Stockholm School of Economics
Bachelor Thesis
Course 639
Accounting & Financial Management
2014

The Trade-off Theory and Firm Leverage

Can the Trade-off theory explain the leverage development among Swedish listed firms?

Hampus Persson*

Joel Ridderström**

Abstract

This thesis aims to investigate if a dynamic application of the classic trade-off theory contributes in explaining the leverage development among companies listed on the Swedish Stock Exchange. After verifying inter-industry leverage differences, an industry comparing approach is applied to contrast the explanatory power of the trade-off theory between industries. A partial adjustment model is used to measure firms' adjustment towards optimal leverage targets. Target leverage is estimated in two ways. First, firm specific characteristics are used to explain firms' optimal leverage. Second, the industry standard is used as proxy for optimal capital structure. The conclusions drawn are that leverage significantly differs across industries and that large- and mid-cap firms' leverage development can be explained by the trade-off theory. However, the trade-off framework does not provide a comprehensive explanation of firms' target leverage on industry level.

Keywords: Trade-off theory, Dynamic framework, Firm characteristics, Leverage determinants, Industry standard
Tutor: Walter Schuster
Date: 19 May 2014

* 22551@student.hhs.se ** 22561@student.hhs.se

Table of contents

1 Introduction

Ever since Modigliani and Miller (1958) presented a theory of leverage irrelevance for firm value in perfect markets, capital structure has been a widely debated subject. Modern theories on optimal capital structure have found important links between leverage and firm value (Schwartz, Aronson 1968; DeAngelo, Masulis 1980; Myers 1984). One theory that has achieved recognition is the trade-off theory, saying that firms weight risks and benefits of debt to find the optimal balance sheet (Myers 1984). In a Swedish context, the Corporate Governance Code suggests that one of the primary tasks of a board is to monitor and decide the firm's leverage (Swedish Corporate Governance Board 2010).

Within the optimal capital structure theory, one line of research suggests that the choice of leverage is set gradually in a dynamic environment. This viewpoint, known as the dynamic framework, argues that investment and financing decisions are taken with flexibility over time and are influenced by firm characteristics such as size, profitability, growth and volatility (Byoun 2008; Mauer, Triantis 1994; Ozkan 2001; Titman, Wessels 1988). Also, further studies within this field of research have found the industry as an explanatory factor of firms' leverage development (Fischer, Heinkel & Zechner 1989; Frank, Goyal 2009).

Inspired by previous research, this thesis contributes to the capital structure debate by examining if the leverage development among Swedish firms can be explained by the trade-off theory in a dynamic framework. As part of the analysis we investigate if the industry belonging plays a role when determining capital structure.

1.1 Background

The interplay between leverage and firm value has been a focal point in the world of finance ever since the article *"The cost of Capital, corporate finance and the theory of investment"* was published by Modigliani & Miller in the American Economic Review 1958. The conclusion, that capital structure under the assumption of perfect markets is irrelevant for firm value, made the two professors both worshiped and questioned.

What started as an article by two professors in the American Economic Review year 1958 has ended up in numerous theories and concepts to understand firms' capital structures. To get a grip of the sprawling research field, two ways of thinking can be contrasted. First, one could follow a pecking order theory, where the company is argued to choose internal before external financing, without following any predetermined target debt-to-equity ratio. Secondly, one can use a trade-off framework to explain the firm's choice of capital structure. In the most basic static trade-off framework, without recapitalization costs, the company is expected to weigh the benefit from tax relief against the increased bankruptcy risk that comes with leverage. In any period of time the company will obtain an optimal capital structure, resulting from a value maximizing trade-off between these two factors. (Myers 1984)

Since the introduction of the two contrasting theories, research has led to confirmation as well as rejection of both schools (Fama, French 2002; Ozkan 2001). Still, there is no conclusion regarding which theory is the most relevant in explaining companies' capital structures. However, further development of the optimal capital structure theory has focused on explaining firms' leverage by using a dynamic framework. According to this later development, firms over time gradually adjust their capital structures towards a target. In presence of market imperfections such as recapitalization costs, deviations from the optimum may not be perfectly adjusted for in each period, as assumed in static trade-off theory (Fischer et al. 1989; Mauer, Triantis 1994).

Within both the static and dynamic framework, several firm specific characteristics have been identified as determinants of a firm's capital structure. Factors argued to be among the most important are profitability, tangibility of assets, size, growth, depreciation and earnings volatility (Frank, Goyal 2009; Rajan, Zingales 1995; Titman, Wessels 1988).

Further studies on firm specific characteristics have also found that companies in the same industry have common leverage and adjust debt levels towards an industry standard. Scott and Martin (1975) found evidence for persistent leverage differences between industries. Lev (1969) developed a dynamic model illustrating the speed by which companies adjust certain key ratios with respect to the industry average. Related studies have also found that share and debt issuances are highly influenced by the company's leverage relative to the industry average (Billingsley, Smith & Lamy 1994; Hull 1999).

1.2 Purpose of study

Since Modigliani and Miller's first article was published in 1958, there has been a constant debate within the academic world about what determines a firm's capital structure. The initial static theories have been further developed into dynamic models, including a large number of explanatory factors. However, there is still no academic consensus regarding how firms set their capital structure (Fischer et al. 1989; Flannery, Rangan 2006; Myers 1984; Ozkan 2001). Therefore, the purpose of this thesis is to investigate to which extent the capital structure development on the Swedish stock market can be explained by the trade-off theory. Thus, the research question reads out:

"Can the capital structure development among Swedish listed firms be explained by the trade-off theory?"

We investigate the question by measuring if there is a gradual adjustment towards an optimal leverage target, using a partial adjustment model within the dynamic framework (specified in section 4.4.2). We use two proxies for the optimal leverage target. First, in accordance with previous studies, we calculate the optimal leverage by regressing leverage ratios on firm characteristics proved central in explaining capital structure (Byoun 2008; Flannery, Rangan 2006; Ozkan 2001). Second, we use the average industry leverage as a proxy for optimal capital structure in the model. The industry proxy builds on previous research concluding that there are persistent inter-industry differences and intra-industry similarities in leverage (Bowen, Dale & Huber 1982; Schwartz, Aronson 1968; Scott, Martin 1975). In light of the found industry differences, we investigate whether the explanatory power of the trade-off theory differs between industries.

In addition to previous studies, our industry comparing approach contributes to further understanding of the leverage development among Swedish listed firms. To the best of our knowledge, previous studies on the subject have not contrasted the explanatory power of the trade-off theory between industries on the Swedish market. Our findings may therefore contribute with new valuable insights into how firms' capital structure is determined in a Swedish setting.

To validate the industry perspective and the usage of an industry standard as proxy for optimal leverage, we first investigate if leverage differs between industries on the Swedish stock market. Thereafter, tests are made on the relevance of the trade-off theory on the data. The research question will be assessed through the work process stated below:

1. Analysis of leverage differences between industries on the Swedish stock market year 2002-2012
2. Analysis of the trade-off theory with an inter-industry perspective
   a. By using a dynamic framework based on firm characteristics
   b. By using a dynamic framework based on industry standards

1.3 Thesis research boundaries

This thesis aims to investigate if the leverage development among Swedish listed firms can be explained by the trade-off theory. However, the study does not aim to isolate a single theory as the answer to how a firm chooses to finance its operations. Several theories, not always mutually exclusive, provide a wide range of frameworks that can be applied to explain firms' leverage[1]. Given the limited scope of this thesis, we chose to focus on the trade-off theory and its explanatory power alone. Also, we use the dynamic framework to measure if there is a gradual correction among firms towards a leverage target in line with the trade-off theory. The purpose is not to explain the potential refinancing costs associated with the speed of correction.

The leverage level is compared between industries to find out if there are persistent industry differences. The comparison is intended to justify the inter-industry perspective and the industry standard proxy. The goal is not to further investigate why there are inter-industry differences or what implication these differences have on firms' operations. Furthermore, the study is conducted in a Swedish setting, only considering firms listed on the small-, mid- and large-cap exchanges on NASDAQ OMX Stockholm. Therefore, we are not aiming to give any general conclusions in an international context.

1.4 Outline

The thesis is presented in the following order. In chapter 2 we present theory and previous research within the subject of optimal capital structure. In section 3 we introduce our analysis logic and hypothesises intended to test. In section 4, a description of the sample and methods used to test the stated hypothesises are presented. In section 5, the found results are reported and investigated. In section 6, the results are discussed and tested for robustness. In Section 7, we present our conclusions and give some suggestions for further research on the topic.

[1]Hovakimian, Opler and Titman (2001) suggest that firms may operate with leverage targets in accordance with the-trade off theory but still prefer internal to financing to external financing, explained by the pecking order framework.

2 Theory & previous research

2.1 Modigliani Miller & the efficient market

The most fundamental theory within the field of capital structure was presented in 1958 by the two professors Modigliani and Miller. Assuming an efficient market (absence of taxes, bankruptcy costs, agency costs and asymmetric information), the theory suggests that the capital structure plays no role for the value of the firm. The theory builds upon two proposals, stated below.

1. *The market value of any firm is independent of its capital structure and is given by capitalizing its expected return at the rate appropriate to its class. (MM, 1958)*
2. *The expected yield of a share of stock is equal to the appropriate capitalization rate for a pure equity stream in the class, plus a premium related to financial risk (MM, 1958)*

The first proposal is illustrated by comparing two firms, one levered and one unlevered. Given that the two firms generate the same cash flow streams, they must be valued at the same price. If this rule is violated, the arbitrage opportunity will make investors act and correct the mispricing. This also implies that the cost of capital for any chosen combination of debt and equity in perfect capital markets will be equal to the cost of capital for the unlevered firm. The second proposal illustrates how the cost of capital will be unaffected by the combination of debt and equity financing. Increasing debt will lead to a rising cost of equity, related to a risk premium, and an unchanged unlevered equity cost of capital. This keeps the firm value constant and unaffected by changed debt-to-equity ratios (Berk, DeMarzo 2011).

2.2 Market imperfections and the trade-off theory

After the first theory in 1958, Modigliani & Miller wrote several articles on the subject of capital structure (Miller, Modigliani 1961; Miller, Modigliani 1963; Miller, Modigliani 1966). The professors again gained much attention when presenting a correction paper to the original theory, relaxing the no tax assumption. Under the new assumptions, a tax advantage to debt financing arises since interest expenses are tax deductible. Higher leverage leads to increased interest costs. The tax rate multiplied by the interest cost will be sheltered from the required tax payment. This benefit of debt is called a tax shield and leads to an optimal capital structure fully financed by debt (Baxter 1967; Modigliani, Miller 1963).

The correction paper presented in 1963, arguing that a tax shield provided by tax-deductible interest expenses creates an optimal capital structure fully financed by debt, was discarded as unrealistic by numerous later researches. First, debt financing is often conditional on a certain equity stake in the company (Baxter 1967; Solomon 1963). Second, empirical evidence shows that companies in practice only are levered to a fraction of total firm value (Kim 1978). Clearly, some important variables where left out when allowing for market imperfections.

In reality, an important consequence of debt financing, and a missing element in Modigliani and Millers framework, is the increased bankruptcy risk (Baxter 1967; Van Horne 1974). Since debt financing leads to fixed payment claims, increased leverage also leads to higher bankruptcy risk and increased borrowing costs. Increased cost due to bankruptcy risk and financial distress will at a certain level offset the positive effect from leverage and reduce the firm value. The approach to weight pros and cons of leverage has developed into a well-known line of research called the trade-off theory (Berk, DeMarzo 2011). From this perspective, a levered company reaches maximized firm value when the marginal gain from the tax shield is exactly offset by the increased cost of financial distress. The earliest trade-off theory can be seen as a static framework where every firm holds investment plans constant and where the optimal trade-off is at one fixed point. Assuming no refinancing costs, a firm that is off the optimal point will immediately adjust perfectly towards the value-maximizing target (Myers 1984).

What is described as an optimal capital structure in theory demands a number of assumptions in reality. To determine the present value of financial distress costs, several aspects need to be considered. First, the risk of bankruptcy or financial distress must be estimated. Second, the costs in case of distress need to be approximated. Also, the discount rate of the estimated bankruptcy- or distress costs must be calculated (Berk, DeMarzo 2011). Due to the real-world complexity, Miller (1977) argued that no firm can have enough information of the business outlook to provide any evidence of the described trade-off optimization. Miller also challenged the trade-off theory by showing that under certain conditions the tax advantage of debt financing is counterbalanced by the tax disadvantage of debt at a personal tax level.

Since Millers' evidence against some of the tax advantages from debt, the research has continued in trying to understand how and why firms end up with a certain capital structure. The agency theory takes a managerial approach in explaining how companies act. The theory can be seen as an extension of the trade-off framework (Berk, DeMarzo 2011; Frank, Goyal 2009). From an agency perspective, costs and benefits occur when there is a conflict of interest between sponsors of the firm. Executives are tempted to run the company in a way that maximizes their personal wealth. The shareholders wish to maximize shareholder value and the firm's creditors want the firm to be solvent. Since executives often also are owners of the firm, the main focus tends to end up in value maximization of the firm's equity, sometimes at cost of total firm value and creditors interest. One example of an agency related cost rising from the conflict of interest is excessive risk taking. In a firm financed by a large portion of debt, shareholders may consider excessively risky projects since a potential failure mainly affects the debt holders. This can also lead to an asset substitution meaning that high-risk assets substitute low risk assets, increasing the overall risk profile of the firm. Debt overhang and underinvestment are two other agency related costs that need to be considered. In a firm with large portions of debt, debt holders will capture most of the profit from a project, leaving shareholders with low returns and no incentives to take on promising projects. (Berk, DeMarzo 2011)

Examples of agency related benefits of debt are concentration of ownership and increased commitment. Keeping the shareholder base intact will allow the initial owners with high commitment to keep the business on track without any disturbing co-owners following different strategies or agendas. Also, debt can work as a disciplinary factor. Creditors demand fixed payments, which increases the risk of financial distress. The uncertainty leads to higher pressure on the executives to generate profitability. (Berk, DeMarzo 2011)

2.3 Theory development

The optimal capital structure theory, introduced by Modigliani & Miller 1958, has led to the conclusion that in perfect capital markets, the capital structure is irrelevant for firm value (Myers 1984). However, in reality the world is not frictionless and imperfections seem to play a significant role in a firm's choice of capital structure. The trade-off theory, extended with the agency perspective, establishes a relationship between the levered and unlevered firm through four influencing factors. Together, the interest tax shield, bankruptcy costs, agency related costs and agency related benefits build the bridge between the value of an unlevered and a levered firm. The optimal capital structure is reached when a company finds the value-maximized combination of these four factors (Berk, DeMarzo 2011).

What may look like an obvious outcome in theory is not as clear in reality. Studies have discarded the static trade-off theory and found that firms in reality, due to market imperfections such as refinancing costs, seem to set leverage targets in a dynamic way without a fixed optimum or a perfect adjustment in each period (Fischer et al. 1989; Mauer, Triantis 1994). If the static framework presented by the initial trade-off theory is not applicable but firms set their targets in a dynamic setting, the question remains how such a dynamic setting works and which factors that in practice determine the described theoretical optimum.

2.3.1 The dynamic model and firm characteristics

Myers (1984) argued that if market imperfections such as adjustment costs are included in the trade-off framework, a lag effect is expected where firms gradually adjusts towards a target. A consequence of adjustment costs is that firms in several time periods can deviate from the optimal capital structure. However, the static framework assumes the adjustment cost to be negligible and that the company in a each period reaches the optimum.

Fischer, Heinkel and Zechner (1989) included recapitalization costs in the equation and reached new conclusions. By developing a multi period model of dynamic capital structure choices, the authors found that firms follow an optimal dynamic capital structure policy. This policy depends on the conventional benefits and costs of debt financing such as tax advantages and bankruptcy costs, but also on the costs of recapitalization. Due to recapitalization costs, firms may allow the ratio to be in a range around the optimum described in the static trade-off theory. The presented dynamic framework argues that similar firms could have different leverage ratios at any point of time but also that similar firms gradually adjust in the same direction.

Within the trade-off framework, previous research has found several firm specific variables as determinants of optimum leverage. Firm size, tangibility of assets, growth, volatility, profitability and depreciation are variables that consistently re-appear as the most important determinants in the research (e.g. Bauer 2004; Bradley, Jarrell & Kim 1983; Kester 1986).

Firm size is predicted to have positive impact on leverage within the trade-off theory. This relationship is expected due to an established negative correlation between firm size and bankruptcy related costs (Warner 1977). An explanation to the negative correlation is that large firms often have more diversified businesses than small companies. A wider business model generates more stable cash flow streams, which leads to a lower rate of bankruptcy, resulting in better borrowing terms and higher optimal leverage (Margaritis, Psillaki 2007; Rajan, Zingales 1995). Also, the agency related costs described in section 2.2 are predicted to be lower among large firms compared to small companies (Antoniou, Guney & Paudyal 2008).

In accordance with firm size, tangibility of assets is predicted positively correlated with leverage within the trade-off framework. A negative effect of tangibility on bankruptcy risk and agency-related costs explains the predicted positive correlation. Since tangible assets are considered easier to value and sell than intangible assets, a firm with high rate of tangibility will find it easier to survive in times of financial distress. A high rate of tangible assets also makes it harder to conduct the asset substitution, described in section 2.2 (Frank, Goyal 2009).

The static trade-off theory predicts positive correlation between profitability and leverage. Profitability is associated with high stock returns, low bankruptcy risk and therefore low borrowing costs. Low borrowing costs together with the tax shield advantage discussed in section 2.2 increases the incentives to take on debt (Margaritis, Psillaki 2007). The increased discipline that comes with debt, described by the agency theory, is also argued to keep pressure on executives to perform in an already profitable firm (Frank, Goyal 2009). However, within a dynamic framework, the positive relationship between profitability and leverage may be dampened due to market frictions such as refinancing costs (Strebulaev 2007). This reasoning is further backed by the mechanical relationship between retained earnings and solidity (Flannery, Rangan 2006).

Volatile earnings and high growth are considered to be factors increasing the risk profile of a firm and thus lead to lower optimal leverage levels. Unpredictable earnings make it harder to maintain an appropriate debt level from a tax-shield perspective. It becomes hard to match the tax-deductible interest cost with the volatile earnings and a mismatch could lead to financial distress (Titman, Wessels 1988). Fast growing firms are more exposed to the described agency-related costs than mature firms. High growth also leads to increased bankruptcy risk and thus higher cost of financial distress, which should lead to a lower optimal leverage (Frank, Goyal 2009).

Depreciation is predicted negatively correlated with leverage within the trade-off theory. A higher rate of depreciation will lead to tax deductions comparable to the tax shield provided by increased debt, which lowers the incentives to take on debt (DeAngelo, Masulis 1980).

Worth noticing is that the expected leverage effect from the variables are different depending on which theoretical framework that is used. For example, the Pecking order theory stands in contrast to the trade-off theory when it comes to leverage effects from different variables. In fact, according to the Pecking order theory, a majority of the variables are predicted to have the opposite effect on leverage to the above described (Frank, Goyal 2009; Myers 1984; Titman, Wessels 1988). In addition, the depreciation effect on leverage is assumed positive when following the secured debt hypothesis, presented by Scott (1977). According to this hypothesis, a high level of depreciation is a result of high tangibility, which should lead to better borrowing terms and higher debt levels (Boquist, Moore 1984). Even though the focus in this thesis is on the trade-off framework, we find it important to address the double-faced character of the variables.

2.3.2 The industry standard

Research has also found a significant relationship between firms' characteristics, their leverage ratios and industry classification. The argument is that firms within the same industry tend to have similar firm characteristics, facing the same business environment and therefore also aim for similar capital structures (Bradley et al. 1983; Remmers, Stonehill, Wright & Beekhuisen 1974). From a theoretical perspective, the relationship can be explained by sub-dividing risk into operating and financial components, as done in equation 1 below.

(1) $$r_e = \underbrace{r_t}_{1} + \underbrace{(r_t - r_d)\,\frac{D}{E}}_{2}$$

1: Operating Risk
2: Financial Risk

Return on equity (r_e) is a function of return on total capital (r_t) and leverage ($(r_t - r_d)\ \frac{D}{E}$). Operating risk is defined as the variability in return on total capital. This risk component is associated with investments, production and price policies. The financial risk component is risk related to debt and financial leverage (Johansson 1983). Mandelker and Rhee (1984) and Marsh (1982) have found a negative correlation between operating and financial risk. Firms in the same industry face similar business environments and are therefore considered having comparable operating risks (Berk, DeMarzo 2011). This should lead to intra-industry similarities and inter-industry differences in capital structure. For example, firms within sectors such as *Real Estate* and *Construction & Materials* are expected to have lower operating risk and thus higher leverage ratios than firms within areas such as *Software* and *Biotechnology* (Bougheas 2004). The finding that firms within the same business tend to aim for similar capital structures have led to an application of the industry standard as proxy for optimal leverage in several well recognized studies on capital structure (Bowen et al. 1982; Fischer et al. 1989; Hull 1999).

2.4 Previous research

The dynamic framework has been used to test the trade-off theory in multiple studies and settings. Several studies have also investigated firm characteristic leverage effects and what role the industry plays in the framework.

2.4.1 Firm characteristics and the dynamic framework

The predicted firm characteristic leverage effects, described in section 2.3.1, have been investigated by numerous empirical studies. A selection of previous findings is presented in table 1 below.

Table 1 – Articles investigating firm specific determinants of leverage

Article	Effect on leverage from Independent variables								Tested leverage ratios[1]
	Tangibility	Depreciation	Growth	Size	Volatility	Profitability	R&D	Industry[2]	
Bradley et al. (1983)		+			-		-	x	LTD/(E (MV) + TD (BV))
Bauer (2004)	-	-	-	+		-		x	TL/TA (BV&MV), TD/TA (BV& MV)
Friend and Lang (1988)	+			+	-	-			TD/TA (BV)
Kester (1986)			+	-	-				TD/TA (BV & MV), ND/E (BV & MV)
Kim & Sorensen (1986)			-		+				TD/E (MV)
Marsh (1982)	+			+					LTD/CE (BV), STD/TD (BV)
Titman & Wessels (1988)	+	-	-	-	-	-	-	x	TD/TA[3]
Margaritis and Psillaki (2007)	+			+					LTD/TA (BV), STD/TA (BV)
Ozkan (2001)		-	-	+		-			TD/TA (BV)
Frank and Goyal (2009)	+		-	+		+/-		x[4]	TD/TA (MV&BV), LTD/TA (BV& MV)
Byoun (2008)		-	-	+					TD/TA (BV & MV), LTD/TA (BV & MV)
Prediction by the trade-off framework	+	-	-	+	-	+	-		

[1] LTD = Long Term Debt, STD = Short Term Debt, TD = Total Debt, ND = Net Debt, TL = Total Liabilities, TA = Total Assets, E = Equity, CE = Capital Employed, BV = Book Value, MV = Market Value

[2] Industries contrasted by dummy variables, therefore no unanimous sign presented

[3] Numerous other leverage ratios tested

[4] Positive relation found between mean industry leverage and firm leverage

A majority of the studies have found that the independent variables generally affect leverage in line with the predictions in the trade-off framework. However, research has also found some interesting contradicting results. Kester (1986) found a positive relationship between growth and leverage when comparing U.S. and Japanese manufacturing corporations. Investigating U.S. firms, Titman and Wessels (1988) found contradicting results for firm size. This effect was especially strong when short-term debt was used as dependent variable. The outcome was explained by substantial refinancing costs for small firms with low bargaining power when issuing long-term debt, leading to higher short-term leverage ratios. Bauer (2004) investigated the Czech Republic market and found a negative relationship between tangibility and leverage, lacking any theoretical support. Bradley, Jarrell and Kim (1983) and Titman and Wessels (1988) highlighted R&D spending as an additional important variable within technology dependent sectors. Kim & Sorensen (1986) found contradicting results when measuring the earnings volatility effect on leverage. Even though the results differed from the predicted outcomes, spill over effects from the agency theory were argued to lead to a positive relation, still in accordance with the trade-off framework. The authors reasoning illustrate the complexity of the subject and the potential weakness of the somewhat simplified predictions presented in our theoretical framework.

The authors verify the scattered results by claiming that other theories better explain some of the variables' leverage effect than the trade-off theory. Frank and Goyal (2009) found the negative relationship between profitability and debt to be more in line with the pecking order theory. Bradley et al. (1983) rejected the predicted negative relation between depreciation and leverage by referring to the hypothesis of secured debt (Scott 1977). Nevertheless, a general conclusion among the studies is that the trade-off theory to a high degree explains the firm characteristics' effect on leverage. Frank and Goyal (2009) summarize that no available theory fully can explain firms leverage on the U.S. market but that the trade-off theory still provides the most comprehensive framework in understanding firms' capital structure.

A conclusion among studies investigating the trade-off theory in a dynamic framework is that firms over time adjust leverage ratios towards an optimum determined by firm characteristics. However, the discovered adjustment speed towards the optimum differs among studies. Ozkan (2001) revealed fast adjustments toward leverage targets on the UK market[2]. Later, Antoniou, Guney and Paudyal (2008) confirmed the fast adjustment speeds among European and U.S. firms. Flannery and Rangan (2006) identified slower adjustments among U.S. firms,

[2] Above 50% of the deviation was corrected towards the target in each time period.

robust for size differences[3]. Fama and French (2002) found even slower correction speeds among firms on the U.S. market[4]. All studies investigated the trade-off theory by specifications of a partial adjustment model, later described in section 4.4.2. High adjustment speeds are said to imply low refinancing costs while slow adjustments are associated with higher refinancing costs, preventing firms from perfect adjustments in line with the trade-off theory (Fama, French 2002; Ozkan 2001).

2.4.2 Industry membership and capital structure

The validity of an industry standard as proxy for optimal capital structure builds on the assumption that there are similar leverage levels within industries and different leverage levels between industries. If this condition is not fulfilled, the industry standard is said to lack explanatory power of firms' leverage (Flannery, Rangan 2006). Below, a brief summary of studies on industry differences is provided.

Table 2 – Previous studies on industry differences in leverage

Authors	Industries tested	Country
Schwartz & Aronson	Railroads, Utilities Electric & Gas, Mining, Industrials	U.S
Scott & Martin	Aerospace, Auto Parts and Accessories, Chemicals, Drugs, Glass producers & Container, Machinery & Machinery Tools, Mining, Non-ferrous Metals, Oil, Paper & Forest Products, Retail Stores, Steel	U.S
Bowen, Daley & Huber	Textile Products, Chemicals, Oil-Integrated Domestic, Steel, Auto Parts & Accessories, Aerospace, Air Transportation, Retail Department Stores, Retail Food Chains	U.S
Remmers et al*	Appliances and Electronics, Chemicals, Farm and Industrial Machinery, Food, Metal Manufacturing, Metal Products, Motor Vehicles and Parts, Paper and Wood Products, Petroleum Refining	France, Japan, Netherlands, Norway, U.S
MacKay and Phillips	315 competitive manufacturing firms where included in an international study to find potential inter-industry differences	U.S

*Tests outside the U.S only including Electrical, Paper, Food and Chemicals industries

Schwartz and Aronson (1968) found early evidence for industry differences in leverage ratios in the U.S. The findings where criticised as biased since several of the investigated industries where regulated, leading to forced variances. However, including numerous unregulated industries, Scott and Martin (1975) found further evidence for persistent differences. Bowen Daley and Huber (1982) added robustness to the discovered industry differences using more granular sector classifications (using four digit SIC codes). By also applying pairwise tests, the authors verified that several of the studied sectors differed from each other. However, not all previous findings agree on the results. In an international study, Remmers, Stonehill, Wright and Beekhuisen (1974) rejected the industry standard as a good proxy for business risk and optimal leverage when no significant inter-industry differences in leverage were found. MacKay and Phillips (2005) also provided evidence for larger intra-industry than inter-

[3] Between 20 and 30% of the deviation from the target was found corrected in each time period. A slight inversed relationship between size and adjustment speed was found.
[4] Correction speeds measured between 10 and 20%.

industry variation in leverage in the U.S. The contrasting results make an assessment of the Swedish environment necessary before applying the proxy.

Also when testing the proxy for optimal capital structure, previous studies have reached contrasting conclusions. Using a partial adjustment model, Lev (1969) found significant convergence towards an industry standard for numerous leverage measures. Using a non-parametric approach, Bowen et al. (1982) added further robustness to the proxy. On the contrary, MacKay and Phillips (2005) and Flannery and Rangan (2006) rejected the proxy as substitute for firm specific targets.

3 Hypothesizes and analysis logic matrix

We follow the outline stated in section 1.2 to answer our research question. First, we map the leverage development among listed firms on the Swedish stock market to investigate if there are persistent industry leverage differences. This is done to confirm or reject the connection between industry belonging and capital structure. Confirmation or rejection will be made through tests of the null hypothesis H_0^1 with the belonging two-sided alternative hypothesis H_1^1, stated below.

H_0^1 *The average leverage ratio does not differ between industries over time*

H_1^1 *The average leverage ratio does differ between industries over time*

The rule used is to reject H_0^1 if any industry differences are found. After rejecting or confirming the hypothesis regarding industry differences, an analysis is conducted to investigate whether the companies in our sample over time adjust leverage in line with the trade-off theory. The analysis is conducted through tests of the null hypothesis H_0^2 with the belonging alternative hypothesis H_1^2, stated below. Since we are taking an industry perspective in the analysis, after initial tests on the whole sample, industry comparisons are made to find if the outcome of the test of H_0^2 is dependent on industry belonging.

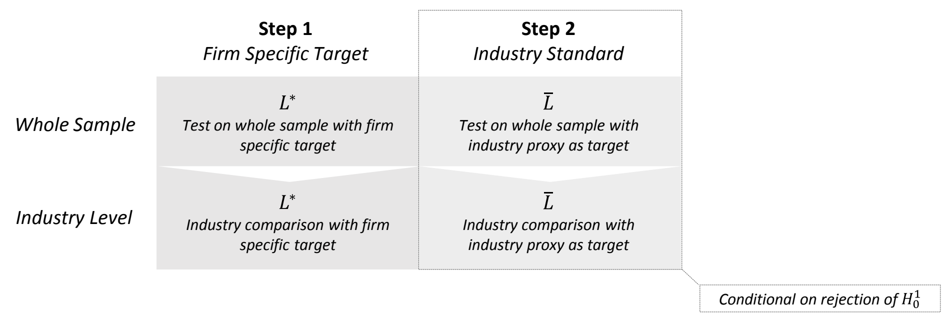
H_0^2 *Companies on the Swedish market do not adjust the leverage ratio in accordance with the trade-off theory*

H_1^2 *Companies on the Swedish market do adjust the leverage ratio in accordance with the trade-off theory*

The test of the null hypothesis H_0^2 on the whole sample and with an industry perspective is done in two steps. First, a dynamic framework based on firm characteristics is used to determine the optimal leverage level and to investigate if any movement towards a target can be found in accordance with the trade-off theory. Second, in the same setting, the industry standard as proxy for optimal leverage is used to investigate firms' adjustment. However, the rational for using the proxy for optimal leverage is conditional on rejection of the null hypothesis H_0^1.

To summarize the analysis logic of our study, a two by two matrix is used, illustrated in figure 1. In step 1, the null hypothesis H_0^2 is tested with a target based on firm characteristics (L^*). Industry comparisons are made of the results after an initial test on the whole sample has been conducted. Thereafter, conditional on rejection of H_0^1, step 2 of the analysis is initiated. Each industry's yearly mean leverage ratio ($\bar{L}$) is used as target to again test the null hypothesis H_0^2 and contrast the industries.

Figure 1 – Analysis logic matrix



In step 1, we reject the null hypothesis H_0^2 if a majority of the significant firm characteristics affect the estimated target (L^*) in line with the trade-off theory and if significant adjustment towards the targets is found. In step 2, the target ($\bar{L}$) is assumed in line with the trade-off theory. In this case, the rejection rule is only based on a significant adjustment speed towards the target.

4 Method

4.1 The leverage measure

The theoretical framework has been used when choosing which leverage ratio to investigate. The leverage components of interest are the ones affecting the optimal capital structure according to the trade-off theory. Bankruptcy costs and tax shields are dependent on tax-deductible interest-bearing debt that lowers tax payments and increases risk through fixed payment claims. A first constraint is therefore to focus on interest-bearing debt.

When defining interest-bearing debt, book value or market value can be used. There are advantages and drawbacks with both approaches. Myers (1977) and Graham and Harvey (2001) argue that book value of debt is the most accurate. Since the capital markets can be volatile, executives are claimed to put little value in market-based ratios. The argument for market leverage being superior to book values is that the book value of equity works as residual to make the financial statements balance, leading to skewed leverage ratios without any explanatory power (Welch 2004). Due to data limitations we have chosen to measure leverage in terms of book values rather than market values. Since research contrasting book and market values of debt has found that the two approaches give results close to each other (Bowman 1980), we do not consider this limitation a problem.

As described in section 2.4, numerous leverage ratios have been assessed in the research of optimal capital structure. To limit the scope of the study, we have decided to focus on one measure that is widely accepted and applied. We investigate the *Total Debt-to-Total Assets* ratio. However, in section 6.1, some additional leverage ratios are tested for robustness.

4.2 Industry classification

When examining the industry's role in the framework, we use the Industry Classification Benchmark (ICB) to categorize the companies in our sample. The rational for using the ICB standard is that it is a widely accepted taxonomy, used by NASDAQ, NYSE and several other stock markets[5]. The system is built on four levels of accuracy, illustrated in figure 2. In total the system consists of 10 industries, 19 Supersectors, 41 Sectors and 114 Subsectors. We build our analysis on the third most accurate level, the sector level. Using a more rough industry classification would lead to firms with business differences to be categorized in the same industry, making the industry perspective less precise. A more granular classification

[5] http://www.icbenchmark.com

would lead to very few companies in each classification, making it hard to conduct any analysis on the samples. The yearly mean leverage within each sector is used as industry standard. When industry standard is mentioned in later sections, we refer to the sector mean.

Figure 2 – Industry Classification (ICB)

Industry level	Supersector level	Sector level	Subsector level
			Forestry
			Paper
		Forestry & Paper	
	Chemicals		Aluminium
Basic Materials		Industrial Metals	
	Basic Resources		Nonferrous Metals
		Mining	
			Coal
			Diamonds

4.3 The sample

Since we examine the leverage development over an eleven-year period on the Swedish market, a panel data set has been compiled for firms listed on the OMX Stockholm stock Exchange. After screening all listed companies as of year-end 2012, a selection of firms has been made to fit our analysis. The selection process has been done in the following order. First, financial institutions have been excluded from the sample. Second, only firms with available accounting data for all eleven years have been selected. Third, only sectors consisting of at least 10 companies are included. All steps in the selection process have been done in line with the methodology used in previous research (Bowen et al. 1982; Byoun 2008; Lev 1969; Ozkan 2001).

The selections are made with a few objectives in mind. The character of debt in financial institutions differs from debt in non-financial firms. The financial sector is also regulated, which affects the leverage ratios. Pure financial firms are therefore excluded from the sample. By only including firms with complete accounting data for the eleven years we get a balanced panel of data over the studied time period. Since our analysis to a large extent builds on linear regressions, see section 4.4.2, missing values would reduce the explanatory power of the results (Lev 1969; Wooldridge 2013). The criterion of minimum ten firms per sector is made to make the sector mean leverage ratio more independent of changes in single firms and make the industry standard robust as proxy for optimal capital structure. The database DATASTREAM has been used for data collection and STATA 13 has been used for data handling. By using figures from annual reports we have completed missing values from the database. In table 3, the sample is presented on sector level. The companies within each sector are presented in table 1 in appendix. The firms excluded from the analysis due to data limitations are presented in table 2, appendix.

Table 3 - Firms in sample

Sector Name	Sector Code	Industry	No. Of firms
(1) Construction & Materials	2350	Industrials	12
(2) Electronic & Electrical Equipment	2730	Industrials	18
(3) Industrial Engineering	2750	Industrials	13
(4) Support Services	2790	Industrials	16
(5) Healthcare Equipment & Services	4530	Healthcare	10
(6) Pharmaceuticals & Biotechnology	4570	Healthcare	13
(7) Software & Computer Services	9530	Technology	21
(8) Real Estate investment & Services	8630	Financials	13

Our sample consists of eight sectors derived from the four wide industry classifications *Industrials*, *Healthcare*, *Technology* and *Financials*. To facilitate for the reader in later sections we use the following sector abbreviations. (1) *Construction*, (2) *Electronic*, (3) *Industrial Eng.*, (4) *Support*, (5) *Healthcare Eq.*, (6) *Pharmaceuticals*, (7) *Software* and (8) *Real Estate*.

4.4 Tests

To test the stated hypothesizes and answer the research question several methods are used. First, variance tests are conducted to answer if the leverage ratio is significantly different between sectors over time. Second, a partial adjustment model is used to test firms' movement towards a dynamic target leverage ratio, dependent on a number of firm specific characteristics. Third, the industry standard as proxy for optimal capital structure is tested through a partial adjustment model.

4.4.1 Variance test

In accordance with the technique used by Bowen et al. (1982) and Scott and Martin (1975) we test if the leverage ratio differs across sectors by using a one-way parametric analysis of variance called ANOVA. The ANOVA test is made for each year on the cross section of companies in our sample. The idea of the analysis is to test the equality of the mean of a variable (the leverage ratio) between groups (the sectors) with the null hypothesis that the mean is the same across the groups. The test is conducted by comparing the within group variation (SS_b) of the chosen variable with the between group variation (SS_w) of the variable. The null hypothesis is tested through an F-test statistic (2) with *k-1* numerator degrees of freedom (k = no. of groups) and *n-k* denominator degrees of freedom (n = total sample size).

Rejection suggests that at least one of the means is different from the others (Newbold, Carlson & Thorne 2010).

(2) $$F = \frac{SS_b/_{k-1}}{SS_w/_{n-k}}$$

The ANOVA-test is a parametric test, which assumes that the population from which the sample is obtained is at least approximately normally distributed. If this assumption is violated, the test may return biased results. Also, the test statistic can be rendered by large inequalities in sample sizes. To avoid the risk of drawing conclusions on biased results, we also conduct the non-parametric Kruskal-Wallis one-way analysis of variance. The null hypothesis is stated in accordance with the ANOVA-test, with the difference that the Kruskal-Wallis test investigates median values. The test statistic stated in (3) is calculated by organizing the observations (the leverage ratios) by rank.

(3) $$H = \frac{12}{n(n+1)}\left(\sum \frac{T_i^2}{n_i}\right) - 3(n+1)$$

T and n is the rank sum and sum of firms in the sectors. n_i is the number of firms in each sector. Under the null hypothesis, since all our sectors consist of more than six firms, the distribution of H will approximately follow a χ^2 distribution with *(k-1)* degrees of freedom. Rejection of the null hypothesis suggests that at least one of the sector medians is different from the others (Newbold, Carlson & Thorne 2010). We use a 10% significance level to define the rejection region.

If both tests lead to rejection of the null hypothesis, post-hoc multiple comparisons are conducted to see which sectors that are significantly different from each other in each year. The sectors are pairwise tested for different average values. Since we are comparing several sectors simultaneously, a multiple comparison problem occurs, leading to an increased family-wise error rate. This means the rate of type 1 errors will escalate by each comparison, increasing the risk of one or more false rejections of the null hypothesis. We handle this problem using a Bonferroni adjustment, dividing the critical alpha value by the number of pairwise tests to keep the family wise error at a constant level (Leon, Heo 2005).

4.4.2 Partial adjustment model

The second hypothesis, H_0^2, is tested through a partial adjustment model. The partial adjustment model we use builds on the same model first created by Lev (1969), further developed by Ozkan (2001) and Flannery and Rangan (2006). The idea of the model is to measure the speed by which a firm's leverage ratio is adjusted towards a target. As stated in section 4.1, the leverage ratio we test is the interest bearing debt ($D_{i,t}$) to total assets ($A_{i,t}$). We compute the ratio for every firm, *i*, in each year, *t*, over the eleven-year period, in accordance with equation 4.

(4) $$L_{i,t} = \frac{D_{i,t}}{A_{i,t}}$$

There are numerous ways of estimating the target leverage ratio. Byoun (2008), Flannery and Rangan (2006) and Ozkan (2001) estimate the target based on yearly cross sectional regressions of the observed ratio on firm characteristics said to determine capital structure. This method builds on the assumption that the observed debt ratio in each time period is the optimal level and that the adjustment towards the target is perfect each year (Byoun 2008). Another approach is to assume the industry average of leverage to be the optimal level in each time period. We use both the firm characteristics (L^*) and industry standard ($\bar{L}$) approach, as described by step 1 and 2 in figure 1, section 3. However, in the earlier, due to lack of observations, we use panel data over eleven years and a fixed effect regression[6]. The interpretation is the same as the one from a cross sectional regression and since we estimate L^* using observed debt ratios, the perfect adjustment assumption stands intact (Flannery, Rangan 2006). The estimation of a target using firm characteristics is illustrated in equation 5. The target ratio is estimated through a regression of the leverage ratio on a number of firm characteristics, x_k, empirically found to be leverage determining.

(5) $$L_{i,t}^* = \alpha + \sum \beta_k x_{k,i,t} + \varepsilon_{i,t}$$

The perfect adjustment assumption in equation 5 does not allow for a partial adjustment towards the target over time. However, in the presence of adjustment costs and other imperfections, the assumption of immediate convergence needs to be relaxed. It is rather more

[6] A methodology also applied by Antoniou et al. (2008). Argued to provide more robust target estimations than the cross sectional approach since the regression can be done with firm and year fixed effects (method described in section 4.4.2.3).

interesting to find if there is any partial adjustment towards the target over time or not. By plugging in the fitted value from equation 5 in the partial adjustment model specified in equation 6 and 7, the perfect adjustment assumption is relaxed and the gradual movement towards a target can be measured (Byoun 2008; Flannery, Rangan 2006; Ozkan 2001).

(6) $$L_{i,t} - L_{i,t-1} = \delta\left(L_{i,t}^{*} - L_{i,t-1}\right) + \varepsilon_{i,t}$$

(7) $$\Delta L_{i,t} = \delta(ADJ) + \varepsilon_{i,t}$$

$(L_{i,t}^{*} - L_{i,t-1})$ or ADJ is interpreted as the "target change" a firm should make to reach the optimum. $L_{i,t} - L_{i,t-1}$ or $\Delta L_{i,t}$ is the actual change of leverage and δ the fraction of target change achieved over the measured period. If δ takes the value 1, there is a perfect adjustment towards the optimum. Without any refinancing costs, the adjustment would be perfect, as assumed in the static trade-off theory and predicted in the estimation of L^*. However, in the presence of refinancing costs, the adjustment is harder to predict. The partial adjustment model assumes that the cost of adjustment towards a target is independent of the target leverage change and provides an indication of how substantial the refinancing costs are (Flannery, Rangan 2006).

4.4.2.1 Firm characteristics as determinants of L*

We estimate L^* by inserting firm specific variables (x_k) in equation 5, empirically recognized as capital structure determinants. In total we use six explanatory variables that are most frequently applied by previous research. Below, each variable is described. The variables' predicted effects within the trade-off framework are summarized in table 4.

x_1 *Profitability* – In accordance with previous research, we use the EBIT-margin, defined as operating profit divided by sales, to measure a firm's profitability (Fama, French 2002; Flannery, Rangan 2006). We find this ratio a suitable proxy since operating profit is the result used to benefit from an interest tax shield provided by debt. As stated in the theoretical framework, profitability should over time have a positive relationship with leverage due to the tax shield advantage. However, the dynamic setting may dampen the positive effect.

x_2 *Earnings volatility* - We estimate earnings volatility with the yearly standard deviation of quarterly earnings. Since increased volatility is associated with higher bankruptcy risk, a relationship described in the theoretical framework, the trade-off framework predicts a negative leverage effect from the variable.

x_3 *Size* – The log of total assets is used to proxy firm size. This proxy has been applied and verified in several previous studies (Frank, Goyal 2009; Titman, Wessels 1988). According to the framework presented in section 2.3.1, size is predicted to have a positive effect on leverage.

x_4 *Tangibility of assets* – We approximate tangibility of assets by each firm's Fixed Asset-to-Total Asset ratio. This method is also in line with previous research (Byoun 2008; Flannery, Rangan 2006; Frank, Goyal 2009). As stated in the theoretical framework, tangibility of assets should be positively correlated to firms' leverage ratios.

x_5 *Depreciation* – The non-debt tax shield provided by depreciation is measured by depreciation as fraction of total assets. This proxy is also applied in previous research (Ozkan 2001; Titman, Wessels 1988). According to the theoretical framework in section 2.3.1, the non-debt tax shield substitutes the leverage benefits of debt. This should lead to a negative relationship between the independent variable and the leverage ratio.

x_6 *Growth* – Previous studies, using market values to measure the investigated leverage ratios, normally apply firms' market value to book ratio as proxy for predicted growth (Byoun 2008; Fama, French 2002; Flannery, Rangan 2006; Ozkan 2001). Since we are taking an internal perspective, measuring leverage ratios using book values, we find the market to book ratio unsuitable as proxy. Instead, we take a retrospective approach and use each firm's yearly change in log assets to measure growth. This proxy is also empirically found to be capital structure determining (Frank, Goyal 2009). In the robustness section, we also test growth in sales as determinant for leverage. As discussed in section 2.3.1, growth is expected to have negative effect on the leverage ratio.

Table 4 –Predicted signs of coefficients

Coefficient	X_k	Predicted Sign
β_1	Profitability	+
β_2	Earnings volatility	-
β_3	Size	+
β_4	Tangibility of Assets	+
β_5	Depreciation	-
β_6	Growth	-

4.4.2.2 Industry standard ($\bar{L}$) as proxy for optimal leverage

Inspired by Lev (1969) and Flannery and Rangan (2006), in step 2 of the analysis (Illustrated in figure 1, section 3), the partial adjustment model is used to test the industry average ($\bar{L}$) as proxy for optimal leverage. This proxy builds on the assumption that the trade-off between debt and assets is similar within industries and different across industries (Flannery, Rangan 2006), an assumption first scrutinized through tests of the hypothesis H_0^1. The industry standard used is the mean leverage value on sector level, leading to the modified partial adjustment model described by equation 8 below.

$$(8) \qquad L_{i,t} - L_{i,t-1} = \delta(\bar{L}_t - L_{i,t-1}) + \varepsilon_{i,t}$$

In equation 8, $\bar{L}_t$ is the sector average leverage ratio in time t. In this setting, the speed of adjustment, δ, is towards the common leverage level within each sector.

4.4.2.3 Fixed effects and sector dummy variables

In the estimation of target leverage using firm characteristics, a fixed effects model is used to handle unobservable variables that can lead to biased results in the regression. This means each variable described in section 4.4.2.1 is differenced over time to filter the results from firm specific factors that are constant over time but different among firms and not included among the explanatory variables. Year dummy variables are also included in the regression of L^* in equation 5 to filter the results for time specific factors affecting all firms' optimal leverage. Examples of filtered effects are tax rate changes and general business cycles. Running the regression without these adjustments would increase the risk of creating an underspecified model returning results biased by omitted variables (Wooldridge 2013).

Previous research has also stressed the risk of autocorrelation (correlation between $\varepsilon_{i,t}$ over time) and heteroskedasticity (changing variance in $\varepsilon_{i,t}$ over time) when estimating the stated regressions in section 4.4.2 (Fama, French 2002; Lev, 1969; Ozkan, 2001). In accordance with Ozkan (2001), we assume the error term to be serially uncorrelated and use robust standard errors to handle potential heteroskedasticity when running regression 5, 6, 7 and 8. This method is aimed to reduce the risk of biased firm characteristic- and speed coefficients.

The industry perspective, which is a focal point in the thesis, is based on a comparing approach. By interacting the adjustment coefficient δ in equation 6, 7 and 8 with eight sector dummy variables, the speed of adjustment is contrasted between the investigated sectors. The adjustment speed within one of the sectors is used as base case and then compared to the speeds of the other sectors by two-tailed t-tests. For each sector, the null hypothesis $\delta_i = 0$, that the speed is not different from the base-case, is tested with the two-sided alternative hypothesis $\delta_i \neq 0$, that the speed differs from the base case. Through this procedure, we investigate if sector belonging affects the results from tests of the stated null hypothesis H_0^2 in section 3.

4.5 Method critique

Several studies highlight the drawbacks of the partial adjustment model building on fixed effect estimations (Nickell 1981; Ozkan, 2001). Since the target adjustment speed may be correlated with the error term $\varepsilon_{i,t}$ in equation 6, 7 and 8, the found adjustment speed could be biased. It is also argued that the relationship between the dependent and explanatory variables in the model is non-linear which makes the linear regression method described above an inappropriate technique (Ozkan 2001). The highlighted problems with the regression method have been handled through a number of advanced econometric approaches such as lagged instrumental variables (Dang 2013; Ozkan 2001). However, no method is proved superior to the basic approach (Huang, Song 2009). Therefore, the method described in section 4.4.2 is kept but the interpretation of the results is made with the limitation of the model in mind.

More advanced frameworks consider the described partial adjustment model too simplified in explaining the adjustment speed. Dang (2013) argues the assumption of independence between refinancing costs and target change to be unrealistic when developing a more sophisticated error correction model. Also, the applied fixed effects model when estimating the target leverage, L^*, in equation 5 may lead to exaggerated significance levels due to the large number of observations (Wooldridge 2011). The simplified assumption and chosen method stated in section 4.4.2 constrains the interpretation of reached results.

The consequences of using a method with variables measured by book values must also be commented upon. By taking an internal perspective of the analysis and focusing on book values of the leverage ratio, the firms' adjustment in response to external chocks is neglected. This limits the interpretation of the achieved results from the study. Nothing can be said about how firms behave in relation to dynamics in the capital markets or macro-economic chocks.

Also, the estimated leverage for each firm ignores measurement errors derived from accounting methods. This may lead to inaccuracies when mapping the leverage development to answer the null hypothesis H_0^1. For example, firms in R&D heavy sectors such as *Software* and *Pharmaceuticals* recognize intangible assets in accordance with the International Accounting Standard 38 (IAS 38). Since each firm makes an assessment of internally developed intangibles, firms with similar projects and businesses might generate different ratios of capitalization. Increasing investments in combination with capitalization leads to a higher solidity (White, Sondhi & Fried 2003), which may lead to subjective evaluations and biased leverage ratios. Enea, Novotek and Addnode are firms included in our analysis exposed to this potential measurement error. A required assumption is therefore that the firms in our sample have similar strictness when assessing internally developed intangible assets.

Treatment of lease contracts is another example of how accounting methods may lead to misleading leverage measures, affecting comparability between firms. In accordance with IAS 17, a lease agreement can either be considered financial or operating. A finance lease will give rise to a debt-financed asset on the firm’s balance sheet and a higher leverage ratio. An operating lease agreement will not give rise to a debt-financed asset (White et al. 2003). Several companies in our sample have both financial lease- and operating lease agreements. A necessary assumption is therefore that all firms make the right classification and show truthful leverage ratios in their books.

Lastly, the selection process described in section 4.3 is supposed to facilitate the analysis. However, the data collection also leads to certain shortcomings that may restrict us in our conclusions. A consequence of only including firms with complete accounting data for the eleven years is that only firms that have survived during the period are included. The survivorship bias means we need to be cautious when drawing general conclusions from the analysis. Also, a logic consequence from the Swedish focus of our analysis is that our results will not necessarily be applicable on other markets. All the above stated risks and shortcomings should be considered when interpreting our results.

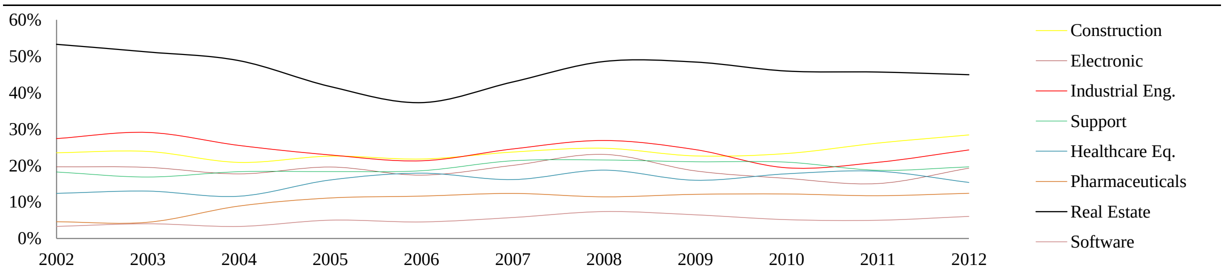
5 Results and analysis

In the following section, we present the results and analysis in three steps. First, the leverage development at sector level is investigated in section 5.1. Second, results from the partial adjustment model are presented with firm characteristics as determinants of optimal leverage (L^*) (Step 1 in figure 1). Third, results from the tests with an industry standard ($\bar{L}$) as proxy for optimal leverage are presented (Step 2 in figure 1).

5.1 Leverage development on the Swedish market (Test of H_0^1)

Figure 3 illustrates the mean leverage development among the selected sectors on the Swedish stock market between year 2002 and 2012. The graph shows that *Real Estate* consistently has been the highest leveraged sector and *Software* the lowest. These first findings are in line with the theory presented in section 2.3.2 and with previous research presented in section 2.4.2. *Software* together with *Pharmaceuticals* are sectors known to be dependent on high R&D costs and thus associated with higher operating risk than for example the *Construction* and *Real Estate* sectors. *Industrial Eng.*, *Construction* and *Electronic* are quite similar sectors where firms have considerable proportions of property, plant and equipment on their balance sheets. These sectors all show higher mean leverage than the *Software* and *Pharmaceuticals* sectors over the time period.

Figure 3 - Mean leverage development (Debt / Total Assets), 2002-2012



The results from the ANOVA and Kruskal-Wallis tests are presented in table 5 to verify the sector differences in leverage that seem to prevail. As seen in the table, at least one of the sector means and medians is significantly different from the others in each year. The parametric ANOVA test returns high F-values leading to a rejection of the null hypothesis, that all means are equal, at a 1% significance level in every year. The Kruskal-Wallis test shows the same significant results with persistently high chi-square values.

Table 5 – ANOVA (F) & Kruskal-Wallis (χ²) test of leverage differences

Year	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
F	12,43***	11,39***	9,91***	6,19***	5,41***	7,60***	7,53***	9,47***	10,02***	12,75***	10,57***
χ^2	39,06***	37,28***	34,45***	34,27***	34,08***	34,64***	36,25***	35,80***	37,56***	41,73***	40,8***

***p<0,01 **p<0,05 *p<0,1

After rejecting the null hypothesis of the initial ANOVA and Kruskal-Wallis tests, post-hoc comparisons have been conducted to find which of the sectors that significantly differ from each other over time. Table 6 shows a summary of the results from the post-hoc comparisons. All sectors are compared to each other in each year. In each row, the upper figure shows the average leverage difference (percentage points) between each pair of sectors over the eleven years. The lower figures show number of years with significant differences (Rejection at a 10% significance level). Figures not in parenthesis indicate number of years with significant results according to the ANOVA post-hoc comparisons (mean leverage values). Figures within parenthesis indicate number of years with significant differences according to the Kruskal-Wallis post-hoc comparisons (median leverage values). The Bonferroni adjustment is applied in both tests. All yearly tests are presented in table 3 and 4, appendix.

Table 6 - Pairwise ANOVA & (Kruskal-Wallis) post hoc comparisons

	Construction	Electronic	Healthcare Eq.	Industrial Eng.	Pharmaceuticals	Real Estate	Software
Eletronic	5% 0 (0)						% Diff ANOVA (KW)
Healtcare Eq.	8% 0 (0)	4% 0 (0)					
Industrial Eng.	4% 0 (0)	5% 0 (0)	8% 0 (0)				
Pharmaceuticals	14% 2 (0)	9% 0 (0)	5% 0 (0)	14% 2 (3)			
Real Estate	22% 9 (6)	27% 11 (9)	30% 10 (7)	22% 9 (6)	36% 11 (10)		
Software	19% 8 (11)	14% 2 (7)	11% 0 (0)	19% 9 (10)	5% 0 (0)	44% 11 (11)	
Support	4% 0 (0)	2% 0 (0)	4% 0 (0)	5% 0 (0)	9% 0 (0)	27% 11 (9)	13% 6 (6)

The pairwise comparisons give insight into which sectors that differ from each other over time. In a majority of the years, mean and median leverage is significantly different in the *Real Estate* sector compared all other sectors. Both the ANOVA and Kruskal-Wallis post-hoc comparisons confirm persistently higher leverage within the sector. This is a predicted outcome since the sector has had a remarkably high mean leverage compared to all other sectors over the years. *Software* has significantly lower leverage than all sectors but *Healthcare Eq.* and *Pharmaceuticals* in a majority of the years. This further verifies the reasoning in section 2.3.2 regarding R&D intensive businesses. However, sectors within the same general industry do not have significantly different leverage from each other in any time period. This can be seen in the pairwise comparisons between the four sectors *Electronic, Construction, Industrial Eng.* and *Support,* all sectors derived from the general industry *Industrials*. The results indicate that firms within the same general industry have enough common capital structure characteristics to be regarded similar in each year.

Over all, the results from the variance analysis lead to a rejection of the null hypothesis H_0^1 when following the rejection rule stated in section 3. There seem to be inter-industry differences in leverage over the years. However, since the sectors within a common industry show similarities, one could argue that a more rough industry classification is enough to contrast different types of businesses in the trade-off framework. A rougher industry classification would also be more in line with some of the previous research that has verified inter-industry differences (Schwartz, Aronson 1968; Scott, Martin 1975). However, the granular classification might still add to the further analysis by contrasting sectors that appear similar. We therefore keep the more accurate perspective.

5.2 The partial adjustment model (Test of H_0^2)

The result from the partial adjustment model is reported in two steps, as described in figure 1, section 3. First, firms' adjustment speeds towards the estimated target L^*, as described in section 4.4.2, are presented and contrasted between sectors. Since the sector comparison in section 5.1 led to rejection of H_0^1, the second step of the analysis is thereafter conducted by measuring the adjustment speed towards the industry standard, $\bar{L}$, defined as sector mean leverage in each year.

5.2.1 Firm characteristic determinants

Before using the fitted values from regression 5 (section 4.4.2) in the partial adjustment model, the outcome of the regression is examined to give an initial picture of how firm characteristics affect the leverage target. The regression results are presented in table 7 together with the predicted signs from the trade-off theory. All regressions can be found in table 5 and 6, appendix. The regression is first made on the whole sample and thereafter on sector level. The sector level regressions are made to investigate whether the inter-sector perspective plays an important role in the analysis or not. If the sector level regressions all show homogenous results in line with the whole sample regression, the explanatory variables would not be dependent on sector belonging. Then an inter-industry perspective again could be argued irrelevant for the analysis even though the null hypothesis H_0^1 has been rejected.

Table 7 – Determinants of L^*

	Growth	Size	Profitability	Depreciation	Volatility	Tangibility	No. of obs.	R^2
Predicted outcome	-	+	+	-	-	+		
1 Whole sample	-0.003	0.048 ***	0.004 ***	0.012	-0.0009 *	0.237 ***	1160	0.480
By Sector								
2 Construction	0.092	0.074 **	-0.881 ***	1.787 **	-0.002	0.405 ***	120	0.204
3 Electronic	-0.010	0.067 ***	0.003	0.236	-0.001	0.073	180	0.162
4 Industrial Eng.	0.026 **	0.024	-0.002	1.158 ***	0.001	0.075	130	0.354
5 Support	0.010	0.027 *	-0.401 ***	-0.924 *	-0.004	0.353 ***	160	0.555
6 Healthcare Eq.	-0.079 **	0.014	0.047 *	-0.527 *	-0.001	0.290 ***	100	0.324
7 Pharmaceuticals	-0.001	0.025 **	0.004 ***	0.111	-0.001	0.157 ***	130	0.287
8 Real Estate	0.001	0.022	-0.005	-0.647 ***	-0.001	0.505 ***	130	0.535
9 Software	0.004	0.040 ***	-0.044 *	0.238 ***	-0.003	0.175 ***	210	0.200

***p<0,01 **p<0,05 *p<0,10

We find that in the regression on the whole sample, a majority of the variables show signs in line with the outcomes predicted by the trade-off theory. Size, profitability, volatility and tangibility of assets all show significant values in line with the predicted outcome in the trade-off theory, even though the coefficients for profitability and volatility are small. Depreciation is the only variable showing an unexpected leverage effect. The explanatory power of the regression is high, indicated by an R^2 value of 0.48.

The regressions made on sector level show less unanimous results. Size and tangibility are the only coefficients with signs matching the predicted outcome in all the investigated sectors. Volatility does not have significant impact on leverage within any of the sectors. Either volatility is not a capital structure determinant as previous research has found, or our specification of the proxy described in 4.4.2.1 fails to capture the leverage affecting risk associated with increased volatility. The proxy used for profitability and growth show scattered results without any clear interpretation in line with the trade-off theory. *Healthcare Eq., Pharmaceuticals, Real Estate* and *Support* are the only sectors where a majority of more than one significant variable are in line with the prediction from the trade-off theory. For the *Healthcare Eq.* sector, all signs are in line with theory and many of the coefficients are significant below a 10% level. *Industrial Eng., Construction* and *Software* are sectors on the other side of the spectra, showing the opposite sign to the predicted for many of the significant variables.

Obviously, firm characteristics have different effects on leverage within different sectors. This result is in line with the rejection of hypothesis H_0^1 in section 3. Different sectors do not only seem to have persistently different leverage ratios, firm characteristics are also affecting the leverage ratio differently between sectors.

5.2.2 Speed of adjustment (Step 1)

Since the sector specific regressions show results widely different from each other, each industry specific estimation of L^* (row 2-9 in table 7) is used in the partial adjustment model when comparing the speed of adjustment between industries. Using the regression on the whole sample (row 1 in table 7) also when comparing the industries would lead to estimated debt ratios influenced by companies from all different sectors. With big sector differences, this alternative approach would clearly lead to an imprecise analysis.

The results from the partial adjustment model are presented in table 8. The speed of adjustment is first measured for the whole sample towards the target estimated in row 1 in table 7 to find out if there is any general adjustment in line with the trade-off theory. After the initial speed measurement, the different sectors are contrasted to find if the adjustment speed differs between the sectors. The sector comparison is conducted by interacting all sectors with the adjustment coefficient δ and using *Healthcare Eq.* as base case.

Table 8 – Speed of adjustment towards L^*

	Coefficient	Std. Err.	t-value	No. Of obs.	R^2
Adjustment, whole sample (δ)	0.164	0.014	11.60 ***	1160	0.104
Sector comparison (δ)	0.188	0.049	3.83 ***	1160	0.100
Construction	-0.092	0.064	-1.43		
Electronic	-0.025	0.055	-0.45		
Industrial Eng.	0.037	0.067	0.56		
Support	-0.033	0.062	-0.54		
Pharmaceuticals	-0.189	0.049	-3.84 ***		
Healthcare Eq.	0	(omitted)			
Real Estate	-0.050	0.052	-0.95		
Software	-0.042	0.075	-0.56		

***p<0,01 **p<0,05 *p<0,10

For the whole sample, there is a significant adjustment speed of 0.164 towards L^*, demonstrating that companies adjust towards a target, in accordance with the trade-off theory. In the sector comparison, a majority of the sectors show the same adjustment speed, not significantly different from the speed within the base case sector. However, within the *Pharmaceuticals* sector, the movement towards a target seems to be non-existing. This result stands in contrast to the outcome described in section 5.2.1. When estimating L^* in table 7, *Pharmaceuticals* was one of the sectors that best followed the predicted outcome. Even though the explanatory variables affect the debt ratio in accordance with the trade-off theory, no adjustment towards the estimated target can be found. Conditional on correctly specified firm characteristics, the dynamic model captures important inter-sector differences in adjustment speed. While the model captures an adjustment speed for a majority of the sectors, it fails to explain the leverage development within the *Pharmaceuticals* sector. Firms within this sector are obviously not following the theoretical framework presented in section 2 to the same extent as firms in the other sectors are. The initial estimation of L^* in line with the trade-off theory gives the impression that firms within the *Pharmaceuticals* sector actually are weighting the benefits from debt with the costs associated with higher leverage. However, the non-existing speed of adjustment indicates that deviation from the target is ignored.

Following the rejection rule stated in section 3, the results from the target estimation and partial adjustment model lead to a general rejection of the null hypothesis H_0^2 in step 1 of the analysis. In the regressions made on the whole sample, a majority of the chosen firm characteristics affect the target in accordance with the trade-off theory and the adjustment towards the target is significant. A significant adjustment speed is also found within a majority of the sectors. However the *Pharmaceuticals* sector shows contrasting results. Also, since many of the coefficients on sector level in table 7 show signs contradicting the prediction in the trade-off framework, the adjustments on sector level cannot in isolation be interpreted as results explained by the theory. Even though firms in a majority of the sectors seem to weight pros and cons of leverage and adjust towards an optimal trade-off between the factors, the optimal point is not fully explained by the theoretical framework.

5.2.3 Industry standard ($\bar{L}$) as proxy for optimal leverage (Step 2)

Backed by the rejection of H_0^1, the trade-off theory is also tested with the sector standard ($\bar{L}$) as proxy for optimal leverage. The results are presented in table 9 below, showing the outcome both for the whole sample and the sector comparison. To clarify, the whole sample regression is made without including sector interaction dummies but still with sector specific leverage targets. In this setup, the sector comparison is conducted by using *Software* as base case.

Table 9 – Speed of adjustment towards $\bar{L}$

	Coefficient	Std. Err.	t-value	No. Of obs.	R^2
Adjustment, whole sample (δ)	0.136	0.013	10.05 ***	1160	0.080
Sector comparison (δ)	0.147	0.059	2.46 **	1160	0.085
Construction	-0.026	0.075	-0.35		
Electronic	0.016	0.067	0.23		
Industrial Eng.	-0.008	0.074	-0.11		
Support	-0.062	0.069	-0.90		
Healthcare Eq.	-0.064	0.072	-0.88		
Pharmaceuticals	-0.005	0.077	-0.06		
Real Estate	0.024	0.066	0.36		
Software	0	(omitted)			

***p<0,01 **p<0,05 *p<0,10

The outcome from the modified partial adjustment model shows results overall in line with the model using firm characteristics as target determinants. The adjustment speed for the whole sample is 0.136 and significant at a 1% level. The inter-sector comparison shows a homogenous speed of adjustment independent from sector belonging. No sector shows a speed of adjustment significantly different from the base case sector *Software*. The conflicting result from the *Pharmaceuticals* sector in the previous section is not apparent when using the sector average as proxy for optimal leverage. Firms within all sectors show significant positive adjustment speeds toward the sector average. The industry standard seems to be an appropriate proxy for optimal capital structure. The results are comparable with a target estimated by firm characteristics. Over time, firms within all sectors converge towards the sector mean leverage value.

The analysis of firms' adjustment towards a target leverage ratio in step 2 of the analysis leads to an additional rejection of the null hypothesis H_0^2. Firms do not only seem to follow a firm specific target when adjusting their leverage ratio in accordance with the trade-off theory, the industry standard also seems to play a role in the framework.

6 Discussion

There are several aspects of the method applied that may have affected the results stated in the previous section and thus need to be commented upon. Also, the interpretation limitations of the achieved results are obvious when allowing for a wider analytical perspective. Below, a critical discussion of the method, results and analysis follows.

Examining the null hypothesis H_0^1 with an ANOVA-test assumes normal distribution of the underlying population. We have not been able to verify that the population is normally distributed through skewness and kurtosis tests of normality on our sample. Also, the compared samples are of different sizes, which make the ANOVA-test less powerful. With these shortcomings in mind, conclusions from the test need to be drawn with caution. However, since the non-parametric Kruskal-Wallis test generated results in line with the parametric test, the null hypothesis can be rejected with additional certainty. Our results are well in accordance with previous research, indicating that there are persistent inter-industry differences and intra-industry similarities in leverage. Yet, the granular sector classification leads to insignificant differences among sectors within the same general industry. Therefore our evidence for industry differences is weaker than the proof provided by Bowen et al. (1982) who found differences between firms in granular sectors within common industry.

In light of the results in section 5.2.1, we find it important to further discuss the double-faced nature of firm characteristics, previously addressed in section 2.3.1. Even though this study focuses on testing the trade-off theory, a total isolation from other perspectives would limit the interpretation of the results and lead to several uncommented question marks. The regression of L^* made on the whole sample, presented in table 7, indicates that the trade-off theory can explain most firm characteristic leverage effects. However, the sector wise regressions show scattered results. We interpret the results in accordance with the previous studies presented in section 2.4.1. Full understanding of how firm specific characteristics affect the capital structure target cannot be accomplished through a single theory perspective. It seems like different theories co-exist and work as complements rather than substitutes in explaining firms leverage ratios on the Swedish stock market. For example, within both the *Construction* and *Support* sector, a significant negative relationship is found between profitability and leverage. The outcome is in line with all the presented previous findings but, as stated by Frank and Goyal (2009), better explained by the pecking order theory. Also, the positive leverage effect of depreciation found in the *Construction* and *Industrial Eng.* sectors stands in contrast to the predicted effect and previous findings. Referring to the reasoning by Bradley et al. (1983), we conclude that firms in these sectors may follow the secured debt theory, rather than using depreciation as tax shield when determining debt levels.

The scattered findings limit the rejection of the stated null hypothesis H_0^2. The theory does not provide a comprehensive explanation of the target on sector level, indicating that other frameworks sometimes may better explain firms' leverage ratios. The trade-off theory stands out as a good explanatory framework within the *Healthcare Eq.*, *Real Estate* and *Support* sectors. Within these sectors, a majority of several significant variables affect leverage as predicted and the adjustment speeds are significant. The other sectors show ambiguous results when estimating the target leverage ratio on firm characteristics.

When applying the partial adjustment model to investigate the null hypothesis H_0^2, we find homogenous significant adjustment speeds towards both alternative leverage targets in a majority of the sectors (step 1 & step 2). However, the fast adjustment towards a target based on firm characteristics, identified in some of the previous research, is not apparent in our study. The slow adjustment speeds are in accordance with the findings by Fama and French (2002) and may be explained by substantial refinancing costs associated with leverage correction. The risk of exaggerated speed coefficients caused by omitted variables is handled through a fixed effects model with year dummies. However, due to the flaws of the model described in section 4.5, rejection of the null hypothesis H_0^2 is done with caution. The survivorship bias and geographical limitation of our study, described in section 4.3 also restrains the rejection of H_0^2 on a general basis.

The model based on firm characteristics applied in the first step of the analysis fails to explain the leverage development within the *Pharmaceuticals* sector. Since the adjustment towards a sector average exists for the *Pharmaceuticals* sector, the partial adjustment model based on firm characteristics could be argued to suffer from under-specification. There may be important capital structure determinants missed out in the model described in section 4.4.2.1, later caught by the proxy in step 2 of the analysis. The potential under-specification is further investigated in section 6.1.

6.1 Robustness

With the critical discussion regarding shortcomings of the method and limitations of the interpretations in mind, a number of adjustments have been made to test the robustness of the findings in section 5 and the rejection of the null hypothesizes.

First, the risk of omitted variables affecting the results has led to a further investigation of possible capital structure determinants. As previous research highlights in section 2.4.1, R&D can affect leverage in technology-dependent sectors. Therefore, a re-run of regression 5, 6 and

7 has been made, including R&D as fraction of sales as an additional explanatory variable. This robustness check did not provide any better understanding of the leverage development. The fraction of R&D had no significant impact on leverage and the speed of adjustment was still missing within the *Pharmaceuticals* sector. As an alternative to the change in log assets, we have also included yearly sales growth in equation 5 as proxy for growth. The effect from the sales growth is consistent with the growth proxy used in section 5, adding no further explanatory power to the model.

To add further reliability to the rejection of the null hypothesis H_0^2, we investigate if adjustment speeds depend on firm size. Companies within each sector have been divided into sub-samples of small, mid- and large-cap firms, as defined by NASDAQ OMX Nordic[7]. Thereafter, the speed of adjustment has been measured for each group within the sectors. The same method used to contrast the different sectors is applied in the size comparisons (described in section 4.4.2.3). A summary of the results is presented in table 10. All comparing regressions can be found in table 7, appendix. Since the already small sized sector samples are divided into even more granular subsamples, some of the groups consist of a small numbers of observations, making the regression method less appropriate. Regressions on sub-samples with the least observations therefore need to be interpreted with caution.

Table 10 - Speed of adjustment, size comparison

ADJ Coefficient (δ)	Large Cap (L^*)	Mid Cap (L^*)	Small Cap (L^*)	Large Cap ($\bar{L}$)	Mid Cap ($\bar{L}$)	Small Cap ($\bar{L}$)
Construction	0.106 *	0.231 ***	-0.056	0.116 *	0.209 ***	-0.037
Electronic	0.901 ***	0.249 ***	0.173 ***	0.907 **	0.217 ***	0.164 ***
Industry Eng.	0.251 ***	0.368 ***	0.161	0.251 ***	0.232 **	0.069
Support	0.354 *	0.126 *	0.221 ***	0.354 *	0.112 *	0.090 ***
Healthcare Eq.	0.477 ***	0.544 **	0.114 **	0.477 ***	0.601 ***	0.098 *
Pharmceuticals	0.146	0.000	-0.003	0.146	0.094	0.276
Real Estate	0.146 ***	0.229 ***	-	0.145 ***	0.239 ***	-
Software	0.476 **	0.295 **	0.124 ***	0.476 **	0.173 *	0.137 ***

No. Of observations	Large Cap	Mid Cap	Small Cap
Construction	50	50	20
Electronic	10	60	110
Industry Eng.	80	30	20
Support	10	40	110
Healthcare Eq.	20	20	60
Pharmceuticals	30	40	60
Real Estate	60	70	-
Software	10	20	180

***p<0,01 **p<0,05 *p<0,10

The comparison shows important differences between the size groups. Even though there seems to be significant movement within a majority of the sectors and size groups, firms in the large and mid-cap groups show faster and more significant speeds of adjustment than firms in the small-cap group. Also, when comparing the speed coefficients between the

[7] http://www.nasdaqomxnordic.com/aktier

groups, the speed of adjustment is persistently lower and often insignificant for the small-cap firms (See table 7, appendix). Rejection of H_0^2 must therefore be restricted to large- and mid-cap firms. The results contrast the conclusion reached by Flannery and Rangan (2006) who found the opposite relationship between size and adjustment speed. Small firms having high-risk profiles and low bargaining power, leading to high refinancing costs, may explain the neglected targets[8].

Since single companies with extreme values might skew the sector mean proxy, the adjustment regression (equation 8) has been recalculated with sector median leverage as proxy for an optimal level (Not presented in appendix). The found adjustment speeds towards a median are consistent with the results presented in section 5.2.3. All sectors show the same significant adjustment speed towards the target, in line with the trade-off theory. The homogenous results from mean and median targets contribute with additional robustness to an industry standard as proxy for optimal leverage level.

The target leverage ratio used in step 2 of the analysis in section 5 is derived from accounting figures presented at the end of each time period. Arguably, a more realistic assumption is that firms adjust towards a target based on accounting figures from the latest period known. Therefore, the target in equation 8 has been replaced with a one year lagged variable of leverage ($\bar{L}_{t-1}$). The re-run of the regressions shows no different results from the initial analysis, which means the proxy stands robust. However, with the steady sector mean leverage ratios in mind (illustrated in figure 3), the similar outcome from a lagged variable is expected.

The analysis presented in section 5 is focused on how firms adjust the single leverage ratio book value of *Total Debt-to-Total Assets* in relation to an estimated target. To add further robustness to the discovered adjustment speeds, the speed coefficient is measured for the two alternative leverage ratios *Long Term Debt-to-Total Assets* (LTD/TA) and *Common Equity-to-Assets* (E/A). These ratios are also used in the presented previous research. The use of alternative leverage ratios as dependent variables provide further proof in line with rejection of the null hypothesis H_0^2. As can be seen in table 11 below, a majority of the sectors show significant adjustment speeds independent of which leverage ratio and target type used in the

[8] An argument in line with the reasoning by Titman and Wessels (1988)

analysis. The non-adjustment within *Pharmaceuticals* is also persistent, showing insignificant adjustment for all ratios based on firm characteristics.

Table 11 – Speed of adjustment with different leverage ratios

ADJ Coefficient (δ)	TD/TA (L^*)	LTD/TA (L^*)	E/A (L^*)	TD/TA ($\bar{L}$)	LTD/TA ($\bar{L}$)	E/A ($\bar{L}$)
Construction	0.094**	0.114**	0.124***	0.121***	0.119***	0.114***
Electronic	0.179***	0.249***	0.256***	0.163***	0.200***	0.262***
Industrial Eng.	0.212***	0.367***	0.149***	0.139***	0.262***	0.121***
Support	0.174***	0.230***	0.274***	0.085***	0.173***	0.255***
Pharmaceuticals	0.000	0.000	-0.010	0.082**	0.094**	0.131***
Healthcare Eq.	0.211***	0.265***	0.197***	0.142***	0.147***	0.197***
Real Estate	0.185***	0.208***	0.121***	0.169***	0.203***	0.207***
Software	0.149***	0.164***	0.206***	0.147***	0.174***	0.189***

***p<0,01 **p<0,05 *p<0,10

The adjusted models and added perspectives lead to both additional robustness and need for further isolation of the achieved results in section 5. While the size comparison indicates insignificant adjustments within small-cap firms, the multiple leverage ratio perspective adds further evidence in line with the rejection of H_0^2. In addition, the industry standard stands out as a good proxy for optimal capital structure after the further investigation.

6.2 Reliability, validity & generalizability

In the light of the methods used and results found, our study's validity, reliability and generalizability should be commented upon. The methods used in the study follow previous practice to a large extent and the results are well in line with numerous earlier findings. The partial adjustment model is a widely accepted framework to measure firms' adjustment towards leverage targets. These factors indicate good reliability of our methods and results. However, the panel data method used to determine target leverage, L^*, may to some extent exaggerate the significance levels and reduce the reliability of our results. Backed by several robustness checks, our results have been further scrutinized and validated. Yet, the previously described accounting measurement errors and somewhat simplified adjustment model applied may reduce some of the validity of our findings. Furthermore, the Swedish setting restrains the generalizability of the study's results in an international context.

7 Conclusions and suggestions for further research

Investigation of the stated hypothesizes leads to the conclusions that the leverage level significantly differs between industries over the examined time period and that firms' leverage development generally can be explained by the dynamic trade-off theory. The results hold both when using a model with a target based on firm characteristics (step 1 of the analysis) and when using a model with an industry standard as proxy for optimal leverage (step 2 of the analysis). The sector comparisons show that firms within all sectors but *Pharmaceuticals* have homogenous adjustment speeds. Also, the adjustment speeds are maintained when using alternative leverage ratios as dependent variable, adding more credibility to the rejection of H_0^2. Additionally, the tested industry standard stands out as a good proxy for optimal capital structure within all sectors. However, no evidence is found for leverage differences between sectors within common industries. Also, the trade-off theory fails to provide a comprehensive explanation of firms target leverage on sector level. In the sector comparison, *Healthcare Eq.*, *Real Estate* and *Support* are the only sectors with both an estimated target and adjustment speed well in line with theory. Lastly, the adjustment speed is only uniformly significant for large- and mid-cap firms within the different sectors, indicating larger refinancing costs for small firms.

The study contributes to better understanding of how firms on the Swedish stock market have chosen their capital structure between the years 2002 and 2012 and may be used as base for further research on the subject of optimal capital structure in a Swedish setting. In practice, the results may help practitioners on the stock market understand why firms have the observed leverage ratios and how firms deviating from sector standards will likely develop. The study also provides insight into how a single theory perspective lacks comprehensive explanatory power when explaining the leverage development among sectors on the Swedish market.

Our thesis opens up for further studies investigating the interplay between different theoretical frameworks regarding how firms set their capital structure. Also, the sector comparing approach could in further research be taken with an international perspective. Furthermore, the missing adjustment speed within the *Pharmaceuticals* sector could be investigated in a more narrow study. It would also be interesting to investigate if the found adjustment speeds stand robust when applying more complex statistical models. Our study is strictly quantitative. By instead taking a qualitative approach and interview market participants, further interesting insights on the subject may be found. Lastly, a study on ratios based on market values would add valuable understating of how firms adjust their leverage ratios in response to macroeconomic chocks and dynamics in capital markets.

8 Literature

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9 Appendix

Table 1 *- Firms in sample*

Company	Sector	Size	Company	Sector	Size
Assa Abloy	Construction & Materials	Large Cap	ÅF	Support Services	Mid Cap
Fagerhult	Construction & Materials	Mid Cap	Aerocrine	Healthcare Equipment	Mid Cap
Geveko	Construction & Materials	Small Cap	Boule Diagnostics	Healthcare Equipment	Small Cap
Lindab	Construction & Materials	Mid Cap	CellaVision	Healthcare Equipment	Small Cap
NCC	Construction & Materials	Large Cap	Elekta	Healthcare Equipment	Large Cap
Nibe	Construction & Materials	Large Cap	Elos	Healthcare Equipment	Small Cap
Nederman	Construction & Materials	Mid Cap	Feelgood Svenska	Healthcare Equipment	Small Cap
Peab	Construction & Materials	Large Cap	Getinge	Healthcare Equipment	Large Cap
SWECO	Construction & Materials	Mid Cap	Ortivus	Healthcare Equipment	Small Cap
Skanska	Construction & Materials	Large Cap	Raysearch Labratories	Healthcare Equipment	Small Cap
Svedbergs	Construction & Materials	Small Cap	Sectra	Healthcare Equipment	Mid Cap
Systemair	Construction & Materials	Mid Cap	Active Biotech	Pharmaceuticals & Biotech	Mid Cap
Addtech	Electronic Equipment	Mid Cap	AstraZeneca	Pharmaceuticals & Biotech	Large Cap
Beijer Electronics	Electronic Equipment	Small Cap	BioGaia	Pharmaceuticals & Biotech	Mid Cap
Consilium	Electronic Equipment	Small Cap	BioInvent	Pharmaceuticals & Biotech	Small Cap
Duroc	Electronic Equipment	Small Cap	Biotage	Pharmaceuticals & Biotech	Small Cap
Fingerprint	Electronic Equipment	Mid Cap	Karo Bio	Pharmaceuticals & Biotech	Small Cap
Gunnebo	Electronic Equipment	Mid Cap	Meda	Pharmaceuticals & Biotech	Large Cap
Hexagon	Electronic Equipment	Large Cap	Medivir	Pharmaceuticals & Biotech	Mid Cap
Image Systems	Electronic Equipment	Small Cap	Oasmia Pharmaceutical	Pharmaceuticals & Biotech	Small Cap
Lagercrantz	Electronic Equipment	Mid Cap	Orexo	Pharmaceuticals & Biotech	Mid Cap
Malmbergs elektriska	Electronic Equipment	Small Cap	Probi	Pharmaceuticals & Biotech	Small Cap
Micronic Mydata	Electronic Equipment	Small Cap	Swedish Orphan Biovitrum	Pharmaceuticals & Biotech	Large Cap
NOTE	Electronic Equipment	Small Cap	Vitrolife	Pharmaceuticals & Biotech	Small Cap
OEM International	Electronic Equipment	Mid Cap	Atrium Ljungberg	Real Estate	Large Cap
Opus	Electronic Equipment	Mid Cap	Castellum	Real Estate	Large Cap
PartnerTech	Electronic Equipment	Small Cap	Catena	Real Estate	Mid Cap
Precise Biometrics	Electronic Equipment	Small Cap	Corem	Real Estate	Mid Cap
Pricer B	Electronic Equipment	Small Cap	Fabege	Real Estate	Large Cap
Sensys Traffic	Electronic Equipment	Small Cap	Fast Partner	Real Estate	Mid Cap
ABB Ltd	Industry Engineering	Large Cap	Heba	Real Estate	Mid Cap
Alfa Laval	Industry Engineering	Large Cap	Hufvudstaden	Real Estate	Large Cap
Arcam	Industry Engineering	Mid Cap	JM	Real Estate	Large Cap
Atlas Copco	Industry Engineering	Large Cap	Klövern	Real Estate	Mid Cap
Beijer B	Industry Engineering	Mid Cap	Kungsleden	Real Estate	Mid Cap
Scania	Industry Engineering	Large Cap	Wallenstam	Real Estate	Large Cap
SKF	Industry Engineering	Large Cap	Wihlborgs Fastigheter	Real Estate	Mid Cap
Sandvik	Industry Engineering	Large Cap	Acando	Software	Small Cap
SinterCast	Industry Engineering	Large Cap	Addnode Group	Software	Small Cap
Trelleborg	Industry Engineering	Large Cap	Aspiro	Software	Small Cap
Volvo	Industry Engineering	Large Cap	Avega Group	Software	Small Cap
Xano	Industry Engineering	Small Cap	Connecta	Software	Small Cap
Beijer alma	Industry Engineering	Mid Cap	CyberCom group	Software	Small Cap
B&B Tools	Support Services	Mid Cap	Enea	Software	Small Cap
BTS Group	Support Services	Small Cap	HiQ international	Software	Mid Cap
Bong	Support Services	Small Cap	I.A.R. Systems	Software	Small Cap
Cision	Support Services	Small Cap	Industrial & Financial Syst. B	Software	Mid Cap
Elanders	Support Services	Small Cap	KnowIT	Software	Small Cap
ITAB Shop Concept	Support Services	Mid Cap	MSC Konsult B	Software	Small Cap
Intellecta	Support Services	Small Cap	Micro Systemation B	Software	Small Cap
Poolia	Support Services	Small Cap	NOVOTEK B	Software	Small Cap
Proffice	Support Services	Mid Cap	Prevas B	Software	Small Cap
Rejlers	Support Services	Small Cap	Proact IT Group	Software	Small Cap
Securitas	Support Services	Large Cap	ReadSoft B	Software	Small Cap
Semcon	Support Services	Small Cap	Seamless Distribution	Software	Small Cap
Transcom Worldwide	Support Services	Small Cap	Softronic B	Software	Small Cap
Uniflex	Support Services	Small Cap	Tieto Oyj	Software	Large Cap
eWork Scandinavia	Support Services	Small Cap	Vitec Software Group B	Software	Small Cap

Table 2 *– Deleted firms due to data limitations*

Company	Sector	Size
Concentric	Industry Engineering	Mid Cap
Loomis	Support Services	Mid Cap
Dedicare	Healthcare Equipment	Small Cap
Global Health	Healthcare Equipment	Small Cap
Karolinska	Pharmaceuticals & Biotech	Small Cap
Moberg Pharma	Pharmaceuticals & Biotech	Small Cap
Neuroviwe	Pharmaceuticals & Biotech	Small Cap
Diös	Real Estate	Mid Cap
Balder	Real Estate	Mid Cap
Sagax	Real Estate	Mid Cap
Viktoria Park	Real Estate	Mid Cap
Formpipe	Software	Small Cap

Table 3 - *Yearly ANOVA post-hoc comparisons by Sector codes*

All sectors are compared over 11 years. The upper figure is the leverage difference. Lower figure is the belonging p-value to each test. Bonferroni adjustment made automatically in Stata 13.

Y2002

	2350	2730	4530	2750	4570	8630	9530
2730	-0,039 (1,000)						
4530	-0,111 (1,000)	-0,073 (1,000)					
2750	0,039 (1,000)	0,077 (1,000)	0,150 (0,764)				
4570	-0,189 (0,100)	-0,151 (0,304)	-0,078 (1,000)	-0,228 (0,012)			
8630	0,298 (0,000)	0,336 (0,000)	0,409 (0,000)	0,259 (0,002)	0,487 (0,000)		
9530	-0,202 (0,019)	-0,164 (0,052)	-0,091 (1,000)	-0,241 (0,001)	-0,013 (1,000)	-0,499 (0,000)	
2790	-0,053 (1,000)	-0,014 (1,000)	0,059 (1,000)	-0,092 (1,000)	0,137 (0,670)	-0,350 (0,000)	0,149 (0,160)

Y2003

	2350	2730	4530	2750	4570	8630	9530
2730	-0,044 (1,000)						
4530	-0,109 (1,000)	-0,065 (1,000)					
2750	0,052 (1,000)	0,096 (1,000)	0,161 (0,554)				
4570	-0,194 (0,094)	-0,151 (0,335)	-0,085 (1,000)	-0,247 (0,005)			
8630	0,273 (0,001)	0,317 (0,000)	0,382 (0,000)	0,221 (0,020)	0,467 (0,000)		
9530	-0,198 (0,028)	-0,155 (0,100)	-0,089 (1,000)	-0,251 (0,001)	-0,004 (1,000)	-0,471 (0,000)	
2790	-0,070 (1,000)	-0,026 (1,000)	0,039 (1,000)	-0,122 (1,000)	0,124 (0,670)	-0,343 (0,000)	0,128 (0,523)

Y2004

	2350	2730	4530	2750	4570	8630	9530
2730	-0,032 (1,000)						
4530	-0,093 (1,000)	-0,062 (1,000)					
2750	0,047 (1,000)	0,078 (1,000)	0,139 (1,000)				
4570	-0,119 (1,000)	-0,088 (1,000)	-0,027 (1,000)	-0,166 (0,221)			
8630	0,279 (0,001)	0,311 (0,000)	0,372 (0,000)	0,233 (0,007)	0,399 (0,000)		
9530	-0,176 (0,070)	-0,144 (0,141)	-0,082 (1,000)	-0,222 (0,003)	-0,056 (1,000)	-0,455 (0,000)	
2790	-0,026 (1,000)	0,006 (1,000)	0,067 (1,000)	-0,072 (1,000)	0,094 (1,000)	-0,305 (0,000)	0,150 (0,076)

Y2005

	2350	2730	4530	2750	4570	8630	9530
2730	-0,029 (1,000)						
4530	-0,066 (1,000)	-0,036 (1,000)					
2750	0,003 (1,000)	0,033 (1,000)	0,0687 (1,000)				
4570	-0,115 (1,000)	-0,085 (1,000)	-0,049 (1,000)	-0,118 (1,000)			
8630	0,190 0.083	0,221 0,005	0,256 0.005	0,188 0,080	0,305 0.000		
9530	-0,176 (0,070)	-0,146 (0,128)	-0,110 (1,000)	-0,179 (0,045)	-0,061 (1,000)	-0,367 (0,000)	
2790	-0,042 (1,000)	-0,013 (1,000)	0,023 (1,000)	-0,046 (1,000)	0,072 (1,000)	-0,233 (0,003)	0,133 (0,330)

Y2006

	2350	2730	4530	2750	4570	8630	9530
2730	-0,044 (1,000)						
4530	-0,039 (1,000)	0,005 (1,000)					
2750	-0,005 (1,000)	0,039 (1,000)	0,034 (1,000)				
4570	-0,102 (1,000)	-0,058 (1,000)	-0,063 (1,000)	-0,097 (1,000)			
8630	0,155 (0,544)	0,198 (0,031)	0,193 (0.158)	0,159 (0,393)	0,256 (0,003)		
9530	-0,172 (0,117)	-0,128 (0,441)	-0,134 (0,976)	-0,167 (0,120)	-0,071 (1,000)	-0,327 (0,000)	
2790	-0,032 (1,000)	0,012 (1,000)	0,007 (1,000)	-0,027 (1,000)	0,069 (1,000)	-0,187 (0,076)	0,141 (0,083)

Y2007

	2350	2730	4530	2750	4570	8630	9530
2730	-0,037 (1,000)						
4530	-0,076 (1,000)	-0,038 (1,000)					
2750	0,008 (1,000)	0,045 (1,000)	0,084 (1,000)				
4570	-0,113 (1,000)	-0,076 (1,000)	-0,038 (1,000)	-0,121 (1,000)			
8630	0,192 (0,091)	0,229 (0,004)	0,268 (0.003)	0,184 (0,113)	0,306 (0,000)		
9530	-0,179 (0,067)	-0,143 (0,174)	-0,104 (1,000)	-0,188 (0,032)	-0,066 (1,000)	-0,372 (0,000)	
2790	-0,024 (1,000)	0,013 (1,000)	0,052 (1,000)	-0,032 (1,000)	0,089 (1,000)	-0,216 (0,012)	0,156 (0,045)

Y2008

	2350	2730	4530	2750	4570	8630	9530
2730	-0,017 (1,000)						
4530	-0,060 (1,000)	-0,043 (1,000)					
2750	0,021 (1,000)	0,038 (1,000)	0,081 (1,000)				
4570	-0,133 (1,000)	-0,117 (1,000)	-0,073 (1,000)	-0,155 (0,756)			
8630	0,238 (0,028)	0,255 (0,003)	0,298 (0.003)	0,217 (0,061)	0,371 (0,000)		
9530	-0,174 (0,207)	-0,157 (0,181)	-0,114 (1,000)	-0,195 (0,060)	-0,040 (1,000)	-0,411 (0,000)	
2790	-0,032 (1,000)	-0,015 (1,000)	0,028 (1,000)	-0,054 (1,000)	0,101 (1,000)	-0,270 (0,002)	0,142 (0,475)

Y2009

	2350	2730	4530	2750	4570	8630	9530
2730	-0,041 (1,000)						
4530	-0,067 (1,000)	-0,026 (1,000)					
2750	0,017 (1,000)	0,058 (1,000)	0,084 (1,000)				
4570	-0,105 (1,000)	-0,064 (1,000)	-0,039 (1,000)	-0,123 (1,000)			
8630	0,258 (0,002)	0,299 (0,000)	0,324 (0,000)	0,240 (0,005)	0,363 (0,000)		
9530	-0,162 (0,148)	-0,121 (0,515)	-0,095 (1,000)	-0,179 (0,045)	-0,056 (1,000)	-0,419 (0,000)	
2790	-0,016 (1,000)	0,025 (1,000)	0,051 (1,000)	-0,035 (1,000)	0,089 (1,000)	-0,274 (0,000)	0,1455 (0,172)

Y2010

	2350	2730	4530	2750	4570	8630	9530
2730	-0,068 (1,000)						
4530	-0,056 (1,000)	0,012 (1,000)					
2750	-0,039 (1,000)	0,029 (1,000)	0,017 (1,000)				
4570	-0,111 (1,000)	-0,043 (1,000)	-0,055 (1,000)	-0,072 (1,000)			
8630	0,226 (0,005)	0,294 (0,000)	0,282 (0,000)	0,265 (0,000)	0,337 (0,000)		
9530	-0,181 (0,022)	-0,113 (0,462)	-0,126 (0,723)	-0,142 (0,177)	-0,070 (1,000)	-0,408 (0,000)	
2790	-0,024 (1,000)	0,045 (1,000)	0,032 (1,000)	0,015 (1,000)	0,087 (1,000)	-0,250 (0,000)	0,158 (0,039)

Y2011

	2350	2730	4530	2750	4570	8630	9530
2730	-0,111 (0,907)						
4530	-0,077 (1,000)	0,034 (1,000)					
2750	-0,053 (1,000)	0,058 (1,000)	0,024 (1,000)				
4570	-0,144 (0,279)	-0,033 (1,000)	-0,067 (1,000)	-0,092 (1,000)			
8630	0,195 (0,016)	0,306 (0,000)	0,272 (0,000)	0,248 (0,000)	0,339 (0,000)		
9530	-0,212 (0,001)	-0,101 (0,689)	-0,134 (0,344)	-0,159 (0,040)	-0,067 (1,000)	-0,407 (0,000)	
2790	-0,075 (1,000)	0,037 (1,000)	0,003 (1,000)	-0,022 (1,000)	0,069 (1,000)	-0,269 (0,000)	0,137 (0,092)

Y2012

	2350	2730	4530	2750	4570	8630	9530
2730	-0,091 (1,000)						
4530	-0,130 (1,000)	0,039 (1,000)					
2750	-0,041 (1,000)	0,050 (1,000)	0,089 (1,000)				
4570	-0,160 (0,175)	-0,069 (1,000)	-0,030 (1,000)	-0,119 (1,000)			
8630	0,165 (0,135)	0,257 (0,000)	0,296 (0,000)	0,207 (0,011)	0,325 (0,000)		
9530	-0,223 (0,001)	-0,132 (0,137)	-0,093 (1,000)	-0,182 (0,013)	-0,063 (1,000)	-0,389 (0,000)	
2790	-0,087 (1,000)	0,037 (1,000)	0,043 (1,000)	-0,046 (1,000)	0,073 (1,000)	-0,253 (0,000)	0,136 (0,100)

Table 4 – Yearly Kruskal-Wallis post-hoc comparisons by Sector codes

All sectors are compared over 11 years. The upper figure is the chi-square value. Lower figure is the belonging p-value to each test. Bonferroni adjustment done manually by dividing the critical value by total no. of tests.

Y2002

	2350	2730	4530	2750	4570	8630	9530
2730	0,518 (0,472)						
4530	2,504 (0,114)	1,113 (0,292)					
2750	0,757 (0,384)	1,745 (0,187)	6,465 (0,011)				
4570	7,104 (0,008)	6,981 (0,008)	0,985 (0,321)	46,596 (0,000)			
8630	8,340 (0,004)	8,540 (0,004)	8,496 (0,004)	7,249 (0,007)	10,941 (0,001)		
9530	8,304 (0,004)	9,429 (0,002)	0,714 (0,398)	17,934 (0,000)	0,000 (0,986)	12,685 (0,000)	
2790	0,623 (0,430)	0,000 (0,986)	0,900 (0,343)	2,223 (0,136)	6,031 (0,014)	8,125 (0,004)	8,662 (0,003)

Y2003

	2350	2730	4530	2750	4570	8630	9530
2730	0,717 (0,397)						
4530	2,504 (0,114)	0,451 (0,502)					
2750	0,855 (0,355)	1,963 (0,161)	6,465 (0,011)				
4570	7,695 (0,006)	5,79 (0,018)	1,388 (0,239)	13,444 (0,000)			
8630	6,536 (0,011)	8,776 (0,003)	7,446 (0,006)	5,934 (0,015)	10,273 (0,001)		
9530	8,964 (0,003)	7,013 (0,008)	1,886 (0,170)	17,339 (0,000)	0,385 (0,535)	12,434 (0,000)	
2790	1,043 (0,307)	0,030 (0,863)	0,434 (0,510)	3,556 (0,059)	4,248 (0,039)	8,377 (0,004)	6,871 (0,009)

Y2004

	2350	2730	4530	2750	4570	8630	9530
2730	0,717 (0,397)						
4530	2,17 (0,099)	0,451 (0,502)					
2750	0,757 (0,384)	1,963 (0,161)	5,850 (0,016)				
4570	3,834 (0,050)	0,673 (0,412)	0,035 (0,852)	8,101 (0,004)			
8630	5,728 (0,017)	9,014 (0,003)	7,446 (0,006)	4,976 (0,026)	8,695 (0,003)		
9530	9,882 (0,002)	5,802 (0,016)	1,607 (0,205)	18,236 (0,000)	4,080 (0,043)	12,938 (0,000)	
2790	0,216 (0,643)	0,171 (0,679)	1,344 (0,246)	1,300 (0,254)	2,925 (0,087)	7,633 (0,006)	15,801 (0,001)

Y2005

	2350	2730	4530	2750	4570	8630	9530
2730	0,258 (0,612)						
4530	1,409 (0,235)	0,113 (0,737)					
2750	0,003 (0,957)	0,707 (0,401)	1,696 (0,193)				
4570	4,500 (0,034)	2,827 (0,093)	2,404 (0,121)	7,249 (0,007)			
8630	5,344 (0,021)	7,194 (0,007)	6,785 (0,009)	5,934 (0,015)	8,695 (0,003)		
9530	12,113 (0,001)	8,197 (0,003)	5,016 (0,025)	15,335 (0,000)	1,020 (0,313)	15,335 (0,000)	
2790	0,485 (0,486)	0,000 (1,000)	0,069 (0,792)	0,769 (0,381)	3,077 (0,079)	7,877 (0,005)	9,398 (0,002)

Y2006

	2350	2730	4530	2750	4570	8630	9530
2730	0,790 (0,374)						
4530	0,526 (0,468)	0,057 (0,811)					
2750	0,089 (0,764)	1,348 (0,246)	0,385 (0,535)				
4570	4,734 (0,029)	2,963 (0,085)	2,600 (0,107)	5,934 (0,015)			
8630	3,942 (0,047)	5,391 (0,020)	0,446 (0.350)	3,798 (0,051)	6,975 (0,008)		
9530	12,640 (0,000)	10,679 (0,001)	5,802 (0,016)	12,185 (0,001)	1,766 (0,184)	13,715 (0,000)	
2790	0,078 (0,781)	0,233 (0,629)	0,003 (0,958)	0,694 (0,401)	5,002 (0,025)	11,372 (0,001)	13,700 (0,001)

Y2007

	2350	2730	4530	2750	4570	8630	9530
2730	0,351 (0,553)						
4530	0,735 (0,391)	0,745 (0,388)					
2750	0,027 (0,870)	0,707 (0,401)	0,985 (0,321)				
4570	2,936 (0,086)	3,40 (0,060)	1,112 (0,292)	3,504 (0,061)			
8630	8,290 (0,004)	8,308 (0,004)	8,138 (0,004)	8,238 (0,004)	10,941 (0,001)		
9530	9,882 (0,002)	10,134 (0,002)	4,288 (0,038)	8,967 (0,003)	0,138 (0,701)	18,236 (0,000)	
2790	0,156 (0,693)	0,058 (0,810)	0,336 (0,562)	0,069 (0,793)	1,789 (0,181)	9,156 (0,003)	7,955 (0,005)

Y2008

	2350	2730	4530	2750	4570	8630	9530
2730	0,581 (0,446)						
4530	0,852 (0,356)	0,021 (0,886)					
2750	0,214 (0,644)	1,168 (0,280)	0,865 (0,352)				
4570	4,500 (0,034)	4,168 (0,412)	1,862 (0,172)	4,750 (0,029)			
8630	8,995 (0,003)	10,256 (0,001)	9,235 (0,002)	8,395 (0,004)	13,071 (0,000)		
9530	9,076 (0,003)	8,257 (0,004)	3,457 (0,063)	10,173 (0,001)	0,053 (0,818)	19,155 (0,000)	
2790	0,285 (0,594)	0,019 (0,890)	0,100 (0,752)	0,731 (0,393)	2,925 (0,087)	10,531 (0,001)	6,090 (0,014)

Y2009

	2350	2730	4530	2750	4570	8630	9530
2730	0,549 (0,459)						
4530	1,332 (0,249)	0,359 (0,549)					
2750	0,189 (0,664)	0,579 (0,447)	1,246 (0,264)				
4570	3,420 (0,064)	2,827 (0,093)	0,188 (0,664)	2,778 (0,095)			
8630	8,950 (0,003)	13,271 (0,000)	10,004 (0,002)	9,626 (0,002)	13,823 (0,000)		
9530	8,964 (0,003)	8,917 (0,003)	1,302 (0,254)	7,543 (0,006)	0,071 (0,790)	20,738 (0,000)	
2790	0,044 (0,835)	0,086 (0,770)	0,367 (0,544)	0,325 (0,569)	1,848 (0,174)	11,700 (0,000)	5,147 (0,023)

Y2010

	2350	2730	4530	2750	4570	8630	9530
2730	1,835 (0,176)						
4530	0,978 (0,323)	0,057 (0,810)					
2750	0,358 (0,550)	0,190 (0,660)	0,138 (0,710)				
4570	4,050 (0,044)	0,923 (0,337)	0,985 (0,321)	1,989 (0,159)			
8630	8,627 (0,003)	13,271 (0,000)	9,615 (0,002)	10,604 (0,001)	13,071 (0,000)		
9530	15,148 (0,000)	5,870 (0,015)	5,402 (0,020)	10,400 (0,001)	0,754 (0,039)	20,738 (0,000)	
2790	0,138 (0,710)	0,171 (0,679)	0,178 (0,673)	0,012 (0,913)	1,617 (0,204)	10,817 (0,001)	8,102 (0,004)

Y2011

	2350	2730	4530	2750	4570	8630	9530
2730	4,303 (0,038)						
4530	1,257 (0,263)	0,230 (0,632)					
2750	1,565 (0,211)	1,540 (0,215)	0,096 (0,757)				
4570	5,991 (0,012)	0,707 (0,401)	0,554 (0,457)	2,778 (0,096)			
8630	6.536 (0,011)	14,160 (0,000)	9,235 (0,002)	9,310 (0,002)	13,071 (0,000)		
9530	15,41 (0,000)	5,870 (0,015)	3,457 (0,061)	9,836 (0,002)	0,694 (0,405)	21,717 (0,000)	
2790	1,940 (0,164)	0,576 (0,448)	0,003 (0,958)	0,123 (0,726)	2,094 (0,148)	12,002 (0,001)	6.320 (0,012)

Y2012

	2350	2730	4530	2750	4570	8630	9530
2730	2,588 (0,108)						
4530	2,401 (0,121)	0,589 (0,443)					
2750	0,296 (0,587)	0,848 (0,357)	1,246 (0,264)				
4570	5,597 (0,110)	2,194 (0,139)	0,116 (0,733)	4,103 (0,043)			
8630	9,842 (0,002)	11,308 (0,001)	10,004 (0,002)	8,975 (0,003)	12,340 (0,000)		
9530	13,866 (0,001)	9,603 (0,002)	2,004 (0,157)	10,746 (0,001)	0,849 (0,357)	20,738 (0,001)	
2790	2,071 (0,150)	0,011 (0,918)	0,625 (0,430)	0,769 (0,381)	2,094 (0,148)	11,108 (0,001)	8,662 (0,003)

Table 5 *– Determinants of L*, whole samples*

Fixed-effects (within) regress	Number of obs = 1160			R^2	0.459		
Group variable: Name	Number of groups = 116						
D/A	**Coef.**	**Std. Err.**	**t**	**P>t**	**[95%Conf.**	**Interval]**
Growth	-.003304	.000378	-0.87	0.382	-.0010721	.0004114
Size	.0478159	.0052436	9.12	0.000	.0375265	.0581053
Profitability	.004042	.0000741	5.46	0.000	.0002589	.0005496
Depreciation	.0119444	.0726506	0.16	0.869	-.130616	.1545047
Earnings Volatility	-.0009131	.000537	-1.70	0.089	-.0019669	.0001407
tangibility of Assets	.2369844	.0231094	10.25	0.000	.1916375	.2823314
Year						
2004	-.0127664	.0098949	-1.29	0.197	-.0321828	.00665
2005	-.026111	.0100248	-2.60	0.009	-.0457825	-.0064395
2006	-.0398761	.0101633	-3.92	0.000	-.0598193	-.019933
2007	-.0353433	.0103908	-3.40	0.001	-.055733	-.0149536
2008	-.0259937	.0105585	-2.46	0.014	-.0467124	-.0052749
2009	-.0426359	.0104839	-4.07	0.000	-.0632081	-.0220637
2010	-.054401	.0106213	-5.12	0.000	-.0752429	-.0335591
2011	-.0568359	.0107151	-5.30	0.000	-.0778618	-.03581
2012	-.0514339	.0108227	-4.75	0.000	-.0726709	-.0301968
_cons	-.5481432	.0695392	-7.88	0.000	-.684598	-.4116883

Table 6 *– determinants of L^*, by sector*

Construction, determinants of D*

Sector = 2350 | Number of obs = 120
Fixed-effects (within) regression | Number of groups = 12
Group variable: Name | R^2 0.204

D/A	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
Growth	.0922145	.0659808	1.40	0.166	-.0388102	.2232392
Size	.0736953	.0357953	2.06	0.042	.0026128	.1447777
Profitability	-.881267	.2325543	-3.79	0.000	-1.343074	-.4194603
Depreciation	1.787153	.711848	2.51	0.014	.3735642	3.200742
Earnings Volatility	-.0015012	.001916	-0.78	0.435	-.005306	.0023036
Tangibility of Assets	.4054234	.1460764	2.78	0.007	.1153447	.6955021

Healthcare Equipment, determinants of D*

Sector = 4530 | Number of obs = 100
Fixed-effects (within) regression | Number of groups = 10
Group variable: Name | R^2 0.324

D/A	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
Growth	-.0791851	.0325587	-2.43	0.017	-.1440454	-.0143249
Size	.0142414	.0188176	0.76	0.452	-.0232452	.0517279
Profitability	.0467421	.0237837	1.97	0.053	-.0006374	.0941216
Depreciation	-.5266254	.2985884	-1.76	0.082	-1.121444	.0681933
Earnings Volatility	-.0007494	.004091	-0.18	0.855	-.0088992	.0074003
Tangibility of Assets	.2903916	.0920566	3.15	0.002	.1070055	.4737777

Electronic Equipment, determinants of D*

Sector = 2730 | Number of obs = 180
Fixed-effects (within) regression | Number of groups = 18
Group variable: Name | R^2 0.162

D/A	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
Growth	-.0096181	.007854	-1.22	0.223	-.0251395	.0059032
Size	.0674591	.0119177	5.66	0.000	.0439069	.0910112
Profitability	.00323	.0107455	0.30	0.764	-.0180057	.0244656
Depreciation	.235975	.2948185	0.80	0.425	-.3466551	.818605
Earnings Volatility	-.0006412	.0023416	-0.27	0.785	-.0052688	.0039864
Tangibility of Assets	.0729937	.0667401	1.09	0.276	-.0589004	.2048878

Pharmaceuticals & Biotech, determinants of D*

Sector = 4570 | Number of obs = 130
Fixed-effects (within) regression | Number of groups = 13
Group variable: Name | R^2 0.287

D/A	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
Growth	-.0005826	.0003629	-1.61	0.111	-.0013025	.0001372
Size	.0250556	.0122857	2.04	0.044	.000687	.0494242
Profitability	.003842	.0000703	5.46	0.000	.0002446	.0005237
Depreciation	.1110759	.1587639	0.70	0.486	-.2038317	.4259834
Earnings Volatility	-.0010047	.0031686	-0.32	0.752	-.0072896	.0052801
Tangibility of Assets	.1571452	.0453313	3.47	0.001	.0672307	.2470596

Industry Engineering, determinants of D*

Sector = 2750 | Number of obs = 130
Fixed-effects (within) regression | Number of groups = 13
Group variable: Name | R^2 0.354

D/A	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
Growth	.0258447	.012034	2.15	0.034	.0019754	.0497141
Size	.0243469	.0399703	0.61	0.544	-.054934	.1036278
Profitability	-.0018575	.0137943	-0.13	0.893	-.0292183	.0255034
Depreciation	1.15843	.3337639	3.47	0.001	.4964112	1.82045
Earnings Volatility	.0007631	.0037516	0.20	0.839	-.0066781	.0082043
Tangibility of Assets	.0753518	.1131334	0.67	0.507	-.1490478	.2997514

Real Estate, determinants of D*

Sector = 8630 | Number of obs = 130
Fixed-effects (within) regression | Number of groups = 13
Group variable: Name | R^2 0.535

D/A	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
Growth	.000777	.002534	0.31	0.760	-.0042492	.0058032
Size	.0223584	.0185808	1.20	0.232	-.0144965	.0592133
Profitability	-.004689	.0047733	-0.01	0.992	-.0095139	.0094219
Depreciation	-.6470731	.2331906	-2.77	0.007	-1.109606	-.1845407
Earnings Volatility	-.0010687	.0037609	-0.28	0.777	-.0085284	.006391
Tangibility of Assets	.5050213	.0707404	7.14	0.000	.3647081	.6453345

Support Services, determinants of D*

Sector = 2790 | Number of obs = 160
Fixed-effects (within) regression | Number of groups = 16
Group variable: Name | R^2 0.555

D/A	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
Growth	.0096268	.0259752	0.37	0.712	-.0417658	.0610195
Size	.0269679	.0162677	1.66	0.100	-.0052181	.059154
Profitability	-.4009386	.0966876	-4.15	0.000	-.5922373	-.2096399
Depreciation	-.924355	.5016519	-1.84	0.068	-1.916886	.0681756
Earnings Volatility	-.004204	.001668	-0.25	0.801	-.0037206	.0028797
Tangibility of Assets	.3528596	.0736052	4.79	0.000	.20723	.4984893

Software, determinants of D*

Sector = 9530 | Number of obs = 210
Fixed-effects (within) regression | Number of groups = 21
Group variable: Name | R^2 0.200

D/A	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
Growth	.0044245	.0058041	0.76	0.447	-.0070311	.0158801
Size	.0404153	.0084836	4.76	0.000	.0236712	.0571594
Profitability	-.0438158	.0223639	-1.96	0.052	-.0879553	.0003236
Depreciation	.2383043	.0821535	2.90	0.004	.0761586	.40045
Earnings Volatility	-.003393	.0004045	-1.09	0.279	-.0012376	.000359
Tangibility of Assets	.1745039	.0357783	4.88	0.000	.1038885	.2451193

Table 7 *– Speed of adjustment, size comparison (L^* in left column & $\overline{L}$ in right column)*

Construction, Speed of adjustment by size

Sector = 2350
Number of obs = 120
R^2 = 0.073

D/A	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
ADJ	.1077986	.0738764	1.46	0.147	-.0385229	.2541201
large_cap	0	(omitted)				
mid_cap	.0409564	.0944124	0.43	0.665	-.1460392	.227952
small_cap	-.1635309	.1139867	-1.43	0.154	-.3892959	.0622341
_cons	.0111149	.0066585	1.67	0.098	-.0020732	.024303

Electronic Equipment

Sector = 2730
Number of obs = 180
R^2 = 0.131

D/A	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
ADJ	.2687052	.0684702	3.92	0.000	.133577	.4038335
large_cap	.0342663	.2374748	0.14	0.885	-.4343983	.502931
mid_cap	0	(omitted)				
small_cap	-.1210686	.0773008	-1.57	0.119	-.2736244	.0314873
_cons	.0169005	.0073546	2.30	0.023	.002386	.031415

Healthcare

Sector = 4530
Number of obs = 100
R^2 = 0.207

D/A	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
ADJ	.5611374	.1302803	4.31	0.000	.302533	.8197417
large_cap	-.1871578	.2225648	-0.84	0.402	-.6289455	.2546299
mid_cap	0	(omitted)				
small_cap	-.4387417	.1421366	-3.09	0.003	-.7208805	-.1566028
_cons	.015083	.0080976	1.86	0.066	-.0009906	.0311566

Ind. Engineering

Sector = 2750
Number of obs = 130
R^2 = 0.167

D/A	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
ADJ	.086277	.0807534	1.07	0.287	-.0735317	.2460857
large_cap	.1575722	.1136711	1.39	0.168	-.0673796	.3825241
mid_cap	.204682	.1062272	1.93	0.056	-.0055384	.4149025
small_cap	0	(omitted)				
_cons	.0047325	.0065494	0.72	0.471	-.0082286	.0176937

Pharma

Sector = 4570
Number of obs = 130
R^2 = 0.023

D/A	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
ADJ	.0004346	.0017963	0.24	0.809	-.0031202	.0039894
large_cap	.1366907	.1036988	1.32	0.190	-.0685261	.3419075
mid_cap	0	(omitted)				
small_cap	-.0032865	.0032255	-1.02	0.310	-.0096697	.0030967
_cons	.0070268	.0064742	1.09	0.280	-.0057856	.0198391

Real Estate

Sector = 8630
Number of obs = 130
R^2 = 0.163

D/A	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
ADJ	.2338475	.0637374	3.67	0.000	.1077228	.3599722
large_cap	0	(omitted)				
mid_cap	-.0599633	.0624638	-0.96	0.339	-.1835678	.0636413
small_cap	-.1210675	.0773008	-1.56	0.118	-.2736244	.0314873
_cons	.0342125	.0120031	2.85	0.005	.0104605	.0579644

Software

Sector = 9530
Number of obs = 210
R^2 = 0.104

D/A	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
ADJ	.2338475	.0637374	3.67	0.000	.1077228	.3599722
large_cap	0	(omitted)				
mid_cap	-.0599633	.0624638	-0.96	0.339	-.1835678	.0636413
small_cap	-.1210675	.0773008	-1.56	0.118	-.2736244	.0314873
_cons	.0342125	.0120031	2.85	0.005	.0104605	.0579644

Support Services

Sector = 2790
Number of obs = 160
R^2 = 0.114

D/A	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
ADJ	.1298411	.0535759	2.42	0.017	.0240132	.2356689
large_cap	.0322804	.2009713	0.16	0.873	-.3646957	.4292565
mid_cap	0	(omitted)				
small_cap	.0875113	.0697992	1.25	0.212	-.0503623	.2253848
_cons	.0180699	.0061422	2.94	0.004	.0059372	.0302026

Construction, Speed of adjustment by size

Sector = 2350
Number of obs = 120
R^2 = 0.109

D/A	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
ADJ	-.0195477	.0763481	-0.26	0.798	-.1707648	.1316694
large_cap	.1585989	.1029446	1.54	0.126	-.0452958	.3624936
mid_cap	.2238381	.1003364	2.23	0.028	.0251093	.4225669
small_cap	0	(omitted)				
_cons	.0061062	.0058348	1.05	0.298	-.0054505	.0176628

Electronic Equipment

Sector = 2730
Number of obs = 180
R^2 = 0.107

D/A	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
ADJ	.0721879	.1338757	0.54	0.590	-.1920204	.3363963
large_cap	0	(omitted)				
mid_cap	.1176922	.1540471	0.76	0.446	-.1863251	.4217096
small_cap	.0903209	.1407114	0.64	0.522	-.187378	.3680197
_cons	-.0017209	.0065195	-0.26	0.792	-.0145874	.0111455

Healthcare

Sector = 4530
Number of obs = 100
R^2 = 0.124

D/A	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
ADJ	.0302408	.112506	0.27	0.789	-.1930819	.2535635
large_cap	0	(omitted)				
mid_cap	.3629366	.1681496	2.16	0.033	.0291622	.6967109
small_cap	.0694177	.1314728	0.53	0.599	-.1915538	.3303892
_cons	-.003245	.0078366	-0.41	0.680	-.0188007	.0123106

Ind. Engineering

Sector = 2750
Number of obs = 130
R^2 = 0.085

D/A	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
ADJ	.1980113	.0874694	2.26	0.025	.024912	.3711106
large_cap	-.0449099	.1095711	-0.41	0.683	-.2617479	.1719282
mid_cap	0	(omitted)				
small_cap	-.1280462	.1170733	-1.09	0.276	-.3597308	.1036384
_cons	-.0024814	.0062514	-0.40	0.692	-.0148528	.00989

Pharma

Sector = 4570
Number of obs = 130
R^2 = 0.032

D/A	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
ADJ	.0837978	.1188258	0.71	0.482	-.1513549	.3189506
large_cap	-.0186123	.1479719	-0.13	0.900	-.3114444	.2742197
mid_cap	.00697	.1321358	0.05	0.958	-.2545229	.2684628
small_cap	0	(omitted)				
_cons	.0068563	.0074344	0.92	0.358	-.0078561	.0215688

Real Estate

Sector = 8630
Number of obs = 130
R^2 = 0.163

D/A	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
ADJ	.0853443	.0625259	1.36	0.175	-.0383831	.2090717
large_cap	0	(omitted)				
mid_cap	.1405343	.0811258	1.73	0.086	-.0199989	.3010675
small_cap	-.002245	.0055366	-0.41	0.680	-.0188007	.0123106
_cons	-.0042277	.0086062	-0.49	0.624	-.0212578	.0128025

Software

Sector = 9530
Number of obs = 210
R^2 = 0.073

D/A	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
ADJ	.1873056	.0780309	2.40	0.017	.033464	.3411472
large_cap	-.0546312	.1428032	-0.38	0.702	-.3361743	.2269119
mid_cap	0	(omitted)				
small_cap	-.0522579	.0911003	-0.57	0.567	-.2318663	.1273505
_cons	.0025901	.0031191	0.83	0.407	-.0035595	.0087396

Support Services

Sector = 2790
Number of obs = 160
R^2 = 0.054

D/A	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
ADJ	.1094964	.0578368	1.89	0.060	-.004748	.2237408
large_cap	-.126948	.1245552	-1.02	0.310	-.3729803	.1190844
mid_cap	0	(omitted)				
small_cap	-.0224257	.0691899	-0.32	0.746	-.1590957	.1142443
_cons	.0001549	.0050775	0.03	0.976	-.0098747	.0101845