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Abbreviations

CF	corporate finance
DEF	deficit
DIV	dividend
E.g.	for example
Etc.	et cetera
EU	European Union
EUR	Euro
Ext. Fin.	external financing
GDP	gross domestic product
INV	investment
IPO	initial public offering
LSALE	log sales
MTOB	market-to-book
PO	Pecking Order
PROF	profitability
SSM	Shyam-Sunder and Myers
TA	target-adjustment
TANG	tangibility
US	United States
USA	United States of America
USD	United States Dollar
WC	working capital

Introduction and Motivation

The understanding of decisions concerning capital structure raises the following questions for many authors in their research: “How do firms choose their capital structure?” (Lemmon et al. 2008, p. 1575), “Does the choice of capital structure affect the value of the firm?” (Berk 2014, p. 473), “What proportion of the deficit should be financed by borrowing rather than by an issue of equity?” (Brealey et al. 2006, p. 378), and “How can we move still closer to ultimately providing a more complete understanding of capital structure decisions?” (Lemmon et al. 2008, p. 1575). In terms of capital structure to answer these questions researchers mainly focus on competitive theories that differentiate between or favour one of the theories, which describe their data more convincingly.

This master’s thesis presents the pecking order theory and other related capital structure theories in detail like ones by Modigliani and Miller in addition to the static and dynamic trade-off theories. This thesis focuses on the study of Frank and Goyal (2003, p. 217), which is entitled “Testing the pecking order theory of capital structure”. The aim of the study was to determine whether and how the pecking order theory is implemented by publicly traded US firms between 1971 and 1998. The results show for the 768 firms researched that the smaller firms do not follow the pecking order theory, however, larger firms follow the theory more closely but their support declines over time and “equity becomes more important” (Frank and Goyal, 2003, p. 241).

The goal of my master’s thesis is to understand whether the pecking order theory is applicable to European firms. One hundred randomly selected European firms were empirically tested from 2007 to 2017, and the aim of my analysis was to show if and how the pecking order theory is implemented. Since the US and European markets are poles apart, it is expected that European firms tend to follow the pecking order theory.
The paper by Frank and Goyal (2003) is followed in my analysis in which three similar empirical models are presented. The empirical results of European firms support the pecking order theory. It was found that larger companies mainly

finance their deficit using debt, and only rarely issue equity. On the other hand, the empirical support of smaller companies is not so strong. Furthermore, the empirical results of the European companies show that when the analysis was conducted also plays a major role. Support for the pecking order theory declines over the analysed period of time, which could be explained by changes in the financial sector during the financial crisis in Europe.
The goal of the present thesis is to provide an overview concerning capital structure theories; namely their implementation focusing on the pecking order theory and a potential comparison and discussion of the differences between the US and European markets in the light of my empirical results.

The structure of this paper is as follows. In the first section an overview of capital structure theories in the literature of corporate finance is presented. This overview focuses on the previous empirical findings with regard to the pecking order theory by Frank and Goyal (2003) and Shyam-Sunder and Myers (1999), in addition to other related empirical results concerning capital structure theories like the static and dynamic trade-off theories by Shyam-Sunder and Myers (1999), Leary and Roberts (2005) as well as Lemmon et al. (2008). The second section of my thesis presents the empirical hypothesis, models and analysis. First, two empirical models by Shyam-Sunder and Myers (1999) which show that deficit financing is related to decisions concerning the change in debt of companies are presented, followed by a conventional leverage model by Rajan and Zingales (1995) that expounds on other related components that influence changes in net debt. The analysed data set is described in the third section. In the fourth section the empirical results are presented. The differences between the US and European markets are compared and discussed in section five and the conclusions are presented in section six.

1. Overview of Capital Structure Theories in the Literature of Corporate Finance

Let me introduce the overview of capital structure theories with a short quote from Chandra (2014, p. 463): “Capital structure is essentially concerned with how the firm decides to divide its cash flows into two broad components, a fixed component that is earmarked to meet the obligations toward debt capital and a residual component that belongs to equity shareholders”. Competitive theories try to explain why the decisions concerning the capital structure of firms should be the focus of research. Additionally, the majority of managers are concerned if and how this influences the value of their firm (Lemmon et al. 2008).

1.1. Modigliani and Miller’s Capital Structure Theories

The I. Modigliani and Miller’s proposition concerning capital structure is as follows: “The average cost of capital to any firm is completely independent of its capital structure and equal to the capitalization rate of the pure equity stream of its class” (Modigliani and Miller, 1958, p. 268).

The theory by Modigliani and Miller (1958) describes a perfect and efficient market, where there are no taxes and shareholders can borrow on the same terms. Moreover, neither financial distress costs nor agency problems are present and symmetric information exists between the parties (Siegel et al. 2000, p. 326). In a perfect market the terms of the assets, which are similar respectively, are identical and must be handled at the same price and under matching conditions. The same applies if two companies are considered, one of higher and the other of lower leverage (Bengtsson and Wagner, 2013). According to Modigliani and Miller (1958) if these two firms were unlevered, they would provide identical returns on equity as they do on leverage (Bengtsson and Wagner, 2013). Under these assumptions, Modigliani and Miller (1958, p. 268) claim that the capital structure is “irrelevant” and the value of a firm is “independent” from how a firm determines their debt-to-equity ratio. However, it

must be taken into consideration that the first proposition of Modigliani and Miller's capital structure theory assumes perfect market conditions, which is a useful basis for further analysis of other advanced capital structure theories.

1.2. Trade-off Theory

By putting the perfect capital market and its perfect conditions in comparison with the capital structure of Modigliani and Miller aside, the trade-off theory assumes potential benefits of debt with regard to the capital structure of a firm, which originate from the tax benefits of interest payments. "The deductions that result in a reduction of income tax payments. The tax shield is calculated by multiplying the deduction by the tax rate itself" (Bengtsson and Wagner, 2013, p. 5; Siegel et al. 2000, p. 438). In the light of this theory, firms that maximize their overall value balance their debt-to-equity ratio such that the marginal costs and marginal benefits of debt financing, as well as the precise values of interest tax savings and financial distress costs of debt are balanced, facilitating the optimal leverage of a firm (Shyam-Sunder and Myers, 1999; Leary and Roberts, 2005). To be more exact the static trade-off theory predicts the value of a levered firm which is equal to the value of an unlevered firm, in addition to the present value of the tax shields (Modigliani and Miller, 1963; Miller and Scholes, 1978; Defngelo and Masulis, 1980), but deducts the present value of the expected bankruptcy and financial distress costs (Myers, 1977) as well as the present value of the agency costs (Jensen, 1986; Fama and Miller, 1972; Harris and Raviv, 1991).

1.2.1. Static Trade-off Theory

"The static trade-off theory of optimal capital structure" by Shyam-Sunder and Myers (1999, p. 220) is illustrated in Figure 1; the debt volume is represented by the horizontal axis and the market value of the firm by the vertical axis.

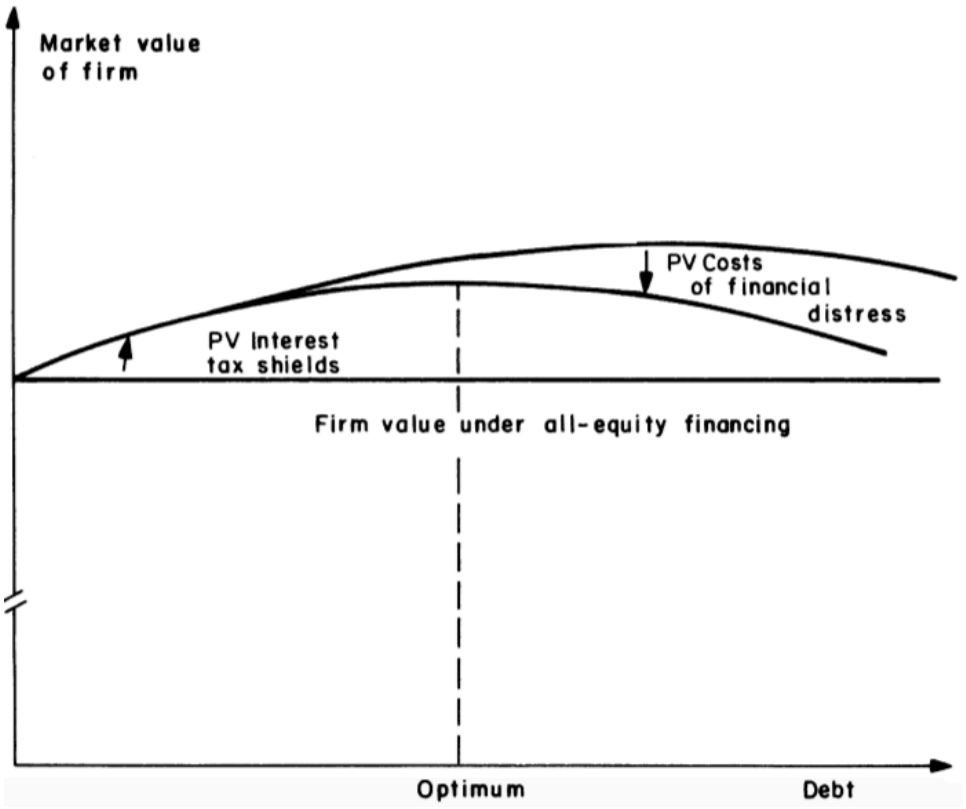

Figure 1: "The static trade-off theory of optimal capital structure" (Shyam-Sunder and Myers 1999, p. 220)

On the one hand, by assuming a firm that is financed by equity alone in the absence of debt financing, the value of this firm will be unaffected. On the other hand, by assuming a firm, which starts to issue debt, the value of a second firm will increase due to tax benefits originating from the interest payments. In the light of the contexture, the question concerns whether it is necessary for firms to finance themselves by debt alone, thereby maximising their value? In short, the answer is no because debt issuance does not only inhere in benefits but also costs. Eventually the costs of financial distress will exceed that of the interest tax shields and the value of the firm will decrease. The trade-off theory assumes that leverage within a capital structure is beneficial until the optimal capital structure is achieved (Shyam-Sunders and Myers, 1999). "A value-maximizing firm would equate benefit and cost at the margin, and operate at the top of the value curve (…). The curve would top out at relatively high debt ratios for safe, profitable

firms with plenty of taxes to shield and assets whose values would escape serious damage in financial distress" (Shyam-Sunder and Myers, 1999, p. 220).

Shyam-Sunder and Myers (1999) not only tested the pecking order theory, but also the static trade-off theory separately and together against the pecking order theory. Empirically, their results favour the pecking order model over a target-adjustment model based on the static trade-off model. Methodologically, checks are presented in order to determine the statistical power of the tests against their alternative hypotheses. The test results show that the pecking order theory is capable of rejecting alternative trade-off hypotheses, but not the static trade-off theory, even if it is wrong (Shyam-Sunder and Myers, 1999).

In terms of the analysis, 157 firms were included in the tests by Shyam-Sunder and Myers (1999) between 1971 and 1989. The pecking order theory will be later presented later in Equation 2 and with regard to the static trade-off theory the following target-adjustment model was adopted:

$$\Delta DEBT_{it} = a + \beta_{TA}(DEBT^*_{it} - DEBT_{it-1}) + e_{it} \qquad (1)$$

The null hypothesis is as follows: $a = 0$ *and* $0 < b_{TA} < 1$

where $DEBT^*_{it}$ denotes the target debt level for firm *i* at time *t* (the target of the firms is generally unobservable, for that reason usually the historical mean of the debt ratio is used), the intercept *a* is predicted to be zero and β_{TA} represents the target-adjustment coefficient which according to the hypothesis, should be between 0 and 1. The difference between the target debt level for firm *i* at time *t* and the actual debt level for firm *i* at time *t-1* should be positive with regard to the changes in debt (Shyam-Sunder and Myers, 1999).

The main empirical results by Shyam-Sunder and Myers (1999) show that if external funding is required in the pecking order theory, firms prefer to issue debt and the predicted coefficients are true. First, tests were run independently, and it was shown that the simple pecking order model explains the data much more precisely than the target-adjustment model based on the static trade-off theory.

Second, the two models were tested together and both performed worse than separately. A notable but still statistically significant decrease in the coefficients was observed. Third, the statistical relevance of the pecking order and target-adjustment models was tested by a Monte Carlo simulation concerning the generation of hypothetical data to fit to real and simulated data of debt issues. On the one hand, the results showed that the pecking order model performed well using actual data, but poorly using the simulated data based on the specifications of the target-adjustment model. The pecking order theory is rejected by some alternative hypotheses. On the other hand, the results concerning the specifications of the target-adjustment model are identical when the actual data and simulated specifications of the pecking order model are used, which must be incorrect because in this case the target-adjustment model is not rejected by alternative hypotheses (Shyam-Sunder and Myers, 1999).

Overall, Shyam-Sunder and Myers (1999) determined that the pecking order theory performed strongly, which suggests that firms act and use debt financing not only on a short-term basis, but usually have plans to finance their financing deficits by issuing debt. Even though it would be suitable, Shyam-Sunder and Myers (1999) pointed out that managers are probably not interested in achieving an optimal debt ratio as in the static trade-off theory. Therefore, Shyam-Sunder and Myers (1999) identified more convincing reasons to favour the pecking order theory over the target-adjustment model with regard to their data. Still some caveats remain, namely whether or not the pecking order theory would perform equally as well if growing companies invested in intangible assets, as the models presented above are very simple in the absence of specifications. Shyam-Sunder and Myers (1999) suggested options for further research as did Jalilvand and Harris (1984) and Fischer et al. (1989).

1.2.2. Dynamic Trade-off Theory

The static trade-off theory is challenging for firms, because shocks can push them away from their target debt-to-equity ratio. The dynamic trade-off theory

investigates how and when firms react to such shocks. Rebalancing the capital structure to suit the optimal target could be costly for firms who may not immediately react to shocks that push them away from their target. The dynamic trade-off theory states that “firms do not simply have an optimal level of leverage but an optimal range in which they” can maintain a certain level where the costs of rebalancing fall short of the benefits of rebalancing (Leary and Roberts 2005, p. 1).

Leary and Roberts (2005) were inspired by the paper of Fischer et al. (1989) and presented the consistency of corporate financial policy according to the trade-off theory including adjustment costs. Leary and Roberts (2005, p. 2) found that “firms are significantly more likely to increase (decrease) leverage if their leverage is relatively low (high), if their leverage has been decreasing (accumulating), or if they have recently decreased (increased) their leverage”.

According to Fischer et al. (1989) this dynamic rebalancing implies that firms behave in a similar way to the trade-off theory. If leverage remains within a target range, firms stay inactive should their capital structure be taken into account and rebalancing does not continuously occur. Rebalancing adjustments are only made when the leverage falls outside the specific target range. In spite of such trade-off behaviour, shocks have a stabilising effect on the leverage. Leary and Roberts (2005) demonstrated that firms control large positive shocks of equity by issuing debt and large negative shocks of equity by repaying debt, as a result the impacts on the leverage are rebalanced within a few years.

First, Leary and Roberts (2005) first described the effects of shocks on the firm’s leverage when adjustment costs are present. Second, the dynamic duration model is presented to understand the actual leverage adjustments. Third, the results support the rebalancing mechanism of firms and are consistent with a dynamic trade-off theory. Leary and Roberts (2005) found that firms do not immediately respond to equity issuances and equity price shocks, rather leverage rebalancing occurs within the following one to four years. The rebalancing is only appropriate if its benefits exceed its costs (Leary and Roberts, 2005).

Leary and Roberts (2005) also agreed with the pecking order theory that, should it be available, firms are more likely to use internal cash rather than external financing. Only in the event of significant investment needs are external funds used. As far as decision-making is concerned, the costs of asymmetric information may also play a major role for firms by following a dynamic rebalancing strategy. Leary and Roberts (2005) focused mainly on rebalancing behaviour, however, trade-off and pecking order behaviours were indistinguishable.

Researchers have also tested more plausible theories in their papers, for example, Shyam-Sunder and Myers (1999) tested the pecking order and static trade-off theories. A brief overview and comparison between research by Frank and Goyal (2003) and Shyam-Sunder and Myers (1999) is presented in Table 1.

Table 1: Comparison of papers by Frank and Goyal (2003) and Shyam-Sunder and Myers (1999)

	Shyam-Sunder and Myers (1999)	Frank and Goyal (2003)
Goal	• Test the pecking order theory • Test the static trade-off theory • Test them separately and together • Test the reliability of both theories	• Test the pecking order theory • With regard to corporate leverage, a broad cross-section is present
Data	Publicly traded American firms between 1971 and 1989	Publicly traded American firms between 1971 and 1998
Sample	157 firms	768 firms
Method	• Results of net and gross debts issued as well as changes in the debt ratio were reported separately. • The deficit financing and statistical influence were tested against alternative hypotheses that concern financing behaviour.	• Results of net and gross debts issued as well as the change in the debt ratio were reported separately. • Deficit financing and conventional leverage were tested.
Results	• Strong support for the pecking order theory. • Managers seem not to be interested in achieving a target debt level. • The pecking order theory is favoured over the target-adjustment model. • Alternative hypotheses rejected in terms of the pecking order theory but not the target-adjustment model.	• No support for the pecking order theory. • More small firms were publicly traded during the 90's than the 70's, the change in the average over this period of time detracts from the pecking order. • Support declines, even for large firms, over time. "Equity becomes more important" (Frank and Goyal 2003, 241)

1.3. Pecking Order Theory

In contrast to the capital structure theory by Modigliani and Miller, which assumes that neither taxes nor tax benefits are recognised, the trade-off theory, which defines an optimal leverage, includes the identification of taxes and the tax benefit of interest payments (Shyam-Sunders and Myers, 1999). The interest tax shields and the financial distress costs are of secondary importance in the pecking order theory by Myers and Majluf (1984). There is no defined optimal debt-to-equity ratio; “changes in debt ratios are driven by the need for external funds, not by any attempt to reach an optimal capital structure” (Shyam-Sunders and Myers, 1999, 221). Furthermore, if firms produce insufficient earnings or internal cash, they prefer to issue debt rather than equity (Brealey et al. 1995).

Firms finance themselves first by funds that they generate within their organization, retained earnings and cash, which signal that a firm generates a sufficient cash flow. When firms are in need of more money, for example, to finance a new project, investments, dividend payments, expenditures or other costs, the pecking order theory states that firms will choose debt over equity. On the one hand debt signals an imbalance in terms of internal cash flow, but on the other hand a low risk of future financial distress. The pecking order theory takes the adverse selection problem into consideration, namely that there is a lack of symmetric information prior to a deal between two parties and the adverse selection risk premium is higher with regard to equity rather than debt. Low- and high-growth firms tend to have more serious adverse-selection problems than those that also face large information asymmetries (Frank and Goyal, 2003).

This present work mainly focuses on the paper “Testing the Pecking Order Theory of Capital Structure” by Frank and Goyal (2003, p. 217), which tests the pecking order theory of capital structure. Their study shows to what extent the pecking order theory of capital structure was implemented by 768 public US firms between 1971 and 1998. Frank and Goyal (2003) were motivated by the findings of Shyam-Sunder and Myers (1999); their model states that “the financing deficit should normally be matched dollar-for-dollar by a change in

corporate debt" Frank and Goyal (2003, p. 218). In the empirical analysis, Shyam-Sunder and Myers (1999) identify strong statistical result of the pecking order theory from their sample of 157 firms over the researched period between 1971 and 1989. Frank and Goyal (2003) seek to understand whether or not the pecking order theory is broadly applicable.

First, the paper by Frank and Goyal (2003) first presents a series of checks concerning the significance of external financing with regard to the overall financing activities of firms, for example, bonds and equity issues. Second, the paper analyses several implications of the pecking order theory. The empirical model by Shyam-Sunder and Myers (1999) is tested in two ways with both an aggregated and disaggregated model. Following this it proceeds to test a conventional leverage model by Rajan and Zingales (1995), which includes other related components that influence changes in debt. These statistical models are presented in more detail in Section 2. Finally, the paper discusses the results and findings of their empirical analysis to determine whether or not the pecking order theory is broadly applicable (Frank and Goyal, 2003).

To test the pecking order theory, Frank and Goyal (2003) took the data from cash flow statements of Compustat funds, chose the same time period of between 1971 and 1989 as Shyam-Sunder and Myers (1999), and extended it until 1998 for their sample of 768 publicly traded American firms. Financial firms, regulated utilities, as well as firms during mergers and missing book values were excluded from the base dataset. Frank and Goyal (2003, p. 230) presented the average ratios of "financing deficit to net assets, net debt issued to net assets and net equity issued to net assets" between 1971 and 1998. In the light of the average book values, the correlation between net equity and deficit financing is 0.80, while between net long-term debt and deficit financing it is 0.48, which disagree with the previous expectations of the pecking order theory, where financing deficit should match one-to-one with the net-debt issuance (Frank and Goyal, 2003).

Frank and Goyal (2003) were the first to report a regression analysis with regard to an aggregated model during the same period of time between 1971 and 1989

using the same reporting approach as Shyam-Sunder and Myers (1999). Net-debt and gross-debt issuances in addition to changes in debt ratios were reported separately. While Shyam-Sunder and Myers (1999) identified strong pieces of evidence of the pecking order theory, in terms of gross-debt issuance the pecking order coefficient was 0.85 with R^2 equal to 0.86. Frank and Goyal (2003) reported an estimated pecking order coefficient for the aggregated model of 0.75 with an R^2 of 0.71. In the case of net debt issued, Frank and Goyal (2003) identified strong evidence of the pecking order theory, but in another case that focused on gross debt and changes in debt ratio their results are not sources of convincing evidence.

Frank and Goyal (2003, p. 231) also conducted an analysis of the "broader population", where gaps exist in the reporting data. On average such firms with "gaps permitted in the reporting data" possess half the book value of assets than in the sample of 768 firms with "no gaps permitted in the reporting data". Firms possessing higher book values of assets probably issue more debt than equity. The results of the broader population when the same aggregated model was run yielded an estimated coefficient concerning the financing deficit of 0.28 and an R^2 of 0.27, which do not strongly support the pecking order theory (Frank and Goyal, 2003).

Frank and Goyal (2003) were interested in determining whether or not the period of time matters, therefore, they extended that used by Shyam-Sunder and Myers (1999) by nine years from 1989 to 1998. The criteria of continuous reporting were relaxed to examine whether the results are dependent on the period of time analysed by requiring that reported data is continuous with regard to cash flow and funds. The results show that the period of time plays a major role, because the estimated coefficients and R^2's are less even for firms with no reporting gaps. Frank and Goyal (2003) concluded that during the extended period of time firms issued more equity and support in favour of the pecking order theory declined in the 1990's.

Tests of the pecking order theory for sub-samples of small and large firms are also showed by Frank and Goyal (2003). Due to adverse selection, corporate

insiders and the market are distinguishable because of the information asymmetry between the parties. Probably, for small- and high-growth firms this asymmetry is greater than for larger firms. The results show that large firms agree more strongly with the pecking order theory, in contrast the pecking order theory is rejected by small firms. Frank and Goyal (2003) analysed the strictly positive dividend paying firms separately and firms with moderate leverage were also rejected.

Frank and Goyal (2003) go on to report their second regression analysis with regard to the disaggregated model over the same period of time from 1971 to 1989 as Shyam-Sunder and Myers (1999). Net-debt and gross-debt issuances in addition to changes in debt ratio were reported separately. The variables of financing deficit such as cash dividends, investments, changes in working capital and internal cash flow were observed separately in the disaggregated model, which is explained in more detail in Section 2. The test by Frank and Goyal (2003) with regard to the disaggregated model by Shyam-Sunder and Myers (1999) yielded a positive dividend coefficient in terms of net-debt issuance and a negative dividend coefficient in terms of gross-debt issuance, which could be a result of less long-term debt issuance by dividend-paying firms. The significantly positive investment coefficients most probably imply that more investing activity usually leads to an increase in tangible assets. According to Frank and Goyal (2003, p. 236), “timing issues” can significantly influence positive working capital coefficients. Significantly negative internal cash flow coefficients have a minimal effect on the data. The negative sign could represent the potential future growth of firms. The empirical results of Frank and Goyal (2003, p. 231) for the disaggregated model support the pecking order theory, but only if the data is considered “with no gaps permitted”. The coefficients for the much larger dataset “with gaps permitted” change dramatically. Frank and Goyal (2003, p. 236) conclude that, “during the 1990s, the evidence moves further away from supporting the pecking order aggregation hypothesis”.

Frank and Goyal (2003) then report the third regression analysis for the period of time between 1971 and 1993 with regard to the conventional leverage model by Rajan and Zingales (1995), which is presented in detail in Section 2. All firms,

irrespective of their size, were reported separately. The conventional leverage model contains tangibility, market-to-book, log sales and profitability ratios of the analysed companies. When the variable of financing deficit is added to the conventional variables, the pecking order hypothesis with regard to the unit coefficient can easily be rejected for the largest firms as well, however, the deficit financing should be taken into consideration (Frank and Goyal, 2003).

The pecking order theory was tested over a broad cross-section of the population by Frank and Goyal (2003). If retained earnings are insufficient, firms have to make use of external financing. The results do not support the pecking order theory unlike those of Shyam-Sunder and Myers (1999). Frank and Goyal (2003) interpreted the potential reasons in two ways. First, on average small firms do not follow the pecking order theory and during the 90's more small firms were publicly traded than during the 70's. Therefore, the average changes are comparable to the pecking order theory. Second, support from the largest firms also declined during the 90's. "Equity becomes more important" (Frank and Goyal, 2003, p. 241).

Does this mean that the information in the deficit financing is completely irrelevant? Not at all, because the components of the financing deficit still mainly provide information mostly from large firms and show that deficit financing is less relevant for firms in terms of net debt issuances (Frank and Goyal, 2003).

1.4. Unexplained Determinants in Previous Theories

Lemmon et al. (2008, p. 1575) address how the "capital structure puzzle" can be solved and the capital structure of a firm defined? A number of components have already been identified in research concerning corporate finance that attempt to explain corporate capital structures according to theories such as target capital structure, also referred to as the trade-off theory, and to optimal capital structure such as the pecking order theory and market timing. However, Lemmon et al.

(2008) raise the question whether or not the factors that influence the capital structure of firms are actually known.

Lemmon et al. (2008) tested the influence of observed determinants with regard to capital structures according to changes in cross-section and timeline to better explain the data from previous theories. Lemmon et al. (2008, p. 1575) identified an “unobserved time-invariant effect” that supports the stable capital structure of a firm. Firms with a high degree of leverage remain highly levered, while firms with a low level of leverage remain poorly levered for approximately 20 years. This finding in terms of capital structure has yet to be explained by previously presented components like size, profitability, market-to-book ratio or industry and suggests that the capital structure of a firm depends on other factors because a stable level of leverage can be observed following its initial public offerings (IPOs) over time. First, the persistency effect that highly levered firms maintain to remain highly levered and poorly levered firms maintain to remain poorly levered. Second, the convergence effect shows that the stable ratios remain constant over time (Lemmon et al. 2008).

The traditional leverage regressions yield adjusted R-squares of between 18% and 29%. While the leverage regression on the fixed effects of a firm yields an adjusted R^2 of 60%, which explains why unexplained determinants are still present following the leverage of panel firms (Lemmon et al. 2008).

This “time-invariant effect” is not included in previous empirical models, which might suggest that they are “misspecified”. Short-term changes are observed in previous empirical models, but Lemmon et al. (2008, p. 1576) commented on the behaviour of managers, namely that they tend to make decisions based on long-term development, on the other hand, their reaction with regard to short-term shocks is not always measurable. Lemmon et al. (2008) also demonstrated that the behaviour of debt issuance plays a major role as far as the behaviour of equity issuance is concerned in research that addresses corporate leverage. The capital structures of firms tend to remain stable for over 20 years such that a balance between factors concerning cross-sectional variation with regard to leverage ratios is maintained. The results, in addition to those concerning

research to identify traditional variations, underline that leverage in the future is highly dependent on the historical leverage of the firm. On the whole, Lemmon et al. (2008) determined that decisions concerning the leverage of firms are generally based on long-term perspectives when managers are aware and interested in controlling the leverage ratios of their firm.

2. Modelling

Three statistical models are presented in the following section, the aggregated and disaggregated by Shyam-Sunder and Myers (1999) in addition to the conventional leverage model by Rajan and Zingales (1995), which are empirically tested in this thesis. Related data and results are presented in the proceeding sections.

2.1. Aggregated Model

The first model in my thesis was also tested by Frank and Goyal paper (2003) and by Shyam-Sunder and Myers (1999). Their analyses focused on publicly traded US companies. Shyam-Sunder and Myers (1999) argue that after an Initial Public Offering (IPO), equity is issued only rarely according to the pecking order theory. The aggregated model of the hypothesis states that deficit financing has a one-to-one impact on the net debt issued in year *t*, which means if the financing deficit increases by 1 dollar the net debt issued in year *t* will increase by 1 dollar as well. The correlation between deficit financing and net debt issued in year *t* is represented by the pecking order coefficient, which must be equal to one in the following statistical model, where the intercept is denoted by *a* and the usually inserted error term by e_{it}:

$$\Delta DEBT_{it} = a + \beta_{PO} DEF_{it} + e_{it} \qquad (2)$$

The null hypothesis is as follows: $a = 0$ *and* $\beta_{PO} = 1$

- The null hypothesis is as follows: intercept gives value of zero and financing deficit has a unit impact on changes to net debt.

- The alternative hypothesis states that intercept gives different value than zero and financing deficit has an impact on changes to net debt which is not equal to one.

According to Shyam-Sunder and Myers (1999, p. 226) this, “simplest version of the pecking order” theory is represented by Equation 2, cannot be correct and the pecking order model can easily be rejected statistically. Still this simple model can provide a good description of conservative debt proportion and yielded a good first-order approximation of their data (Shyam-Sunder and Myers, 1999).

Financing deficit was calculated by Frank and Goyal (2003) as follows:

$$DEF_{it} = DIV_{it} + INV_{it} + \Delta WC_{it} - \Delta CASH_{it} = \Delta DEBT_{it} + \Delta EQUITY_{it} \qquad (3)$$

where the variables are calculated as follows:

- $\boldsymbol{DIV_{it}}$ - Cash dividends paid by the company *i* in year *t*
- $\boldsymbol{INV_{it}}$ – Cash from investing activities of the company *i* in year *t* (i.e., INV_{it} = Change in fixed & intangibles + Net change in LT (long-term) investment + Net cash from acquisitions & divestitures + Other investing activities)
- $\boldsymbol{\Delta WC_{it}}$ – Change in working capital of company *i* in year *t* (i.e., ΔWC_{it} = Net income + Depreciation & amortization + Non-cash items + Change in non-cash working capital + Other operating activities)
- $\boldsymbol{\Delta CASH_{it}}$ – Changes in the cash of company *i* in year *t* (i.e., $\Delta CASH_{it}$ = Net changes in cash - Effects of foreign exchange rates)
- $\boldsymbol{\Delta DEBT_{it}}$ - Net debt issued by company *i* in year *t*; (i.e., $\Delta DEBT_{it}$ = debt issuance - debt reduction)
- $\boldsymbol{\Delta EQUITY_{it}}$ - Net equity issued of company *i* in year *t* (i.e., $\Delta EQUITY_{it}$ = sale of common stock - stock repurchases).

The model of Shyam-Sunder and Myers (SSM) (1999) includes the current amount of long-term debt (R_t), because of the prediction that firms will repay their long-term debt when it is due:

$$DEF_{it}^{SSM} = DIV_{it} + INV_{it} + \Delta WC_{it} + \boldsymbol{R_{it}} - CASH_{it} = \Delta DEBT_{it} + \Delta EQUITY_{it} \quad (4)$$

The approach by Frank and Goyal (2003) was followed who how do not include the current amount of long-term debt (R_t) as part of the financing deficit. Current maturing long-term debt can be regarded as short-term debt in that year and most firms do not consider their financing operations as working capital, because investors often want to take current assets and liabilities into account. Moreover, changes in cash flow could have an impact on the debt issuance that is included with regard to changes in net working capital (ΔWC). Still the following econometric issues have to be solved in the pecking order theory. Deficit financing includes investments and dividends, which are probably endogenously determined, but are exogenous due to the pecking order theory. Frank and Goyal (2003) implemented two steps to avoid any misspecification of the theory. Firstly, robustness checks were included in all tests and secondly a hold-out sample of firms was defined for each fitted model to verify their ability and predict debt issues (Frank and Goyal, 2003). Empirical tests are also included also in my empirical analysis, which are presented in the section entitled empirical results.

2.2. Disaggregated Model

Further steps can be taken by following the structure of Frank and Goyal (2003) to test whether or not the data of the pecking order theory rejects the aggregation step and if the DEF_{it} components exhibit unit impact on $\Delta DEBT_{it}$:

$$\Delta DEBT_{it} = a + \beta_{DIV} DIV_{it} + \beta_{INV} INV_{it} + \beta_{WC} \Delta WC_{it} - \beta_{CASH} \Delta CASH_{it} + e_{it} \quad (5)$$

The null hypothesis is as follows: $a = 0$ *and* $\beta_{DIV} = \beta_{INV} = \beta_{WC} = \beta_{CASH} = 1$

- The null hypothesis is as follows: intercept gives a value of zero and all the components of financing deficit have unit impact on changes to net debt.

- The alternative hypothesis is as follows: intercept gives different value than zero and at least one of the components of financing deficit have impact on changes to net debt, which is not equal to one.

The goal of the disaggregated model is to observe each component of financing deficit separately. The main question is whether the components have unit, a stronger or no impact at all on decisions that concern debt financing made by companies (Frank and Goyal, 2003).

2.3. Conventional Leverage Model

The above-mentioned pecking order models make different exogeneity predictions and use different sets of information concerning leverage than in a conventional empirical model (Frank and Goyal, 2003). Harris and Raviv (1991) provided an explanation of conventional variables and then Rajan and Zingales (1995) distilled these variables into a simple statistical model:

$$\Delta DEBT_{it} = \alpha + \beta_{TANG}\Delta TANG_{it} + \beta_{MTOB}\Delta MTOB_{it} + \beta_{LSALE}\Delta LSALE_{it} + \beta_{PROF}\Delta PROF_{it} + \beta_{DEF}DEF_{it} + e_{it} \quad (6)$$

where the additional variables are calculated as follows:

- $\boldsymbol{TANG_{it}}$ – Tangible assets of company *i* in year *t* (i.e., $TANG_{it}$ = Tangible Assets / Total Assets)
- $\boldsymbol{MTOB_{it}}$ – Market-to-book ratio of company *i* in year *t* (i.e., $MTOB_{it}$ = Market Capitalization / Total Book Value)
- $\boldsymbol{LSALE_{it}}$ – Log Sales of company *i* in year *t* (i.e., $LSALE_{it}$ = Natural Logarithm of Sales and Revenues)
- $\boldsymbol{\Delta PROF_{it}}$ – Profitability of company *i* in year *t* (i.e., $\Delta PROF_{it}$ = Operating Income / Total Assets)

Rajan and Zingales (1995) identified strong pieces of evidence in support of their data; a different information basis and international data were used to study corporate leverage. The aim was to determine whether or not conventional

leverage regression is effective, and if the deficit financing has a unit impact on $\Delta DEBT_{it}$ or other factors play important roles, as well.
Before formulating the main hypothesis, the expectations of the impacts on the variables in terms of conventional leverage regression based on the model by Rajan and Zingales (1995) are presented.

2.3.1. Tangibility of assets

The tangibility of assets is controversial and the opinions of authors differ regarding its impact on debt financing. On the one hand, a negative correlation is described and on the other hand a positive correlation is explained by authors between leverage and tangible assets. Some arguments of previous studies from both viewpoints are presented below.

Grossman and Hart (1982) state that a negative correlation exists between leverage and tangible assets. Companies with specific or unique products are faced with the problem that they cannot use their tangible assets as collateral because it is difficult to sell them or sometimes the assets have a lower degree of liquidity. These firms must create other collateral such as equity issuance or internal sources. The pecking order theory favours this statement, as well (Grossman and Hart, 1982). However, Harris and Raviv (1991) say that companies favour using internal sources of finance, which also predict a negative correlation between debt-to-equity ratio and tangible assets. Tangible assets are typically used as collateral, which are related to low levels of information asymmetry and diminish the costs of equity issuance. Some other studies have revealed that if an enterprise possesses a lot of short-term debt this leads to a negative correlation (Cassar and Holmes, 2003; Nivorozhkin, 2002; Cornelli et al. 1996).

On the other hand Myers and Majluf (1984) supposed that equity issuance has negative effect on the relationship between managers and shareholders because the information asymmetry leads to greater expenses. Therefore, companies even favour debt issuance. According to this announcement it is more likely that

companies with higher shares of tangible assets use this opportunity to issue debt (Myers and Majluf, 1984). Furthermore, a company that possesses a high proportion of tangible assets is indicative of reliability as far as creditors are concerned. The issuance of secured debt is also a good sign of security as the debt is "secured by the value of the fixed assets" of the company (Mugoša, 2015, p. 78). If the stock price of the secured debt increases, this could increase the equity value. An increase in equity value is indicative of a stable company (Mugoša, 2015).

Collateral is usually related to higher degrees of leverage. Based on the pecking order theory it can be assumed that "leverage is positively correlated with tangible assets" and enterprises with greater tangible assets will increase their debts over time whereby they become highly levered (Mugoša, 2015, p. 78).

The tangibility ratio is calculated by following the approach by Frank and Goyal (2003) namely the tangible assets divided by the total assets of each company. Following the usual prediction of tangibility: tangible assets stead as collateral imply a higher degree of leverage. Prediction to be tested is that an increase in the amount of tangible assets follows to an increase in net-debt issuance, $\beta_{TANG} > 0$.

- The null hypothesis is as follows: the tangibility ratio has no positive impact on changes to net debt.

- The alternative hypothesis is as follows: the tangibility ratio has a positive impact on changes to net debt.

2.3.2. Growth

Growth is a controversial subject in capital structure theories, namely between the trade-off and pecking order theories, with regard to its impact on debt financing. On the one hand, a negative correlation is described and, on the other

hand, a positive correlation between the leverage and growth of firms is explained by those theories. Some arguments from previous pieces of research concerning both viewpoints are as follows:

The static trade-off theory (Kraus and Litzenberger, 1973) concludes that firms usually increase the leverage if the current level is low. In the case of a low debt-to-equity ratio, managers may decide to raise additional debt, because this helps "to rebalance the cost of financial distress and benefits of interest tax shields" (Mugoša, 2015, p. 80). The static trade-off theory states that firms which can invest and support their own growth are likely to only issue debts sporadically. With this strategy they try to avoid risky and "unprofitable investments, financial distress and information asymmetry between shareholders and creditors" (Mugoša, 2015, p. 79). Furthermore, Jensen and Meckeling (1976) acknowledge that an awaited future growth of a company is a negative correlated with the level of its leverage and debt issuance.

In contrast Jensen and Meckling (1976) claim that the pecking order theory foretells a positive correlation between the expected growth and leverage of a firm, because highly profitable companies are likely to invest more. An enterprise decides to issue debt if its investment costs are greater than its retained earnings (Mugoša, 2015). Myers (1984) says that firms can avoid information asymmetry between shareholders and creditors by short-term debt issuance rather than long-term debt issuance.

On the other hand, a more complicated representation of the pecking order theory exists where the rational prediction of the future according to managers in terms of current and future financial costs will be considered as well. This leads to another decision: if the company is forecast to grow in the future or a large future investment is expected, the managers decide to minimise the proportion of debts (Baker and Martin, 2011). The firm will use internal sources if the right equilibrium between current and future expenses of financial backing is well preserved by limiting the leverage ratio. This evinces a negative correlation between the future growth and leverage of a firm (Mugoša, 2015). Goyal et al. (2002) stated that if a "defence firm" is unlikely to experience growth in the

future, it opts for debt financing. Additionally, the statistical model by Barclay et al. (2001), which suggests that growth can have a negative impact on the debt volume of companies, is presented.

The average stock return could be used as an indicator of growth. Welch (2004) claims that changes in the stock return influence changes in terms of capital structure. In the case of stock price fluctuations, firms usually issue more shares. This behavior is also explained in the market timing theory, which has been proven that changes in stock price have a great impact on decisions concerning capital structure (Uysal, 2007; Titman, 2002; Hovakimian, et al. 2001; Welch, 2004; Baker and Wurgler, 2002).

Due to the possible large fluctuations in stock price, the sole use of the stock prices of companies may result in this measurement being biased (Mugoša, 2015). Therefore, the growth ratio is calculated by following the approach by Frank and Goyal (2003). The business growth can be measured by dividing the market value of the company by its total assets, which is referred to as the market-to-book ratio. This is the most utilized ratio for measuring business growth (Mugoša, 2015). Following the usual prediction of growth: higher market-to-book ratios reflect more opportunities for future growth, which imply higher financial distress costs and lower leverages. It can be predicted that higher rates of growth are a consequence of less net-debt issuance, $\beta_{MTOB} < 0$.

- The null hypothesis is as follows: growth (market-to-book ratio) has no negative impact on changes to net debt.

- The alternative hypothesis is as follows: growth (market-to-book ratio) has a negative impact on changes to net debt.

2.3.3. Size

Size is controversial in different capital structure theories and the opinions of authors differ with regard to its impact on debt financing. On the one hand, a negative correlation is described and, on the other hand, a positive correlation is explained by the trade-off and pecking order theories as well as the authors between the leverage and size of companies. Some arguments of previous studies from both viewpoints are presented below.

It is quite understandable that the size of a firm has an influence on decisions concerning capital structure (Mugoša, 2015). Baker and Martin (2011) claim that larger companies are more likely to issue debt. Basically, larger enterprises are more reliable and effective than smaller ones. Baker and Martin (2011) report that these firms are prone to have “diversified business portfolios”, which imply lower probabilities of default, and are less likely to fall into financial distress and possess lower degrees of cash flow volatility, which is indicative of a more reliable borrower. Smaller companies are often faced with the above-mentioned negative situation but this is also indicative of an enhanced ability to compete, better conditions for external financing, for example, bank loans, and almost unlimited or simple access to funds. Large companies are likely to be listed on stock exchanges and tend to be subject to better handling conditions. This is also an indicator of greater “business transparency” and reduce “information asymmetry” (Mugoša, 2015, p. 79).

Based on the aforementioned statements, the static trade-off theory explains that there is a negative relationship between size and bankruptcy because the probability of large companies going bankrupt is lower. However, size has a positive impact on leverage (Mugoša, 2015). The pecking order theory by Myers and Majluf (1984) shows that a negative correlation could exist between the size of a firm and its debt. Due to lower information asymmetry typical by large firms could lead to advantageous equity issuance conditions (Mugoša, 2015).

Based on a theory by Rajan and Zingales (1995) the logarithm of, for example, tangible assets, sales or job-quit rates can be taken as the basis of a measure of

the size of a company. The supposition is that larger enterprises have more valuable assets and greater sales. Additionally, the market capitalization formula should be avoided when determining the size of a company because the stock price often varies (Mugoša, 2015).

Following the theory by Rajan and Zingales (1995) and approach by Frank and Goyal (2003), the size of the companies is calculated from the natural logarithm of sales and revenues. The prediction is that larger companies mostly have higher sales and revenues, receive better conditions for their debts and have lower costs of information, which follows on from more debt issuance, $\beta_{LSALE} > 0$.

- The null hypothesis is as follows: size (natural logarithm of the ratio of sales) has no positive impact on changes to net debt.

- The alternative hypothesis is as follows: size (natural logarithm of the ratio of sales) has a positive impact on changes to net debt.

2.3.4. Profitability

Profitability is controversial in various capital structure theories and the opinion of authors differs with regard to its impact on debt financing. On the one hand, a negative correlation is described and, on the other hand, a positive correlation is explained by the trade-off and pecking order theories as well as the authors between the leverage and profitability of companies. Some arguments of previous studies from both viewpoints are presented below.

The trade-off theory regards profitable firms as more highly levered and describes a positive correlation between profitability and issuances of debt. By having a higher debt-to-equity ratio, corporate taxes can be reduced, which would provide more profit for the firms (Frank and Goyal, 2003). The asymmetric information model is also presented by Ross (1977) which shows that profitable firms most probably exhibit a higher degree of leverage. On the one hand, this

strategy is chosen by firms because if the profitability of the firm increases, the unexpected bankruptcy cost decreases. Moreover, profitable firms usually have lower costs of bankruptcy. On the other hand, the cost of interest can be deducted which can lower the tax base. This effect ensures that debt issuance is chosen by the enterprise (Mugoša, 2015). A positive relationship in the free cash flow hypothesis, which occurs as a result of the agency problem between managers and shareholders, is also argued by Jensen's (1986). Otherwise the managers of profitable companies would not be protected from expensive and uneconomical spending. These above-mentioned statements indicate a positive correlation between profitability and debt.

If a firm is currently profitable its investment opportunities increase. Based on the studies by Gilchrist and Himmelberg (1995) in addition to Kaplan and Zingales (1997) this issue concerning interpretation is very important. It is hard to identify a cogent substitute for investment opportunities. This is the reason why the profitability of a company is an important influential factor. Erickson and Whited (2000) state that if some other measures like q by Tobin or the market-to-book ratio is incorrectly interpreted this might lead to a false prediction of profitability.

On the other hand, the pecking order theory (Myers, 1984; Myers and Majluf, 1984) states something different. A negative impact of the pecking order theory is presented by Myers (1984) and Myers and Majluf (1984). “The hierarchy within the financing of companies, retained earnings have priority as a source of finance” (Mugoša, 2015, p. 80). Moreover, a negative correlation is identified between profitability and debt issuance according to the literature of Titman and Wessels (1988) in addition to MacKay and Phillips (2002) Furthermore, Fama and French (2002) claim that a negative correlation is predicted by the pecking order theory. What is more, companies can pay off their outstanding debt from their profits which leads to a lower debt-to-equity ratio (Fischer et al. 1989).

A profitability ratio is calculated by following the approach by Frank and Goyal (2003) by dividing the operating incomes by the total assets of each company. Given the prediction of profitability according to the pecking order theory, namely that there is a negative correlation between profitability and debt, the hypothesis

to be tested is that more profitable firms most probably produce less net-debt issuance, $\beta_{PROF} < 0$.

- The null hypothesis is as follows: the profitability ratio does not have a negative impact on changes to net debt.

- The alternative hypothesis is as follows: the profitability ratio has a negative impact on changes to net debt.

These predictions, the main hypotheses concerning conventional leverage regression and the comparison with the trade-off theory are summarized in Table 2. Predictions with regard to the pecking order and trade-off theories show similar coefficient signs, apart from for profitability. However, in the literature of Titman and Wessels (1988) as well as Fama and French (2002), profits and leverage correlate negatively with changes in debt. Therefore, Fischer et al. (1989) also argue that if the trade-off theory is true, profitable firms can still be less levered by considering their adjustment costs, as well.

	Interpretation of the Conventional Leverage Variables with regard to the Pecking Order Theory	Alternative Hypothesis	Trade-off Theory
Tangible assets	• Tangible assets as collateral • Linked to higher leverage	$\beta_{TANG} > 0$	$\beta_{TANG} > 0$
Market-to-book ratio	• Higher MTOB ratios • Opportunities for future growth • Higher financial distress costs	$\beta_{MTOB} < 0$	$\beta_{MTOB} < 0$
Log sales	Larger firms are/have • more diversified • better reputations • lower information costs	$\beta_{LSALE} > 0$	$\beta_{LSALE} > 0$
Profitability	Profitability stead as investment opportunities: by earning profits, debt will be paid off and leverage shrinks	$\beta_{PROF} < 0$	$\beta_{PROF} > 0$
Deficit Financing	If the pecking order theory does not hold, so does not unit impact	$\beta_{PO} \neq 1$	

Table 2: Main Hypothesis of comparison between conventional leverage regression and the trade-off theory (Frank and Goyal 2003, 239ff, modified)

3. Data

The annual panel data was collected from Bloomberg during the sample period from 2007 to 2017. This period commenced from the beginning of the European financial crisis to identify whether the lending mechanism was affected by the changing financial environment. In order to test the pecking order theory, the standardized balance sheet, income and cash flow statements are needed.

The aim of this thesis is to provide a general overview of the companies in the European market. 100 publicly traded companies were randomly selected from STOXX® Europe 600 Index, which has "a fixed number of 600 components, represents large, mid and small capitalization companies across 17 countries of the European region: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Ireland, Italy, Luxembourg, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom" (STOXX, 2018).

Empirical tests were implemented not only on the sample as a whole, but also separately for higher (referred to as "larger" in the rest of this thesis) and lower ranked firms (referred to as "smaller" from now on in this thesis) according to the Bloomberg Rankings. 50 larger firms were randomly selected from the Bloomberg Rankings from the first 300 places and 50 smaller firms were randomly selected from the Bloomberg Rankings between the 301st and 600th places, with the restriction that they are not financial firms or regulated utilities. The ranking of companies is analysed by the Bloomberg Rankings team. "These rankings seek to enlighten and entertain readers on topical issues of immediate and perennial interest in business, economics, investing, lifestyle, personal finance and politics & policy. Bloomberg Rankings differentiates its products through its commitment to creating rankings that are totally transparent and do not include editorially adjusted or opinion-based data" (Bloomberg, 2018).

Empirical tests were also implemented to analyse European companies before, during and after the financial crisis. According to the assumption by Golab (2018) the data "before" and "during" the financial crisis was collected between 2007

and 2012, respectively. Furthermore, the data "after" the financial crisis in Europe was collected between 2013 and 2017. The companies were analysed to determine if the financial crisis in Europe had a major effect on decisions concerning the capital structure of firms.

Table 3: Summary of statistics: a sample of annual panel data from 2007 to 2017. The components of the reported data were calculated as a percentage of the book value of the total assets of each firm

Variable		Mean	Std. Dev.	Min.	Max.	Observations
DIV	overall	-0.0332	0.047	-0.551	0.000	N = 1100
	between		0.035	-0.202	0.000	n = 100
	within		0.032	-0.444	0.122	T = 11
INV	overall	-0.0646	0.083	-0.694	0.373	N = 1100
	between		0.040	-0.208	0.030	n = 100
	within		0.073	-0.637	0.294	T = 11
ΔWC	overall	0.1013	0.071	-0.224	0.443	N = 1100
	between		0.057	-0.036	0.280	n = 100
	within		0.042	-0.134	0.434	T = 11
ΔCASH	overall	0.0038	0.052	-0.511	0.540	N = 1100
	between		0.019	-0.096	0.112	n = 100
	within		0.048	-0.432	0.432	T = 11
DEF	overall	-0.0004	0.087	-0.748	0.475	N = 1100
	between		0.037	-0.159	0.126	n = 100
	within		0.079	-0.700	0.349	T = 11
ΔDEBT	overall	-0.0004	0.082	-0.673	1.127	N = 1100
	between		0.029	-0.061	0.194	n = 100
	within		0.077	-0.619	0.933	T = 11
ΔEQUITY	overall	0.0000	0.066	-1.010	0.321	N = 1100
	between		0.032	-0.164	0.116	n = 100
	within		0.058	-0.942	0.333	T = 11

The components of the reported data were calculated as a percentage of the book value of the total assets of each firm. This provides a comparable percentage of the data. A summary of the statistics concerning the sample of annual panel data from 2007 to 2017 is presented in Table 3. The mean values, standard deviations, as well as minimum and maximum values are summarised. To avoid autocorrelation in the sample, the panel data for the empirical analysis was calculated using first differences. Therefore, the regression analysis contains 10 years of observations.

Table 4: Corporate Cash Flows from 2007 to 2017: The components of the reported data calculated as a percentage of the book value of the total assets of each firm to calculate the average across each firm

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
DIV	-0.026	-0.028	-0.023	-0.023	-0.026	-0.025	-0.025	-0.024	-0.024	-0.024	-0.023
INV	-0.104	-0.072	-0.070	-0.046	-0.052	-0.058	-0.055	-0.058	-0.063	-0.054	-0.063
ΔWC	0.096	0.095	0.092	0.086	0.081	0.088	0.083	0.080	0.080	0.072	0.081
ΔCASH	0.004	-0.002	0.007	0.006	-0.001	0.012	-0.001	0.002	-0.001	0.001	0.000
DEF	**-0.039**	**-0.003**	**-0.009**	**0.011**	**0.004**	**-0.007**	**0.004**	**-0.003**	**-0.007**	**-0.007**	**-0.005**
ΔDEBT	-0.044	-0.014	-0.002	0.010	-0.001	-0.009	0.000	-0.008	-0.009	-0.007	-0.007
ΔEQUITY	0.006	0.011	-0.007	0.001	0.006	0.002	0.004	0.005	0.003	0.001	0.001
Ext. Fin.	**-0.039**	**-0.003**	**-0.009**	**0.011**	**0.004**	**-0.007**	**0.004**	**-0.003**	**-0.007**	**-0.007**	**-0.005**

The corporate cash flows from 2007 and 2017 are reported in Table 4. On the one hand, during this period dividend payments remained stable at around 2.5%, investments shrank from 10.4% to 6.3%, the working capital declined by around 1.5% and changes in cash flow fluctuated over a range of 1%. In 2007, the deficit was -3.9%; after the financial crisis a surplus was obtainable, which meant that firms generated enough money to cover their expenditures. After 2013, deficit once again was close to 1%.

On the other hand, my research focuses on the financing decisions of firms, namely whether they finance their investment needs from debt or equity. In 2007, it would seem that firms tended to finance their deficit and issuances from debt, as well. During the financial crisis small changes were observable, but after 2014 debt financing became preferred.

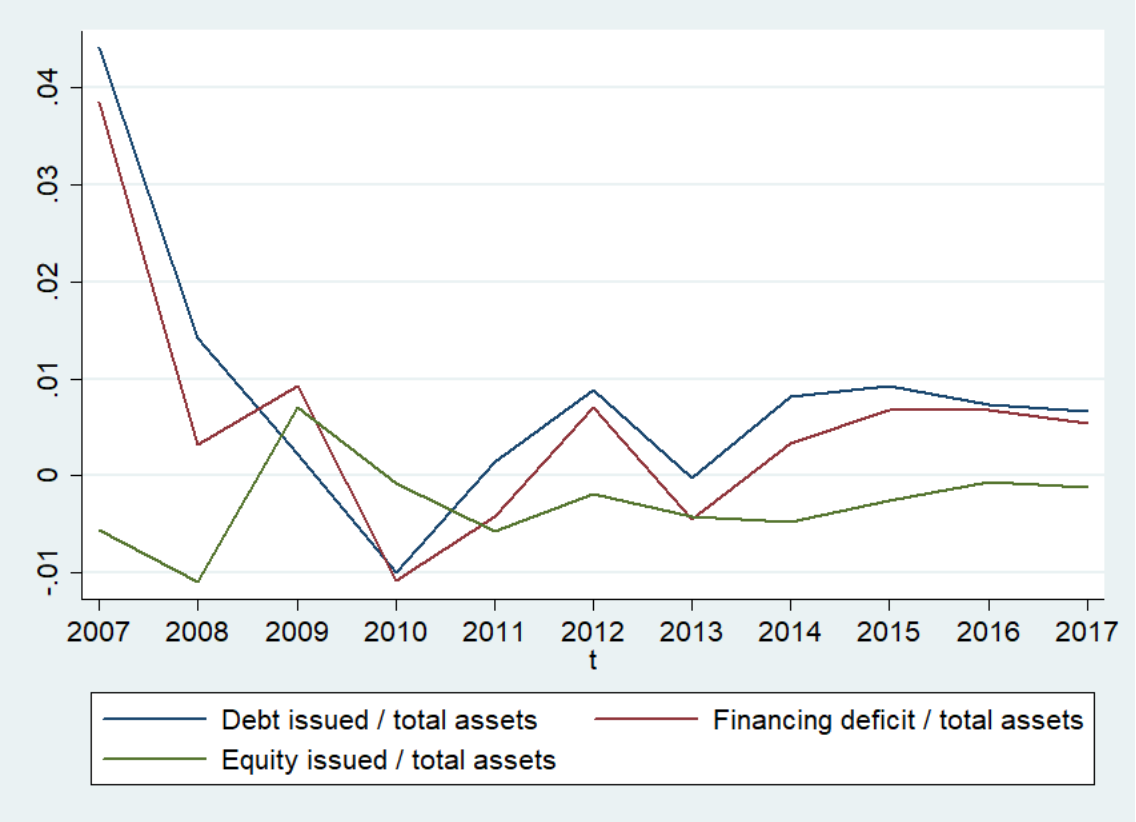

Figure 2: Average financing deficit to total assets, debt issued to total assets and equity issued to total assets from 2007 to 2017

Figure 2 follows on from the data in Table 4 and it can be seen more precisely that from the first point of view the majority of the companies seem to make their financing decisions according to the pecking order theory. The lines that represent financing deficit and debt issuance track each other quite well. The correlation between financing deficit and debt issuance is 0.945, but between financing deficit and equity issuance is only -0.033. According to Figure 2 up until 2007 the outstanding debt of firms was relatively high compared to equity

financing. During the European financial crisis debt financing dropped and equity became more important to financing deficit. After 2009, the analysed period fluctuated quite significantly. After 2014, debt financing became substantially less than at the beginning of the financial crisis and equity financing took on a more important role for European companies. However, a conclusion still cannot be made, further empirical analysis of the panel data is required.

Figure 3: Scatter Plot using the panel data for the debt issued to total assets against financing deficit to total assets of firms. The panel data for the empirical analysis was calculated using first differences

A scatter plot of the relationship between debt and financing deficit of the 100 companies analysed is shown in Figure 3. Apart from some outliers, most of the companies correlate well with the red line which represents the prediction of linear regression between debt issued and financing deficit. The positive correlation between debt issued and financing deficit is clearly visible.

4. Empirical Results

Research by Shyam-Sunder and Myers (1999) as well as Frank and Goyal (2003) studied publicly traded US firms. Shyam-Sunder and Myers (1999) reported on 157 US firms between 1971 and 1989. Frank and Goyal (2003) reported on 768 US firms between 1971 to 1989 and extended this period from 1989 to 1998. Mugoša (2015) studied publicly traded Western European firms between 2003 and 2010. In contrast to the first two papers, this thesis sought to determine if the pecking order theory is implemented in Europe, therefore, publicly traded European firms were studied to answer the main hypothesis. For the purpose of obtaining a more comprehensive comparison, the same empirical models were tested as used by Frank and Goyal (2003). The sample contained 100 publicly traded European firms between 2007 and 2017.

Cross-sectional regression was applied by Shyam-Sunder and Myers (1999) as well as Frank and Goyal (2003) to determine differences over time. As is well known, time-series and cross-sectional data only handle one dimension. Time-series data allows one to control the dataset over time, while cross-sectional data units' similar people, firms, states and countries (Baltagi, 2014). In contrast, Mugoša (2015) used a panel dataset for empirical analysis to control more dimensions and complicated models simultaneously. Panel data also facilitates the control of unobservable variables like changes across companies and helps to control variables at different levels. Moreover, panel data has the advantage with its ability to control individual heterogeneity, be more accurate at estimating and handle more degrees of freedom. However, the collection of panel data is far more complex and difficult than the sampling of time-series and cross-sectional data. A potential disadvantage of panel data could be its cross-sectional dependency, for example, its correlation between companies (Baltagi, 2014).

In this thesis, after analysing three possible models, the empirical models are presented using the panel data of firms from 2007 to 2017. This facilitates the possibility to analyse the variables that lead to variations over time in depth (Mugoša, 2015). The Hausman test (Hausman, 1978) helps to identify either the fixed- or random-effects model that has to be implemented in the analysis.

Estimates of the parameters of fixed- and random-effects models have been compared and tested (Greene, 2012; Wooldridge, 2002). “The hypothesis tests whether the unique errors (e_i) are correlated with the regressors, (...) the null hypothesis is that the preferred model is random effects” (Torres-Reyna, 2007, p. 29). The results of the Hausman test are summarized in Table 5. The null hypothesis is rejected, therefore, fixed-effects panel regression is used. Fixed-effects panel regression helps to control for individual-specific and remove time-invariant characteristics (Torres-Reyna, 2007).

Table 5: The results of the Hausman test

	----- Coefficients -----			
	(b)	(B)	(b-B)	sqrt(diag(V_b-V_B))
	Fixed	Random	Difference	S.E.
DEF	.6959656	.6841924	.0117731	.0060203

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(1) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 16.88
Prob>chi2 = 0.0000

All the empirical tests were run with robust standard errors, which are known as “Huber-White or sandwich estimators” (Torres-Reyna, 2007, p. 35). The Huber-White’s Robust Standard Errors approach enables the heteroscedasticity to be controlled. In this approach the covariance matrix of the coefficient matrix is

calculated differently than in the absence of robust standard errors and helps to reduce the degree of bias in the empirical results (Torres-Reyna, 2007).

4.1. Aggregated Model

First, the aggregated financing deficit model by Shyam-Sunder and Myers (1999) was tested. The aggregated model analyses the relationship between the debt financing and calculated deficit financing of companies. The first regression analysis of European firms between 2007 and 2017 is presented in Table 6 where larger and smaller firms are also compared. The analysis of European firms from 2007 to 2012 as well as between 2013 and 2017 during the financial crisis is shown in Table 7 and the difference between larger and smaller companies before and after the financial crisis is presented in Table 8.

Table 6: The test of the pecking order theory with the aggregated model between 2007 and 2017 (The "_cons" represents the intercept "a" in the model description)

	(1) DEBT All Firms	(2) DEBT Large Firms	(3) DEBT Small Firms
DEF	0.696***	0.925***	0.556***
	(0.0874)	(0.0299)	(0.1130)
_cons	0.00122***	-0.00041***	0.00259***
	(0.000230)	(0.000081)	(0.000291)
N	1000	500	500
adj. R-sq	0.543	0.883	0.365

Standard errors in parentheses
* p<0.05, ** p<0.01, *** p<0.001

The results of the aggregated model are summarised in Table 6. The panel data for the empirical analysis are calculated using first differences. The sample was tested in three different regressions.

In Table 6, column (1) represents the whole sample of 100 firms over 10 years. The main hypothesis is that the pecking order coefficient of deficit financing (DEF) is assumed to be 1, in the same way the 1% growth of deficit net debt should grow also by 1%. The test of the aggregated deficit model is statistically significant at the 0.001 level pecking order coefficient of 0.696 and the null hypothesis is rejected. In other words, if the deficit of the company grows by 1%, debt financing is expected to grow by around 0.7%. Following this prediction, it can be concluded that the selected European companies finance more than two thirds of their deficit by debt. The output of the test yields a constant *"a"* of almost 0 and an adjusted R-squared of 54.3%. These results indicate that there are further potential variables which influence the debt financing of companies, in fact this prediction is tested in the conventional leverage model of Section 4.3.

In columns (2) and (3) of Table 6, the sample is separated into two groups: column (2) represents the 50 larger firms and column (3) the 50 smaller firms. The aim of this is to identify whether a difference in terms of decisions concerning capital structure exists for large and small firms in the sample.

The results of the aggregated deficit model show that in Table 6, in column (2) to be exact, the pecking order coefficient is statistically significant at the 0.001 level and is almost 1, 92.5% to be precise, so that the null hypothesis is not rejected. This indicates that if the deficit increases by 1%, the expected growth of net debt is 0.925%, meaning that larger firms finance most of their investment needs by issuing debt, rather than equity. The output of the test yields a constant *"a"* of almost 0 and an adjusted R-squared equal to 88.3%. These results indicate that the debt financing of companies is influenced by more potential variables and this prediction is tested by the conventional leverage model in Section 4.3.

In column (3) of Table 6, the pecking order coefficient for smaller firms is 55.6%, is statistically significant at the 0.001 level and the adjusted R-squared of the correlation is 36.5%. As the level of the coefficient is relatively low in contrast to previous results and the goodness-of-fit is also flat, the null hypothesis can be rejected. Smaller firms seem to use both debt and equity financing to cover their financing needs.

The aggregated model which contains information about the size of the firms shows that larger firms follow the pecking order theory more closely than smaller firms. In the next regression analysis in Table 7 the one hundred European companies are tested over different periods of time. The sampling period is divided into two, from 2007 to 2012 and from 2013 to 2017. The period from 2007 to 2012 represents company data before and during the financial crisis and from 2013 to 2017 data after the financial crisis in Europe. The aim of the test was to determine whether the financial crisis had a major effect on the decision-making of firms with regard to their capital structures, namely whether and if so how the companies in bank-based Europe were affected from the rapidly changing financial outlook.

Table 7: Test of the pecking order theory with the aggregated model before and during the financial crisis from 2007 to 2012 and afterwards from 2013 to 2017 (The "_cons" represents the intercept "a" in the model description)

	(1) DEBT Whole Analysed Period 2007-2017	(2) DEBT Before/During 2007-2012	(3) DEBT After 2013-2017
DEF	0.696***	0.902***	0.466***
	(0.0874)	(0.0360)	(0.1190)
_cons	0.001220***	0.000911***	0.000678***
	(0.000230)	(0.000170)	(0.000065)
N	1000	500	500
adj. R-sq	0.543	0.824	0.268

Standard errors in parentheses
* p<0.05, ** p<0.01, *** p<0.001

The results of the aggregated model before/during (2007-2012) and after (2013-2017) the financial crisis are summarised in Table 7. The panel data for the empirical analysis is calculated using first differences. The sample was tested in three different regressions.

In Table 7, for the purpose of a better comparison, the whole sample of 100 firms over 10 years is represented once more by column (1). This result has been presented previously.

In Table 7, the sample is separated into two groups in columns (2) and (3), column (2) represents the period before/during the financial crisis from 2007 to 2012 and column (3) the period afterwards from 2013 to 2017. The aim was to identify whether a difference in decisions concerning capital structure before/during and after the financial crisis exists in the sample.

The results of the aggregated deficit model show that in column (2) of Table 7 the pecking order coefficient is 90.2% and statistically significant at the 0.001 level and the null hypothesis can not be rejected. Therefore, if a growth in deficit of 1% occurs the expected growth of net debt is 0.902%, meaning that before/during the financial crisis firms finance most of their investment needs by issuing debt, rather than equity. The output of the test yields a constant *"a"* of almost 0 and an adjusted R-squared of 82.4%. These results indicate that debt financing is mainly influenced by the deficit financing of companies. This prediction is tested by the conventional leverage model in Section 4.3.

In column (3) of Table 7, the pecking order coefficient following the financial crisis was 46.6%, statistically significant at the 0.001 level, and the adjusted R-squared for the correlation was 26.8%. As the coefficient is relatively low in contrast to previous results and the goodness-of-fit is also flat, the null hypothesis can be rejected. Since the financial crisis firms seem to use more equity financing to cover their financing needs than before.

Table 8: Test of the pecking order theory using the aggregated model for large and small firms before, during and after the financial crisis between 2007 and 2017 (The "_cons" represents the intercept "a" in the model description)

	(1) DEBT 2007-2017 All	(2) DEBT 2007-2012 Large Firms	(3) DEBT 2007-2012 Small Firms	(4) DEBT 2013-2017 Large Firms	(5) DEBT 2013-2017 Small Firms
DEF	0.696***	0.948***	0.849***	0.864***	0.365**
	(0.0874)	(0.0417)	(0.0536)	(0.0543)	(0.1260)
_cons	0.00122***	-0.00042***	0.00201***	-0.00069***	0.00314***
	(0.00023)	(0.00031)	(0.00011)	(0.00011)	(0.00039)
N	1000	250	250	250	250
adj. R-sq	0.543	0.900	0.739	0.839	0.167

Standard errors in parentheses
* p<0.05, ** p<0.01, *** p<0.001

The results of the aggregated model for larger and smaller companies before/during (2007-2012) and after (2013-2017) the financial crisis are summarised in Table 8. The panel data for the empirical analysis are calculated using first differences. The sample was tested in five different regressions.

In column (1) of Table 8, for the purposes of a better comparison, once more the whole sample of 100 firms over 10 years is represented. This result has been presented previously.

In columns (2) to (5) of Table 8, the sample from the STOXX® Europe 600 Index is separated into two groups, the period before/during the financial crisis between 2007 and 2012 is represented by columns (2) and (3): 50 larger publicly traded firms are presented in column (2) and 50 smaller publicly traded firms in column (3). The period after the financial crisis from 2013 to 2017 is represented by columns (4) and (5). The 50 larger publicly traded firms are presented in column (4) and the 50 smaller publicly traded firms in column (5). The aim is to

check whether a difference in decisions concerning capital structure before/during and after the financial crisis exists for large and small firms in the sample.

The results of the aggregated deficit model show that in column (2) of Table 8 the pecking order coefficient was 94.8% and statistically significant at the 0.001 level and the null hypothesis is not rejected. Therefore, if a growth in deficit of 1% occurs the expected growth of net debt would be 0.948%, meaning that before/during the financial crisis larger firms financed most of their investment needs by issuing debt, rather than equity. The output of the test yielded a constant *"a"* of almost 0 and an adjusted R-squared equal to 90.0%. These results indicate that most of the large firms financed their deficit from issuing debt during the financial crisis.

The results of the aggregated deficit model show that in column (3) of Table 8 the pecking order coefficient was 84.9% and statistically significant at the 0.001 level and the null hypothesis is not rejected. Therefore, if a growth in deficit of 1% occurs the expected growth of net debt would be 0.849%, meaning that before/during the financial crisis smaller firms financed the majority of their investment needs by issuing debt. The output of the test yielded a constant *"a"* of almost 0 and an adjusted R-squared equal to 73.9%. These results indicate that smaller firms financed their deficit from other sources in addition to issuing debt during the financial crisis.

In column (4) of Table 8, the pecking order coefficient for large firms after the financial crisis was 86.4%, statistically significant at the 0.001 level, the null hypothesis is not rejected, and the adjusted R-squared for the correlation was equal to 83.9%. As the coefficient is relatively small and the goodness-of-fit relatively high, following the financial crisis large firms seemed to still use debt financing intensively, but issue more equity to cover their financing needs than before.

In column (5) of Table 8, the pecking order coefficient for small firms after the financial crisis was 36.5%, statistically significant at the 0.01 level, the null

hypothesis is rejected and the adjusted R-squared for the correlation was equal to 16.7%. As the coefficient is relatively small and the goodness-of-fit is also flat, following the financial crisis smaller firms seemed to use equity financing much more to cover their financing needs than before. This trend is confirmed by the fact that smaller firms were subjected to poor debt-issuance conditions after the financial crisis and they were in most cases more sensitive to price changes than the larger firms, since they were not as liquid as large firms.

The results of the pecking order theory test using the aggregated model for large and small firms before and after the financial crisis yielded a significant difference during that period. As for the previous regression, the support of the pecking order theory is stronger from larger firms than smaller firms. The results show that even larger firms supported the pecking order theory less following the financial crisis. Moreover, support of the pecking order theory from small firms notably decreased after the financial crisis in Europe.

The aggregated regression model is subjected to empirical tests, for example, for cross-sectional dependence, contemporaneous correlation, heteroscedasticity and serial correlation. The exact results are presented in ANNEX I. The first test for the cross-sectional dependence and contemporaneous correlation was conducted by Pesaran cross-sectional dependence. “The Pesaran cross-sectional dependence test helps to test whether the residuals are correlated across entities” (Hoechle, 2007; Torres-Reyna, 2007, p. 34). By contemporaneous correlation the result from the test can be biased (Torres-Reyna, 2007, p. 34). The test result failed to yield cross-sectional dependence for the analysed dataset. The second test for heteroscedasticity included the Wald test: “If the variance of the error term is constant (homoscedasticity), if the error terms do not have constant variance, they are said to be heteroscedastic” (Williams, 2015, p. 1). The test result shows the presence of heteroscedasticity for the analysed dataset. The third test was the Lagrange-multiplier test for serial correlation. “Serial correlation causes the standard errors of the coefficients to be smaller than they actually are and higher than R-squared” (Torres-Reyna, 2007, p. 36). The test result yields a p-value of 0.0216, where the null hypothesis had

to be rejected and as a result the analysed data does not exhibit first-order autocorrelation.

4.2. Disaggregated Model

The second empirical model to be tested is the disaggregated financing deficit model by Shyam-Sunder and Myers (1999). The model evaluates the relationship between the debt financing and the separately calculated disaggregated financing deficit of companies, which is calculated from dividend payments, investments, changes in working capital as well as cash flow.

Table 9: The test of the pecking order theory using the disaggregated model between 2007 and 2017 (The "_cons" represents the intercept "a" in the model description)

	(1) DEBT All Firms	(2) DEBT Large Firms	(3) DEBT Small Firms
DIV	0.787***	0.958***	0.684***
	(0.0732)	(0.0705)	(0.1120)
INV	0.728***	0.926***	0.597***
	(0.0877)	(0.0377)	(0.1170)
WC	0.566***	0.912***	0.433
	(0.1620)	(0.0535)	(0.220)
CASH	-0.647***	-0.907***	-0.501***
	(0.1100)	(0.0562)	(0.1430)
_cons	0.00140***	-0.000352***	0.00265***
	(0.000299)	(0.0000917)	(0.000354)
N	1000	500	500
adj. R-sq	0.549	0.883	0.371

Standard errors in parentheses
* p<0.05, ** p<0.01, *** p<0.001

The results of the disaggregated model are summarised in Table 9. The panel data for the empirical analysis was calculated using first differences. The sample was tested in three different regressions.

In column (1) of Table 9, the whole sample of 100 firms is represented over 10 years. The main hypothesis is the disaggregated coefficients as dividends (DIV), investments (INV), working capital (WC) and cash flow (CASH) are each assumed to be equal to 1, as with a growth of 1% for each coefficient the net debt should grow also by 1%. The interpretation of the coefficients is explained below in detail.

The test of the disaggregated deficit model was statistically significant at the 0.001 level with a positive dividend coefficient of 78.7%. Therefore, the null hypothesis can be rejected. If the dividend payments of the company grow by 1%, debt financing is expected to grow by around 0.8%, which is in line with the pecking order theory. Dividend paying firms seem to issue debt to meet their obligations to shareholders. The trade-off theory also describes a positive relationship between dividend payments and debt financing. Firms who pay higher dividends usually suppose high cash flows in the future but less investment costs. Those firms are capable of paying larger dividends to their shareholders (Frank and Goyal, 2003).

The test result was statistically significant at the 0.001 level and yielded a positive investment coefficient of 72.8%. The null hypothesis is rejected. Therefore, if the investments of the company grow by 1%, debt financing is expected to grow by around 0.7%, which is also in line with the pecking order theory. Larger investments result in a greater amount of tangible assets. Tangibility, as described by the prediction above in Section 2.3.1, normally serves as collateral and helps to facilitate better loan conditions from banks. This might help to increase debt capacity and a positive relationship is also described by the trade-off theory between investments and debt financing (Frank and Goyal, 2003).

The test results are statistically significant at the 0.001 level and yield a positive working capital coefficient of 56.6%, the null hypothesis can be rejected. Therefore, if the change in working capital of the company grows by 1%, debt financing is expected to grow by around 0.6%, but support for the pecking order theory is not as strong when compared to dividend payments and investments. According to Frank and Goyal (2003, p. 236), “timing issues” can affect the change in working capital, when firms take out a bank loan they might save that amount of money in a bank account. The investment is not always spent at the time of debt issuance, which might affect the change in working capital. The trade-off theory also describes a positive relationship with regard to change in working capital and debt financing (Frank and Goyal, 2003).

The test results are statistically significant at the 0.001 level and yielded a negative cash-flow coefficient of -64.7%. The null hypothesis is rejected. Therefore, if the change in cash flow of the company grows by 1%, debt financing is expected to decrease by around 0.6%. The negative sign could be an indication of potential future growth of the firms. The trade-off theory also describes a negative relationship with regard to change in cash flow and debt financing (Frank and Goyal, 2003).

The empirical results for the disaggregated model yielded a constant *“a”* of almost 0 and the data of the 100 publicly traded companies analysed fits the statistical model with an adjusted R-squared of 54.9%. These results indicate that there are further potential variables which influence the debt financing of companies and this prediction is tested by the conventional leverage model in Section 4.3.

In columns (2) and (3) of Table 9, the sample is separated into two groups, the 50 larger firms of the STOXX® Europe 600 Index are represented in column (2) and the 50 smaller ones in column (3). As a result of this division it is possible to test whether decisions concerning capital structure can be differentiated between the large and small firms in the sample and if this enables the presence of a

relevant difference to be verified, which could occur from non-uniform debt-issuing conditions for bigger and smaller companies.

The results of the disaggregated deficit model show that in column (2) of Table 9 the dividend payments, investments and changes in working capital coefficients are statistically significant at the 0.001 level and positive between 0.9 and 1, the null hypothesis is not rejected. Therefore, if the separated coefficients of the company grow by 1%, debt financing is expected to also grow by approximately 0.9% to 1%. The impact on these coefficients is almost equal to that of debt financing, which means if larger firms in Europe need to finance their dividend payments, investments or working capital, they will use debt issuance in most cases. The coefficient of change in cash flow is statistically significant at the 0.001 level and negative, -90.7% to be precise, the null hypothesis is not rejected. Therefore, if the change in cash flow of the company grows by 1%, debt financing is expected to decrease by approximately 0.9%. This is the most convincing result of my thesis so far because the larger publicly traded firms tend to support the pecking order theory in Europe between 2007 and 2017. The output of the test yielded a constant *"a"* of almost 0 and an adjusted R-squared of 88.3%. These results indicate that the debt financing of companies is mainly influenced by deficit.

The next regression analyses the 50 smaller publicly traded European firms of the STOXX® Europe 600 Index. The results are presented in column (3) of Table 9. The dividend payments, investments and changes in the coefficients of working capital are statistically significant at the 0.001 level and positive between 0.4 and 0.7. The null hypothesis is rejected. Therefore, if the aggregated coefficients of the company grow by 1%, debt financing is expected to grow by approximately 0.4% to 0.7%. Dividend payments with a coefficient of 68.4% have a stronger impact on the pecking order theory of smaller firms than on changes to the working capital with a coefficient of 43.3%. The coefficient of changes in cash flow is statistically significant at the 0.001 level and negative, -50.1% to be exact. The results of the smallest quintile of firms provided less support for the pecking order theory. Only a few of the smaller firms seem to make their financing decisions according to the pecking order theory. The output of the test

yielded a constant *"a"* of almost 0 and an adjusted R-squared of 37.1%. These results indicate that there are other potential variables which influence the debt financing of companies and this prediction is tested by the conventional leverage model in Section 4.3.

The disaggregated regression model is subjected to empirical tests for cross-sectional dependence, contemporaneous correlation, heteroscedasticity and serial correlation. A detailed description of each test has already been presented in Section 4.1, therefore, only the main results are highlighted here and the exact ones are presented in ANNEX I. The existence of cross-sectional dependence and contemporaneous correlation was evaluated by the Pesaran cross-sectional dependence test. The test result yielded no cross-sectional dependence for the analysed dataset. The second test was conducted to identify possible heteroscedasticity. The test result showed the presence of heteroscedasticity within the analysed dataset. Thirdly, the existence of serial correlation was conducted by the Lagrange-multiplier test. The test result proved that the analysed dataset is not of first-order autocorrelation.

The disaggregated model shows that larger firms support the pecking order theory more strongly than smaller ones. The results provide more support from larger firms, but this does not mean that smaller firms never implement the pecking order theory. The results for smaller companies are significant but in all likelihood larger firms are more reputable according to credit institutions and subject to better conditions in terms of loans. The results of the disaggregated model and a comparison with the trade-off theory are summarised in Table 10. The latter exhibits a coefficient that is POSITIVE/NEGATIVE just like for the variables.

Table 10: Results of the disaggregated model and a comparison with the trade-off theory

	Results	Interpretation of the Pecking Order Theory	Trade-off Theory
Dividends	Significantly positive	More long-term debt issued by dividend-paying firms	$\beta_{DIV} > 0$
Investments	Significantly positive	More investments, increase in tangible assets	$\beta_{INV} > 0$
Working capital	Significantly positive	Timing issues	$\beta_{WC} > 0$
Internal cash flow	Significantly negative	Opportunities to grow in the future	$\beta_{CASH} < 0$

4.3. Conventional Leverage Model

The third empirical model to be tested was the conventional leverage model by Rajan and Zingales (1995). The model evaluates the relationship between debt financing, the aggregated financing deficit plus other potentially related components like the tangibility, growth, size and profitability of companies. The aforementioned empirical models by Shyam-Sunder and Myers (1999) showed strong support for the pecking order theory for mainly larger firms, therefore, the aim of this test was to identify whether other components also play important roles as far as the decision-making with regard to the financing deficit of companies is concerned.

Table 11: Test of the pecking order theory using the conventional leverage model between 2007 and 2017 (The "_cons" represents the intercept "a" in the model description)

	(1) DEBT	(2) DEBT	(3) DEBT	(4) DEBT	(5) DEBT	(6) DEBT
	All Firms		Large Firms		Small Firms	
TANG	0.290**	0.118	0.418**	0.086*	0.218*	0.115
	(0.0866)	(0.0606)	(0.1240)	(0.0369)	(0.1080)	(0.0901)
MTOB	0.0004	0.000001	-0.0024**	0.0001	0.0006***	0.0001
	(0.0003)	(0.0001)	(0.0008)	(0.0002)	(0.0001)	(0.0001)
LSALE	-0.0073	0.0033	-0.0274*	0.0036	0.0080	0.0072
	(0.0088)	(0.0054)	(0.0126)	(0.0029)	(0.0097)	(0.0090)
PROF	0.188	-0.328*	0.703*	-0.173	-0.087	-0.453*
	(0.228)	(0.143)	(0.298)	(0.091)	(0.274)	(0.221)
DEF		0.718***		0.926***		0.585***
		(0.0802)		(0.0355)		(0.1170)
_cons	0.0057***	0.0011	0.0054***	0.0002	0.0040*	0.0005
	(0.0010)	(0.0007)	(0.0013)	(0.0003)	(0.0016)	(0.0012)
N	944	944	488	488	456	456
adj. R-sq	0.029	0.541	0.120	0.873	0.016	0.372

Standard errors in parentheses
* p<0.05, ** p<0.01, *** p<0.001

The results of the conventional leverage model are summarised in Table 11. The panel data for the empirical analysis is calculated using first differences. The sample was tested in six different regressions.

In columns (1) and (2) of Table 11 the whole sample of 100 firms is represented over 10 years. The main hypothesis states that the coefficients of tangibility (TANG) are assumed to be positive, that of market-to-book ratio (MTOB) is assumed to be negative, of log sales (LSALE) positive, profitability (PROF) negative and financing deficit (DEF) to be 1, as a growth of 1% in deficit should

result in the coefficient of net debt growing by 1% as well. The description of the components and main predictions with regard to the conventional leverage model have already been presented in Section 2.3.

The test of the first variation with regard to the conventional leverage model is presented in column (1) of Table 11, where tangibility, market-to-book ratio, log sales and profitability were added to the regression and yielded a tangibility coefficient of 29%, which was statistically significant at the 0.01 level and the null hypothesis is rejected. Therefore, firms with more tangible assets will issue more debt. The market-to book ratio was close to zero but positive, which is contrary to alternative hypothesis that companies with higher growth potentials have a negative impact on debt financing. The null hypothesis can not be rejected. The coefficient of log sales was also close to zero but remained negative, therefore, in contrast to the alternative hypothesis, a higher volume of sales would reduce debt issuance. Profitability has a positive impact on debt issuance which is consistent with the null hypothesis; if the profitability of the firm increases by 1%, the volume of net debt could potentially grow by around 0.2%, but the results are statistically not significant. The output of the test yielded a constant of nearly 0.6%, statistically significant at the 0.001 level, the null hypothesis is not rejected and an adjusted R-squared of only 2.9%. These results indicate that without a doubt further potential variables influence the debt financing of companies. This prediction was tested in the next regression which also took the financing deficit in the statistical model into consideration.

In column (2) of Table 11, the financing deficit is incorporated into the conventional leverage regression. The results yielded a negative profitability coefficient of -0.328 which is statistically significance at the 0.05 level. The negative nature of the profitability coefficient is consistent with the alternative hypothesis that there is a negative relationship between profitability and net debt. The null hypothesis is rejected. The pecking order coefficient is of 0.718 statistically significance at the 0.001 level and the null hypothesis can be rejected. Therefore, if the deficit of the company grows by 1%, the debt financing is expected to increase by around 0.7%, which is a sign that firms tend to focus on the pecking order theory and financing decisions focus on debt issuance. The

tangibility coefficient was 11.8%, the market-to-book ratio and log-sales coefficient have almost no impact on debt issuance, however, these coefficients are statistically not significant. The null hypothesis can not be rejected. The output of the test yielded a constant *"a"* of almost 0 and an adjusted R-squared for the model of 54.1%. These results indicate that further potential variables exist that influence the debt financing of companies other than tangibility, market-to-book ratio, log sales, profitability and deficit financing.

In columns (3) to (6) of Table 11, the sample from the STOXX® Europe 600 Index is separated into two groups: columns (3) and (4) represent the 50 larger publicly traded firms and columns (5) and (6) the 50 smaller publicly traded firms. With this approach, the study examines whether a difference in terms of decisions concerning capital structure exists for large and small firms in the sample. The level of impact as a result of the added components is dependent on the size of the firms.

The results of the conventional leverage model are presented in column (3) of Table 11. The test concerning the second group that consists of 50 large companies with regard to the conventional leverage model, where tangibility, market-to-book ratio, log sales and profitability were incorporated into the regression, yielded coefficients that are significant on different levels. The tangibility coefficient was 41.8% and statistically significant at the 0.01 level which is in line with the prediction that companies with more tangible assets finance themselves, probably by debt to a greater extent. The null hypothesis is rejected. The market-to-book coefficient was negative as predicted but exhibited no strong impact on net debt, with a statistically significance of -0.2% at the 0.01 level. The null hypothesis is rejected. The log-sales coefficient also has a negative impact, with a statistically significance of -2.7% at the 0.05% level, rather than a positive effect as predicted. The null hypothesis can not be rejected. Surprisingly, the profitability coefficient is high and positive with a statistically significance of 70.3% at the 0.05 level, which means in terms of larger firms profitability supports debt financing. The null hypothesis can not be rejected. The output of the test yielded a constant *"a"* of almost 0.5%, was

statistically significant at the 0.001 level and the adjusted R-squared was only 12%. These results indicate that without a doubt further potential variables influence the debt financing of larger companies. This prediction is tested in the next regression that incorporates the financing deficit into the statistical model.

In column (4) of Table 11, the financing deficit is incorporated into the conventional leverage regression of larger firms. The tangibility coefficient is equal to 8.6%, null hypothesis is rejected and is statistically significant at the 0.05 level. The pecking order coefficient of 92.6% is statistically significant at the 0.001 level. The null hypothesis is not rejected. Therefore, if the deficit of the company grows by 1%, debt financing is expected to increase by around 0.9%, which is in close agreement with the pecking order theory according to larger companies. The market-to-book ratio and log-sales coefficient are positive when almost zero but their impact is statistically not significant. The profitability coefficient is negative at -17.3% but still statistically not significant. The output of the test yielded a constant *"a"* of almost 0 and an adjusted R-squared of 87.3%. These results show that larger publicly traded firms tend to support the pecking order theory in Europe between 2007 and 2017 and that firms with more tangible assets issue more debt.

The 50 smaller publicly traded European firms in the STOXX® Europe 600 Index are analysed in the next regression. In the third variation of the test with regard to the conventional leverage model the following coefficients were incorporated into the regression: tangibility, market-to-book ratio, log sales and profitability. The results are presented in column (5) of Table 11. The tangibility coefficient was 21.8% and statistically significant at the 0.05 level, therefore, if the tangibility of the company grows by 1%, debt financing is expected to increase by around 0.2%. The null hypothesis is rejected. The market-to-book coefficient is positive in contrast to the prediction with a statistically significance of 0.1% at the 0.001 level. The null hypothesis can not be rejected. The log-sales coefficient is positive but almost zero and has no strong impact, however, the profitability coefficient is -8.7% but statistically not significant. The output of the test yielded a constant *"a"* of almost 0.4% statistically significance at the 0.05 level and an adjusted R-squared of only 1.6%. These results indicate that without a doubt

additional potential variables have an influence on the debt financing of smaller companies. This prediction was tested in the next regression that incorporates the financing deficit into the statistical model.

In column (6) of Table 11, the financing deficit has been incorporated into the conventional leverage regression of smaller firms. The profitability coefficient is equal to -45.3% and statistically significant at the 0.05 level, in accordance with the prediction that profitability has a negative impact on net debt. The null hypothesis is rejected. The pecking order coefficient of 58.5% is statistically significant at the 0.001 level. Meaning, if the deficit of the company grows by 1%, debt financing is expected to increase by around 0.6%. The tangibility coefficient is equal to 11.5%, however, the market-to-book ratio and log sales coefficient have almost no impact on debt issuance. These coefficients are statistically not significant. The null hypothesis can not be rejected. The output of the test yielded a constant *"a"* of almost 0 and an adjusted R-squared of 37.2%. The result shows that support in favour of the pecking order theory from smaller publicly traded firms in Europe decreased between 2007 and 2017 and that more highly profitable firms issue less debt. Further research into other related variables of debt financing is needed to better understand whether companies follow the pecking order theory.

The conventional leverage regression model was subjected to empirical tests, namely cross-sectional dependence, contemporaneous correlation, heteroscedasticity and serial correlation. A detailed description of each test was presented above in Section 4.1, therefore, only the main results are highlighted here and the exact results are presented in ANNEX I. The first test for cross-sectional dependence and contemporaneous correlation was conducted by Pesaran cross-sectional dependence. Unfortunately, the test could not be conducted because there 'were not enough observations across the panel to perform the Pesaran's test'. The second test was for heteroscedasticity. The test result shows the presence of heteroscedasticity in the analysed dataset. The third test was conducted by the Lagrange-multiplier test for serial correlation. The test result shows that the analysed data does not exhibit first-order autocorrelation.

Two important conclusions can be made from the conventional leverage model. Firstly, that by incorporating more potential variables into the empirical model, which could influence financing decisions of the analysed companies, a bigger picture of the financing mechanism in Europe can be observed. However, the variables added to financing deficit, namely tangibility, market-to-book ratio, log sales and profitability, seem to not cover all the potential impacts in terms of debt financing. Further research into other potential variables of debt financing is needed to better understand whether the influential factors of financing decisions by companies follow the pecking order theory in Europe. Second, according to the empirical results larger firms follow the pecking order theory more closely than smaller ones. The major difference is a result of decisions concerning deficit financing between larger and smaller companies in Europe. Larger firms finance their whole deficit almost entirely by issuing debt, rather than equity. In contrast, smaller firms issue both debt and equity to finance their obligations.

5. European and US Markets

The empirical analyses yield different results for the European and US companies. On the one hand, most previous research has focused on publicly traded companies in the USA. Frank and Goyal (2003) did not manage to identify any strong evidence in favour of the pecking order theory by implementing the models by Shyam-Sunder and Myers (1999) and Rajan and Zingales (1995). On the other hand, studies on European publicly traded companies have identified more persuasive evidence in favour of the pecking order theory. A study by Mugoša (2015) on western European firms also provided evidence to support the pecking order theory in addition to the empirical analysis presented previously in this thesis. An attempt is made to answer the following research question in this section: where do differences between the European and US markets originate from? The following comparison identifies potential explanations for the differences in the empirical research.

The first point that appears by comparing the European and US markets is the types of financial systems. If retained earnings are insufficient and companies require external financing, two possibilities arise as mentioned previously in the thesis. Firms can choose either to appeal to the capital markets or banks. On the one hand, most European countries are known for their bank-oriented financial systems, which were established from their policies of creditor protection (SVR, 2005). On the other hand, the US is known for its market-oriented financial system, which was established from its policies of investor protection and transparency (Corporate Governance). Most papers examine various aspects of capital market- and bank-oriented systems and the goal of their comparison is said to be impartial. The main differences between bank- and capital market-oriented financial systems are explained below in more detail.

The first main difference between bank- and capital market-oriented financial systems is the “corporate financing” (Hügle, 2001, p. 77). In the bank-oriented financial system corporate financing is mostly conducted by financial intermediaries. Long-term credit relationships and strategic shareholding in other

companies to which they grant credits exist simultaneously. In contrast, in the capital market-oriented financial system corporate financing is mostly by organized markets. Companies issue shares and bonds to finance their long-term needs (Brückmann and Patzig, 2007). However, this does not mean that the two financial systems can choose from only one or the other financing possibility. A mixture of both exists but simultaneously a visible difference is present in terms of the “share of bank loans” (Hügle, 2001, p. 77). Companies in the bank-oriented financial system, as expected, usually have a larger proportion of bank loans and less outstanding shares and bonds. In contrast, firms in the capital market-oriented financial system possess a lower share of bank loans and a higher outstanding value of shares and bonds (Hügle, 2001).

The second main difference between bank- and capital market-oriented financial systems is the “share of business volume of the banks” (Hügle, 2001, p. 77), which can be measured, for example, as a percentage of the GDP. Banks in the bank-oriented financial system usually have a higher share of business volume. In contrast, banks in capital market-oriented financial systems have a lower share of business volume (Hügle, 2001).

The third main difference between bank- and capital market-oriented finance systems is the “share of trade and market value of companies” (Hügle, 2001, p. 77), which can be measured, for example, as a percentage of the GDP. Companies in bank-oriented financial systems usually possess a smaller share of trade and market values. In contrast, companies in capital market-oriented financial systems possess a larger share of trade and market values (Hügle, 2001).

The fourth main difference between bank- and capital market-oriented financial systems is the “number of listed companies” (Hügle, 2001, p. 77). Less companies are listed on the stock exchange in bank-oriented financial systems than in capital market-oriented ones (Hügle, 2001).

The fifth main difference between bank- and capital market-oriented financial systems is the “shareholding in corporations, to be more exact, in private

households and banks" (Hügle, 2001, p. 77). Companies usually possess "low shares in private households" in bank-oriented financial systems. On the contrary, companies in capital market-oriented financial systems possess large shares in private households. In the bank-oriented financial system "shareholding in banks" is allowed (Hügle, 2001, p. 77). In contrast, in capital market-oriented financial systems "shareholding in banks" is forbidden (Hügle, 2001).

The sixth main difference between bank- and capital market-oriented financial systems is the "concentration of owners and investors" (Hügle, 2001, p. 77), which in bank-oriented financial systems is much higher than in capital market-oriented ones (Hügle, 2001).

The seventh main difference between bank- and capital market-oriented financial systems is the "futures and options markets" (Hügle, 2001, p. 77), which in bank-oriented financial systems is illiquid. Furthermore, allocation in bank-oriented financial systems could cause potential problems concerning asymmetric information through long-term relationships to arise. Interdependence, intransparency, illiquidity and the lack of competition can cause misallocation (Brückmann and Patzig, 2007). In contrast, in capital market-oriented financial systems financial markets are liquid (Hügle, 2001). Furthermore, in the capital market-oriented financial system competition and allocative efficiency are promoted by transparency and liquidity. "Problems of asymmetric information can lead to credit rationing" (Brückmann and Patzig, 2007, p. 13).

The eighth main difference between bank- and capital market-oriented financial systems is the "corporate debt ratio" (Hügle, 2001, p. 77). Companies in bank-oriented financial systems usually possess higher degrees of leverage. In contrast, firms in capital market-oriented financial systems possess a lower degree of leverage (Hügle, 2001).

The ninth main difference between bank- and capital market-oriented financial systems is the "information and transparency available to corporations" (Hügle,

2001, p. 77), which is limited in the bank-oriented financial systems (Hügle, 2001). The information sharing is not equal nor accessible to everyone, for example, financial intermediaries have privileged access and receive much more data. In the bank-oriented financial systems the protection of creditors is the priority, which is strengthened by accounting standards (Brückmann and Patzig, 2007). In contrast, in the capital market-oriented financial systems information and transparency are usually published or publicly available (Hügle, 2001). Companies have to fulfil more stringent disclosure requirements. The information provided by accounting reports is used more frequently for company valuation in the capital market-oriented financial systems (Brückmann and Patzig, 2007).

The tenth main difference between bank- and capital market-oriented financial systems is the “management control in corporates” (Hügle, 2001, p. 77). In the bank-oriented financial systems, control is implemented through long-term credit relationships, mostly in-house banking relationships and participation in financial intermediary corporations. Banks control not only the shareholdings of firms themselves but often the shares belonging to clients of companies, as well (Brückmann and Patzig, 2007). In the capital market-oriented financial systems, the market that concerns corporate control and credit-rating agencies takes over control (Hügle, 2001). Therefore, the shares of companies are controlled externally. External controls are also needed should companies be misevaluated (Brückmann and Patzig, 2007).

The eleventh main difference between bank- and capital market-oriented financial systems is “stability” (Brückmann and Patzig, 2007, p. 13). In bank-oriented financial systems, an “insurance function” exists in the event of company-specific shocks. In the capital market-oriented financial systems, the response to systematic shocks is more effective (Brückmann and Patzig, 2007).

Last but not least, the twelfth main difference presented in this thesis between bank- and capital market-oriented financial systems is “adaptability” (Brückmann and Patzig, 2007, p. 13). In bank-oriented financial systems and other technologies, existing companies have the advantage because close relationships are present between the banks and companies. In the capital

market-oriented financial systems young companies are advantageous in terms of rapid technological change. “The competition acts as a mechanism for discovery and increases adaptability” (Brückmann and Patzig, 2007, p. 13).

The aforementioned differences show that both bank- and capital market-based systems have advantages and disadvantages. Banks establish long-term relationships with their customers, which help to reduce information asymmetry between creditors and lenders. The personal information of customers and their trades are kept confidential, and less information concerning the needs of customers is published. The in-house banks usually know the company much more thoroughly than other possible investors. For that reason, in many cases only an in-house bank can approve a loan for a company. However, interest rates could be set higher (Winterberg, 2015). On the other hand, in capital market-oriented financial systems, creditors can be subjected to better conditions. However, companies have to publish their data to be able to participate directly in the capital market, which is costly for companies (Winterberg, 2015).

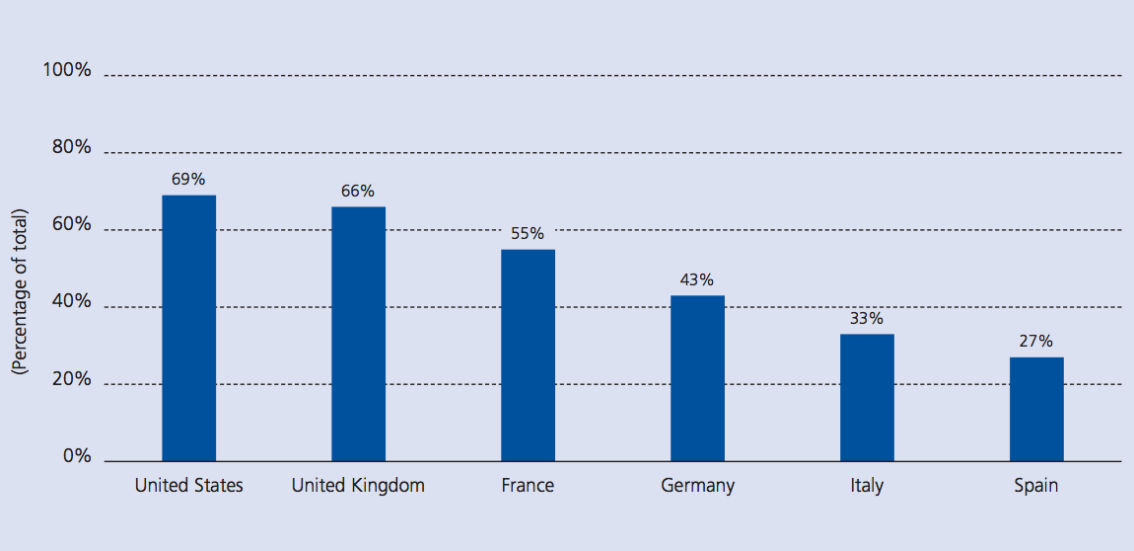

Figure 4: Predominance of bank loans over capital market financing in the EU: Capital market financing versus Bank financing. Averages, 2000-2010 (WSBI, ESBG and IEB, 2015, p. 4)

After reviewing the differences between bank- and capital market-oriented financial systems, it is no surprise that the results from the empirical studies are different in terms of the European- and US-focused studies. Companies are in all likelihood influenced due to the financial system, according to their operation. As long as US companies operate within the capital market-based financial system, firms probably issue equity more often. European companies operate within the bank-based financial system and probably issue more debt. Capital market financing versus bank financing between 2000 and 2010 is represented in Figure 4 and shows the “predominance of bank loans over capital market financing in Europe” (WSBI, ESBG and IEB 2015, p. 4). In the US and UK capital market financing plays a leading role. In France capital market financing is still more popular than bank financing. In contrast, in Germany, Italy and Spain bank financing plays a major role (WSBI, ESBG and IEB 2015, p. 4). The pecking order theory states that should firms require external financing, they choose debt financing first and if their debt is insufficient or unavailable they issue equity (Myers and Majluf, 1984). By taking into account the financial system, the pecking order theory favours the bank-based European system. The above-mentioned empirical research concerning one hundred European companies is more strongly in favour of the pecking order theory than previous US studies, which is also indicative of financial systems playing a direct or indirect role in the financial decisions of companies.

Conclusion

Capital structure theories describe the effect of changes to leverage in firms. Competitive theories and models, namely that of capital structure by Modigliani and Miller, static and dynamic trade-off theories, as well as the pecking order theory, were presented in this master's thesis. Shyam-Sunder and Myers (1999) found strong evidence in support of the pecking order theory for US publicly traded firms, however, the target-adjustment model of the static trade-off theory was rejected by them. Frank and Goyal (2003) also tested the pecking order theory also with US publicly traded firms and found that net-equity issues correlate with financing deficit more efficient than net-debt issues and the importance of financing the deficit of firms decreases over time.

After analysing the capital structure theories in the literature of corporate finance, in which most empirical analyses are made for US publicly traded companies, the aim of my research was to understand whether the pecking order theory is applicable to European firms. One hundred European publicly traded firms were randomly selected from the STOXX® Europe 600 Index. The annual panel data was collected from Bloomberg between 2007 and 2017. Right at the beginning of the financial crisis in Europe, to understand whether the lending mechanism was affected by the changing financial environment. Three empirical models were presented and tested to show if and how European companies implement the pecking order theory. The goal of this thesis was to compare the results of previous studies on US publicly traded firms with those on European publicly traded firms. The models of Shyam-Sunder and Myers (1999), namely the aggregated and disaggregated models, in addition to the conventional leverage model by Rajan and Zingales (1995) were empirically tested using the selected dataset. The three statistical models were each tested on all one hundred companies and then on the fifty larger and fifty smaller companies separately to identify potential differences between their decisions with regard to capital structure.

In contrast to previous studies, my empirical results are much more positive with regard to the implementation of the pecking order theory. The results support the application of the pecking order theory by European companies. However, this support was stronger from larger firms than smaller ones, which could be in accordance with different capabilities of debt issuance. Furthermore, the results are highly dependent on the period of time analysed. Before the beginning of the financial crisis in 2007, companies had much larger outstanding debts, which declined during and after the financial crisis in Europe. As the test of the models by Shyam-Sunder and Myers (1999) showed, the influence on decisions with regard to debt financing is likely to originate not only from financing deficit. Therefore, in the conventional leverage model by Rajan and Zingales (1995) further potential variables were included. However, the influence of the new variables on net-debt issuance is not as strong as on financing deficit. Moreover, the results are insignificant in terms of the analysed dataset. Further comprehensive research into potential unexpected components with regard to the capital structure of firms is necessary, because at present the theories are not able to describe all the decisions concerning the capital structure of firms.

Furthermore, the comparison and discussion of differences between the US and European markets were presented. Due to the vast differences between the European and US markets, the empirical tests imply that European firms are more likely to follow the pecking order theory and issue debt rather than equity to satisfy their deficits. However, following the financial crisis in Europe, companies seem to trust banks less. Firms often decide to issue equity sooner than they did before the financial crisis.

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Appendix I: Empirical Tests

//Aggregated Model

Pesaran's test of cross sectional independence = 16.317, Pr = 0.0000

Average absolute value of the off-diagonal elements = 0.296

Modified Wald test for groupwise heteroskedasticity

in fixed effect regression model

H0: sigma(i)^2 = sigma^2 for all i

chi2 (100) = 1.3e+06

Prob>chi2 = 0.0000

Wooldridge test for autocorrelation in panel data

H0: no first-order autocorrelation

F(1, 99) = 5.453

Prob > F = 0.0216

//Disaggregated Model

Pesaran's test of cross sectional independence = 13.926, Pr = 0.0000

Average absolute value of the off-diagonal elements = 0.298

Modified Wald test for groupwise heteroskedasticity

in fixed effect regression model

H0: sigma(i)^2 = sigma^2 for all i

chi2 (100) = 2.9e+05

Prob>chi2 = 0.0000

Wooldridge test for autocorrelation in panel data

H0: no first-order autocorrelation

F(1, 99) = 5.099

Prob > F = 0.0261

//Conventional Leverage Model version 1

Error: The panel is highly unbalanced.
Not enough common observations across panel to perform Pesaran's test.
insufficient observations; r(2001);

Modified Wald test for groupwise heteroskedasticity
in fixed effect regression model
H0: sigma(i)^2 = sigma^2 for all i
chi2 (100) = 29112.75
Prob>chi2 = 0.0000

Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
F(1, 99) = 2.414
Prob > F = 0.1234

//Conventional Leverage Model version 2

Error: The panel is highly unbalanced.
Not enough common observations across panel to perform Pesaran's test.
insufficient observations; r(2001);

Modified Wald test for groupwise heteroskedasticity
in fixed effect regression model
H0: sigma(i)^2 = sigma^2 for all i
chi2 (100) = 2.7e+05
Prob>chi2 = 0.0000

Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
F(1, 99) = 0.024
Prob > F = 0.8778

Appendix II: STATA Do-files

```
set more off
clear
import excel "...", sheet("Tabelle1") firstrow

//Exploring the data
xtset p t, yearly
twoway scatter DEBT DEF, clstyle(p2)
xtsum
twoway (line MEAN_DEBT MEAN_DEFF MEAN_EQUITY t, sort)
egen firms = cut(p), at(1,51,101) icodes

//Hausman test
xtreg DEBT DEF, fe
estimates store Fixed
xtreg DEBT DEF, re
estimates store Random
hausman Fixed Random

//Regression with first differences (Aggregated Model)
xtreg DEBT DEF, fe level(99.9) robust
estimates store all
xtreg DEBT DEF in 1/500, fe vce(robust) level(99.9)
estimates store large
xtreg DEBT DEF in 501/1000, fe vce(robust) level(99.9)
estimates store small
esttab all large small, se ar2

xtreg DEBT DEF if twithin(2007,2013), fe vce(robust) level(99.9)
estimates store before
xtreg DEBT DEF if twithin(2012,2018), fe vce(robust) level(99.9)
estimates store after
xtreg DEBT DEF in 1/500 if twithin(2007,2013), fe vce(robust) level(99.9)
```

```
estimates store beforelarge
xtreg DEBT DEF in 1/500 if twithin(2012,2018), fe vce(robust) level(99.9)
estimates store afterlarge
xtreg DEBT DEF in 501/1000 if twithin(2007,2013), fe vce(robust) level(99.9)
estimates store beforesmall
xtreg DEBT DEF in 501/1000 if twithin(2012,2018), fe vce(robust) level(99.9)
estimates store aftersmall
esttab all before after, se ar2
esttab all beforelarge beforesmall afterlarge aftersmall, se ar2
```

//Testing for the time-fixed effects

```
xtcsd, pesaran abs
xttest3
xtserial DEBT DEF
```

//Regression with first differences (Disaggregated Model)

```
xtreg DEBT DIV INV WC CASH, fe level(99.9) robust
estimates store all1
xtreg DEBT DIV INV WC CASH in 1/500, fe vce(robust) level(99.9)
estimates store large1
xtreg DEBT DIV INV WC CASH in 501/1000, fe vce(robust) level(99.9)
estimates store small1
esttab all1 large1 small1, se ar2
```

//Testing for the time-fixed effects

```
xtcsd, pesaran abs
xttest3
xtserial DEBT DIV INV WC CASH
```

//Regression with first differences (Conventional Leverage Model)

```
xtreg DEBT TANG MTOB LSALE PROF, fe level(99.9) robust
estimates store all2
xtreg DEBT TANG MTOB LSALE PROF in 1/500, fe vce(robust) level(99.9)
estimates store large2
xtreg DEBT TANG MTOB LSALE PROF in 501/1000, fe vce(robust) level(99.9)
estimates store small2
esttab all2 large2 small2, se ar2
```

//Testing for the time-fixed effects

```
xtcsd, pesaran abs
xttest3
xtserial DEBT TANG MTOB LSALE PROF

xtreg DEBT TANG MTOB LSALE PROF DEF, fe level(99.9) robust
estimates store all3
xtreg DEBT TANG MTOB LSALE PROF DEF in 1/500, fe vce(robust) level(99.9)
estimates store large3
xtreg DEBT TANG MTOB LSALE PROF DEF in 501/1000, fe vce(robust) level(99.9)
estimates store small3
esttab all3 large3 small3, se ar2

esttab all2 all3 large2 large3 small2 small3, se ar2
```

//Testing for the time-fixed effects

```
xtcsd, pesaran abs
xttest3
xtserial DEBT TANG MTOB LSALE PROF DEF
```

Appendix III: Abstract

Competitive theories and models, namely that of capital structure by Modigliani and Miller, static and dynamic trade-off theories, and the pecking order theory, are presented in this master's thesis. The first aim of this research was to understand whether the pecking order theory is applicable to European publicly traded firms when compared to previous studies on US publicly traded firms. The second was to determine whether the lending mechanism was affected by the changing financial environment. The annual panel data was tested in the empirical models of Shyam-Sunder and Myers (1999) as well as Rajan and Zingales (1995) between 2007 and 2017. According to the empirical results European firms are more likely to follow the pecking order theory and issue debt rather than equity to satisfy their deficits. However, this research shows that larger firms support the pecking order theory more strongly than smaller ones, which could be a result of different capabilities with regard to debt issuance. Moreover, the results were highly dependent on the period of time analysed. Before the beginning of the financial crisis in 2007, the outstanding debts of big companies were significantly larger, but this declined during and after the financial crisis in Europe.

Appendix IV: Zusammenfassung

In dieser Masterarbeit werden konkurrierende Theorien und Modelle vorgestellt, und zwar die der Kapitalstruktur von Modigliani und Miller, statische und dynamische Trade-Off-Theorien sowie die Hackordnungstheorie. Das Ziel meiner Forschung ist es zu verstehen, ob die Hackordnungstheorie für die europäischen börsennotierten Unternehmen im Vergleich zu früheren Studien für die US-amerikanischen börsennotierten Unternehmen anwendbar ist. Zweitens, ob der Kreditmechanismus durch das sich verändernde finanzielle Umfeld beeinflusst wurde. Die jährlichen Paneldaten werden in den empirischen Modellen von Shyam-Sunder und Myers (1999) sowie Rajan und Zingales (1995) für den Zeitraum von 2007 bis 2017 getestet. Die empirischen Ergebnisse bestätigen, dass europäische Unternehmen eher der Hackordnung folgen und sich verschulden, um ihre Defizite zu finanzieren und diese als Eigenkapital auszunutzen. Weiteres, fand ich mehr Unterstützung bei größeren Unternehmen als bei kleineren Firmen, was durch das Auftreten unterschiedlicher Schuldentilgungsfähigkeiten gegeben sein könnte. Darüber hinaus zeigen die Ergebnisse eine starke Abhängigkeit von dem analysierten Zeitraum. Vor dem Beginn der Finanzkrise im Jahr 2007 hatten die Unternehmen viel größere Schulden ausstehend, die während und nach der Finanzkrise in Europa zurückgegangen sind.