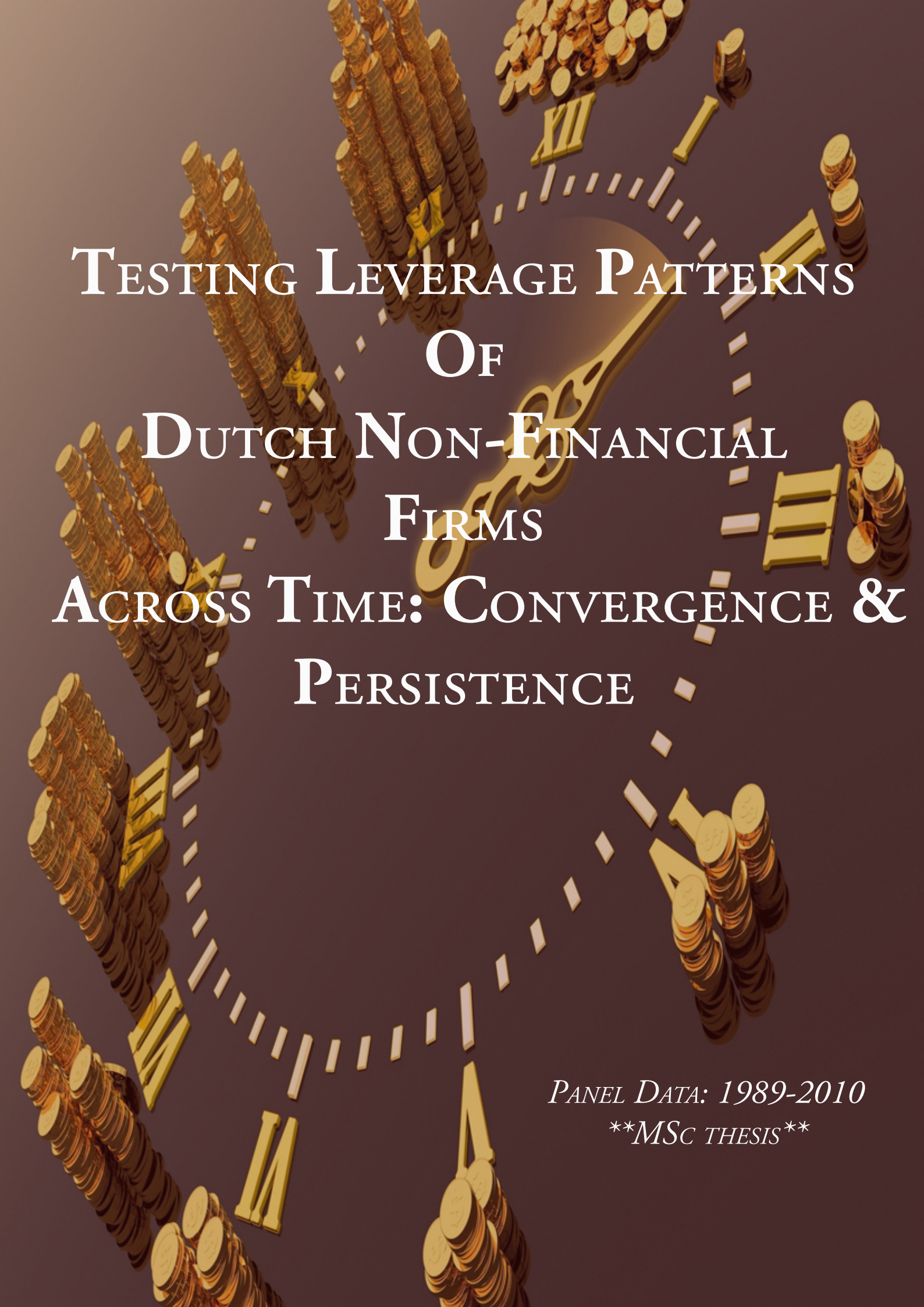


# Testing Leverage Patterns Of Dutch Non-Financial Firms Across Time: Convergence & Persistence

*Panel Data: 1989-2010*

***MSc thesis***


AUTHOR: RESHAD SAKHI
EMAIL: RESHAD.SAKHI@HOTMAIL.COM
DATE: 22-09-2011
STUDENT NUMBER: S1019686
EDUCATION: BUSINESS ADMINISTRATION (MBA)
TRACK SPECIALIZATION: FINANCIAL MANAGEMENT
ASSIGNMENT: MSC-THESIS
TOPIC: CAPITAL STRUCTURE PUZZLE
MENTOR: DR. XIAOHONG HUANG (FIRST SUPERVISOR)
IR. H. KROON (SECOND SUPERVISOR)

# Acknowledgements

I've heard people saying that to every good fairy tale comes an end. As I write this thesis acknowledgement I also realize that the same adage also applies to me. A journey that started six years ago seems to have come to an end. After four years studying Business economics at HU I decided to continue the journey at University Twente. With this MSc-thesis I also close my 2-year student time at University Twente.

This thesis covers the topic corporate capital structure puzzle, one of the interesting topics in the field of corporate finance. It is a pleasure to thank many people who made this thesis possible. First of all this work would have not been possible without the support from Dr. Xiaohong Huang. I am also grateful to Ir. H. Kroon for sharing his view. Further I would also like to thank my close friends who always stood by my side and provide the necessary help whenever needed. My final words go to my family. I want to thank my family, whose love and guidance is with me in whatever I pursue. Thanks mom for being there my whole life and supporting my decisions.

Reshad Sakhi

## Abstract

In this thesis one finds that the corporate capital structure of Dutch non-financial firms do not only converge over time but they also persist. The feature regarding persistence component is found to have been caused by firm specific time invariant factors. Firm fixed effects on a five year base have even more explanation power than firm fixed effects on a yearly base. The time varying determinants often applied by researcher do not only behave differently under different financials systems, but also loss their marginal effect when firm-fixed effects are added. In overall the results show that capital structure studies are more difficult than implied by previous research.

# Table of content

## Figures



## Tables

# 1. Introduction

## 1.1. Research problem & motivation

One of the key aspects in the finance literature is that of the capital structure that implies the way in which corporations finance their assets. In professor Miller's words "in an economist's ideal world of complete and perfect capital markets and with full and symmetric information among all market participants, the total market value of all securities issued by a firm is governed by the earning power and risks of its underlying real assets and is independent of how the mix of securities including debt instruments and equity capital issued to finance it" *(Hillier et al, 2010: 413)*. Unfortunately there are imperfections to be found in the real world, making the total value of a firm to be not only dependent on the earning power and risks of its underlying real assets but also on the way these underlying real assets are financed. Although the possible source of financing for a company is a dichotomy (i.e. debt and equity with respect to many different alternative forms these sources can take), the infinite number of choices available among these sources of financing have leaded to a fundamental question in the financial economics, namely: "How do firms choose their capital structures?" While this question was put forward by *Myers (1984: 575)* his own answer was: "We don't know".

The magnificent work of *Modigliani & Miller (1958)* (M&M), which can be seen as a starting point, has magnified the focus dealing with capital structure. Many researchers and scholars have attempted to answer this question without a definite answer. Even though a number of determinants are found and amended during the years that purport to explain variation in corporate capital structures, still only a relatively small part of the variation in leverage can be clarified by these findings. Take for example the eight traditional determinants of *Rajan & Zingales (1995)* and of *Frank & Goyal (2007)* — the tangibility of assets, the market-to-book ratio, size measured by log of sales, profitability, median industry leverage, expected inflation, cash flow volatility, and whether a firm is a dividend payer or not — that seems to account for 18% to 29% of the variation according to the model of *Lemmon, Roberts & Zender (2008)*. The question still remains, is this closest that one can get? The answer is still one does not know.

After a great strides for many years a recent paper published by *Lemmon, Roberts & Zender (2008)* has proven that it is possible to increase this explained variability in leverage up to 60%. The main conclusion of the study of *Lemmon, Roberts & Zender (2008)*, that focuses on US non-financial firms, is that leverage ratios are mostly

affected by time-invariant and firm-specific factors. The results of their study have proven that by including the firm fixed effects into the model, the variability in leverage of 18% to 29% explained by traditional determinants only, increases to 60%. Since the elements of the analytical methods applied by these authors will form the basis of this study, in the methodology chapter a detailed discussion will be given. As such, these outcomes may be of great meaning in future research into the determinants of capital structure, the question still remains whether these results hold in different circumstances.

Henceforth, in this study the research problem will be referred to as corporate capital structure puzzle in the Netherlands whereas the work of *Lemmon, Roberts & Zender (2008)* will be repeated and applied. The motivations for this study include the limited number of studies conducted into the Dutch situation in the field of corporate finance and the relative small part of the variations explained by these studies *(Cools & Spee (1990), De Bie & De Haan (2007), De Jong & Van Dijk (2007))*.

Previous studies have shown that there are differences to be found between the Netherlands and the US firms. According to *De Bie & De Haan (2007)* US studies are dealing with the case of a highly market-oriented financial system. By this they mean that US corporate firms tap the public capital markets quite often compared to the Dutch firms. Dutch firms on the other hand, first of all, seem to prefer internal financing over external financing. In case of external financing Dutch firms seem to favour bank loans over issuance of securities. Finally when they do tap the public capital markets shares are preferred quite frequently over bonds. The reason for this is that there is an imbalance in the development factor between the bond markets and the stock markets. Stock markets are more developed compared to the Dutch bond markets. Conclusion is that the Netherlands seems to have a more bank-oriented financial system. In view of these different characteristics and given the high degree of legal, institutional, and cultural differences among US and Dutch non-financial firms with respect to other differences, and as the former research results have proven that it should not always have to be the case, what is known about corporate capital structure of US non-financials firms may not be generalizable elsewhere.

### 1.2. Research question

The general research question that will be answered in this study is:

** *What patterns are recognizable in the corporate capital structure of Dutch non-financial firms across time being active in a bank-oriented financial system and what are the main*

*drivers of these patterns?***

By repeating and applying the work of *Lemmon, Roberts & Zender (2008)* into the Dutch firms one will find out whether their findings hold in different circumstances. Assuming that the results for the Netherlands will show similarity with the US counterparts, it may not only confirm the results found by *Lemmon, Roberts & Zender (2008)*, but it will also encourage further research. By this the gap will get even smaller and it will move us toward solving a challenging problem that has kept many researchers busy for a lifetime, namely the corporate capital structure puzzle.

### 1.3. Further outlines

This paper proceeds as follow. After a review of the theories behind the capital structure in section 2, in section 3 the methodology will be described. Since the aim of this study is to apply the findings of *Lemmon, Roberts & Zender (2008)* to the Dutch non-financial firms the methodology will take the form of a summary. Additional measure taken in order to make sure whether methodology applied is appropriate will be discussed in sections where the elaborations take place. An introduction on the data is given in section 4 supplemented with some extra explanation of the relevant variables. The results are presented in section 5 including the interpretation. In section 6 the conclusions and recommendations wrap up this report.

## 2. Literature on capital structure

### 2.1. General introduction to the concept of capital structure

Capital structure seems to have been a subject that has been studied extensively in the former five decades. The pioneering work of *M&M (1958)* that consist out two propositions argues that in a perfect market[1], the capital structure of a firm is irrelevant to the value of firm. This is where proposition I stands for. Proposition II pronounces that an increase in leverage is associated with a larger expected return since the risk-level increases with leverage. On the other hand still assuming a perfect market but with corporate taxes *M&M (1963)* debate, that a firm should be using as much debt as possible since interest expenses are tax deductible. While their theorem discusses capital structure from a perfect market standpoint that makes its results rather irrelevant in real world, it has attended as a guide that expresses where to look for determinants that may, perhaps, lead to an optimal capital structure.

[1] The assumptions for a perfect market are: no taxes, no transaction cost, and individuals & firms can borrow at same rate.

Hence, one can argue that the theorem developed by *M&M (1958, 1963)* has been used as a stimulant by many well-known authors who have developed theories including trade-off theory, signaling theory, agency theory, pecking order theory, and market timing theory that explains why firms choose for a certain debt-equity ratio, and so it has magnified the focus dealing with capital structure. Figure 1 gives an overview of the theories developed during the past decades that are used to explain certain debt-equity ratios, also termed leverage. In the next subsections these theories will be further elaborated and explained.


Figure 1: Principle Theories On Capital Structure

## 2.2. The trigger of decades work (M&M, 1958)

Insofar as it is known and generally accepted nowadays the goal of a financial manager in a profit organization is to maximize the market value of the existing owners' equity. Earlier days, the decisions regarding which funds to use in order to procure assets with uncertain yields were made by either maximizing profit or maximizing market value. According to *M&M (1958)* considering profit maximization as a decision criterion implies that on the one hand managers like to increase their earnings or profits, and on the other hand they would like to control their risks. Take for e.g. an investment project whereas debt as a financing tool instead of equity is used. Although this might increase the expected return to the owners, this will only occur at the cost of increased dispersion of the outcomes. The involvement of different shareholders with dissimilar risk attitudes leads to a difficulty at this point, as in the words of *M&M (1958: 264)*:

> *"How is management to ascertain the risk preferences of its stockholders and to compromise among their tastes? And how can the economist build a meaningful investment function in the face of the fact that any given investment opportunity might or might not be worth exploiting depending on precisely who happen to be the owners of the firm at the moment?"*

By considering the market value maximization approach as a decision criterion this difficult aspect is bypassed. According to this approach a decision regarding an investment and its associated financing plan is undertaking when its returns are higher than the marginal cost of capital to the firm and is independent of the current owners' tastes. Managers that apply this approach act in the stockholders' best interests by making decisions that increase the value of the company's shares. The

aim of the authors was to develop a theory that was still lacking in order to explore the effect of capital structure decisions on market value. This has resulted in to the two well-known M&M propositions that nowadays can be found in all finance textbooks.

1. Proposition I debates that *"the market value of any firm is independent of its capital structure and is given by capitalizing its expected return at the rate $P_K$ appropriate to its class"* or formulated differently *"the average cost of capital to any firm is completely independent of its capital structure and is equal to the capitalization rate of a pure equity stream of its class (M&M, 1958: 268-269)"*.
2. Propositions II debates that *"the expected yield of a share of stock is equal to the appropriate capitalization rate $P_K$ for a pure equity stream in the class, plus a premium related to financial risk equal to the debt-to-equity ratio times the spread between $P_K$ and r (M&M, 1958: 268-269)."*

Proposition I firstly finds support by the researchers' argument where unlevered firms are taken into account. In unlevered firms the physical assets are financed through the use of common stock. The cash flows generated over time by these physical assets including the need not to be constant and even certain will eventually be distributed to the stockholders. Even though this stream of cash flows can be regarded as extending indefinitely into the future, the authors comment that the mean value of stream over time is finite and represents a random variable subject to a probability distribution. The assumption is that these firms can be divided into classes of equivalent return with scale factor being the only difference within the classes. After adjusting for this difference by taking the ratio of return to the expected return all shares in the same class can be displayed according to one probability distribution. Accordingly, this identical probability distribution will allow for a degree of homogeneity and so substitutability of shares. From this it follows that in a perfect capital market given a certain class the price of every share within that class must be proportional to its expected return. This is denoted by the following two equations:

| $P_j = 1/P_K * \overline{X}_j$ | $\overline{X}_j / P_j = P_K$ |
|---|---|

In the first equation the price per share of firm $j$ is denoted as $P_j$, $1/P_K$ stands for the proportionality factor for each class $k$, and $\overline{X}_j$ stands for expected return per share for firm $j$ in class $k$. In the second equation $P_K$ denotes the expected return, yield or capitalization rate for the uncertain stream.

When levered firms are taken into account whereas the physical assets are financed through the use of common stock and debt the authors argue that the identical probability distribution for expected return per share for firms within the same class does not hold anymore. The expected return per share of firms with different proportion of debt which is a measure of financial risk do not meet the concept of homogeneity and are no longer perfect substitute for one another. By assuming a certain and a constant income per unit of time and a perfect market regarding the nature of the bond and the bond market the authors stated that only some small adjustments are needed to come to the same claims. The presentations of the equations for levered firms which are an adjusted form of the unlevered equations are as follow:

$$V_j = (S_j + D_j) = \overline{X}_j / P_K \qquad (\overline{X}_j / (S_j + D_j)) \equiv \overline{X}_j / V_j = P_K$$

A large modification in these equations is the fact that they no longer consider individual shares, but firms in their complete form. $V_j$ denotes the market value of the firm. $S_j$ and $D_j$ stand for the market value of common shares and the market value of the debts of the firm. $\overline{X}_j$ represents the *expected return before interest* on the asset owned by the company. The authors argue that when the relations do not hold between the equivalent ways of presenting the equation arbitrage will take place and restore the stated equalities[2].

The second proposition that is driven from the first proposition claims that the expected rate of return on common stock in levered firms are a linear function of leverage. The equation that present this linear function is:

$$i_j = P_K + (P_K - r)\, D_j / S_j$$

$i$ denotes the expected rate of return of the stock of any company $j$ to the class $k$. $P_K$ is capitalization rate and $r$ stands for interest rate on bonds. $D_j/S_j$ denotes the ratio of debt to equity (leverage). A comparison between the equation belonging to the first proposition and the second proposition leads to the conclusion that although increasing debt does not affect market value of a firm, it does increase the risk. Since the risk increases with leverage shareholders seem to require higher returns. Levered firms have better returns in good times compared to unlevered firms, but when the

[2] *Hillier et al, (2010)* call this homemade leverage and argues that as long as individuals can borrow or lend on the same rates as the firms, they can duplicate the effect of corporate leverage on their own. A rational investors for e.g. would not invest in a levered firm if its shares are priced too high. He may rather borrow on his own account and buy shares in unlevered firm. This approach will lead to the same amount of return but cheaper. The results of the actions taken by these rational investors will lead a decline in the value of the levered firm and an increase in the value of unlevered firm until they become equal. This is just a simple matter of supply and demand.

time is bad the return are no better as well. However it might be correct that debt financing is cheaper compared to equity, firms should consider that by adding more debt the risk will increase and so finally the total cost of a firm.

### 2.2.1. Taxes as only market imperfection (M&M, 1963)

Although the authors were aware of the real world imperfections including taxes and transaction costs in their work of 1958 they concluded by saying that when taxes are considered the market value of firm in each class must be proportional in equilibrium to their expected return net of taxes[3]. The aim of the 1963 version of their paper was to correct for these mistakes. Given a certain risk class for firms with different degree of debt, the expected ($\overline{X}^T$) and the actual income net tax ($X^T$) does not have to share the same degree of spread. This implies that if a firm's expected income net tax is double of another firm's expected income net tax within the same risk class, it should not have to be case that the actual returns between these firms will share the same spread. Differences in the degree of leverage among firms within a certain risk class prevent this event from happening. *M&M (1963)* stated since the distribution of income net taxes of the firms within certain risk class will not be proportional owing to different degree in leverage among firms there can be no "arbitrage" process which forces their values to be proportional to their expected income net taxes. In their new proposition they claim that the arbitrage process undertaking by entities (investors) depends besides on the firm's income net tax also on the firm's tax rate and leverage.

The alternative formula introduced in order to correct for the effect of leverage on income net tax start by first introducing a long-run average variable $X$. $X$, a random variable, stands for earnings before interest and tax (EBIT) generated by a given firm in a certain risk class. Given this certain risk class $X$ can be represented in the form $\overline{X}Z$, $\overline{X}$ being the expected value of $X$ and $Z$ representing a random variable from a distribution $X/\overline{X}$. The income net tax in the form of a random variable can be given according to the following equation with $\tau$ being the marginal corporate income tax

[3] The effect of corporate taxation leads to the following adjustments:
Total income is replaced by total income net tax: $\overline{X}^T_j = (\overline{X}_j - rD_j)(1-\tau) + rD_j \equiv \overline{\pi}^T_j + rD_j$ resulting in;
Proposition I: $\overline{X}_j / V_j = P_K$ becomes $\overline{X}^T_j / V_j = P^T_j$.
Proposition II: $i_j = P_K + (P_K - r)\, D_j / S_j$ becomes $i_j \equiv \overline{\pi}^T_j / S_j = P^T_j + (P^T_K - r)\, D_j / S_j$.
$\overline{X}^T_j$ stands for net income generated by the firm, $rD_j$ denotes the interest amount paid by the firm. The average rate of corporate income tax is represented by $\tau$, $\overline{\pi}^T_j$ represents the expected net income stream to the common shareholders. $P^T_K$ & $P^T_j$ represent the capitalization rate for income net of taxes in class *k*, and cost of capital for and unlevered firm *j*.

and $R$ the interest:

$$X^T = (1-\tau)(X-R)+R = (1-\tau)X+\tau R = (1-\tau)\overline{X}Z+\tau R$$

By rewriting the formula while considering the origins $Z = X/\overline{X}$ it is possible to get the expected return.

$$E(X^T) \equiv \overline{X}^T = (1-\tau)\overline{X}+\tau R$$

Substituting $\overline{X}^T - \tau R$ for $(1-\tau)\overline{X}$ in the former equation leads to:

$$X^T = (\overline{X}^T - \tau R)Z + \tau R = X^T(1 - \tau R/\overline{X}^T)Z + \tau R$$

From this equation it follows that when taxes are considered, "the shape of the distribution of $X^T$ will depend not only on the scale of the stream $\overline{X}^T$ and on the distribution of $Z$, but also on the tax rate ($\tau$) and degree of leverage ($R$) *(P.435)*".

The equation $\overline{X}^T=(1-\tau)\overline{X}Z+\tau R$ compared to the equation presented in 1958 version, differ on the basis of uncertainty in the income streams. The equation presented in the 1958 version is based only on uncertain streams, whereas $P^T$ is used as the only capitalization rate. This equation consists out a certain stream $\tau R$ and an uncertain stream $(1-\tau)\overline{X}Z$. For the calculation of the market value of unlevered ($V_U$) and levered firms ($V_L$), with $P^T$ and $r$ representing the capitalization rate for an unlevered firm and the capitalization rate of debt, this means:

$$V_U = (1-\tau)\overline{X}/P^T \quad \text{or} \quad P^T=(1-\tau)\overline{X}/V_U$$

$$V_L = (1-\tau)\overline{X}/P^T + \tau R/r = V_U + \tau D_L$$

According to this equation decisions regarding capital structure do have effect on the market value of firms. A financial manager should always finance the procurement of physical assets with debt, since debt seems to affect the value of a firm in a positive way.

Proposition II under the market imperfection of taxes is stated to hold its linear function as the leverage increases, with some small adjustment. The equation which is driven from the precedent equation is again obtained by substituting $\overline{X}^T - \tau R$ for $(1-\tau)\overline{X}$ with $V_L \equiv V$ leading to:

$$V = \overline{X}^T - \tau R/P^T + \tau D = \overline{X}^T/P^T + \tau(P^T - r)/P^T * D$$

In order to calculate the ratio of the income net taxes to the value of the shares, equity ($S$) need to be obtained first. After subtracting ($D$) from both side of the preceding

equation, with $\overline{X}^T$ divided into the components $\overline{\pi}^T$ (income net tax) and $R=rD$ (interest bill), the following simplified equation is attained:

$$S = V-D = \overline{\pi}^T / P^T-(1-T)(P^T- r)/ P^T*D$$

From this equation it follows that $S=\overline{\pi}^T/P^T$, denoting that $S$ is the outcome of expected income net tax at rate $P^T$. By rearranging the equation the following end result is achieved:

$$i_j = \overline{\pi}^T / S = P^T+(1-T)(P^T- r)D/S$$

As the leverage increases, risk increases as well and shareholder wants to get compensated for this extra risk, but at the same time they also take the benefits of increase in firm's value into account. This means that although the cost of equity rises with leverage the slope is less steep compared to the 1958's version, owing to $(1-T)$.

## 2.3. Theories of capital structure

### 2.3.1. Trade off theory

In the previous two sections, it was discussed that given a perfect market condition, the market value of the firm is independent of its mix financing decisions. When corporate taxes, as the only market imperfection, is taken into account it was concluded that the capital structure of a firm does matter to its market value. From this it followed that a firm should be financed with as much debt as possible. Since the interest charges that arises with debt financing are tax deductible, more debt implies for a firm a decrease in its corporate income tax liabilities and so finally a higher market value. In other words considering a firm's market value as a pie that consists out ingredients equity, debt, and tax liabilities, a financial manager should choose the pie that the tax authority hates the most *(Hillier et al. , 2010)*.

Bond is characterized by its legal obligation to pay a fixed amount somewhere in the future. When a firm is not in state owing to some kind of reason to meet its legal obligations, the bond claimants may take legal action and sue the firm for not meeting its legal obligations, resulting in bankruptcy. In contrary to this statement the money brought into the company by shareholders, in the form of equity financing, with the expectations to receive a certain amount of dividend in the future is not legally entitled. Since dividend is not legally entitled, this implies that the shareholders cannot sue the company when it does not pay dividend. The costs and the benefits of mix financing have leaded to the problem of optimal capital structure. Although the use of debt brings benefits in the form of tax shields since interest expenses are tax deductible, there are dangers from having excessive debt. It is the task of every corporation to find the optimal balance whereas the tax benefits are increased and

bankruptcy risks are decreased. The trade-off theory that goes back to the work of *Kraus & Litzenberg (1973)* cover this problem by considering a balance between costs of bankruptcy and the benefits of tax saving when financed with debt.

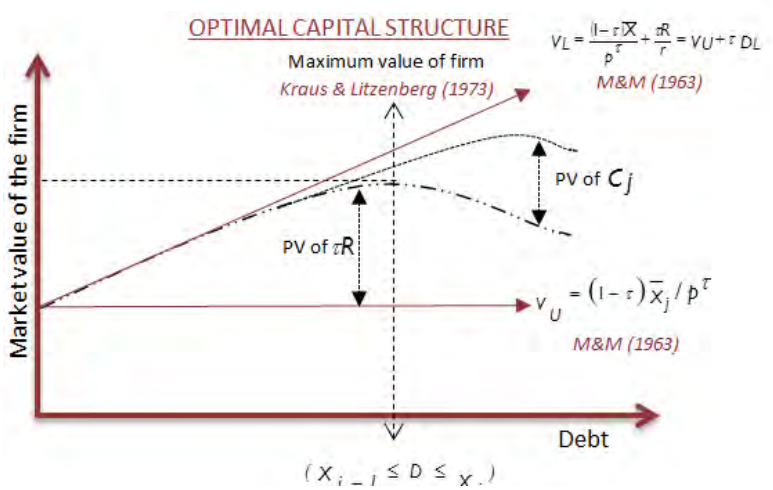
The problem of the optimal capital structure with the market imperfections corporate taxes and bankruptcy costs seems to have the following consequence for the market value of the firm ($V$) that consists of a certain stream ($D$) and an uncertain stream ($S$). Assume that $P_j$ ($0 \leq P_j \leq 1$) & $X_j$ ($X_1 \leq X_2 \leq \ldots \leq X_{n-1} \leq X_n$) represent the market price of a security ($D$ or $S$) that consists of a claim on one euro, and EBIT of a firm in state $j$. For $D$ it is true that a firm should pay a certain fixed amount irrespective of the state. The market value of $D$ depends on the size $D$ relative to $X_j$. $Y_j$ standing for the amount received by debt holders is unaffected as long as $D \leq X_j$. If $D \geq X_j$, this means that the firm by definition is insolvent. The cost of being insolvent in state $j$ is denoted as $C_j$ ($0 \leq C_j \leq X_j$). In this state the amount received by debt holders ($Y_j$) is EBIT ($X_j$) minus the cost of being insolvent ($C_j$)[4]. Note that the law describes that corporations have limited liabilities, and that the costs cannot be recovered on the personal belongings of shareholders. Based on this statement, and as in the words of *Kraus & Litzenberg (1973: 913)*: "the market value of the debt will depend on the amounts that will actually be paid in the various states." For the shareholders this means that the amount received in the form of compensation, denoted as $Z_j$ and $T_j$ representing the tax rate, is zero when $D \geq X_j$. If the state is equal to $D \leq X_j$, the following is true $Z_j = X_j(1-T_J) + T_j D - D$. In words this means that when a firm is levered, the amount paid to the shareholders given a certain state $j$ is the amount would have received by the same firm in unlevered form, plus the tax benefit since financed with debt, minus the fixed amount of the legal obligation. Summarized, dependent on the state of the firm (i.e. levered ($V_L$) or unlevered ($V_U$)), the market value of the firm can be presented according to the following two equations:

$$V_U = \Sigma_{j-1}^{n}(1-T_j)X_j P_j \qquad V_L = \Sigma_{j-1}^{n}(Y_j - Z_j)\, P_j$$

The second equation differs from the first equation in the sense of tax advantage obtained by debt financing and insolvent cost in the form bankruptcy costs. Although *Kraus & Litzenberg (1973)* seem to agree with the first statement made by *M&M (1963)* and prove that by rewriting their equations a consistency is created with M&M tax correction model, they do want to make the correction that not all bonds are free of default risk. The optimal amount of $D$ should meet the state $X_{j-1} \leq D \leq X_j$ in order to achieve the highest tax benefits possible, while at the same time the bankruptcy risks remain unchanged. The graphical view of this theory is a follow:

[4] A bundle of contingent claims leads to possible combination of these two states. See *Kraus & Litzenberg (1973: 913)* equation 3 the second option.

Figure 2: Optimal Capital Structure




*Kraus & Litzenberg (1973: 916)* stated that: "Under this approach, the slope of the function would be positive for very low levels of debt, decrease monotonically with leverage, and eventually become negative as leverage becomes extreme". The conclusion from the preceding discussion is that it is not clever to finance through large amount of debts. Not meeting the obligation of debt financing, bring along bankruptcy cost that lowers the market value of a firm.

It is worthwhile to describe these costs since they may not be clear. *Hillier et al. (2010)* argue that financial distress may be a better phrase than bankruptcy costs and divide these costs into two categories including the direct and the indirect costs of financial distress. One form of a direct financial distress costs is the cost of lawyer. Firms that are sued for not meeting their obligation hire lawyers to defend themself. Other forms include the administration costs, accounting fees, and the fees for witnesses to testify. Although former research results conduct different outcomes, the overall conclusion is that the direct financial distress costs in percentage are relative low to the firm's value[5]. On the other hand indirect costs are characterized by their complexity that makes measuring them a quite difficult job. *Altman (1984: 1067-1068)*, who is the person that presented the first proxy methodology for measuring the indirect costs of a financial distress, defined these costs as; "namely the lost profits that a firm can be

[5] See for e.g. *White (1983)* who studied whether the changes made under the new bankruptcy Code tend to raise or lower aggregate US bankruptcy costs. *Weis (1990)* who found that the direct costs associated with bankruptcy for the US firms is on average 3.1% of the sum of the market value of equity and the book value of debt for the period 1979-1986. *Bris et al. (2006)* who debate that the costs are very heterogeneous and sensitive to the measurement method used.

expected to suffer due to significant bankruptcy potential and the probability of bankruptcy for the sample firms", or said briefly indirect costs are unexpected losses. Their research results conduct that these costs are on average between 11%-17% of the firm's value. With respect to the methodological differences applied by these researchers the overall conclusion is that the range of indirect costs to the firms' value are higher than the range of direct costs to the firms' value. *Altman (1984)* research results provide evidence for the work of *Kraus & Litzenberg (1973)* by demonstrating that the present value of the expected financial distress costs will exceed the present value of tax benefits.

### 2.3.2. Agency theory

Agency theory is concerned with the so-called agency conflicts, or conflicts of interest between agents and principals. The conflict of interest can be between ❶ stockholders and managers and between ❷ debt-holders and stockholders.

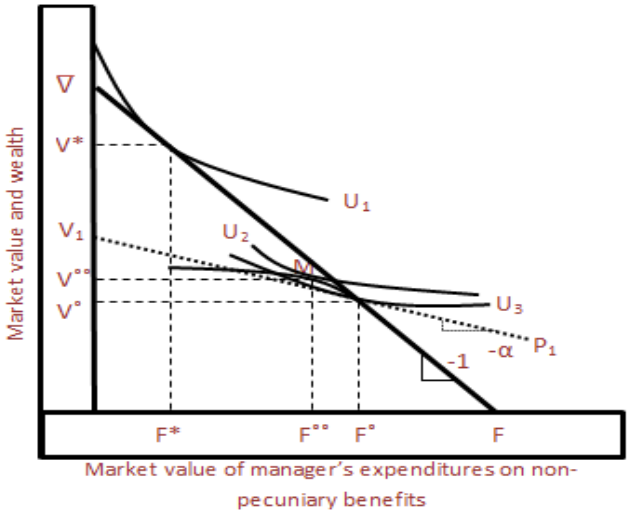
Figure 3: Agency Theory


Although many studies refer to the work of *Jensen & Meckling (1976)* as being the origins of the agency theory, this citation is incorrect. According to *Mitnick (2011)* it were the work of Ross and Mitnick himself that started in 1972 which origins this theory. *Mitnick (2011: 5)* argues that the agency theory of Jensen & Meckling which has had an enormous influence in the literature is: "indeed, actually originated a variant of an agency theory of the firm, not agency theory in general". The agency theory of *Jensen & Meckling (1976)* that will be discussed here is also seen as an extension form of the trade-off theory discussed earlier. This theory which considers agency costs instead of only bankruptcy costs provide even stronger reasons for the probability distribution of future cash flows to be dependent on its capital structure. It all starts as in the words of *Jensen & Meckling (1976: 5)* when: "one or more persons (the principal(s)) engage another person (the agent) to perform some service on their behalf which involves delegating some decision making authority to the agent". In the concept of finance the path through which this engagement is formed, also called agency relationship, is when a firm's insider equity holder taps the public capital markets with the aim to acquire financial recourses in order to expand his business since the firm may not possess these. The owner-manager may either issue outside equity or debt. "If both parties to the relationship are utility maximizers, there is good reason to believe that the agent will not always act in the best interests of the

principals" *(Jensen & Meckling,1976: 5)*. Different sources of funding (i.e. outside equity or debt) require for different measures to be taken in order to make sure that the agent is acting according to principals' expectations, resulting in different agency costs.

The outside equity resource fund is associated with the agency costs: the residual loss, the monitoring expenditures by the principal, and the bonding expenditure by the agent. The following simplified example originally put forward by *Jensen & Meckling (1976)* covers these issues. By taking the figure 4 into account simplicity may be created.

Figure 4: The wealth of owner-manager




The V and F on the vertical and horizontal axes in general represents the market value of the firm and the market value of non-pecuniary costs. Consider a manger who owns 100% of the share of the company, denoted as α. The wealth of this owner-manager measured by pecuniary and non-pecuniary returns depends on the operating decisions he makes that decide the degree of his utility U. Pecuniary returns are returns that add something to the market value of the firm, compared to non-pecuniary. Large office, expensive car, and personal relations are the well-known example of these costs. The F, $\overline{V}$ line represents the budget constraint to the owner-manager with a slope of -1. This means that given the budget constraint the maximum non-pecuniary benefit to the owner-manager cannot be greater than the maximum value of the firm, and every dollar withdrawn from the firm reduces the market value of the firm by same amount. For an owner-manager who owns all the shares, the maximum value of the firm can be represented as $\overline{V}$. This happens when the non-pecuniary costs are zero. Since some of these costs have to be made anyway the optimal wealth level of the owner-manager who owns 100% of the share is $F^*$, $V^*$.

Attracting outside equity affects the owner-manager's behaviour so he increases his non-pecuniary benefit consumption. Although he may still enjoy these luxuries, the out of his pocket costs associated with these luxuries declines since it is proportionally distributed among several shareholders now. Issuing equity implies that that shares held by the owner-manager will decline by (*1*- α), leaving α for the manager. The amount received from issuing equity given the degree of non-pecuniary costs $F^*$ is equal to $(1- \alpha)V^*$. As the owner-manager is free to decide on his non-pecuniary benefits, his budget constraint would be $V_1P_1$ with a steeper slope equal to α passing through the line $F,\overline{V}$ since he is still able to enjoy non-pecuniary benefits as a 100% owner. The new non-pecuniary benefit point on the vertical axes will be based on the point where $V_1P_1$ is tangent to $U_2$. This represents the optimal amount of utility. As the non-pecuniary benefits rises to $F^0$, the firm value drops to $V^0$. The difference between the $V^*$ and $V^0$ is called the residual loss. Since the owner-manager still owns a certain amount of share α, this loss in value is also incurred by the manager but is again partly offset by the increase in $F^0$.

Assume that the new shareholders are aware of the consumption of these non-pecuniary costs. They may decide to take measures such as monitoring, denoted as *M*. By including the monitoring costs into the model the market value of the firm becomes $V^{00}$, since the benefits of these costs are taken into account by future investors. The *M* with the optimal amount occurs at $U_3$. Although monitoring requires some costs, it also lowers the non-pecuniary costs to $F^{00}$ . From this it follows that $F^0$ becomes $F^{00}$ and $V^0$ becomes $V^{00}$. The increase in the market value and the decrease in non–pecuniary benefits seem to again offset one another. As it makes no difference who bears these costs because it will affect every claimants equally, owner-managers are more concerned with how to keep these costs as low as possible. By taking measures such as contractual guarantees to the outside equity holders (e.g. financial accounts audited by a public account) sureness is created. The costs made for these purposes are bonding costs. The aim of these costs are to guarantee the outside equity holders that the manager would limit his activities which costs the firm *F*.

On the other hand debt as a source of funding is associated with the agency costs: the wealth loss caused by the impact of debt on the investment decisions of the firm, the monitoring and the bonding expenditure by the bondholders and the owner-

manager, and the bankruptcy and reorganizations costs[6] *(Jensen & Meckling, 1976: 51)*. Owner-managers are tempted to pursue selfish strategy when they are in a situation where the firm is highly leveraged. Since the money brought into the firm belongs to the creditors, the owner-manager prefers to engage in new investment activities that are the riskiest among the possible alternatives. In the situation when the investment is success, a certain amount as agreed will be paid to the creditors. The residual gain generated by taken the riskiest project is captured by the shareholders. In a case where it may turn out badly, the creditors are the ones who bear these costs.

In order to clarify this, imagine a situation where the owner-manager considering two investment projects with equal expected total value, $V^1=V^2$. The variance of the second project is being larger than the variance of the first project is represented as $\sigma_1^2<\sigma_2^2$. These projects may be mutually exclusive with each facing two equally economic conditions, including $C_1$ & $C_2$, $C_1=C_2$. For $V^1$, the project can have either the value $V_1^1$ if $C_1$ and $V_2^1$ if $C_2$ with $V_2^1>V_1^1$. For the project $V^2$, these values are either $V_1^2$ if $C_1$ and $V_2^2$ if $C_2$ with $V_2^2>V_1^2$. Among these projects: $V_1^1>V_1^2$ and $V_2^2>V_2^1$. The creditors are agreed to be paid a certain fixed amount ($B$). The final amount these creditors receive given the limited liability of a corporation and the creditors' prior claim on the pay-offs depend on the choice of the owner-manager between the two project and their possible values $V_1^1, V_2^1$ or $V_1^2, V_2^2$. The creditors in project $V^1$ is denoted as $B_1^1$ if $C_1$ and $B_2^1$ if $C_2$ with $B_1^1=B_2^1$, and in project $V^2$ as $B_1^2$ if $C_1$ and $B_2^2$ if $C_2$ with $B_2^2>B_1^2$. The shareholders on the other hand in project $V^1$ is presented as as $S_1^1$ if $C_1$ and $S_2^1$ if $C_2$ with $S_2^1<S_1^1$, and in project $V^2$ as $S_1^2$ if $C_1$ and $S_2^2$ if $C_2$ with $S_2^2>S_1^2$.

Assume that the owner manager choose the first project and $V_1^1=B_1^1$, the shareholders who do not have legal obligation will have zero residual claims. In situation $C_2$ since $V_2^1>V_1^1$ the shareholders will get $V_2^1-B_2^1= S_2^1$. On average the creditors will be not hurt in this situation as they get their fully agreed amount.

Suppose now the owner-manager select the second project. It was mentioned that $V_1^1>V_1^2$, this implies that the creditors will not be compensated in full here. The amount received finally will depend on $V_1^2$. Since this amount is not enough to cover the cost of debt the shareholders will get nothing. Assume if $C_2$ occurs $V_2^2>V_1^2$ the creditors will be paid in fully, and the extra gain generated by picking this risky project will be distributed to the shareholders. Given this situation the average amount the creditors will receive is not equal to amount agreed on. Overall as the owner-manager pick this project the following happens[7]:

[6] Since this theory is seen as an extended form of the trade-off theory the agency costs consisting out bankruptcy costs and reorganization costs will not be discussed here, as these costs are already covered earlier.

[7] See *Hillier et al. (2010: 439-440)* for a numerical elaboration.

-Firm's Value: $V_1^1*C_1 + V_2^1*C_2 > V_1^2*C_1 + V_2^2*C_2$
-Shareholders: $S_1^1*C_1 + S_2^1*C_2 < S_1^2*C_1 + S_2^2*C_2$
-Creditors: $B_1^1*C_1 + B_2^1*C_2 > B_1^2*C_1 + B_2^2*C_2$

The choice for choosing the riskiest project leads to a decline in the value of the firm. *Jensen & Meckling (1976)* refer to residual loss as the difference between *V1-V2*. *Hillier et al. (2010)* argues that as rational creditors may be aware of this unwanted behaviour, they may take actions so to protect themselves. The monitoring costs associated with these unwanted behaviour will finally be paid by shareholders, since these will be charged by raising the interest rates required on those bonds. As in the former situation where equity was involved, the owner-manager may want to keep these costs as low as possible. As it gets even harder to obtain debt when owner-manager face these decorations he may engage in bonding activities including providing annual reports and to have their accuracy testified by an independent outside auditor[8].

Although the authors agreed that in overall both types of agency costs do affect firm's value negatively, they expected that the agency costs that come with debt will outweigh the agency costs that come with outside equity *(Jensen & Meckling, 1976: 58: Fig 6)*. This led to the conclusion that firms are better off when their leverages are low. Some years later this statement was amended by *Jensen (1986)*, who argues that the benefit of debt in motivating owner-manager to be efficient was ignored. As this benefit is taken into account more reasons are created for firms to issue debt over equity. A firm's owner-manager with substantial free cash flow in its low leveraged form may be more capable in consuming non-pecuniary benefits. Even if he pays dividend, this form of compensation is not a legal obligation. By adding more debt to the firm, the amount of free spending will decline and the owner-manager is less capable of consuming non-pecuniary benefits. Note that debt is a legal obligation, and that the firm's market value is the sum of market value of the shares and the market value of the debts. As both of these streams –interest plus principal and dividend – decide the finally market value of the firm, debt characterized by its legal obligation should have a greater effect on firm's value. This statement is known under the name of free cash flow hypothesis.

### 2.3.3. Signaling theory

The signaling theory in the arrangement *"the incentive-signaling approach"* origins the

[8] *Hillier et al. (2010: 440-441)* defines two other types of selfish strategies, namely incentive toward underinvestment and milking property. Since the ideas are similar these are not described here. According to *De Jong & Van Dijk (2007)* the frequently cited conflicting objectives of individuals are the direct wealth-transfer problem, the asset-substitution problem and the underinvestment or overinvestment problem.

work of *Ross (1977)* [9]. The underlying idea behind this theory being information asymmetry arises when there are differences in information and uncertainty between the agents and the principals to the transaction. It is generally accepted that the agent being an insider of the firm possess over more information than the principals who are considered as outsiders. As there may be a misalignment of interest between the agent and the principal, the agent may get motivated and act inappropriately. This problem is known under the name "moral hazard". In the context of finance this implies that the agent being the more informative person takes decisions regarding the degree of debt to be issued (meaning a higher risk), while the principals bear the costs if things turn out badly. The question whether things turn out badly or not depends on the firm's ability whether it can cover its costs or not. A firm being financially secure may have a high level of debt and it may decide to issue even more debt to raise its tax shield. When a company issues more debt, the market (investors) perceives this as a good sign. Issuing debt implies making commitments to pay interest on the amount borrowed, which is a legal obligation. The market perceives this as a good sign because it assumes that company is financially stable enough to make this commitment. In general the repayment of debt and so reducing debt on the other hand is perceived as bad sign, implying weak financial stability.

As debt is seen as a signal to the firm's value, *Ross (1977)* raised the question what if the situation occurs when the incentive of the agent is to act inappropriate. He may decide to issue debt just to fool the market so to get his reward or because some of the shareholders can sell their shares at a higher price, even if he (given the information which he only knows) is not able to meet the associated upcoming obligations. As these decisions are taken according to a time line, the principals will bear the future costs. *Ross (1977)* argues that if the agent is accountable for the time when the decision is made, then there is a means of validating financial signals. He proved that

[9] This notion of signaling was first studied in the field of job and product markets by Akerlof and Arrow, later on this concept was developed into an equilibrium theory by Spence *(Ross, 1977).* The well-known job-market signaling model of Spence, also known as the intro game theory, considers two interested parties (i.e. employees and employers) in a competitive context. As the employers want employees with a certain skill, this information may not be verifiable. *Spence (1974)* proved that although it is not possible to check directly for this information since it is not verifiable, one is able to create a situation in equilibrium for employees to self-selection whereby education is considered as a measure of skill……..the main lesson is that good signals needs to be differentially costly across different types.

by creating a rewarding system for the agent this moral hazard problem is avoid since the agent has only profit from the signal based on the information which he only may know. Even if he may decide to act inappropriate, this will have consequences for his rewarding. As it turns out that even when managers attempt to fool the investors, the more valuable firms will still want to issue more debt than less valuable firms and so from this it follows that investors can still treat debt level as a signal of firm's value. Although this theory is not considered as an important theory of capital structure *Hiller et al. (2010)* argues that signaling theory is best validated by empirical evidence.

### 2.3.4. Pecking order theory

The view of pecking order theory which is originally put forward by *Myers (1984)* and *Myers & Majluf (1984)* suggests that the principle of firm's financing is according to a hierarchical order, with information asymmetry and timing, that until so far was neglected, as the most solid explanation. *Myers (1984)* argues that although the trade-off theory has played a dominant role in corporate finance for a decade, it does not provide us with adequate understanding of corporate financing behaviour. However more understanding can be created when the shortcomings are taken into account. Take for example the adjustment cost of capital structure. As the trade-off theory suggest that firms in similar form should have an identical optimal capital structure. The author debates that by taking the adjustment costs into account, which the trade-off theory neglects, more understanding can be created among the firms that seem similar in all views but have different leverage ratios in practice.

The model developed by *Myers (1984)* & *Myers & Majluf (1984)* take the position of a financial manager who taps the capital market in order to finance an investment opportunity. The choice that the financial manager faces is either debt or equity. As the manager may decide to issue equity, the amount required $N$ is the market value. The real value ($N_1$) may diverge, since the investors assume that the manager hold over information which they do not know. According to asymmetric information the manager will always issue equity if he thinks $\Delta N=N_1-N$ is negative or in words if the shares are overvalued. Even if the investment project has a negative NPV he may decide to issue equity, since the amount received is worth $N$ and the amount giving away is worth $N_1$, with $N>N_1$. On the other hand when $\Delta N=N_1-N$ is positive or in words if the shares are undervalued the manager may decide to only issue equity if the NPV benefits of the investment opportunity offset the loss in share price. From this it follows that when the NPV benefits of the investment opportunity does not

offset the loss in share price, managers will abandon investment opportunities even if they have a positive NPV. Thus timing might be an essential motive in equity issuance.

The hierarchical order is that firms first use internal funds, and when internal funds are exhausted, debt is issued[10], and when it is not sensible to issue any more debt, equity is issued. So, risk-free debt may have been the second safest option for a manager. *Myers (1984)* stated that the effect of information revealed to the market will be least for risk-free debt compared to stocks. According to this theory issuing equity will cause the share price to fall because the investors assume that the shares are overvalued and will not buy it. Risk-free debts seem to be correctly priced, because the price is determined by the interest rate that is widely known. This implies that $\Delta N=0$ in the equation $\Delta N=N_1-N$. Even if riskier types of debt are considered *Myers (1984)* argues that $\Delta N_{debt}<\Delta N_{stocks}$ or in words the price of debt is still more correct than the price of stocks. From this it follows that when debt is considered in general as a source of funding the chance of abandon a positive NPV investment project will be least compared to the situation when equity is considered as a source of funding.

So far it is said that debt is safer compared to equity. But this does not mean that debt is the safest option possible when the disadvantages of debts including financial distress and agency costs are taken into account. This implies that debt can also be mispriced as the manager may possess over information which the market does not know yet. As long as these costs associated with debt are avoided the mispricing effect for equity is greatest. *Myers (1984)* stated that the safest option for a financial manager is to use internal finance, since no mispricing costs are associated with. This requires from a financial manager to build financial slack or in other words he must maintain the free cash flows within the firm which is in contrast to the free cash flow hypothesis of *Jensen (1986)*. As the sources of funding are exhausted the manager may move down the hierarchical order.

Up so far this theory is often set up as a competitor theory to trade-off theory of *Kraus & Litzenberg (1973)* and has produced mixed evidence. The implications associated with pecking order theory and at odds with trade-off theory include no target amount leverage for pecking order theory which is in contrast to trade off theory that does have optimal debt level. According to pecking order theory there is a negative

[10] Straight debt should be issued before convertible debt since convertible debt is more risky, so it should occur according to safest way *(Hillier et al, 2010)*.

correlation between profitability and leverage. Managers considering trade-off theory may expect a positive correlation between profitability and leverage since more debt will capture the tax shield.

### 2.3.5. Market timing theory

The market timing theory that is put forward by *Baker & Wurgler (2002)* argues that information asymmetry is irrelevant when firms consider issuing debt or equity. Although there are two versions of this theory including a dynamic version of *Myers and Majluf (1984)* with rational managers and investors and a version where managers think investors are irrational. The authors stated that evidence from long-run studies support only the version where irrationality is thought. This makes the information asymmetry, an essential motive in equity issuance in the dynamic version of the theory, irrelevant to the theory proposed by *Baker & Wurgler (2002)*. According to this theory corporations use a certain type of financing depending on the favourable conditions. Managers are more likely to issue stocks when the stock are overpriced and buy back stocks when the stocks are undervalued. Thus timing is the only essential motive in equity issuance as the managers try to raise capital when the market conditions are right. The measure variable used in order to decide on this favourable condition is the market-to-book ratio. *Bakker & Wurgler (2002)* found that firms with low leverage ratio are firms that have high market-to-book ratio as characteristic, and firms with high leverage ratio were firms that have low market-to-book ratio. This implies that depending on the ratio of market-to-book firms decide whether to issue debt or equity or in other words there is gain from opportunistically switching between equity and debt.

*Hiller et al. (2010)* argue that prescription for capital structure under either the trade-off theory, the pecking order theory or the market timing theory are vague by comparison. As these theories may be the dominants among the theories discussed in the field of corporate finance, no definite formula is developed for evaluating the optimal level of debt. Different theories seem to reveal different outcomes. By considering the real world it may help to explore our knowledge of understanding. In next section some evidence from real world will be discussed.

## 2.4. Empirical studies

Numerous determinants are theoretically deemed to affect the capital structure. These determinants can be derived from the trade-off theory, signaling theory, agency theory, pecking-order theory, and market timing theory. As there may be an endless list of papers dealing with capital structure determinants, the results and variability

explained by these papers seem to differ even if the same methodology is applied. Although one may think that by adding more determinants into the models the variability explained by these models may increase, but former research results provide evidence that it rather diminishes the relative importance of other variables. Further it is notable that large part of the literature dealing with capital structure is based on developed capital markets such as US and UK that has a liquid capital market. In this section the paper of *Rajan & Zingales (1995)* and *Frank & Goyal (2007)* are shortly described who explore the importance of these considerations.

One of the objectives of *Rajan & Zingales (1995)* was to establish whether factors that influence US firms' capital structure also lead to the same effect when G-7 countries[11] are considered, as there are differences between these countries with respect to accounting rules and institutional environments. In order to test for this, first, some correction were made regarding differences in accounting rules and some robustness checks were conducted with regard to institutional differences. The results revealed that G-7 countries are similarly leveraged, with UK and Germany to some lessor extend because these countries seem to provide more creditor protections rights. The second step undertaken was to test whether the factors identified as important including tangibility of assets, market-to-book ratio, firm size, and profitability in determining capital structure variations among US firms also lead to similar correlation in other six countries.

The theoretical suggestions for these variables are as follow: firms with high tangible assets are firms that are highly leveraged. From the perspective of the trade-off theory and agency theory these tangible assets can be used as collateral. As the investors risks are now partly covered, they are more willing to supply the necessary loans when required or as *Myers & Majluf (1984)* put it forward: it diminishes agency problems between existing shareholders and creditors. Firms with high market-to-book ratios are assumed to be firms that have growth opportunity in the form of profitable investment opportunities. In the view of agency theory this leads to a conflict between shareholders and bondholders since firms in growth stage phases many of these investment opportunities with some being very risky *(Jensen & Meckling, 1976)*. As the bondholder may be aware of this opportunistic behaviour a negative correlation is expected between leverage and Market-to-book. According to pecking order theory the effect of market-to-book ratio can be either positive or negative. Although pecking order theory believers prioritize internal funding as the

[11] These include the United States, Japan, Germany, France, Italy, the United Kingdom, and Canada.

safest, at some point these sources may be exhausted and so the manager may move down the hierarchical order and issue debt. As long as the costs associated with debt are avoided a positive relation is expected. The signaling theory expect a negative relation between market-to-book (a measure for economic condition) and the level of debt since the companies issue debt only when the shares are undervalued (market-to-book is low). From the perspective of trade-off theory a positive relation is expected between the size of a firm and its debt level as large firms are able to diversify their businesses, and so lower their risk of bankruptcy. This view is in contrast to the pecking order theory which expects a negative relationship. As the firm's size gets larger the asymmetric information seem to decline, this lead for outside investors to prefer equity over debt. Finally there are also conflicting expectations in relation between profitability and leverage ratio. According to the pecking order theory a negative relation is expected. Pecking order theory requires managers to finance the procurement of assets with internal fund since this is considered to be the safest. As the profit of a certain firm rises, less use is made from debt financing. This leads to a negative correlation *(Myers & Majluf, 1984)*. From the perspective of free cash flow hypothesis of *Jensen (1986)* a conflicting view is expected. The theory argues that when firms consider adding more debt to its capital structure, the amount of free spending will decline. As the profit increases the owner-manager is less capable of consuming non-pecuniary benefits, since the firms have to meet their legal obligations first.

Although *Rajan & Zingales (1995)* found different significant levels per determinant given a country, the overall sign of the determinants were similar across countries. Tangibility of assets was positively related to leverage, the sign for market-to-book ratio was negative, firm size was positively related to debt with exception for Germany, and profitability was also negatively related to debt with exception for Germany. Pecking order theory is seemed to be dominant when German firms are taken into account.

On the other hand the objective of *Frank & Goyal (2007)* was to create a standardized list of most reliable variables for future research purposes with the requirements that these variables have consistent signs and statistical significance across many alternative treatments of the data. Although the researcher in total considered 25 variables, a set of six variables was selected that accounted for the highest variation (27%) in leverage possible whereas different alternative treatments were taken into account. As this list was created the following three considerations were taken into

account: First of all, the authors stated that many of researchers are aimed at providing support for a particular theory for which they make a selection of the determinants available. As these determinants may lead to a certain outcome, there is a downside to this way of working since these determinants are just a selected part and thus it does not lead to an overall understanding of capital structure decision. In order to avoid this problem an exhaustive analysis of all the determinants of capital structure was performed. Further as the time passes, corporate financing decision also undergo some changes. The authors debated that it is therefore important to examine the changes over time as well. Finally, it was stated that one also needs to consider that different theories apply to firms under different circumstances. The most reliable factors founded were: median industry leverage, tangibility, log of assets and expected inflation with a positive effect on leverage and market-to-book ratio and profits with a negative effect on leverage.

### 2.5. Concluding remarks

In the preceding subsections a comprehensive overview of the theories dealing with corporate capital structure decisions was given. Although one knows not much yet, from this one knows that given a perfect capital market a firm's value is independent of its capital structure. When taxes are considered to be the only market imperfection, it is known that a firm should be financed with 99.9% debt. One knows that the expected rate of return on common stocks in levered firms is a linear function of leverage and as the amount of debt increases, risks increases, and shareholders want to get compensated for this. By exploring this imperfect view of the real world whereas bankruptcy cost as the cost of debt is considered, it was concluded that given a firm there is a point where the capital structure is optimal. As more debts are added firms' value will rather decrease than increase. One also knows that managers are not always acting in shareholders' interest. Some examples include: asset-substitution, that means that low risk assets are exchanged for high risk assets with the aim to increase profit, whereas extra risks are shared with debtors without being compensated for it and the added profits only benefit the equity owners. Or under-investment problem that occurs when firms reject low-risk project since it does not add much to profit, implying no benefit for shareholders. Or overinvestment problem that takes place when a manager accepts even negative NPV projects with the aim to increase firm's size, just because his or her salary will rise with the firm's size *(De Jong & Van Dijk, 2007)*. The cost associated with these inappropriate behaviour gives even more reasons to believe that the probability distribution of future cash flows are dependent on capital structure and that there is an optimal structure given a firm. One also knows that corporate capital structure decisions are influenced by

information asymmetry and timing. Such as the pecking order theory believers who argue that as the securities get more complex, the mispricing effect increases due to the increase in asymmetric information or the market timing theory founders that consider only timing as being the main factor in corporate capital structure decisions.

As these may give one some alternative explanations for why firms choose for a certain capital structure, one also know that the real world is more complex since no definite formula is developed for evaluating the optimal level of debt and different theories seem to reveal different outcomes. The methodology discussed in the next chapter provides a promising direction in which to continue the search.

# 3. Methodology

In this section the methodology will be described. Since this study is a repetition of the work of *Lemmon, Roberts & Zender (2008)*, the methodology will be a summary of some of the steps taken by these researchers.

## 3.1. Main motivation of their study

During the former decades many research has been conducted in the field of capital structure puzzle. Researchers have identified different determinants and have been using different empirical models to explain the variability, with less success. The aim of *Lemmon, Roberts & Zender (2008)* was to summarize these findings and to provide a more complete understanding of capital structure decisions. Since the current determinants seem to explain a small part off the variability in the leverage models applied by different researchers, the authors stated that a large gap still remains unsolved what the existing determinants appear to miss.

## 3.2. Data and sample selection

The sample used consists of all non-financial US firms with the constructed dataset obtaining yearly observations in the Compustat Database for the period 1965 to 2003. Requirements are no missing firm-year data for book assets[12] and both leverage (market and book) to lie in the closed unit interval. A second sample under the name "*Survivors*" is created with at least 20 years of existence to check for potential survivorship bias. All subsequent analyses are performed for this subsample as a robustness check.

[12] According to *Cameron & Trivedi (2009: 230)* the missingness is for random reasons rather than for systematic reason.

### 3.3. The patterns of leverage in time

The study starts with sorting firms according to their actual book and market leverage ratios into four portfolios, including very high, high, medium, and low. Event year 0 is denoted as the portfolio formation. For each subsequent calendar year this process of ranking is repeated, during which portfolio composition is kept constant. The process ends by averaging the leverage of each portfolio across the event time. The results show that there is "*convergence*" and "*persistence*" among four portfolios over time. Portfolios that are remarked as being highly leveraged are still highly leveraged after 20 years, but the leverage ratio for book value is declined from 55% to 35%. On the other hand low remarked portfolios behave the other way around. On average the book leverage portfolio increases from 3% to 19% in 20 years time. The same results are found for market leverage as well. Further the graphical view provides evidence that the effect of convergence is at its highest in the first few years after the formation period with further statistically and economically significant differences across the event time.

As a robustness check these findings are subjected to four other tests. First, to make sure that these findings are not caused due to the survivorship bias the analysis described above is repeated for the Survivors sub-sample with the requirement of at least 20 years of data. The results reveal negligible differences between the whole sample and the Survivors. Second, the analysis is repeated for the firms that exit the sample as these may be the drivers behind the convergence. The analysis preformed on the sub-sample consisting of these firms provides similar findings. The average leverage ratios of the exit sub-sample firms are in line given their final year with the whole sample. Third, a logit transformation is used to transform average leverage to the real line because as leverage is defined on the unit interval, average leverage will have a natural tendency to reflect away from the extremes of zero and one *(P.1582)*. The formula applied is $Logit(Leverage_{it})=In(leverage_{it}/1\text{-}leverage_{it})$. The result also holds here with only difference being the scale. The final robustness check takes the effect of observable heterogeneity associated with traditional determinants of capital structure into account that may also explain this. For e.g. large firms may simply have very high leverage ratio and small firms may have low leverage ratio, since there is positive correlation between size and leverage. To check for this effect all observable heterogeneity is removed. The procedures applied for this is a cross-sectional regression estimation of leverage on 1-year lagged variables firm size, profitability, tangibility, market-to-book, and industry indicators. From these results the actual leverage are subtracted. Further the same process of sorting and averaging is applied

for these residuals as earlier discussed. The outcome show remarkably similar patterns of convergence and persistence. This implies that after removing all observable heterogeneity, the residuals in the graphs still remains highly persistent. Therefore it suggests that the current model and their associated determinants are missing a key determinant that can be characterized as a transitory or short-run component that leads to a gradual convergence in leverage ratios, as well as a permanent or long-run component that leads to highly persistent cross-sectional differences in leverage *(P.1581)*".

### 3.4. The importance of economic persistence in capital structure

The persistence caused by the permanent component seems to be most interesting of the two findings. In this section the three models applied to quantify the importance of determinants in explaining future leverage is discussed. The first model takes the role of firms' initial leverage in explaining the firms' future leverage ratios into account, as the importance of this variable was revealed from the earlier graphical presentations[13]. To estimate the effects the following equation is applied:

$$Leverage_{it} = \alpha + \beta X_{t-1} + \gamma Leverage_{i0} + V_t + \varepsilon_{it}$$

$i$ denotes indexes firms and $t$ represents indexes years. $X$ is a set of 1-year lagged control variables. $Leverage_{io}$ is firm $i$'s initial leverage defined as the first non-missing value for leverage given a firm. $Y$ measures the importance of firms' initial leverage values in determining future values of leverage. $V$ is a year fixed effect and $\epsilon$ is a random error term assumed to be possibly heteroskedastic and correlated within firms *(P.1585)*. The models is executed for both type of leverage ratios and samples (i.e. the market and the book leverage ratios and the whole and the Survivors sample), and is continuously extended with determinants of *Rajan & Zingales (1995)* and *Frank & Goyal (2007)*[14], described in the former chapter, starting with initial leverage only. Further each coefficient is scaled by corresponding variable's standard deviation so to facilitate comparisons. The results represent the estimated effect of one-standard deviation ($\sigma$) change in vector $X$ on leverage. Following findings are found: a one $\sigma$ change in initial leverage, being the only regressor in the model, leads to an average change of 7% (11%) in future value of book leverage (market leverage). When the model is extended with the determinants of *Rajan & Zingales (1995)* and augmented with calendar year fixed effects, the coefficient of the initial leverage undergoes only a small decline (-1.5%), and remains significant in term of sign. Finally, keeping everything constant and extending the model with the determinants of *Frank & Goyal (2007)* initial leverage coefficient seems to decrease, but is still highly

[13] Owing to space limitation these graphs are not presented here. For an overview see *Lemmon, Roberts & Zender (2008)* page 1580 and 1583.

[14] In their working paper *Frank & Goyal (2004)* mentioned 8 core variables later on in the final version *Frank & Goyal (2007)* 2 of the 8 variables are left out.

significant and superior in magnitude than all other determinants with Industry Median Leverage being an exception. Conclusion is: given this specification initial leverage seems to be the most important determinant in forecasting future capital structures. As more determinants are added, the effect of initial leverage seems to hold its highness in magnitude with one exception. From this it can be suggested that the missing component in the model is a firms-specific (with initial leverage as only a part) time-invariant variable for which the importance of explanatory power is unclear.

The second model maps the explanatory power of existing determinants in relation to leverage and tests for presence of firm fixed effects by preforming a variance decomposition method. The non-parametric variance decomposition for both leverage types result in between-firm variation to be on average 50% larger than within-firm variation, implying that leverage varies significantly more across firms. For the parametric variance decomposition an ANCOVA[15] analysis is applied, with the following equation:

$$Leverage_{it} = \alpha + \beta X_{t-1} + \eta_i + \varepsilon_{it}$$

The definitions of all variables are held constant, with exception for $\eta$ that represents firm fixed effects. Table 1 in appendix which is originally taken over from the work of *Lemmon, Roberts & Zender (2008)* represents some of the findings. Columns a-g correspond to different model specification for leverage. Each value in cells represents the fractions of model's (a-g) Adj.$R^2$ attributed to a particular variable in the same row after removing the variance for which quantitative predictors (covariates) account. Remarkable about this finding is that the regressor firm fixed effects in model "a" explains 60% of the variability on its own. Further when the regressor firm fixed effects is introduced into a model which already contains traditional determinants, the explanatory power of traditional determinants declines and are partly removed due to this factor[16].

Thirdly, a distributed lag model of leverage is applied to test whether the results found in the ANCOVA analysis are owing to managers reacting to changes in long-run or expected levels of previously identified determinants, as opposed to short-run fluctuations in their values. Or in other words it may be possible that the model applied is incomplete owing to reaction time of the managers that is taken into consideration. To examine this, the following equation is formulated:

[15] ANCOVA tests whether certain factors have an effect on the outcome variable after removing the variance for which quantitative predictors (covariates) account. This is for e.g. achieved by $n_i$ which contains firm fixed effect dummy variables that can be used to control for unobservable factors.
[16] Consult page 1588-1590 *Lemmon, Roberts & Zender (2008)* for more.

$$Leverage_{it} = \alpha + \Sigma_{s=1}^{n} \beta_S X_{t-1} + \gamma\, Leverage_{i0} + V_t + \varepsilon_{it}$$

Also here all definitions for variables are held constant with exception for $n$ that corresponds to the lag order of each independent variable $X$. The number 8 is based on the BIC and AIC (a measure of the relative goodness of fit of a statistical model). The 1-year lag model measure the short-run impact of regressors on leverage and represent coefficients scaled by corresponding variable's standard deviation. The 8-year lag model measure the long-run impact of regressors on leverage and represent sum of the eight estimated slope coefficients times the standard deviation of the corresponding variable. In general the results reveal mixed outcome, with some determinants exhibit a stronger long-run sensitivity to changes in leverage determinants and vice versa.

Summarized, all analyses seem to lead to the conclusion that firms' leverages are rather stable over time. Previously identified determinants seem to explain relatively little variation in leverage. Initial leverage being statistically and economically significant in all models explains the most variation but this is only a small part of the unobserved firm specific factor that is observed.

### 3.5. Implications of empirical studies of capital structure

The OLS regressions applied earlier are likely to be misspecified because they seem to ignore a significant time invariant component of leverage ratio that is likely to be correlated with traditional right hand side variables *(P.1594)*. The model may be misspecified owing to firm specific component that is not captured by the current observed firm specific variables. As these omitted variables may lead to incorrect conclusions drawn from the data, the following robustness check is applied: First the same OLS model is applied whereas initial leverage is excluded now. The second model is a fixed effect estimation and holds the following equation:

$$Leverage_{it} = \alpha + \beta X_{t-1} + \eta_i + V_t + u_{it} \quad \text{where} \quad u_{it=p}\, u_{it-1} + \acute{\omega}_{it}$$

All other variables represent the same definitions as earlier, $u$ is assumed to be stationary. $\acute{\omega}$ is assumed to be serially and cross-sectionally uncorrelated but possibly heteroskedastic. Although results conduct high statistical significances for most determinants, carefulness is required when interpreting since there are large differences in the magnitude of the coefficients given a model.

### 3.6. What lies behind the transitory component?

In order to test whether convergent effects are the result of active or more passive management behaviour toward desired leverage ratios, net security issuance activities undertaken by managers given the four portfolios are analysed. For net debt, the findings show a clear negative relation between leverage ratio and net debt issued for the first five years. This may explain some of the convergence effect. Firms

in low leverage portfolio seem to issue more debt compared to firms in very high leverage portfolio. Firms in the low leverage portfolio are also the ones with the highest net equity issuance, but this has little effect on their capital structure because in many cases these are firms with very low or even zero leverage already. Firms in the very high leveraged portfolio are the second highest net equity issuers, thus also providing evidence for convergence. Conclusion is that the convergent effect is partly the result of active management behaviour.

# 4. Sample and data

In this section the data will be introduced. First the sample selection will be covered followed by the construction of the variables. Finally, the chapter includes summary statistics.

## 4.1. Sample selection

The sample selected consists of all non-financial Dutch firm-year observations in the annual Compustat database and DataStream database from 1989 until 2010. Since Compustat database does not give access to go further back than 1989, it is selected to keep this as time period. The market value of equity only is obtained from DataStream, this because it was not possible to obtain this from Compustat database. For some firms data was hand collected, since this was specially missing for year 2010. Financial firms with the SIC>5999 & SIC<7000 are dropped out of the sample as this is common for this kind of studies since financial firms are imposed to capital requirements and have inherently a different capital structure. The firm-year observations from 1989 until 2000 are converted at the rate of euro adoption (0.45378). To mitigate the effect of outliers and eradicate errors in the data the variables book leverage, log of assets, log of sales, profitability, market to book and cash flow volatility are winsorized (at the max of highest and lowest 1%) , and only one firm is dropped out of the sample (12 observations) as for this no explanation could be found[17]. The corrections made here are in line with the procedures applied by *Lemmon, Roberts & Zender (2008)*. Winsorizing is applied when extreme outliers are detected for a certain variable given a firm. If the detected extreme outliers are found for more than one variable given a firm the firm is dropped out of the sample. Based on the same sample a second sample is selected, which is called the Survivors. The requirements for this sample are: (1) to exist at least 11 years and (2) to have no missing value regarding variable book leverage. This sample selection is in line with the paper of *Lemmon, Roberts & Zender (2008)* who require 20 years of existence for a panel data of 38 years. Since one of the problems in panel data is survivorship bias, all subsequent tests will be applied to this sample as a robustness check.

[17] This firm contained very extreme outliers and data entry error is assumed here.

## 4.2. Variable construction

The constructions of the variables that will be used in this study are as follow:

- *Total Debt = Short-Term Debt + Long-Term Debt*
- *Book Leverage = Total Debt / Book Assets*
- *Initial Book Leverage = The First Book Leverage Of The Firm Since Existence*
- *Industry Median Leverage = Median Book Leverage Per Industry On A Year Base*
- *Cash Flow Volatility = The Standard Deviation Of Historical Operating Income, Requiring At Least 3 Years Of Data (Standardized)*
- *Dividend = A Dummy Variable, Either A Firm Pays Dividend (1) Or Not (0)*
- *Firm Size = Log Of Book Assets (Corrected For Inflation)*
- *Firm Size = Log Of Sales*
- *Market Equity = Stock Price ∗ Shares Outstanding*
- *Market Leverage = Total Debt / (Total Debt + Market Equity)*
- *Initial Market Leverage = The Market Leverage Of The Firm Since Existence*
- *Market-To-Book = (Book Assets – Common Book Equity + Market Equity)/Book Assets*
- *Growth Ratio = Intangible Assets / Book Assets*
- *Profitability = Operating Income Before Depreciation / Book Assets*
- *Tangibility = Net PPE / Book Assets*
- *Net Debt Issuance = (Total Debt - Total Debt $_{t-1}$) / Book Assets $_{t-1}$*
- *Net Equity Issuance = Sale Of Common Stocks – Purchase Of Common Stocks / Book Assets*

Although the selection and the importance of the variables constructed above are already comprehensively clarified by many scholars including *Rajan & Zingales (1995)* and *Frank & Goyal (2007)*, for clarity reasons these will be briefly discussed here and related to the corporate capital structure theories and if possible to different financial systems (i.e. bank or market based). The dependent variables book leverage and market leverage are of great importance since the aim of this study is to test whether convergence and persistence effect also apply to the Dutch non-financial firms. The independent variables initial book leverage and initial market leverage, which are the first observations per firm since existence, are assumed to have a permanent characteristic. As these permanent components hold, it is expected to see a persistence effect across event time regardless of the type of financial system.

The independent variables sales and assets are usual measures for firm size. Larger firms do not only lead to low information asymmetry but also to low congestions. In the original study this effect was found to be positive. Since this variable is assumed to be independent of the type of financial system one expects a similar positive relationship. In finance studies it is common to take the log of these variables as their values have conditional distributions that are heteroskedastic or skewed. By taking the log these effects are mitigated. Further these variables are corrected for inflation in order to get the real growth. Market to book ratio is a common measure for growth opportunity. Firms with higher market to book ratios may issue equity as their share

prices are high leading to a negative relationship between leverage and market to book. Assuming there is certain amount of information asymmetry indicate that one should find similar outcome, but because in bank oriented financial systems borrowers and lenders are more likely to be much closely tied implies that the information asymmetry found should also be much lower. This again means that the effect found in this study should be weaker. Profitability, a measure of financial security, is expected to have a negative coefficient. The value attached to this variable is assumed to be much stronger in bank-based financial systems who favour self-financing. Based on this argument it is expected to find a stronger effect for this variable in this study. Tangibility on the other hand is also a financial security in the form of collateral. Theoretically firms with high tangibility ratio are expected to have high debt ratio, since these can be used as collaterals. The value attached to these collaterals is assumed to be much higher in bank-oriented financial system and thus the effect is expected to be much stronger.

Businesses that are the riskiest are assumed to have higher cash flow volatility and low debt ratio. Although this is just a theoretical view in the practice it is common to find businesses with both variables being high (e.g. Spyker). Since in bank-based financial systems the relation ties are assumed to be rather close between borrowers and lenders, one does not expect the effect to be stronger in this study. Industry median leverage is considered to be a benchmark measure, implying those managers are acting toward a certain degree of leverage. Thus its effect is assumed to depend on its current leverage ratio to that of the median industry ratio. *Frank & Goyal (2007)* have found this variable to be positively related to leverage. Finally the dummy variable dividend --whether a firm pays dividend or not-- is a measure that declares the financial stability of a firm and is assumed to have a negative relationship. Also here by assuming a lower degree of information asymmetry, one expects a lower signal for this variable in this study.

### 4.3. Summary statistics

Table 2A represents summary statistics for both type of samples. The first part elaborates on the whole sample while the second part describes the firms with at least 11 years of existence and no missing value for book leverage. While this subsample is selected a total of 554 observations are dropped out of the sample. A comparison between two samples reveals small differences. Although all test are also applied for this subsample due to small differences and space limitations these will be not always presented. Some differences that are found and are consistent with the earlier scholar findings include the log of assets and the amount of dividend paid being larger and the cash flow volatility being smaller for the Survivors. As the results are compared with the findings of *Lemmon, Roberts & Zender (2008)*, one can see that Dutch non-financial firms are more profitable and pay more dividend than their US counterparts. On the other hand Dutch non-financial firms hold fewer tangible assets

than their US counterparts. With respect to the variable book leverage US firms are highly leveraged. This indicates that US firms are dealing with the case of highly

**Table 2A: Summary statistics.** The sample consists of all non-financial firm-year observations in the Compustat database & DataStream database from 1989 to 2010. The table represents mean, median, standard deviation, smallest observation, highest observation and the amount of observation given a variable. The first part of the table contains summary statistics for all firms whereas the second part of the table represents summary statistics for firms with at least 11 years of existence.

| "All FIRMS" | | | | | | |
|---|---|---|---|---|---|---|
| Variable | Mean | Median | (SD) | (Min) | (Max) | (N) |
| Book leverage (BL) | 0.22 | 0.21 | 0.17 | 0.00 | 0.87 | 2695 |
| Market leverage (ML) | 0.28 | 0.23 | 0.26 | 0.00 | 1.00 | 2352 |
| Initial Book leverage (INBL) | 0.20 | 0.17 | 0.18 | 0.00 | 0.87 | 2720 |
| Initial Market leverage (INML) | 0.32 | 0.16 | 0.36 | 0.00 | 1.00 | 2720 |
| Log Of Assets (LOGA) | 5.69 | 5.69 | 2.06 | 0.08 | 11.08 | 2707 |
| Growth Ratio (GRWOTH) | 0.10 | 0.01 | 0.16 | 0.00 | 0.78 | 2678 |
| Profitability (PROF) | 0.12 | 0.13 | 0.13 | -0.62 | 0.41 | 2704 |
| Tangibility (TANG) | 0.27 | 0.25 | 0.19 | 0.00 | 0.94 | 2706 |
| Cash Flow Volatility (CFV) | 0.06 | 0.03 | 0.09 | 0.00 | 0.57 | 2062 |
| Median Industry Leverage (MEDIND) | 0.21 | 0.21 | 0.12 | 0.00 | 0.80 | 2718 |
| Dividend Payer (DIVDUM) | 0.54 | 1.00 | 0.50 | 0.00 | 1.00 | 2720 |
| **"Survivors"** | | | | | | |
| Variable | Mean | Median | (SD) | (Min) | (Max) | (N) |
| Book leverage (BL) | 0.22 | 0.21 | 0.16 | 0.00 | 0.87 | 2153 |
| Market leverage (ML) | 0.27 | 0.23 | 0.24 | 0.00 | 1.00 | 1982 |
| Initial Book leverage (INBL) | 0.19 | 0.16 | 0.16 | 0.00 | 0.65 | 2166 |
| Initial Market leverage (INML) | 0.32 | 0.19 | 0.35 | 0.00 | 1.00 | 2166 |
| Log Of Assets (LOGA) | 5.87 | 5.80 | 2.05 | 0.08 | 11.08 | 2164 |
| Growth Ratio (GRWOTH) | 0.10 | 0.01 | 0.16 | 0.00 | 0.77 | 2139 |
| Profitability (PROF) | 0.12 | 0.13 | 0.11 | -0.62 | 0.41 | 2161 |
| Tangibility (TANG) | 0.27 | 0.25 | 0.19 | 0.00 | 0.91 | 2163 |
| Cash Flow Volatility (CFV) | 0.05 | 0.03 | 0.08 | 0.00 | 0.57 | 1773 |
| Median Industry Leverage (MEDIND) | 0.21 | 0.21 | 0.12 | 0.00 | 0.80 | 2173 |
| Dividend Payer (DIVDUM) | 0.59 | 1.00 | 0.49 | 0.00 | 1.00 | 2166 |

market-oriented financial system *(De Bie & De Haan, 2007)*. Table 2B gives an overview of the correlation matrix results after correction. A collinear relationship of 0.8 is assumed to be not acceptable. Multicollinearity is found for the variables log of

assets and log of sales (94%), implying that these variables should not be used in one model at the same time.

**Table 2B: Correlation matrix.**

| | *(1)* | *(2)* | *(3)* | *(4)* | *(5)* | *(6)* | *(7)* | *(8)* | *(9)* | *(10)* |
|---|---|---|---|---|---|---|---|---|---|---|
| ML *(1)* | 1.00 | | | | | | | | | |
| BL *(2)* | 0.70 | 1.00 | | | | | | | | |
| INBL *(3)* | 0.31 | 0.38 | 1.00 | | | | | | | |
| INML *(4)* | 0.17 | 0.12 | 0.59 | 1.00 | | | | | | |
| TANG *(5)* | 0.21 | 0.25 | 0.19 | 0.10 | 1.00 | | | | | |
| DIVDUM *(6)* | -0.14 | -0.12 | -0.10 | -0.06 | 0.16 | 1.00 | | | | |
| LOGA *(7)* | 0.19 | 0.22 | 0.02 | 0.03 | 0.15 | 0.27 | 1.00 | | | |
| PROF *(8)* | -0.17 | -0.11 | -0.02 | -0.05 | 0.22 | 0.32 | 0.18 | 1.00 | | |
| CFV (9) | -0.08 | -0.04 | -0.01 | 0.00 | -0.21 | -0.33 | -0.38 | -0.30 | 1.00 | |
| GROWTH *(10)* | 0.02 | 0.09 | -0.17 | -0.08 | -0.43 | -0.15 | 0.21 | -0.08 | 0.00 | 1.00 |
| MEDIND *(11)* | 0.50 | 0.60 | 0.38 | 0.18 | 0.34 | 0.02 | 0.19 | -0.04 | -0.17 | -0.05 |

# 5. Results

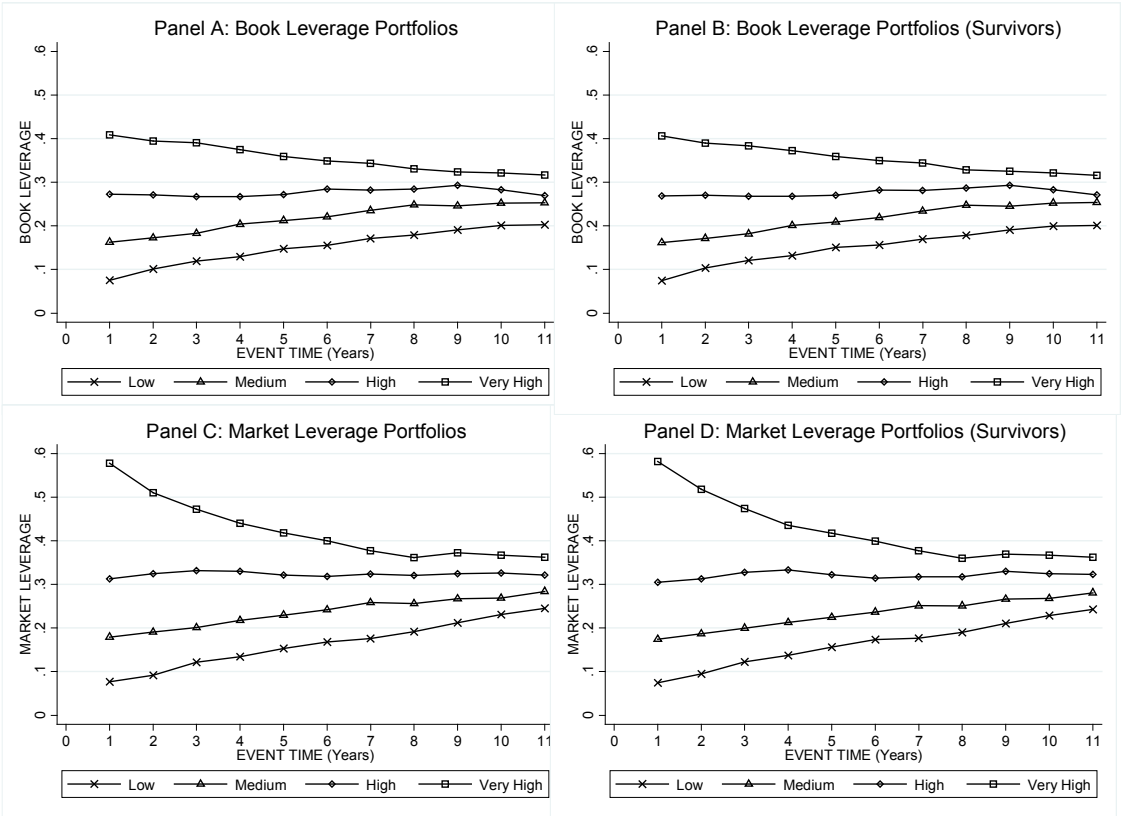
In this chapter the methodology described in chapter 3 will be used and applied to the data described in chapter 4. The outline of this chapter will be as follow: Subsection 5.1 will elaborate on the convergence and persistence patterns of actual leverage, natural log of leverage, and unexpected leverage. In subsection 5.2 the attention will focus on the role of variables: initial leverage, log of assets, growth ratio, profitability, tangibility, median industry leverage, cash flow volatility, and dividend payer for forecasting purposes. In subsection 5.3 a variance decomposition model is applied whereas the individual contribution of these variables in explaining variability (Adj.$R^2$) is given. Since some of the findings may have been caused due to the response time of the managers, subsection 5.4 pays some attention to the time effect. Further in subsection 5.5 the results are exposed to different models in order to check for model sensitivity. Financing behaviour of Dutch non-financial firm managers are worked out in subsection 5.6.

## 5.1. Convergence and persistence patterns

This section describes the patterns of leverage of all Dutch non-financial firms over a period of 11 events. The starting point of the portfolio formation year is 1989. In 1989 firms are divided into four quintiles according to their actual leverage and are named low, medium, high, and very high. As the compositions of these portfolios are kept constant the average leverage is calculated for the years 1990 through 2000. In 1990

the portfolios are again reformed and the actual leverage is calculated for the years 1991 through 2001. The same process of portfolio reformation is applied for the years 1992 till 1999. This means that in total the portfolios are eleven times reformed. Finally, the average leverage of these portfolios is averaged leading to a final set of four portfolios per event. The same process is applied to the market leverage and the sample Survivors. Figure 5 presents the final results.

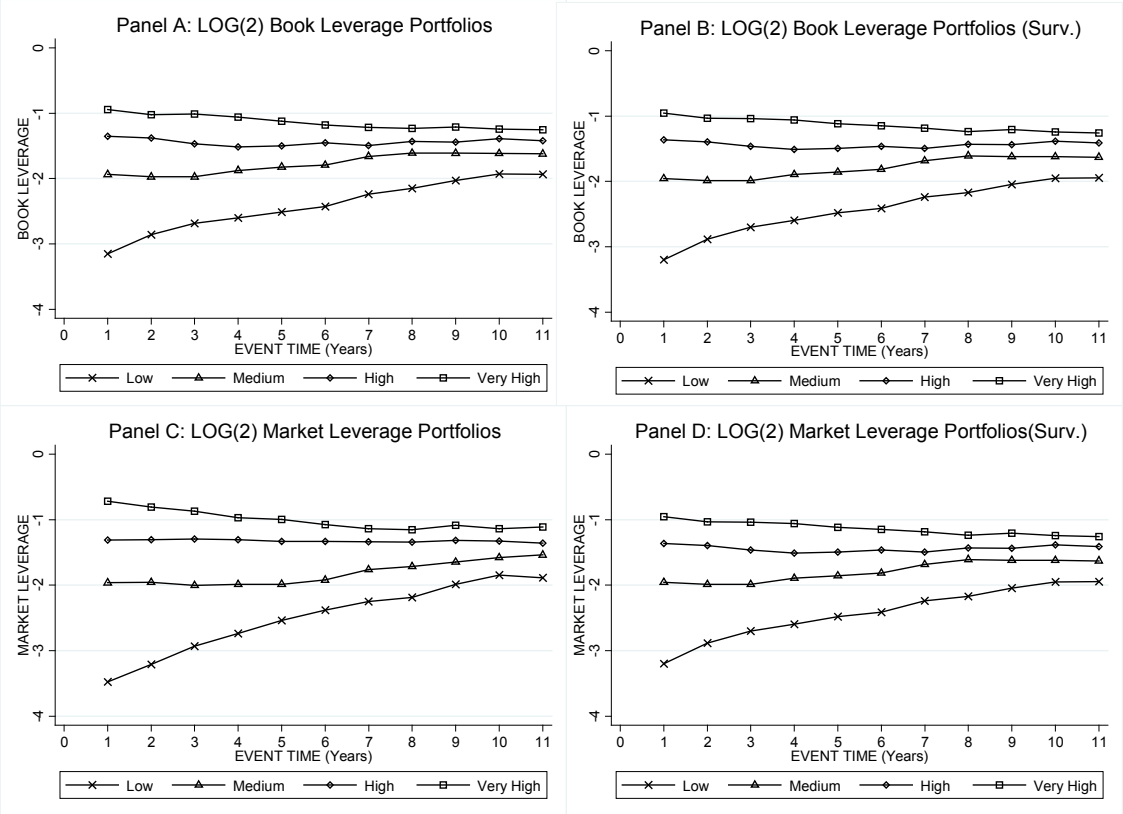
**Figure 5: Leverage patterns in event time according to actual leverage portfolios.** The sample consists of all non-financial firm-year observations in the Compustat database & DataStream database from 1989 to 2010. Each panel consists of four lines representing the average leverage of four portfolios including low, medium, high & very high across event time. The process is as follow: year 1989 is the portfolio formation period. In 1989 firms are ranked according to their actual leverage and are divided into four portfolios. As these portfolio compositions are kept constant across the event time, the average leverage is calculated for the subsequent 11 years (1990-2000). The process of ranking and averaging is repeated for the firms all the way through 1999, leading to a total of 11 sets across 11 event times. Finally for every event time the average of portfolios is calculated leading to four final portfolios per event time. Panel A and B represent book leverage portfolios for all firms and the survivors. Panel C and D represent market leverage portfolios for all firms and the Survivors. For the construction of the variables ML & BL consult 4.2. Variable construction.



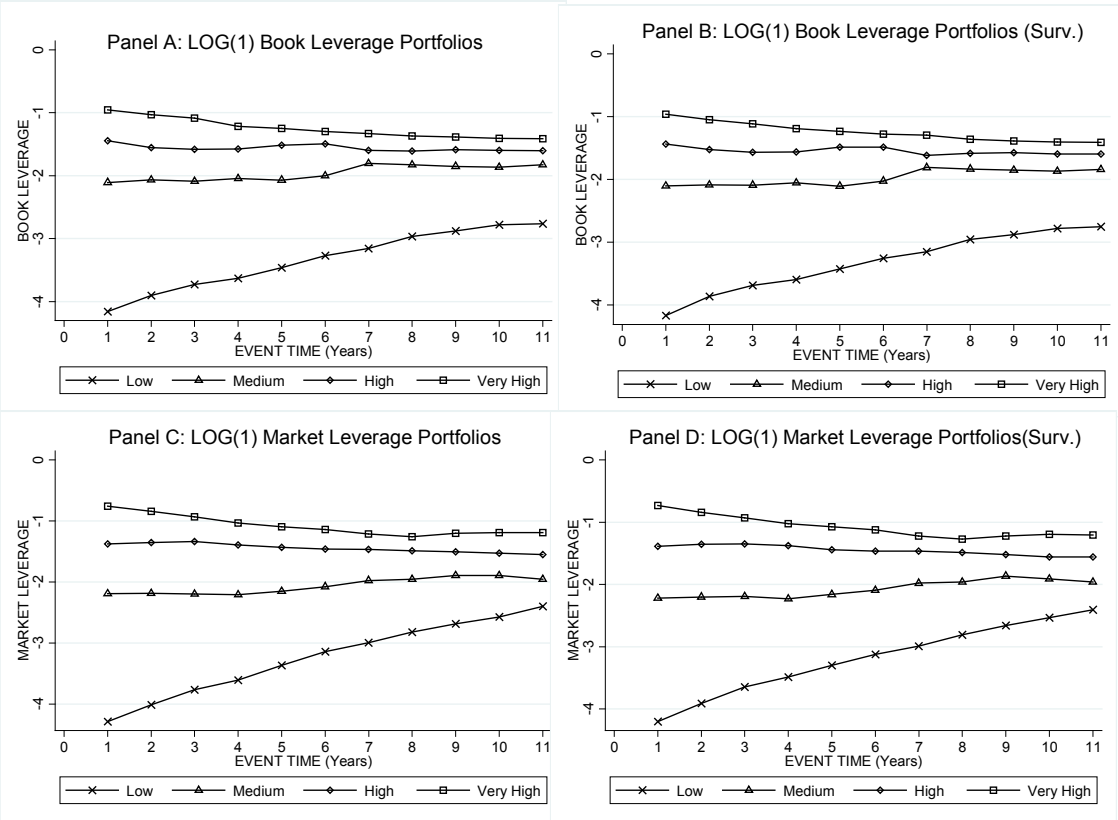
In event time zero when the actual book leverage portfolios are formed the average leverage ratio per portfolio is 7.54% for low, 16.29% for medium, 27.28% for high and 40.90% for very high. 10 years later the average ratio per portfolio is 20.24% for low, 25.31% for medium, 26.96% for high and 31.70% for very high. The lowest portfolio undergoes the highest percentage change, namely an increase of 268.61% followed by an increase of 155.40% for the medium portfolio, a decrease of 22.50% for the very high portfolio and a decrease of 1.17% for the high portfolio. Both Panel A and B provide clear evidence for the convergence and persistence effect. Further with exception for some very small differences the book leverage portfolios for the survivors show similar behaviour in pattern. This implies that the findings are not caused owing to dropouts. On the other hand over a period of 11 years after the actual market leverage portfolios are formed the average leverage ratio per portfolio rises from 7.70% to 24.51% for the low portfolio. For the medium portfolio the leverage ratio increases from 17.94% to 28.41% followed by the high portfolio which also rises from 31.29% to 32.14%. The very high portfolio behaves the other way around and drops from 57.76% to 36.22%. Also here the Survivors portfolio displays similar pattern and survivorship biased is eliminated. Remarkably, these graphical findings are in line with those of *Lemmon, Roberts & Zender (2008)* as the results both indicate convergence and persistence effects among these portfolios.

Although the findings are not driven by the dropouts *Lemmon, Roberts, & Zender (2008: 1582)* argue that it is possible that the findings are possibly due to the mere result of construction as the leverage ratio are restricted to the unit interval and the mean of such observations have the natural tendency to reflect away from extremes of zero and one. To check for this possibility the leverage ratios are first transformed into logit leverage ratios whereas the following formula is applied $Logit(Leverage_{it})=In(leverage_{it} /1\text{-}leverage_{it})$. Since it is not possible to apply this transformation method to exact values zero and one two different methods are applied. In the first analysis only values equal to one are dropped out of the sample and 0.001 is added to all other observations. In the second method values equal to zero and one are dropped out of the sample. The loss in amount of observations regarding these methods include 8.5% in observations for book leverage ratios equal to 0, 6.84% loss in observations for market leverage ratios equal to 0 and 3.86% loss in observations for market leverage ratios equal to 1. For the survivors these losses comprise 7.66% for book leverage ratio equals to 0, and 6.19% (2.95%) for market leverage equals to 0 (1). The results are presented in the figure 6. The first four graphs represent the first analysis whereas values equal to one are dropped and 0.001 is added to the rest of the sample. In overall all four graphs indicate similar findings as in figure 5. The large spread between the low and medium portfolio is caused due to the amount of low leverage firms (i.e. natural log of 0.001 is -3). As one corrects for this by also removing values equal to zero in the second analysis the effect is mitigated. Both analyses indicate that convergence is not the result of construction.

**Figure 6: Leverage patterns in event time according to natural log of actual leverage portfolios.** The sample consists of all non-financial firm-year observations in the Compustat database & DataStream database from 1989 to 2010. Each panel consists of four lines representing the average natural log of leverage of four portfolios including low, medium, high & very high across event time. The process is as follow: first the actual leverage ratios are transformed into natural log leverage ratios. The natural log transformation maps leverage from unit interval onto the whole real line and so controls for the possibility of construction biased regarding convergence and persistence effect. Since the natural log function cannot be applied to exact units including 0 and 1, two separate methods are applied. In the first method only observations equal to 1 are dropped out of the sample and 0.001 is added to all observations (LOG(1)). In the second method all observations equal to 0 and 1 are dropped out of the sample (LOG(2)). Year 1989 is the portfolio formation period. In 1989 firms are ranked according to their natural log leverage ratio and are divided into four portfolios. As these portfolio compositions are kept constant the average natural log of leverage is calculated for the subsequent 11 years (1990-2000). The process of ranking and averaging is repeated for the firms all the way through 1999, leading to a total of 11 sets across 11 event times. Finally for every event time the average of portfolios is calculated leading to four final portfolios per event time. Panel A and B represent natural log of book leverage portfolios for all firms and the survivors. Panel C and D represent natural log of market leverage portfolios for all firms and the survivors.




continue




Thirdly, *Lemmon, Roberts & Zender (2008)* acknowledge that it is possibly that the results are just due the observable heterogeneity associated with traditional determinants of leverage. This implies that the possibility exist that for e.g. low portfolios contain only firms with small size and low tangibility characteristics or in order words convergence and persistence might be the results of sorting procedures. In order to check whether these findings are robust to sorting procedures, the data is exposed to a third robustness check whereas the observable heterogeneity captured by the variables firm size, profitability, tangibility, growth ratio[18], and industry dummy variables is removed. The procedure applied is as follow. After creating 1-year lagged variables for firm size, profitability, tangibility and growth ratio a cross-sectional regression estimation is applied whereas dummy variable for industries are also included[19]. From these estimation the actual leverage ratios are tracked leading to a certain yearly amount that is unexplained by the model which is termed

[18] Market to book ratio is found to be not linearly related to market leverage. Based on this finding a different measure for growth is defined, namely intangible assets ratio (growth ratio). This because one of the assumptions of OLS regression is that there should be a certain linear relationship between the dependent and the independent variable. Consult appendix for more information.

[19] See appendix for assumptions of OLS.

unexpected leverage. Unexpected leverage is to be defined as the residuals from an OLS regression of book and market leverage on the key specified regressors mentioned earlier. By removing the effect of these observable determinants also the correlation among these variable within portfolios are eliminated. Based on the outcomes for each calendar year four portfolios are formed by dividing it into four quintiles. While keeping the composition of the portfolios constant across the even time the average of these portfolios are calculated, leading to a total of 10 sets for 11 even times. Finally the average of these portfolios is calculated across event time. The results are presented in figure 7. The results presented are nearly the same as the actual leverage. The standard deviation of unexpected leverage among the four portfolios during the formation period amounts 10.56% (14.61%) for book leverage (market leverage). After 11 years the deviation is decreased to 3.96% (4.14%) for book leverage (market leverage).

In sum the results found are similarly in line with those of *Lemmon, Roberts & Zender (2008)* and is irrespective of the type of economy's orientation (i.e. bank or market). The portfolios tend to converge over time, which appears to be concentrated on the short run, implying that the data comprise a transitory component. The graphical views also provide non-parametric evidence for the permanent component that lead to dispersion among portfolios over time. In overall it shows that even when one controls for the effect of variables which are acknowledged by *Rajan & Zingales (1995)* to be the most important determinants of future capital structure, one is still able to find similar patterns as when these are included. This implies that although the traditional determinants are possibly necessary they are not sufficient on their own to explain the variability among capital structure of firms. In the next section these findings will be further quantified and exposed to some parametric tests.

### 5.2. The role of variables

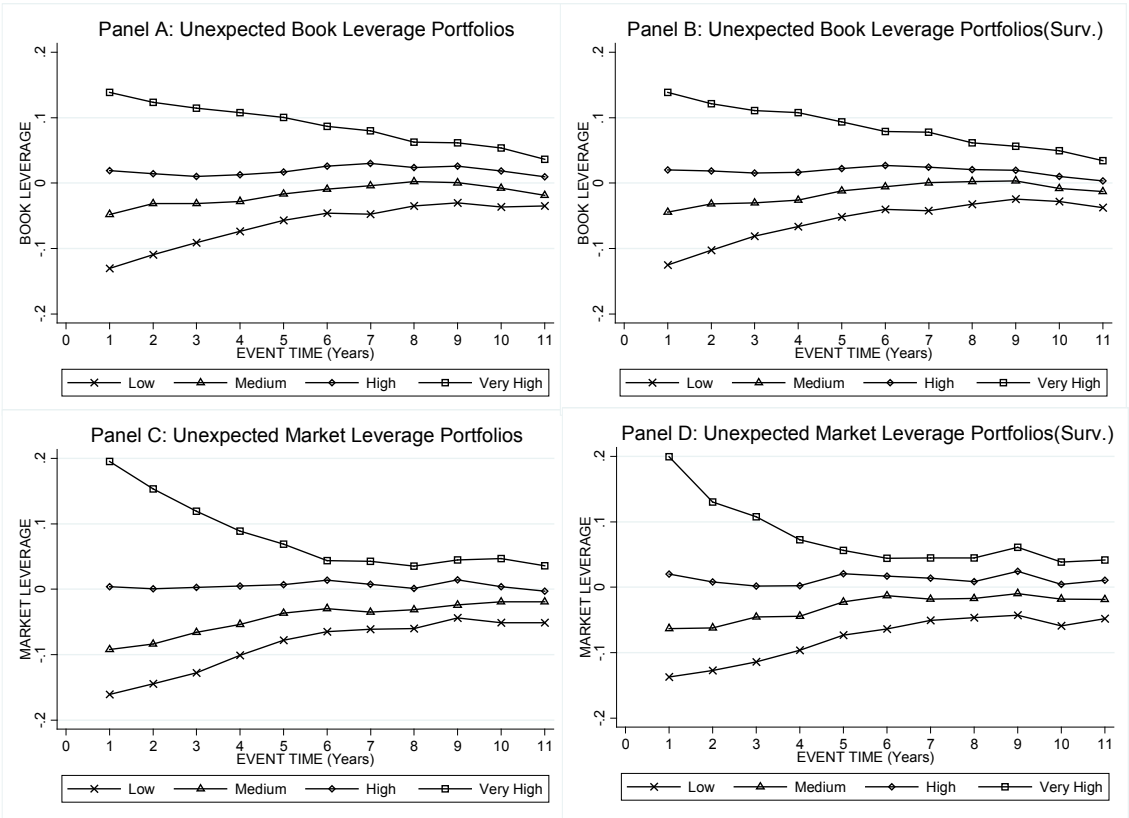
Even though the graphical view did provide evidence for the convergence and persistence, it didn't provide any quantitative evidence. In this section the importance of the variables of *Rajan & Zingales (1995)*, *Frank & Goyal (2007)*, and *Lemmon, Roberts & Zender (2008)* described earlier will be further examined. To estimate the effects the following equation is applied[20]:

$$Leverage_{it} = \alpha + \beta X_{t-1} + \gamma Leverage_{i0} + V_t + \varepsilon_{it}$$

The abbreviations $i$ & $t$ represent firms and years. $X$ represents a set of 1-year lagged control variables. $Leverage_{i0}$ is firm $i$'s initial leverage defined as the first non-missing

[20] See appendix for the assumptions required and how these are met.

**Figure 7: Leverage patterns in event time according to unexpected leverage portfolios.** The sample consists of all non-financial firm-year observations in the Compustat database & DataStream database from 1989 to 2010. Each panel consists of four lines representing the average unexpected leverage of four portfolios including low, medium, high & very high across event time. The process is as follow: first, for the independent variables log of assets, profitability, growth ratio and tangibility 1-year lagged variables are created followed by estimating cross-sectional regression for each calendar year whereas industries are also included. Per year from the outcomes of cross-sectional regression the actual leverage are tracked leading to a certain amount that is unexplained, which is termed "unexpected Leverage". In other words unexpected leverage is residuals from cross-sectional regression on the variable named earlier. Year 1990 is the portfolio formation period. In 1990 firms are ranked according to their unexpected leverage and are divided into four portfolios. As these portfolio compositions is kept constant across the event time, the average leverage is calculated for the subsequent 11 years (1991-2001). The process of ranking and averaging is repeated for the firms all the way through 1999, leading to a total of 10 sets across 11 event times. Finally for every event time the average of portfolios is calculated leading to four final portfolios per event time. Panel A and B represent unexpected book leverage portfolios for all firms and the survivors. Panel C and D represent unexpected market leverage portfolios for all firms and the survivors.




value for leverage given a firm since existence[21]. $Y$ measures the importance of firms'

[21] First encountered observation that is found.

initial leverage. $V$ is a year fixed effect and $\epsilon$ is a random error that is heteroskedastic and correlated within firms. The model is executed for book leverage and market leverage. Also the same method is applied to the Survivors. As the OLS regression starts only with the variable Initial leverage, it is continuously extended. First the determinants log of assets, growth ratio, profitability, and tangibility are added followed by a second expansion where the variables median industry leverage, cash flow volatility and dividend dummy variable are added. Further to make comparison possible each coefficient is scaled by corresponding variable's standard deviation. The results represent the estimated effect of one standard deviation ($\sigma$) change in vector $X$ on leverage. Table 3 represents the findings. In Panel A all firms are taken into account and in Panel B only firms with at least 11 years of existence.

The second and the fourth columns in Panel A represent the results for the OLS regression when only initial leverage is considered. A one standard deviation change in initial book leverage corresponds to an average change of 8% in future value of book leverage. For the market model this effect is even 9%, and is significant for both models at the 1% level. The total variability explained by this variable amounts 23% (11%) in book (market) leverage model. In the original study the result for this coefficient is 7% (11%) for book (market) leverage and show an adjusted R-squared of 13% (20%). This suggests that although the magnitude in variability explained differ between this study and the original study, the initial leverage of firms contain a certain permanent component which is in line with earlier graphical findings. When the model is extended with four traditional determinants of *Rajan & Zingales (1995)* of which the results are presented in columns 3 and 6 some features are worth noting.

First as the effect of initial leverage in the book leverage model remains equally strong it losses some of its strong feature in the market model. Except for the growth ratio which is not significant all other variables are equally important in making predictions for market leverage and are in term of sign highly significant. Finally when the determinants of *Frank & Goyal (2007)* are added to the model, initial leverage losses some of its magnitude in book leverage model and is supplement with growth ratio which has an equal effect. In this book leverage model specification median industry leverage is the variable with the highest marginal effect. Considering the same specification leads to a dramatic loss in the coefficient magnitude of initial market leverage and its statistical and economic importance. Also in the market model the most single important determinant is now the median industry leverage with an effect of 9% change in market leverage when one standard deviation change occurs in median industry leverage.

In this study the log of assets is positively related to leverage in both models. These results being albeit not always significant are in line with thoughts behind the trade-off and signaling theory implying that as firm gets bigger in size diversification may

**Table 3: Contribution of initial leverage for forecasting purpose.** The sample consists of all non-financial firm-year observations in the Compustat database & DataStream database from 1989 to 2010. Each column represents scaled parameter estimates from OLS regressions on book and market leverage on the underlying key specified determinants including initial book leverage, initial market leverage, log of assets, growth ratio, profitability, tangibility, industry median leverage, cash flow volatility, dividend, and year fixed effects. When a column contains yes for the dummy variable year fixed effects, it implies that calendar year fixed effects are included in the regression. The italic and bold values represent the t-statistics which are robust to both clustering at the firm level and heteroscedasticity. Regarding interpretation, a one standard deviation change in underlying key specified determinant is associated with the presented value for parameter estimate change in leverage. Panel A represent the findings of all firms whereas panel B takes the survivor sample into account. Further each column includes the amount of observation and the adjusted R-squared. For the construction of the variables consult 4.2. Variable construction. Italic and bold values of 2.58 or higher, representing t-statistics, are highly significant at the 1% level for a two-tailed test. Values above 1.96 are significant at the 5% level.

| Panel A: All Firms | | | | | | |
|---|---|---|---|---|---|---|
| Variable | Book Leverage | | | Market Leverage | | |
| Initial leverage | 0.08 | 0.07 | 0.04 | 0.09 | 0.05 | 0.01 |
| | ***8.49*** | ***7.62*** | ***4.59*** | ***6.20*** | ***4.09*** | ***0.85*** |
| Log Of Assets | | 0.02 | 0.01 | | 0.04 | 0.03 |
| | | ***2.57*** | ***1.75*** | | ***3.12*** | ***2.43*** |
| Growth Ratio | | 0.04 | 0.04 | | 0.01 | 0.01 |
| | | ***5.58*** | ***5.29*** | | ***1.00*** | ***0.14*** |
| Profitability | | -0.01 | -0.01 | | -0.05 | -0.04 |
| | | ***-1.80*** | ***-1.61*** | | ***-4.18*** | ***-3.61*** |
| Tangibility | | 0.04 | 0.03 | | 0.05 | 0.02 |
| | | ***4.69*** | ***3.39*** | | ***3.89*** | ***1.72*** |
| Median Industry Leverage | | | 0.07 | | | 0.09 |
| | | | ***8.78*** | | | ***8.86*** |
| Cash Flow Volatility | | | 0.00 | | | -0.01 |
| | | | ***0.76*** | | | ***-0.70*** |
| Dividend Payer | | | -0.01 | | | -0.02 |
| | | | ***-2.11*** | | | ***-2.52*** |
| Year Fixed Effects | No | Yes | Yes | No | Yes | Yes |
| Adj.$R^2$ | 0.23 | 0.29 | 0.40 | 0.11 | 0.19 | 0.30 |
| Obs. | 2696 | 2432 | 1811 | 2352 | 2136 | 1606 |

(Continued)

| Panel B: Survivors | | | | | | |
|---|---|---|---|---|---|---|
| Variable | Book Leverage | | | Market Leverage | | |
| Initial leverage | 0.08 | 0.06 | 0.03 | 0.07 | 0.04 | 0.01 |
| | ***6.62*** | ***6.18*** | ***3.62*** | ***4.46*** | ***3.22*** | ***0.78*** |
| Log Of Assets | | 0.02 | 0.01 | | 0.04 | 0.03 |
| | | ***2.39*** | ***1.60*** | | ***3.32*** | ***2.10*** |
| Growth Ratio | | 0.04 | 0.04 | | 0.01 | 0.01 |
| | | ***5.52*** | ***5.25*** | | ***1.15*** | ***0.69*** |
| Profitability | | -0.02 | -0.01 | | -0.06 | -0.04 |
| | | ***-1.70*** | ***-1.31*** | | ***-3.93*** | ***-3.39*** |
| Tangibility | | 0.05 | 0.03 | | 0.05 | 0.02 |
| | | ***4.62*** | ***3.03*** | | ***3.57*** | ***1.42*** |
| Median Industry Leverage | | | 0.06 | | | 0.09 |
| | | | ***7.03*** | | | ***7.89*** |
| Cash Flow Volatility | | | 0.00 | | | -0.01 |
| | | | ***0.06*** | | | ***-0.65*** |
| Dividend Payer | | | -0.00 | | | -0.02 |
| | | | ***-2.04*** | | | ***-1.96*** |
| Year Fixed Effects | No | Yes | Yes | No | Yes | Yes |
| Adj.$R^2$ | 0.21 | 0.31 | 0.41 | 0.09 | 0.20 | 0.31 |
| Obs. | 2153 | 1995 | 1610 | 1982 | 1837 | 1485 |

take place which lowers the risk of bankruptcy and make borrowing easy. Further, more debt in combination with large firms are considered as a sign of vitality to the market *(Paulo et al. 2007)*. On average the marginal effect found for this variable shows that irrespective of the type of financial system as firms increase in their size the information asymmetry declines and a positive relationship arises. Even if not significant in both models growth ratio is positively related to leverage. According to the pecking order theory growth opportunities have a positive impact on debt when they are greater than the profits retained, and a negative influence when they are less than retained profits. On average the growth ratio and the profits retained ratio in this study amount 0.10 and -0.06 supporting this theory. The positive relationship found in this study and the negative relationship found in the original study is assumed to have been caused due to this difference. Another possible explanation lies in different way of connectedness among the financial systems. In bank oriented financial systems banks provide most of credit to the economy and in order to minimize risk they like to hold their contacts as close as possible resulting in high connectedness and low information asymmetry. Dutch companies operating in bank

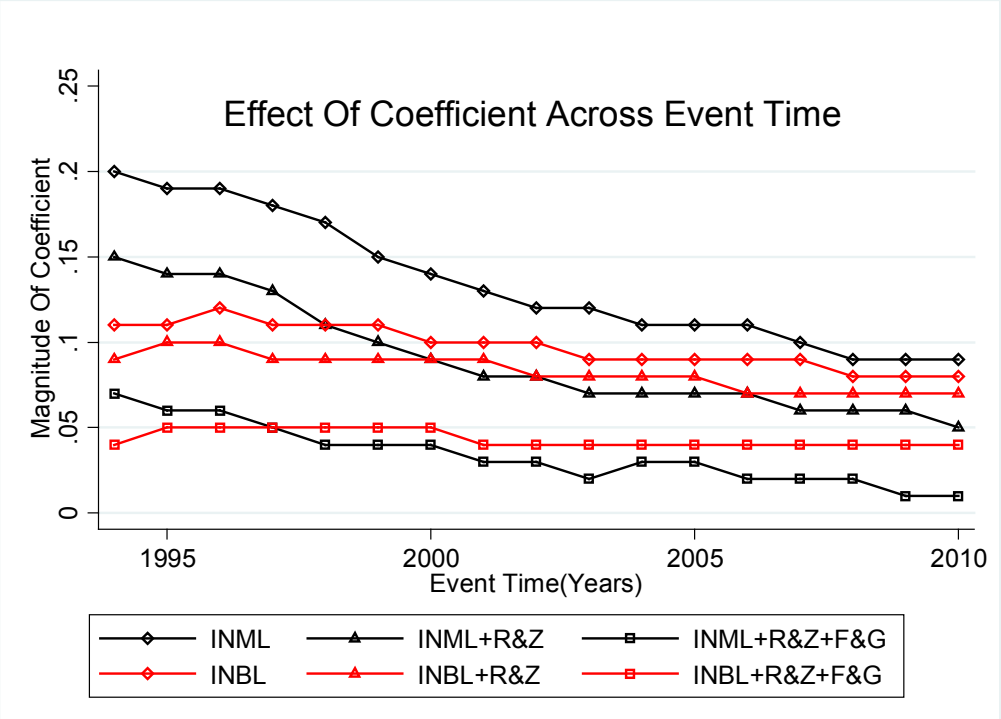
oriented financial system are more likely to have this close lenders and borrowers relationships. On the other hand in market oriented finical systems companies raise funds in capital markets. It is assumed that the degree of connectedness is much lower (i.e. information asymmetry is high) and that managers are possibly forced to reduce their leverage ratios because according to the trade-off theory the cost of financial distress rises with expected growth. Profitability is only found to be significant in the market model. Also these results are in line with pecking order theory who assumes that the most profitable companies turn to self-financing rather than debt financing. The same (i.e. similar) finding also hold for companies being active in market-based financial systems. The positive coefficient of the variable tangibility implies that companies' fixed assets serve as collateral security for outside capital *(Myer & Majluf, 1984)*. Even if expected the marginal effect to be more prominent in bank oriented financial systems the results provide the opposite. Remarkably also here on average one finds the effect of this variable to be nearly equal among both finical systems when focusing on the market model.

The effect of the median industry leverage is as expected and found by *Frank & Goyal (2007)*, and *Lemmon, Roberts & Zender (2008)*. In this study cash flow volatilities are found to be not a relevant factor in explaining the capital structure as these are not statistically significant. Earlier for dividend one found that on average 54% to 59% of the Dutch non-financial firms pay dividend to their shareholders. From pecking order theory perspective firms become less levered over time as the amount of dividend paid to the shareholders is reduced *Frank & Goyal (2007)*. A comparison between the average dividend paid before and after 1999 supports this statement. Before 1999 on average 71% of Dutch non-financial firms paid dividend. This percentage amounts 42% after 1999. The marginal effect found for this variable is more prominent in the original study (i.e.-3% (-5%) for book (market) model). This implies that the value that dividend signals is much higher in original study. It is in general known that Dutch firms have a high ownership concentration which is assumed less likely to be the case in US. Earlier one argued that in bank oriented financial systems closely tied relationships are more likely. Based on these arguments one can argue that the value of the signal being low in this study is possibly due to this difference (i.e. information asymmetry is low). For the Survivors in Panel B the results are nearly similar.

In sum as important the variable initial leverage in the book leverage model it is not equally important in making projections for market leverage. But one should consider when interpreting the results that initial leverage is a constant value that does not change over time (time-invariant). Regarding other traditional determinants change in time implies variation in these variables and so these are considering the time

effect as well. It is rather interesting to see how the coefficients of initial leverage behave as one extends the model with other determinants and calendar year observations. The graphical view in figure 8 represents the magnitude of the coefficient of initial leverage across event time. The black lines represent the market model and the red lines take the book model into account. Each line represents the estimated standardized coefficients from an OLS regression of book and market leverage on several different specifications, starting with initial leverage. The panel data is continuously extended with calendar year observations. The first prediction is based on data from 1989-1994. The same method is applied for the rest of the sample leading to a total of seventeen estimated and standardized coefficients per line.

**Figure 8: Magnitude of coefficient across event time according to different specification.** The figure represents six lines. Each line maps the magnitude of the coefficient of initial leverage on future leverage over time an according to different specifications. The INML line takes only the effect of initial market leverage into account and it estimates the standardized coefficient from an OLS regression of market leverage. Lines equipped with abbreviations R&Z and F&G take also the variables of Rajan & Zingales and Frank & Goyal into account. The first estimation is made for observations until 1994. Every time when this method is applied one year is added to the sample (starting with 1994…2010). All coefficients are found to be significant (except for specification 3 of market leverage model) and robust to both clustering at the firm level and heteroscedasticity. The result shows how important and volatile initial leverage is when different specification and time period (calendar year observations) are considered. INBL line represents the effect on book leverage.



The graphical view provides interesting features. When the model only considers initial leverage, the results in this study show that initial leverage is the most important determinant of future capital structure in the market model. As this model is expanded with the traditional determinants of *Rajan & Zingales (1995)* the coefficient in the market model undergoes a loss of 53.33% in magnitude. For the book leverage this amount a loss of 18%. Both lines outweigh the estimated effect of the same coefficient as the model is expanded with the traditional determinants, implying that traditional determinants in overall affect this variable negatively. Although this is normal in multiple regression analysis as the independent variables effect one another, a bigger surprise is the difference in effect of initial leverage on market leverage and book leverage when the event time is lengthened (i.e. calendar year observations are added). The coefficient of initial leverage in the market model and book model declines on average by 70% and 18% implying that initial leverage is more stable determinant of book leverage with an average within standard deviation of 0.01 in contrast to market model which has an average within standard deviation of 0.03. Interestingly when one continuously extend the third specification model for market leverage where all traditional determinates are considered with calendar year observations 1998 and further on, one find a loss in statistical sign for the coefficient of the variable Initial market leverage. In all other cases this variable is found to be highly significant.

The findings indicate that in order to solve the capital structure puzzle one should also look at time invariant factors. For certain time variant factors one not only find a different sign but also a different measure of strength, implying that there are certain differences among type of economies. Initial leverage being only a fraction of a bunch of time invariant firm specific factors indicate in this study that on average this variable contains equally or sometimes even more information about corporate leverage compared to the time variant factors. Further these results provide evidence that even time invariant factors have different effect over time and within different specifications. These results however do not indicate the economic importance of variables as these are combined. In other words existing determinants as a whole may have a different impact on capital structure in contrast to their individual impact. In the next paragraph these issues will be elaborated.

### 5.3. A variance decomposition model

In the aforementioned section the findings indicate that initial leverage is one of the firm's key specific time-invariant factor that has an important impact on capital structure decisions. One also argued that this is only a fraction of a set of firm specific variables a firm possesses. While this variable has an economic impact of its own, the

effect of this impact may change and take different direction when considered as whole. This statement is assumed to hold for the other variables as well, including year fixed effects, industry fixed effects, and when traditional determinants are combined. To measure the total variation that is attributable to different individual factors a variance decomposition method is applied (ANCOVA). The ANCOVA applied tests whether certain variables have an effect on the product variables after removing the variance for which quantitative regressor(s) account(s). For each type of leverage (i.e. book and market) in total seven different model specifications are made whereas the following estimation model is used:

$$Leverage_{it} = \alpha + \beta X_{t-1} + \eta_i + Ind_i + \varepsilon_{it}$$

The abbreviation $\eta$ represents firm fixed effects and *Ind* denotes industry fixed effects[22]. These variables measure firm and industry specific characteristics associated along individual firms. Since Initial leverage is now absorbed by firm fixed effects this variable is left out of the model. The definitions of all other variables in the model are the same as in the aforementioned estimation model. The results are presented in table 4. In section one estimations take the book leverage model into account and in section two the market leverage model. Column "a" through "g" corresponds to different model specifications for leverage. Each value in cells represents the fractions of model's (a-g) adjusted $R^2$ attributed to a particular variable in the same row after removing the variance for which quantitative predictors (covariates) account. To calculate this individual contribution one divides the partial-ss of the individual factor by the aggregate partial-ss of all factors in the model specification, leading to a total of one (100%) for each column.

The results provide interesting outcomes. When only firm fixed effects are considered one finds an adjusted *R* squared of 54%. In other words this implies that firm fixed effects alone explain 54% of the variability in capital structure. For the market leverage the findings indicate this to be 39% and is in line with the findings of figure 8. *Lemmon, Roberts & Zender (2008)* find this amount to be nearly equal (60% vs. 61%). In this study the results indicate that firm specific factors contribute more in explaining variability when book leverage is considered. A possible explanation for this finding may lay in the nature of the data (i.e. the amount of observation and thevariability of market and book leverage). In this study book leverage is found to be stable (i.e. the average standard deviation is 17%) in contrast to market leverage (i.e. the average standard deviation is 26%). In the original study the average variability for the book (market ) leverage amounts 21% (26%). In the book leverage estimation model (column b) year fixed effects as the single regressor captures zero variation.

[22] The original paper seems to have forgotten this variable in their model.

The variation captured by this time effect amount 3% in the market model. In line

**Table 4: Variance Decomposition/ individual contribution.** The sample consists of all non-financial firm-year observations in the Compustat database & DataStream database from 1989 to 2010. The ANCOVA test applied here tests whether certain variables have an effect on the product variables after removing the variance for which quantitative regressors account. In other words it corrects for cofounding variable effect. The first part of the table represents outcomes for book leverage whereas the second part contains results for market leverage. Each column (a-g) represents a variance decomposition for several different model specifications. At the bottom of each column the adjusted $R^2$ are presented. Each sell represents the variability explained by the variable given the row. In order to calculate this, the "partial ss" per variable is divided by the sum of all "partial ss" in the model (normalized). For e.g. in column c 97% of the variability measured by Adj.$R^2$ is attributable to Firm FE, and only 3% to Year FE. The abbreviation FE denotes fixed effects.

| | Book Leverage | | | | | | |
|---|---|---|---|---|---|---|---|
| Variable | a | b | c | d | e | f | g |
| Firm FE | 1.00 | . | 0.97 | . | 0.92 | . | 0.89 |
| Year FE | . | 1.00 | 0.03 | 0.07 | 0.02 | 0.12 | 0.03 |
| Log Of Assets | . | . | . | 0.03 | 0.02 | 0.06 | 0.01 |
| Growth Ratio | . | . | . | 0.11 | 0.01 | 0.14 | 0.01 |
| Profitability | . | . | . | 0.03 | 0.00 | 0.02 | 0.01 |
| Tangibility | . | . | . | 0.09 | 0.02 | 0.13 | 0.02 |
| Median Industry Leverage | . | . | . | . | . | 0.25 | 0.04 |
| Cash Flow Volatility | . | . | . | . | . | 0.00 | 0.01 |
| Dividend Payer | . | . | . | . | . | 0.08 | 0.01 |
| Industry FE | . | . | . | 0.68 | . | 0.20 | . |
| Adj.R2 | 0.54 | 0.00 | 0.55 | 0.28 | 0.61 | 0.38 | 0.68 |

| | Market Leverage | | | | | | |
|---|---|---|---|---|---|---|---|
| Variable | a | b | c | d | e | f | g |
| Firm FE | 1.00 | . | 0.94 | . | 0.86 | . | 0.83 |
| Year FE | . | 1.00 | 0.06 | 0.15 | 0.07 | 0.19 | 0.08 |
| Log Of Assets | . | . | . | 0.08 | 0.03 | 0.12 | 0.04 |
| Market to Book | . | . | . | 0.01 | 0.00 | 0.00 | 0.00 |
| Profitability | . | . | . | 0.12 | 0.02 | 0.07 | 0.01 |
| Tangibility | . | . | . | 0.05 | 0.01 | 0.05 | 0.00 |
| Median Industry Leverage | . | . | . | . | . | 0.18 | 0.03 |
| Cash Flow Volatility | . | . | . | . | . | 0.00 | 0.00 |
| Dividend Payer | . | . | . | . | . | 0.05 | 0.00 |
| Industry FE | . | . | . | 0.60 | . | 0.34 | . |
| Adj.R2 | 0.39 | 0.03 | 0.42 | 0.27 | 0.51 | 0.35 | 0.61 |

with the findings of *Lemmon, Roberts & Zender (2008)* when both variables (i.e. Firm FE & Year FE) are included in the model specification firm fixed effects remain dominant in capturing variation effect. Column d which is to the utmost extent inspired by the key specified determinants of *Rajan & Zingales (1995)* reveals that these variables are not equally effective in capturing variability effects. Interestingly as the combination of these factors are taken into account one finds that the variation explained among both model become nearly equal (i.e. 28% ad 27%). Also the same effect can be found in model f where the specification also includes the variables inspired by *Frank & Goya (2007)* (i.e. 38% and 35%). Surprisingly, even though the adjusted R squared is just on average 28%, industry fixed effects are accounting for most of the variability in model d. As these results are rather noticeable and tremendously differ from original paper, these are further examined. The examination of these variables reveal the following: in total this study contains 234 firms and 43 industries[23] leading to an average of 5 firms within one industry compared to an average estimation of 5.921 firms per industry in the original paper. This finding reveals that industry fixed effects may to a larger extent capture the same effect as firm fixed effects. In model f the results indicate the importance of variable median industry leverage (i.e. 25% vs. 18%). Large difference in adjusted R squared between this study and the original study (for e.g. in model d 28% and 18%) is assumed to have been caused due to the variability in the nature of this data. In both models specification g provide the most complete model, resulting in adjusted R squared of 68% for the book leverage and 61% for the market leverage.

In unreported results one even finds an explanation power of 70% (61%) for book leverage (market leverage). These findings hold for specification a, but when one uses dummy variables on a 5 years base for firms instead of just 1 year. When the same specification is used but then with decade dummies for firms one finds an explanation power of 63% (51%) for book leverage (market leverage). After many different trials the most complete model is found when one uses the specification g, but substitute the yearly firm fixed effects by dummy variables on a five years base. The adjusted R squared found amounts 79% for book leverage model and 72% for market leverage model.

Interestingly in overall the results provide similar findings as *Lemmon, Roberts & Zender (2008)* with some exceptions. Firm fixed effects is the most important component in explaining variability among capital structure. This effect even increases in magnitude when one uses dummy variables on a five years base for firms as a replacement for just one year. In line with the earlier graphical findings this component to more extent has a stronger tie with book leverage than market

[23] The original amount of industries are 127. By rounding these numbers to 50 and 100 a total of 43 industries are created.

leverage. In other words: as capital structures do differ cross-sectionally, overtime the book leverage is more stable than market leverage. The variation explained by the adjusted *R* squared above support this statement. Also the non-parametric decomposition of book and market leverage indicate that on average the between-firm variation for book leverage (market leverage) is 25.44% (21.61%) larger than within-firm variation. A higher difference in the composition of this equation is considered as a signal of stability. In other words the variation in leverage is owing to cross-sectional differences and to less extent due to the time-series variations meaning that time variant factors are still important but to a lesser extents. However the possibility exists that the findings regarding the traditional determinants are just due to the unrealistic time effect (1-year lagged variables). In the next section the response time of the managers are lengthened and tested for this possible cause.

### 5.4. The response time: short versus long

To test for the response time as this might be a cause of the earlier findings the following estimation model is formulated:

$$Leverage_{it} = \alpha + \Sigma_{s=1}^{n} \beta_S X_{t-1} + \gamma\, Leverage_{i0} + V_t + \varepsilon_{it}$$

The abbreviation *n* corresponds to the lag order of each independent variable *X*. The error term is assumed to be heteroskedastic and correlated within firms. The definitions for all other variables are held constant. The 1-year lag model measure the short-run impact of regressors on leverage and represent coefficients scaled by corresponding variable's standard deviation. In order to determine how many lags to use for the long-run model the "varsoc" commando is applied in Stata. The outcome of this model gives an indication for the optimal amount of lags according to three commonly used methods including Schwarz's Bayesian information criterion (SBIC), the Akaike's information criterion (AIC), and the Hannan and Quinn information criterion (HQIC). The outputs of all three procedures indicate the optimal amount of lag to be one. In other words this imply a way to choose the best statistical model for a particular situation is when one uses 1-year lags for the independent lag variables. Since this lag number is al already used for the short-run the number of lags is intuitively chosen. *Lemmon, Roberts & Zender (2008)* use for each of their independent variable eight lags. Since the sample in this study is from 1989 to 2010 compared to original authors who have a sample from 1965 to 2003, using the same amount of lags leads to possible loss of many observations. Owing to this statement it is decided to intuitively choose different lags. The procedure is then to do OLS regressions using the specified number of lags. The 2-year to 6-year lag models measure the long-run impact of regressors on leverage and represent the estimated sum of slope coefficients times the standard deviation of the corresponding variables. For the sum of the coefficient and their underlying t-statistics the lincom command is applied. The results are presented in table 5.

Although the idea behind this method for the short-run effect and the method applied for table 3 are similar some remarkable changes occur. To make comparison

**Table 5: Short and Long run effects on leverage.** The sample consists of all non-financial firm-year observations in the Compustat database & DataStream database from 1989 to 2010. The first part of the table represents summary measures for book leverage from panel OLS regression. The second part of the table represents summary measures for market leverage from panel OLS regression. The first column of each lag model (1-6) is regressed on a 1-year distributed lag variables, whereas the second column is regressed on 2-year to 6-year distributed lag variables (depending on the model). The coefficients are scaled by the standard deviation of the corresponding regressors. The italic and bold values represent the t-statistics which are robust to both clustering at the firm level and heteroscedasticity. Values of 2.58 or higher, representing t-statistics, are highly significant at the 1% level for a two-tailed test. Values above 1.96 are significant at the 5% level. Regarding interpretation a one standard deviation change in underlying key specified determinant is associated with the presented value for parameter estimate change in leverage. For the construction of the variables consult 4.2. Variable construction.

| | Book Leverage | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Model 1 (1LAGS) | | Model 2(2LAGS) | | Model 3 (3LAGS) | | Model 4 (4LAGS) | | Model 5(5LAGS) | | Model 6 (6LAGS) | |
| Variable | Short Run | Long Run | Short Run | Long Run | Short Run | Long Run | Short Run | Long Run | Short Run | Long Run | Short Run | Long Run |
| Initial leverage | 0.04 | . | 0.04 | . | 0.04 | . | 0.03 | . | 0.03 | . | 0.03 | . |
| | ***4.59*** | . | ***4.30*** | . | ***3.79*** | . | ***3.30*** | . | ***2.72*** | . | ***2.75*** | . |
| Log Of Assets | 0.01 | . | 0.07 | 0.01 | 0.09 | 0.01 | 0.09 | 0.01 | 0.07 | 0.01 | 0.06 | 0.00 |
| | ***1.75*** | . | ***1.97*** | ***1.50*** | ***2.24*** | ***1.23*** | ***2.24*** | ***0.79*** | ***1.76*** | ***0.51*** | ***1.33*** | ***0.31*** |
| Growth Ratio | 0.04 | . | 0.03 | 0.04 | 0.02 | 0.04 | 0.02 | 0.05 | 0.02 | 0.05 | 0.03 | 0.05 |
| | ***5.29*** | . | ***3.04*** | ***4.76*** | ***2.16*** | ***4.73*** | ***1.81*** | ***4.94*** | ***2.13*** | ***4.82*** | ***2.62*** | ***4.86*** |
| Profitability | -0.01 | . | 0.00 | -0.01 | 0.00 | -0.01 | 0.00 | -0.01 | 0.00 | -0.01 | 0.00 | -0.01 |
| | ***-1.61*** | . | ***-0.09*** | ***-1.56*** | ***0.22*** | ***-1.02*** | ***-0.10*** | ***-0.91*** | ***-0.21*** | ***-0.66*** | ***-0.38*** | ***-0.32*** |
| Tangibility | 0.03 | . | 0.05 | 0.03 | 0.05 | 0.03 | 0.04 | 0.03 | 0.04 | 0.03 | 0.05 | 0.03 |
| | ***3.39*** | . | ***3.48*** | ***3.11*** | ***3.31*** | ***2.87*** | ***2.66*** | ***2.67*** | ***2.42*** | ***2.25*** | ***2.66*** | ***2.32*** |
| Median Ind. Lev. | 0.07 | . | 0.06 | 0.07 | 0.05 | 0.06 | 0.05 | 0.06 | 0.05 | 0.06 | 0.06 | 0.06 |
| | ***8.78*** | ***.*** | ***6.75*** | ***7.52*** | ***5.98*** | ***6.57*** | ***5.40*** | ***5.69*** | ***5.14*** | ***5.12*** | ***5.44*** | ***4.24*** |
| Cash Flow Volatility | 0.00 | . | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | -0.01 | -0.02 | -0.01 | -0.03 |
| | ***0.76*** | ***.*** | ***1.06*** | ***0.11*** | ***0.89*** | ***0.33*** | ***-0.06*** | ***-0.39*** | ***-0.63*** | ***-1.02*** | ***-0.65*** | ***-1.97*** |
| Dividend Payer | -0.01 | . | -0.01 | -0.01 | -0.02 | -0.02 | -0.02 | -0.02 | -0.02 | -0.02 | -0.01 | -0.02 |
| | ***-2.11*** | . | ***-2.74*** | ***-1.78*** | ***-2.82*** | ***-1.63*** | ***-2.94*** | ***-1.55*** | ***-2.34*** | ***-1.67*** | ***-2.26*** | ***-1.36*** |
| Year Fixed Effects | Yes | . | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Adj.$R^2$ | 0.40 | | 0.41 | | 0.39 | | 0.38 | | 0.38 | | 0.40 | |
| Obs. | 1811 | | 1595 | | 1394 | | 1216 | | 1050 | | 901 | |

| | Market Leverage | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Model 1 (1LAGS) | | Model 2(2LAGS) | | Model 3 (3LAGS) | | Model 4 (4LAGS) | | Model 5(5LAGS) | | Model 6 (6LAGS) | |
| Variable | Short Run | Long Run | Short Run | Long Run | Short Run | Long Run | Short Run | Long Run | Short Run | Long Run | Short Run | Long Run |
| Initial leverage | 0.01 | . | 0.00 | . | 0.00 | . | -0.01 | . | 0.00 | . | 0.00 | . |
| | ***0.85*** | . | ***0.29*** | . | ***-0.18*** | . | ***-0.43*** | . | ***-0.28*** | . | ***-0.05*** | . |
| Log Of Assets | 0.03 | . | 0.10 | 0.03 | 0.10 | 0.03 | 0.12 | 0.02 | 0.11 | 0.01 | 0.09 | 0.01 |
| | ***2.43*** | . | ***2.14*** | ***2.15*** | ***2.03*** | ***1.86*** | ***2.25*** | ***1.35*** | ***2.41*** | ***0.94*** | ***1.89*** | ***0.70*** |
| Growth Ratio | 0.00 | . | 0.00 | 0.00 | -0.01 | 0.01 | 0.00 | 0.01 | 0.00 | 0.01 | 0.01 | 0.01 |
| | ***0.14*** | . | ***0.04*** | ***0.27*** | ***-0.36*** | ***0.45*** | ***-0.25*** | ***0.46*** | ***-0.18*** | ***0.69*** | ***0.38*** | ***0.86*** |
| Profitability | -0.04 | . | -0.02 | -0.06 | -0.02 | -0.08 | -0.03 | -0.09 | -0.05 | -0.11 | -0.04 | -0.10 |
| | ***-3.61*** | . | ***-1.91*** | ***-4.23*** | ***-1.66*** | ***-4.71*** | ***-2.04*** | ***-4.80*** | ***-3.02*** | ***-5.10*** | ***-2.34*** | ***-5.00*** |
| Tangibility | 0.02 | . | 0.02 | 0.02 | 0.01 | 0.02 | 0.01 | 0.02 | 0.01 | 0.02 | 0.02 | 0.02 |
| | ***1.72*** | . | ***1.16*** | ***1.42*** | ***0.36*** | ***1.37*** | ***0.40*** | ***1.00*** | ***0.44*** | ***0.93*** | ***0.72*** | ***0.94*** |
| Median Ind. Lev. | 0.09 | . | 0.05 | 0.09 | 0.04 | 0.09 | 0.04 | 0.09 | 0.04 | 0.08 | 0.04 | 0.09 |
| | ***8.86*** | ***.*** | ***4.96*** | ***8.45*** | ***3.84*** | ***7.17*** | ***3.85*** | ***6.76*** | ***3.34*** | ***5.58*** | ***3.24*** | ***5.02*** |
| Cash Flow Volatility | -0.01 | . | -0.02 | -0.02 | -0.02 | -0.03 | -0.02 | -0.05 | -0.02 | -0.07 | -0.03 | -0.08 |
| | ***-0.70*** | ***.*** | ***-1.24*** | ***-1.33*** | ***-1.24*** | ***-1.99*** | ***-1.64*** | ***-3.35*** | ***-1.61*** | ***-3.47*** | ***-1.87*** | ***-3.77*** |
| Dividend Payer | -0.02 | . | -0.02 | -0.02 | -0.01 | -0.02 | -0.02 | -0.02 | -0.01 | -0.02 | -0.01 | -0.02 |
| | ***-2.52*** | . | ***-2.21*** | ***-1.84*** | ***-1.99*** | ***-1.70*** | ***-2.29*** | ***-1.84*** | ***-1.39*** | ***-1.68*** | ***-1.58*** | ***-1.49*** |
| Year Fixed Effects | Yes | . | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Adj.$R^2$ | 0.30 | | 0.32 | | 0.32 | | 0.33 | | 0.33 | | 0.32 | |
| Obs. | 1606 | | 1430 | | 1261 | | 1110 | | 968 | | 839 | |

meaningful since one is interested in coefficient differences along the short-run versus long-run, the variables generated for the long and short run are first equalized regarding their amount of observations by Stata. This means that as one applies a regression model the amount of observation per variable is equal in both models (i.e. short versus long) and thus robust toward observation size. In other words one estimates a single regression model, but report coefficients according to short run and long run. Owing to this automatic procedure one will find only one value for amount of observation and one value for adjusted $R^2$ per lag model. Further, the marginal effect of the variables lagged more than the amount of lags for the long run is replaced by zero. This procedure is also automatically applied by Stata. The corrections made here are in line with the methods of original authors. As one move from the left side of the tables to the right side of the tables the amount of observation per model declines. This equalization process leads to an average loss of 50% (48%) in observations for book leverage model (market leverage model) when a 6-year lag model is considered.

Focusing on the short-run effects among different lag models for the book leverage one finds a rather stable effect for initial book leverage, growth ratio, tangibility, median industry leverage and dividend payer. Even with a decrease in amount of observations the coefficients of these variables remain stable and significant. Albeit not always highly significant the magnitude of the coefficient of log of assets is rising upwards as the amount of observations decline. For the market model the same findings regarding stability and significance can be drawn for the variables median industry leverage and profitability only, with some exceptions. For the variable median industry leverage findings regarding stability and significance holds from model two and on. The variable profitability losses its statistical sign in certain models. Albeit not always significant, also in these models as the amount of observations decline the effect of log of assets rises. Interestingly in model one the results indicate that 1% change in leverage is insignificantly and positively associated with one standard deviation change in determinant initial market leverage. As the amount of observations decreases the association between these variables becomes negative. The results regarding the determinants initial leverage confirm the earlier findings in figure 8. Then one saw that initial book leverage is more stable than initial market leverage. Tremendous changes in coefficients and loss of signs for determinants being significant in model one and not in other lag models is assumed to have been caused due to the loss of observations and the stability of the variables. In sum a comparison among the two tables indicates the following: extending the length of lags leads to loss in information, and shorten the length of lag leads to loss in variance.

Further analysis among short-run versus long-run effects reveal less new information. The coefficient estimation for initial leverage is omitted by Stata automatically. Since this variable is constant over time (time-invariant) and is serially correlated (autocorrelation)[24]. This means that the same marginal effect holds for the long-run as well. The coefficient of the variable median industry leverage is on average a bit greater for the long run in both models. The same effect can be found for the variable growth ratio in book model only. For the variable tangibility the opposite finding holds in the book model. The effect for the variable profitability is great and significant for the long-run in the market model. In general the results for both models represent a mix of outcomes and no clear patterns are recognizable. For some determinants even the slope changes.

In sum, the comparison analysis reveals no evidence for the response time of managers. Albeit not highly significant some of the traditional determinants account for even less variation in leverage as one lengthens the time span. This implies that even when response time is considered the traditional determinants lack in sufficiency to explain variability. Although one does find certain pattern for certain variables, these findings hold for certain models only and not for all. In this analysis one only find initial book leverage to play an important role in influencing capital structure decisions. For market leverage this effect is not similar. From this one has to conclude and confirm the findings of original authors that capital structure studies is more difficult than implied by previous research *(Lemmon, Roberts & Zender, 2008: 1593)*.

### 5.5. The effect of different model specification on coefficients

The pooled OLS regression models applied earlier assume that the regressors are exogenous and simply write the error term as $u_{it}$ rather than using a decomposition $a_i + \varepsilon_{it}$ *(Wooldridge, 2001)*. This implies that the model specification is possibly misspecified since a time invariant component of leverage ratio is ignored. As these omitted variables are likely to be correlated with traditional right hand side variables, drawing conclusions from such results may lead to incorrect conclusions. In this section one's interest is to see the difference in magnitude when a different model specification is applied. The most commonly used techniques for analysing panel data is fixed effects and random effects. To decide between these models a Hausman test is run. The null hypothesis assuming that the unique errors are not correlated

[24] One of the assumptions of OLS regression is that error terms need to be uncorrelated. This assumption is violated when serial correlation (autocorrelation) is present in the model. Although it does not bias the OLS coefficient estimations according to *Wooldridge (2001)*, the violation leads standard errors to be underestimated when serial correlation is positive resulting in t-statistics that are possibly overestimated.

with the regressors is rejected. To analyses the difference in magnitude first the same OLS model is applied whereas initial leverage is excluded now. The second model is a fixed effect estimation and holds the following equation:

$$Leverage_{it} = \alpha + \beta X_{t-1} + \eta_i + V_t + u_{it} \quad \text{where} \quad u_{it=p}\, u_{it-1} + \acute{\omega}_{it}$$

All other variables are representing the same definitions as earlier, with the following exceptions: $u$ is assumed to be stationary and $\acute{\omega}$ is assumed to be serially and cross-sectionally uncorrelated but possibly heteroskedastic *(Lemmon, Roberts & Zender 2008.1594)*. This model includes some benefits which are worth mentioning. In this study for e.g. each firm is assumed to own a certain individual characteristics that is likely to influence the predictor variables, meaning that the error term is not 100% idiosyncratic. Basically this implies that the way a Dutch firm does business may have impact on its stock price and thus its capital structure. This is the rationale behind the assumption of the correlation between company's error term and predictor variables. By applying this model one can assess the predictors' net effect and so remove the effect of those time-invariant characteristics from the predictor variables. In sum this indicate that since the firms specific unobserved variables does not change over time, then the change in the coefficient over time must be due to the influences others than these individual time-invariant characteristics. The results represented in table 6 show two different types of estimations. The coefficients in the second and the fourth columns are estimated using the same equation applied for table 3 where now initial leverage is ignored. The third and the fourth columns represent fixed effect estimations. The difference in magnitude between identical coefficients and different model specification is to be found in columns four and seven. In line with the original paper the results in the fixed effect model are robust to within firm serial correlation and heteroscedasticity. Serial correlation also known as autocorrelation is a violation of the assumption that the errors are uncorrelated and independent *(Wooldridge, 2001)*.

As one exchange from model the statistical significance of certain variables undergo either small changes or is lost. This implies that the statistical significance to a certain level depends on the model specification, although in this study. By applying the fixed effect transformation the between variation captured by existing determinants is removed. The coefficient of many variables as expected decline since their effects are absorbed or captured by these time- invariant factors. These results confirm the earlier findings in table 4. For the variable log of assets the opposite holds. A possible explanation for this may lie in the nature of this variable which is assumed to be subject to change or in other words log of assets possibly greatly change over time. In sum this means that the coefficient estimations according to pooled OLS is greatly lacking in purity since it does not consider these time-invariant factors.

### 5.6. The financing behaviour of Dutch non-financial managers

The empirical view in figures 5 to 7 provide certain amount of evidence for the work of Kraus & Litzenberg that goes back to 1973. The authors acknowledge in their paper that as firms consider capital restructuring, the optimal capital structure for a

**Table 6: Model sensitivity comparison.** The sample consists of all non-financial firm-year observations in the Compustat database & DataStream database from 1989 to 2010. The second and the fifth columns represent parameter estimates (not scaled) from pooled OLS regressions on book and market leverage on the underlying key specified determinants including log of assets, growth ratio, profitability, tangibility, median industry leverage, cash flow volatility, dividend, and year fixed effects. The third and the sixed columns represent parameter estimates (not scaled) from fixed effect regressions on book and market leverage on the underlying key specified determinants mentioned earlier. Firm FE model is robust to Hausman test. The standard errors for the pooled OLS regression are robust to heteroscedasticity and within firm equi-correlation. The standard errors for the firm fixed effects regression are robust to heteroscedasticity and within firm serial correlation. Columns four and seven represent changes in coefficient when a different model is considered. *AR(1)* is the estimated first order serial correlation coefficient. For the construction of the variables consult 4.2. variable construction.

| | Book Leverage | | | Market Leverage | | |
|---|---|---|---|---|---|---|
| Variable | Pooled OLS | Firm Fe | % Change | Pooled OLS | Firm Fe | % Change |
| Log Of Assets | 0.007 | 0.018 | 161% | 0.015 | 0.060 | 294% |
| | ***1.65*** | ***2.07*** | | ***2.51*** | ***4.40*** | |
| Growth Ratio | 0.208 | 0.011 | -95% | 0.001 | -0.007 | -631% |
| | ***3.79*** | ***0.30*** | | ***0.02*** | ***-1.01*** | |
| Profitability | -0.084 | 0.013 | -115% | -0.294 | 0.038 | -113% |
| | ***-1.67*** | ***0.38*** | | ***-3.68*** | ***0.76*** | |
| Tangibility | 0.167 | 0.134 | -20% | 0.115 | 0.084 | -27% |
| | ***3.47*** | ***3.27*** | | ***1.74*** | ***1.32*** | |
| Median industry leverage | 0.660 | 0.171 | -74% | 0.713 | 0.149 | -79% |
| | ***11.15*** | ***4.17*** | | ***8.92*** | ***2.37*** | |
| Cash flow Volatility | 0.063 | 0.016 | -74% | -0.102 | 0.002 | -102% |
| | ***0.83*** | ***0.32*** | | ***-0.66*** | ***0.03*** | |
| Dividend Payer | -0.038 | -0.017 | -56% | -0.045 | -0.005 | -89% |
| | ***-2.71*** | ***-2.47*** | | ***-2.62*** | ***-0.49*** | |
| Year Fixed Effects | | | | | | |
| Adj.R2 | 0.36 | | | 0.30 | | |
| AR(1) | | 0.47 | | | 0.49 | |
| Obs. | 1811 | | | 1606 | | |

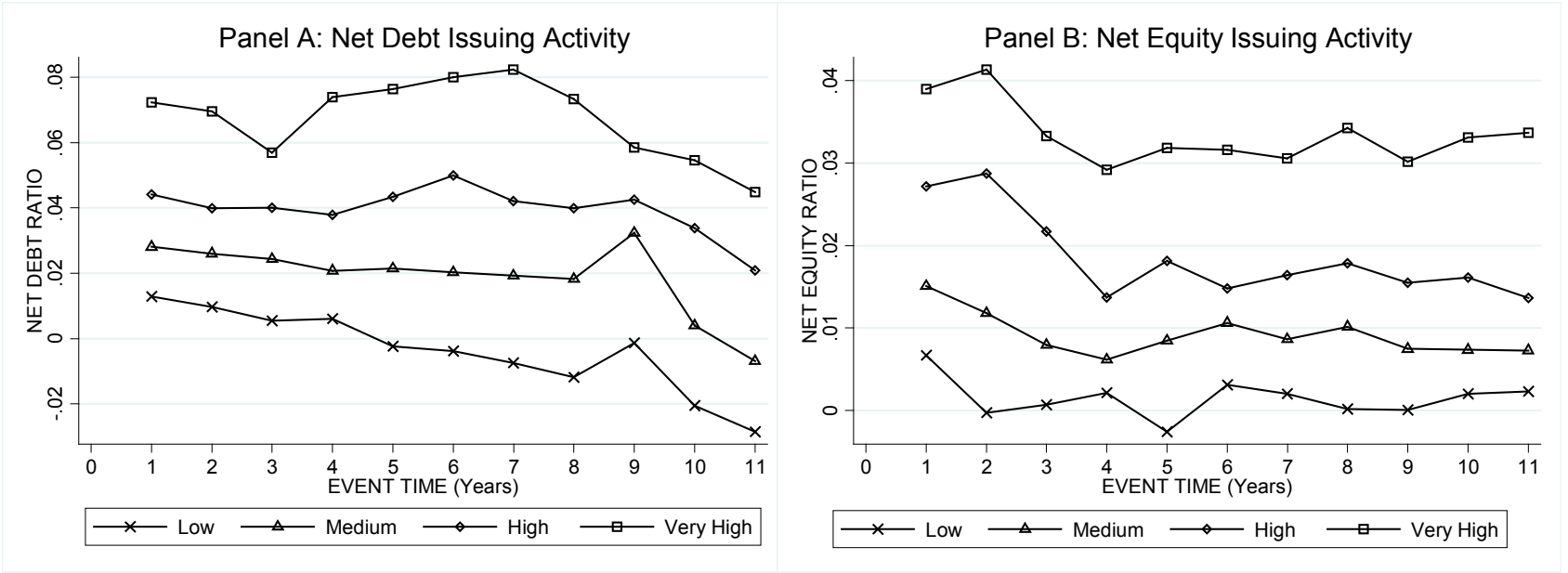
firm is when there is a balance between the costs of bankruptcy and the benefits of tax saving. Followed by many survey studies, CFOs admitted to actively manage their capital structure toward certain desired ratios. As the results of all earlier figures converge over time, this may imply that Dutch non-financial firms are also more likely to manage their capital structure in the direction of certain looked-for leverage ratio. To see whether this hypothetical view holds in real world the financing behaviour of Dutch non-financial firms are analysed next.

The procedure applied for this analysis is as follow. In order to form portfolios book leverage is regressed on log of assets, profitability, growth ratio and tangibility 1-year lagged variables whereas industries are also included. Per year from the outcomes of a cross-sectional regression the actual leverage are tracked. Based on the residuals for each calendar year four portfolios are formed, starting with 1990. As these portfolios composition are kept constant for the next 11 years the average net issuing activities are calculated. The same process of sorting and averaging is applied for all other years until 2000, followed by averaging these sets across event time. The results of net debt issuing activities are presented in figure 9 panel A. For net equity issuing activities consult Panel B same figure.

Focusing on the net debt issuing activities of non-financial Dutch firms, the results indicate a downward trend toward the end. The average cross sectional standard deviation amounts 0.02 when the portfolios are formed, 11 years later this value amounts 0.03. Further the lines do not cross each other over the event time. For the net equity issuing activities one finds a rather stable pattern as well. In overall the analysis regarding financing behaviour of Dutch non-financial firms indicates that convergence patterns found are not due to active capital structure management, which possibly requires long-run thinking[25]. Therefore these results are not in line with the findings of original authors. However they do seem to support the remarks made by *De Bie & De Haan (2007)*. These authors, who made a distinction between two different financial systems, argue that in bank-based systems when there is a need for external financing bank loans are favoured over issuance of securities. It is in general known that decisions regarding taking bank loans are usually made much faster and in rather short time compared to issuance of securities. Also the time required for the preparation is more likely to be much shorter. This implies that firms active in bank oriented financial systems can be characterized as short-run thinkers. Thus the results found here are in line with this characteristic.

[25] Think for e.g. of an IPO process which requires 2 to 3 years of preparation.

**Figure 9: Dutch way of financing in event time according to unexpected leverage portfolios.** The sample consists of all non-financial firm-year observations in the Compustat database & DataStream database from 1989 to 2010. Panel A and B represent the net debt issuing activity and net equity issuing activity. Each panel consists of four lines representing the average unexpected book leverage of four portfolios including low, medium, high & very high across event time. The process is as follow: first, for the independent variables log of assets, profitability, growth ratio and tangibility 1-year lagged variables are created followed by estimating cross-sectional regression for each calendar year whereas industries are also included. Per year from the outcomes of a cross-sectional regression the actual leverage are tracked leading to a certain amount that is unexplained, which is termed "unexpected Leverage". In other words unexpected leverage is residuals from cross-sectional regression on the variable named earlier. Year 1990 is the portfolio formation period. In 1990 firms are ranked according to their unexpected leverage and are divided into four portfolios. As these portfolio compositions are kept constant across the event time, the average net debt ratio and net equity ratio are calculated for these portfolios. The same procedure is applied for the years 1991 till 1999, leading to a total of 10 portfolio reformation sets. Finally for every event year the average net debt ratio and net equity ratio of portfolios is calculated. Variable definitions are to be found in subsection 4.2. Variable construction.



Interestingly when one takes a closer look at the patterns of the lines in both issuing activities the results indicate certain evidence for the timing of the decisions which are consistent with the dynamic version of market timing hypothesis. In general during certain events one finds that firms rather follow same patterns, indicating that dependent on the market circumstances Dutch non-financial firms decide to adjust their issuance behaviour. A possible explanation for this finding may lie in the way firms are related to one another. Earlier one argued that firms active in bank-based systems are more likely to have close borrowers-lenders ties. This possibly indicates that parties are more likely to receive similar information and by this may adjust their issuing activities.

## 6. Conclusion & Discussion

One of the topics in corporate finance studies which has received a lot of attention in the former five decades is that of corporate capital structure. Why do firms choose between certain capital structure ratios and why firms have different capital structures even when they are similar in all other aspects are just a fraction of many questions reported by scholars in the former five decades.

In the first place the aim of this thesis has been to find out what theories are out there dealing with capital structure and how these are developed (i.e. their origins) and related to one and another. This objective is fulfilled by an in-depth analysis of historical literature which has resulted in a comprehensive discussion of the theories of capital structure. One find that different theories including trade-off theory, agency theory, signaling theory, pecking order theory and market timing theory are out there which are developed by assuming a perfect market and continuously adding real market imperfections. Albeit not all, but many of these theories are discussed in every corporate finance book. The simplification process applied in these books has resulted in loss of many details associated with these theories leading to misperceptions. The discussions of the theories in this study can serve as a supplement to this weakness while at the same time keeping it easy and understandable for readers.

A general study of the empirical findings out there dealing with capital structure shows that scholars' views contradict under corporate capital structure studies and there is no such thing as a definite answer. Determinants making part of the theories discussed earlier show different outcomes under different market circumstances including the extreme ones such as financing decisions are possibly random. One also finds that many of the papers regarding capital structure puzzle

published deals with US and UK countries. To this end an interesting discovery is made, namely the paper of *Lemmon, Roberts & Zender (2008).* The research performed by *Lemmon, Roberts & Zender (2008)* also focuses on US firms and as their outcomes are of great meaning in future research into the determinants of capital structure it was decided to use and apply their findings. One of the main motivations and also at the same time the second aim of this study was to find out whether the same findings are applicable under different circumstances. In a study conducted by *De Bie & De Haan (2007)* the results provide evidence for certain differences among US and Dutch financial systems. The authors acknowledge that US system is a case of highly market-oriented financial system in contrast to the Dutch system which is more bank-oriented. Given these empirical findings it was decided to choose Dutch non-financial firms and to find out whether the outcomes found for US companies active in market oriented financial system also hold for companies under a bank-oriented financial system. Based on these findings the following research question was formulated:

** *What patterns are recognizable in the corporate capital structure of Dutch non-financial firms across time being active in a bank-oriented financial system and what are the main drivers of these patterns?* **

The outcomes not only provide a certain level of robustness but it has also resulted in certain new discoveries according to one's knowledge. The leverage of Dutch non-financial firms over event time shows two interesting trends. First the results show that portfolios converge over time. Independent of the type of leverage (i.e. market or book leverage) these portfolios remain also persistent. Firms remarked as being highly levered remain highly levered, and firms remarked as being lowly levered shows the same behaviour after 11 event times. To be sure that these findings are not biased the results were exposed to different robustness checks. All results indicate similar findings, namely convergent and persistent patterns.

To quantify these findings the results were further tested with initial leverage, a time-invariant variable, playing a tremendous role. The results show some difference regarding the importance of this variable and the model considered. For book leverage initial leverage is found to be the single most determinant even when the equation is extended with traditional determinants (time-variant variables). For the market model the results show this variable to be not equally important. As the model was extended with the traditional determinants, a loss in magnitude for this variable was found. A further examination of the magnitude of initial leverage coefficient across event time and according to different specifications show that this

variable plays a more stable role in the book leverage model in contrast to the market leverage model. This result shows that even time invariant factors can have different effect over time and within different specifications. In overall the results of traditional determinants show low marginal effects with some exceptions. For certain time- variant variables including growth ratio and dividend payer one found not only a different sign but also a different measure of strength. This implies that depending on the type of financial system certain variable either have a different direction (i.e. +/-) or a different effect (i.e. stronger/ weaker).

To measure the total variation that is attributable to different individual factors (i.e. regressors) a variance decomposition method is applied (ANCOVA). The results of the variance decomposition model—which defines the variability explained (Adj.$R^2$) per certain regressor— indicate that firm fixed effects explain on average to a greater extent the variability in the book model (54%) than market model (39%). *Lemmon, Roberts & Zender (2008)* find this to be nearly equal (60% vs. 61%). The results found in this study indicate that firm specific factors contribute more in explaining variability when book leverage is considered. A possible explanation for this finding is assumed to lay in the nature of the data (i.e. the amount of observation and the variability of market and book leverage). Further when firm fixed effects are incorporated into a model which already contained certain traditional determinants, the variability explained by these variables decline as these are absorbed by firm fixed effects. One also finds that firm dummies on a five year base result in an even higher explanation power. This can be seen as a new challenge to understanding how Dutch non-financial firms choose their capital structure.

To check whether the low explanation power of the traditional determinants are not due to the unrealistic time effect (i.e. 1-year lag), the results were exposed to different lag models. In overall lengthen the time span leads to loss in significance level and magnitude of the coefficient of initial market leverage, providing evidence for market leverage to be highly volatile and hence supporting the earlier findings. Owing to lack of clear recognizable patterns regarding short versus long run effects it is concluded that even when response time is considered the traditional determinants shortage in sufficiency to explain variability. Further the results of a comparison between pooled OLS regression and firm fixed effect regression indicate that the coefficient estimations according to pooled OLS is greatly lacking in purity since it does not consider time-invariant factors.

Although an attempt to find a certain explanation that possibly leads to convergence did not provide a clear image, one did find certain non-parametric

evidence for the timing of the decisions which are consistent with the dynamic version of market timing hypothesis. In overall the analysis regarding financing behaviour of Dutch non-financial firms indicate that convergence patterns found are not due to active capital structure management, which possibly requires long-run thinking. One argued that since bank-oriented financial system can be characterized as short-run thinker this finding is more likely to be in line with the short Dutch way of financing.

In overall the results are of great meaning in future research into the determinants of capital structure. Since most of the variability are explained by time-invariant firm specific factors future research need to focus on this aspect. According to *Babbie (2009)* a case study is a good research method when little is known about. Case study methods involve an in-depth, longitudinal examination of a single instance or event. Thus to define such firms specific factors that is proven to explain more variability in capital structure it is easier to observe these with rich, multifaceted data in a single firm than in a more reduced form or larger sample study. Unfortunately given the time restriction and the techniques required one has not succeeded to identify these variables, implying that henceforth studies may focus on this.

## 7. References


- Altman, E.I., 1984, A Further Empirical Investigation of the Bankruptcy Cost Question, The Journal of Finance, 39, pp.1067-108.
- Babbie, E.R., 2009, The practice of social research. 12th ed. Philadelphia: Wadsworth Publishing.
- Baker, M., & Wurgler, J., 2002, Market timing and capital structure, The Journal of Finance, 57, pp.1-32.
- Bates, T.W., Kahle, K.M., & Stulz R.M., 2008, Why do U.S. firms hold so much more cash than they used to?, working paper, pp.1-50.
- Bris, A., Welch, I., & Zhu, n., 2006, The Costs of Bankruptcy: Chapter 7 Liquidation versus Chapter 11 Reorganization, The Journal of Finance, 3, pp.1253-1302.
- Bruin, J. 2006. newtest: command to compute new test. UCLA: Academic Technology Services, Statistical Consulting Group.
- Cameron, C., & Trivedi, P.K., 2009, micro econometrics using stata, Stata Press.
- Cools, K., & R. Spee, 1990, De vermogensstructuur van Nederlandse beursondernemingen, Maandblad voor Accountancy en Bedrijfseconomie, pp.409-428.
- De Bie, T., & De Haan, L., 2007, Market Timing and Capital Structure: Evidence for Dutch Firms: De Economist, 155, pp.183-206.
- De Jong, A., & Van Dijk, R., 2007, 'Determinants of Leverage and Agency Problems: A Regression Approach with Survey Data', The European Journal of Finance, 13, pp.565-593.
- Hillier, D., Ross, S., Westerfield, R., Jaffe, J., & Jordan, B., 2010, Corporate finance, First European edition.
- Jensen C.M., & Meckling, H.W., 1976, Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure, Journal of Financial Economics, 3, pp.305-360.
- Jensen, M. ,1986, Agency costs of free cash-flow, corporate finance and takeovers, American Economic Review, 76, pp.323–329.

- Kraus, A. & Litzenberg, R., 1973, A state-preference model of optimal financial leverage, The Journal of Finance, 28, pp.991–922.
- Lemmon, L.M., Roberts, R.M., & Zender, F.J., 2008, Back to the Beginning: Persistence and the Cross-Section of Corporate Capital Structure., The Journal of Finance, 63, pp.1575-1608.
- Modigliani, F., & Miller, H.M., 1958, The cost of capital, corporation finance, and the theory of investment, American Economic Review, 48, pp.261-279.
- Modigliani, F., & Miller, H.M., 1963, Corporate income taxes and the cost of capital: A correction, American Economic Review, 53, pp.433-443.
- Murray Z.F., & Vidhan, K.G., 2007, Capital Structure Decisions: Which Factors are Reliably Important?, working paper, pp.1-59.
- Myers, S., & Majluf, N.,1984, Corporate financing and investments decisions when firms have information that investors do not have, Journal of Financial Economics, 13, pp.187–222.
- Myers, S.,1984, The capital structure puzzle, Journal of Finance, 39, pp.575–592.
- Paulo J. Maçãs and Serrasqueiro, Zélia M. ,2007, 'Capital Structure of Portuguese Service Industries: A Panel Data Analysis', The Service Industries Journal, 27,pp. 549 – 562.
- Petersen, M. A., 2009, Estimating Standard Errors in Finance Panel Data Sets: Comparing Approaches, The Review of Financial Studies, 22 ,pp.435-480.
- Rajan, R. G., & Zingales L., 1995, What Do We Know about Capital Structure? Some Evidence from International Data, The Journal of Finance, 50, pp.1421-1460.
- Ross, S.,1977, The determination of financial structure: the incentive-signaling approach, Bell Journal of Economics, 8, pp.23–40.
- Spence, A.M., 1973, Job Market Signaling, Quarterly Journal of Economics, The MIT Press 87, pp.355–374.
- Weiss A.L., 1990, Direct costs and violation of priority of claims, Journal of financial economics, 27, pp.285-314.
- White, J.M., 1983, Bankruptcy Costs and the New Bankruptcy Code, The Journal of Finance, 38, pp.477-488.
- Wooldridge, J.M., 2001, Econometric Analysis of Cross Section and Panel Data, The MIT Press, Cambridge, Massachusetts, pp.1-753.


# 8. Appendix

**Table 1: Variance decomposition.** The table presents a variance decomposition for several different model specifications, with adjusted *R*-squares at the bottom. First, the partial sum of squares for each effect in the model is computed and then normalizes each estimate by the sum across the effects, forcing each column to sum to one *(P.1589)*.

Book leverage

| Variable | (a) | (b) | (c) | (d) | (e) | (f) | (g) |
|---|---|---|---|---|---|---|---|
| Firm FE | 1.00 | . | 0.98 | . | 0.95 | . | 0.92 |
| Year FE | . | 1.00 | 0.02 | 0.11 | 0.01 | 0.05 | 0.01 |
| Log(Sales) | . | . | . | 0.04 | 0.01 | 0.07 | 0.02 |
| Marke-to-book | . | . | . | 0.09 | 0.00 | 0.03 | 0.00 |
| Profitability | . | . | . | 0.11 | 0.01 | 0.06 | 0.01 |
| Tangibility | . | . | . | 0.27 | 0.01 | 0.08 | 0.01 |
| Indust med lev | . | | . | . | . | 0.46 | 0.02 |
| Cash flow vol | . | . | . | . | . | 0.00 | 0.00 |
| Dividend payer | . | . | . | . | . | 0.16 | 0.01 |
| Industry FE | . | . | . | 0.38 | . | 0.09 | . |
| Adj. $R^2$ | 0.60 | 0.01 | 0.61 | 0.18 | 0.63 | 0.29 | 0.65 |

## 8.1. Important assumptions

The literature defines many different views on how to check and correct data in order to be able to apply certain regression and to make correct estimations. This is usually rather confusing as these actions are either too vague or too difficult to execute for students who first encounter with this problem. The steps taken in this section may therefore be useful tool for future students as it is kept rather simple by applying only techniques which are used quite often. Depending on the statistical method applied the assumptions do differ, but in general there are certain assumptions which may hold in different circumstances.

*Peterson (2009: 435)* acknowledge that although the use of panel data sets are common in finance studies, the ways that researchers have addressed possible biases in the standard errors varies widely and in many cases is incorrect. His results provide evidence for 42% of the recently papers published in the field of finance who have violated the assumption required for OLS and so have provided incorrect t-statistics for standard errors. In order to confirm that the results are not misleading, in this section the steps taken for meeting certain assumptions are described. This section will explore in particular the assumptions required for OLS as this is of great importance regarding statistical method applied in this paper, but some of these assumptions may also apply to other statistical method used. Firstly, although not a really assumption for OLS the data is checked for unusual an influential points. To check for this first a scatterplot is made for every independent variable against the dependent variable. From these scatterplots it is possible to detect unusual an influential data. Unusual data is defined as outliers and influential points. As an extra check the observations are also exposed to lvr2plots. This commando provides a graph of leverage (deviation of independent variable from its mean) versus squared residual and is quick way for spotting influential observations and outliers that are of great concerns.

Secondly, the data is checked for multicollinearity, which implies that two variable in a model are near perfect linear combination of one another. In other words this means that the model contains variables that measure identical items. When the data is not checked for this assumption and the model contains multicolliear variables, the coefficients estimations become unstable while their standard errors get wildly inflated. In order to get stable coefficient and no wildly inflated standard errors it is important to check for this. To detect for multicollinearity after each regression a variance inflation factor (VIF) method is applied. As a rule of thumb a VIF of ten or higher between two variables implies that the two variables can be considered as linear combination of one another (this rule of thumb is acceptable in finance studies).

Thirdly, in order to apply a linear regression the data is checked for the assumption of linearity which assumes a certain amount of linearity in relationship between the dependent and the independent variables. Linear regression that tries to make a best

fit line to the data provide biased coefficient estimation when in reality the data does not follow a straight line. Since this study considers a multiple regression it is not possible to just follow the straightforward method applied to simple regressions which is making scatter plots of independent variable against the dependent variable. To check for the assumption, the most straightforward technique is applied here, which is plotting standardized residuals against each regressor in the model. A linear relationship is assumed when no clear linear patterns are found in these scatterplots. In overall these plots provide reasonable evidence of linearity, except for the variable market to book ratio in the market model. As a robustness check the independent and the standardized residuals are exposed to a second linearity check commando, namely acprplots. An acprplot graphs an augmented component-plus-residual plot also known as augmented partial residual plot and it can be used to identify nonlinearities in the data. Also according to this command market to book ratio is not linearly related to market leverage. Based on these findings a different measure for growth is defined, namely intangible assets ratio (growth ratio). According to *Bates, Kahle, and Stulz (2008)* intangible assets a proxy for growth opportunities refer to assets that are expected to pay off in the future, such as brand names, goodwill or research and development expenses.

Finally, the data is checked for the normality assumption of the residuals. Although the normality assumption of residuals provide one only the confident to believe that the p-values for the t-tests and F-test are valid, it is not necessary to attain unbiased estimations of the regression coefficients *(Wooldridge, 2001)*. This aspect is also known as the homogeneity of variance of the residuals. Contrary heteroscedasticity occurs when the variance of the residuals are not constant. Although heteroscedasticity does not lead to biased coefficient estimates, it does affect the variance of the coefficient in a biased way leading to biased inferences (i.e. rejecting or accepting null hypothesis when not correct). In order to check for this a graphical and a non-graphical method is applied. For the graphical method the residuals versus fitted values, also known as rvfplot, is applied. The funnelling shape in patterns of observations provides indication of heteroscedasticity for both models. As it is common in practice to combine graphical views with non-graphical test to make correct judgments the residuals were exposed to Breusch-Pagan / Cook-Weisberg test for heteroscedasticity. The null hypothesis the variance of the residuals being homogenous is rejected when the P-value is small[26].

[26] The methods applied to data to check for assumptions required for OLS are from *Bruin, J. (2006)*.

# A
# Start Has been Made
# But
# The Journey Will Continue