treatment of depreciation and amortization across countries, EBITDA is believed to be a better measure than EBIT.

### 5.2 SIZE

Company size is also a common company characteristic used in empirical research and a determinant which also provides consistent results in its relationship to leverage. The interpretation of size in a trade-off perspective is frequently that of larger companies being more diversified and therefore subject to lower default risk and less volatility in cash flows. (Frank & Goyal, 2009) Similarly, direct bankruptcy costs, are relatively

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14 Another way is for the company to increase the dividend payments.
fixed and therefore as a proportion of company value they decrease with company size. The trade-off theory thus predicts that company size is positively related to leverage.

Larger companies are likely to be better known and will therefore be subject to less asymmetric information and the related costs. Accordingly, larger companies will be able to issue equity at lower costs which will mean a lower leverage ratio and furthermore larger companies are assumed to have had an opportunity to retain earnings. (Frank & Goyal, 2009) So according to the pecking order theory larger companies will make less use of debt.

The empirical results of the relationship between size and leverage are consistently positive, although Rajan and Zingales (1995) find that it is the opposite in Germany.

**H2: Larger companies have higher leverage ratios.**

Size is usually proxied by the logarithm to either sales or total assets. The logarithm to sales is used.

### 5.3 ASSET TANGIBILITY

The thought behind asset tangibility as a determinant is that tangible assets provide more security for potential investors as assets can serve as collateral. This will reduce the risk for debtholders and ultimately reduce the cost of debt for the companies and they will be able to operate with higher leverage ratios without incurring higher financial distress costs. (Titman & Wessels, 1988) Accordingly, the trade-off theory predicts that companies in which tangible assets accounts for a large part of the asset structure should include larger debt levels than companies with a relatively larger amount of intangible assets. Furthermore, collateralized debt makes it difficult for investors to conduct asset substitution as the debtholders have collateral in specific assets. Therefore agency costs should be lower between shareholders and debtholders, and companies should use more debt relative to the amount of tangible assets they own.

The pecking order theory makes the opposite prediction as it suggest that tangibility will generate less information asymmetries between potential investors and shareholders, and hence the cost of issuing equity will fall, resulting in lower levels of debt. (Frank & Goyal, 2009) Arguably, the argumentation used to predict this relationship could also be used to predict that the cost of debt will fall as they will now be able to have collateralized debt. So unless the cost of equity falls below the cost of debt, the pecking
order theory implies that companies will use the cheapest sources of funding, debt would still be the preferred funding to equity, at least for moderate amounts of debt. Therefore the prediction of the pecking order theory might not be as unambiguous as some researchers argue.

Based on predictions of these theories and the consistent findings in previous empirical research the following relationship between asset tangibility and leverage is expected:

**H3: Companies with more tangible assets has higher leverage ratios.**

Measures of asset tangibility differ between the empirical papers. The measure used should be compared to the measure used for leverage. If the leverage measure used is total liabilities to total assets, as Welch (2011) suggest, a broad measure of tangibility is likely needed in order to capture all factors that could serve as collateral e.g. inventory, accounts receivables etc. In studies using total debt to total assets as a proxy for leverage, fixed assets to total assets will be a suitable measure of asset tangibility. The latter is used as a measure in this paper, measured as property, plant and equipment.

### 5.4 GROWTH OPPORTUNITIES

Growth opportunities calls for a similar reasoning as previously used to explain the predictions of asset tangibility’s effect on leverage, although with opposing conclusions. The first notion of the relationship between growth opportunities and leverage is made by Myers (1977) who states that the problem of shareholders making suboptimal investment decisions is more severe when a company has more growth opportunities as potential investors cannot value or decide which growth opportunities the company should follow.

The value of a company’s growth opportunities are most likely only valuable to the individual company, or at least less valuable to other companies, in which case the costs of financial distress and bankruptcy will be higher for companies with many growth opportunities. With this consideration the trade-off theory suggests a negative relationship between growth opportunities and leverage. (Titman & Wessels, 1988) Similarly, with many investment opportunities the earnings before taxes is assumed to be lower in which case companies will not be able to fully utilize the interest tax shields associated with high amounts of leverage. Furthermore, companies having more
investment opportunities likely value financial flexibility highly, which also reduce the optimal leverage ratio.

Contrasting this prediction is once again the pecking order theory, as it predicts a positive relationship between debt and growth opportunities. The argumentation behind is that growth opportunities involves higher information asymmetries as shareholder are not willing to reveal much information about their investment opportunities, and given that investment opportunities requires investment outlays and thus increasing a company’s financing deficit, companies will issue debt financing and preferable short-term financing when they experience finance deficits. (Gaud, et al., 2005)

The empirical results show consistent behaviour of the relationship between leverage and growth opportunities and it is expected that this behaviour is also present for Danish companies.

**H4: Companies with more growth opportunities will have lower leverage ratios.**

The most common proxy for growth opportunities is a company's market-to-book ratio, as it reflects investors’ expectations of future earnings.

5.5 RISK

Risk relates to the volatility in earnings and according to the trade-off theory companies with high risk are likely to face higher costs of financial distress and will therefore use less debt. Similarly, volatility in earnings may limit the probability of fully utilizing the benefits from tax shields, again leading to lower debt levels. (Frank & Goyal, 2009) Conversely, the pecking order theory posits that higher volatility in earnings will lead investors to require a higher rate of return, making it more expensive to issue equity. Therefore the prediction of the pecking order theory is that higher risk leads to higher leverage. (Rajan & Zingales, 1995)

The empirical results from the previous chapters offer mixed findings in regards to the relationship between leverage and risk. However, the following hypothesis are suggested for the relationship between risk and leverage for Danish companies:

**H5: Companies with higher risk have lower leverage ratios.**
The measures of risk vary in the papers examined, but most common is a standard deviation measure of earnings. In this paper the standard deviation of EBIT will be used.

5.6 NON-DEBT-TAX-SHIELDS

DeAngelo and Masulis (1980) argue that if companies have a large amount of non-debt tax shields they have less need for debt to provide tax shields. As such, the trade off model will suggest that companies with a large amount of non-debt tax shields will have less debt. (Titman & Wessels, 1988)

The pecking order theory offer no prediction in regards to non-debt tax shields and therefore the hypothesis tested in this thesis is:

**H6: Companies with high non-debt-tax-shields have lower leverage ratios.**

The measure of non-debt tax shields should capture the tax credits not arising from interest on debt payment, therefore variants of amortisation, depreciation and tax credits are often used. This thesis will use depreciation and amortisation to total assets.

5.7 FINANCING DEFICIT

The financing deficit is the core of the pecking order model. For the pecking order theory to hold, the amount of debt issued should relate one to one with the financing deficit. (Shyam-Sunder & Myers, 1999) As presented in the previous sections the empirical results are mixed and only the paper by Seifert and Gonenc (2008) conducts a cross-country analysis on the validity of the pecking order model in which they find very little support for the model in Germany, US and UK, but support for the model in Japanese companies although mostly so in years prior to 1990. Investor rights are lower in Denmark compared to investor rights in US and UK. This involves higher risk for potential investors who in return will require more information or higher returns inevitably leading to higher equity issuance cost. Similar, the importance of bank lending in Denmark and long-term relationships between banks and companies mean that banks have easier access to information and are able to continuously monitor companies. This relationship involve less information asymmetry and hence less cost for debt issues which should result in higher power of the pecking order theory. Nevertheless, as most of the examined papers find no or very little support for the pecking order model in recent year, the following hypothesis is tested:
H7: The financing deficit may be statistically significant, but are closer to zero than to one, i.e. the pecking order model does not explain capital structure in Danish listed companies.

5.8 ADJUSTMENT SPEED

Öztekin and Flannery (2012) found that institutional differences across countries have a significant impact upon capital structure adjustment speeds. Adjustment costs will have a negative effect on adjustment speeds and adjustment benefits will have the opposite effect. Ease of access to financial markets, information asymmetries and financial constraints contributes to higher adjustment costs and hence lower adjustment speeds. Özteking and Flannery (2012, p. 100: Fig. 2) rate Denmark to have higher adjustment costs than both UK and US although lower than Germany. Contrary to this, higher tax rates, distress costs and the use of debt covenants are expected to increase adjustment speeds as these factors will increase the benefits of adjusting towards the target capital structure. Comparing corporate tax rates from the OECD tax database reveals that corporate tax rates are lower in Denmark than in US, UK and Germany and as such this should results in lower adjustment speeds as the benefits of adjusting for Danish companies are lower. (OECD, 2013) However, the reliance on bank lending often involves the inclusion of debt covenant which creates some form of penalty if companies exceed those covenants, meaning that companies adjustment speeds will be higher. This could also indicate that companies who exceed their debt covenants, i.e. who are overleveraged, adjusts faster due to covenants penalties and financial distress costs, than their underleveraged counterparts.

As the institutional difference covered affect adjustment speeds in opposite direction and based on the above discussion, the following hypotheses are suggested for Danish listed companies:

H8a: Danish listed companies exhibit moderate adjustment speeds, similar to the speeds reported by Öztekin and Flannery (2012).
H8b: Overleveraged companies who are at risk of facing debt covenant penalties and financial distress costs exhibit higher adjustment speeds than companies that are underleveraged.

After the presentation of the hypotheses tested through the analysis, the next chapter presents and discusses the research methods used in order to achieve valid results.
CHAPTER 6: RESEARCH METHODS

This chapter provides the framework used to analyse Danish listed companies’ capital structures and the chapter begins with a description of the sample of companies used in the analysis along with an argumentation for the chosen search strategy and construction of the data set. The model specifications based on the pecking order theory and trade-off theory are presented and discussed along with the econometric issues likely to be present.

6.1 THE SAMPLE DATA

The sample contains Danish companies listed on OMX Copenhagen in the period of 2001-2011. The data selection process used is strict and only companies meeting all of the following requirements are included in the analysis. Financial companies are excluded due to the distinct regulatory financial requirements for these companies. Similarly, companies listed on First North are also excluded as well as companies who have sports as their primary activity. Data is imported from Datastream. As the model specifications include lagged variables, at least two years of consecutive data is required from each company and as such companies not fulfilling this requirement are excluded. If a given company lacks an observation on a ratio in a specific year, the whole company year observation is left out. Finally, 106 companies are included in the analysis. Appendix A describes in meticulous the search strategy used to obtain the list of companies as well as the procedure used in order to import the data from Datastream. Appendix B shows the list of companies included in the analysis. In order to ensure the accuracy of the data imported from Datastream a number of randomly selected figures are compared against the specific companies’ annual reports and no discrepancies are found. In order to mitigate the consequences arising from potential errors in data which could give rise to extreme outliers, all variables are winsorized at

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15 Companies within sports are often subject to special financial requirements, e.g. soccer-companies are subject to a minimum capital requirement established by Dansk Boldspil Union, DBU.
16 The list of excluded companies, along with the reason for exclusion, are provided on the supplementary CD in a word-file with the name “Excluded Companies”.
17 Some variation occurred, however examination revealed that it was due to alternative definitions of the figures between some companies and Datastream. As Datastream uses the same definitions for all companies this is not a problem for the analysis. See appendix C for the Datastream definitions of imported figures.
the 1% and the 99% level. This method reduces the impact of extreme outliers, without loss of observations.¹⁸

The data set is constructed as an unbalanced panel and as such the number of company year observations varies between companies. Using panel data presents many notable advantages, the most relevant for the current research topic being the following: (Baltagi, 2005)

- Constructing the data set as panel data makes it possible to examine the dynamic properties of the data, which is important in the area of capital structure as highlighted in section 2.3.2.
- Panel data enables researchers gain more information about the areas examined as both time dimensions and individual dimensions can be examined.
- Also of importance is the possibility to account for firm heterogeneity in the data set examined, a feature that is not possible with normal time-series of cross-sectional data.

Especially the dynamic properties and the possibility to account for firm heterogeneity are important in the current research area. This also indicates that not accounting for firm heterogeneity will have an impact on the reliability of the estimates achieved through the statistical analysis. The disadvantages of panel data relate to computational challenges and violations of assumptions related to standard OLS regression analysis. These problems, and other econometric issues, will be discussed in due course along with the appropriate statistical estimators.

Structuring the data set as an unbalanced panel also provide some computational challenges, however, the advantages of using an unbalanced panel outweigh these difficulties. An unbalanced panel provides a much larger number of observations and reduces the potential survivorship bias that could be present when using a balanced panel.¹⁹ The unbalanced panel is only restricted in number of required company year observations by the model specifications and estimation procedures.

¹⁸ See Appendix E for scatter of the effect of winsorizing variable.
¹⁹ Most statistical packages such as Eviews 7 and Stata 11 have built-in features that automatic account for unbalanced versus balanced panel data.
6.2 MODEL SPECIFICATION

Model specifications based on both the pecking order theory and the trade-off theories are used in order to determine the relevance of each in relation to Danish companies’ capital structure choices.

6.2.1 PECKING ORDER MODEL

As discussed in section 2.4 the pecking order theory posits that companies will use internal funds such as retained earnings before using external financing, and when external financing is needed companies will prefer debt to equity financing. This indicates an empirical test of the pecking order theory that examines whether a company’s financing deficit tracks the debt issuance. Shyam-Sunder and Myers (1999) proposed such a model to examine the qualities of the pecking order theory and this model has been widely used in empirical papers since in originated. (Fama & French, 2002; Frank & Goyal, 2003) This also means that the model has been tested thoroughly and by using the model, comparability to similar empirical research from other countries becomes available. Hence, the model employed to test for the pecking order theory resemble that of Frank and Goyal (2003).

The model they test empirically is similar to the one below and is essentially a static linear model: (Verbeek, 2008)

\[
\Delta D_{it} = \alpha + \beta DEF_{it} + e_{it} \quad (6.1)
\]

\( \Delta D_{it} \) is the change in debt levels, meaning the amount of debt issued or repaid in a given period t, for a specific company i. \( \beta \) is the pecking order coefficient which measures companies’ reaction to their financing deficits \( DEF_{it} \). The financing deficit is calculated as a function of dividends paid \( DIV_i \), expenditures on capital, \( CAPEX_i \), changes in net working capital \( \Delta NWC_i \), and finally operating cash flow after taxes and interest payments, \( CF_i \). The financial deficit for a given company is given by:

\[
DEF_i = DIV_i + CAPEX_i + \Delta NWC_i - CF_i \quad (6.2)
\]

If companies follow the pecking order theory of capital structure than \( \beta \) should be equal to one while \( \alpha \) should be zero.
The simplicity of the test of the importance of the factors underlying the pecking order theory is a result of the developments made with this theory. Compared to the trade-off theory, the pecking order theory is still rather static in its testing form and interpretation.

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### 6.2.2 TRADE-OFF THEORY

As discussed in the literature review and empirical results, companies operate in dynamic settings and hence their capital structure choices should also be analysed using a framework that allows for such dynamic features. The process of adjusting company capital structure has costs associated and therefore it is likely that companies adjust their capital structures only gradually. In order to capture such gradual adjustment, a partial adjustment model as developed by Flannery and Rangan (2006) is used.

\[
D_{it} - D_{i,t-1} = \gamma(D^*_{it} - D_{i,t-1}) + \varepsilon_{it}
\]

(6.3)

This model measures the change in leverage between two periods. The first term on the right side of the equation is the speed of adjustment, \( \gamma \), the speed by which companies adjust towards their target capital structure from their leverage ratio in the previous period. The target leverage ratio is measured as:

\[
D^*_{it} = \beta x'_{i,t}
\]

(6.4)

In (6.4) \( x'_{i,t} \) is a vector of the explanatory variables used. Integrating (6.4) into (6.3) and rearranging gives the following dynamic panel data model, similar to the model used in Gaud, et al. (2005):

\[
D_{it} = \gamma D_{i,t-1} + \beta x'_{i,t} + \alpha_i + \lambda_t + \varepsilon_{it}^{20}
\]

(6.5)

As it is very likely that the model contains unobserved time-invariant company heterogeneity and time effects, these effects are included into the final model specification as \( \alpha_i \) and \( \lambda_t \) respectively. Unobservable time-invariant company heterogeneity stems from consistent differences between companies included in the regression, but not captured by the explanatory variables. (Verbeek, 2008) Different managerial preferences and different risk profiles of investors are factors that likely could lead to consistent leverage differences between companies. Macroeconomic shocks that have occurred within the sample period could lead to sudden changes in

---

\(^{20}\) This type of model is also referred to as a first-order autoregressive, AR(1), model.
leverage ratios in a single time period, but otherwise not provide explanation for the changes in companies leverage ratios. These unobservable effects will be examined a bit further in the next section.

Writing the full list of explanatory variables instead of the vector in (6.5) gives the full model specification used to test for the trade-off theory’s relevance in regards to Danish listed capital structure choices:

\[ D_{it} = \gamma D_{i,t-1} + \beta_1 Profit_{it} + \beta_2 Size_{it} + \beta_3 Growth_{it} + \beta_4 Tang_{it} + \beta_5 NDTS_{it} + \beta_6 Risk_{it} + \alpha_i + \lambda_t + \epsilon_{it} \]  

(6.6)

The next section describes the econometric issues as well as which estimators are most efficient for estimation of the trade-off model and the pecking order model.

### 6.3 Estimators and Econometric Issues

The use of panel data offers, as mentioned earlier, many advantages in econometric analysis. However, measuring the same cross-section of companies at several points in time means that it is no longer suitable to assume that the individual observations are independent. Several estimators are available to account for these unobservable effects, depending on the model specification. For the linear panel data model, the one used to estimate the pecking order model, the three most common estimators are the random effects (RE) estimator, fixed effects estimator and the first-difference estimator. (Verbeek, 2008; Wooldridge, 2010) For the dynamic linear model used to estimate the trade-off theory, more complex estimators need to be used viz. IV or GMM estimators. Consequently, the discussion of estimators and econometric issues are divided into the specific models used.

#### 6.3.1 Pecking Order Model

The FE, RE and FD estimators are all available to account for unobservable effects, as the assumptions underlying the estimators are different, tests have to be conducted in order to determine the most efficient estimator. Table 3 presents these three estimators and the assumptions required to achieve efficient estimates.\(^{21}\)

\(^{21}\) For a thorough presentation and comparison of the estimators, see the file named ‘Comparison of estimators’ on the supplementary CD.
The key distinguishing factor between the RE estimator and the FE or FD estimators is the treatment of the unobserved effects. The RE estimator assumes that the unobservable effects are uncorrelated with the explanatory variables and thus includes them in the model error term, whereas both the FD and FE estimators treat them as correlated and therefore separate in the model specification (Point a and b in Table 3).

Table 3: Comparison of the assumptions of the FE, RE and FD estimators

<table>
<thead>
<tr>
<th>Random Effects(RE)</th>
<th>Fixed effects(FE)</th>
<th>First-differencing(FD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>( y_{it} = \beta_0 + \beta x_{it} + v_{it}, v_{it} = \alpha_i + u_{it} )</td>
<td>( y_{it} = \beta x_{it} + \alpha_i + u_{it} )</td>
<td>( y_{it} = \beta x_{it} ' + \alpha_i + u_{it} )</td>
</tr>
<tr>
<td>b. ( \alpha_i ) and ( x_{it} ) are uncorrelated</td>
<td>b. ( \alpha_i ) and ( x_{it} ) are correlated</td>
<td>b. ( \alpha_i ) and ( x_{it} ) are correlated</td>
</tr>
<tr>
<td>c. ( \alpha_i ) and ( x_{it} ) are correlated</td>
<td>c. ( x_{it} ) are time-varying</td>
<td>c. ( x_{it} ) are time-varying</td>
</tr>
<tr>
<td>d. No serial correlation</td>
<td>d. No serial correlation</td>
<td>d. Error terms follow a random walk.</td>
</tr>
<tr>
<td>( Cov(v_{it}, v_{it}) = 0. )</td>
<td>( Cov(u_{it}, u_{it}) = 0 )</td>
<td>( Cov(\Delta u_{it}, \Delta u_{i,t-1}) = 0 ).</td>
</tr>
<tr>
<td>e. Homoskedastic error terms</td>
<td>e. Homoskedastic error terms</td>
<td>e. Homoskedastic error terms</td>
</tr>
</tbody>
</table>

Source: (Verbeek, 2008; Wooldridge, 2010), own contribution.

Wooldridge (2010) and Baltagi (2005) both recommend a Hausman test in order to estimate the consistency and efficiency of the random effects estimation versus the fixed effects estimation. The Hausman test examines whether the estimated coefficients from the fixed effects estimation and the random effects estimation is statistically significant. A rejection of the test is commonly interpreted as a rejection of the random effects model estimation, although Wooldridge (2010) lists a number of potential drawbacks of this interpretation. Table 4 presents the results of the Hausman test.

Table 4: Hausman Specification test.
The Hausman test examines the null hypothesis that \( H_0 : \beta_{RE} = \beta_{FE} \). The two models estimated corresponds to the following:

\[ \begin{align*}
RE : \Delta D_{it} &= DEF_{it} + \epsilon_{it}, \\
FE : \Delta D_{it} &= DEF_{it} + \alpha_i + \lambda_i + \epsilon_{it}
\end{align*} \]

<table>
<thead>
<tr>
<th></th>
<th>FE</th>
<th>RE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financing Deficit, coefficient</td>
<td>0,0533755</td>
<td>0,0731157</td>
</tr>
<tr>
<td>Chi-Sq. df.</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Chi-Sq. value</td>
<td>2,63</td>
<td></td>
</tr>
<tr>
<td>Prob.</td>
<td></td>
<td>0,1045</td>
</tr>
</tbody>
</table>

Source: Stata 11, Own contribution
The test-value obtained from the Hausman test means that the difference between the random effects and fixed effects model isn’t significant, leading to a rejection of the fixed effects. The next step is to estimate whether random effects is preferred to pooled OLS estimation. (Verbeek, 2008)

The test whether it is appropriate to use the random effects model compared to a pooled OLS regression, a Breush-Pagan LM test for random effects are conducted, according to Wooldridge (2010). The Breush-Pagan LM test for unobservable effects, tests the null hypothesis of equal variances across companies.

Table 5: Breush-Pagan LM test
The test the null hypothesis, that the variances across companies are zero. H_0: Var(α_i)=0. This hypothesis cannot be rejected.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0,007</td>
<td>1</td>
<td>0,00</td>
<td>0,969</td>
</tr>
</tbody>
</table>

Source: Stata, own contribution.

As Table 5 shows, the null hypothesis cannot be rejected and hence it cannot be documented that unobservable effects are present. Consequently, pooled ordinary least squares is the most efficient estimator and used for the estimation of the pecking order model.

With the exception of assumption b in Table 3, the assumptions underlying pooled OLS is similar and therefore the assumptions of homoskedasticity, serial correlation and exogeneity should be tested.

6.3.1.1 HOMOSKEDASTICITY AND SERIAL CORRELATION

If there is presence of homoskedasticity or serial correlation in the estimated model, the estimated coefficients are still unbiased, but the estimated model is not efficient due to the inconsistency of the standard errors estimated. Homoskedasticity states that the variance in the error terms is equal across observations. A simple test for homoskedasticity is the Breush-Pagan test. (Baltagi, 2005) This test is conducted and
the null hypothesis of equal variances is rejected, so standard errors robust to heteroskedasticity are used.

Serial correlation indicates that the error terms in the estimated model are correlated over time. A simple test of first-order autocorrelation consists of regressing the residuals from the model estimation onto their lagged counterparts. (Verbeek, 2008)

Table 6: Test for Serial Correlation
The test for serial correlation is based on the following regression: $\hat{e}_{it} = \delta \hat{e}_{i,t-1} + \nu_{it}$. If $\delta = 0$, the test of no serial correlation cannot be rejected.

<table>
<thead>
<tr>
<th>Dep. Residual, $e_{it}$</th>
<th>Coefficient</th>
<th>Standard Error</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>$e_{i,t-1}$</td>
<td>0,079</td>
<td>0,034</td>
<td>0,022</td>
</tr>
</tbody>
</table>

Source: Stata, own contribution.

Table 6 shows that the estimated model suffers from first-order serial correlation, therefore standard errors robust to serial correlation are employed. Petersen (2009) discusses several robust standard errors and recommends using cluster robust standard error in finance panels. The standard errors presented in the results section are therefore cluster robust standard errors.\(^{22}\)

6.3.1.2 EXOGENEITY

One of the assumptions required for all the discussed estimators are that the explanatory variables have to be exogenous, i.e. uncorrelated with the error term. Typical causes of endogeneity are omitted variables, simultaneity and measurement error and the presence of endogeneity will result in biased estimated.\(^{23}\) (Verbeek, 2008) Wooldridge (2010, p. 325) suggest a straightforward method of testing for endogeneity which involves regressing the dependent variable onto the independent variables and the leads of the independent variables. This test is undertaken and the assumption of exogeneity cannot be rejected on the basis of the results in Table 7, so endogeneity is not regarded as a problem in the pecking order model.\(^{24}\)

\(^{22}\) Alternative robust standard errors were also tried with very little effect on the standard errors and thus inferences.

\(^{23}\) Endogeneity and the measurement error problem is covered more extensively in under the trade-off model, as the presence of these concerns are well documented, although often not explicitly covered in empirical capital structure papers.

\(^{24}\) See Appendix G for all tests and Stata outputs from the pecking order model estimation.
Table 7: Endogeneity test
The test examines the following regression:
\[ D_{it} = \beta_0 + \beta_i DEF_{it} + \beta_i DEF_{i,t+1} + \epsilon_{it} \]

<table>
<thead>
<tr>
<th>BLEV_Issues</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>Prob</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>0.0011001</td>
<td>0.0034244</td>
<td>0.749</td>
</tr>
<tr>
<td>DEF</td>
<td>0.0798716</td>
<td>0.0417927</td>
<td>0.059</td>
</tr>
<tr>
<td>DEFt+1</td>
<td>0.0368217</td>
<td>0.0407551</td>
<td>0.368</td>
</tr>
</tbody>
</table>

Source: Stata, own contribution

Finally, the assumption of no perfect collinear explanatory variables is examined in the descriptive statistics section. 25

The next section covers the estimators used to estimate the trade-off model and their underlying assumptions.

6.3.2 TRADE-OFF MODEL

The dynamic model used to estimate this model involves regressing the leverage ratio in year t on a set of explanatory variables including the leverage ratio in year t-1. Due to the presence of the lagged dependent variable as an explanatory variable, the strict exogeneity assumption required by the previously covered estimators is not satisfied. It is well documented and accepted that applying OLS or fixed effects estimation to the dynamic panel model in (6.5) will generate biased coefficients. (Flannery & Hankins, 2013) In fact, OLS (FE) will generate an upward (downward) bias to the lagged leverage variable’s coefficient resulting in a downward (upward) bias in the estimated speed of adjustment. The bias in the FE, RE and FD estimators are especially severe for short panels. 26 (Bond, 2002)

A wide variety of estimators have been applied in empirical capital structure studies and most researchers report results from several estimators. Commonly used estimators are the Anderson-Hsiao instrumental variable estimator (Verbeek, 2008), Arellano-Bond’s difference-GMM estimator (Gaud, et al., 2005), long differencing estimator (Huang & Ritter, 2009) and the Blundell-Bond’s system-GMM estimator (Lemmon & Zender, 2010; Öztekin & Flannery, 2012). The variety of estimators used resembles the difficulties in finding a suitable estimator as well as the disagreement among researchers.

25 The assumption of normality is also checked, although not reported. The results shows sign that normality is not satisfied; however asymptotic properties of the estimators mean that they are still efficient and unbiased due to the large sample size.

26 Large N, small T panels are the most common panels used in empirical studies in corporate finance.
as to what estimators are most valid in empirical capital structure research. Huang and Ritter (2009) discuss the most common estimators and conclude that their long differencing approach is superior to the two GMM estimators, as these suffer from finite sample bias. The findings of Huang and Ritter (2009) are contradicted by Flannery and Hankins (2013), who conduct the first examination of alternative estimation methods in an empirical capital structure framework, taking into account the potential presence of endogeneity, arising from measurement error, and missing data. Flannery and Hankins (2013) show, based on simulation data from a common capital structure panel, that in unbalanced panels and in the presence of endogeneity arising from measurement error and missing data, that the Blundell-Bond system-GMM estimator suffers from less bias than the alternative estimators.27

Based on the findings of Flannery and Hankins (2013), the ability of the system GMM estimator to handle endogeneity and its application to unbalanced panels along with the increased efficiency compared to the Arellano-Bond GMM estimator, the system-GMM estimator from Blundell and Bond (1998) is used in the estimation of the trade-off model. This estimator suits the objective of obtaining estimates that can be compared to equivalent studies conducted in other countries. The GMM estimators of Arellano and Bond (1991) and Blundell and Bond are designed to address panels containing large number of cross-sections, but with a small number of time periods. The criticism revolving the finite sample bias in the GMM estimators, arising from including several instruments in finite samples is also taken into account. As a result the more simple first-difference instrumental variable estimator proposed by Anderson and Hsiao (1981) is also used. Furthermore, the intuitive recommendations of Bond (2002) of using the opposite biases in the lagged dependent variable’s coefficient generated by the OLS and fixed effects estimations, to obtain a range of the true coefficient is used. Any valid estimator will provide estimates of the lagged dependent variable within the range generated by OLS and fixed effects.

As a valid estimation of the trade-off model is ensured by the use of several estimators, a thorough walkthrough of the assumptions and accompanying tests, as provided in the previous section on the pecking order model, is to space consuming and therefore left to the appendices. The results of the assumptions checks will however be reported and

27 The Blundell-Bond estimators was tested against long-differencing, least squares dummy variable corrected (LSDVC), Arellano-Bond GMM.
commented alongside the estimation results in the chapter 7. The assumptions and procedures of the OLS and fixed effects estimators have already been covered, so the rest of this section covers the assumptions and procedures following the Anderson-Hsiao instrumental variables estimator and the Blundell-Bond system-GMM estimator.

6.3.2.1 THE ESTIMATORS

Both the Anderson-Hsiao IV estimator and the Blundell-Bond estimator build upon first-differencing and the use of instrumental variables. Anderson and Hsiao (1981) proposed using either the lagged levels or lagged differences of the lagged dependent variables as instruments. The first-differenced equation of (6.5) is the following:

\[
\Delta D_i = (D_{it} - D_{i,t-1}) = (D_{i,t-1} - D_{i,t-2}) + \beta (x_{it} - x_{i,t-1}) + (u_{it} - u_{i,t-1})
\]  

(6.7)

Estimating (6.7) will be done using both \(D_{i,t-2}\) and \(\Delta D_{i,t-2} = (D_{i,t-2} - D_{i,t-3})\) as instruments for \(\Delta D_{i,t-1}\). However, using instruments means loss of observations. The instrument \(D_{i,t-2}\) does not become available before \(T=3\) and the lagged difference \(\Delta D_{i,t-2}\) doesn’t become available before \(T=4\). The loss of two or three time periods, depending on choice of instrument, often means large losses in observations in standard corporate finance panels, where the cross-section is typically large and time period is small. The number of observations will be reported alongside the results.

The Anderson-Hsiao estimator might be consistent but it isn’t efficient as it doesn’t use all the lagged instruments and moment restrictions. Arellano and Bond (1991) develop a difference-GMM estimator that uses all lagged values as instruments in the difference equation (6.7), i.e. \((D_{i,t-2}, D_{i,t-3}, \ldots, D_{i})\) are used as instruments for \(\Delta D_{i,t-1}\). Blundell and Bond (1998) show that the difference-GMM estimator suffers from weak instrument and finite sample bias. Blundell-Bond (1998) developed a system-GMM estimator that in addition to using the lagged levels as instruments in the differenced equation (6.7) also uses lagged differences as instruments in estimation of the level equation (6.5), i.e. \((\Delta D_{i,t-2}, \Delta D_{i,t-3}, \ldots, \Delta D_{i})\) are used as instruments for \(D_{i,t-1}\). As noted initially, Flannery and Hankins (2013) find that this system-GMM estimator performs best in unbalanced panels where some of the explanatory variables are expected to be
endogenous. Furthermore, the system-GMM estimator doesn’t require homoskedasticity.

Table 8 presents an overview of the most important assumptions underlying the two chosen estimators.\(^{28}\) The rest of this section chapter provide more detail on the consequences of endogeneity, autocorrelation and heteroskedasticity in the models.

Table 8: The Important Assumptions of the Anderson-Hsiao IV and Blundell-Bond System-GMM Estimators.

<table>
<thead>
<tr>
<th>Anderson-Hsiao IV</th>
<th>Blundell-Bond System-GMM</th>
</tr>
</thead>
<tbody>
<tr>
<td>( y_{it} = \beta z_{jt} + \beta x_{it} + \alpha_i + u_{it} )</td>
<td></td>
</tr>
<tr>
<td>a. ( z_j ) and ( x_i ) should be exogenous.</td>
<td>a. ( z_j ) and ( x_i ) should be exogenous.</td>
</tr>
<tr>
<td>b. Instruments, ( z_j ) should be valid and relevant.</td>
<td>b. Instruments, ( z_j ) should be valid and relevant.</td>
</tr>
<tr>
<td>( \text{Cov}(z_j, x_i) \neq 0 )</td>
<td>( \text{Cov}(z_j, x_i) \neq 0 )</td>
</tr>
<tr>
<td>( \text{E}(z_j, u_{it}) = 0 )</td>
<td>( \text{E}(z_j, u_{it}) = 0 )</td>
</tr>
<tr>
<td>c. Explanatory variables may not be constant over time.</td>
<td>c. Explanatory variables may not be constant over time.</td>
</tr>
<tr>
<td>d. No second order autocorrelation in the error terms</td>
<td>d. No second order autocorrelation in the error terms</td>
</tr>
</tbody>
</table>

Source: (Anderson & Hsiao, 1981; Blundell & Bond, 1998; Baltagi, 2005), own contribution.

6.3.2.2 HOMOSKEDASTICITY, SERIAL CORRELATION AND ENDOGENEITY

The system-GMM estimator requires no assumption of homoskedasticity and is therefore not a concern, although the Sargan test of overidentifying restrictions, which tests the validity of the instruments, rejects too often when the homoskedasticity is not satisfied. (Gaud, et al., 2005) The Sargan test of overidentifying restrictions is also provided along with the results in order to check the validity of the instruments. It is important that the instruments are exogenous.

One of the vital assumptions in both the system-GMM estimator and the Anderson-Hsiao IV estimator is the lack of second-order autocorrelation. The presence of second--

---

\(^{28}\) For a more thorough presentation of the models, the reader should consult Appendix G, or the corresponding articles. (Anderson & Hsiao, 1981; Blundell & Bond, 1998)
order autocorrelation will invalidate the estimator, as the instruments will be correlated with the error terms. Arellano and Bond (1991) develop an m-statistic that tests for the presence of second-order autocorrelation. This test is used and presented along with the results. Following Gaud, et al., (2005) tests for the joint significance of the determinants and the time effects are presented along with the regression results.

The problem of endogeneity is also a concern, although many empirical capital structure papers provide very little discussion in this respect. Endogeneity in corporate finance settings often arise from omitted variables and measurement error. (Roberts & Whited, 2011) Measurement error often arises when proxies are used as extensively as it is in corporate finance settings, e.g. measurement error in the market-to-book value as a proxy for growth opportunities. (Erickson & Whited, 2011) Erickson and Whited (2002) develop estimation procedures aimed at mitigating the bias arising from measurement error, but cautions on the use of them in leverage regressions, where it is known that fixed effects is present. (Erickson & Whited, 2011, p. 1304) A test for endogeneity as proposed by Wooldridge (2010) is conducted. The validity of the estimates from the system-GMM method is intact even in the presence of endogeneity. (Flannery & Hankins, 2013).
CHAPTER 7: EMPIRICAL RESULTS, DISCUSSION AND ANALYSIS

This chapter presents and discusses the empirical results on Danish listed companies obtained from estimating the model specifications discussed in chapter 6 Research Methods. The results are compared and contrasted against the findings from Part Two – literature review. The progress of this chapter resembles the structure of the research methods. Initially, descriptive statistics about the proxies chosen are presented along with test of collinearity between the proxies. Next, the chapter presents and discusses the results of the pecking order models ability to explain the choice of capital structure in Danish listed companies. The tests of the pecking order model are followed by the results obtained from the trade-off model specification, including target capital structure and adjustment speeds. Appendix D through appendix J provide supplementary information on the results and regressions presented in this chapter.

7.1 DESCRIPTIVE STATISTICS

Table 9 present summary statistics for the entire sample period and selected years covering the beginning, middle and end of the sample period. The proxies appear steady over the entire sample period with the exceptions being the leverage ratios. The average leverage ratio is 25.4 % and 21.2 % for book measures and market measures, respectively. Both leverage measures have decreased over the sample period from 30.4 % (book measure) and 27.3 % (market measure) to 23.5 % (book measure) and 21.7 % (market measure) with the lowest leverage ratios occurring in 2007, before the financial crisis began in 2008. This indicates that Danish listed companies had a robust capital structure prior to the beginning of the crisis, being at their lowest leverage ratios in 2007. As expected the proxies using market measures, i.e. the market leverage proxy and the proxy for growth opportunities, market-to-book ratio, changed most from 2007 to 2008 due to the dramatic decreases in share prices. The rest of the proxies appear stable over the sample period. The leverage ratios are smaller compared to the leverage ratios of Danish companies found in other empirical papers presented in chapter 3.29 (Alves & Ferreira, 2011; Gaud, et al., 2007) However, these studies cover periods prior

29 Only the leverage ratios presented in Gaud, et al. (2007) and Alves & Ferreira (2011) are directly comparable to the leverage ratios presented here, as these two studies also use total debt to market capitalization.
to the one studied in this study, so the higher leverage ratios in these studies are consistent with the initial trend seen in Table 9, that Danish listed companies have decreased their leverage ratios in recent years.

Table 9: Descriptive statistics.
Summary statistics for the entire sample period and selected individual years. BLEV is total debt to total assets. MLEV is total debt to total market value of assets (total assets – book value of equity + market value of equity). PROF is EBITDA to total assets. SIZE is the logarithm to net sales. GROWTH is measured by the market-to-book ratio. TANG is property, plant and equipment to total assets. NDTS are measured by depreciation and amortization to total assets. RISK is defined as the standard deviation of EBIT. DEF is the financial deficit defined as the sum of dividends paid out, CAPEX and change in net working capital less cash flows from operating activity. a: Due to the definition of DEF only 891 observation are available for this variable. For a detailed overview of the means of the proxies each year, see appendix F. All variables are winsorized at the 1% and 99% level.

<table>
<thead>
<tr>
<th></th>
<th>2001-2011</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Std</td>
<td>Min</td>
<td>Max</td>
<td>Mean</td>
<td>Std</td>
<td>Mean</td>
<td>Std</td>
</tr>
<tr>
<td>BLEV</td>
<td>0.254</td>
<td>0.201</td>
<td>0.000</td>
<td>0.803</td>
<td>0.304</td>
<td>0.178</td>
<td>0.224</td>
<td>0.212</td>
</tr>
<tr>
<td>MLEV</td>
<td>0.212</td>
<td>0.194</td>
<td>0.000</td>
<td>0.797</td>
<td>0.273</td>
<td>0.178</td>
<td>0.146</td>
<td>0.164</td>
</tr>
<tr>
<td>PROF</td>
<td>0.083</td>
<td>0.176</td>
<td>-0.755</td>
<td>0.486</td>
<td>0.094</td>
<td>0.164</td>
<td>0.114</td>
<td>0.147</td>
</tr>
<tr>
<td>SIZE</td>
<td>5.955</td>
<td>0.965</td>
<td>3.003</td>
<td>8.179</td>
<td>6.075</td>
<td>0.813</td>
<td>5.898</td>
<td>1.025</td>
</tr>
<tr>
<td>Growth</td>
<td>1.694</td>
<td>1.291</td>
<td>0.622</td>
<td>8.315</td>
<td>1.456</td>
<td>1.206</td>
<td>2.270</td>
<td>1.433</td>
</tr>
<tr>
<td>TANG</td>
<td>0.326</td>
<td>0.234</td>
<td>0.000</td>
<td>0.925</td>
<td>0.375</td>
<td>0.207</td>
<td>0.296</td>
<td>0.235</td>
</tr>
<tr>
<td>NDTS</td>
<td>0.047</td>
<td>0.028</td>
<td>0.000</td>
<td>0.157</td>
<td>0.053</td>
<td>0.024</td>
<td>0.037</td>
<td>0.022</td>
</tr>
<tr>
<td>RISK</td>
<td>0.020</td>
<td>0.029</td>
<td>0.000</td>
<td>0.181</td>
<td>0.021</td>
<td>0.029</td>
<td>0.020</td>
<td>0.024</td>
</tr>
<tr>
<td>DEF(^a)</td>
<td>0.019</td>
<td>0.193</td>
<td>-0.494</td>
<td>0.799</td>
<td>-</td>
<td>-</td>
<td>0.028</td>
<td>0.201</td>
</tr>
<tr>
<td>Obs.</td>
<td>997(^*)</td>
<td>85</td>
<td>96</td>
<td>94</td>
<td>87</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Eviews 7, own contribution

The number of companies appearing in the study each year ranges from 85 to 96 so the number of companies is also steady. Further studying the division of companies each year reveals that the number of observations ranges from 2-11, with the average being 9.4 years. This indicates that many companies have existed throughout the period.

Although using panel data for analysis mitigates the effects of collinearity between variables, it can still cause problems in regressions if two variables are close to being perfectly collinear, e.g. risk could be correlated with firm size, as larger more diversified companies are expected to have less risk. Table 10 shows the correlation between the variables included in the analyses. As can be seen the correlation between variables are relatively low and therefore not of concern. As expected the correlation
between the market leverage and book leverage measures are high due to their very similar definitions.  

Table 10: Correlation Matrix.  
Shows the correlations between variables included in the analysis. For variable definitions see Table 9 or appendix D.

<table>
<thead>
<tr>
<th></th>
<th>BLEV</th>
<th>MLEV</th>
<th>PROF</th>
<th>SIZE</th>
<th>GROWTH</th>
<th>TANG</th>
<th>NDTS</th>
<th>RISK</th>
<th>DEF</th>
</tr>
</thead>
<tbody>
<tr>
<td>BLEV</td>
<td>1,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MLEV</td>
<td>0,875</td>
<td>1,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PROF</td>
<td>-0,011</td>
<td>-0,069</td>
<td>1,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SIZE</td>
<td>0,159</td>
<td>0,125</td>
<td>0,480</td>
<td>1,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GROWTH</td>
<td>-0,151</td>
<td>-0,430</td>
<td>0,025</td>
<td>-0,105</td>
<td>1,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TANG</td>
<td>0,414</td>
<td>0,424</td>
<td>0,172</td>
<td>0,162</td>
<td>-0,183</td>
<td>1,000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NDTS</td>
<td>0,178</td>
<td>0,136</td>
<td>0,109</td>
<td>0,173</td>
<td>-0,116</td>
<td>0,303</td>
<td>1,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RISK</td>
<td>-0,147</td>
<td>-0,155</td>
<td>-0,449</td>
<td>-0,356</td>
<td>0,174</td>
<td>-0,204</td>
<td>-0,035</td>
<td>1,000</td>
<td></td>
</tr>
<tr>
<td>DEF</td>
<td>0,028</td>
<td>0,019</td>
<td>-0,189</td>
<td>-0,233</td>
<td>0,031</td>
<td>-0,039</td>
<td>-0,153</td>
<td>0,096</td>
<td>1,000</td>
</tr>
</tbody>
</table>

Source: Eviews 7, own contribution

The correlations between the leverage ratios and the financing deficit are rather low. The relationships between these variables are covered more deeply through analysis of the pecking order model.

7.2 PECKING ORDER MODEL

Recall that the basic idea behind the pecking order model is to test how well the financing deficits follow debt issues. An adoption of the pecking order model means that the financing deficit follow debt issues one to one, i.e. a coefficient of one.

Table 11: Mean and Median Equity and Debt Issues  
The table presents mean and median values of debt issues and equity issues in the period 2002-2011. Equity issues are defined as the change in book equity between two periods divided by total assets at the ending or previous year. Similarly, debt issues are defined as the change in total debt between two periods divided by total assets at the ending of the previous year.

<table>
<thead>
<tr>
<th></th>
<th>2002-2011</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
</tr>
<tr>
<td>Equity Issues</td>
<td>0,0553</td>
</tr>
<tr>
<td>Debt Issues</td>
<td>0,0005</td>
</tr>
<tr>
<td>N</td>
<td>890</td>
</tr>
</tbody>
</table>

Source: Eviews 7, own contribution.

---

Another way to check the collinearity between variables is calculating the variance inflation factors, however due to the low correlations shown in Table 10 it isn’t necessary. Even if there is high correlation Wooldridge (2010) cautions on the exclusion of one, as it might create an omitted variable bias, unless the variables are perfectly collinear.
Table 11 shows mean and median debt and equity issues over the entire sample period 2002-2011. Debt issues throughout the sample period is on average almost non-existent with the median being a smaller debt retirement. The reverse is true for equity issues which on average are about 5.5% each year. The lack of debt issues is consistent with the initial findings of the decreasing leverage ratios, reported in the previous section. Figure 2 compares the development in average equity issues, debt issues and financing deficits.

**Figure 2: Average Debt Issues, Equity Issue and Financial Deficits, 2002-2011.**
The figure illustrates the development in average equity issues, debt issues and financial deficits. For variable definitions see Table 9 and Table 11.

Equity has clearly been the most common form of external finance issued in the sample period. Looking at the trends of the variables, it doesn’t seem that the financing tracks either equity issues or debt issues well, and it seems more closely related to equity issues than debt issues. The correlations between the variables supports this as the correlation between debt issues and the financing deficit is only 0.13 while the correlation between the financing deficit and equity issues is 0.44. Figure 2 also suggest that companies in 2002 and 2003 have issued equity not only to finance the deficit, but also to retire debt. In addition, equity issues clearly exceed both the financing needs and debt retirements in the period up until 2007. Examining the development in cash holdings in the same period reveals that they have increased from

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31 For summary statistics for more years as well as correlations between variables, see Appendix G.
32 See appendix G for more the correlation between the variables, as well as summary statistics for cash.
being 11.80% of total assets in 2002 to a peak of 19.38% in 2007. So the equity issues have also been used to build up cash holding in the sample period.

From these initial findings it doesn’t seem that Danish listed companies are following the pecking order theory, as using equity issues to retire debt and build up cash holdings are clearly against the intuitions behind the pecking order model. Conversely, it actually shows support for market timing behavior as it could indicate that listed companies in Denmark have taken advantage of the increasing share prices that peaked before the crisis in 2008.

Table 12 presents the empirical results from the estimation of the pecking order model on the sample of Danish listed companies. Column (1) presents the regression results from the estimation of the full sample of companies. The estimated constant is zero

<table>
<thead>
<tr>
<th>Table 12: Tests of the Pecking Order Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>The table presents the results of the estimation of the pecking order model on the sample of companies from 2002-2011. The model tested is the pooled OLS regression discussed in section 6.2 and 6.3.1 and corresponds to the estimation of the model ( \Delta D_{it} = \alpha + \beta DEF_{it} + e_{it} ), where</td>
</tr>
<tr>
<td>( DEF_{it} = DIV_{it} + CAPEX_{it} + \Delta NWC_{it} - CF_{it} ). ( \Delta D_{it} ) is debt issued, calculated as (( D_{it} - D_{i,t-1} ))/Total Assets( _{i,t} ). Variables are winsorized at the 1% and 99% level. Column 1 is the regression including the full sample of companies and observations. Columns (2) and (3) are regressions based on the 25% largest companies and the 25% smallest companies, respectively. Similarly, columns (4) and (5) are regression based on the 25% companies with the lowest and highest growth opportunities, respectively. Company cluster robust standard errors are reported in parentheses. F-test tests the null hypothesis that the financial deficit coefficient is equal to 1. *, **, and *** indicate significance at the 0.1, 0.05 and 0.01 level, respectively.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financing Deficit</td>
<td>0.077*</td>
<td>0.122</td>
<td>0.036</td>
<td>0.180***</td>
</tr>
<tr>
<td>Constant</td>
<td>-0.001</td>
<td>0.011*</td>
<td>0.004</td>
<td>-0.008</td>
</tr>
<tr>
<td>Adj. R²</td>
<td>0.015</td>
<td>0.024</td>
<td>0.001</td>
<td>0.061</td>
</tr>
<tr>
<td>F-test</td>
<td>520.63***</td>
<td>112.13***</td>
<td>296.04***</td>
<td>221.02***</td>
</tr>
<tr>
<td>Obs.</td>
<td>890</td>
<td>230</td>
<td>212</td>
<td>219</td>
</tr>
</tbody>
</table>

Source: Stata 11, own contribution.

and the coefficient of the financing deficit is statistically significant but far from being one as the pecking order theory suggests. The F-test, testing whether the financing deficit is equal to unity, is clearly rejected for every model which shows that debt issues does a very poor job at tracking the financing deficit, and hence offers no support for the pecking order theory. The results are consistent with the initial findings of the low
correlations and dominance of equity issues shown in Figure 2. Robustness test on the results in column (1) are performed by examining if the results are robust to the use of alternative estimators and the inclusion of time effects. The tests shows that the results are robust and the same results are achieved using random effects and fixed effects estimators, corroborating the finding in chapter 6 that firm and time effects are not important in the pecking order model. The results from the robustness tests are presented in appendix G.

As a further examination, the sample is divided into four subgroups on which the model is estimated. Column (2) and (3) presents regression results on the 25 % largest and smallest companies, respectively. The basic intuition being that smaller companies suffer more from asymmetric information problems and as such it would be expected that the pecking order model will perform better for small companies than large companies. As the results reveal, neither of the regressions yields significant results and furthermore the deficit coefficient are highest for large firm. This is consistent with findings of Frank and Goyal (2003) and Seifert and Gonenc (2008). The results are clearly inconsistent with the predictions of the pecking order theory. In addition, in column (4) and (5) regressions are run on samples on the 25 % companies with the lowest and highest growth opportunities, respectively. High growth companies are expected to face more information asymmetries, as they are not able to share their growth opportunities with potential investors. As such, the pecking order model is anticipated to be more appropriate for the high growth companies than their low growth counterparts. The results show the opposite effect. The highest and most statistically significant effect of the financing deficit is from the sample of low growth companies. Similar trends are found for German companies in related research. (Seifert & Gonenc, 2008)

Overall the results offer no support for the pecking order model to explain the capital structure of Danish listed companies and it doesn’t support the notion by Seifert and Gonenc (2008) that the pecking order model has more support in bank-based economies. On the contrary, the financing deficit is smaller than any of those found in US (Shyam-Sunder & Myers, 1999; Fama & French, 2002), UK and German companies. (Seifert & Gonenc, 2008) Part of this is likely due to the time period examined. As earlier research have highlighted, the relevance of the pecking order model have are decreased with time, having the best applicability prior to 1990. (Frank
The high increase in share prices during the period have also made it attractive for companies to issue equity, which they then have used to build of cash holding. This finding is consistent with the survey results of Bancel and Mittoo (2004) as well as Graham and Harvey (2001) who both find that financial flexibility is of high importance for CFO’s. Similarly, it is also consistent with the findings of Huang and Ritter (2009, p. 237) who find that ‘companies are more likely to use external equity financing when the relative price of equity is low’. In contrast the large cash holdings mean that the agency costs associated with the free cash flow problem suggested by Jensen (1986) aren’t a concern in Danish companies.

7.3 TRADE-OFF THEORY

The previous sections showed that the pecking order theory have very little support in the capital structure choices of Danish listed companies. The results from the trade-off theory will be presented in this section. Initially, the target leverage ratio from equation (6.4) is examined and compared to the actual leverage ratios observed over the entire sample. This is followed by estimation of the partial adjustment model in equation (6.6).

7.3.1 TARGET CAPITAL STRUCTURE

Table 13 reports the results from the estimation of the target capital structure regression. Columns (1) and (2) presents the estimation results of fixed effects regressions on market leverage measure. Columns (3) and (4) reports similar regressions on book leverage measures. The regressions in columns (2) and (4) contain time fixed effects. The results show that profitability is found to be negatively related to leverage for both leverage measures. As reported earlier in the literature review section, the negative sign of profitability is one of the most consistent findings in capital structure research. (Titman & Wessels, 1988; Rajan & Zingales, 1995) The negative relationship is consistent with the predictions of the pecking order theory which posits that increased profitability leads to more retained earnings and hence less use of debt. However, the results in the previous sections clearly showed that there is no support for the pecking order theory in the capital structure. Even though the negative relationship is often stated as a contradiction of the trade-off theory (Frank & Goyal, 2009; Jong, et al., 2008), the development in dynamic trade-off theory find several possible explanations
for this negative relationship, e.g. financial flexibility. (DeAngelo, et al., 2011; Strebulaev & Whited, 2012) The low leverage ratios and increasing cash holdings in Danish companies over the sample period suggest that financial flexibility is an important factor when choices concerning capital structures are made in Danish companies. Asset tangibility is positively related to leverage, consistent with the trade-off theory’s prediction that tangible assets provide collateral and hence less risk for investors and less agency costs. The market-to-book ratio is significantly negative in relation to the market leverage ratio, as predicted by the trade-off theory and consistent with earlier empirical papers based on other countries. (Frank & Goyal, 2009)

**Table 13: Target Capital Structure**

This table presents the regression results from estimating the target capital structure of Danish listed companies. The model estimated is the following:

\[ D^*_a = \beta_0 \text{PROF} + \beta_1 \text{SIZE} + \beta_2 \text{GROWTH} + \beta_3 \text{TANG} + \beta_4 \text{NDTS} + \beta_5 \text{RISK} \]

For variable definitions see Table 9 or appendix D. Columns (1) and (2) show the results of the regressions with market leverage as the dependent variable. Columns (3) and (4) show the results of the regression with book leverage as the dependent variable. Columns (1) and (3) are without time effects, while columns (2) and (4) are with time effects. Cluster robust standard errors are reported in parenthesis. Wald 2 is a test for joint significance of the coefficients of the independent variable. Wald 1 is a test for joint significance of the time effects (time dummies). *, ** and *** indicate significance at the 10 %, 5 % and 1 % level, respectively.

<table>
<thead>
<tr>
<th></th>
<th>(1) Market Leverage</th>
<th>(2) Market Leverage</th>
<th>(3) Book Leverage</th>
<th>(4) Book Leverage</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Profitability</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-0.215***</td>
<td>-0.189***</td>
<td>-0.224***</td>
<td>-0.234***</td>
</tr>
<tr>
<td></td>
<td>(0.05)</td>
<td>(0.05)</td>
<td>(0.05)</td>
<td>(0.05)</td>
</tr>
<tr>
<td><strong>Size</strong></td>
<td>0.013</td>
<td>0.010</td>
<td>0.011</td>
<td>0.017</td>
</tr>
<tr>
<td></td>
<td>(0.02)</td>
<td>(0.02)</td>
<td>(0.02)</td>
<td>(0.02)</td>
</tr>
<tr>
<td><strong>Growth</strong></td>
<td>-0.032***</td>
<td>-0.024***</td>
<td>0.003</td>
<td>0.004</td>
</tr>
<tr>
<td></td>
<td>(0.01)</td>
<td>(0.01)</td>
<td>(0.01)</td>
<td>(0.01)</td>
</tr>
<tr>
<td><strong>Tangibility</strong></td>
<td>0.457***</td>
<td>0.443***</td>
<td>0.499***</td>
<td>0.490***</td>
</tr>
<tr>
<td></td>
<td>(0.08)</td>
<td>(0.08)</td>
<td>(0.08)</td>
<td>(0.09)</td>
</tr>
<tr>
<td><strong>NDTS</strong></td>
<td>0.183</td>
<td>0.070</td>
<td>0.516</td>
<td>0.428</td>
</tr>
<tr>
<td></td>
<td>(0.32)</td>
<td>(0.32)</td>
<td>(0.34)</td>
<td>(0.33)</td>
</tr>
<tr>
<td><strong>Risk</strong></td>
<td>0.161</td>
<td>0.153</td>
<td>0.090</td>
<td>0.077</td>
</tr>
<tr>
<td></td>
<td>(0.23)</td>
<td>(0.23)</td>
<td>(0.32)</td>
<td>(0.31)</td>
</tr>
<tr>
<td><strong>Time Effects</strong></td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Adj. R²</strong></td>
<td>0.287</td>
<td>0.311</td>
<td>0.238</td>
<td>0.236</td>
</tr>
<tr>
<td><strong>Wald 2</strong></td>
<td>18.887***</td>
<td>14.146***</td>
<td>16.202***</td>
<td>13.790***</td>
</tr>
<tr>
<td><strong>Wald 1</strong></td>
<td>5.317***</td>
<td>0.895</td>
<td>0.895</td>
<td></td>
</tr>
<tr>
<td><strong>Obs.</strong></td>
<td>997</td>
<td>997</td>
<td>997</td>
<td>997</td>
</tr>
<tr>
<td><strong>Companies</strong></td>
<td>106</td>
<td>106</td>
<td>106</td>
<td>106</td>
</tr>
</tbody>
</table>

Source: Stata, own contribution.

However, for the book measure of leverage, growth is positive and insignificant. If companies use book measures to determine their optimal capital structure as Welch (2011), amongst others argue, than it might be that the market-to-book ratio is a poor
proxy of growth opportunities for book debt. When using market leverage, the negative relation between leverage and the market-to-book ratio could be purely mechanical due to the definitions of the variables. If investors perceive a company to have many growth opportunities they increase their valuation of the company. This higher valuation of the company will, ceteris paribus, lead to a decrease in the market leverage measure, unless the amount of debt is also increased accordingly. For size, non-debt-tax-shields and risk the coefficients are positive but insignificant. These findings are comparable to those reported by Jong, et al. (2008) and Alves and Ferreira (2011) who also find positive and insignificant results for these three determinants. The reason these factors might not have an effect is the reliance on bank lending in Danish companies, which means that the long-term relationships between banks and companies and the less asymmetric information associated with bank debt lending cause factors such as size to be less important. Correlation between the variables could also cause the factors to be insignificant, e.g. risk have been mentioned to be correlated with size as larger, more diversified companies have lower risk. (Gaud, et al., 2007) To check whether this is the case alternative model specification is tested, leaving out one or more of the variables that showed no significance. This examination revealed that the results in Table 13 are robust to alternative model specifications.33

The Wald tests show that the coefficients of the determinants are jointly significant for both market and book leverage measures. However, the Wald 1 test shows that the time effects are only significant for market values of debt, reflecting that macroeconomic changes and shocks have been most significant for market measures. The regressions in columns (2) and (3) are used to determine the target leverage ratios for market and book measures respectively compared against observed leverage ratios.

7.3.2 TARGET VERSUS OBSERVED CAPITAL STRUCTURE

In order to determine whether Danish listed companies have been over- or underleveraged in the sample period, the target leverage ratios estimated in the previous section is compared to the observed leverage ratios. Figure 3 presents the development in target and actual leverage ratios. The deviations between target and actual leverage ratios are smaller for book measures of leverage than they are for market measures,

33 See appendix I, for the results of these alternative model specifications as well as test with an alternative estimator.
which appear consistent with the notion that companies use book measures when they decide upon their capital structures. (Welch, 2011) Furthermore, the deviations between target and observed leverage ratios have decreased over the sample period. Between 2001 and 2004 companies appeared to be overleveraged for both measures of leverage. However, in the period 2005-2008 companies were underleveraged confirming the initial findings that Danish listed companies, prior to the financial crisis on average appeared to have robust capital structures. The last three years of the sample period, the observed leverage ratios have followed the target leverage ratios closely, suggesting that companies have increased their focus on being at their target leverage ratios. The developments in leverage ratios shown in Figure 3 suggest that companies adjust towards their target capital structure, which are in accordance with the trade-off theory. The speed of this adjustment will be studied further in the next section.

**Figure 3: Target leverage versus actual leverage.**

The figure compares the development in actual leverage ratios and target leverage ratios. Target leverage measures are obtained through the estimation of the following: (See Table 13)

\[
D_t^* = \beta_1 PROF + \beta_2 SIZE + \beta_3 GROWTH + \beta_4 TANG + \beta_5 NDTS + \beta_6 RISK
\]

Source: Stata 11, own contribution.

7.3.3 SPEED OF ADJUSTMENT

As the previous sections have shown support for the trade-off theory, both in regards to the relationship between selected determinants and leverage and in regards to showing sign of adjusting their leverage ratios towards their targets. Therefore it is fitting to test the speed by which the companies adjust towards their target capital structure.
Table 14 reports the results from estimating the partial adjustment model from equation (6.6) using the estimators discussed in section 6.3.2. However, the results using the Anderson-Hsiao instrumental variables estimators are presented in appendix J.3, as the results from these estimators have proven to be very sensitive to the number of observations included in the sample and the coefficient of the lagged leverage coefficient are biased, which have been shown to be a problem if the coefficient approaches unity. (Verbeek, 2008)

Table 14: Target Adjustment Model
This table presents the results from performing estimation of the partial adjustment model
\[ D_{it} = \gamma D_{it-1} + \beta x_{it} + \alpha_i + \lambda_t + \epsilon_{it} \]. The table presents results from three different estimators, viz. OLS, fixed effects and Blundell-Bond two step system-GMM, all discussed in chapter 6. OLS estimation results are presented in columns (1) and (4), fixed effects estimation in columns (2) and (5) and the Blundell-Bond system-GMM estimator in columns (3) and (6).

<table>
<thead>
<tr>
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<th>(1)</th>
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<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
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<td>Book Leverage</td>
<td>OLS FE BB-2step</td>
<td>Market Leverage</td>
<td>OLS FE BB-2step</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( D_{it} )</td>
<td>0.838***</td>
<td>0.513***</td>
<td>0.737***</td>
<td>0.791***</td>
<td>0.465***</td>
<td>0.640***</td>
</tr>
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<td></td>
<td>(0.03)</td>
<td>(0.06)</td>
<td>(0.11)</td>
<td>(0.04)</td>
<td>(0.06)</td>
<td>(0.10)</td>
</tr>
<tr>
<td>Profitability</td>
<td>-0.158***</td>
<td>-0.230***</td>
<td>-0.199***</td>
<td>-0.104***</td>
<td>-0.197***</td>
<td>-0.136***</td>
</tr>
<tr>
<td></td>
<td>(0.03)</td>
<td>(0.04)</td>
<td>(0.04)</td>
<td>(0.02)</td>
<td>(0.04)</td>
<td>(0.03)</td>
</tr>
<tr>
<td>Size</td>
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<td>0.029**</td>
<td>0.016**</td>
<td>0.010*</td>
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<td>0.012</td>
</tr>
<tr>
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<td>(0.01)</td>
<td>(0.01)</td>
<td>(0.02)</td>
<td>(0.01)</td>
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<tr>
<td>Growth</td>
<td>-0.000</td>
<td>0.001</td>
<td>-0.003</td>
<td>-0.014***</td>
<td>-0.020***</td>
<td>-0.018***</td>
</tr>
<tr>
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<td>(0.00)</td>
<td>(0.00)</td>
<td>(0.00)</td>
<td>(0.01)</td>
</tr>
<tr>
<td>Tangibility</td>
<td>0.108***</td>
<td>0.384***</td>
<td>0.178***</td>
<td>0.110***</td>
<td>0.334***</td>
<td>0.200***</td>
</tr>
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<td></td>
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<td>(0.06)</td>
<td>(0.03)</td>
<td>(0.08)</td>
<td>(0.05)</td>
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<tr>
<td>NDTs</td>
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<td>-0.439</td>
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<td>(0.27)</td>
</tr>
<tr>
<td>Risk</td>
<td>0.065</td>
<td>0.211</td>
<td>0.125</td>
<td>0.015</td>
<td>0.190</td>
<td>0.119</td>
</tr>
<tr>
<td></td>
<td>(0.28)</td>
<td>(0.32)</td>
<td>(0.28)</td>
<td>(0.20)</td>
<td>(0.24)</td>
<td>(0.22)</td>
</tr>
<tr>
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<td>-0.009</td>
<td>-0.015</td>
<td>-0.015</td>
</tr>
<tr>
<td></td>
<td>(0.04)</td>
<td>(0.05)</td>
<td>(0.04)</td>
<td>(0.05)</td>
<td>(0.05)</td>
<td>(0.05)</td>
</tr>
<tr>
<td>Time Effects</td>
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<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Wald 2</td>
<td>331.75***</td>
<td>69.04***</td>
<td>482.37***</td>
<td>251.65***</td>
<td>61.47***</td>
<td>412.47***</td>
</tr>
<tr>
<td>Wald 1</td>
<td></td>
<td></td>
<td></td>
<td>10.78***</td>
<td>7.31***</td>
<td>69.60***</td>
</tr>
<tr>
<td>AR2(m2)</td>
<td></td>
<td></td>
<td></td>
<td>-0.006</td>
<td></td>
<td>-0.652</td>
</tr>
<tr>
<td>Sargan (d.f)</td>
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<td></td>
<td></td>
<td>14.44 (9)</td>
<td></td>
<td>16.25* (9)</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Obs.</td>
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<td>885</td>
<td>885</td>
<td>885</td>
<td>885</td>
<td>885</td>
</tr>
<tr>
<td>Companies</td>
<td>106</td>
<td>106</td>
<td>106</td>
<td>106</td>
<td>106</td>
<td>106</td>
</tr>
</tbody>
</table>

Source: Stata 11, own contribution.
Especially the variant of the Anderson-Hsiao IV approach using the lagged differenced leverage ratio as an instrument yield spurious results, indicating the additional loss of observations have a big impact for small samples. The estimation results in Table 14 provide acceptable results. The AR2 or m2 test for second-order autocorrelation is rejected when using the two-step Blundell-Bond system GMM estimator which was a requirement for the estimator to be valid. Furthermore, the Sargan test for overidentifying restrictions which test for the validity of the instruments are rejected using the book measure of leverage. Caution should be taken with the market leverage regressions as the Sargan test is rejected at the 10 % significance level. However, the Sargan test rejects too often in the presence of heteroskedasticity which is the case with the data set used. The sample is later divided into subsamples and under these conditions the Sargan test is not rejected when using market measures of leverage. The Wald test shows that the determinants are jointly significant as are the time effects when using market leverage. The fact that time effects are only significant when using the market measure of leverage indicates that macroeconomic shocks and institutional changes have primarily had an impact on market measures.\textsuperscript{34} The more reliance on bank lending in Danish companies compared to companies in the US and UK might explain why time effects doesn’t have an significant impact on the capital structure choice measured in book values. Due to the long-term relationships between companies and banks, as well as less information asymmetries, bank lending conditions may be more stable over time.

Overall, the coefficients of the determinants correspond to the findings from the previous sections and provide support for the trade-off theory. Size is significant under book values of debt, indicating that larger companies suffer less from asymmetric information and can obtain more debt. Tangibility is positive and significant supporting the importance of tangible asset as collateral for debt financing. Growth and profitability is significant and negative.

The system GMM estimated adjustment speeds are 26,3 % (1-0,737) for book leverage and 36,0 % (1-0,640) for market leverage. These adjustment speeds are placed in the range generated by the OLS and fixed effects regressions which are anticipated for a valid estimator. The adjustment speeds in book leverage terms are very similar to the

\textsuperscript{34} See Appendix J.2 for a regression of on book leverage with time effects. The results obtained are similar to those presented here. The short time period might explain the insignificance of the time effects.
ones reported for Danish companies by Öztekin and Flannery (2012). For market leverage the adjustment speed is faster than the ones reported for US companies by Huang and Ritter (2009) as well as those reported by Lemmon, et al. (2008), but comparable to the findings of Flannery and Rangan (2006). It is difficult to make comparisons between results obtained in different countries as variances occur in samples sizes, model specifications, time periods and choice of estimators. Disregarding the last three years of the sample period in which leverage ratios have been quite stable, the fast adjustments speed could indicate the ease with which Danish companies have been able to acquire financing either through equity or debt during the growth years ending in 2008.

Section 7.2 showed that much of the adjustments made in the sample period have been done through the use of equity issues and at the same time companies have been building up cash holdings. This suggested that companies wanted to create financial flexibility which would indicate a slow adjustment speed (Strebulaev & Whited, 2012) which the results above show isn’t the case. However, the adjustments speeds estimated above are based on the full sample of companies and it would be interesting to test whether differences occur between companies in order to determine if company characteristics have an impact on adjustment speeds.

Companies adjustment speeds is a result of balancing cost of adjustment with the benefits of adjusting. Higher taxes are a factor that could increase companies adjustment speeds if they were underleveraged, unless the need for financial flexibility is higher. Furthermore, higher financial distress costs and penalties from going above target leverage ratios cause companies to adjust faster towards their target. In order to examine this further the sample of Danish listed companies are divided into two subsamples containing the companies that are overleverage and underleveraged, and the partial adjustment model are applied to these subsamples.

Table 15 presents the results from running the partial adjustment model on the samples of underleveraged and overleveraged companies using the Blundell-Bond two-step system GMM estimator. For OLS and fixed effects results, see appendix J.4 and appendix J.5. Interestingly, there are significant differences in adjustment speeds between the two samples. Underleveraged companies have adjustment speeds of 57.0 % (51.1 %) when using the book (market) measure of leverage, whereas overleveraged
companies have adjustment speeds of only 31.9 % (22.2 %), which is a significant difference.\textsuperscript{35}

Table 15: Target Adjustment Model – Underleveraged vs. Overleveraged
This table presents the results from performing estimation of the partial adjustment model
\[ D_{t} = \alpha D_{t-1} + \beta x_{i} + \gamma \epsilon_{t} + \lambda_{t} + \epsilon_{t} \]
on the underleveraged and overleveraged companies. Columns (1)-(2) provide estimation from the Blundell-Bond two-step system-GMM on book leverage and market leverage measures on the sample of underleveraged companies. Columns (3)-(4) provide estimation from the Blundell-Bond two-step system-GMM on book leverage and market leverage measures on the sample of overleveraged companies. The instruments used in the system-GMM estimator are \((D_{i,t-2}, D_{i,t-3}, \ldots, D_{i,t})\) and \((\Delta D_{i,t-2}, \Delta D_{i,t-3}, \ldots, \Delta D_{i,t})\). Wald 2 is a test of joint significance of the explanatory variables coefficients. Wald 1 is a joint test of significance of the time effects. Both Wald tests having the null hypothesis that the coefficients are jointly equal to zero. AR2 is the test of second-order serial correlation as proposed by Arellano and Bond (1991). Sargan test is a test of overidentifying restriction, indicating the validity of the instruments. Robust standard errors are reported in parenthesis. *, **, *** indicate significance at the 10 %, 5 % and 1 % level respectively.

<table>
<thead>
<tr>
<th></th>
<th>Underleveraged</th>
<th></th>
<th>Overleveraged</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
</tr>
<tr>
<td></td>
<td>Book</td>
<td>Market</td>
<td>Book</td>
<td>Market</td>
</tr>
<tr>
<td>(D_{t-1})</td>
<td>0.430**</td>
<td>0.489***</td>
<td>0.681***</td>
<td>0.778***</td>
</tr>
<tr>
<td></td>
<td>(0.17)</td>
<td>(0.11)</td>
<td>(0.19)</td>
<td>(0.08)</td>
</tr>
<tr>
<td>Profitability</td>
<td>-0.079***</td>
<td>-0.093***</td>
<td>-0.323***</td>
<td>-0.200**</td>
</tr>
<tr>
<td></td>
<td>(0.02)</td>
<td>(0.03)</td>
<td>(0.10)</td>
<td>(0.09)</td>
</tr>
<tr>
<td>Size</td>
<td>0.008</td>
<td>0.018***</td>
<td>0.011</td>
<td>0.006</td>
</tr>
<tr>
<td></td>
<td>(0.01)</td>
<td>(0.01)</td>
<td>(0.01)</td>
<td>(0.01)</td>
</tr>
<tr>
<td>Growth</td>
<td>-0.000</td>
<td>-0.015***</td>
<td>-0.003</td>
<td>-0.011</td>
</tr>
<tr>
<td></td>
<td>(0.00)</td>
<td>(0.00)</td>
<td>(0.01)</td>
<td>(0.01)</td>
</tr>
<tr>
<td>Tang</td>
<td>0.150**</td>
<td>0.107**</td>
<td>0.150**</td>
<td>0.134***</td>
</tr>
<tr>
<td></td>
<td>(0.06)</td>
<td>(0.04)</td>
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<tr>
<td>NDTS</td>
<td>0.248</td>
<td>-0.103</td>
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<td>(0.17)</td>
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<td>(0.26)</td>
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<tr>
<td>Risk</td>
<td>-0.193*</td>
<td>-0.117</td>
<td>-0.014</td>
<td>0.233</td>
</tr>
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<td></td>
<td>(0.11)</td>
<td>(0.11)</td>
<td>(0.47)</td>
<td>(0.34)</td>
</tr>
<tr>
<td>Constant</td>
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<td>-0.058**</td>
<td>0.028</td>
<td>0.026</td>
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<td></td>
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<td>(0.06)</td>
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<tr>
<td>Time Effects</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Wald 2</td>
<td>197.54***</td>
<td>244.38***</td>
<td>836.76***</td>
<td>711.96***</td>
</tr>
<tr>
<td>Wald 1</td>
<td>14.03</td>
<td></td>
<td>57.55***</td>
<td></td>
</tr>
<tr>
<td>AR2(m2)</td>
<td>1.213</td>
<td>1.134</td>
<td>1.015</td>
<td>-0.315</td>
</tr>
<tr>
<td>Sargan (d.f.)</td>
<td>12,12 (9)</td>
<td>14,571 (9)</td>
<td>11,792 (9)</td>
<td>11,327 (9)</td>
</tr>
<tr>
<td># Instruments</td>
<td>17</td>
<td>26</td>
<td>17</td>
<td>26</td>
</tr>
<tr>
<td>Obs.</td>
<td>445</td>
<td>455</td>
<td>331</td>
<td>321</td>
</tr>
<tr>
<td>Companies</td>
<td>71</td>
<td>77</td>
<td>63</td>
<td>64</td>
</tr>
</tbody>
</table>

Source: Stata 11, own contribution.

Even though caution should be taken when using the two-step system GMM estimator on small samples, the ranges generated by OLS and fixed effects estimation shows that

\textsuperscript{35} The results is actually consistent with the simulation result generated by DeAngelo, et al. (2011), who also find significantly faster adjustment speeds for underleveraged companies, although no treating it in depth.
the GMM estimates are within the ranges, suggesting valid results. Examining the ranges generated by the OLS and fixed effects estimators show that the high end of the adjustment speed range for overleveraged companies, generated by the fixed effects estimation, is very close to the low end of the adjustment speed range for underleveraged companies, generated by the OLS estimation.\footnote{Specifically, the range of adjustment speed is 18.8 \% - 31.9 \% (25.6 \% - 49.7 \%) for overleveraged companies, whereas the range is 30.9 \% - 60.7 \% (43.4 \% - 66.7 \%) for underleveraged companies, when using the book (market) leverage measure. See Appendix J.4 and J.5.} The high adjustment speed for underleveraged companies shows that they very actively adjust their capital structures. Underleveraged companies are considerably more active in adjusting their capital structure than the full sample of companies as well as the sample of overleveraged companies, suggesting that the underleveraged companies have lower adjustment costs or that they benefit from being at their optimal target leverage, e.g. by using the tax advantage of debt. For further examination descriptive statistics of the samples of under- and overleveraged companies are studied. The descriptive statistics are presented in appendix J.6 and show considerable differences between the two groups. Cash holdings in the underleveraged companies are significantly larger than the cash holdings in overleveraged companies as underleveraged companies have on average cash holding of 20.21 \% - 21.70 \% of total assets, whereas overleveraged companies only have average cash holdings of 6.80 \% - 8.50 \%. Initially this could indicate that the lower adjustment speed of the overleveraged companies is a result of liquidity constraints if they are unable to retire debt or issue equity. Given the recent years development in economic and financial market, where companies in Denmark have experienced a credit crunch, this factor might offer some explanation to the lower adjustment speeds. (Henriksen & Bünger, 2012) However, looking at the other characteristics offers more interesting perspectives on the average companies in each group. On average, underleveraged companies are smaller, have higher growth opportunities and their average leverage ratios are around 25 \% lower in absolute terms for both leverage measures.

Adjustment speeds are also tested for samples of the 25 \% smallest and largest companies as well as the 25 \% of the companies with the lowest and highest growth opportunities. No differences are found in adjustment speeds for high and low growth companies, however small companies exhibit considerable larger adjustment speeds.
than large companies. The estimation results are presented in appendix J.7 – appendix J.9. Examining the samples in more detail reveals that smaller companies on average have negative profits during the period, lower leverage ratios and significant higher cash balances.

The results indicate that companies with robust capital structures, i.e. low leverage ratios, and who due to large cash holdings are expected to have higher financial flexibility, more actively manage their capital structures. This is inconsistent with the notion that companies wishing to preserve financial flexibility exhibit slower adjustment speeds, suggesting that other considerations are important. In general terms the findings show that company characteristics have significant impact on companies’ adjustment speeds in Danish companies, supporting the findings of Titman and Tsyplakov (2007).

7.4 SUMMARY OF FINDINGS

This chapter has presented the findings of determinants of capital structure in Danish listed companies. The analysis offers no support for the pecking order theory. Danish listed companies have on average over the sample period issued equity to build up cash holdings, which contradicts the pecking order theory. Hypothesis 7 is thus confirmed. The behavior of Danish companies suggests that they have taken advantage of the high share prices prior to 2008 which made them have robust capital structures when the financial crisis started in 2008. Danish listed companies have decreased their leverage ratios over the sample period and combined with the increased cash holdings it suggest that Danish listed companies value financial flexibility.

Examination of the trade-off model was conducted in several steps and the results from the target capital structure model gave in results consistent with earlier empirical results and largely supportive of the trade-off model. Profitability and growth opportunities are found to be negative related to leverage in Danish companies. Thus, hypotheses 1 and 3 are confirmed. Furthermore, asset tangibility is positively related to leverage which is also the case for size in most regressions using the target adjustment model resulting in confirmation of hypothesis 4 and partly confirmation of hypothesis 2. The estimated models offer mixed results in respect to non-debt tax shield and risk, but predominantly these determinants enter the models with insignificant and positive signs, leading to a non-confirmation of hypotheses 5 and 6. The results are consistent for both market and
book measures of leverage and consistent with the findings of determinants of capital structure conducted in other countries as well as empirical studies from cross-country investigations. (Alves & Ferreira, 2011; Gaud, et al., 2005) The results offer support for the presence of a target capital structure, although the target seems to vary over time.

The investigation of the target adjustment model confirms the adjustment speeds estimated by Öztekin and Flannery (2012), confirming hypothesis 8a. The fact that underleveraged companies adjust rapidly towards their target capital structure, at significantly higher speeds than overleveraged companies, suggest the presence of a lower barrier of leverage. Hypothesis 8b is rejected on the basis of these findings.

This is contradictory to the findings of Gaud, et al. (2007) who find an upper barrier to leverage but not lower barrier. Compared with the finding that small companies have faster adjustment speeds than large companies suggest that company characteristics have significant influence on adjustment speeds, although the analysis showed that growth opportunities has no effect. The in depth analysis of the subsamples revealed some similarities. Underleveraged and small companies had low leverage ratios, below the average of the full sample, and they had very high cash balances, whereas the opposite pattern was observed for overleveraged and large companies. These findings suggest that financial constraints and financial flexibility is of primary concern for danish companies. Underleveraged and small companies face less financial contraints and are therefore subject to lower adjustment costs. Large and overleveraged companies have much smaller cash holdings and higher leverage ratios, which inevitably makes it more difficult to adjust their leverage ratios. Another possible explanation to the difference in adjustment speeds could be the relationship with banks and risk associated with the companies. The sample of small companies had, on average, negative earnings indicating significant higher risk associated with these companies than large companies. As such the fast adjustment speeds of underleveraged and small companies along with their low leverage ratios could be remedies to minimize risk for their investors. Larger companies may be more diversified and with more stable earnings as their above average profitability suggest and therefore they may not be as much about financial distress costs of being overleveraged.
PART FOUR: CONCLUSION

CHAPTER 8: CONCLUSION AND EVALUATION

This chapter concludes the thesis by presenting the major findings as well as providing a discussion of the limitations of the study. Finally, a section finishes this thesis by highlighting the contributions of the study as well as providing recommendations for future research.

8.1 CONCLUSIONS

This thesis has investigated the determinants of capital structure in Danish listed companies during the 2001-2011 period. The test of the capital structure has evolved around the pecking order theory and the trade-off theory. The literature review revealed a gap in empirical capital structure research in Danish companies, supporting the need for this thesis.

The empirical analysis revealed that Danish listed companies on average decreased their leverage ratios over the entire period, with leverage ratios being at the lowest before the financial crisis started. The low leverage ratios were obtained primarily through equity issues that also served to build up average cash holdings in the companies. This finding suggests that companies have taken advantage of the high share prices and at the same time showed very little pecking order behaviour. The empirical analysis of the pecking order model revealed that the capital structures of Danish listed companies showed no support for the pecking order theory during the sample period. In fact, the pecking order model performed best, although still not good, on low growth companies and large companies, which contradicts the predictions of the pecking order theory. This finding proves consistent with results of the pecking order theory in other countries. The growth in equity markets, i.e. growth in share prices, during the sample period provides good explanation for the very low support for the pecking order theory.

Conversely, support was found for the trade-off theory. Common determinants of capital structure were found to have signs consistent with empirical research from other countries, e.g. asset tangibility and size was found to be positively related to leverage while growth opportunities and profitability was negatively related to leverage.
Evidence of a target capital structure for Danish listed companies was found which led to an investigation of capital structure adjustment speeds using a partial adjustment model. This examination showed that Danish listed companies on average adjusts 26.3% towards their target each year when using a book leverage measure. For market leverage the speed of adjustment was 36.0%. These adjustment speeds confirmed the results of Öztekin and Flannery (2012), although the fast adjustment speed contradicts the idea of slower adjustment speeds in bank based countries. A further investigation revealed the overleveraged and underleveraged companies both exhibit faster adjustment speeds than the speed of the full sample, indicating costs of deviating from their target. Interestingly, the analysis showed that underleveraged companies have significantly faster adjustment speeds than overleveraged companies, leading to a predictions that companies that are underleveraged suffers higher costs when deviating from their target capital structure.

Furthermore the analysis of underleveraged and overleveraged companies revealed significant differences in company characteristics between the two samples, indicating that company characteristics have important implications on companies’ adjustment speeds. These differences were further investigated by estimating the partial adjustment model small and large companies as well as high growth and low growth companies. This analysis showed that growth opportunities had no effect on adjustment speeds whereas small companies exhibited significantly higher adjustment speeds than large companies and the full sample of companies. This indicate that companies’ size have a significant impact on their adjustment speeds.

Comparison of the sample of underleveraged companies the sample of small companies showed similarities of a magnitude that indicate the presence non-random effects on adjustment speeds. These companies had on average very low leverage ratios, low profitability and very high cash balances, especially compared to their overleveraged and large counterparts, both also compared to the averages of the full sample. The full meaning of these differences and similarities haven’t been covered but they suggest that factors such as profitability, financial flexibility and risk are important in determining adjustment speeds of Danish listed companies.
8.2 LIMITATIONS OF STUDY

As with most empirical research this thesis has its limitations. The mainly relate to the econometric tools used to carry out the analysis of the data on Danish listed companies. The multitude of econometric estimators used to estimate the partial adjustment model is one of the primary concerns. The differences in adjustment speeds across studies reveal that the results are very sensitive to the chosen estimator. As such, the often referenced slow adjustment speeds from the paper of Fama and French (2002) are the result of an estimator that produce biased results. It has after their paper’s publication been widely accepted that the OLS estimator they use produces downward biased estimated of adjustment speeds. The correct estimator to use is a topic of disagreement among empirical capital structure researchers, and the variety of estimators used makes it difficult to compare results across studies unless the same estimators are used. This thesis has dealt with this problem by using several estimators where OLS and fixed effects estimation are used to generate a range of adjustment speeds. The validity of an estimator is increased if it produces results in the range generated by OLS and FE.

The small sample size as well as the short time period covered is also a potential limitation as some of the estimators used in empirical corporate finance suffer from small finite sample biases. This problem has been mitigated by performing tests of validity on the estimation results obtained. Increasing the time period covered was also an option, however, institutional changes over time might cause companies behaviour to change in which case large time periods could bias the results.

8.3 CONTRIBUTIONS OF STUDY AND RECOMMENDATIONS

This thesis conducts, to the author’s knowledge, the first in-depth analysis of the determinants of capital structure in Danish listed companies. Even though the analysis builds upon known research methods and models used in several similar studies in other countries, the findings of determinants of capital structure in Danish listed companies are unique.

As it is the first study to investigate in depth the capital structure of Danish companies, a large amount of possibilities exists for future research. As such, a survey similar to the ones conducted by Bancel & Mittoo (2004) and Graham & Harvey (2001), could produce interesting insights into the thoughts of CFO of Danish listed companies, and a
valuable input for comparison with the results from this study. Another focus of research are to expand the time span of the study in order to test the robustness of the results presented in this study, as well as an opportunity to examine of adjustment speeds and capital structure determinants varies over time periods.

Although many empirical studies conducted in other countries are similar, this study takes the analysis of adjustment speeds a bit further with the investigation of the adjustment speeds sensitivity to company characteristics. Flannery and Rangan (2006) conduct similar studies on adjustment speeds of underleveraged and overleveraged companies, but this study provides, to the author’s knowledge, the first examination of company characteristics effects on adjustment speeds. The significant differences between small companies and large companies’ adjustment speeds, along with the similarities between the small companies and underleveraged companies are probably the most interesting findings of this thesis. Future research on could benefit from more detailed investigation of these effects on adjustment speeds. This is also the case for Danish companies as this study only provide initial evidence that should company characteristics appear to be significant.

Finally, further developments needs to be done within the econometrics part of empirical capital structure research in order to create consistent and valid results. The paper by Flannery and Hankins (2013) are an interesting contribution to this area.


**Programs**

**Stata 11**

**Eviews 7**