LUND UNIVERSITY
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Firm-Specific Determinants of Capital Structure

Is Firm's Leverage Determined as a Residual of other Financial Decisions?

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Abstract

This thesis empirically investigates the question if US firm's capital structures are stable over longer periods of time and which firm characteristics drive optimal leverage. The analysis is based on a Compustat panel data sample consisting of 2,900 US firms between 1985 and 2016. After analyzing the stability of firm's capital structure via a "narrow band" and a "relative bucket approach" an error correction model is used to measure the speed of adjustment towards a moving optimal target of leverage. The thesis finds that firms capital structures are far away from being stable. Furthermore, trade-off theory and pecking order hypothesis are not able to fully explain the evolution of leverage in the data sample. The remarkable finding is that leverage seems to be mainly determined as a residual of other financial decisions (investment and payout) as long as leverage is in an acceptable target zone around its optimum. Outside this range, the speed of adjustment significantly increases pushing leverage back to its optimal level. Another notable finding is, that credit rating downgrades work well to specify an upper border of firm's leverage target zones encouraging the assumption that managers target credit ratings instead of optimal leverage ratios.

Keywords: Stability of Capital Structure, Leverage Determinants, Trade-Off Theory, Pecking Order Hypothesis, Financial Deficit, Credit Ratings, Error Correction Model

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List of Abbreviations

AT	Total assets
BV	Book value
CFO	Chief financial officer
Compustat	Annual Compustat / Capital IQ - North America – Daily tape
CPI	Consumer price index
CR	Credit rating
DIV	Cash dividends
EBIT	Earnings before interest and taxes
ECM	Error correction model
EViews	Econometrical software
FCF	Operating free cash flow
FD	Financial deficit
FS	Financial surplus
FX	Exchange rate effects
GDP	Gross domestic product
GLS	Generalized least squares
INV	Net investments
LN	Natural logarithm
LT	Long-term
MM	Modigliani-Miller
OLS	Ordinary least squares
PLS	Panel least squares
PP&E	Property, plant & equipment
R&D	Research and development
S&P	Standard & Poor's
STD.S	Sample standard deviation
ST	Short-term
VIF	Variance inflation factor
WC	Working capital

1 Introduction

Empirical literature on the question if leverage ratios are stable or at least mean reverting towards an optimal target is divided by disagreement. Since back in the days when Kraus and Litzenberger (1973) and Myers and Majluf (1984) came up with the two contesting theories of trade-off theory and pecking order hypothesis, different scholars tested competing theories on leverage evolution empirically and came up with different results.

By way of example (Miller, 1977, p. 264) argues that there are no leverage targets and leverage evolution is random such that the “supposed trade-off between tax gains and bankruptcy costs looks suspiciously like the recipe for the fabled horse-and-rabbit stew - one horse and one rabbit”. On the contrary Frank and Goyal (2007) find that leverage stays in a narrow band over long horizons, Lemmon et al. (2008) find that corporate capital structures are stable over long periods of time and that active management is at least partially responsible for the mean reversion. Fama and French (2002) argue that leverage ratios are time-varying and that the speed of adjustment is too low for the trade-off theory to explain the observed variation in firm’s leverage. In contrast, Flannery and Rangan (2006) state that a typical firm completes more than half of its required leverage adjustment in less than two years - far faster than estimated by many previous authors. Finally, DeAngelo and Roll (2015) conclude that capital structures are best described by time-varying target models or target zones with flexible boundaries. So, after all this empirical work in the last four decades, the interesting but uncovered question is still the same: how do capital structures of firms evolve over time and which factors mainly drive changes in leverage?

This thesis adds some value to the still existing capital structure puzzle. Based on the latest findings of DeAngelo and Roll (2015) the thesis checks if over a relatively wide spectrum, firm-specific leverage ratios are of second-order importance and are therefore largely determined as a residual of other financial decisions. The theory to be tested is that firms have leverage target zones with non-leverage related dynamics inside the target zone and leverage related rebalancing incentives towards an optimal target as soon as leverage falls outside this target zone. Accordingly, this theory suggests that long-term mean reverting tendencies towards an optimal leverage target are existing but outweighed by short-term transitory factors as long as leverage stays within a certain (acceptable) target zone.

The short-term transitory factors mentioned above are assumed to be closely related to financial decisions about payouts and investments. The inference of this assumption is related to the conclusion of Lambrecht and Myers (2012) who state that target adjustment models for payout and capital structure cannot coexist. Their reasoning is that a firm's budget constraint implies that a dynamic payout and investment policy (among others) effectively dictates a dynamic capital structure. Empirically stylized facts about the stability of dividends (see for example Farre-Mensa et al., 2014) and the necessity of outside funding of investments together with the pecking order hypothesis (see for example Elsas et al., 2006) suggest that variance in firm's leverage ratio could be a by-product of decisions about other time-varying components of financial policy. The stylized facts about dividends and payouts have strong empirical support, and so there is a reason to assume that firm's leverage may be shaped by a trade-off between other financial policy objectives and a desired adaptation towards optimal leverage targets.

Analogously, the aim of this thesis is to first investigate if firm's leverage ratios are stable over longer periods of time. It is then further analyzed if firms prioritize investment and payout considerations over the leverage decision and therefore may deviate from their optimal leverage as long as they stay in a certain target zone. As a proxy for the investment and payout considerations, the factor financial deficit (or financial surplus respectively) is introduced.[1] The thesis is then analyzing if the speed of adjustment towards an optimal firm leverage ratio in a two-step least square representation is significantly reduced by the existing financial deficit of the individual firm. Furthermore, the thesis also aims to identify criteria that determines possible borders of target leverage zones. In a first step, the target zone borders are defined in an empirical way. In a next step, the borders are additionally defined in accordance with an external shock defined as a credit rating downgrade. The idea that credit rating downgrades may qualify as a trigger for firms to recover mean reversion towards an optimal target is based on the empirical findings of Kisgen (2009) who states that firms are actively targeting credit ratings rather than an optimal leverage. Therefore, the theory to be tested is that firms are going to prioritize capital structure decisions over other financial decisions after a credit rating downgrade and therefore increase the speed of adjustment

[1] Financial deficit is defined as the sum of net investments, change in working capital and cash dividends minus the operating free cash flow plus any exchange rate effects (for more details see chapter 3.1 and Appendix 1).

towards an optimal leverage ratio in order to recover the lost credit rating. To sum up, the thesis at hand therefore analyzes the following three particular research questions:

1. Are firm's capital structures stable over longer periods of time?
2. Are long-term mean reverting tendencies existing but outweighed by short-term transitory factors as long as leverage is within a certain (acceptable) target zone?
3. Do firm's credit ratings qualify as borders for such target zones?

This thesis finds that firm's capital structures are highly volatile and far away from being stable over longer periods of time. Only 2.8% of firms stay in a narrow band of width 0.200 for more than 15 years. Furthermore, 65.6% of firms show up in at least three out of four different leverage buckets over a period of 20 years. Both, trade-off theory and pecking order hypothesis are not able to explain this variation in leverage ratios sufficiently. Contrarily, financial deficit is a highly significant driver of firm's capital structure. The speed of adjustment is thereby significantly impacted by short-term deviations in financial deficit. Furthermore, the speed of adjustment significantly changes between firms that are inside or outside a certain target zone. The empirical results indicate that the speed of adjustment towards an optimal target significantly increases by up to 41.3% if firms fall outside a certain target range, implying that long-term adjustment effects are outweighed by short-term impacts of other financial decisions as long as firms are within a certain (acceptable) target range. Credit rating downgrades seem to reliably indicate the exit of such leverage target zone. By way of example, a credit rating downgrade leads to a significant increase of 13.3% in the speed of adjustment towards an optimal target, implying that firms instantaneously prioritize capital decisions over other financial decisions after a credit rating downgrade.

The approach to investigate the impact of financial deficit on leverage ratios is not a completely new phenomenon. But to this day, previous research was either focusing on the fact that firms issue debt to finance investments if they are below target and redeem debt if they generate a financial surplus and are above target (see Hovakimian et al. (2001)) or how speed of adjustment is increased if leverage is below target and financial deficit exist (see Byoun (2008)). Therefore, to our knowledge, this thesis is the first paper that finds empirical evidence for the theory that long-term mean-reverting tendencies are outweighed by short-term fluctuation in other financial decisions and that financial deficit effectively dictates the evolution of leverage within a certain predefined acceptable target zone. Furthermore, the idea to introduce credit ratings as borders for leverage target zones is a completely new aspect in the field of determining flexible target zones.

The remaining part of the thesis is structured in the following way: chapter 2 gives an overview over the existing literature on capital structure theories, chapter 3 summarizes the data and sample selection and describes the empirical methodology applied, chapter 4 displays the most relevant empirical results and chapter 5 finishes with a conclusion.

2 Literature Review

Over the last few decades, several important capital structure theories evolved. They consist of the Modigliani-Miller theorem, the trade-off theory and the pecking order hypothesis, to name only the one of utmost importance. However, all these theories are somehow divided by empirical disagreement. Thus, it is inevitable to elucidate the most important corporate capital structure theories in more detail. The following sub-chapters provide an overview of the latter and also highlight the latest empirical findings from recent research in the capital structure literature.

2.1 Modigliani-Miller Theorem

The origin of modern capital structure theory is based on a publication stating different capital structure irrelevance proposition introduced by Modigliani and Miller (1958).[2] Modigliani and Miller (MM) started by assuming relatively strict conditions in order to evolve the respective propositions. These conditions consist of frictionless and efficient capital markets (no transaction costs and arbitrage opportunities), homogenous expectations (the same and all information is available for individuals and corporates), atomistic market participants (both individual and corporates are price takers) and no bankruptcy costs (Modigliani and Miller, 1958). The basis for the MM proposition is the idea, that the total market value of a firm is determined as the future expected cash flow of this particular firm (Modigliani and Miller, 1958). The first proposition of Modigliani-Miller then follows that the corporate capital structure is irrelevant for its market value and is defined as follows:

Proposition I: "*The total market value of any firm is independent of its capital structure"* (Modigliani and Miller, 1958, p. 268).

The proposition I basically says that a manager of a firm is not able to fundamentally change the market value of a firm by simply changing its corporate capital structure. Under the strict condition of frictionless markets, most of a firm's financial decisions such as payout and debt policy are therefore irrelevant for its market value (Modigliani and Miller, 1958). Put differently, the firm simply divides its expected stream of cash flow among the investors of

[2] Note that the paper "The Cost of Capital, Corporation Finance and the Theory of Investment" has been partially revised by F. Modigliani and H. Miller in 1963 (Modigliani and Miller (1963)).

the firm (equity- and debt-holder). Due to the fact that firms and investors have the same access to financial markets (and therefore debt and equity financing), it does not matter how the financing streams are split up across capital providers (Modigliani and Miller, 1958). Especially as investors can create any leverage they want but which was not provided by the firm and on contrary, remove any leverage they do not want but which was provided by the firm (Frank and Goyal, 2007).

The second proposition of MM follows that the corporate capital structure is irrelevant for the cost of capital and is defined as follows:

Proposition II: "*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 equal to the debt-to-equity ratio"* (Modigliani and Miller, 1958, p. 271).

In other words, the cost of equity increases linearly with its debt-to-equity ratio. Thus, from a firm's point of view, it is not cheaper to finance its investment with more debt - even if its cost of debt is lower than the cost of equity, due to the fact that its costs of equity increase accordingly. However, from an investor point of view, an expected return of equity can simply be increased by enlarging the leverage as long as the equity return on the investment is higher than the cost of debt (Fama, 1978).

Adding corporate income taxes to the MM model represents the first attempt to add frictions to the ideal markets setting of the original propositions. Under the assumption of corporate taxes, the corporate capital structure is no longer irrelevant. The MM theorem including corporate taxes therefore says:

Proposition under corporate taxes: "*Under the absence of arbitrage opportunities and in the presence of taxes, the value of the firm increases linearly with the level of debt"* (Amaro de Matos, op. 2001, p. 45).

In other words, as the payoff of debt-holders takes place before taxes are paid, the existences of debt reduces the taxable income and therefore creates debt tax shields. Thus, by taking on debt instead of equity, a firm can reduce the full impact of taxes on earnings of the firm and therefore also on the value of the equity holder claims on these earnings. The proposition therefore suggests that in the presence of corporate taxes, a firm can increase its firm value by taking on more debt and therefore assumes that it would be optimal for firms (in an extreme case) to finance all operations and investments fully with debt (Modigliani and Miller, 1963).

Contributions to the original Modigliani-Miller paper were made by Hirshleifer (1966) and Stiglitz (1969) who further analyzed optimal capital structures and the underlying assumptions which have to be fulfilled that the MM theorems hold. According to Frank and Goyal (2007), the Modigliani-Miller theorem does not provide a realistic description of the way how firm finance their operations, but it provides at least a method of finding reasons why financing decisions may matter for a firm. This is why the MM propositions provided the basis for interpreting most of the theory within corporate finance until the 1980s and are the genesis of why researchers have investigated firm's financing decision about how to fund their investments. In this context, the aforementioned description, especially the proposition in the presence of taxes, laid the foundation of the trade-off theory and the pecking order hypothesis (Flannery and Rangan, 2006).

2.2 Trade-off Theory

The foundation of the trade-off theory is dated back to 1973 when Kraus and Litzenberger (1973) initially came up with the idea of the trade-off between tax benefits and increased bankruptcy costs of higher debt levels. The standard presentation of the static trade-off theory was then provided by Bradley et al. (1984). As already mentioned before, the trigger of their idea was the introduction of taxes in the Modigliani and Miller (1963) framework, which led to controversy. As such, debt had a clear advantage compared to equity due to its shielding of earnings, also known as debt tax shields (Jensen and Smith, 2000). The reason for additionally introducing bankruptcy penalties is to prevent a linear relationship between market value of the firm and its debt (Jensen and Smith, 2000). In other words, the unrealistic assumption of no bankruptcy which would lead to an extreme situation of 100% debt financing under the MM theorem is undesired. As a result, introducing an offsetting cost in the form of bankruptcy costs leads to a non-linear relationship between the market value of the firm and its own debt level (Jensen and Smith, 2000).

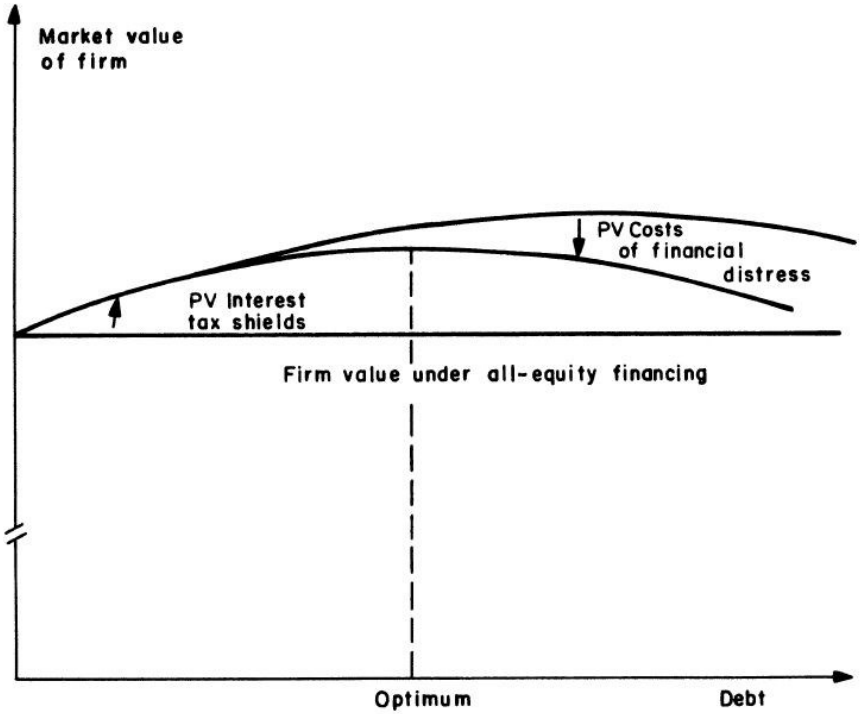

Figure 1: The static trade-off theory (Myers, 1984, p. 577)

According to Myers (1984), a firm that follows trade-off theory sets a target debt-to-value ratio and then gradually moves towards the target which is determined by balancing debt tax shields and deadweight costs of bankruptcy as shown in Figure 1. Thus, the firm maximizes its function of the market value of a firm, debt and its debt tax shields to reach the optimal firm value. However, Frank and Goyal (2007) added several critical discussion points in regards to Myers' theory of 1984. First, the debt-to-equity target of firms is not directly observable; instead, it must be estimated accordingly. Second, the implication of tax with its different tax code features is way more complicated in the real world compared to the theoretical framework of the trade-off theory.[3] Third, the determination of bankruptcy costs is not specified. Thus, it is for example not defined if bankruptcy costs are fixed, if they increase linearly with size and if they are one-off items or arise more often.[4] Fourth, the marginal transaction cost of adjusting must increase with larger adjustments to ensure that the latter takes place gradual rather than abrupt.[5]

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[3] For more details on the different features of tax effects refer to Graham (2003).

[4] For a more detailed discussion of bankruptcy costs refer to Haugen and Senbet (1978).

[5] Note that this form of adjustment cost is rather unrealistic as one would expect large fixed costs and roughly constant marginal cost. For more details on the different implications of adjustment cost refer to Leary and Roberts (2005).

2.3 Pecking Order Hypothesis

The genesis of the pecking order hypothesis is dated back to the early 1960s when Donaldson (1961) did empirical research on how the management of a firm decides on which form of financing is preferred in which order. He concludes in his early studies that *"Management strongly favored internal generation as a source of new funds even to the exclusion of external funds except for occasional unavoidable 'bulges' in the need for fun"* (Donaldson, 1961, p. 67). In other words, internal financing such as retained earnings is favored over external financing such as debt or equity. Myers (1984) picked up this theory and suggests that the financing pecking order is defined as follows (Myers, 1984, p. 581):

1. Firms prefer as first financing source internal financing.
2. Firms change their dividend payout policy according to their investment opportunities even though dividends are sticky.
3. Sticky dividend payouts and changing profitability and investment opportunities lead to the fact that the internally generated cash flow might be more or less than the investment outlays which can lead to a usage of the existing cash balance and or marketable securities.
4. In case external finance is necessary, firms prefer secured debt followed by hybrid securities (such as convertible bonds) and as a last resort equity.

According to Myers (1984) and Myers and Majluf (1984), the financing pattern of the pecking order hypothesis is mainly based on adverse selection. The main idea of adverse selection is that only managers of a firm know the true value of a firm in each period of time while outside investors can only guess the value of firm's assets and its growth opportunities. In case the manager of the firm chooses to fund a growth opportunity with internal or external financing respectively, this sends a signal to outside investors. By way of example, a manager of a firm is only willing to issue equity in case the firm is overvalued, sending a clear signal to its own shareholders.

The issue addressed by Myers and Majluf (1984) is based on the famous "lemon" problem by Akerlof (1970). The "lemon" problem represents a market failure in case potential investors cannot distinguish between a "good" and a "bad" offer by the firm on the market (Akerlof, 1970). As such, no financing at all is provided and the market can break down. Thus, according to Akerlof (1970), potential investors require a discount due to the fact of facing the risk of buying a bad good (i.e. lemon product). As a result, firms offering non-lemon products do not have any incentive to stay in the market anymore. If this logic is applied to equity markets this would mean that outside investors cannot observe the true value of a firm and thus require a higher return on investment. Thus, firms will prefer to finance projects rather internally than externally.

According to Frank and Goyal (2007), there are also pecking order models based on agency costs, tax considerations or other features that lead to a financing hierarchy. For example, Jensen and Meckling (1976) suggest that there are also agency costs connected to the use of debt and equity. They show that retained earnings are preferred, that debt is just as good as internal financing and equity financing is inefficient, therefore, leading to a version of the pecking order. Baker et al. (2007) show that excessive managerial optimism – if the only distortion in the firm – also may generate a version of the pecking order.

Myers (1984) states that the pecking order hypothesis obviously cannot explain everything, but his empirical research showed that non-financial firms between 1973 and 1982 covered approx. 62% of capital expenditures by using internally generated cash. Many problems of the pecking order theory have been considered in subsequent theoretical literature such as Dybvig and Zender (1991), Eckbo and Masulis (1992), Eckbo and Norli (2004) and Halov and Heider (2011). They all showed that the results of the pecking order are not as robust as expected.

2.4 Recent Research

The three above mentioned theories impose significantly different assumptions on the stability and the underlying determinants of firm’s capital structure. According to Miller (1977), there is no optimum debt ratio for any individual firm. Myers (1984) observes that actual debt ratios of a firm vary a lot among similar firms. He concludes that either firms accept actual leverage ratios far away from their optimal target or that leverage targets themselves depend on unknown factors. The static trade-off theory per se assumes stable capital structures at optimal levels determined by debt tax shields and bankruptcy costs (Bradley et al., 1984). All of these theories have been contested in subsequent years. However, according to Frank and Goyal (2007), over the past few decades, some scholars moved back to the trade-off theory of taxation and bankruptcy costs but with a higher focus on the time dimension which leads to the dynamic trade-off theory. He defines the dynamic trade-off theory as time-specific aspects of taxation and bankruptcy, in particular expectations and adjustment costs are being considered accordingly. By way of example, financing decisions take into account future financing needs on a rolling basis (i.e. multi-period consideration).

A well-known pioneer of the modern dynamic trade-off theory is Stiglitz (1973) who examined taxation effects from a public finance perspective. A decade later, Brennan and Schwartz (1984) as well as Kane et al. (1984) examined first dynamic models considering debt tax shields and deadweight costs of bankruptcy, including uncertainty but no transaction costs. They state that firms usually maintain high debt levels to take advantage of tax savings. Thus, they can react promptly to unfavorable shocks by readjustment without transaction costs. Since no costs for rebalancing capital structure is highly unrealistic, Fischer et al. (1989) introduced rebalancing costs within the dynamic trade-off theory model. In accordance to them, this theory depends on the conventional benefits and costs of debt financing (tax shields and bankruptcy costs) but also on the costs of recapitalization. Fischer et al. (1989) suggest that corporate capital structure drifts over time and firms may allow the ratio to be in a range around the optimum described by the static trade-off theory. Thus, the actual leverage of a firm often deviates from the optimal target. The results of the empirical research of Fischer et al. (1989) showed the importance of viewing observed leverage ratios as non-optimal. 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 (Fischer et al., 1989).

Based on these findings many scholars have analyzed different firm characteristics as determinants of firm's leverage and their coherence with the trade-off theory and pecking order hypothesis. Within this framework, previous researchers have found several firm-specific variables as empirically significant and financially meaningful determinants of leverage. Firm size, tangibility of assets, profitability, firm's growth opportunities, business risk (volatility in earnings) and non-interest tax shields are variables that consistently re-appear as the most important determinants in empirical research. The predicted impact on leverage has been investigated by numerous empirical studies. A selection of previous findings as well as a summary of their expected sign under the trade-off theory and the pecking order hypothesis is presented in Table 1.

Table 1: Literature overview of firm-specific determinants of leverage

The table below summarizes the empirical results and prediction by trade-off theory and pecking order hypothesis for firm-specific determinants of leverage of different scholars of the recent history in corporate finance theory.

Journal	Size	Profitability	Tangibility	Non-interest tax shields	Growth opportunities	Business risk
Frank and Goyal (2009)	+/-	+	+			
Titman et al. (1988)	+/-	+	+/-	+	+	+
Byoun (2008)	+	-	+	+/-		
Akhtar (2002)	+	-	+			
Dang (2011)	+	-	+	+/-	-	
Drobetz (2005)	+	-	+	-		
Flannery and Rangan (2006)	+	-	+	-		
Kraemer (2015)	+	-	+			
Lemmon (2008)	+	-	+			
Marinsek (2016)	+	-	+		+	
Smith (2015)	+	-	+		+	
Fama and French (2002)	+	-	+	-		
Hovakimian (2001)	+	-	+	-		
Prediction by trade-off theory	+	+	+	-	-	-
Prediction by pecking order hypothesis	-	-	-	-	+	-

Firm size is predicted to be positively related to leverage within the trade-off framework. This is due to a negative correlation between firm size and bankruptcy costs since larger firms are expected to be more diversified, more mature and therefore also more reliable (Gruber and Warner, 1977). A tried and trusted business model is assumed to generate more stable cash flow streams leading to a lower rate of bankruptcy, better borrowing terms and higher optimal leverage (Rajan and Zingales, 1994). Also, the agency related costs are expected to be lower for large firms compared to small companies (Antoniou et al., 2008). In contrast to that, the pecking order hypothesis predicts a negative relation between size and leverage. As larger firms are better known they face lower adverse selection and can more easily issue equity compared to smaller firms (Frank and Goyal, 2007).[6]

Trade-off theory predicts that more profitable firms have higher leverage. Profitable firms are associated with high stock returns, high retained earnings and therefore lower external financing needs, low bankruptcy risk and low borrowing costs which increases the incentives to take on more debt (Margaritis and Psillaki, 2007).[7] The increased discipline that comes with debt (monitoring) also keeps the pressure on managers to perform in an already profitable firm, leading to reduced agency risk (Jensen, 1986). However, this relation may be dampened within a dynamic framework due to market frictions such as refinancing costs (Strebulaev, 2007) or the mechanical relationship between retained earnings and solidity (Flannery and Rangan, 2006). The pecking order hypothesis again argues in the other direction. As firms are assumed to prefer internal financing over external financing, higher (retained) earnings will ceteris paribus decrease the need for debt financing and therefore lower the leverage ratio (Fama and French, 2002).

Tangibility of assets is predicted to be positively correlated with leverage under trade-off theory and negatively correlated under the pecking order. Tangible assets are easier to collateralize and easier to value and sell in times of financial distress than intangible assets and therefore reduce bankruptcy risk and agency-related costs (Frank and Goyal, 2007) In contrast to that, Harris and Raviv (1991) argue that tangible assets make equity less costly

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[6] Note that other scholars also argue that the pecking order theory predicts a positive relation between size and leverage as large firms have more assets and therefore the adverse selection may be more important compared to a firm with a small asset base.

[7] Note that other scholars also argue that under the trade-off theory profitability works as a proxy for growth opportunities and therefore should be negatively related to leverage.

because of its low information asymmetries leading to a negative relation between tangibility and leverage under the pecking order hypothesis.

Non-interest tax shields such as depreciation, amortization or R&D expenses are expected to be negatively correlated with the level of debt under both, trade-off theory and pecking order hypothesis. A higher level of non-interest tax shields will lead to higher tax deductions which obviously lowers the need for interest deductions from debt financing (DeAngelo and Masulis, 1980). As such, an increase in non-interest tax shields leads to a reduction in the optimal level of debt. Contrary, one could also argue via the secured debt hypothesis presented by Scott (1977). According to this hypothesis, a high level of depreciation is a result of high tangibility and therefore should lead to lower borrowing costs and higher optimal debt levels (Boquist and Moore, 1984). Under the pecking order hypothesis, higher tax shields will ceteris paribus lead to higher profitability a decreased need for debt financing and therefore a lower leverage ratio (Fama and French, 2002).

Leverage and growth opportunities are assumed to be negatively related under the trade-off framework. As growth firms lose more of their value when they go into distress than matured firms, bankruptcy costs are higher. Fast growing firms are also more exposed to agency-related costs than mature firms, as they may run in underinvestment problems if they are highly leveraged, due to the fact that shareholder bear the entire risk of the investment but have to share the increase in value with the debt holders (Myers, 1977). Contrarily, the pecking order hypothesis assumes a positive relation. As firms prefer debt financing over equity financing and growth firms are generally more dependent on outside financing more growth opportunities will ceteris paribus lead to higher leverage (Myers and Majluf, 1984).

Volatile earnings (business risk) increase the risk profile of a firm and therefore lead to higher bankruptcy costs and higher borrowing costs and thus to lower optimal leverage levels under the trade-off theory. Unpredictable earnings make it also harder to maintain an appropriate debt level from a tax-shield perspective. It becomes more difficult to match the existing tax shields of a firm with volatile earnings and a mismatch could lead to financial distress (Titman and Wessels, 1988). To lower the chance of issuing new risky securities or foregoing profitable investments when earnings (free cash flow) are low, a firm with more volatile earnings are likely to have less leverage under the pecking order hypothesis (Fama and French, 2002).

A conclusion among the studies mentioned in Table 1 is that firms mainly adjust their leverage ratios towards an optimum determined by these six firm characteristics. However, the estimated speed of adjustment towards this optimum differs among studies. For example, Fama and French (2002) argue that the speed of adjustment is insufficient low (7%-10% for dividend payers and 15%-18% for non-dividend payers) for the trade-off theory in order to explain the range of observed variation in firms' leverage data. Byoun (2008) finds that adjustment speeds vary significantly between 2% - 33% depending on if firms are above or below their leverage target and if they show a financial deficit or financial surplus. Contrary to many other researchers, Flannery and Rangan (2006) state that a typical firm completes more than half of its required leverage adjustment in less than two years. However, all studies investigated the speed of adjustment by applying a so-called error correction model (ECM) similar to the one used in the thesis at hand.[8]

Financial deficit and firms credit ratings are less prominent factors in the discussion of optimal capital structures. However, Hovakimian et al. (2001) find that firms tend to use financial decisions about repurchasing and issuing capital to move toward target debt ratios. Anyhow, it appears that this tendency is less important for equity or debt issuances than for repurchases and debt retirements (Hovakimian et al., 2001). They argue that leverage deficit (i.e. if actual leverage is above or below the target) is an appropriate predictor for whether equity is repurchased, or debt is retired and also the amount that is repurchased. In contrast, the leverage deficit gives a much weaker prediction of what kind of instrument (debt or equity) is issued and how much is issued (Hovakimian et al., 2001). They therefore conclude that capital considerations play a much more important role when firms repurchase rather than raise capital.

Byoun (2008) analyzes the theory that firms use financial deficits / financial surpluses in line with pecking order considerations to faster adjust to their optimal leverage target. Following the pecking order hypothesis, adverse selection costs are higher for equity than for debt and firms with a financial surplus are more likely to pay back debt rather than equity to keep up the debt capacity for future financing needs (Byoun, 2008). He argues that the main goal is to avoid a situation where firms must finance their investment opportunity with the issuance of equity which would lead to high adverse selection costs (Byoun, 2008). In line with this

[8] For a detailed explanation of the error correction model refer to chapter 3.2.2.

theory, he finds that firm's speed of adjustment is much higher when they face a financial deficit with below target debt or a financial surplus with above-target debt than when they face a financial surplus with below-target debt or a financial deficit with above-target debt. Smith et al (2015) confirm this result for New Zealand firms.

Kisgen (2006) was the first researcher focusing on whether managers target credit ratings or a specific leverage ratio when facing capital structure decisions. He finds that firms are trying to avoid downgrades and are aiming for an upgrade respectively. Later on, Kisgen (2009) complements his paper from 2006 by examining the behavior of leverage following a credit rating downgrade. He adds that firms are not only changing their corporate capital structure in order to obtain a certain rating (i.e. avoiding downgrades and achieving upgrades) but rather change their corporate capital structure after a downgrade. He observes that a downgrade can be directly associated with subsequent capital structure change focusing on lowering the leverage accordingly. As a matter of course, an upgrade in a corporate´s credit rating does not implicitly lead to a change in corporate capital structure once other capital structure factors are taken into account. Kisgen (2009) further finds that firms with a downgrade in its credit rating adjust more quickly towards a certain leverage level using a partial adjustment model.

A survey of Graham and Harvey (2001) showed that CFOs target credit ratings in order to make financial decision, in particular on debt and thus capital structure of a firm. Furthermore, other literature such as Ederington and Goh (1998), Ederington et al. (1987) and Hand et al. (1992) showed that changes in credit ratings had a significant impact on bond and stock prices.

3 Methodology

3.1 Data and Sample Selection

We construct our initial sample from all firms included in the annual Compustat / Capital IQ - North America - Daily tape (Compustat) between the years 1985 and 2016. We begin in 1985 because we require credit ratings for our last specification of the regressions and this data is not available prior to 1985. Annual observations are defined on the basis of fiscal as opposed to calendar years due to the fact that our sample firms use a variety of different fiscal year ends. Following previous research, we exclude financial firms (SIC 6000–6999) and regulated utilities (SIC 4900–4999) whose capital structures and financing decisions may not convey the same information as non-financial and non-regulated firms. By way of example, a relatively high leverage may be normal for financial firms who use customer deposits as an important part of their business model but the same high leverage ratio for non-financial firms may indicate financial distress (see for example Byoun (2008)). Also excluded are firms that report their funds flow statement under format codes 4, 5, or 6 for the reason that Compustat does not define format codes 4 and 6 and format code 5 is a Canadian file only (Compustat, 2003).[9]

To model an optimal debt ratio, we use a set of firm characteristics that appear regularly in the literature (see for example Rajan and Zingales (1994); Hovakimian et al. (2001); Fama and French (2002); Frank and Goyal (2003)). The variables include size, profitability, tangibility, non-interest tax shields, growth opportunities and business risk. A more detailed explanation why these factors should significantly impact firm's leverage and a thorough summary of empirical literature on these factors can be found in chapter 2.4. The definition of the variables and a reference on how to find and construct these variables in Compustat is depicted in Table 2.

Other scholars also analyze the impact of these firm characteristics on market value leverage ratios, but Shyam-Sunder and C. Myers (1999) and Myers (1984) argue that there are rational reasons for managers to specify debt targets in terms of book values and (Hovakimian et al., 2001, p. 6)) find that the results using book value targets were very similar to the results using market value targets. In what follows, we therefore solely focus on book leverage.

[9] Note that the restrictions on the data sample selection have an impact on the results of the empirical part. For further details on limitations, refer to chapter 5.2.

Table 2: Firm-specific determinants of leverage

The table below provides an overview of the variables used in this thesis. The left-hand side column provides a definition of the variables used, the middle column highlights the way of construction and the right-hand side column shows under which line item code the relevant input variables can be found in Compustat.

Variable	Construction	Compustat Code
Dependent Variable		
Leverage Ratio (BV)	$\frac{ST\ Debt + LT\ Debt}{Total\ Assets}$	$\frac{DLC + DLTT}{AT}$
Independent Variables		
Size	$\frac{LN\ (Total\ Assets)}{Avg.CPI\ Deflator}$	$\frac{LN\ (AT)}{CPI}$
Profitability	$\frac{EBIT}{Total\ Assets}$	$\frac{EBIT}{AT}$
Tangibility	$\frac{Net\ PP\&E}{Total\ Assets}$	$\frac{PPENT}{AT}$
Non-Interest Tax Shields	$\frac{R\&D\ expense + depreciation + amortization}{Total\ Assets}$	$\frac{XRD + DP}{AT}$
Growth Opportunities	$LN(Total\ Assets_t) - LN(Total\ Assets_{t-1})$	$LN(AT_t) - LN(AT_{t-1})$
Business Risk	$\frac{STD.S\ (EBIT)}{Total\ Assets}$	$\frac{STD.S\ (EBIT)}{AT}$
Financial Deficit	*see Equation* (1)	*see* Appendix
Dummy Variables		
Credit Rating	S&P’s long-term domestic issuer credit rating	SPLTICRM

One additional remark on the construction of the data should be made with regard to financial deficit. The construction of the variable is highly dependent on the format code of the funds flow statement of the respective firm since US firms report their accounts in a number of different formats over the last thirty years. Especially for the time periods 1985 to 1987, there exist three distinct but closely related formats (Compustat format codes 1, 2, 3) that all represent the cash flows by a statement of sources and uses of funds. This representation changed in 1988. For fiscal years ending after July 15, 1988, most firms start reporting their cash flows as income plus indirect operating activities plus investing activities plus financing activities equals a change in cash and cash equivalents (format code 7). To have a consistent time-series, we merge the different format codes to a common format (see Appendix 1). In this context we mainly follow Frank and Goyal (2003) and Byoun (2008) to compute financial deficit as the sum of net investments (INV), change in working capital (WC) and cash dividends (DIV) minus the operating free cash flow (FCF) plus any exchange rate effects (FX) divided by total assets (AT):

$$FD_{it} = \frac{INV_{it} + \Delta WC_{it} + DIV_{it} - FCF_{it} + FX_{it}}{AT_{it}} \quad (1)$$

$$FS_{it} = -FD_{it} \quad (2)$$

As a suitable credit rating, we follow Kisgen (2009) and use the S&P's long-term domestic issuer credit rating.[10] According to Kisgen (2009), the domestic long-term issuer credit rating is the most suitable corporate credit rating, also in comparison to other provided credit ratings by Compustat such as subordinated credit ratings and domestic short-term issuer credit ratings.[11] For a detailed description of the different rating categories refer to Appendix 2.

Most of our variables are expressed as ratios with total assets as a denominator to avoid inflation-based bias. Where this is not the case (that is the variable "firm size" (ln AT)), we deflate the nominal magnitudes by the consumer price index (CPI) to express real asset values in 1985 US dollars. The relevant information for the CPI is obtained from the United States Department of Labor, Bureau of Labor Statistics (2018).

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[10] According to Compustat (2003, p. 246) this credit Rating is defined as follows: "*The Standard & Poor's Issuer Credit Rating (ICR) is a current opinion of an issuer's overall creditworthiness, apart from its ability to repay individual obligations. This opinion focuses on the obligor's capacity and willingness to meet its long-term financial commitments (those with maturities of more than one year) as they come due. You can use this monthly item to find the rating for a specified month and year*".

[11] Note that Compustat also does not provide enough data in regards to subordinated and domestic short-term credit ratings, which might lead to missing observations and therefore a smaller data sample.

Table 3: Descriptive statistic of sample data

The table below gives an overview of the descriptive statistics of the initial sample used in this thesis. The sample consists of all firms with an active S&P long-term issuer credit rating included in the annual Compustat / Capital IQ - North America - Daily tape between the years 1985 and 2016. This timeframe gives a total of 32,895 firm year observations for 2,900 different firms with an average lifetime of 11.34 years. Because of the non-numerical representation of its variables, the descriptive statistics for firm's credit ratings is limited to the non-numerical mean, median, minimum and maximum.

	Leverage Ratio	Size	Profitability	Tangibility	Non-Interest Tax Shields	Growth Opportunities	Business Risk	Financial Deficit	Credit Rating
Mean	0.3557	5.0166	0.0830	0.3627	0.0645	0.0791	0.0279	0.0227	BBB-
Standard Error	0.0011	0.0067	0.0004	0.0013	0.0002	0.0012	0.0002	0.0007	-
Median	0.3244	4.8058	0.0820	0.3115	0.0531	0.0444	0.0187	0.0036	BB+
Standard Dev.	0.1936	1.2205	0.0719	0.2442	0.0442	0.2263	0.0298	0.1357	-
Minimum	0.0035	2.2472	-0.1762	0.0140	0.0052	-0.4985	0.0016	-0.3487	D
Maximum	0.9047	10.9559	0.2815	0.9024	0.2505	1.0840	0.1814	0.5510	AAA

All of the variables are winsorized at the 1st and 99th percentile to avoid the influence of extreme observations (see C. Hastings et al. (1947)). We also require firms to have non-missing observations for all relevant factors and furthermore positive values for total assets and book value of equity as these variables are used to deflate other variables and the results could become difficult to interpret when they are non-positive. Business risk is calculated as the average standard deviation of earnings before interest and taxes (EBIT) of the last three years which leads to the fact that any firm with fewer than three consecutive years is excluded.[12] As our last regressions specification requires a credit rating, we also have to exclude all firms without a credit rating. Accordingly, all these exclusions leave us with a data sample of 32,895 firm-year observations, which consist of 2,900 firms with an average of 11.34 years each. According to Faulkender and Petersen (2006) approximately 78% of outstanding debt is issued by firms with a public debt rating, suggesting that this sample covers a significant portion of firms active in capital markets.[13]

3.2 Empirical Model

3.2.1 Stability of Firm's Capital Structure

In a first step, this thesis empirically investigates if firm's capital structures are stable over longer periods of time. The analysis is mainly based on the methods used by DeAngelo and Roll (2015). In this context, a capital structure regime is defined as stable if the leverage ratio remains in a band of width 0.050 around its own median (thereafter "narrow band approach"). For example, if a firm has a median leverage ratio of 0.350, the leverage band would be defined from 0.325 to 0.375. Two other scenarios in which leverage ratios consistently remain in bandwidths of 0.100 or 0.200 are defined as "weakly stable" regimes.

The approach continues with an analysis of how many firms in the sample keep their leverage ratios in such a narrow band for more than 5, 10, and 15 years. For comparison purposes, it is also reported how many firms stay in a broader leverage band of width 0.300, 0.400, 0.500

[12] Note that in order to avoid losing too much data, we collected EBIT as of 1982 in order to have balanced panel data as of 1985 which is in accordance with the availability of credit ratings.

[13] Note that some prior studies also exclude smaller firms from their analysis, because their adjustment costs may be unusually large or their leverage determinants might be significantly different (see for example Lemmon and Zender (2009). However, this further specification is outside of the scope of this thesis and is left for future analyzes.

and above 0.500. The analysis also reports the median leverage, the median range (defined as the difference between minimum and maximum) and the median standard deviation of leverage ratios for the different groups (leverage bands) of firms.[14]

To simplify the analysis to a doable extent but to still obtain meaningful results the initial sample is reduced to firms that have active entries for the last 20 years of the sample period (1997 – 2016). The construction of such a constant composition sample simplifies the analysis but also ensures comparability to the "bucket approach" (see below). This approach reduces the sample to a total of 288 firms. Although only representing around 10% of all firms in the sample these 288 firms still account for 47.7% of total assets per 31.12.2016.[15]

The aforementioned approach allows testing for how long firms stay in a narrow leverage band and therefore allows to make a statement on the question if firms follow a stable capital structure regime as predicted by the static trade-off theory. Anyhow, it can be the case that firms leverage ratios jump outside the narrow leverage band for one period and return to the median band in the next period, leading to results that allow for the assumption of a stable capital structure (as leverage remains in the band for most of the time) but effectively representing a non-stable capital structure. Contrary, it could also be the case that firms stay most of the time in a narrow band but only a few outliers impact the median in such a way that most of the leverage ratio observations are stable but outside the range defined around the median.

The descriptive statistics (median range and median standard deviation) to some extend account for this shortcoming of the "narrow band approach", but to check the robustness of the results, the approach is additionally back tested by a leverage "bucket approach". In this context all firms in the sample are assigned to a certain initial leverage bucket and it is then consecutively checked which firms stay in the same leverage bucket and which firms are moving to other leverage buckets over a period of 20 years.

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[14] Note that each firm is allocated to a leverage band group based on the minimum band range in which they stay for more than five years. For example, if a firm stays for a total of four years in the leverage band of width 0.050 and for six years in the leverage band of width 0.100 it would be allocated to the 0.100 leverage band group.

[15] Note that the way of construction of the sub-sample may face a selection bias towards large and mature firms within our sample. As large and mature firms are expected to have more stable capital structures compared to small and young firms this potential bias will be specifically addressed in the interpretation of the results under chapter 4.1.

As before, the analysis starts in fiscal year 1997 (event year t = 0) and sorts all 288 firms from the constant composition sample into four equally-sized groups based on their initial leverage ratio at this point in time (0–25% quantile, 25–50% quantile, 50–75% quantile and 75–100% quantile).[16] The bucket formation from event year t = 0 is then tracked forward and the fraction of firms that remain in the same bucket is recorded as a percentage of total firms. The process is repeated for 1998, 1999, …, 2016, reporting the bucket location of each firm in each of the subsequent 19 years.

The analysis then reports the fraction of firms that have remained in a given leverage bucket in every year up to the event year in question as well as the fraction of firms that are currently in their initial bucket formation in the event year (even though they may have left that group sometime before the current year). The analysis additionally gives an overview of the fractions of firms who showed up in four different quartiles, in at least three different quartiles and in at least two quartiles at different times over the 20 years.

This approach therefore allows analyzing the time variance in firms leverage ratios. As the first approach ("narrow band approach") is analyzing the variance in leverage around an absolute value (median leverage ratio), the second approach ("bucket approach") is analyzing the variance in leverage relative to the evolution of other firms.[17]

The empirical results from both the "narrow band approach" and the "bucket approach" are depicted in Table 5 and Table 6 in chapter 4.1. The results indicate the assumption that leverage ratios are far away from being stable and contrary vary substantially over time. There are only two possible explanations for this observation. Either leverage follows a moving target (dynamic trade-off theory) with flexible boundaries on leverage target zones (see for example Graham and Harvey (2001), Fama and French (2005) and Leary and Roberts (2005) or leverage is of second-order importance and largely determined as a residual.

[16] Note that the allocation of a firm into a bucket is made relative to the other firms in the sample and therefore is significantly different to the absolute treatment under the „narrow band approach".

[17] Note that the relative "bucket approach" obviously faces the shortcoming that firms can move to a different leverage bucket - even if they are completely stable – only because of the variation in other firms leverage. But this is again why both approaches the absolute "narrow band approach" and the relative "bucket approach" are run in parallel.

3.2.2 Two-Step Ordinary Least Square Approach

In a next step this thesis empirically investigates the question if leverage is determined by dynamic trade-off theory factors or as a residual of other (more "important") financial decisions. To check the dynamic trade-off theory framework, this thesis uses the firm characteristics already analyzed by other scholars as depicted in Table 1 and Table 2. To answer the question if leverage is determined as a residual of other financial decisions, the term financial deficit is introduced (see equations (1) and (2)). To check if the mean reversion towards an optimal leverage target is outweighed by implications of the existing financial deficit, leverage ratios are analyzed via a two-step ordinary least square approach[18] in a similar way already used by other scholars, see for example Hovakimian et al. (2001) or Kayhan and Titman (2004).[19]

In the first step, the actual leverage ratios of the firms are regressed on a vector of firm characteristics related to the costs and benefits of leverage (dynamic trade-off theory):

$$LEV_{it} = \alpha + X_{it}\beta + \varepsilon_{it} \tag{3}$$

where LEV_{it} is the leverage ratio of the individual firm defined as the book value of debt divided by the book value of total assets (see Table 2), where X_{it} is a vector of firm characteristics that previously have been identified as significant explanatory variables for optimal leverage under the trade-off theory (see Table 1 and Table 2), and ε_{it} is an error term.[20]

Before settling on the used set of independent variables in the first step, the set of independent variables is checked for multicollinearity. The results show that all pairwise correlations are within the interval of [-0.2044; 0.2398]. Moreover, in order to check also for multicollinearity between several independent variables (i.e. x_1 and $x_2 + x_3$), the variance inflation factor

[18] Note that the dependent variable in the first step regression, LEV_{it}, is, censored from both below (by the value of zero) and above (by the value of one). Therefore, a Tobit regression would be preferable to get consistent estimates of a censored data, but for practical reasons, this thesis focusses on the estimation of a regular ordinary least square regression.

[19] Note that all econometric models applied in this thesis are run by using EViews.

[20] For technical details on the econometrical setup refer to Brooks (2014).

(VIF) is calculated which amounts to 1.0138 at the case at hand.[21] Thus, there are no problems of using the factors chosen as independent variables.

As such, in a next step, the pooled regression is estimated. This simple panel least square (PLS) regression with no effects or other corrections shows that all coefficients are highly significant with p-values between [0.0000; 0.0031].[22] Anyhow, the Durbin-Watson statistic of the pooled regression already indicates potential autocorrelation problems in the residuals, that is heterogeneity in the cross-section, the time dimension or both.[23]

In a next step, the pooled regression is therefore further analyzed for heterogeneity. To formally check for heterogeneity, the dummy variable approach for the cross-section as well as the time dimension is applied in order to test for joint significance. The effect of introducing dummy variables will push back the residuals towards zero since the dummy explains the average deviation. The fixed effects model thus has a straightforward dummy variable interpretation, and can be written as:

$$LEV_{it} = \alpha + X_{it}\beta + \mu_1 D1_i + \mu_2 D2_i + \cdots + \mu_N DN_i + \varepsilon_{it} \tag{4}$$

$$LEV_{it} = \alpha + X_{it}\beta + \lambda_1 D1_t + \lambda_2 D2_t + \cdots + \lambda_T DT_t + \varepsilon_{it} \tag{5}$$

where μ_i is a non-time-varying intercept that varies over different firms (cross-sectional fixed effects model) and λ_t is a time-varying intercept that is constant over different firms (period fixed effects model). In analogy with the interpretation of the usual intercept term as a coefficient to be fitted to a column of ones, μ_1 (λ_1) can be seen as a coefficient to be fitted to a variable that takes on the value one for observations on firm 1 (period 1) and zero otherwise, μ_2 (λ_2) is fitted to a variable that takes on the value one for observations on firm 2 (period 2) and zero otherwise, etc. $D1_i$, $D2_i$ etc. are then the dummies for firm one, two etc. (cross-

[21] Note that the VIF is the ratio of the variance of the multivariate coefficient estimate to the simple regression coefficient variance and is calculated as $1/(1-R^2)$ where a VIF of greater than ten is indicating multicollinearity.

[22] Note that all main outputs of the different regression specifications in the first step are depicted in Table 4.

[23] The pooled regression is a simple way to proceed with the data at hand and only requires the estimation of a few parameters, however, it has some very limitations. By way of example, pooling the data assumes that the average values of the variable are constant over time across all cross-sectional units (Brooks (2014)).

section fixed effect model) and zero otherwise, and $D1_t$, $D2_t$ etc. are the dummies for period one, two etc. (period fixed effects model) and zero otherwise. [24]

As a result, the redundant fixed effect test is being applied separately in the cross-section as well as the time dimension. The results of the F-statistics and Likelihood Ratio (Chi-square) of each test indicates that cross-section dummies and time dimension dummies are highly significant compared to the pooled regression. This highly significant p-value of the redundancy fixed effect tests in both dimensions shows statistical evidence of rejecting the pooled ordinary least square regression.

In a next step, it should be tested if random effects can be used to account for this heterogeneity. While the fixed effects model is most easily viewed as modeling firm-specific (time specific) intercepts, the random effects model is most easily seen as modeling firm-specific (time specific) random error terms. In general, random effects are preferred since the model is more efficient as the generalized least squares (GLS) procedure removes only precisely as much of the variation in the variables as needed. But the assumptions of the random effects model are also more restrictive as also the composite error term must be independent of the explanatory variables (endogeneity). The random effects model can be written as:

$$(LEV_{it} - \theta\overline{LEV_i}) = (1-\theta)\alpha + (X_{it} - \theta\bar{X}_i)\beta + (\mu_{it} - \theta\bar{\mu}_i) + (\varepsilon_{it} - \theta\bar{\varepsilon}_i) \quad (6)$$

$$(LEV_{it} - \theta\overline{LEV_t}) = (1-\theta)\alpha + (X_{it} - \theta\bar{X}_t)\beta + (\lambda_{it} - \theta\bar{\tau}_t) + (\varepsilon_{it} - \theta\bar{\varepsilon}_t) \quad (7)$$

$$\theta = 1 - \frac{\sigma_v}{\sqrt{T\sigma_\mu^2 + \sigma_v^2}} \ or \ \theta = 1 - \frac{\sigma_v}{\sqrt{T\sigma_\lambda^2 + \sigma_v^2}} \quad (8)$$

Where θ is a correlation coefficient between the general error term ε_{it} and the average firm-specific (time specific) error term μ_{it} (λ_{it}), $\overline{LEV_i}$, $\bar{X}_i$, $\bar{\mu}_i$, $\bar{\varepsilon}_i$ etc. are the relevant firm (time) averages of the specific variables and μ_{it} (λ_{it}) is the composite error term.[25]

[24] For technical details on the econometrical setup refer to Brooks (2014).

[25] For technical details on the econometrical setup refer to Brooks (2014).

Due to the limitation of EViews, it is not possible to test for random effects in both the cross-section and time dimension at the same time or to test for random effects in one dimension and fixed effects in the other dimension. However, the test can be applied manually by using random effects in the cross-section (time dimension) and a within transformation[26] for the time dimension (cross-section) simultaneously. The specification test applied to check for cross-section and period random effects is the Hausman specification test. This test is a way to determine if the composite error term μ_{it} (λ_{it}) is independent of the explanatory variables X_{it} and the general error term ε_{it}. As a result, it effectively tests if the model can be best explained by using fixed effects or random effects.[27]

The correlated random effects Hausman tests results in a Chi-square statistic of 9.7449 which results in a p-value of 0.1358. The H_0 that the composite error term is independent of the explanatory variables and the general error term therefore cannot be rejected at a 10% significance level. But as the p-value is close to the rejection area not enough evidence is given for exogeneity. Since the presence of a simultaneous / reverse causal relationship between the composite error term and the explanatory variables and/or the general error term is likely, ignoring the endogeneity problem could lead to biased and inconsistent coefficient estimates. It is therefore advisable to do not use random effects in the cross-section. In the same way as before random effects are applied in the time dimension (and therefore within transformation in the cross-section. The correlated random effects Hausman tests shows a Chi-square statistic of 298.5421 which amounts to a p-value of 0.0000 and the null hypothesis of using random effects in the time dimensions is clearly rejected.

As estimates from a random effects model therefore could be biased and inconsistent, the best representation for the sample at hand is a two-way fixed effects model. The details of the results for the different model representations of the first step least square approach are depicted in Table 4.

[26] Note that the within transformation is an algebraic way of constructing fixed effect dummies, where the time series (cross-section) average of the variables is subtracted from the initial variables used in the general fixed effects model. According to Brooks (2014) alternative transformations include for example the between estimator or first-differencing. However, since the within transformation is used more often in practice, it is applied to the thesis at hand.

[27] For details on the Hausman test, refer to Brooks (2014, p. 312).

Table 4: Overview of first step least square models

The table below summarizes the regression results for the different model representations used in the first step least square regression to determine the best model for the sample data at hand. The table therefore displays the coefficients, R^2 and test results of the redundant fixed effect test (F-test[28]) and the random effects Hausman test (Chi-square statistic) for the different representations. Column (1) shows the results for the pooled regression, column (2) – (4) the results for the fixed effects representations and column (5) and (6) the results for the random effects representation. *, **, *** denote significance at the 10%, 5%, 1% confidence level.

Effects specification:						
- **Cross-section**	**None**	**Fixed**	**None**	**Fixed**	**Random**	**Within**
- **Period**	**None**	**None**	**Fixed**	**Fixed**	**Within**	**Random**
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Coefficient estimates:						
Constant	0.5886***	0.3937***	0.7143***	0.5205***	0.0006	0.0224***
Size	-0.0403***	-0.0057***	-0.0642***	-0.0280***	-0.0089***	-0.0425***
Tangibility	0.1121***	0.0288***	0.1002***	-0.0007	0.0188**	-0.3791***
Profitability	-0.4737***	-0.3718***	-0.4383***	-0.3647***	-0.3549***	0.0338***
Non-interest tax shields	-0.4343***	0.1643***	-0.4185***	0.1079***	0.1418***	-0.0652**
Growth opportunities	0.0134***	0.0030	0.0047	0.0054*	0.0061**	0.0058*
Business risk	-0.1756***	-0.0012	-0.3569***	-0.0389	-0.0019	-0.0724***
Adjusted R^2	0.1169	0.6887	0.1590	0.6991	0.0295	0.0463
Fixed effects F-test (cross-section)	-	21.84 (0.00)	-	21.38 (0.00)	-	-
Fixed effects F-test (period)	-	-	52.98 (0.00)	34.61 (0.00)	-	-
Fixed effects F-test (cross-section/period)	-	-	-	22.72 (0.00)	-	-
Hausman random effects (cross-section)	-	-	-	-	9.74 (0.14)	-
Hausman random effects (period)	-	-	-	-	-	298.54 (0.00)

[28] Note that although not displayed the results from the Likelihood Ratio (Chi-square) give similar results like the F-test.

In a next step, the model is further checked for heteroscedasticity. As EViews does not provide a built-in functionality to test for heteroscedasticity, the Breusch-Pagan-Godfrey[29] test must be conducted manually applying the following regression:

$$\varepsilon_{it}{}^2 = \alpha + X_{it}\beta + u_{it} \quad (9)$$

where $\varepsilon_{it}{}^2$ are the squared residuals from the first step regressions, X_{it} the explanatory variables from the first step regression and u_{it} an error term.[30]

The joint F-test of this regression significantly rejects the null hypothesis of homoscedasticity. As this means that the residual variance is non-constant in the explanatory variables (heteroscedasticity) the model additionally uses "White diagonal" coefficients as a covariance method.

In order to determine the best model for the first step, it is also important to consider and test for non-normality, autocorrelation, endogeneity and non-stationarity (diagnostic testing). However, testing for non-normality (that is the distribution of the residuals) is redundant due to the fact that the panel data at hand gives a sufficient number of observation. Thus, the model does not rely too strongly on the normality assumption.

The fixed effects model also already takes sufficiently care of residual autocorrelation. Non-stationarity is also not an issue as the number of years (32) is relatively small compared to the number of firms (2,900). There is also no reason to assume any endogeneity problem (simultaneity, omitted variables or measurement error) in the first step of the regression. Other corrections such as taking into account industry dummies, is redundant as well since it is already accounted for when correcting for heterogeneity (i.e. using fixed effects in the cross-section and time dimension).

The final model representation of the first step least square therefore can be written as:

$$LEV_{it} = \alpha + X_{it}\beta + \mu_1 D1_i + \lambda_1 D1_t + \mu_2 D2_i + \lambda_2 D2_t + \cdots + \mu_N DN_i + \lambda_T DT_t + \varepsilon_{it} \quad (10)$$

[29] For details on the Breusch-Pagan-Godfrey test, refer to Brooks (2014, p. 197).

[30] For technical details on the econometrical setup refer to Brooks (2014).

The empirical results from this two-way fixed effects model with “White diagonal” coefficients as a covariance method are depicted in Table 7 in chapter 4.2. The results suggest the assumption that neither trade-off theory nor pecking order hypothesis are able to explain the evolution of leverage within the sample at hand.

In the second step, the fitted values (LEV_{it}^{*}) from the first step regression (Equation (10)) are used to provide an estimate of each firm's optimal leverage ratio that firms would choose in the absence of information asymmetries, transaction costs, or other adjustment costs. These fitted values are then used in the second step to estimate the speed of adjustment towards the optimal leverage target via an error correction model (ECM). To analyze the impact of other financial decisions on the evolution of leverage, financial deficit is introduced as a short-term effect in the second step least square regression. The model therefore estimates the adjustment towards a moving target with financial deficit capturing the short-term effect and the difference between the firm’s actual leverage ratio from the last period and the fitted optimal leverage ratio capturing the long-term adjustment towards the target.

$$\Delta LEV_{it} = \beta_1 FD_{it}^{*} + \delta_1 (LEV_{it}^{*} - LEV_{it-1}) + u_{it} \qquad (11)$$

where ΔLEV_{it} is the change in firms leverage from one time period to another, FD_{it}^{*} is the financial deficit estimated by equation (1), LEV_{it}^{*} is the optimal leverage estimated by equation (10), LEV_{it-1} is the actual leverage ratio of the firm from one period before, δ_1 is the speed of adjustment and u_{it} is an error term.[31]

The empirical results from the second step are depicted in Table 8 in chapter 4.2. The results suggest the assumption that financial deficit has a highly significant impact on the evolution of firm’s leverage.

3.2.3 Definition of Leverage Target Zones

In a next step it should be analyzed if the impact of financial deficit on firm’s leverage is significantly determined by the fact that firm’s actual leverage is inside or outside a specific

[31] Note that the error correction model (ECM) can be validly estimated using regular ordinary least square (OLS) regression. For consistency and comparability, the model is run under the same specifications as the first step, i.e. as a two-way fixed effects model with “White diagonal” coefficients as a covariance method. For technical details on the econometrical setup refer to Brooks (2014).

target zone. The related hypothesis to be tested is that leverage is mainly determined as a residual as long as actual leverage is within a certain (acceptable) target zone, but gains priority and therefore gets pushed back to its optimal level when actual leverage is outside a specific target zone.

Another specification of the model therefore additionally includes dummy variables for the cases where actual leverage is inside or outside the defined target zone. Thus, this specification allows to test whether the impact of financial deficit on the speed of adjustment significantly differs if the actual leverage is inside or outside the target zone. The general specification is defined as:

$$\Delta LEV_{it} = \alpha_0 + \beta_1 FD_{it}^{*} * D_{it}^{inside} + \beta_2 FD_{it}^{*} * D_{it}^{outside} + \delta_1 (LEV_{it}^{*} - LEV_{it-1}) * D_{it}^{inside} + \delta_2 (LEV_{it}^{*} - LEV_{it-1}) * D_{it}^{outside} + u_{it} \quad (12)$$

where D_{it}^{inside} is a dummy variable equal to one if the actual leverage is inside the target zone and zero otherwise and $D_{it}^{outside}$is a dummy variable equal to one if the actual leverage is outside the target zone and zero otherwise.

The crucial aspect for the empirical part is therefore the definition of the borders of the target leverage zones. To test different specifications of target zones the above-mentioned error correction model will be estimated for three different sub-samples including three different definitions of the target zone.

(i) Empirical Approach

In a first step, the borders of the leverage target zone are defined empirically by analyzing the historical evolution of capital structures. The leverage ratio of each company is sorted and divided into three zones (inside the target zone, above the target zone and below the target zone)[32] whereby the borders are defined at the 15% highest observation and the 15% lowest observation respectively. The percentiles of being inside or outside the leverage target zone are chosen somehow arbitrarily. But the borders are more or less in line with a representation of one standard deviation away from the mean and therefore define all actual leverages as

[32] Note that this means that the dummy variable $D_{it}^{outside}$ is further broken down into the variables D^{above} and D^{below}.

outside the target zones which are outside the standard fluctuation around its mean. Furthermore, the borders are also in line with the results of the "narrow band" approach described under chapter 3.2.1. The final representation is therefore chosen under a trade-off between sufficient observations for the outside the target zone dummy and sufficient extreme values for the leverage ratio. In this context the borders are defined as follows:

$$D^{inside} = \begin{Bmatrix} 1 \;\; if \; 15\% \leq \; LEV_{it} < 85\% \\ 0 \;\; otherwise \end{Bmatrix} \tag{13}$$

$$D^{above} = \begin{Bmatrix} 1 \;\; if \; 85\% \leq \; LEV_{it} < 100\% \\ 0 \;\; otherwise \end{Bmatrix} \tag{14}$$

$$D^{below} = \begin{Bmatrix} 1 \;\; if \; 0\% \leq \; LEV_{it} < 15\% \\ 0 \;\; otherwise \end{Bmatrix} \tag{15}$$

The "inside the target zone" range consists therefore of 70% of the leverage observations. By way of example, if there are 20 leverage observations for a firm, the upper bound of the target zone is the 17th highest leverage ratio observed for that company whereby the lower bound is the third lowest accordingly. In case a leverage ratio is above the 17th highest value or if the leverage ratio is below the 3rd lowest value, the dummy variable D^{inside} is set equal to zero indicating a case in which actual leverage falls outside the target zone.

The next two representations of target zones are related to credit ratings. The underlying assumption of this approach is that during the course of a credit rating downgrade the leverage ratio will receive particular (first order) importance and therefore pushes back the leverage ratio closer to its optimal target. The nexus between credit ratings and leverage is quite obvious and can be directly obtained from the relation to bankruptcy risk. The idea that credit ratings also qualify as borders for leverage target zones is then based on the finding of Kisgen (2009) who finds that managers seem to target optimal credit ratings instead of optimal leverage ratios.

The aim of the following two representations therefore is to check if firms are actively targeting credit rating and therefore a deviation from a targeted credit rating also leads to an increased speed of adjustment towards the optimal leverage ratio target as a response to recover the lost rating.[33]

(ii) Initial Credit Rating Approach

In the first representation, the dummy variables are set-up in a way that all firms with a credit rating below its initial credit rating characterize a firm outside the leverage target zone. The initial credit rating is thereby defined as the average credit rating of the first three firm years in the sample and this approach therefore requires a minimum of three firm year observations for all firms.[34] Thus, if a firm is below its average credit rating of the first three years, it is defined as being outside the target leverage zone. In this context the borders are defined as follows:

$$D^{inside} = \begin{Bmatrix} 1 \ \ if \ CR_{it} \geq \dfrac{(CR_{i1} + CR_{i2} + CR_{i3})}{3} \\ 0 \ \ otherwise \end{Bmatrix} \tag{16}$$

$$D^{outside} = \begin{Bmatrix} 1 \ \ if \ CR_{it} < \dfrac{(CR_{i1} + CR_{i2} + CR_{i3})}{3} \\ 0 \ \ otherwise \end{Bmatrix} \tag{17}$$

By way of example, if a firm's average S&P long-term issuer credit rating of the first three years amounts to BBB and the firm is being downgraded to a BBB- five years after, the firm changes from inside the target zone to outside the target zone. In case the firm is able to achieve a credit rating upgrade to BBB later on, the firm will be considered inside the leverage target zone again. However, this approach suffers from a selection bias and is solely depending on the average credit rating of the first three years. In particular, if a firm is downgraded and the new credit rating is being seen as the new target (i.e. "new normal"). Imagine a firm's credit rating is downgraded at the beginning of its sample period and stays on the downgraded credit rating for all consecutive firm years. This would lead to the fact that for all consecutive firm years, the firm is defined as being outside its target leverage zone

[33] Note that the relation between changes in credit ratings and the speed of adjustment is analyzed only from a downgrade perspective as there are no economic reasons to assume why firms should try to recover a lower credit rating after an upgrade in its credit rating.

[34] Note that the starting point of the firm year observation is of no consideration, i.e., it does not matter if the firm exists from the beginning of the sample period in 1985 or has a later entry into the sample period.

even though it might represent a new optimal and stable level the firm is targeting ("new normal"). In order to account for this "new normal" issue, a second credit rating approach is introduced.

(iii) Credit Rating Downgrade Approach

In the second credit rating approach the borders of the leverage target ratio are determined based on a downgrade in the credit rating. As a result, any downgrade – irrespective of the initial credit rating – characterizes a leverage ratio outside the target zone. This also means that any recovery after a downgrade will lead to the fact that the observation is defined as being inside the target zone again. Furthermore, a firm is also defined as inside the target zone when the firm stays at the same credit rating for at least three consecutive years after a downgrade. This approach actively avoids self-selection as it automatically adopts to a "new normal" and therefore also allows leverage ratios to be inside the target zone even if they are below its initial representation. In this context the borders are defined as follows:

$$Dummy = D^{outside} = \begin{Bmatrix} 1 \ \ if \ CR_{it} < \ CR_{it-1} \\ \quad or \ CR_{it} = \ CR_{it-1} and \ CR_{it} < CR_{it-2} \ or \ CR_{it} < CR_{it-3} \\ 0 \ \ otherwise \end{Bmatrix} \quad (18)$$

$$Dummy = D^{inside} = \begin{Bmatrix} 1 \ \ if \ CR_{it} > CR_{it-1} \\ \quad or \ CR_{it} = CR_{it-1} and \ CR_{it} > CR_{it-2} \\ \quad or \ CR_{it} = CR_{it-1} \ and \ CR_{it} \geq CR_{it-2} \ and \ CR_{it} \geq CR_{it-3} \\ 0 \ \ otherwise \end{Bmatrix} \quad (19)$$

By way of example, if a firm is downgraded from an AA S&P credit rating to an AA- S&P credit rating in year two and stays there for all consecutive years, then the firm will be outside the target zone for years two, three and four, but in year five the AA- S&P credit rating becomes the "new normal" and the firm returns to the inside of the target zone.

4 Empirical Results

4.1 Are Firm's Capital Structures Stable?

In a first step this thesis empirically investigates if firm's leverage is stable over longer periods of time. The analysis is based on the methods used by DeAngelo and Roll (2015). In this context a capital structure regime is defined as stable if the leverage ratio remains in a band of width 0.050 around its own median. Two other scenarios in which leverage ratios consistently remain in bandwidths of 0.100 or 0.200 are defined as weakly stable regimes.[35]

Table 5 reports which firms stay in a narrow leverage band for more than 5, 10 and 15 years and therefore checks if firms in general follow a stable capital structure regime as predicted by the static trade-off theory. The table also reports the median leverage, the median range (defined as the difference between minimum and maximum) and the median standard deviation of leverage ratios for the different groups (leverage bands) of firms.

The data show that only a minority of firms keeps their leverage in a stable band for more than 10 years and practically no firm has permanently stable regimes. Only 4.9% of the firms in the sample keep their leverage in a bandwidth of 0.050 for more than 5 years. The median leverage ratio of these firms is 44.6% with a median range of 18.1% and a median standard deviation of 0.050. Furthermore, none of these firms keep their leverage ratios in this band for more than 10 years and not to mention more than 15 years. This means that none of the firms in the sample show a strictly stable leverage ratio behavior over a longer period of time.

There is also only a little more incidence of stable leverage regimes using a weaker definition of stability in which leverage ratios remain in a bandwidth of 0.100 or 0.200. Around 19.8% (35.1%) of the firms keep their leverage ratios stable in a bandwidth of 0.100 (0.200) for more than 5 years. This means that a cumulative 59.7% of firms keep their leverage ratios in a stable band of width 0.200 for more than 5 years. But again, stable regimes over longer periods (10 or 15 years) are much less common. Only 1.4% (13.5%) of the firms keep their leverage ratio in a bandwidth of 0.100 (0.200) for more than 10 years and an even less amount of 0.3% (2.8%) stay in this band for more than 15 years. These results indicate that it is uncommon to see even weakly stable regimes that persist for more than 10 years.

[35] For more details on the methodology recapped throughout chapter 4, refer to chapter 3.

Table 5: Fraction of firms with leverage ratio in a narrow range

The analysis allocates all firms in the sample into a leverage band group based on the minimum band range in which they stay for more than five years. For example, if a firm stays for a total of four years in the leverage band of width 0.050 and for six years in the leverage band of width 0.100 it would be allocated to the 0.100 leverage band group. Columns (1) to (6) report how many firms in the sample keep their leverage ratios in certain bands for more than 5, 10, and 15 years. The values are displayed in absolute values for the specific leverage band range as well as cumulative values for the specific leverage band range and all tighter bands. Columns (7) to (9) report the median leverage, the median range (defined as the difference between minimum and maximum) and the median standard deviation of leverage ratios for the different groups (leverage bands) of firms. The sample composition includes all firms from the initial Compustat sample with active entries for the last 20 years of the sample (1997 – 2016) leading to a total of 288 firm observations.

Leverage band range	**Firms with leverage ratios in specified range for more than**						**Descriptive Statistics**		
	5 years		10 years		15 years		Median leverage ratio	Median Range	Median stand. deviation
	abs. (1)	cum. (2)	abs. (3)	cum. (4)	abs. (5)	cum. (6)	(7)	(8)	(9)
< 0.05	0.0486	0.0486	0.0000	0.0000	0.0000	0.0000	0.4459	0.1808	0.0503
0.05 < X < 0.10	0.1979	0.2465	0.0139	0.0139	0.0035	0.0035	0.3262	0.1903	0.0555
0.10 < X < 0.20	0.3507	0.5972	0.1354	0.1493	0.0243	0.0278	0.2766	0.2488	0.0707
0.20 < X < 0.30	0.1736	0.7708	0.2326	0.3819	0.0660	0.0938	0.2450	0.2872	0.0834
0.30 < X < 0.40	0.0972	0.8681	0.1979	0.5779	0.0972	0.1910	0.2267	0.2903	0.0873
0.40 < X < 0.50	0.0451	0.9132	0.1528	0.7326	0.1146	0.3056	0.1871	0.3475	0.0995
0.500 < X < 1.000	0.0868	1.0000	0.2674	1.000	0.6944	1.000	0.1260	0.2805	0.0936

Furthermore, it needs a bandwidth of 0.400 to allow more than 50% of the firms (58.0%) to be in a stable range for more than 10 years and 69.4% of the firms have a minimum of 5 outliers even if the bandwidth is defined as 0.500 around the median leverage ratio. The results suggest the assumption that leverage ratios are far away from being stable and contrary vary substantially over time. These results are also highly consistent with the empirical findings from DeAngelo and Roll (2015).

Anyhow, it seems that when stable regimes do occur they largely arise at relatively higher leverage ratios, as can be seen from the median leverage ratios for the different bands. Whereas the median leverage for firms that stay for more than 5 years in the 0.050 bandwidth is 44.6% the median leverage consecutively lowers for firms in broader bandwidths up until a median leverage ratio of 18.7% for firms that stay for more than 5 years in the 0.500 bandwidth. This is in contrast with results from DeAngelo and Roll (2015) and Strebulaev and Yang (2012) who find that stable regimes largely arise at low leverage.

One explanation for the different result can be due to the set-up of the "narrow band approach". For example, it could be the case that firms stay most of the time in a narrow band but only a few outliers impact the median in such a way that most of the leverage ratio observations are stable but outside the range defined around the median. This would also explain why the median range and the median standard deviation for the broadest bandwidth (0.500 – 1.000) are lower than the values for the bandwidths before.

Therefore, in a second step, the robustness of the "narrow range" approach is back tested by applying a so-called "bucket approach" which is analyzing the variance in leverage relative to the evolution of other firms.

Table 6 shows the results of the "bucket approach". It consists of a short explanation of the methodology, the fraction of the firms which are always in the initial leverage bucket and the fraction of the firms which are currently in the initial leverage bucket. At the bottom of Table 6, the fraction of firms is shown that are apparent in all four buckets, at least three or at least two different buckets over the 20-year time period.

Table 6: Fraction of firms always / currently in their initial leverage bucket

The analysis starts in fiscal year 1997 and sorts firms into four equal-sized groups based on their initial leverage ratio (0–25% quantile, 25–50% quantile, 50–75% quantile and 75–100% quantile). This bucket formation from event year t = 0 is tracked forward and the fraction of firms that remain in the same bucket for years t = 1, 2, . . . , 19 is recorded as a percentage of total firms in the initial bucket. The process is repeated for 1998, 1999, … , 2016, reporting the bucket location of each firm in each of the subsequent 19 years. In columns (1) to (5), the table reports the fraction of firms that have remained in a given leverage bucket in every year up to the event year in question. In columns (6) to (10), the table reports the fraction of firms that are currently in their initial bucket formation in the event year (even though they may have left that group sometime before the current year). The rows at the bottom of the table give the fractions of firms in four different quartiles, at least three different quartiles, and at least two quartiles at different times over the 20 years. The sample composition includes all firms from the initial Compustat sample with active entries for the last 20 years of the sample (1997 – 2016) leading to a total of 288 firm observations.

	Fraction of firms always in initial leverage bucket					**Fraction of firms currently in initial leverage bucket**				
Years Elapsed	Full Sample (1)	Lowest Leverage (2)	Low-Med Leverage (3)	Med-High Leverage (4)	Highest Leverage) (5)	Full Sample (6)	Lowest Leverage (7)	Low-Med Leverage (8)	Med-High Leverage (9)	Highest Leverage (10)
0	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1	0.6736	0.7778	0.6389	0.5556	0.7222	0.6736	0.7778	0.6389	0.5556	0.7772
2	0.5035	0.6667	0.3889	0.3611	0.5972	0.6076	0.7083	0.5139	0.5139	0.6944
3	0.3611	0.5694	0.1528	0.1667	0.5556	0.4861	0.6389	0.3472	0.3056	0.6528
4	0.2986	0.5000	0.0694	0.1250	0.5000	0.4861	0.5972	0.3611	0.3889	0.5972
5	0.2639	0.4444	0.0417	0.0694	0.5000	0.4549	0.5694	0.3472	0.3056	0.5972
6	0.2569	0.4444	0.0417	0.0556	0.4861	0.4340	0.5000	0.3472	0.2917	0.5972
7	0.2292	0.3611	0.0417	0.0417	0.4722	0.4479	0.4861	0.3333	0.3611	0.6111
8	0.1944	0.3056	0.0139	0.0278	0.4306	0.4236	0.5278	0.2778	0.3194	0.5694
9	0.1840	0.2639	0.0139	0.0278	0.4306	0.4583	0.4861	0.3611	0.4167	0.5694

10	0.1632	0.2361	0.0139	0.0278	0.3750	0.4340	0.4722	0.4028	0.3333	0.5278
11	0.1563	0.2361	0.0139	0.0278	0.3472	0.4097	0.4861	0.3611	0.2917	0.5000
12	0.1493	0.2361	0.0139	0.0278	0.3194	0.4306	0.4722	0.4028	0.3056	0.5417
13	0.1389	0.2222	0.0000	0.0278	0.3056	0.4444	0.4861	0.3889	0.3611	0.5417
14	0.1250	0.1944	0.0000	0.0278	0.2778	0.4375	0.5139	0.3750	0.3333	0.5278
15	0.1250	0.1944	0.0000	0.0278	0.2778	0.4097	0.4583	0.3472	0.3056	0.5278
16	0.1181	0.1806	0.0000	0.0278	0.2639	0.3924	0.4306	0.2778	0.3472	0.5139
17	0.1146	0.1806	0.0000	0.0278	0.2500	0.3993	0.4583	0.3056	0.3194	0.5139
18	0.1007	0.1528	0.0000	0.0139	0.2361	0.3403	0.3750	0.2639	0.2500	0.4722
19	0.0972	0.1389	0.0000	0.0139	0.2361	0.3333	0.3750	0.2639	0.2778	0.4167

Fraction of firms staying in X different buckets

4 buckets	0.2396	0.2917	0.2639	0.1944	0.2083
At least 3	0.6563	0.5278	0.7778	0.8056	0.5139
At least 2	0.9028	0.8611	1.0000	0.9861	0.7639

According to Table 6, the results of the firms staying always in the initial leverage bucket clearly show a decreasing trend: By way of illustration, the full sample declined from the initial 288 firms to 9.7% by the end of the 20-year period. Thus, only 28 out of 288 firms are staying in their initial bucket over the 20-year period. In case the single buckets are analyzed, obviously the same decreasing trend is observed. However, it should be stated that for the “extreme buckets”, namely the lowest and the highest leverage bucket, the decline is significantly different. In particular, the decrease is more slowly and thus 27 out of the 28 “stable” firms are either part of the lowest or the highest leverage bucket. This result is not surprising at all since it can be expected that it is easier for firms which are in the in-between buckets to deviate from its initial bucket rather than for a firm which is censored from either below or above.[36]

In addition, the results of the firms staying currently in the initial bucket show a similar picture as of the firms staying always in the initial bucket as discussed above. By way of example, the full sample decreases from initially 288 firms to 96 firms by the end of the 20-year period, representing 33.3% of the initial sample. This decrease in the full sample is less significant compared to the results of the firms staying always in the same bucket due to the fact, that the assumption of only being currently in the initial bucket is less strong. The same results are observed for the single buckets: the trend is also decreasing, and similar observations are made. There is again a significant difference between the “extreme buckets” and the in-between buckets, leading also to a more slowly decrease in the lowest and the highest leverage bucket due to the same reasons as stated above.

Furthermore, Table 6 shows that 24.0% of the full sample of firms are in all buckets throughout the 20-year time period, 65.6% in at least three buckets and 90.3% in at least two buckets indicating that virtually no firm has permanently stable regimes.

The results from the “bucket approach” therefore confirm the results from the “narrow band approach” and give strong evidence to assume that firm’s capital structures are not stable over longer periods of time. The results are additionally strengthened by the underlying choice of the sub-sample as this consist of mainly large and mature firms. This selection bias

[36] Note again, that this is maybe due to the shortcoming that firms can move to a different leverage bucket - even if they are completely stable – only because of the variation in other firms leverage.

additionally works in the direction of capital structure instability as younger and faster growing firms which are excluded from the analysis are expected to vary even more than large and mature firms.

4.2 Is Leverage Determined as a Residual?

To check if the mean reversion towards an optimal leverage target is outweighed by implications of the existing financial deficit, leverage ratios are analyzed via a two-step least square approach. Thus, in a first step, the actual leverage ratios of the firm are regressed on a vector of firm characteristics related to the costs and benefits of leverage to obtain estimates for the optimal leverage target used as an input for the error correction model in the second step. The ECM is then used to calculate the speed of adjustment towards the estimated optimal target under different specifications.

Table 7 summarizes the results from the first step regression. Although not at the center of interest of this thesis, the results of the regression are somehow surprising and therefore worth a short discussion. Size is highly significant with negative magnitude which is in line with pecking order but contrary to trade-off theory and previous research such as Akhtar (2012), Dang et al. (2011) and Flannery and Rangan (2006). But, investigating US firms, Titman and Wessels (1988) find contradicting results for firm size. A negative effect is especially strong when short-term debt is used as dependent variable. The outcome is explained by substantial refinancing costs for small firms with low bargaining power when issuing long-term debt, leading to higher short-term leverage ratios. In line with pecking order hypothesis one could also argue that large firms who have been around longer and are better known face lower adverse selection and can more easily issue equity compared to smaller firms (Frank and Goyal, 2007).

Profitability is highly significant and has a negative sign as well. Which is again in line with pecking order but contrary to trade-off theory. The negative relation was also find by many other scholars like Byoun (2008) and Fama and French (2002) and (Hovakimian et al., 2001). The explanation from the pecking order is that firms are assumed to prefer internal financing over external financing, and higher earnings therefore decrease the need for debt financing and therefore lower the leverage ratio (Fama and French, 2002).

Non-interest tax shields are significant and of positive magnitude which contradicts both, pecking order hypothesis and trade-off theory. However, previous empirical research is of two minds about it. Titman and Wessels (1988), Byoun (2008) and Dang et al. (2011) find a positive relation while Flannery and Rangan (2006), Fama and French (2002) and Hovakimian et al. (2001) find a negative impact of non-interest tax shields on leverage. One explanation for the positive sign would be the secured debt hypothesis presented by Scott (1977). According to this hypothesis, a high level of depreciation is a result of high tangibility and therefore should lead to lower borrowing costs and higher optimal debt levels (Boquist and Moore, 1984).

All other factors like tangibility, growth opportunities and business risk are insignificant and therefore do not explain leverage which contrasts with previous research who all find a significant relation between the variables and leverage in line with the trade-off theory framework. Anyhow, the most relevant drivers of the high R^2 are unobserved fixed effects. This finding may be best explained by the fact that industry related specifications drive optimal leverage (Flannery and Hankins, 2013).

The results from Table 7 therefore do not confirm the general conclusion among previous researchers that the trade-off theory to a high degree explains the firm characteristics' effect on leverage.[37] Even more, all significant factors in the regression contradict the theory and most favor the pecking order hypothesis. Anyhow, also the pecking order hypothesis has to be taken with caution as most of the explained variation in leverage comes from unobserved firm fixed effects which also weakens the prediction from the pecking order hypothesis. It therefore looks as neither trade-off theory nor pecking order hypothesis are able to significantly explain the variation in firm's capital structure. Thus, the question of which factors are driving firm's capital structure is still unanswered.

Although most of the explanatory variables are unobserved, the high R^2 allows to use the fitted values from the first step as an input for the second step least square. In the second step, the fitted values for the leverage ratio are therefore used as a proxy for firm's optimal leverage to estimate the speed of adjustment towards a moving optimal target.

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[37] See for example Frank and Goyal (2009) who states that no available theory fully explains firms leverage on the US market, but that trade-off theory still provides the most comprehensive framework in understanding firms' capital structure.

Table 7: First step least square: the impact of firm characteristics on leverage

The regression stated below consists of the book value of leverage as the dependent variable regressed on the different factors consisting of size, tangibility, profitability, non-interest tax shields, growth opportunities and business risk as the independent variables. The method applied is the so-called panel least squares (PLS) for the sample period from 1985 to 2016 leading to 32 periods. The cross-sections included amount to 2.900 which results in a total of of 32.895 unbalanced panel firm year observations. As described in the methodology section, the best representation for the sample at hand is a two-way fixed effect model using cross-section fixed (dummy variables) as well as period fixed (dummy variables). In order to account for the observed heteroscedasticity, White diagonal standard errors and covariance (number of degree of freedom correction) are used as a covariance method. *, **, *** denote significance at the 10%, 5%, 1% confidence level.

	First step least squares		
	Coefficient	**Standard Error**	**t-statistic**
Constant	0.5205***	0.0127	41.0107
Size	-0.0280***	0.0023	-12.2146
Tangibility	-0.0007	0.0113	-0.0656
Profitability	-0.3647***	0.0157	-23.2521
Non-interest tax shields	0.1079**	0.0451	2.3913
Growth opportunities	0.0054	0.0038	1.4263
Business risk	-0.0389	0.0348	-1.1178
Adjusted R^2	0.6992		
Log-likelihood	28,636		
Prob(F-stat.)	0.0000		
Observations	32,895		
Fixed firm effects	Yes		
Fixed time effects	Yes		

The ECM is then estimated via regressing the change in actual leverage as a dependent variable on the difference between actual leverage one period before and optimal leverage (correction term) and financial deficit (short-term effect).[38]

The regression is estimated in three different versions. First, on the full sample, second, on a sub-sample only including leverage ratios inside a specific target zone, and third, on a sub-sample only including leverage ratios outside a specific target zone. The borders of the leverage target zone are defined empirically by analyzing the historical evolution of capital structures using the 15% highest and 15% lowest leverage observations as boundaries to determine the target zone. However, running a regression with outside the target zone dummies ($D^{outside}$) defined as the 15% highest and 15% lowest leverage observations simultaneously would give distorted results. This is why separate regressions are run for the observations being outside the target zone. Thus, the outside target zone is further split up into "above" and "below" the target zone leading to three different values for the dummy variables and therefore in total to four separate regressions.

Table 8 summarizes the results from the second step regression. The results of the base regression using the full sample show that the speed of adjustment amounts to 0.3689 and is highly significant on the 1% confidence level. Thus, it takes firms usually 2.71 years to close the gap between the actual leverage and the target leverage. This is quite high compared to other empirical results (see for example Fama and French (2002)) even if controlled for financial deficit. The table also shows that financial deficit has a significant impact on the evolution of firm's leverage. The regression has an adjusted R-squared of 0.2156 and the respective F-statistics (3.8132) rejects the null that all coefficients are zero.

Table 8 also presents an overview and comparison of the three different regressions for inside, above and below the target zone. The regression representing the state of being inside the target zone shows that the speed of adjustment amounts to 0.5207. Both, financial deficit as well as the speed of adjustment are highly significant on a 1% confidence level presenting a p-value of 0.0000 each and the adjusted R-squared totals to 0.3668.

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[38] Note that potential endogeneity issues between leverage and financial deficit is not considered at this step. For details on the robustness check in regard to endogeneity, refer to chapter 4.4.

Table 8: Second step least square: leverage target zones based on an empirical approach

The overview below represents an error correction model (ECM) using the difference in actual leverage as the dependent variable and optimal leverage (i.e. the fitted values from the first step regression) minus the lagged actual leverage as well as financial deficit as independent variables. The regression is run for four different sub-samples, column (1) reports the results of the full sample, column (2) the result of the sub-sample only including leverage ratios inside the target zone, column (3) the results of the sub-sample only including leverage ratios above the target zone and column (4) the results of the sub-sample only including leverage ratios below the target zone. Columns (3) and (4) additionally include information about the change in coefficients compared to the sub-sample only including leverage ratios inside the target zone. Since lagged leverage values and dummy variables of the empirical approach are used in the ECM, the number of observations differs from the initial sample of 32.895 firm year observations and the period decreases to 31 years. *, **, *** denote significance at the 10%, 5%, 1% confidence level.

	Second step least squares									
	Full Sample (1)		Inside Target Zone (2)		Above Target Zone (3)			Below Target Zone (4)		
	Coeff.	t-stat.	Coeff.	t-stat.	Coeff.	t-stat.	**Δ**	Coeff.	t-stat.	**Δ**
Constant	-0.0007	-1.5508	-0.0054***	-12.7108	0.1182***	75.5666	0.1236	-0.1173***	-59.7823	-0.1119
$LEV_{it}^{*} - LEV_{it-1}$	0.3689***	46.348	0.5207***	56.2037	0.9330***	58.4867	0.4123	0.9334***	39.7358	0.4127
FD^{*}	0.0964***	15.402	0.0617***	10.3427	0.0381***	4.1612	-0.0236	-0.0253**	-2.5262	-0.0870
R^2	0.2923		0.4464		0,8467		0.4003	0.9040		0.4576
Adjusted R^2	0.2156		0.3668		0,7658		0.3990	0.8159		0.4491
Log-likelihood	34,709		31,057		7,452		-23,605	5,825		-25,232
Prob(F-stat.)	0.0000		0.0000		0,0000		0,0000	0,0000		0,0000
Observations	29,995		23,309		3,991			2,695		
Fixed firm effects	Yes		Yes		Yes			Yes		
Fixed time effects	Yes		Yes		Yes			Yes		

The results for the regression with dummy variables representing leverage ratios above the target zone (regression (3)) show significant changes in the size of the financial deficit coefficient and the speed of adjustment. The coefficient financial deficit declined by -0.0236 to 0.0381. Although the p-value of financial deficit is still highly significant on the 1% confidence level, the decrease shows that the economic power of financial deficit influencing leverage diminishes when being above the target zone. This finding is further strengthened by the change in the speed of adjustment which increased significantly from 0.5207 to 0.9330. In other words, as soon as the leverage ratio is above the target zone, the speed of adjustment increases significantly and almost doubles. The results for the regression with dummy variables representing leverage ratios below the target zone (regression (4)) show similar results. Financial deficit drops from 0.0617 by 0.0871 to -0.0253[39] with a less significant p-value (0.0116) and the speed of adjustment increases from 0.4464 by 0.4870 to 0.9334.

These results substantiate the theory of a significantly different treatment of leverage depending on the fact if actual leverage is within or outside a certain target range. It can be stated that inside the target zone financial deficit together with the optimal leverage target drive actual leverage. However, as soon as actual leverage leaves the optimal target zone, the speed of adjustment towards its leverage target gets significantly more important and pushes leverage back into the target zone. Thus, when being outside the leverage target zone, optimal leverage overpowers financial deficit in order to go back inside the target zone.

But as long as actual leverage is inside the leverage target zone, financial deficit is a highly significant driver of actual leverage. Although, the speed of adjustment towards the optimal target is still high, a faster adjustment towards the target is outweighed by financial decisions about payouts and investments. This is especially true as the absolute value of the speed of adjustment may be misleading as a financial deficit can also (accidentally) increase the speed of adjustment which is why the difference in the speed of adjustment between inside and outside the target zone gives more robust indications about the influence of financial deficit on the actual leverage.

The results from the regressions therefore suggest the assumption that firms have leverage target zones with mainly non-leverage related dynamics inside the target zone and mostly

[39] The magnitude of the coefficient is somehow unexpected since from an economical perspective, an increase in financial deficit would still lead to an increase in leverage, no matter if above or below the target zone.

leverage related rebalancing incentives towards an optimal target when leverage falls outside this zone.

4.3 Do Credit Ratings Qualify as Borders for Leverage Target Zones?

The analysis from before has shown that the speed of adjustment varies significantly for firms depending on the fact if they are inside or outside a specific target zone. The borders of these target zones, so far, were set empirically. In a next step it should be further analyzed if firm's credit ratings may also qualify as such borders. In this context the speed of adjustment will be estimated for two different sub-samples including two different definitions of credit rating downgrades. First, an initial credit rating approach which defines all leverage ratios below the initial credit rating as outside the target zone and second, a downgrade approach which defines all leverage ratios after a credit rating downgrade as outside the target zone.

Table 9 gives an overview of the results from the two different credit rating regressions. The results are mainly in line with the observations from the empirical approach before. The regression using the initial credit rating dummy gives highly significant coefficients for both financial deficit and optimal leverage when inside the target zone. This again confirms the result that financial deficit and optimal leverage drive actual leverage if inside the target zone. When turning to the state of being outside the target zone, the results show that both, financial deficit as well as the speed of adjustment, change significantly. In particular, although financial deficit is still highly significant its coefficient drops from 0.1061 by 0.0347 to 0.0714 indicating that the economic impact of financial deficit declines when being outside the leverage target zone. This observation is completed by the speed of adjustment which increases from 0.4014 by 0.0301 to 0.4506 which is in line with the prediction made that optimal leverage is of greater importance when actual leverage falls outside the target zone.

The findings from the initial credit rating approach are confirmed by the back test using a downgrade approach. Even more, not only that the coefficient for financial deficit slightly decreases when actual leverage falls outside the target zone, the significant increase in the speed of adjustment is even stronger than before. Under the downgrade approach the speed of adjustment increases by 0.1327 indicating a significant switch of priorities when actual leverage falls outside the target zone.

Table 9: Leverage target zones based on a credit rating approach

The overview below represents an error correction model (ECM) using the difference in actual leverage as the dependent variable and optimal leverage (i.e. the fitted values from the first step regression) minus the lagged actual leverage as well as financial deficit as independent variables. The regression is run for two different sub-samples, namely the initial credit rating approach (left hand side) as well as the credit rating downgrade approach (right hand side). In more detail, column (1) and column (2) reports the results of the initial credit rating approach when being inside and outside the target zone respectively. Column (3) and column (4) show the results of the credit rating downgrade approach, again, when being inside as well as outside the target zone. Furthermore, the differences in the coefficients are presented (Δ). Since lagged leverage values and dummy variables of the empirical approach are used in the ECM, the number of observations differs from the initial sample of 32.895 firm year observations and the period decreases to 31 years. *, **, *** denote significance at the 10%, 5%, 1% confidence level.

	Initial Credit Rating Approach					**Credit Rating Downgrade Approach**				
	Inside Target Zone (1)		Outside Target Zone (2)			Inside Target Zone (3)		Outside Target Zone (4)		
	Coeff.	t-stat.	Coeff.	t-stat.	**Δ**	Coeff.	t-stat.	Coeff.	t-stat.	**Δ**
Constant	-0.0068***	-13.5838	0.0080***	11.5121	0.0148	-0.0063***	-14.4085	0.0164***	17.3430	0.0227
$LEV^{*}_{it} - LEV_{it-1}$	0.4205***	38.8304	0.4506***	33.0055	0.0301	0.3674***	41.5669	0.5001***	30.1563	0.1327
FD^{*}	0.1061***	13.9065	0.0714***	7.3728	-0.0347	0.0880***	12.8804	0.0872***	7.5921	-0.0008
R^2	0.4014		0.4084		0.0070	0.3569		0.4752		0.1183
Adjusted R^2	0.2872		0.3020		0.0148	0.2613		0.3122		0.0509
Log-likelihood	23,247		14,401		-8,846	29,055		8,840		-20,215
Prob(F-stat.)	0,0000		0,0000		0.0000	0.0000		0.0000		0.0000
Observations	17,296		1,904			21,794		8,201		
Fixed firm effects	Yes		Yes			Yes		Yes		
Fixed time effects	Yes		Yes			Yes		Yes		

Both credit rating approaches are therefore in line with the findings from the empirical approach. Although the magnitude of the change in the speed of adjustment is not as high as under the empirical approach it can be observed that as soon as there is a downgrade in the initial credit rating, financial deficit becomes significantly less important and optimal leverage is prioritized. Thus, it can be stated that firms credit rating may qualify as borders for optimal leverage target zones since they represent suitable structural breaks. The results also confirm the findings of Kisgen (2009) who finds that firms are actively targeting credit ratings instead of optimal leverage.

4.4 Robustness Check for Endogeneity

In the empirical analyses under chapter 4.2, the variable financial deficit is assumed to be exogenous. However, it is possible that financial deficit is determined endogenously. For example, it could be the case that managers target specific leverage levels and therefore adjust their investment and payout policy accordingly. Or put differently, it might be the case that firms respond to cash flow / earnings shocks via adjusting their investments rather than their capital. This would mean that financial deficit is at least partly determined by the leverage ratio of the firm which would cause a simultaneity problem in the applied regressions under equation (11) and (12) (see Byoun (2008)).

To capture this possible simultaneous relationship between financial deficit and leverage, the empirical results from chapter 4.2 are checked for its robustness. To avoid simultaneity, the same regressions are therefore run with financial deficit (as an explanatory variable) lagged by one period. There is no reason to assume that financial deficit from one period before is seriously impacted by the leverage ratio today which is why this representation should be able to account for any simultaneity problem.[40] The regression is therefore given by:

$$\Delta LEV_{it} = \alpha_0 + \beta_1 FD_{it-1}^{*} * D_{it}^{inside} + \beta_2 FD_{it-1}^{*} * D_{it}^{outside} + \delta_1 (LEV_{it}^{*} - LEV_{it-1}) * D_{it}^{inside} + \delta_2 (LEV_{it}^{*} - LEV_{it-1}) * D_{it}^{outside} + u_{it} \quad (20)$$

[40] Note that the introduction of a dynamic panel model may face serious econometric biases (see for example Flannery and Hankins (2013), Dang et al. (2015) or Zhou et al. (2014)) but any detailed consideration of these problems is out of the scope of this thesis.

Where FD^{*}_{it-1} is the financial deficit from one period before. This means that for example the leverage ratio of a firm in 2015 is regressed on the financial deficit from the same firm in 2014.

For each target zone approach (empirical approach, initial credit rating approach and downgrade approach) the difference in coefficients, t-statistic and R-squared between the regression using inside the target zone dummies (D^{inside}_{it}) and the regression using outside the target zone dummies ($D^{outside}_{it}$) is calculated and then compared to the differences obtained from the initial regressions (difference in differences). The comparison of the differences in the speed of adjustment and the R^2 works then as a robustness check of the results obtained under chapter 4.2.[41] The main results of this robustness check are depicted in Table 10.

The results from the robustness check in Table 10 support the conclusions derived from the results of the initial regression. The change of the speed of adjustment for all three different leverage target zone approaches is similar to the one observed under the initial regression. In all three cases, the switch from inside the target zone to outside the target zone leads to a significant increase in the speed of adjustment. The most significant increase can be seen for the empirical approach and the downgrade approach. The overall fit of the regression (R^2) follows the same direction. The differences between inside and outside the target zone regressions show the same sign and magnitude as the initial regression. However, the loading and magnitude of financial deficit differs remarkably when accounting for lagged financial deficit. This observation might be based on the fact that financial deficit itself fluctuates heavily from year to year. Thus, drawing any conclusion from it has to be treated with caution. The results from this analysis therefore give evidence for the robustness of the results found under chapter 4.2. Another approach to account for the endogeneity problem with financial deficit would be for example to examine a treatment dummy variable in form of an exogenous shock. In the context of the US firms sample at hand a change in state taxes may qualify as such an exogenous shock. Anyhow, a further examination of testing endogeneity lies beyond the scope of the current paper.

[41] Note that financial deficit highly depends on earnings and operating free cash flows and therefore might fluctuate quite heavily from one period to another. Thus, lagging financial deficit by one period might lead to significant changes in the factors loading and the factors significance. A comparison of these values with the initial regression therefore must be treated with caution.

Table 10: Robustness check for endogeneity

For each target zone approach (empirical approach, initial credit rating approach and downgrade approach) the regressions are split up into the initial regression as described under Equation (10) (left hand side of the table) and the robustness regression with lagged financial deficit as described under Equation (20) (right hand side of the table). The table then displays for each target zone approach the difference in coefficients, t-statistic and R-squared between the regression using inside the target zone dummies ($\boldsymbol{D_{it}^{inside}}$) and the regression using outside the target zone dummies ($\boldsymbol{D_{it}^{outside}}$). The differences are calculated by subtracting the values from the inside the target zone regression from the values from the outside the target zone regression. For example, the first value 0.1237 means that the coefficient for the constant increases by 0.1237 when switching from inside the target zone to outside the target zone under the empirical approach. Note that only the above target difference is shown from the empirical approach.

Approach	**Variable**	**Difference between variables inside and outside the target zone**					
		$\Delta LEV_{it} = \beta_1 FD_{it}^{*} + \delta_1(LEV_{it}^{*} - LEV_{it-1}) + u_{it}$			$\Delta LEV_{it} = \beta_1 FD_{it-1}^{*} + \delta_1(LEV_{it}^{*} - LEV_{it-1}) + u_{it}$		
		Δ Coefficient	**Δ t-statistic**	**Δ R-squared**	**Δ Coefficient**	**Δ t-statistic**	**Δ R-squared**
Empirical Approach	C	0.1237	88.2774	0.4004	0.1249	98.9968	0.4047
	FD^{*}	-0.0237	-6.1815		0.0052	0.2005	
	$LEV_{it}^{*} - LEV_{it-1}$	0.4123	2.2830		0.4231	7.1455	
Initial Credit Rating Approach	C	0.0148	25.0960	0.0070	0.0143	22.3162	0.0193
	FD^{*}	-0.0347	-6.5337		0.0069	0.8001	
	$LEV_{it}^{*} - LEV_{it-1}$	0.0301	-5.8249		0.0256	-6.2835	
Downgrade Approach	C	0.0227	31.7515	0.1183	0.0238	30.3216	0.1242
	FD^{*}	-0.0008	-5.2883		0.0031	0.2651	
	$LEV_{it}^{*} - LEV_{it-1}$	0.1328	-11.4106		0.1398	-11.5225	

5 Conclusion

The following chapter provides an overview of the main findings of the paper in order to answer the research questions stated under chapter 1. Furthermore, this chapter completes the paper in regards to its limitations as well considerations for further research.

5.1 Main Findings

a) Are firm's capital structures stable over longer periods of time?

Both, the "narrow band approach" as well as the "bucket approach" show that firm's capital structures are not stable over time. A non-trivial minority of firms keeps their leverage in a stable band for more than 10 years and practically no firm has permanently stable regimes. The data shows that none of the firms keep their leverage ratios in a narrow band of width 0.050 around its mean for more than 10 years and only 0.3% (2.8%) of the firms keep their leverage ratio in a somehow broader bandwidth of 0.100 (0.200) for more than 15 years. In contrast, instability in firm's leverage is substantial and pervasive, with 65.6% of firms appearing in three or four different leverage quartiles over the last 20-years in the sample. Applying these two approaches, it can be shown that leverage heavily fluctuates over time and the static trade-off theory therefore should be rejected. By way of conclusion, the two approaches do not provide any evidence that corporate capital structure tends to be stable.

b) Are long-term mean reverting tendencies outweighed by short-term transitory factors as long as leverage is within a certain acceptable target zone?

By regressing standard firm characteristics on firm's leverage ratios, it can be shown that trade-off theory and pecking order hypothesis are only partially relevant in explaining leverage evolution. Some factors like growth opportunities, business risk and tangibility of assets are statistically insignificant, the factor loading for size, profitability and non-interest tax shields clearly contradicts trade-off theory. In fact, unobserved heterogeneity in the cross-section explains most of the variation in leverage.

Contrary, a factor that seems to have a significant impact on firm's capital structure is financial deficit. A two-step least square approach shows that financial deficit, as a short-term transitory factor, may at least partly outweigh long-term adjustment effects towards an optimal leverage target. It can be shown that the impact of financial deficit significantly differs if actual leverage is inside or outside a specific target zone. Three different approaches robustly predict that the coefficient for financial deficit is decreased and the speed of adjustment is significantly increased by up to 41% if actual leverage falls outside the target zone. The results are even robust when accounting for a possible endogeneity problem between financial deficit and actual leverage. This finding also indicates that firm's capital structure may be largely determined as a residual of other financial decisions as long as it stays in a specific target zone and that leverage related rebalancing incentives towards an optimal target only fully takeover when actual leverage falls outside this target zone.

Thus, it can be concluded that firms do not meticulously manage leverage to ensure capital structure optimality as long as actual leverage is within a certain target range. Even more the data suggest that capital structure decisions are mainly determined as a residual of other financial decisions about payout and investments. But, the adjustment towards a leverage target becomes more important in case leverage is outside its optimal target zone.

c) Do firms credit ratings qualify as border as such target zones?

The application of credit rating related firm dummies to the data shows that firm's credit ratings have a significant impact on the evolution of leverage. It can be shown that credit rating downgrades qualify as structural breaks indicating a move outside of the leverage target zone. The results of an error correction model using dummy variables for a credit rating downgrade show that a downgrade leads to a higher speed of adjustment towards a certain optimal leverage target. This observation is in line with empirical findings made by Kisgen (2009) and also shows that credit ratings may qualify as an input factor for the definition of leverage target zones. Even more it confirms the assumption that firms are targeting credit ratings and actual leverage is of second-order importance.

Thus, Myers (1984, p. 575) answer to the question "how do firms choose their capital structures?" – "We don't know", can be partially revised. As a matter of course, it is still not fully empirically evaluated what really drives leverage but the result from the thesis at hand can add valuable extensions. First, financial deficit at least partially determines leverage in the short-run, as long as leverage stays within an acceptable target zone. Second, credit ratings qualify as borders for such target zone and force the attention of firms towards leverage if downgraded. Overall, the results of the thesis show that US firm's corporate capital structure is not chosen deliberately, instead, as long as leverage stays within an acceptable target zone, which can be determined by credit rating downgrades, financial deficit as a short-term transitory factor (mainly) outweighs the adjustment towards an optimal leverage target.

5.2 Limitations and Further Research

As already mentioned in chapter 3.1, the sample data underlying the present paper is restricted to US companies included in the annual Compustat – Daily tape between 1985 and 2016 with an active S&P long-term issuer credit rating, excluding financial firms as well as regulated utilities. Even though this represents a large sample of yearly firm observations, any conclusions drawn in this paper are solely based on this particular sample (out-of-sample robustness). Especially the restriction on the active credit rating crates a focus towards large and capital market orientated firms, which might not hold for non-listed (private), small- and medium sized US firms which are not covered accordingly.

As already mentioned in chapter 4.4, all regressions including financial deficit as an explanatory variable may suffer an endogeneity problem. Although the robustness checks conducted in this thesis should avoid any significant bias within the results, the simultaneity between financial deficit and actual leverage can bear some further implications not fully covered by this thesis.

The variable financial deficit that works as a proxy for payout and investment decisions does by way of construction exclude any implications from stock repurchases or any other payouts different to dividends. As Farre-Mensa et al. (2014) point out in their analysis the relevance of these other forms of payouts increased over the last decades which might significantly change the results and implications of the analyses conducted.

The subject, methodologies and approaches applied at the paper at hand offers a variety of future research opportunities. By way of example, more factors can be added in order to explain optimal leverage, i.e. market wide specific factors such as GDP, interest rates or inflation. Moreover, it might be also of interest to analyze the same setting using market value of leverage rather than BV of leverage. Whereby this thesis focuses on changes in credit ratings as an acceptable border of the target zone, it would be worthwhile to define the border instead by other characteristics like capital access considerations, credit market conditions, stock market timing, valuation disagreement, managerial attitude, transaction costs, violations of covenants or information asymmetries.

Building on the limitations mentioned above, it would be of interest to back test the robustness of the results of this paper for other countries. One could also further analyze the impact of stock repurchases as part of the payout policy of a firm in the relation between financial deficit and leverage. The endogeneity problem could be further examined with a treatment dummy variable in form of an exogenous shock. In the context of the US firm sample at hand a change in state taxes may qualify as such an exogenous shock.

As this thesis finds that payout and investment have a significant effect on the evolution of firm's capital structure, it would be of further interest to analyze different evolutions for dividend and non-dividend payers. Furthermore, as leverage gets of first-order importance if it falls outside a specific target zone, the responsive reduction in investment could be analyzed in a broader sense by an analysis of the impact on the global economy.

6 Appendix

Appendix 1: Definition of financial deficit

The table below gives an overview of the construction of the variable “financial deficit” under the different cash flow statements in Compustat (format 7 and format 1-3). The left side of the respective format column details how the positions are reported under the respective format. For example, the cash flow statement under format 7 is split up into the three categories “Operating Activities”, “Investing Activities” and “Financing Activities” whereas the cash flow statement under format 1-3 is split up into the two categories “Sources of Funds” and “Uses of Funds”. The right side of the respective format column details which positions from the respective format are used to calculate the five underlying categories of financial deficit: “Net Investments”, “Change in Working Capital”, “Cash Dividends”, “Operating Free Cash Flow” and “Exchange Rate Effects”.

Format 7				**Format 1-3**			
	Cash Flow Statement		**Calculation of Financial Deficit**		**Cash Flow Statement**		**Calculation of Financial Deficit**
	Equity in net loss (earnings)	-	Sale of PP&E		Equity in net loss (earnings)	-	Sale of PP&E
+	Income before extraordinary items	-	Sale of investments	+	Income before extraordinary items	-	Sale of investments
+	Extraordinary items and discontinued operations	+	Increase in investments	+	Extraordinary items and discontinued operations	+	Increase in investments
+	Depreciation and amortization	+	Capital expenditures	+	Depreciation and amortization	+	Capital expenditures
+	Deferred taxes	+	Acquisitions	+	Deferred taxes	+	Acquisitions
+	Sale of PP&E and sale of investments – loss (gain)	+	Cash and cash equivalents – increase (decrease)	+	Sale of PP&E and sale of investments – loss (gain)	+	Cash and cash equivalents – increase (decrease)
+	Funds from operations - other	+	Investing activities - other	+	Funds from operations - other	=	**Net Investments**
+	Accounts receivable – decrease	=	**Net Investments**	=	Funds from Operations		
+	Inventory – decrease			+	Sale of PP&E	=	**Change in Working Capital**
+	Accounts payable and accrued liabilities – decrease	-	Accounts receivable – decrease	+	Sale of common and preferred stock		
+	Income taxes – accrued – increase	-	Inventory – decrease	+	Sale of investments	=	**Cash Dividends**

+	Asset and liabilities – other (net change)
=	**Operating Activities**
	Sale of PP&E
+	Sale of investments
-	Increase in investments
-	Capital expenditures
-	Acquisitions
+	Short-term investments – change
+	Investing activities – other
=	**Investing Activities**
+	Sale of common and preferred stock
+	Long-term debt – issuance
-	Long-term debt – reduction
-	Purchase of common and preferred stock
-	Cash dividends
+	Changes in current debt

-	Accounts payable and accrued liabilities – decrease
-	Income taxes – accrued – increase
-	Asset and liabilities – other (net change)
=	**Change in Working Capital**
=	**Cash Dividends**
+	Equity in net loss (earnings)
+	Income before extraordinary items
+	Extraordinary items and discontinued operations
+	Depreciation and amortization
+	Deferred taxes
+	Sale of PP&E and sale of investments – loss (gain)
+	Funds from operations - other
=	**Operating Free Cash Flow**
=	**Exchange Rate Effects**

+	Long-Term debt – issuance
+	Sources of funds – other
=	**Sources of Funds**
	Increase in investments
+	Long-term debt – reduction
+	Purchase of common and preferred stock
+	Cash dividends
+	Capital expenditures
+	Acquisitions
+	Uses of funds – other
=	**Uses of Funds**
	Sources of Funds
-	Uses of Funds
=	**Change in Working Capital**

+	Equity in net loss (earnings)
+	Income before extraordinary items
+	Extraordinary items and discontinued operations
+	Depreciation and amortization
+	Deferred taxes
+	Sale of PP&E and sale of investments – loss (gain)
+	Funds from operations - other
+	Sources of funds – other
+	Uses of funds – other
=	**Operating Free Cash Flow**
=	**Exchange Rate Effects**
	Net Investments
+	Change in Working Capital
+	Cash Dividends
-	Operating Free Cash Flow

+ Financing activities - other	Net Investments		+ Exchange Rate Effects
= **Financing Activities**	+ Change in Working Capital		= **Financial Deficit**
Operating Activities	+ Cash Dividends		
+ Investing Activities	- Operating Free Cash Flow		
+ Financing Activities	+ Exchange Rate Effects		
+ Exchange Rate Effects	= **Financial Deficit**		
= **Change in Cash and Cash Equivalents**			

Appendix 2: Standard & Poor's Long-Term Domestic Issuer Credit Rating

Rating	Description
AAA	The highest issuer credit rating assigned by Standard & Poor's, the AAA rating indicates an extremely strong capacity of the obligor to meet its financial commitments.
AA+	AA indicates a very strong capacity to meet financial commitments, and differs from the highest rating only in small degree.
AA	AA indicates a very strong capacity to meet financial commitments, and differs from the highest rating only in small degree.
AA-	AA indicates a very strong capacity to meet financial commitments, and differs from the highest rating only in small degree.
A+	A indicates a strong capacity to meet financial commitments, but it is somewhat more susceptible to adverse effects of changes in circumstances and economic conditions than obligors in higher-rated categories.
A	A indicates a strong capacity to meet financial commitments, but it is somewhat more susceptible to adverse effects of changes in circumstances and economic conditions than obligors in higher-rated categories.
A-	A indicates a strong capacity to meet financial commitments, but it is somewhat more susceptible to adverse effects of changes in circumstances and economic conditions than obligors in higher-rated categories.
BBB+	BBB indicates an adequate capacity to meet financial commitments. However, adverse economic conditions or changing circumstances are more likely to lead to a weakened capacity of the obligor to meet its financial commitments.
BBB	BBB indicates an adequate capacity to meet financial commitments. However, adverse economic conditions or changing circumstances are more likely to lead to a weakened capacity of the obligor to meet its financial commitments.
BBB-	BBB indicates an adequate capacity to meet financial commitments. However, adverse economic conditions or changing circumstances are more likely to lead to a weakened capacity of the obligor to meet its financial commitments.
BB+	BB indicates less vulnerability in the near-term than other lower-rated obligors. However, the obligor faces major ongoing uncertainties and exposure to adverse business, financial, or economic conditions which could lead to an inadequate capacity to meet its financial commitment.
BB	BB indicates less vulnerability in the near-term than other lower-rated obligors. However, the obligor faces major ongoing uncertainties and exposure to adverse business, financial, or economic conditions which could lead to an inadequate capacity to meet its financial commitment.
BB-	BB indicates less vulnerability in the near-term than other lower-rated obligors. However, the obligor faces major ongoing uncertainties and exposure to adverse business, financial, or economic conditions which could lead to an inadequate capacity to meet its financial commitment.

B+	B is more vulnerable than a "BB"-rated obligor, but the obligor currently has the capacity to meet its financial commitments. Adverse business, financial, or economic conditions will likely impair the obligor's capacity or willingness to meet its financial commitments.
B	B is more vulnerable than a "BB"-rated obligor, but the obligor currently has the capacity to meet its financial commitments. Adverse business, financial, or economic conditions will likely impair the obligor's capacity or willingness to meet its financial commitments.
B-	B is more vulnerable than a "BB"-rated obligor, but the obligor currently has the capacity to meet its financial commitments. Adverse business, financial, or economic conditions will likely impair the obligor's capacity or willingness to meet its financial commitments.
CCC+	CCC indicates that the obligor is currently vulnerable and is dependent upon favorable business, financial, and economic conditions to meet its financial commitments.
CCC	CCC indicates that the obligor is currently vulnerable and is dependent upon favorable business, financial, and economic conditions to meet its financial commitments.
CCC-	CCC indicates that the obligor is currently vulnerable and is dependent upon favorable business, financial, and economic conditions to meet its financial commitments.
CC	Currently highly vulnerable.
D	Default. Standard & Poor's believes the default will be a general default and the obligor will fail to pay all or substantially all of it obligations as they come due.
SD	Selective Default. Standard & Poor's believes the obligor has selectively defaulted on a specific issue but will continue to meet its obligations on other issues.

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