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The Effect of Recessions on the Capital Structure and Leverage Determinants

Evidence from European Data

Master Thesis

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Defense Date : 20-12-2012

Abstract

It has been investigated in this study if and how the firms' capital structure is affected by recession periods as the two main theoretical capital structure frameworks, the static trade-off and pecking order theory, have different predictions on this matter. By investigating a sample, consisting of data of 4,451 firms from the six largest economies of the European Union, over the timeframe 1993-2011, it has been found that both book and market leverage are significantly negatively affected during crises, indicating that firms start to deleverage as a results of a recession. On the country level, the effects on leverage are heterogeneous, as leverage ratios in Spain and, to a lesser extent, Italy, continued to increase after the start of a recession. With respect to the leverage determinants, it has been found that the effects of size and profitability on leverage are negatively affected in times of recessions. The relations of all other included leverage determinants with leverage remain unaffected during crises periods. The last conclusion that can be drawn based upon this study is that the stylized leverage determinants found by Rajan & Zingales and Lemmon, Roberts & Zender hold their statistical importance when predicting leverage ratios, both at the European sample as across the individual countries.

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Introduction

Understanding the firms' capital structure decision is at the heart of the capital structure puzzle and has been a fundamental issue within financial economics ever since the first contributions of Modigliani & Miller (1958) on this issue.[1] In the decades following their study, many theories have been developed to identify and understand the underlying economic forces behind this puzzle. As a result, theories of capital structure are among the most elegant and sophisticated in the field of finance.[2] Despite this sophistication, there is still a great deal of ambiguity and the practical applications of the developed theories are less than fully satisfactory. The two most important theoretical frameworks on the capital structure decision, the static trade-off and pecking-order theory, sometimes provide different predictions on how several variables should be related to leverage or on how leverage ratios are expected to behave under different market circumstances. These inconsistencies in explaining leverage for both theories have led to an ongoing debate on which theory is best at predicting a firms' capital structure.

An interesting and highly up-to-date issue on which both theories provide differing predictions is on if and how leverage ratios should be affected by economic recessions. The static trade-off theory, which determines the optimal capital structure by trading-off the benefits and costs of debt, predicts leverage ratios to go down as taxable income and the need for a disciplinary role of debt are lower in times of recessions, while the bankruptcy costs are expected to be considerably higher. The pecking-order theory, on the other hand, states that firms' leverage ratios might not be affected, as, according to the theory, leverage ratios will never be adjusted to certain 'optimal' levels because of changing circumstances. Firms' capital structures only change when positive net present value investment opportunities pass by. In this case, the investment opportunity will be financed first with internal funds, then with debt and as a last resort, with equity, because of information asymmetry considerations. As internal funds or retained earnings are lower during recessions and the issuance of equity becomes even more unfavorable due to the drop in share prices which generally coincides with recessions, it could be expected that leverage ratio actually increase during recessions. Debt suddenly seems to be an important way of attracting money to finance investment opportunities or to be able to continue doing regular business during recessions. To be able to reach a conclusion on which of these two theoretical mechanisms is right on this matter, it will be investigated in this study if and how leverage is affected by economic recessions.

[1] Modigliani, F. & Miller, M.H. (1958). 'The Costs of Capital, Corporation Finance and the Theory of Investment', *The American Economic Review, 48 (3)*, 261-275

[2] Ross et al. (2010). 'Corporate Finance', 9th Ed., McGraw-Hill Book Co., New York, p.544

Next to adding an extra dimension to the capital structure puzzle by investigating the effect of economic recession periods on leverage, another purpose of this study is to investigate how the relations of the stylized leverage determinants, pointed out in the studies of Rajan & Zingales and Lemmon, Roberts & Zender, with leverage are affected in times of crises. According to Frank & Goyal, expected bankruptcy costs are expected to increase during economic downturns because of the higher chances of bankruptcy and larger expected losses in case of failure. Also, agency costs of debt are expected to go up as managers' and shareholders' wealth is reduced.[3] As a consequence of these increasing costs and risks for lenders, it could be expected that the providers of debt are more cautious when lending money and therefore attach more value to financial measures that provide information about the financial healthiness of the firm. These expectations are partially confirmed by Geanakoploss, as he found that many businesses were willing to pay higher bank interest rates during the 2008 crisis, but they could not get the loans because they did not have enough collateral to put down to convince banks their loan would be safe.[4] Also, Kwan found that banks tightened their lending terms and standards to unprecedented levels and that discounts on large loans were reduced and risk premiums on more risky loans were raised.[5] Considering these changing market circumstances and different requirements of banks and bondholders during economic downturns, it seems very plausible to expect that the sensitivities and thereby the impact of the existing leverage determinants on leverage will be different during crises.

By investigating a sample of 4,451 firms from the six largest economies of the European Union between the years 1993 and 2011, the effects of crises on leverage and its determinants will be studied. Next to the fact that using a European sample enables us to look at differences across countries, it also adds an extra dimension to this study as it enables us to check whether the main findings and conclusions from earlier studies, which have mostly been done on U.S. samples, also hold for European countries under different circumstances. This empirical study hereby responds to the call of Frank & Goyal and Lemmon et al. to make 'structural estimations on leverage ratios and its leverage determinants'[6] or to 'examine the changes over time'[7], to get a better understanding of how capital structures and their determinants behave.

As a result of the empirical tests performed at this study it has been found that, although leverage ratios tend to rise considerably in the years prior to a recession, a period of deleveraging is initiated

[3] Frank, M.Z. & Goyal, V.K. (2007). 'Capital Structure Decisions: Which Factors Are Reliably Important?' p.11
[4] Geanakoplos, J. (2010). 'Solving the Present Crisis and Managing the Leverage Cycle', *FRBNY Economic Policy Review*, p.101
[5] Kwan, S.H. (2010). 'Financial Crisis and Bank Lending', Federeal Reserve Bank of San Francisco, p.3
[6] Lemmon, M.L., Roberts, M.R., Zender, J.F. (2008) 'Back to the Beginning: Persistence and the Cross-Section of Corporate Capital Structure', *The Journal of Finance, 63 (4),* p. 1605
[7] Frank, M.Z. & Goyal, V.K. (2007). 'Capital Structure Decisions: Which Factors Are Reliably Important?', p.2

about one year after the start of both recessions resulting from the dot-com and the financial crisis, pointing at the static trade-off theory as the theoretical framework that is right on this matter. The high debt levels that have been built up prior to the recessions actually become a burden to the firm by the time an economy is actually in a recession, as they require high obligatory debt payments, making leveraged firms highly vulnerable to changes in the state of the economy and interest rates. As income falls during recessions, the indebtedness to firms' income increases sharply, raising concerns regarding corporate debt sustainability and creditworthiness, which consequently raises bankruptcy risks and costs. The increase in bankruptcy costs, in combination with tightening lending terms of the suppliers of debt, substantially increases the costs of debt, while the beneficial effects of leverage, like the tax shield and the disciplinary effects of debt seem to decrease. As the debt trade-off becomes more unfavorable in times of recessions, the optimal leverage ratio decreases, forcing firms to deleverage.

When concluding on how the relationships of the stylized leverage determinants with leverage are affected during recession periods, it can be stated that both the effects of size and profitability on leverage are negatively affected by recessions or negative GDP-growth rates. For the four remaining leverage determinants, no statistically significant interaction coefficients have been found, indicating that their relation with leverage is not significantly affected by crises. At the country level, the results on the effects of recessions on the relations of the stylized leverage determinants with leverage are highly heterogeneous. A better understanding of each country's institutional differences would be needed to understand and interpret these differing results. The last conclusion that can be drawn based upon this study is that the stylized leverage determinants found by Rajan & Zingales and Lemmon, Roberts & Zender hold their statistical importance when predicting leverage ratios, both at the European sample as across the individual countries.

The remainder of study is structured as follows. The first section will provide a general introduction into the 'capital structure puzzle'. Both the development and the reasoning of the two main theoretical frameworks on this matter will be discussed here, followed by a recap of the most important studies on the determinants of leverage. At section 2, a short introduction of the two crises that took place within the timeframe used for this study will be given. Also, the hypotheses will be developed here. After this, the data and summary statistics will be discussed at section 3, while the actual empirical research and the implications of the findings will be discussed at section 4. Section 5 concludes and highlights some interesting issues for future research.

Section 1: An introduction into the concept of Capital Structure

One of the most fundamental questions within the research stream of financial economics is how firms choose their capital structures. A firms' capital structure generally refers to the mix of a company's debt and equity and indicates how a firm finances its overall operations. Debt financing can come in the form of bond issues or bank loans, while equity mainly consists out of common stock or preferred stock. Both forms of capital are similar in the way that they enable firms to finance their investment projects. The difference between debt and equity however stems at first from their difference in payment seniority, which means that in the event of bankruptcy, debt generally should be paid back first before stockholders receive any payments. Besides, interest payments on debt are obligatory while dividend payments on equity are mostly done on a 'voluntary' base. How much debt a firm holds is generally depicted in its *leverage ratio*. This ratio maps the level of debt relative to the level of equity or the firms' total assets.

Which capital structure or leverage ratio generates the highest firm value and thereby benefits stockholders the most has been a question at the heart of the capital structure puzzle ever since the first studies on capital structure were performed. As a consequence, many factors and circumstances have been studied last decades to understand how they affect the optimal capital structure. This has finally resulted in two widely accepted, but sometimes opposing, theories on the firms' capital structure. As this chapter serves as an introduction into the 'capital structure puzzle', the development and reasoning of both streams will be described hereafter.

1.1 Static Trade-Off Theory

The first out of the two most prominent theories on the capital structure decision is the *static trade-off* theory. Following this theory, a firms' optimal capital structure and thereby the optimal value of the firm is determined by a trade-off between the costs and benefits of debt. Modigliani & Miller are generally seen as the founding fathers of this theory as they introduced the tax-bankruptcy trade-off perspective where firms balance the tax benefits of debt against the deadweight costs of bankruptcy. In the decades following their study, several additional costs and benefits of leverage have been obtained and added to the theory, leaving us with an extensive trade-off framework to determine the optimal capital structure.

1.1.1 Modigliani & Miller

The propositions presented in the first paper of Modigliani & Miller on capital structure are considered as the 'beginning point' of modern managerial finance.[8] Before Modigliani & Millers paper, the effect of leverage on the value of the firm was considered to be too complex and convoluted.[9] The main finding of Modigliani & Millers' study, what has often been called 'the most important result in all of corporate finance', is that managers cannot change the value of a firm by repacking the firm's securities. This conclusion has been based on two propositions stated in their paper.

The first proposition Modigliani & Miller presented in their paper is based on the following formula,

$$V_j = (S_j + D_j) = \frac{\bar{X}_j}{p_k}$$

where V_j stands for the market value of the firm, or of all securities firm j has outstanding, S_j for the market value of the firms common shares, D_j for the market value of the debts of the company and $\bar{X}_j$ for the expected return of the assets owned by the company. The term p_k can be considered as the market rate of capitalization for the expected value of the uncertain streams generated by a k^{th} class firm. This formula depicts that a firm cannot change the total value of its outstanding securities by changing the proportions of its capital structure, or, that the value of the firm is always the same under different capital structures and as a consequence, no capital structure is any better or worse than any other capital structure of the firm's stockholders.[10] The reasoning behind this statement and formula is given by Modigliani & Miller by comparing two firms which generate the same level of earnings and consequently are in the same class k, but have different capital structures; one firm with debt financing and one without. If the levered firm would be priced higher than the unlevered firm, rational investors would simply borrow money on their own account and invest this in the unlevered, cheaper firm. Through this process of *homemade leverage,* investors could duplicate the effects of corporate leverage on their own.[11] As investors would always exploit arbitrage opportunities, the value of the overpriced, levered shares will fall and that of the underpriced shares will rise, eliminating the discrepancy between the market values of the firms. Modigliani & Miller therefore concluded that 'levered companies cannot command a premium over unlevered companies because investors have the opportunity of putting the equivalent leverage

[8] Modigliani, F. & Miller, M.H. (1958). 'The Costs of Capital, Corporation Finance and the Theory of Investment', *The American Economic Review, 48 (3),* 261-275
[9] Ross et al. (2010).'Corporate Finance', 9th Ed., McGraw-Hill Book Co., New York, p.494
[10] Ross et al. (2010).'Corporate Finance', 9th Ed., McGraw-Hill Book Co., New York, p.493
[11] Ross et al. (2010) 'Corporate Finance', 9th Ed., McGraw-Hill Book Co., New York, p.495

into their portfolio directly by borrowing on their personal account'.[12] This finding leads to proposition I, which states 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.* One important assumption for this statement to hold is that individual investors can borrow at the same rate as corporations do. According to Modigliani & Miller this assumption is plausible since 'the relevant interest rate for our arbitrage operators is the rate on brokers' loans and, historically, that rate has not been noticeably higher than representative corporate rates'.[13]

From proposition I, Modigliani & Miller derived proposition II, which concerned the rate of return on common stock in firms that hold some debt. As Modigliani & Miller found that levered, compared to unlevered stockholders, get better returns in good times, but have worse returns in bad times, implying greater risk with leverage, they stated that 'the expected rate of return or yield, *i,* on stock of any company *j* belong to the k^{th} class should be a linear function of leverage'.[14] This finding was depicted in the following formula,

$$i_j = p_k + (p_k - r)\,\frac{D_j}{S_j}$$

which resulted in the formulation of Modigliani & Miller's proposition II: *'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'.*[15] The reasoning behind this statement was that, as the firm adds leverage, the remaining equity becomes more risky. As this risk rises, stockholders will require a premium and as a result, the cost of equity capital rises. This increase in the cost of the remaining equity capital will offset the higher proportion of the firm financed by generally lower-cost debt ($r < p_k$). In fact, Modigliani & Miller proved that the two effects exactly offset each other, so that both the value of the firm and the firm's overall cost of capital are invariant to leverage, although debt appears to be cheaper than equity.[16]

[12] Modigliani, F. & Miller, M.H. (1958).'The Costs of Capital, Corporation Finance and the Theory of Investment', *The American Economic Review, 48 (3),* p. 270
[13] Modigliani, F. & Miller, M.H. (1958).'The Costs of Capital, Corporation Finance and the Theory of Investment', *The American Economic Review, 48 (3),* p. 274
[14] Modigliani, F. & Miller, M.H. (1958). 'The Costs of Capital, Corporation Finance and the Theory of Investment', *The American Economic Review, 48 (3),* p.271
[15] Modigliani, F. & Miller, M.H. (1958). 'The Costs of Capital, Corporation Finance and the Theory of Investment', *The American Economic Review, 48 (3),* p. 271
[16] Ross et al. (2010). 'Corporate Finance', 9th Ed., McGraw-Hill Book Co., New York, p.502

Although many people were fascinated by the far reaching theories of Modigliani & Miller, financial economists, including Modigliani & Miller themselves, argued that real-world factors may have been left out of the theory. One of these real world factors were corporate taxes. Since interest payments are tax deductible while dividend payments are not, corporate leverage lowers tax payments and so the firms' value should be positively related to debt. Realizing this, Modigliani & Miller had to correct for this by stating that it was no longer the case that arbitrage processes made the value of all firms in a given class proportional to the *expected returns* ($\overline{X_j}$) generated by their physical assets. Instead, because of 'the deduction of interest in computing taxable corporate profits, the market values of firms in each class must be proportional in equilibrium to their *expected returns net of taxes.'*[17] Realizing this, they replaced each $\overline{X_j}$ (expected returns) in the original versions of proposition I and II with $\overline{X}_j^{\tau}$, representing the total income net of taxes. $\overline{X}_j^{\tau}$ is given by the following expression,

$$\overline{X}_j^{\tau} = \left(\overline{X_j} - rD_j\right)(1 - \tau) + rD_j = \overline{X}_j(1 - \tau) + \tau r D_j$$

where τ stands for the average rate of corporate income tax, r for the interest rate on debt and $\tau r D_j$ for the tax shield. Although the substitution of X_j by $\overline{X}_j^{\tau}$ does not change anything to the form of the original propositions, certain interpretations do have to be changed. By the inclusion of corporate taxes, the formula to determine the value of the firm now changes from,

$$V_j = \left(S_j + D_j\right) = \frac{\overline{X_J}}{p_k} \quad \rightarrow \quad V_j = \left(S_j + D_j\right) = \frac{\overline{X}_j^{\tau}}{p_{\tau}} + \frac{\tau r D_j}{p_{\tau}}$$

This expression depicts that, by the incorporation of corporate taxes, the value of the firm must tend to rise with debt for any given level of expected total returns after taxes, whereas proposition I stated that the value of the firm is completely independent of its capital structure. The value of a levered firm is now the value of an all-equity firm plus the present value of the tax shield on debt. Because the tax shield increases with the amount of debt, the firm can raise its total cash flow and its value by substituting debt for equity.[18]

Also, the interpretation of the second proposition had to be changed. The formula to determine the cost of equity was rewritten as follows;

[17] Modigliani, F. & Miller, M.H. (1958). 'The Costs of Capital, Corporation Finance and the Theory of Investment', *The American Economic Review, 48 (3),* p. 272
[18] Ross et al. (2010). 'Corporate Finance', 9th Ed., McGraw-Hill Book Co., New York, p.507

$$i_j = p_k + (p_k - r)\,\frac{D_j}{S_j} \quad \rightarrow \quad i_j = p_j^{\tau} + (1-\tau)\left(p_j^{\tau} - r\right)\frac{D_j}{S_j}$$

The new expression implied that the expected rate of return or yield, *i,* on stock of any company *j* belonging to the k^{th} class is still a linear function of leverage, but, the increase in the after-tax yield on equity capital as leverage increases is smaller than was the case with the original formula. To be more precise, the increase is smaller by factor $(1-\tau)$. The reasoning behind the adapted proposition II is that, as the firm adds leverage, the remaining equity still becomes more risky, but because of positive effect of debt, the tax shield, the increase in risk and so the increase in the cost of equity is not as large as was expected in the case without taxes.

Five years later, Modigliani & Miller (1963) had to rewrite their propositions again. This time because they realized that the statement '*the market values of firms in each class must be proportional in equilibrium to their expected returns net of taxes'* was wrong, since the degree of leverage also influenced the value of the firm. Through this, it could be perfectly possible that two firms, with the same expected returns after taxes but with different capital structures, had different firm values.

Under the already rewritten formulation described at the former paragraph, the market values of firms within a class were strictly proportional to the expected earnings after taxes. Hence, 'the tax advantage of debt was due solely to the fact that the deductibility of interest payments implied a higher level of after-tax income for any level of before-tax earnings'.[19] Under the new rule (1963) however, there is an extra gain attached to additional leverage. This stems from the fact that the extra after-tax earnings, $\tau r D_j$, represent a sure income and therefore are capitalized at the more favorable certainty rate $\frac{1}{r}$. This is in contrast to the uncertain outcome $\overline{X}_j^{\tau}$, which is still capitalized at the unfavorable rate p_{τ}. This new insight resulted in the statement that the tax advantages of debt financing are somewhat greater than Modigliani & Miller originally suggested and led to a slightly adapted formula to determine the value of the firm;

$$V_j = \frac{\overline{X}_j^{\tau}}{p_{\tau}} + \frac{\tau r D_j}{p_{\tau}} \quad \rightarrow \quad V_j = \frac{\overline{X}_j^{\tau}}{p_{\tau}} + \frac{\tau r D_j}{r}$$

This reformulation also had an impact on proposition II. While the cost of equity again increases linearly with leverage, the increase goes at an even smaller rate than was the case with the

[19] Modigliani, F. & Miller, M.H. (1963). 'Corporate Income Taxes and the Cost of Capital: a Correction', The *American Economic Review, 53 (3)*, p.438

rewritten proposition II in the 1958 paper. This is because of the certain income stream generated by leverage, which adds another extra positive dimension to debt financing.

After noticing that the existence of tax subsidies on interest payments would cause the value of the firm to rise with the amount of debt financing, Modigliani & Miller realized that this theory would imply that firms should be financed almost entirely with debt. Realizing this inconsistency with the observed financing behavior, Modigliani & Miller ended their 1963 paper with the following comment:

'It may be useful to remind readers once again that the existence of a tax advantage for debt financing [...] does not necessarily mean that corporations should at all times seek to use the maximum amount of debt in their capital structure. There are, as we pointed out, limitations imposed by lenders [...] as well as many other dimensions (and kind of costs) in real world problems of financial strategy which are not fully comprehended within the framework of static equilibrium models, either our own or the traditional variety. These additional considerations, which are typically grouped under the rubric of 'the need for preserving flexibility', will normally imply the maintenance by the corporation of a substantial reserve of untapped borrowing power.'[20]

These 'other dimensions and kind of costs' have later been dedicated to issues like bankruptcy costs, agency costs and personal taxes. Attention will be paid to these issues in the following subsections.

1.1.2 Bankruptcy costs

As found by Modigliani & Miller, debt provides a tax benefit to the firm. This theoretical relationship would imply however that all firms should choose maximum debt levels, which certainly does not predict the behavior of firms in the real world. Debt also puts pressure on the firm, because interest and principle payments are obligations, which have to be met before any funds are spent on other purposes. This is in sharp contrast with stock obligations, since stockholders are not legally entitled to receive dividends. Stock holders are residual claimants and will only receive dividends if all debt obligations are paid and if the dividend payment fits with the firms' internal dividend policy. Due to this 'voluntary' aspect of dividend payments, there will be a small change that equity will bring the firm into financial distress. The debt *obligation* however, can more easily force a firm into financial distress or ultimately, bankruptcy. When a firm is not able to cover its debt related obligations, the ownership of the firm's assets will legally be transferred from the stockholders to the bondholders.[21] Bankruptcy costs or costs of financial distress include the '*legal and administrative costs of bankruptcy, as well as moral hazard, monitoring and contracting costs which can erode firm*

[20] Modigliani, F. & Miller, M.H. (1963). 'Corporate Income Taxes and the Cost of Capital: a Correction', *The American Economic Review, 53 (3),* p.442
[21] Ross et al. (2010). 'Corporate Finance', 9th Ed., McGraw-Hill Book Co., New York, p.520

value even if formal default is avoided'.[22] Another way of describing financial distress costs is by splitting them up into *direct* and *indirect* costs.

Direct financial distress costs are the 'legal and administrative' costs Myers referred to. These costs include the lawyer, accountant and administrative fees, but also the expert witnesses fees which one by one can add up quickly. An example of how large these costs can get is shown by the Enron bankruptcy, of which the direct bankruptcy costs were estimated to be around $1 billion dollar.[23] Although these costs are large in absolute terms, empirical research has found that direct financial distress costs are actually small as a percentage of firm value. White (1983), Altman (1984), and Weiss (1990) for instance found that the direct costs of financial distress were about 3 percent of the market value of the firm.

Aside from the direct legal and administrative costs of bankruptcy, many other *indirect* costs are associated with financial distress. These costs are related to the 'impaired ability to conduct business'.[24] Bankruptcy often impedes the conduct with its stakeholders like customers and supplier and sometimes even the threat of bankruptcy is enough to drive customers away because of fear of impaired service and loss of trust. Suppliers often suddenly require instant payments, or sometimes even stop supplying if they feel that the firm they supply to is in financial distress. Also, credit might become more difficult to obtain or more expensive. Although indirect costs are quite difficult to measure, many researchers expect them to be larger than the direct costs of financial distress. Andrade and Kaplan (1998) estimated *total* distress costs to be between 10 and 23 percent of firm value. This was found however, by investigating firms which were already in financial distress. Bar-Or (2000) estimated expected futures distress costs for firms that are currently healthy to be 8 to 10 percent of operating value. Although these figures seem to suggest that financial distress costs are a very important factor in determining the optimal capital structure, they should be handled with care. If the costs are calculated to be 20 percent of firm value, then the *expected* costs of financial distress for most public companies are modest, because the probability of financial distress is very small.[25]

As a result of these findings, the literature on the costs of financial distress supports two qualitative statements about financing behavior. The first statement tells us that risky firms, in which risk is defined as the variance rate of the market value of the firm's assets, tend to borrow less, other

[22] Myers, S.C. (1984). 'Capital Structure Puzzle', *Journal of Finance, 39 (3),* p.8
[23] Ross et al. (2010).'Corporate Finance', 9th Ed., McGraw-Hill Book Co., New York, p.523
[24] Ross et al. (2010). 'Corporate Finance', 9th Ed., McGraw-Hill Book Co., New York, p.524
[25] Andrade, G. & Kaplan, S.N. (1998). How Costly is Financial (Not Economic) Distress? Evidence from Highly Leveraged Transactions that Became Distressed', *Journal of Finance,* p.1489

things equal. The higher the variance rate, the greater the probability of default on debt claims. Since costs of financial distress are caused by threatened or actual default, safe or less risky firms ought to be able to borrow more before the expected costs of financial distress offset the tax advantage of borrowing.[26] The second finding states that firms holding tangible assets in place will borrow more than firms holding specialized, intangible assets or valuable growth opportunities. The expected cost of financial distress not only depend on the probability of trouble, but also on the value lost if trouble comes. Specialized, intangible assets or growth opportunities are more likely to lose value in times of financial distress.

After the incorporation of financial distress costs into the determination of the optimal capital structure, we could say that a firm's capital structure decision involves a trade-off between the tax benefits of debt and the costs of financial distress.[27] The marginal tax subsidy of debt exceeds the distress costs of debt for low levels of debt, while the reverse holds for high levels of debt. The firm's capital structure is optimized where the marginal subsidy to debt equals the marginal cost.

1.1.3 Agency costs

The introduction of bankruptcy costs in the presence of tax subsidies still leads to a theory which defines an optimal capital structure. Jensen & Meckling however, argue that this theory is 'seriously incomplete since it implies that no debt should ever be used in the absence of tax subsidies if bankruptcy costs are positive'.[28] Since it is known that debt was commonly used prior to the existence of tax subsidies on interest payments, this theory does not capture what must be some important determinants of the corporate capital structure. One such important determinant, according to Jensen & Mecking, is the agency cost of debt and outside equity, which stems from the agency relation within a firm.

This 'agency relation' was described by Jensen & Meckling as 'a contract under which one or more persons (the principal) engage another person (the agent) to perform some service on their behalf, which involves delegating some decision making authority to the agent'.[29] If we assume that both parties in this relationship are utility maximizers, there is a good reason to believe that the agent will not always act in the best interests of the principal. This divergence of interest, or the prevention of it, generates costs, which are magnified in times of financial distress. These costs are

[26] Myers, S.C. (1984). 'Capital Structure Puzzle', *Journal of Finance, 39 (3),* p.8
[27] Ross et al. (2010). 'Corporate Finance', 9th Ed., McGraw-Hill Book Co., New York
[28] Jensen, M.C. & Meckling, W.H. (1976). 'Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure', *Journal of Financial Economics, 3 (4),* p.333
[29] Jensen, M.C. & Meckling, W.H. (1976). 'Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure', *Journal of Financial Economics, 3 (4),* p.308

described by Jensen & Meckling as *agency costs.* Since the agency relation is directly applicable to the firm, in which the manager is the agent and the outside equity or debt holders are the principles, Jensen & Meckling reason that the use of debt and external equity, or the separation of ownership and control, will both generate agency costs, but, in different ways and at different magnitudes.

At first, the *agency costs of debt.* When a firm has debt, a conflict of interest arises between the stockholder (in this case the manager) and the bondholders. This conflict stems from the essential difference between stock and bondholders, where stockholders only have a residual claim on the cash flow generated by the firm and have a limited liability. This makes it attractive for stockholders to pursue selfish strategies, transferring wealth from the bond to the stockholders, generating agency costs.[30] Jensen & Meckling attributed three aspects of agency costs to the existence of debt within a firm. One of them were bankruptcy costs, which have already been discussed at the previous part. The other two costs where described as the *incentive effect* associated with debt and *monitoring* and *bonding* costs, associated with the prevention of selfish investment strategies.

The *incentive effect* refers to the incentive of managers to undertake selfish investment strategies. A first example of a selfish investment strategy managers could engage in, is the incentive to take on large risks or, in other words, to invest in projects which promise very high payoffs if successful, even if they have a very low probability of success. If the investment turns out well, the manager or stockholder captures most of the gains since he receives the 'residual claim'. If the investment turns out to be a bad one, the creditors bear most of the costs, because of the limited liability of the manager.[31] *Milking the property,* mentioned by Ross et al., is another selfish investment strategy managers can engage in.[32] This strategy refers to the case when large amounts of dividends or other cash distributions are paid to the stockholders in times of financial distress. Through this strategy, cash is transferred to the stockholders because they realize that this cash would be claimed by the bondholders in case of bankruptcy. In this way, equity is actually withdrawn through dividend.

Now we have established the reasoning of the incentive effect, it seems that bondholders take on a considerable risk when buying bonds issued by corporations. The fact is however, that the bondmarket anticipates this effect. Prospective bondholders will realize that the manager will try to undertake selfish investment strategies, hence they will incorporate this risk when determining the

[30] Ross et al. (2010). 'Corporate Finance', 9th Ed., McGraw-Hill Book Co., New York, p. 525
[31] Jensen, M.C. & Meckling, W.H. (1976). 'Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure', *Journal of Financial Economics, 3 (4),* p.334
[32] Ross et al. (2010). 'Corporate Finance', 9th Ed., McGraw-Hill Book Co., New York, p.526

price they are willing to pay for- or the returns they require from- the bonds.[33] Next to simply requiring a discount or a higher interest rate on the bonds, bondholders can also try to limit the managerial behavior which results in reductions in the value of the bonds. This could be done by *monitoring*, through which the bondholders try to control the behavior of the manager. Provisions which impose constraints on management's decisions regarding such things as dividends, risky investments or future debt issues are examples of monitoring restrictions. The costs involved in writing such provisions, enforcing them and the reduced profitability of the firm as a result of the restrictions are what they call the *monitoring costs.*

The bondholders will have the incentive to engage in monitoring and writing covenants as long as 'the nominal marginal costs of such activities are just equal to the marginal benefits they perceive from engaging in them'.[34] The word 'nominal' is used here since the bondholders will not bear these costs. As long as the bondholders recognize costs, through monitoring or diverged interests, they will take them into account in deciding the price they will pay for any given debt claim, and therefore the seller of the claim (the manager or stockholder), will bear the costs. Having this in mind, it is in the managers' interest that both internal as external monitoring costs are as low as possible. Therefore, it could be beneficial to the manager to engage in *bonding*, in which he voluntarily provides the bondholders with detailed financial statements to guarantee bondholders that he limits his 'selfish' activities and that there is less need for the bondholders themselves to spend resources on monitoring.

Now it has been argued that the manager captures both the wealth losses caused by the impact of debt on the investment decisions of the firm and the monitoring and bonding expenditures by the bondholders and the manager himself, the agency costs associated with debt tend to discourage the use of corporate debt.[35] There are, however, also agency costs of outside equity, increasing the marginal costs of equity as well, and so, adding an extra dimension to the capital structure trade-off.

The effect of outside equity on agency costs is described by comparing the behavior of a manager when he owns 100 percent (wholly owned) of the residual claim on a firm, to his behavior when he sells off a portion of those claims to outsiders. As we assumed that the manager is a utility maximizer, a 'wholly owned' manager will make operational decisions which will not only involve

[33] Jensen, M.C. & Meckling, W.H. (1976). 'Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure', *Journal of Financial Economics, 3 (4),* p.313
[34] Jensen, M.C. & Meckling, W.H. (1976). 'Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure', *Journal of Financial Economics, 3 (4),* p.338
[35] Jensen, M.C. & Meckling, W.H. (1976). 'Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure', *Journal of Financial Economics, 3 (4),* p.342

the benefits he derives from pecuniary returns, but also the utility generated by non-pecuniary aspects of his managerial activities such as a larger computer to play with, or the purchase of production inputs from friends. If the manager owns all shares by himself, he will bear the full cost of spending the firms' wealth on non-pecuniary items. Therefore, the optimum mix of the various pecuniary and non-pecuniary benefits is achieved when 'the marginal utility derived from an additional dollar of expenditure is equal for each non-pecuniary item and equal to the marginal utility derived from an additional dollar of after tax purchasing power'.[36] Up until now, no agency costs are present since there is no conflict of interest. If the manager sells equity claims on the corporation which are identical to his however, agency costs will be generated. Now, the manager will only bear a fraction of the costs of any non-pecuniary benefit he takes out, while he still reaps all the benefits.[37] Or, as Jensen & Meckling state it: 'the manager will be induced to take additional non-pecuniary benefits out of the firm because his share of the cost falls'.[38] Another conflict which arises from the falling managers' ownership share is that his incentive to devote significant effort to creative activities such as searching out new profitable ventures falls. The reason is that he will only capture a small part from every extra dollar earned, lowering the motivation to increase earnings.

Again, these non-pecuniary activities could be limited through monitoring activities by the outside equity holders or through bonding activities of the manager, if he feels this comes at a lower cost. But again, the manager will have to bear the entire wealth effect of these expected costs as long as the equity market anticipates these effects. Therefore, firm value is now affected by a tradeoff between the lower consumption of non-pecuniary items by the manager and the costs which have to be made to correct this kind of behavior.

As opposed to the agency costs associated with debt, the agency costs of outside equity would encourage to take on corporate debt, resulting in that we, unfortunately, end up at another trade-off within the understanding of financing behavior. The individual costs would have to be weighed against each other to determine which form of outside financing, debt or equity, would be most beneficial to the value of the firm. The magnitude of these individual costs depend on several things however, like 'the tastes of managers, the ease with which they can exercise their own preferences as opposed to value maximization in decision making and the costs of monitoring and bonding

[36] Jensen, M.C. & Meckling, W.H. (1976). 'Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure', *Journal of Financial Economics, 3 (4),* p.312
[37] Ross et al. (2010). 'Corporate Finance', 9th Ed., McGraw-Hill Book Co., New York, p.536
[38] Jensen, M.C. & Meckling, W.H. (1976). 'Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure', *Journal of Financial Economics, 3 (4),* p.346

activities'.[39] Also, it is hypothesized that 'the larger the firm becomes, the larger the total agency costs are because it is likely that the monitoring function is inherently more difficult and expensive in a larger organization'[40].

Although the magnitude of the agency costs depend on many variables, Jensen & Meckling conclude their influential paper by saying that they expected the agency costs associated with debt in general to slightly outweigh the agency costs on outside equity. This statement was graphically demonstrated in their paper, where, when the level of outside financing was increased, the optimum level of outside finance, shifted to a higher fraction of outside financing obtained from equity as this resulted in the lowest level of total agency costs.[41] Jensen & Meckling therefore expected the value of the firm to be higher with the use of equity, which resulted in a preference for equity over debt financing (in the absence of taxes).

1.1.4 Free cash flow hypothesis

About 10 years later, Jensen changed his opinion on the preference of equity over leverage when incorporating the concept of 'free cash flow'. According to Jensen, 'the agency costs of debt have been widely discussed' in his 1976 paper, 'but the benefits of debt in motivating managers and their organization of be efficient have been ignored'.[42] Conflicts of interest between principle and agent are especially severe when the organization generates substantial free cash flow. Reason being, that the presence of free cash flow has a direct positive effect on 'the ease with which managers can exercise their own preferences', where Jensen & Meckling referred to as being one of the factors influencing the magnitude of agency costs.

Based on this, Jensen developed the *free-cash-flow hypothesis*. The idea of this hypothesis is based again, on that managers with only a small ownership interest have an incentive for wasteful behavior as they bear only a small portion of the costs, while they can reap all the benefits.[43] According to the theory, more wasteful activities are expected in a firm with a capacity to generate high cash flows than in one with a capacity to generate only low cash flows. This hypothesis has important implications for the capital structure puzzle, since both debt and equity can reduce free cash flow levels within the firm, however at different ways and magnitudes. Since dividends leave

[39] Jensen, M.C. & Meckling, W.H. (1976). 'Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure', *Journal of Financial Economics, 3 (4),* p.328
[40] Jensen, M.C. & Meckling, W.H. (1976). 'Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure', *Journal of Financial Economics, 3 (4),* p.348
[41] Jensen, M.C. & Meckling, W.H. (1976). *'Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure', Journal of Financial Economics, 3 (4),* p.347
[42] Jensen, M.C. (1986). 'Agency costs of Free Cash Flow, Corporate Finance and Takeovers', *American Economic Review, 76, (2),* p.324
[43] Ross et al. (2010). 'Corporate Finance', 9th Ed., McGraw-Hill Book Co., New York, p.536

the firm, they reduce free cash flow. Thus, according to the free cash flow hypothesis, an increase in dividends should benefit the stockholders by reducing the ability of mangers to pursue wasteful activities. Furthermore, debt payments like interest and principal also leave the firm and therefore, debt reduces free cash flow as well. In fact, interest and principal payments should have a greater effect than dividends have on the free-spending ways of managers, because bankruptcy will occur if the firm is unable to make future debt payments. By contrast, a future dividend reduction will cause fewer problems to the mangers, since the firm has no legal obligation to pay dividends, making it alluring for the manager to waste money. In other words, 'by issuing debt in exchange for stock, managers are bonding their promise to pay out future cash flows in a way that cannot be accomplished by simple dividend increases', lowering agency costs at a higher pace than with increases in dividend.[44] Because of this, the free cash flow hypothesis, which is actually an elaboration on the agency theory, argues that a shift from equity to debt will boost firm value.[45]

1.1.5 Miller 1977

After the pioneering research of Modigliani & Miller and the introduction of bankruptcy and agency costs into the optimal capital structure model, it was believed that the optimal capital structure was simply a matter of balancing tax advantages against bankruptcy and agency costs. Miller, however, concluded in his 1977 research paper, that at both sides of the static tradeoff problems kept on arising. According to Miller, the great emphasis on bankruptcy costs in recent discussions of optimal capital structure policy seemed to have been misplaced. The only study at that time that dealt with the costs of bankruptcy and reorganization for large, publicly-held corporations was the one of Jerold Warner. This research tabulated the direct costs of bankruptcy and reorganization for a sample of 11 railroads that filed petitions in bankruptcy under section 77 of the Bankruptcy Act between 1930 and 1955. He found that eventual cumulated direct costs of bankruptcy averaged 5.3 percent of the market value of the firm's securities as of the end of the month in which the railroad filed the petition. But, these are the ex post, upper-bound cost ratios, whereas of course the expected costs of bankruptcy are the relevant ones when the firm's capital structure decisions are made. On that score, Warner found that the direct costs of bankruptcy averaged only about 1 percent of the value of the firm 7 years before the petition was filed.[46]

Problems also arose on the other side of the trade-off. If the optimal capital structure was simply a matter of balancing tax advantages against bankruptcy costs, why have observed capital structures

[44] Jensen, M.C. (1986). 'Agency costs of Free Cash Flow, Corporate Finance and Takeovers', *American Economic Review, 76 (2),* p.324
[45] Ross et al. (2010). 'Corporate Finance', 9th Ed., McGraw-Hill Book Co., New York, p.537
[46] Warner, J. (1976). 'Bankruptcy Costs, Absolute Priority and the Pricing of Risky Debt Claims', University of Chicago

shown so little change over time? After looking into the data of the Commission on Money and Credit, Miller found that the debt/asset ratio of the typical nonfinancial corporation in the 1950's was little different from that of the 1920's despite the fact that tax rates had quintupled. This led, according to the theory, to a disequilibrium that had lasted 30 years and showed no sign of disappearing, which was 'too large for any economist to accept'. When looking for an explanation, Miller came to the conclusion that the tax advantages of debt financing must have been substantially less than the conventional wisdom suggested.

Millers' solution to this disequilibrium was taking the *personal income taxes* of the investors into account. This led to the following expression to determine the value of the leveraged firm,

$$V_L = V_U + \left[1 - \frac{(1-\tau_C)(1-\tau_{PS})}{(1-\tau_{PB})}\right] D_L$$

where τ_C is the corporate tax rate, τ_{PS} is the personal income tax rate applicable to income from common stock (dividend) and τ_{PB} is the personal income tax rate applicable to income from bonds (interest). Miller derived several important conclusions from this new expression.

First of all, it should be noticed that this expression comes down to the MM no tax result-in case all tax rates are set equal to zero. In this case, a firms' capital structure would have no effect on the value of the firm, as Modigliani & Miller presented in their earlier research. If the personal income tax rates on income from bonds and income from shares are set at the same level, then the gain from leverage is similar to the familiar $\tau_C D_L$. These findings are still in line with the MM propositions. The innovatory aspect about this expression emerges when the tax rate of income from stock is less than the tax on income from bonds. In this case, the gain from leverage will be less than $\tau_C D_L$. In fact, for a wide range of values for τ_C, τ_{PS} and τ_{PB}, the gain from leverage vanishes entirely or even turns negative according to Miller.

An explanation for this result would be as follows. In a world with personal taxes, investors will only care about the yields net of all tax drains. In case personal taxes on income from stocks are lower than on income from bonds, or in other words, if dividends are given a tax advantage over interest, the before-tax return on taxable bonds will have to be higher to compensate investors for the higher taxes they will have to pay. So, while it holds that the owners of a leveraged firm have the advantage of deducting their interest payments to bondholders in computing their corporate

income tax, this advantage is off-set by the higher interest rate the firm has to pay to the bondholders to make up for the tax differential.

After this finding, Miller finally comes back to the question whether or not there is an optimal debt ratio for any individual firm. Through the introduction of personal taxes this is not the case on *individual* firm level anymore. There will, however, be an equilibrium level of aggregate corporate debt and hence an equilibrium debt-equity ratio for the *corporate sector* as a whole. As a result, the market value of a firm is still independent of its capital structure. As personal taxes are progressive, companies following a no or low-leverage strategy would find themselves in a market among investors in the high tax brackets. These investors would want a significant compensation for their high marginal tax rate, making it very unattractive and expensive for corporations to issue bonds. Those corporations opting for high leverage strategies would find the natural clientele for their securities at the other side on the scale; investors within the lower tax brackets, requiring lower 'personal tax' compensations.

1.2 The Pecking-Order Theory

The static trade-off theory has dominated corporate finance circles for a long time, as it provided valuable tools to determine the firms' capital structure and sounded plausible.[47] When researcher tried to confirm the theory by running empirical test however, they found unacceptably low R^2 values and actual debt ratios varying widely across apparently similar firms.[48] This resulted in a search for other theories that were able to explain capital structures and financing behavior.

On such theory is the *'pecking-order'* theory, generally attributed to S.C. Myers. This theory is described and contrasted to the static trade-off theory in Myers' famous paper 'Capital Structure Puzzle', which was designed to be a 'one-on-one competition between the static trade-off and pecking-order stories'.[49] The pecking order theory provided a more intuitive model of capital structure based on *timing* and *asymmetric information*, instead of balancing the value of the interest tax shields against various costs of bankruptcy or financial embarrassment.

Before immediately turning into the reasoning of the pecking-order theory, Myers started his paper with addressing two essential shortcomings of the static trade-off model. The first one was neglecting the *adjustment costs,* which were hardly mentioned or at least never suggested as a first-order concern by the model. Adjustment costs were described by Myers as the costs a firm had to

[47] Ross et al. (2010). 'Corporate Finance', 9th Ed., McGraw-Hill Book Co., New York, p.537
[48] Myers, S.C. (1984). 'Capital Structure Puzzle', *Journal of Finance, 39 (3),* p.22
[49] Myers, S.C. (1984). 'Capital Structure Puzzle', *Journal of Finance, 39 (3),* p.4

cover to move its leverage ratio to the optimum level again after being pushed away from this optimum by a big shock. Exactly these adjustment costs could have explained the observed wide variation in empirical research in actual debt ratios of seemingly similar firms. The other shortcoming Myers addressed was the assumption of Miller in his paper 'Debt and Taxes' that all firms faced approximately the *same marginal tax rate*.[50] According to Myers, the 'extensive trading of depreciation tax shields and investment tax credits through financial leases and other devices', proved this assumption could immediately be rejected.[51]

Before the famous 'Capital Structure Puzzle' paper of Myers, the pecking-order was already pointed out by earlier practitioners. This was based however, on the argument that internal financing would avoid issue costs and if external finance was needed, issuing debt could still avoid the higher issue costs of equity. But, according to Myers, issue costs themselves did not seem to be large enough to override the costs and benefits of leverage emphasized in the static tradeoff story. When Myers incorporated the issues of *timing* and *asymmetric information* however, which according to him so far had been neglected, the predictions started to be in line with the pecking order theory.

The introduction of timing and information asymmetry had some important implications for the capital structure decision. Maljuf and Myers stated that the managers' objective is always to maximize the 'true' or 'intrinsic' value of the firms' existing shares. That is, the manager worries about the value of the 'old' shareholders' stake in the firm.[52] This statement led to the assumption that managers will always try to issue stock at the best time, in other words; when stock is overvalued (*timing*). Another assumption of Myers was that the manager must know more about his firm's prospects than the typical investor does. This should enable the manager to actually time the market, since he has more knowledge about the actual share prices, and so about the over- or undervaluation of the firm's shares (*information asymmetry*). With these assumptions in mind, Myers developed a model to describe the reasoning of the pecking order process.

Consider a firm that has to raise an amount of N dollars through external finance in order to undertake an investment opportunity of which Y is the net present value (NPV). This amount N will be obtained by issuing stock. The benefit of raising this amount by a security issue is Y, but there is also a possible cost; the firm may have to sell the securities for less than they are actually worth and therefore sell a higher number of shares to obtain N. Because of the managers' inside information (asymmetry), he will be the only one who knows the real value of the shares. This real value is N_1.

[50] Miller, M.H. (1977). 'Debt and Taxes', *Journal of Finance, 32,* 261-275
[51] Myers, S.C. (1984). 'Capital Structure Puzzle', *Journal of Finance, 39 (3),* p.7
[52] Myers, S.C. (1984). 'Capital Structure Puzzle', *Journal of Finance, 39 (3),* p.12

Now we know the market value of the stock issued, N, and the real value, N_1, we can calculate the difference, which is the over- or undervaluation of the stock, i.e. $\Delta N = N_1 - N$. If ΔN is negative, the stock will be overvalued and the manager will always want to issue the shares, also if the NPV of the investment opportunity is negative, since the funds raised can always be put in the bank. The firm simply receives more money for the shares then they are actually worth. If ΔN is positive however, the stock is undervalued and the firm may pass up a positive-NPV investment opportunity if the NPV is not large enough to compensate for the loss made on the issuance of undervalued stock.

The assumptions and implications of this model eventually lead to two key points in a firms' capital structure decision. First of all, the model depicts the *cost of relying on external financing*. We usually think of costs of external finance as administrative and underwriting costs. Through asymmetric information however, and so the possibility of undervaluation, the possibility of a different sort of cost is created, i.e. the possibility that firm will choose not to issue, and therefore will pass up a positive NPV investment which is not large enough to cover the loss made on the stock issuance. This cost could be avoided if the firm can retain enough internally generated cash to cover its positive NPV opportunities.

In case the firm cannot finance its investments with internal funds, or the manager still wants to rely on external financing despite is costs, the manager will have to consider the second key point: '*Issue safe securities before risky ones*'.[53] Safe securities are described by Myers as 'securities whose future value changes least when the managers' inside information is revealed to the market', referring to the model, securities with the smallest ΔN, or securities which are correctly priced by the market. Although ΔN is endogenously to the managers, debt is more likely to be priced correctly and so, the absolute value of ΔN is always less for debt than to equity. In case the firm can issue default-risk free debt, ΔN is zero, but even when considering corporate default risk, the absolute value of ΔN will be less for debt than for equity according to Myers, with the result that less positive NPV projects will have to be passed up due to the lower costs of undervaluation.

The story above refers to the case when ΔN is positive, so when the stock is undervalued by the market. But, what would happen if ΔN is negative? According to Myers the decision would seem to be; 'issue debt when investors undervalue the firm and equity when they overvalue it'. The problem with this strategy is however that investors realize that firms will issue equity only when the manager considers the shares to be overvalued and debt otherwise. Therefore, investors will refuse to buy the equity, or will rationally adjust the price they are willing to pay. An overvalued firm will

[53] Myers, S.C. (1984). 'Capital Structure Puzzle', *Journal of Finance, 39 (3),* p.14

have to drop its share prices that far to convince investors that they are not overpaying for the shares, that the equity issuance in general will become more costly than issuing, fairly priced, bonds.

The pecking order theory is almost complete now. Two important things are not yet mentioned however; the financial distress costs of debt and financial slack. Firms always prefer internal financing. If external financing is required however, firms will always prefer debt over equity. A firm, however, cannot increase its debt ratio infinitely. The firm faces two increasing costs as it climbs up pecking order: it faces higher odds of incurring costs of financial distress, and also higher odds that future positive NPV projects will be passed by because the firm will be unwilling to finance them by issuing common stock or other risky securities. To control for these costs, and so move down the pecking order again, the firm may choose to reduce its debt levels by issuing stock, even if new equity is not needed immediately to finance real investment. Firms prefer to accumulate cash today to fund profitable projects at various times in the future. In other words, financial slack is valuable according to the pecking order theory, which is in sharp contrast with the cash flow hypothesis.

Having found this, it can be concluded that firms prefer internal to external funds. When internal funds are exhausted, firms turn to external financing and will issue the safest security first. That is, they start with debt until the debt capacity is exhausted; meaning that the firm has already issued so much debt that it would face substantial additional costs in issuing more. Only at this point, the firm will issue equity as a last resort.[54] This pecking order theory has three important implications which are at odds with the trade-off theory. First of all, there will be *no optimal debt ratio* for an individual firm as there was with the static trade-off theory. Each firm chooses its leverage ratio based on the cumulative requirement for external financing, instead of balancing the benefits of debt with the costs. Second, profitable firms, which can rely on their internally generated cash flows, have less need for outside financing and so, will have lower debt ratios. According to the trade-off model, the greater cash flows of profitable firms would require higher debt ratios to capture the tax shield and other benefits of leverage. At last, as mentioned at the former paragraph, companies like financial slack to a certain extent. [55]

Of course, also the pecking order hypothesis can be rejected if we require it to explain everything. There are always examples of firms issuing stock while they could have issued debt. But when we look at aggregates, the heavy reliance on debt is clear. For all non-financial corporations from the

[54] Myers, S.C. (1984). 'Capital Structure Puzzle', *Journal of Finance, 39 (3),* p.9
[55] Ross et al. (2010). 'Corporate Finance', 9th Ed., McGraw-Hill Book Co., New York, p.540

years 1973-1982, internally generated cash covered 62 percent of capital expenditures. The bulk of required external financing came from borrowing and only 6 percent of external financing came from issuing new stock.[56] That the pecking-order does not only count for the managers, but for the investors as well, is shown in Masulis' study in which stock prices rise on average when a firm offers to exchange debt for equity, and fall when they offer to exchange equity for debt.[57]

1.3 Research on leverage determinants

Ever since the first Modigliani & Miller paper, many theories on financing behavior and capital structure decisions have been developed which afterwards were confirmed or rejected by empirical tests. This is one way of understanding firms' capital structures and its determinants and has resulted in the theories described at the former paragraphs. Another way is to reverse this process. That is, start with empirical research, which is the process of looking for statistical regularities and relations in the history of market data on capital structures and firm characteristics, and subsequently, try to design theoretical frameworks that are able to explain the results found by the empirical research. This empirical search for leverage determinants has been performed by many researchers and has resulted in the appearance of some interesting papers. The most recent, important and influential papers in this stream of research are discussed hereafter and will serve as the basis for this empirical study.

1.3.1 Rajan & Zingales (1995)

Rajan & Zingales started their paper with questioning what 'we really know about the corporate capital structure choice'.[58] They realized that within the theoretical field clearly some progress had been made, but very little was known about the empirical relevance of the different theories developed. Most empirical research at that time was done on firms in the United States and had resulted in some stylized facts on the capital structure decision. The shortcoming of performing empirical tests on just the US however, was that it was hard to determine whether the empirical regularities found where just spurious correlations or actual, robust findings. The objective of Rajan & Zingales' paper, therefore, was to establish whether capital structures in other countries (G7) were related to factors similar to those appearing to influence the capital structure of U.S. firms and subsequently, try to rationalize the observed regularities to get a deeper understanding of the true

[56] Brealey, R.A. & Myers S.C. (1984). 'Principles of Corporate Finance', 2nd Ed., McGraw-Hill Book Co., New York, p.291
[57] Masulis, R.W. (1980). 'The Effects of Capital Structure Change on Security Prices: A Study of Exchange Offers,' *Journal of Financial Economics*, 139-177
[58] Rajan, R.G. & Zingales, L. (1995). 'What Do We Know About Capital Structure? Some Evidence from International Data', *The Journal of Finance, 50 (5),* p.1421

economic forces behind the leverage determinants that were found.[59] This was done by a cross-sectional study on data of all non-financial firms of the G7 countries in 1991.

Rajan & Zingales started their study with simply comparing the capital structures and different leverage ratios, which were corrected for major differences in accounting measures, over the G7 countries. The main results they found were that the United Kingdom and Germany had the lowest average leverage ratios among the G7 and that all other countries had more or less the same amount of leverage. After realizing that not only accounting measures, but also differences in institutions seemed to have some power in explaining differences in aggregate capital structures between countries, they shifted their attention to the cross-sectional differences between firms within a country.

The cross-sectional study of Rajan & Zingales is based on the earlier empirical studies on leverage determinants of Harris & Raviv (1991), who found that leverage *increases* with fixed assets, non-debt tax shields, investment opportunities, and firm size, and *decreases* with volatility, advertising expenditure, the probability of bankruptcy, profitability and the uniqueness of the products'. Bradley, Jarrell, and Kim (1984) and Long and Malitz (1985) also found that fixed assets, investment opportunities, firm size and profitability correlated considerably with leverage ratios.[60] Rajan & Zingales elaborated on these findings by regressing four factors; tangibility (as a proxy for fixed assets), market-to-book ratio (proxy for investment opportunities), firm size and profitability on book and market leverage ratios to figure out the explanatory power of these variables outside the US. They did this, by running the following basic regression model:

$$Leverage\ [firm\ i] = \alpha + \beta_1\ tangibility_i + \beta_2\ market\ to\ book\ ratio_i + \beta_3\ log\ sales_i + \beta_4\ profitability_i + \varepsilon_i$$

The first result stemming from this regression model was that all coefficients for U.S. firms had the same sign as found in previous studies and were significant at the 1 percent level. When looking across all G7 countries, they found that '*tangibility* is always positively correlated with leverage in all countries, […] the *market-to-book* ratio enters with a negative coefficient in all countries, […] *size* is positively correlated with leverage except in Germany, […] and *profitability* is negatively correlated with leverage in all countries expect in Germany again'.[61] In total, these four factors

[59] Rajan, R.G. & Zingales, L. (1995). T'What Do We Know About Capital Structure? Some Evidence from International Data', *The Journal of Finance, 50 (5),* p.1422
[60] Rajan, R.G. & Zingales, L. (1995). 'What Do We Know About Capital Structure? Some Evidence from International Data', *The Journal of Finance, 50 (5),* p.1451
[61] Rajan, R.G. & Zingales, L. (1995). *'What Do We Know About Capital Structure? Some Evidence from International Data'*, *The Journal of Finance, 50 (5),* p.1454

explained about 19 percent of the cross sectional variance in leverage ratios. Also, for the other countries, more or less the same results were found.

The theoretical explanation for these results was, according to Rajan & Zingales, as follows. A likely explanation for *tangibility* to be positively correlated with leverage is that tangible assets are easier to collateralize, which reduces the risk of the lender to suffer agency costs of debt.[57] Also, tangible assets should retain more value in case of bankruptcy, lowering the costs of financial distress. Consequently, the higher the tangibility level, the higher the willingness of lenders to provide these firms with (cheaper) loans and as a result, the higher leverage. The negative relation of *market-to-book* with leverage is argued to come from two things. As the market-to-book ratio is a proxy for the investment and growth opportunities a firm has, we would expect firms with a high ratio to have low levels of leverage as leverage sometimes forces companies to pass up profitable investment opportunities and thereby increases the underinvestment costs. Another explanation for the negative relationship is that firms are expected to *time* the market by issuing equity when the shares prices are perceived to the high. High market-to-book ratio firms will issue more equity and therefore have lower leverage ratios. The factor *size* is somewhat more difficult to back by the theory. On the one hand, Rajan & Zingales argue that size could be a proxy for the inverse probability of default since large firms are more diversified and fail less often.[62] This would propose a positive effect of size on leverage. On the other hand, according to the pecking-order theory, size may also be a proxy for the information asymmetry between insiders of the firm and the capital markets. This asymmetry is expected to be smaller for large firms, lowering the agency costs of equity, thereby increasing the capability of large firms to issuing 'information sensitive securities like equity' and lowering the leverage ratio.[63] At last, the factor *profitability,* which showed a statistically weak negative relation with leverage. According to the pecking-order theory, profitable firms will use its internal funds first to finance investment opportunities, arguing that profitable firms should have lower leverage ratios. Following Jensens' free cash flow hypothesis however, profitable firms are expected to take on more debt because of the disciplinary role of debt, lowering the incentive to waste the profits. When focusing on the supply side at last, suppliers should be more willing to lend money to profitable firms with current cash flows.[64]

[62] Rajan, R.G. & Zingales, L. (1995*). 'What Do We Know About Capital Structure? Some Evidence from International Data', The Journal of Finance, 50 (5),* p.1451
[63] Rajan, R.G. & Zingales, L. (1995). 'What Do We Know About Capital Structure? Some Evidence from International Data', *The Journal of Finance, 50 (5),* p.1457
[64] Rajan, R.G. & Zingales, L. (1995). 'What Do We Know About Capital Structure? Some Evidence from International Data', *The Journal of Finance, 50 (5),* p.1452

1.3.2 Frank & Goyal (2007)

The second interesting paper on the firms' capital structure and its determinants that will be discussed here is the one of Frank & Goyal. Frank & Goyal realized that the importance of leverage determinants found at previous studies had changed over the decades due to changes in financing behavior and market circumstances. The factor 'profitability' for example played a very powerful role in determining leverage during the 1980's, while in later periods profits became less important in leverage decisions. Also capital structures themselves were subject to change over the years. While US firms took on extra leverage during the 1980's due to the pressure for corporate control, from the 1990's onwards, more firms started to make use of publicly traded equity.[65] With this in mind, Frank & Goyal realized that it was important to examine the changes in the firms' capital structure and its determinants over time and therefore decided to examine a long list of factors found at prior research and to determine whether or not these factors were still considered to be reliable for predicting leverage.

Based on a sample of publicly traded US firms from 1950 to 2003, Frank & Goyal found that a set of six factors accounted for more than 27% of the variation in leverage. Four out of these so called 'core factors' where the factors already found by Rajan & Zingales. These factors were complemented by the 'industry median leverage' and 'expected inflation' that both showed to have a positive effect on leverage. The median industry leverage is often seen as a proxy for target capital structure and can therefore serve for managers as a benchmark in determining the capital structure. This variable actually accounted for 17.5 percent of the variation in leverage and therefore seemed to be the most important factor missing at the study of Rajan & Zingales. The sixth factor, expected inflation, also proved to have some explanatory power on leverage, but, due to the small number of observations this finding was based on, it was not seen as a very reliable factor in the end.

At the concluding part of their study, Frank & Goyal realized, just as their colleagues did, that there was still much to be discovered within the world of understanding the capital structure decision and its determinants, both on the empirical aspect, since at best about 25% of the variation in leverage had been explained by firm and industry specific, time variant variables, as in the theoretical area, as there was no unified theoretical model of leverage available that could directly account for all the factors found in recent studies. Although not being able to fully explain the capital structure decision, both the static trade-off and pecking order theory did provide valuables tools for explaining empirical findings on this matter.

[65] Frank, M.Z. & Goyal, V.K. (2007). 'Capital Structure Decisions: Which Factors Are Reliably Important?', p.2

1.3.3 Lemmon, Roberts & Zender (2008)

Although Rajan & Zingales' and Frank & Goyal's studies provided some interesting results, still, only 19 to 27 percent of the cross sectional variance in leverage ratios was explained, leaving a large component of leverage unexplained by the traditional model. Lemmon, Roberts and Zender (2008) were aware of the low R^2 resulting from empirical research on leverage determinants and therefore 'tried to quantify the extent to which existing determinants govern cross-sectional and time-series variation in observed capital structures by examining the evolution of corporate leverage'.[66] This empirical study was done on a sample consisting of all nonfinancial firm-year observations in the annual Compustat database between 1965 and 2003, which is a much larger sample compared to the one of Rajan & Zingales.

The most important result stemming from the paper of Lemmon et al. was that leverage ratios exhibited two prominent features that had not yet been explained by earlier identified determinants. The first feature stated that leverage ratios showed a significant level of *convergence* over time, meaning that firms with relatively high (low) leverage ratios tend to move towards more moderate levels. According to Lemmon et al. this convergence of leverage ratios was, at least partially, due to the role of *initial leverage* as an important variable in firms' net issuance decisions. This statement was confirmed when the variable 'initial leverage' proved to be highly significant when adding it to the original model of Rajan & Zingales. The second feature depicted that, despite the convergence, leverage ratios stayed remarkably *stable* over time. This finding resulted in the statement that leverage ratios exhibit both a *transitory* and a *permanent* component.[63] Realizing this, Lemmon et al. decided to regress leverage on firm fixed effects, capturing the permanent component of leverage, which resulted in an R^2 of 60 percent, indicating that the majority of variation in leverage in a panel of firms is time invariant and is largely unexplained by previously identified determinants'.[63] After noticing the importance of firm fixed effects on future leverage ratios, Lemmon et al. performed a variance decomposition, or ANCOVA analysis to quantify the explanatory power of existing determinants. The results were staggering; adding firm fixed effects to the original leverage determinants found by Rajan & Zingales resulted in an increase in R^2 from 18 percent to 63 percent, where firm fixed effects accounted for 95% of the explanatory power of the model. This shocking result did not necessarily imply however that existing determinants were of little value in explaining variation in leverage ratios. Lemmon et al. reasoned 'if much of the explanatory power of existing determinants comes from cross-sectional variation, then the

[66] Lemmon, M.L., Roberts, M.R., Zender, J.F. (2008). 'Back to the Beginning: Persistence and the Cross-Section of Corporate Capital Structure', *The Journal of Finance, 63 (4),* p.1576

importance of these determinants will necessarily fall as the firm fixed effects remove all such variation'.[67] As pointed out by this paper, much work still needs to be done to understand the capital structure puzzle.

1.4 Conclusion

The goal of the first section of this study has been to give an introduction into the main theories on capital structure and to summarize the most important empirical studies and findings in this stream of research. The theoretical background on the static trade-off and pecking order theory will serve as a tool to develop the hypotheses on the effects of economic crises on leverage and its determinants and will help to interpret and explain the results found in this study. The summarized studies of Rajan & Zingales (1995), Frank & Goyal (2007) and Lemmon, Roberts & Zender (2008) on the other hand, will serve as the basis for the empirical research of this study, as parts of their empirical tests, although performed on different countries (six largest economies of Europe instead of on the US or G7), and more importantly, within a timeframe were two large economic crises took place, will be replicated. In this way, this empirical study responds to the call of Frank & Goyal and Lemmon et al. to make 'structural estimations on leverage ratios and its leverage determinants'[68] or to 'examine the changes over time'[69], to get a better understanding of how capital structures and their determinants behave under different circumstances.

The remainder of this study is structured as follows. At section 2, a short introduction of the two crises that took place within the timeframe of this study will be given. Also, the hypotheses will be developed here. After this, the data and sample selection and summary statistics will be discussed at section 3, while the actual empirical research and the implications of the findings for capital structures and existing determinants will be discussed at section 4. Section 5 concludes and discusses potentially interesting issues for future research.

[67] Lemmon, M.L., Roberts, M.R., Zender, J.F. (2008). 'Back to the Beginning: Persistence and the Cross-Section of Corporate Capital Structure', *The Journal of Finance, 63 (4),* p.1590
[68] Lemmon, M.L., Roberts, M.R., Zender, J.F. (2008). 'Back to the Beginning: Persistence and the Cross-Section of Corporate Capital Structure', *The Journal of Finance, 63, (4),* p.1605
[69] Frank, M.Z. & Goyal, V.K. (2007). 'Capital Structure Decisions: Which Factors Are Reliably Important?', p.2

Section 2: Crises

As the aim of this study is to investigate the effect of economic crises on firms' capital structures and leverage determinants, it has been chosen to perform the empirical study on data of public firms from the six largest European economies from January 1993 until December 2011. Within this timeframe, two large economic crises took place. In the first place, the collapse of the dot-com bubble in 2000 and secondly, the 'global financial crisis' starting in 2008. The emergence and consequences of both crises will shortly be discussed hereafter. After that, the exact definition of a recession will be given and it will be explained how this recession definition will help us, further on in this study, to capture the effects of financial crisis on the capital structure (determinants).

2.1 The collapse of the 'dot-com bubble'

The 'dot-com' bubble, also referred to as the 'internet bubble', 'millennium bubble' or 'technology bubble', covered the period from 1995 to 2000. Over this period, the 'Dow Jones Industrial Average' rose from 3,600 in early 1994 to 10,000 in 1999 and peaked at 11,722.98 in January 14, 2000.[70] The enormous stock market increase, which could hardly be justified in any reasonable terms, already indicated that it could be the case that a bubble was arising. Basic economic indicators did not even come close to tripling figures.[71] The bubble was mainly fed by the emergence of the internet, enabling firms to rapidly expand their customer base. In March 2000, the climax, and simultaneously the end of the dotcom bubble was reached. The market capitalization of U.S. publicly traded internet stocks were estimated to be over $1 trillion dollars prior to the collapse, $843 billion as of June 2000 and $572 billion in early December 2000. About fifty percent of the value was lost.[72]

The United States were not the only place where the dot-com bubble emerged. Large stock price increases occurred in many countries within more or less the same time frame. Between the years 1995 and 2000, the real stock market values of Germany and France almost tripled, while that of the United Kingdom doubled. Nevertheless, the United States realized the highest valuation increase as their value almost sextupled. The burst of the bubble kicked in a little later at countries other than the United States. Also, the severity of the fall of the stock exchanges within the European countries did not even come close to the drop faced by the NASDAQ, implying that it were the United States who faced the severest problems arising from the burst of the tech bubble.

[70] Shiller, R.J. (2005). ´Irrational Exuberance', 2nd Ed., Princeton University Press, p.2
[71] Shiller, R.J. (2005). ´Irrational Exuberance', 2nd Ed., Princeton University Press, p.2
[72] Demers, E. & Lev, B. (2001). 'A Rude Awakening: Internet Shakeout in 2000', *Review of Accounting Studies, 6,* p.331

An interesting feature of the dot-com bubble was that most of the market values of internet firms at that time were based on sheer trust and goodwill. Internet firms had almost no physical collateral, leading to extremely low tangibility levels. The market-to-book ratios on the other hand were extremely high because of the enormous increases in share prices. Also, due to the rise of new financial instruments, firms were able to attract more leverage than ever before, while their collateral to that leverage was quite small. As a consequence of the collapse of the dot-com bubble, companies ran out of capital and faced enormous debt levels. As a result, many technology corporations had to start deleveraging although low interest rates and continued economic growth provided little incentives to actually deleverage.[73] These low interest rates and continued economic growth are two important features of the period after the collapse of the dot-com bubble and stand in sharp contrast with what happened after the 2008 financial crisis. The main reason for the low interest rates and continued economic growth were that the financial system was not really affected by the dot-com crisis (as was the case during the financial crisis) and that mostly the technology sector experienced the negative effects of the collapse of the bubble, instead of the entire economy.

2.2 The global financial crisis

The global financial crisis, also mentioned as the 'sub-prime crisis' or 'credit crunch', has by many economists been considered as the worst financial crisis ever since the Great Depression.[74] The crisis was triggered by the bursting of the US *housing bubble*. This bubble, which peaked in 2005 and 2006, emerged through the availability of easy credit and money inflow and the general assumption of consumers that unprecedented debt loads could be taken on, leading to nearly a decade of exceptionally high growth. Since institutions and investors around the world wanted to profit from the increasing U.S. housing prices, complex financial products like mortgage backed securities (MBS) and collateralized debt obligations (CDOs) were invented. These financial instruments, mainly issued by investment banks and financial institutions which were not part of the commercial banking system and therefore allowed to operate unregulated, derived their value from mortgage payments and housing prices.[75] As housing prices started to decline at the end of 2006 however, financial institutions and investment banks that had borrowed and invested heavily in the MBS market started to report significant losses.[76]

[73] McKinsey Global Institute (2010). 'Debt and Deleveraging: The Global Credit Bubble and Its Economics Consequences', p.1-94.
[74] Haidar, Jamal Ibrahim (2012). 'Sovereign Credit Risk in the Eurozone', *World Economics vol. 13(1),* 123-136
[75] Simkovic, M. (2011). 'Competition and Crisis in Mortgage Securitization', *Indiana Law Journal vol. 88*
[76] IMF loss estimates, 2010

Although these losses by themselves already lead to considerable problems, the problems were compounded through the trade in another financial product which increased the linkage between large financial institutions; the Credit Default Swaps (CDS). The Credit Default Swap is an insurance contract on MBSs and protects investors against the default risk on these securities. As sellers of CDSs started to buy matching CDSs to protect themselves against default risk, the entire global financial system became intertwined through a totally unregulated CDS market that grew astronomically from $900 billion at the turn of the millennium to over $50 trillion in 2008 just before this crisis.[77]

When housing prices continued to decrease, more and more people were saddled up with houses being worth less than their mortgages loans, resulting in increasing rates of mortgage defaults. As a consequence, the Mortgage Backed Securities market lost most of its value which resulted in additional problems since most of the CDSs were executed, deteriorating the balance sheets of (investment) banks all around the world. The collapse of the MBS and CDS market and the ignorance about the real values of the securities lead to the evaporation of trust within the financial system and as a consequence, the freezing of private credit markets. This freezing of credit markets, insolvency issues within the banking sector and even failures or government takeovers of Lehman Brothers, AIG and Fannie Mae and Freddie Mac finally lead to large problems within the real world economy. As described in Ivashina & Scharfsteins paper on bank lending during the financial crisis, new loans to large borrowers fell by 47% during the peak of the financial crisis.[78] This meant that many non financial businesses were not longer able to attract finance to continue doing regular business. This credit tightening, together with a damaged investor confidence and banking panic resulted in large security losses on the global stock markets during 2008 and 2009, a decline in international trade and consequently, an economic slowdown. Because of the impact of this economic slowdown on corporate revenues and the continued impairment of banks, many companies were forced to reduce their debt burdens as loans came due, while it became much more difficult to refinance debt because of more restrictive covenants.

From the descriptions of the dot-com and financial crisis it can be noticed that these two recessions were of a very different nature. During the dot-com crisis, the value lost mainly came from falling stock prices of technology firms. As a result, especially technological corporations were hit. These losses however, did not cause widespread household or firm bankruptcies, leading to only a mild recession and quite unaffected lending terms and interest rates. During the financial crisis of 2008

[77] PIA Connection, 2008
[78] Ivashina, V. & Schaftstein, D. (2010). 'Bank Lending During The Financial Crisis of 2008', *Journal of Financial Economics 97,* 319-338

and 2009, however, the losses were mainly in the form of debts that could not be paid off. Households could not pay their mortgages and banks and financial institutions faced huge losses, resulting in a large recession were not only demand for leverage fell, but also supply because of solvency and liquidity problems of financial institutions. This combination of a severe recession and a banking crisis put upward pressure on interest rates, increasing the costs of corporate and banking borrowing and resulted in tightened lending terms.[79]

2.3 Recession

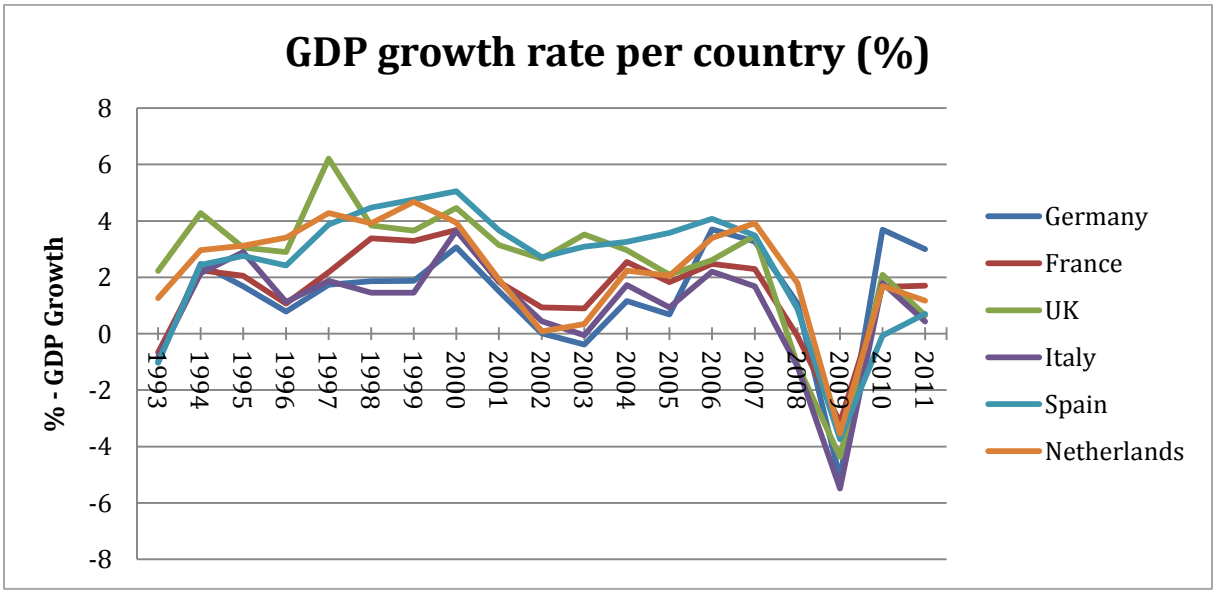
As the two crises within the timeframe used for this study have shortly been discussed, we now move to the issue of how to address the effect of crises on firms' capital structures and leverage determinants. To do this, we first need a clear definition of when a country experiences a crisis. Subsequently, a crisis dummy variable can be generated that takes on the value 1 if a country experiences, according to the definition, a crisis in a certain year and 0 otherwise. The problem is however, that no clear definition of when a country is in a '*crisis*' exists. Fortunately, there is a definition of when a country is in a '*recession'.* According to the National Bureau of Economic Research (NBER) a country experiences a recession if it faces *'two consecutive quarters of decline in real GDP'*. Since information on quarterly GDP growth rates is available through the World Bank, a crisis dummy variable could be generated based on the previous definition. As we have seen at the previous part, the two crises within this timeframe were quite different, both in the way how they emerged and how they affected the economies. As the dot-com crisis is more seen as a (technological) corporate crisis, while the financial crises affected the entire financial system, it could be that leverage is affected in very different ways. Therefore, after investigating the effects of crises in general on the leverage ratios, both the effects of the individual crises on leverage will be studied by constructing two extra dummy variables; a 'dot.com dummy' variable that takes on the value of 1 if a country experienced a recession during the collapse of the dot.com bubble and 0 otherwise, and a 'financial crisis dummy' variable that works the same way, but than during the financial crisis.

As can be seen from the graph below, in which yearly GDP growth rates have been depicted instead of quarterly growth rates to get a clearer picture, the shift from the term 'crisis' to 'recession' has an important implication. Although countries might experience the effects of a crisis like the burst of the dot-com bubble, this does not necessarily mean that this country automatically ends up in a recession. All countries did show decreasing GDP growth rates from the year 2000 until 2003, but

[79] Ivashina, V. & Schaftstein, D. (2010). 'Bank Lending During The Financial Crisis of 2008', *Journal of Financial Economics 97,* p.337

they did not all face a recession. In fact, only Germany and Italy experienced a short and mild recession, while Spain and the UK did not even experience one quarter of negative growth. Apparently, the collapse of the dot-com bubble did not hurt most European countries that hard that it pushed them into recession. When looking at the financial crisis, the results seem to be more in line with the 'crisis theory'. All six countries experienced negative GDP growth rates for several periods, making especially this recession period very interesting for this study.

Figure 1: Yearly GDP growth rate per country from 1993-2011. The yearly GDP growth rates of each individual country from the dataset have been depicted over the entire time frame used for this study. The actual marking of recession periods is done based on quarterly GDP growth rates, but, as a graph based on quarterly data provides us with a sloppy picture, it has been decided to use yearly GDP growth rates for this figure. Yearly and quarterly GDP growth rates have been retrieved from the World Bank.



2.4 Hypotheses

After having shown the presence of at least one large economic recession in the timeframe used for this study, hypotheses will now be developed on the effects of recessions on the firms' capital structure and the incorporated leverage determinants. After this, at section 3 and 4, these hypotheses will be tested by means of empirical tests, hopefully enabling us to reach conclusions about which underlying economic mechanism holds during recessions and which alternative interpretations do not.

At first, the expected effect of recessions on leverage ratios. Although Lemmon et al. concluded that leverage ratios tend to be very stable over time, when looking at the existing theories on capital structures, is seems that leverage ratios could be affected by recessions. According to the static trade-off theory, which tries to strike a balance between the beneficial and detrimental effects of debt to the value of the firm, leverage ratios would be expected to fall during recession periods.

According to this theory, one of the advantages of debt is making use of the tax shield. During crisis however, firms tend to have lower profits and therefore need less interest deduction to offset the firm's pretax income.[80] Another positive feature of leverage according to static trade off and free cash flow theory is the disciplinary roll of debt. Debt would lower the incentive of managers to waste free cash flow since most of the free cash flow will directly be transferred to bondholders through interest payments. As the theory predicts less wasteful activities when free cash flows are low, the need for leverage during economic crises is expected to be lower. Taking these effects into account, it seems that the two positive effects of debt mentioned by the static trade off theory are not so much needed during recessions. The negative effects of leverage, on the other hand, are actually worsened during recessions, offsetting the positive effects of leverage even more. Bankruptcy costs for instance, are expected to be higher because of the higher chances of bankruptcy during recessions, increasing interest rates and thereby increasing the costs of leverage. Also, agency problems and costs are expected to be more severe in times of recessions. As managers are residual claimants, their wealth is reduced relative to that of bondholders during economic downturns. Also, as bankruptcy chances increase, the probability that managers try to 'milk the property' increases. Consequently, it seems that leverage is not as advantageous during recession periods as it is in normal times, thereby lowering the optimal amount of leverage. As, according to the static trade off theory, managers should actively offset deviations from the optimal leverage ratios, and leverage seems to be more costly in times of recessions, leverage ratios are expected to be lower during economic downturns.

While the static trade-off theory clearly predicts decreasing leverage ratios as a result of a recession, the pecking-order theory is not so clear on this issue. According to this theory, because of information asymmetries, firms will first use internal funds to finance investment opportunities, then debt and issue equity as a last resort. On the one hand it states that managers are generally not really interested in setting specific debt targets and that leverage ratios will never be adjusted to certain 'optimal' levels because of changing circumstances.[81] This would indicate that leverage ratios would not be affected by recessions. On the other hand, it could be reasoned that, because internal funds are expected to be lower during recessions and share prices are likely to be underpriced because of fear in the market, that debt is a very important way of financing during crises to stay being able to finance positive net present value investment opportunities or just do

[80] Ross et al. (2010).'Corporate Finance', 9th Ed., McGraw-Hill Book Co., New York
[81] European Central Bank. (2012). 'Corporate Indebtedness in the Euro Area', *Monthly Bulletin (Feb),* p.95

regular business. It therefore seems that leverage ratios are not, or positively, affected by recession periods.

As pointed out, the two main theories on capital structure provide us with different predictions on how leverage ratios are affected during recession periods. Although Breadley & Myers (1984) and Masulis (1980) have found that, when looking at the aggregates, the pecking order theory does a better job at explaining leverage ratios than the static trade off theory does, indicating that leverage ratios should be not or positively affected by recessions, the first hypothesis is that leverage ratios are *negatively* affected by recessions. The reason for expecting the static trade-off to be the right theoretical mechanism when explaining leverage during recessions, is that the pecking order theory is mainly about the financing decision of investment opportunities, while the static trade-off theory is more about the general firms' capital structure. As there are expected to be far less positive net present value investment opportunities in times of economic downturns, the pecking order theory is expected to lose its importance when explaining capital structures during recessions. Also, according to recent surveys, most firms reported that they do have specific target leverage ratios, which ties with the static trade-off theory.[82] Performing empirical tests will hopefully enable us to reach a conclusion on which of the two underlying theoretical mechanisms does the best job at explaining leverage ratios during recession periods and consequently, which of the two interpretations can be ruled out when explaining leverage during economic downturns. To summarize, the first hypothesis on the firms' capital structure during recessions is:

H_1: *Leverage ratios are negatively affected by economic recessions.*

After investigating the general effect of recessions on the firms' capital structure, a distinction will be made between the effects of the dot-com crisis and the financial crisis. As described at the former section, especially the financial crisis resulted in a deep recession were households, corporations and the financial system were severely affected. As a result, interest rates went up and lending terms were tightened during the financial crisis, making it more unattractive and expensive to take on leverage. During the dot-com crisis, interest rates were quite low and there was only a mild crisis. It could therefore be that the effects of recessions on firms' leverage ratios differ for both crises.

Next to investigating how the firms' capital structure is affected by economic crises, another purpose of this study is to check if and how the relation of the main leverage determinants with

[82] European Central Bank. (2012). 'Corporate Indebtedness in the Euro Area', *Monthly Bulletin (Feb),* p.95

leverage is affected by recessions. According to Frank & Goyal, expected bankruptcy costs increase during economic downturns because of higher chances of bankruptcy and larger expected losses in the case of bankruptcy. Also, agency costs of debt are expected to go up during recessions as managers' and shareholders' wealth is reduced.[83] As a consequence of the higher bankruptcy and agency costs, it seems logical that banks and bondholders require more certainty about the financial health of a firm and consequently attach more value to several financial measures to assure that the firm is able to pay back its loans. This expectation is actually confirmed by the finding of Kwan that banks tightened their lending terms and standards to unprecedented levels during the financial crisis of 2008 and 2009, discount on large loans were deduced and risk premiums on more risky loans were raised. Considering these changing market circumstances and different requirements of banks and bondholders during economic downturns, it seems very plausible to expect that the sensitivities and thereby the impact of the existing leverage determinant on leverage will be affected by crises.

As a consequence of the higher bankruptcy costs and the stricter bank requirements, it is for example expected that the factor *size,* which is seen as an inverse proxy for bankruptcy, since larger firms are expected to be more diversified and to fail less often, has a more positive effect on leverage during crises compared to normal times. Also, the factor *tangibility*, which is a proxy for the amount of collateral a firm holds and thereby diminishes the bankruptcy costs, is expected to get a more positive impact on leverage as well. For these factors, it is expected therefore that their already positive effects on leverage found at earlier studies are magnified in times of recessions. For the factor *profitability* this hypothesizing goes into the other direction. Profitability has generally shown a negative effect on leverage. This negative effect was explained by Myers & Maljuf by stating that firms prefer to finance with internal funds than with debt. As banks tighten their lending terms and the risk premiums on loans are generally higher during recessions, it seems that this pecking order explanation of Myers & Maljuf even gains force, thereby expecting an even more negative coefficient for the factor profitability. On the other hand, profitability could also be seen as an indicator of a firms' financial health. More profitable firms have lower chances of bankruptcy, increasing the willingness of banks and bondholders to supply these firms with loans. Reasoning this way, the generally negative coefficient would be expected to become less negative or maybe even positive in times of recession. The fourth and last factor found by Rajan & Zingales, *market-to-book*, has also proved to have a negative impact on leverage. The main theoretical explanations

[83] Frank, M.Z. & Goyal, V.K. (2007). 'Capital Structure Decisions: Which Factors Are Reliably Important?', p.11

given for this negative relationship were that high market-to-book firms have higher costs of financial distress and that firms time the market, issuing stock when their stock price is high relative to book value. Combining these theoretical explanations with the stricter lending terms and increasing bankruptcy costs in times of recessions, it seem that banks are even more cautious with providing high market-to-book firms with loans and that high market-to-book firms prefer issuing equity even more compared to taking on loans. It is therefore expected that the market-to-book factor shows a more negative coefficient during recessions.

All four factors discussed above are similar in a way that they all provide banks and bondholders with information on how much risk they face when providing firms with loans. As risk and the resulting costs are major issues in times of recessions, it has been hypothesized that the relation of these four factors on leverage changes during recession periods. Another factor included in this study is a firms' *cash flow volatility.* This factor is generally seen as a proxy for risk and can therefore be compared with the other four determinants as this factor again provides the lenders with information regarding the risk they face. As it has been stated that banks are more cautious with proving loans during crises, this determinant also is expected to become more negatively correlated with leverage for the crisis sample.

The two last factors that are included in this study are *initial leverage* and the *median industry book leverage*, found by Lemmon et al. to be the most important leverage determinants missing in Rajan & Zingales' study. These factors are different from the earlier ones mentioned, as they do not give much information regarding the riskiness of the firms, but more about the importance of historical or industry leverage ratios when determining a firms' own capital structure. Although both factors have shown very positive relations with leverage in earlier studies, it is expected that both coefficients lose some of their value. Although it seems to make sense that managers consider initial leverage- or industry leverage ratios when deciding on the firms' net issuance decisions during normal times, it also seems plausible that the importance of stable leverage ratios or having leverage ratios which are in line with the industry average ratios decreases in times of recessions. During economic recessions, firms are expected to care more about surviving than about having stable or normal leverage ratios.

As described at this section, there seem to be many reasons to be believe that the relations and thereby the coefficients of the existing well known leverage determinants are different during crises compared to during non-crisis periods. Some theories might gain power when explaining the relation of several determinants with leverage, while others might lose power or can even be ruled

out. The second hypothesis will therefore be that the impact or relation of the included leverage determinants on leverage will change during recession periods.

H_2: *The relations of the well known leverage determinants with leverage are different during recession periods.*

After testing this hypothesis on the full sample, a distinction will later be made between the individual countries, to check if the results that have been found at the European level, apply to the individual countries as well.

Section 3: Data description and summary statistics

The theoretical foundation has been laid and the hypotheses have been developed. Before going to the actual regression models however, an introduction into the dataset and the most important variables used in this study will be given. At section 3.1, it will be described how the dataset has been put together, how it will be used and how the main variables have been constructed. Also, a short recap on what all variables exactly measure and where they are proxies for will be given at this section. After this, at section 3.2, the summary statistics, as a consistency check of the data and to get a first impression and understanding of all variables, will be shown. Also, correlations will be depicted to get a first understanding of how the various factors relate to both book and market leverage.

3.1 Dataset

As mentioned earlier, the goal of this study is to explore the effects of financial crises on firms' capital structures and leverage determinants. This will first be done on a general sample, consisting out the all observations from the six selected European countries, to get a general understanding of the effects within Europe. From now on this sample will be referred to as the '*European sample'*. Subsequently, the empirical tests will partially be replicated on the individual countries to explore if the various countries are affected in the same way. Next to the fact that using a European sample enables us to also look at country differences from within the sample, it also gives an extra dimension to this study as it enables us to check whether the main findings and conclusions from earlier studies which have mainly been done on U.S. samples also hold for European countries under different circumstances.

The European sample does not consist out of observations from all European countries, but just out of observations from six member states; Germany, France, the United Kingdom, Italy, Spain and the Netherlands. The reason for focusing on just these European countries is that they are, according to the International Monetary Funds, the six largest economies of the European Union and are therefore likely to represent sufficient firms and observations to make comparison meaningful.[84] Another reason is that, albeit these six economies all have the attribute of being large, they do have very different characteristics and can therefore be affected by crises in different ways. The final sample consists out of all non-financial firm-year observations of the six countries from the Compustat Global annual fundamentals database from January 1993 to December 2011. As the annual fundamentals database does not provide any share price information, which is needed to

[84] IMF, April 2012

compute market equity, this variable has been retrieved from the Compustat Global Security Daily database. Because Compustat Global does not automatically converts all currencies from before 1999 to Euros, daily currency exchange rates had to be retrieved from the Federal Reserve Bank. With these exchange rates, all financial information from before 1999, which was given in the local currency by that time, has been converted into Euro's, enabling us to actually compare the six countries.

All financial firms like banks and insurance companies (SIC codes 6000-7000) have been eliminated from the dataset as their capital structure is strongly influenced by explicit investor insurance schemes like deposit insurance, or capital requirements imposed by the government which may directly affect their capital structure. Furthermore, their debt-like liabilities are not strictly comparable to the debt issued by nonfinancial firms. Finally, all ratios have been winsorized, *not dropped*, at the 0,5% level in both tails of the distribution to smooth the effect of outliers and eradicate errors in the data. Through winsorizing the data, the 0.5% smallest and largest observations are replaced by the next smallest and largest observations within the sample. The reasoning behind winsorizing the data instead of simply dropping it (as is done by Lemmon et al. and Rajan & Zingales) is that one of the purposes of this study is to understand the effect of economic downturns on the capital structure and its determinants. Since crisis periods are most probably the periods in which extreme outcomes are observed, it would be very wasteful if these extreme observations would have been dropped. Through winsorizing however, the most extreme values are still taken into account, however at a somewhat more moderate pace. The final dataset contains 50,188 firm-year observations of 4,451 companies over six countries.

3.2 Description of variables

Although most variables incorporated in this study have already been mentioned at previous parts, before turning to the summary statistics, a somewhat more extensive explanation of the dependent and independent variables and the reasons of why they have been included in this study will be mentioned here.[85]

At first, the dependent variable *leverage*. As the main goal of this thesis is to understand the effect of recessions on leverage levels and how several factors are correlated with leverage during economic downturns, it is necessary to define leverage. Many different empirical definitions of leverage have been used over the years. As book and market leverage ratios have been defined as measures of

[85] Because of space considerations, the exact construction of all the variables used in this study is detailed in the appendix.

leverage in the studies of Rajan & Zingales, Frank & Goyal and Lemmon et al. which serve as the basis for this research, and as they have been advocated by many scholars, these leverage ratios will also be used in this study. Also, due to the different constructions of both leverage measures, they can be affected by recessions in very different ways. *Book leverage*, as the ratio of total debt over book assets, is generally seen as the backward looking leverage ratio, while *market leverage*, as the ratio of total debt over total debt plus market equity, is seen as forward looking as markets are generally future orientated. To get a first impression of how these leverage ratios have behaved over this studies' timeframe, they have been plotted in the graphs depicted below. Figure 2 depicts the book leverage ratios over the entire timeframe for the European sample and all individual countries, while figure 3 does this for the market leverage ratio.

Figure 2: Yearly average book leverage ratio from 1993-2011. The yearly book leverage ratios, defined as the ratio of total debt over book assets, has been depicted here for the European sample and each individual country.

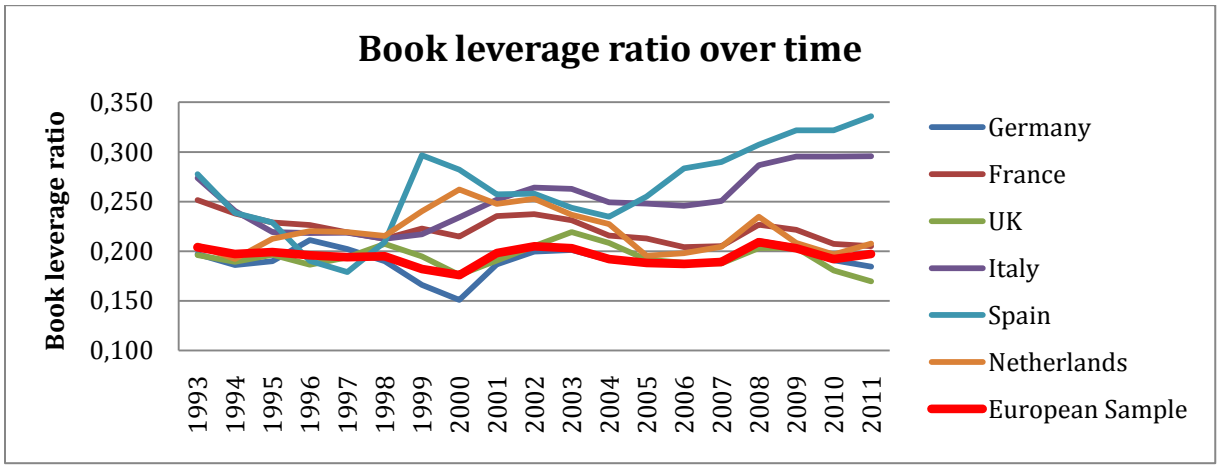
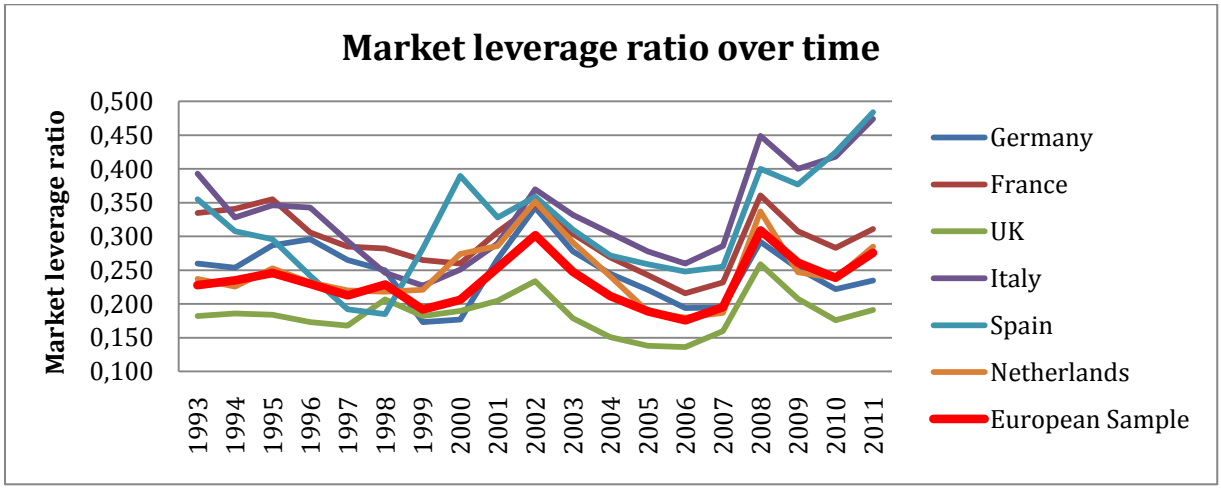


Figure 3: Yearly average market leverage ratio from 1993-2011. The yearly market leverage ratios, defined as the ratio of total debt over the sum of total debt and market equity, has been depicted here for the European sample and each individual country.



When looking at both figures, it can immediately be noticed that the graph of the European sample depicts two peaks. Interestingly enough, these peaks start emerging exactly at the moment when GDP-growth rates, depicted at figure 1, start to decline. By the time a country actually starts to face a recession, which is often about one to two years after the GDP-growth rates started declining or after the collapse of a bubble, leverage ratios seem to be at their peak and start declining. Just looking at these graphs, it seems therefore that, although leverage tends to increase in the period prior to a recession, recession periods seem to have a negative effect on leverage.

Another interesting thing that can be noticed when comparing the graphs of both book and market leverage, is that the market leverage ratio tends to fluctuate much more over time than the book leverage ratio does. This can be explained by considering the construction of both ratios. The market leverage ratio is much more volatile, largely driven by valuation effects owing to movements in equity prices.[86] In other words; as share prices are incorporated in the market leverage ratio, this variable fluctuates much more than the 'stable' book leverage ratio. This is exactly the reason why the use of market values contrasts with the perspectives of many corporate practitioners. They suggest that the use of book values is popular because of the volatility of the stock market. Because of this volatility, 'market-based debt ratios move around too much'.[87]

Apart from the dependent variables, several independent, leverage determinants have been included in this study. The first one is *initial book leverage*, which is the first observation of book leverage, reported for each firm. This variable is included to test the convergence of corporate capital structures found by Lemmon et al. and thereby the importance managers attach to initial leverage ratios when determining the firms' net equity issuance decisions. Complementary to this leverage determinant, the four factors found by Rajan & Zingales are also included here as key determinants of capital structures. Theories of capital structure, described at the first chapter, suggest how these factors might be correlated with leverage. At first; *tangibility*. Tangible assets are assets that have physical existence, like land, machinery and buildings. As these assets generally have relatively fixed values, also in the event of bankruptcy or recessions, these assets tend to serve as collateral, diminishing the risk of the lender. Besides, as tangible firms should retain more value in liquidation, the agency costs of debt are reduced as well. Lenders should therefore be more willing to supply loans to tangible firms. The *market to book* ratio is a proxy for the investment and growth opportunities a firms has. When having high levels of leverage, firms have a higher chance of being forced to pass up profitable investments because they have already exhausted their debt

[86] European Central Bank. (2012). 'Corporate Indebtedness in the Euro Area', *Monthly Bulletin (Feb),* p.89
[87] Ross et al. (2010).'Corporate Finance', 9th Ed., McGraw-Hill Book Co., New York, p.483

reserves. Therefore, firms expecting high future growth and investment opportunities should use a greater amount of equity. The effect of *size* on leverage ratios is more ambiguous. On the one hand large firms tend to be more diversified and fail less often, lowering the probability of bankruptcy and increasing the willingness of lenders to provide large firms with loans. On the other hand, larger firms tend to have less information asymmetry, making it more attractive for firms to issue equity, thereby lowering debt. The proxy for size, the *logarithm of sales*, will try to capture how size is related to leverage during recession periods. The reason for taking to logarithm of size is that sales values are always positive which could result in heteroskedastic or skewed distributions. The log function mitigates this problem.

The last out of the four 'key determinants' is *profitability.* For this factor, there are also conflicting theoretical predictions about its effect on leverage. The pecking order theory predicts a negative relationship, because profitable firms will make more use of internal funds compared to external forms of financing. The free cash flow hypothesis however, expects profitability to have a positive effect on leverage as debt forces firms to commit to paying out cash by levering up, leaving less cash flow to be wasted. The last two factors included in this study are *median industry book leverage*, found by Lemmon et al. to be one of the most important leverage determinants missing in Rajan & Zingales' study, and *cash flow volatility*, included by Lemmon et al. as a proxy for risk. The higher the risk of a firm, the higher the financial distress costs, the lower the expected debt ratios. Especially the median industry book leverage factor has shown very high t-statistics in earlier studies, suggesting that managers consider industry leverage ratios as an important directive when deciding on the firms' net issuance decision. The exact construction of all variables can be found at appendix A.

3.3 Summary statistics and correlations

Now the interpretation and construction of all variables has been discussed, a start can be made with identifying how these variables behave over the different samples. Table 1 presents the summary statistics of the key variables used in this study for two samples. The full sample, consisting out of all observations on the depicted variables from 1993 to 2011, and the crisis sample consisting out of observations during recession periods only. As mentioned at section 2.3, an observation will be marked as a 'recession observation' if this observation is from a year in which two consecutive quarters of decline in real GDP took place. Before looking at the summary statistics for each individual country, the first goal of this study is to get a general understanding of how leverage ratios and determinants behave and are affected by crises, based on the entire sample.

The summary statistics depicted in table 1 are therefore based on the European sample, consisting out of all observations from the six countries. The more extensive version of table 1, where the summary statistics of each individual country have been depicted, can be found at the appendix.

Table 1. Summary Statistics of the most important variables used in this study. Means, median (between brackets) and standard deviations (within parenthesis) are presented for both the entire sample and the crisis sample. All ratios have been winsorized at a 0.5% level to smooth the outliers. The exact construction of the variables is presented in appendix A. The full sample consists out of all data on the depicted variables from 1993 to 2011. The crisis sample consists of data which has been market as 'crisis' data. A year gets a crisis mark if in this year two consecutive quarters of GDP decline have happened. At the appendix a more extensive version of this table has been depicted. Here, the summary statistics of each individual country are also shown, enabling us to identify the differences between the countries included in this study.

	Full sample (1993 – 2011)		**Crisis sample**	
Variable	**Mean [Median]**	**(SD)**	**Mean [Median]**	**(SD)**
Book leverage	0.19	(0.18)	0.21	(0.19)
	[0.16]		[0.18]	
Market leverage	0.23	(0.23)	0.29	(0.26)
	[0.17]		[0.25]	
Initial book leverage	0.20	(0.20)	0.20	(0.21)
	[0.16]		[0.16]	
Log(sales)	4.75	(2.47)	4.71	(2.54)
	[4.76]		[4.70]	
Market-to-Book	1.37	(1.70)	1.04	(1.42)
	[0.92]		[0.72]	
Profitability	0.05	(0.28)	0.01	(0.30)
	[0.10]		[0.07]	
Tangibility	0.25	(0.23)	0.21	(0.21)
	[0.19]		[0.14]	
Median industry book lev.	0.17	(0.11)	0.18	(0.12)
	[0.16]		[0.16]	
Cash flow volatility	84.67	(387.61)	91.54	(442.99)
	[5.03]		[4.59]	

A quick comparison of the two samples reveals some differences which are mostly consistent with intuition. The table for instance shows that during recession periods, firms are smaller (lower sales), less profitable, have fewer growth opportunities (lower market to book levels) and have less tangible assets compared to the full sample. Less straightforward and therefore more appealing is that the table also indicates that firms tend to have higher book and market leverage ratios during recessions. When considering the construction of both ratios, a higher market leverage ratio could partially be explained by falling share prices in times of recession. This fall in share prices lowers market equity levels and automatically the denominator of the ratio, increasing the total ratios' value. Looking at the market leverage ratio in this way, it seems that higher market leverage ratios

do not automatically imply that debt levels have actually increased during recession periods, as this ratio is highly sensitive to changing share prices. The observation that *book* leverage is also higher for the crisis sample compared to the full sample is much more interesting, as this ratio is not affected by changes in market equity. The increase in leverage during recessions would point at the pecking order theory, as opposed to the static trade-off theory, as the theory that predicts leverage during recessions in the right way. Another explanation for the higher leverage ratios could be the increase in leverage prior to a recession. This increase leads to leverage ratios which are above average, although leverage starts declining during recessions. When looking at the cash flow volatility variable, it can be noticed that cash flows tend to be more volatile in times of recession. Risk therefore seems to be higher during recessions, which is also consistent with intuition.

As at the last part of this study attention will also be paid to the differences across individual countries, a short interpretation and discussion of the county level summary statistics, which are reported at appendix B, will be given here. At first, it can be concluded that both book and market leverage ratios, although there are small differences, are fairly similar across countries both during normal as recession times. This observation is in line with what Rajan & Zingales have found when comparing leverage over the G-7 countries, as their conclusion was that 'firm leverage is fairly similar'.[88] Another similarity with Rajan & Zingales' paper is that the United Kingdom and Germany depict the lowest leverage ratios. Next to that, another interesting observation is that especially the United Kingdom seems to be hit very hard by recessions. The four factors log(sales), market-to-book, profitability and tangibility all experience a great drop when being in a recession. The negative value of -0.05 for profitability is most remarkable, as it indicates that the average operating income before depreciation in the United Kingdom was negative during recessions.

Although the summary statistics provide us with some interesting insights, no conclusions can already been drawn based upon just these statistics. Several empirical tests will have to be performed to actually be able to test the hypothesis and determine the statistical significance. Before doing so, a first impression on how all individual leverage determinants relate to the leverage ratios will be given by looking at the correlations, depicted at table 2. Again, these correlations are based on the European sample. In the appendix the correlations of all variables for each individual country are depicted. The correlations provide an insight into the direction of the relation between the variables by showing positive or negative signs. Besides, conclusions on the strength of these relationships can be drawn from the correlations by looking at the absolute values

[88] Rajan, R.G. & Zingales, L. (1995). 'What Do We Know About Capital Structure? Some Evidence from International Data. *The Journal of Finance, 50 (5),* p.1421

of the numbers; no relation exists when the correlations equals zero, while a perfectly linear relation exists when the absolute value of the correlation is one.

When first focusing on the signs of the correlations, the factors initial leverage, log (sales), market-to-book, tangibility and median industry book leverage seem to be correlated with leverage as the theory predicts. The correlation coefficients of the factor profitability however, indicate a positive relation with leverage. Although this positive relationship can be explained when reasoning according to the static trade-off theory, profitability has generally shown negative regression coefficients in earlier studies. Regression and correlation coefficients however, are not directly comparable as regression coefficients control for other independent variables included in the model, while correlation coefficients do not. It can therefore not yet be stated that this positive relation is an irregularity compared to what previous studies have found. Only when it appears that the regression coefficients of profitability at section 4 are also positive, it can be concluded that the relation of profitability and leverage is different for this sample. When looking at the country specific correlations depicted at the more extensive correlation table at appendix C, the issue of a positive profitability coefficient with leverage is already somewhat moderated. The factor profitability is actually negatively correlated with leverage for all countries except for the United Kingdom. As the United Kingdom accounts for a large part of the total number of observations from the 'European sample', this could be the reason for the positive correlations of profitability at table 2, although all other countries depict negative correlations.

The only factor that explicitly contradicts theory is cash flow volatility. This factor, which is a proxy for risk, is always positively related to leverage, while the theory expects risk to increase the cost of leverage, thereby decreasing the attractiveness of debt. From the absolute values of the correlations it can be confirmed that initial leverage and median industry book leverage were indeed the most important factors which were not incorporated in Rajan & Zingales' study. Both factors show correlation values of about 0.50 with leverage.

When focusing on the differences in correlations between the full and crisis sample, it can be noticed that the absolute values of all correlations change. The market-to-book factor for instance seems to become less correlated with leverage during crises periods. The factors log (sales) and tangibility on the other hand seem to get a higher correlation, indicating a stronger relation between the factors and leverage.

Table 2. C**orrelations** between the most important leverage determinants found in earlier studies and the book- and market leverage. The first two columns depict the correlations for the full sample while the last two columns show the correlations stemming from the crisis sample. The correlations for each individual country can be found in the appendix.

	Full sample (1993 – 2011)		**Crisis sample**	
Variable	**Book Leverage**	**Market Leverage**	**Book Leverage**	**Market Leverage**
Initial Leverage	0.523	0.410	0.536	0.422
Log (Sales)	0.214	0.256	0.250	0.289
Market-to-Book	-0.116	-0.316	-0.069	-0.255
Profitability	0.065	0.050	0.087	0.099
Tangibility	0.279	0.239	0.303	0.271
Median industry book lev.	0.446	0.438	0.439	0.449
Cash flow volatility	0.079	0.064	0.098	0.075

Again, some attention will also be paid to the correlations across the individual countries which are depicted at appendix C. At a first glance it seems that most factors are correlated to leverage in more or less the same way across countries. This is again in line with the statement of Rajan & Zingales about the similarity across countries when comparing the G7 countries. Tangibility, log (sales), initial leverage and cash flow volatility are always positive related to leverage. Market-to-book and profitability on the other hand are negatively correlated with leverage for all countries except for Germany and the United Kingdom. When looking at the differences of the correlations across countries and over the two samples, it can be seen that leverage determinants do not seem to be uniformly affected by recession periods as the absolute values of the correlations move in different directions.

The summary statistics and correlations discussed at this section have provided us with a first impression of the data and how the independent variables relate to the dependent variables. These figures do not provide us with hard evidence however. Unconditional correlations are interesting, but more interesting are the effects of the factors when other factors are also taken into account. This is exactly what is done with linear regression models, which will be estimated at section 4. After these empirical tests, the hypotheses can be confirmed or rejected.

Section 4: Empirical tests and results

The data, which has been described at the previous section, will now be used to perform the actual regressions to be able to confirm or reject the earlier formulated hypotheses. At first, it will be studied if and how firms' leverage ratios are affected during crises periods and if the two different crises have a different effect on leverage. At the same time, the quantitative importance of the stylized leverage determinants will be evaluated and discussed. After this, by including interaction terms in the model, the effect of crises on the relation of the stylized leverage determinants with leverage will be studied. At last, both tests will partially be replicated on the individual countries to identify whether large differences exist across countries on the effect of crises on both leverage and its determinants.

4.1 The effect of crises on leverage

As mentioned above, the first goal of this study is to find whether and which effect crisis periods have on the firms' capital structure. By estimating the regression model depicted below, the importance of the stylized leverage determinants in explaining leverage for European countries in the timeframe 1993-2011 can simultaneously be checked.

$$Leverage_{i,t} = \alpha + \beta X_{i,t-1} + \gamma Leverage_{i,0} + \delta D_{crisis,t} + \varphi D_{crisis,t-1} + \lambda D_{country} + \varepsilon_{i,t}$$

In this model, *i* indexes the cross-sectional unit, firms, and *t* captures the time unit, years. The dependent variable '$leverage_{i,t}$' denotes both book- and market leverage, where *book* $leverage_{i,t}$ represents the ratio of total debt divided by the firm´s book assets, while *market* $leverage_{i,t}$ represents the ratio of total debt divided by the sum of total debt and market equity. $X_{i,t-1}$ is a vector of 1-year lagged controlling variables, which is comprised of the factors described at section 3.2.; firm size, market-to-book, profitability, tangibility, median industry book leverage and cash flow volatility. There are several reasons for lagging these variables. First of all, they are lagged because it is expected that leverage can hardly directly be affected by changing controlling (accounting) variables. Also, by lagging the independent variables, concerns about the simultaneity or so called 'chicken-and-egg' problem are solved, since we know that x drives y and not the other way around. At last, these variables have also been lagged in the papers of Lemon et al. and Frank & Goyal, enabling us to compare the results. $Leverage_{i,0}$ represents a firms initial leverage, which is the first non-missing value for leverage. A detailed description of the construction of all variables has been reported at appendix A. The β and γ coefficient will measure the importance of the leverage determinants in explaining leverage. These coefficients will later be compared with the

coefficients found at the earlier mentioned studies to check whether large differences consist or whether these factors behave more or less homogenous over different countries and periods. $D_{crisis,t}$ is a dummy variable which is appointed the value 1 if a country has faced two consecutive quarters of decline in real GDP in a year and 0 otherwise. $D_{crisis,t-1}$ is the 1-year lagged version of the crisis dummy variable. Again, the reason for including a lagged variable is twofold. At first, there is evidence that firms' debt levels tend to lag the business cycle by about three quarters.[89] Besides, by lagging the dummy crisis variable, the simultaneity problem can be ruled out, as, when significant coefficients are shown, we can be sure that recessions cause changes in leverage ratios and not the other way around. The coefficients of interest to test the first hypothesis are therefore δ and φ, where δ mostly captures how book and market leverage ratios tend to behave directly when a country experiences a recession, while φ captures the indirect effect and indicates how leverage ratios are actually *affected* by recessions, or what the impact of recessions on future leverage ratios is.

At last, the error term; $\varepsilon_{i,t}$. With ordinary least square (OLS) regressions, this term is generally assumed to be homoskedastic, meaning that the variance of the error term is the same over all observations and therefore independently and identically distributed (*iid*).[90] This assumption however, is too restrictive when panel data is used. With panel data, each statistical unit (firm) contains several observations over a period of time. Since these observations are on the same firm, there is a potential problem of serial correlation, lowering the standard error and increasing the significance of an effect. To correct for this problem, standard errors have been clustered at the firm level following Petersen.[91] By clustering the standard errors at the firm level, it is assumed that observations for firm i are correlated in some unknown way, but that firms i and j do not have correlated errors. In other words; the error term is assumed to be possibly heteroskedastic and correlated within firms.

Next to the fact that it can no longer be assumed that observations are independently distributed over time with a longitudinal set of panel data, there is another issue that should be taken into account. As the data consists out of a combination of cross-sectional and time-series data, the error

[89] European Central Bank. (2012). 'Corporate Indebtedness in the Euro Area', *Monthly Bulletin (Feb),* p.90

[90] The Ordinary Least Squares (OLS) regression model is one of the major estimation techniques used to estimate unknown parameters in a linear regression model. Through this method the sum of the squared residuals, which is the difference between the observed response from the dataset and the response estimated by the model, is minimized. The resulting regression estimates describe the relationship between a dependent and independent variable. The coefficient estimates are said to be consistent if; the residuals or errors are uncorrelated and have the same variance (homoscedastic) and when the predictor variables are independent and uncorrelated (no multicollinearity).

[91] Petersen, M.A. (2009). 'Estimating Standard Errors in Finance Panel Data Sets: Comparing Approaches', *The Review of Financial Studies, 22 (1),* 435-480

term can now be split up into two parts. One part captures the unobserved factors which vary over time, while the other part captures the unobserved factors that remain constant over time. Failing to control for time-invariant firm characteristics that could influence the dependent variable would introduce a bias in the regression, known as the 'omitted variable bias'. This can result in inconsistent estimators.[92] A simple way to deal with the interference of time invariant unobservable features of the data is to include firm fixed-effects. Through this estimation technique, the dependent and independent variables and the error terms are averaged over time. Subsequently, the averages are subtracted from the real values for every time period, 'time demeaning' the data. In this way, the time invariant variables, η_i in the estimation below, are eliminated before the actually regressions estimation is done. An immediate consequence of introducing the fixed effects estimator in the model is that, next to the unobserved time invariant variables, the constant variables included in the model will also be omitted. The initial leverage variable for example will be omitted when including fixed effects. The inclusion of firm fixed effects in the model will result in the following regression model:

$$Leverage_{i,t}=\alpha+ \beta X_{i,t-1}+ \delta D_{crisis,t} + \varphi D_{crisis,t-1}+ \eta_i+ \varepsilon_{i,t}$$

where η_i is the firm fixed-effects estimator that captures all unobserved, time invariant factors that affect the dependent variable and $\varepsilon_{i,t}$ stands for the random idiosyncratic error term that captures the time variant unobserved variables affecting the dependent variable.

The results from estimating the first and second regression models are presented in table 3. Column (1) and (3) present the regressions on book- and market leverage without the inclusion of firm fixed effects, while column (2) and (4) present the result of the second regression model on both book and market leverage. Attention will later be paid to column (5). In order to facilitate comparison, each coefficient has been scaled by the corresponding variable's standard deviation. In this way, each reported estimate measures the change of book and market leverage responding to a one standard deviation change of the factors incorporated in this study. The crisis dummy coefficients have not been scaled, since a one standard deviation change of a dummy variable does not make sense; it will always change from 0 to 1 or the other way around.

[92] Wooldridge, J.M. (2006). 'Introductory Econometrics: a Modern Approach', Third Edition, Thomson South-Western

Table 3. The effect of crises on leverage ratios. The table reports the estimates of the models: $Leverage_{i,t}=\alpha+\beta X_{i,t-1}+\gamma Leverage_{i,0}+\delta D_{crisis,t}+\varphi D_{crisis,t-1}+\lambda D_{country}+\varepsilon_{i,t}$ and $Leverage_{i,t}=\alpha+\beta X_{i,t-1}+\delta D_{crisis,t}+\varphi D_{crisis,t-1}+\eta_i+\varepsilon_{i,t}$. The dependent variables are *book leverage*$_{i,t}$ and *market leverage*$_{i,t}$. Book leverage$_{i,t}$ represents the *total debt* of firm *i* in year *t*, divided by the firm´s *book assets* in year *t*, while market leverage$_{i,t}$ represents the *total debt* of firm *i* in year *t*, divided by the sum of total debt and market equity. $X_{i,t-1}$ is a vector of six 1-year lagged control variables which have often been used in previous studies: firm size, market-to-book, profitability, tangibility, median industry leverage and cash flow volatility. $Leverage_{i,0}$ represent a firms initial leverage, which is the first non-missing value for leverage. A detailed description of the exact construction of these variables has been reported at appendix A. $D_{crisis,t}$ is a dummy variable which takes on the value of 1 if a country faces two consecutive quarters of decline in real GDP in a year and 0 otherwise. This variable captures the effect of recessions on the dependent variables. $D_{crisis,t-1}$ is the 1-year lagged crisis dummy which captures the longer term or indirect effect of recessions on leverage. For both book- and market leverage, two regressions have been performed; one regression with and one without the inclusion of firm fixed effects. In column (5) the crisis dummy variables have been regressed on the 'Net Debt Issuance' variable as an additional check. The t-statistics are presented between parentheses and calculated using clustered standard error at the firm level, following Petersen (2009). By clustering the standard errors at the firm level, it is assumed that observations for firm *i* are correlated in some unknown way, but that groups *i* and *j* do not have correlated errors. The sample consists of all non-financial firm year observations from 1993 to 2011 of Germany, France, the United Kingdom, Italy, Spain and the Netherlands. The reported coefficients apply to the full, 'European' sample. Up until now, no distinction will be made between the different countries. The observations have been winsorized at the 0,5% level in both tails of the distribution to smooth the effect of outliers and eradicate errors in the data. The reported coefficients (except for the crisis dummy variable) are scaled by the standard deviation of the factor. For example, in the first column, a one-standard deviation change in initial leverage is associated with an increase in book leverage of 0.078. The symbols *, **, and *** denote statistical significance at the 10%, 5% and 1% levels.

Variable	**Book leverage**		**Market leverage**		**Net Debt Iss.**
	(1)	(2)	(3)	(4)	(5)
Initial leverage	0.078***	-	0.072***	-	-
	(19.76)		(15.49)		
Log(sales)	0.016***	0.057***	0.031***	0.114***	-
	(7.51)	(10.34)	(9.83)	(15.89)	
Market-to-book	-0.003	-0.002	-0.045***	-0.015***	-
	(-1.51)	(-1.09)	(-7.28)	(-3.77)	
Profitability	-0.016***	-0.018***	-0.035***	-0.031***	-
	(-5.66)	(-6.51)	(-10.38)	(-10.27)	
Tangibility	0.016***	0.021***	0.021***	0.017***	-
	(8.48)	(5.13)	(7.29)	(3.66)	
Med. industry lev.	0.042***	0.035***	0.053***	0.041***	-
	(18.52)	(15.95)	(19.28)	(15.05)	
Cash flow vol.	-0.000	0.001	-0.006***	0.006***	-
	(-0.08)	(0.95)	(-2.65)	(3.00)	
$Crisis_t$	*0.015****	*0.013****	*0.062****	*0.064****	*-0.0146****
	(7.60)	*(6.68)*	*(20.46)*	*(21.75)*	*(-5.66)*
$Crisis_{t-1}$	*-0.005***	*-0.007****	*-0.012****	*-0.006***	*-0.034****
	(-2.42)	*(-3.40)*	*(-3.84)*	*(-1.97)*	*(-13.41)*
Firm FE	No	Yes	No	Yes	Yes
Country Dummy	Yes	No	Yes	No	No
Adj. R^2	0.384	0.671	0.358	0.671	0.035
Observations	30,667	30,667	29,928	29,928	43,361

Before focusing on the effect of crises on leverage ratios, attention will first be paid to the stylized leverage determinants. When focusing on the first and third column first, it can be concluded that the four factors found by Rajan and Zingales are still highly statistically significant when explaining leverage. Also, the signs of the four determinants are in line with what Rajan & Zingales have found. The *logarithm of sales* and *tangibility* always show positive coefficients, indicating that larger and

more tangible firms generally have higher leverage ratios. This suggests that larger firms are more diversified and therefore face lower chances of bankruptcy and that more tangible firms have more collateral to put down, convincing bondholders that the firm is save to lend money to. The other two factors, *market-to-book* and *profitability* depict negative coefficients, which again is consistent with earlier studies. Especially the negative effect of profitability on leverage is interesting since this is in sharp contrast to what the static trade-off theory predicts. According to this theory, leverage should be higher for profitable firms because of the tax advantage of debt. Apparently, the pecking order theory is right here, as this theory predicts lower leverage for profitable firms, because these firms prefer to finance their projects with their profits (internal funds) before moving to alternative ways to finance their investment opportunities. Another interesting thing of profitability showing a negative regression coefficient is that this is in contrast with the positive correlation coefficient from table 2. Although this seems strange, it could be explained by assuming that one or some of the included controlling variables in this model are correlated with both the dependent as the independent, profitability factor. As the correlation matrix does not show very high correlations between the included independent variables however, it seems more plausible that there are so called confounding variables, which are not included in the model, but are correlating with the dependent and independent, profitability, variable. Although the *market-to-book* factor depicts negative coefficients, it can be seen that its statistical significance is very low when regressing on book leverage. This finding is in line with the study of Lemmon et al., where they state that market-to-book is clearly the weakest explanatory variable for book leverage.[93]

When looking at the variable *initial leverage*, which has been shown by Lemmon et al. to be one of the most important determinant missing in Rajan & Zingales' study, it can be seen that initial leverage is indeed very important in explaining leverage. Its t-value is much larger than any of the four previously described factors. The importance of this factor indicates the convergence of leverage and the importance of time invariant factors when explaining leverage. The first regression reveals that a one standard deviation in a firm's initial book leverage ratio corresponds to an average change of 0.078 in future values of book leverage. For market leverage this effect is 0.072. When comparing the statistical, but especially the economic magnitudes (scaled coefficients) of all factors, the importance of initial leverage compared to the original four determinants becomes even more apparent. The determinants found by Rajan & Zingales therefore seem to contain

[93]Lemmon, M.L., Roberts, M.R., Zender, J.F. (2008). 'Back to the Beginning: Persistence and the Cross-Section of Corporate Capital Structure', *The Journal of Finance, 63 (4),* p.1589

relatively little information on firms' capital structures relative to the time invariant initial leverage factor. These results are completely in line with the results found by Lemmon et al.[94]

The last two factors included in this model are the *median industrybook leverage* and *cash flow volatility*. Again, the highly economical and statistical significance of the median industry book leverage factor is in line with the results found by Lemmon et al. and Frank & Goyal. Apparently, this factor is as important within the European Union in explaining leverage as it is within the United States. The highly significant, positive effect indicates that firms that compete within industries in which the median firm has high leverage tend to have high leverage themselves. Explanations for this observation could be that managers use the industry median leverage as a target capital structure when contemplating their own leverage ratios. Another explanation for the relatively high importance of this factor, given by Movakimian, Hovakimian and Tehranian, could be that the industry median leverage factor captures a set of correlated, but otherwise omitted, industry factors.[95] The last term, cash flow volatility is the only factor that produces surprising results. As cash flow volatility is a proxy for risk, it would be expected, following the trade-off theory, to have a negative effect on leverage because of the increase in expected bankruptcy costs. Also, more volatile cash flows decrease the probability that tax shields will be utilized fully. When looking at the pecking order theory, more volatile firms would be expected to have higher levels of debt, because these firms often face more adverse selection issues. Also, these firms will more often have to access external capital markets. Considering the low t-values and coefficients however, it seems that there actually exists no clear economically or statistically significant effect of cash flow volatility on book leverage within Europe and therefore, none of the two main capital structure theories explain this finding.

As the general statistical and economical significance of all controlling factors has been discussed, it is interesting to shift attention to the differences in explanatory power of the factors on the two dependent variables; book and market leverage. As can be seen from the table, the coefficients and t-values of both size and market-to-book show much higher values for the market leverage regression. This clear difference can be explained by realizing that these factors are forward looking, or future oriented, as is the case with market leverage. As market equity, and thereby share prices are taken into account when determining a firms' market leverage ratio, this ratio is much more future orientated than book leverage. This immediately explains the fact that initial leverage

[94] Lemmon, M.L., Roberts, M.R., Zender, J.F. (2008). 'Back to the Beginning: Persistence and the Cross-Section of Corporate Capital Structure', *The Journal of Finance, 63 (4),* p.1588
[95] Hovakimian, A., Hovakimian, G. & Tehranian, H. (2004). 'Determinants of Target Capital Structure: The Case of Dual Debt and Equity Issues', *Journal of Financial Economics, 71,* 517-540

and tangibility lose some of their explanatory power when comparing the market leverage and book leverage regressions. These two factors are generally seen as backward looking and are therefore more correlated with the backward looking (book) leverage ratio.

The last issue which requires some clarification before moving to the actual effect of crises on firms' capital structures, is the inclusion of firm fixed effects into the model. Column (2) and (4) depict the results of the second regression model. The first and most important effect of including firm fixed effects into the regression is the enormous increase in the adjusted R^2 of the model. The percentage of variability in leverage explained by the traditional leverage regressions using previously identified determinants is about 35% to 40%, while the adjusted R^2 from the same regression, but including firm fixed effects (statistical stand in for the permanent component of leverage) is 67%.[96] This indicates that the traditional models, as used by Rajan & Zingales and Frank & Goyal, that did not include the time-invariant effects, were greatly lacking. This finding is in line with the findings of Lemmon, Roberts and Zender as one of their conclusions was that 'the majority of variation in leverage ratios is driven by an unobserved time-invariant effect'.[97]

Two last interesting effects of incorporating firm fixed effects are that the initial leverage factor has been omitted by the model and that the tangibility and market-to-book factors lose some of their explanatory power. The first effect can be explained by realizing that the fixed effect estimator demeans all variables, dropping the constant variables like initial leverage. The decreasing importance of tangibility and market-to-book when explaining leverage is attributable to the fact that both factors do not vary much over time. These factors therefore have higher correlations with the firm fixed effect estimator, increasing the standard errors and lowering their t-values. In other words, the fixed effects estimator absorbs much of the impact that other factors have on leverage, especially when those factors vary little over time.

As all general findings have been discussed, comparisons with earlier studies have been made and firm fixed effects have been included in the model, it is time to focus on the effect of economic downturns or recessions on firms' capital structures or leverage ratios and consequently, to confirm or reject the first hypothesis. As can be seen from the table, two crisis dummy variables

[96] The R^2 coefficient, which ranges from 0 to 1, can be interpreted as the percentage of the variability in the dependent variable that is explained by the independent variables included in the model. This coefficient is calculated by dividing the explained sum of squares (ESS) by the total sum of squares (TSS). One shortcoming of the R^2 measure is that it does not control for the number of variables included in the model. The adjusted R^2 measure however, does control for this by incorporating the degrees of freedom when calculating the overall fit. As quite some variables have been included in the models used for this study, it has been decided to project the adjusted R^2 instead of the normal R^2 measure.

[97] Lemmon, M.L., Roberts, M.R., Zender, J.F. (2008). 'Back to the Beginning: Persistence and the Cross-Section of Corporate Capital Structure', *The Journal of Finance, 63 (4),* p.1575

have been included in the model. The first dummy variable, '$Crisis_t$', captures how leverage ratios behave directly when a country experiences a recession, while the second variable, '$Crisis_{t-1}$' actually captures how leverage ratios are *affected* by recessions or what the impact of recessions is on future leverage ratios, as this dummy variable is lagged by one year. When looking at the first dummy, it can be noticed that all four coefficients are positive and highly statistically significant. Especially the positive effect on market leverage is enormous. This effect on market leverage should be interpreted with care however as share prices, which make a significant drop after the collapse of a bubble or during a recession, are incorporated in the construction of the market leverage ratio. The observation of positive coefficients for the direct crisis dummy seems to correspond with what has been found at figure 2 and 3, were the leverage ratios were depicted over time. At the start of a recession, firms' leverage ratios seemed to be at a peak, showing relatively high leverage ratios. About one year after the start of the recession however, leverage ratios start to decrease.

The observation that leverage ratios tend to be relatively high at the start of a recessions can be explained in several ways. A first explanation could be that firms increase their leverage ratios prior to recessions, when GDP-growth rates have already started to decline, to enable themselves to continue to finance investment opportunities and thereby maintain the same growth levels as they had in times of increasing GDP-growth rates. As can be seen from figure 1 on page 35, at the start of 2007, GDP-growth rates started to decline all over Europe. Exactly at this moment, an increase in book leverage ratios is shown in figure 2. Another explanation for this increase in leverage could be that the years prior to a recession often collide with the raise of fears and concerns about firms' access to credit in the future, as lenders will most likely tighten lending terms in case a recession is actually experienced. Because firms want to assure financial flexibility and liquidity in times of recessions, corporations try to prepare themselves by retaining earnings and by taking on additional loans in the hope that these loans are still relatively cheap compared to loans issued in times of recession. Although it would be expected that this rise in firms' debt levels would not go unnoticed, it has actually been found in a study of the European Central Bank that the increase in debt levels prior to the financial crisis received limited attention as the costs of debt financing and the *debt burden ratio*, which is the ratio of the costs of debt financing over firm income, of non-financial corporations stood at moderate levels.[98] Next to simply taking on additional loans, firms can also decide to 'draw on their credit lines', where credit lines are prior arrangements between a financial institution and a firm that establishes a maximum loan balance that the bank will permit the borrower to maintain at prespecified rates and conditions. As the corporations can draw down

[98] European Central Bank. (2012). 'Corporate Indebtedness in the Euro Area', *Monthly Bulletin (Feb),* p.90

their credit lines as long as they do not exceed the maximum set in the arrangement, many firms might decide to fully draw down their credit lines in the light of uncertainties about economic conditions and credit markets, thereby increasing their leverage ratios. This behavior has actually been confirmed by Ivashina's and Scharfsteins' study, were they found that firms drew on their credit lines to ensure that they had access to funds at a time when there was widespread concern about the solvency and liquidity of the banking sector.[99] To summarize, the increase in leverage prior to a recession results in relatively high leverage ratios at the start of a recession, which is confirmed by the statistically significant positive coefficient of the first crisis dummy variable.

When shifting attention to the lagged crisis dummy variable, which actually indicates how firms' leverage ratios are affected by recessions, it can be noticed that all coefficients depict negative values which are highly statistically significant. This finding indicates that firms seem to lower their debt levels, or *deleverage*, as a result of a crisis, pointing at the trade-off theory as the theoretical framework that is right on this matter. This deleveraging process can be explained by both by changes in the demand and supply of debt as a result of a recession.

Although the increase in leverage has seemed to assure firms with financial flexibility and liquidity in times of fear about the future state of the economy, and high debt levels could have had positive implications for growth up to a certain degree, by the time an economy is actually hit by a recession, the high debt levels can become a real burden to the firms. The high debt levels, which required high obligatory debt payments, have made the leveraged firms highly vulnerable to changes in the state of the economy and interest rates. As income falls during a recession, while interest rates, especially after the financial crisis, tend to rise, the indebtedness to firms' income, or debt burden ratio, increased sharply, raising concerns regarding corporate debt sustainability and credit worthiness and consequently, increasing bankruptcy risks and costs.[100] Next to increasing debt burdens and bankruptcy costs that already forced firms to deleverage, the demand for debt is also lowered during recessions because of the weaker capital formation, lower need for working capital and the already accumulated retained earnings prior to the recession. Next to decreasing demand for debt, another reason for decreasing leverage ratios during recessions might be that refunding loans is much more expensive and difficult in times of economic downturns because of changes in the requirements of banks when supplying debt. According to Kwan, recessions tend to go hand in

[99] Ivashina, V. & Schaftstein, D. (2010). 'Bank Lending During The Financial Crisis of 2008', *Journal of Financial Economics 97,* p.320
[100] European Central Bank. (2012). 'Corporate Indebtedness in the Euro Area', *Monthly Bulletin (Feb),* p.89

hand with 'tightened lending terms and standards, reduced discounts on large loans and increased risk premiums on more risky loans', making it costly to attract or refund loans.[101]

As can be concluded from the story above, the costs of debt significantly increase during recessions because of higher bankruptcy costs and tightened lending terms. On the other hand, the beneficial effects of leverage, like the tax shield and the disciplinary effect of debt seem to decrease in times of economic crisis. It therefore seems that the static trade-off theory, which trades-off the benefits and costs of debt, justifies the negative effect of recessions on debt. The reasons why most attention is paid to the lagged dummy variable, which depicts the negative effect, as opposed to the direct crisis dummy variable, which depict positive coefficients are, is first of all that, with the direct crisis dummy a simultaneity problem might arise. The causal effect could, in the direct case, easily be reversed by stating that it is not the recession that causes high leverage ratios, but that high leverage ratios cause a recession. This problem is solved by lagging the crisis dummy variable by one year. The lagged variable indicates what happens to firms' leverage ratios one year after a recession took place and thereby does describe the causal relationship. It therefore investigates whether a crisis today drives the leverage ratios of next year. Another reason for taking the lagged variable as the real variable of interest is that it is hard to believe that firms can adjust their leverage ratios to changes in the economy within less than a year. Considering the lagged dummy variable, it can therefore be concluded that from the results of table 3 in combination with figures 1 to 3, that leverage ratios are affected in a statistically significant negative way by recession periods, pointing at the static trade-off theory as the right theory when predicting leverage ratios under these extreme circumstances. With this statistically significant effect, the first hypotheses, which states that leverage ratios are negatively affected by economic recessions, can be *confirmed*.

Although the first hypothesis has been confirmed based on the first four columns of table 3, an additional regression has been performed to confirm that the firms' capital structure decision is indeed affected by crises. The main reason for this additional check is that the second dependent variable, market leverage, is, in contrast to other debt ratios, very volatile and largely driven by valuation effects owing to movements in equity prices.[102] It has therefore been decided to also check what happens with the net debt issuance policy of the firms from this sample, by regressing both crisis dummy variables on 'net debt issuance', which is the change in total debt from year *t-1* to *t* divided by the end of year *t-1* total assets. The results of this regression have been depicted in column 5 of table 3. As can be seen from the coefficients of the crisis dummy variables, firms indeed

[101] Kwan, S.H. (2010). 'Financial Crisis and Bank Lending', *Federal Reserve Bank of San Francisco*, 1 - 43
[102] European Central Bank. (2012). 'Corporate Indebtedness in the Euro Area', *Monthly Bulletin (Feb),* p.90

tend to lower their net debt issuance in times of recession. Considering that the mean value of 'net debt issuance' is 0.030, it can be concluded that at *t=0*, the real debt financing growth of non-financial firms is already declining and actually becomes negative one year later. This finding also confirms that leverage indeed seems to be less attractive during recessions.

Now it has been found how leverage ratios are affected by recessions, a side step will be made by making a distinction between both crises, enabling us to confirm or reject the second hypothesis. As was already mentioned at section 2 that the nature and consequences of the dot-com and the financial crisis were very different, it could be that both crises have had a different impact on leverage. This will be investigated by subdividing the two general crisis dummies into two crisis dummies per crisis. This results in the following regression model:

$$Leverage_{i,t}=\alpha+\beta X_{i,t-1}+\delta D_{dot\text{-}com,t}+\varphi D_{dot\text{-}coms,t-1}+\delta D_{fincrisis,t}+\varphi D_{fincrisis,t-1}+\eta_i+\varepsilon_{i,t}$$

As we have already seen that the controlling variables behave as expected and the focus is here on the dummy variables of both crises, only the coefficients of these variables have been depicted in table 4. Again, the dummy variables are also regressed on the net debt issuance variable.

Table 4. The effect of both crises on leverage. This table depicts the coefficients of the normal and 1-year lagged crisis dummy variables for both the dot-com and the financial crisis, to identify whether the effects of both crises on leverage are different. As the focus is on just these coefficients, the regression results of the controlling variables have not been shown here.

Variable	Book leverage	Market leverage	Net Debt Iss.
Dot-com Crisis$_t$	0.002	0.010	-0.020***
	(0.38)	(1.30)	(-3.17)
Dot-com Crisis$_{t-1}$	-0.012**	-0.014*	-0.030***
	(2.18)	(-1.82)	(-5.56)
Financial Crisis$_t$	0.014***	0.071***	-0.013***
	(6.81)	(22.21)	(-4.16)
Financial Crisis$_{t-1}$	-0.007***	-0.009***	-0.035***
	(-3.03)	(-2.73)	(-12.38)
Firm FE	Yes	Yes	Yes
Adj. R^2	0.671	0.672	0.034
Observations	30,667	29,928	43,361

As can be seen from the table 4, the effects of the both crises on book and market leverage seem to quite the same and in line with what has been found at table 3. The significance of the coefficients of both crises on book and market leverage seems to be different however. While the financial crisis depicts statistical significant results for the direct and 1-year lagged dummy variables, this is for the dot-com crisis only the case for the lagged variable. This observation, of an insignificant positive value for the direct dot-com crisis dummy variable versus a highly significant positive value for the

direct financial crisis dummy variable, can be explained by considering the following. As can be seen at figure 1, the GDP-growth rates after the collapse of the dot-com bubble did not decline as much as was the case after the collapse of the housing bubble. The period in between the collapse of the dot-com bubble and the resulting recession was actually characterized by low interest rates and continued economic growth. These indicators might have suppressed the fears and concerns about the future economy and future access to credit and lending terms, which led to a run on credit which was much smaller than was the case prior to the financial crisis where there were huge concerns about the future state of the economy and the financial institutions. As the coefficients at table 4 indicate, although firms did not leverage up too much before the recession, they did start to deleverage one year after the recession, just as has been seen after the recession resulting from the financial crisis. This deleveraging observation can be explained by considering what has been mentioned about recessions and deleveraging earlier. When the economy slows down, corporate revenues decrease, making it more difficult for firms to meet the obligatory payments that debt requires and thereby significantly increases the bankruptcy costs and costs of debt. To lower these costs and improve the firms' creditworthiness, firms will start to deleverage, which results in a decrease of leverage ratios. Another reason for the falling ratios is that it is more difficult and expensive to refund loans during recessions.

Although there are some differences in the field of statistical significance for book and market leverage, when focusing on the 1-year lagged dummy variable, it can be concluded from table 4 that the effects of both recessions on the firms' capital structure is quite the same. A period of deleveraging starts after both recessions. When quickly looking at the net debt issuance variable, it can also be seen that after both crises, firms issued less debt. This effect seemed to be a little bit larger for the financial crisis, which could be explained by the less favorable lending terms because of the problems with the financial system compared to the ones during the dot-com crisis, and by considering the severity of the financial crisis as compared to the dot-com crisis.

To summarize, the main conclusions that can be drawn from table 3 and 4 are, at first, that firms' leverage ratios tend to decrease as a result of both recessions resulting from the dot-com and financial crisis. These 'deleveraging' observations clash with the expectations of the pecking order theory, but are in line with the static trade-off theory. Besides, pretty much all findings on existing leverage determinants and firm fixed effects estimators hold their importance and relations with leverage within different geographical areas and during different time frames compared to the

studies of Rajan & Zingales, Frank & Goyal and Lemmon, Roberts & Zender, even after including the crises dummy variables.

4.2 The effect of crises on stylized leverage determinants

As the effect of economic crises on firms' leverage ratios has been studied and the continuing importance of the stylized leverage determinants on a different, more recent sample has been confirmed, it is now time to check whether crises periods affect the relations of the stylized leverage determinants with leverage. In other words, it will be investigated whether coefficients of the controlling variables are significantly different in times of crises compared to during normal times. This will be done by estimating the following regression model:

$$Leverage_{i,t}=\alpha+ \beta X_{i,t-1}+ \gamma D_{crisis,t} + \delta D_{crisis,t-1}+ \varphi X_{i,t-1} * D_{crisis,t-1} +\eta_i + \varepsilon_{i,t}$$

When comparing this regression estimate with the former one, it can be seen that the only difference comes from the inclusion of the interaction term '$X_{i,t-1}*D_{crisis,t-1}$', which is a combination of two independent variables. Since this interaction term consists out of a vector of the earlier defined leverage determinants which interact with the crisis dummy variable, it will only generate values different from zero in times of economic recession. When regressing this interaction term on leverage, the coefficient of interest 'φ', will then capture how much and in which direction the coefficients of the leverage determinants on the entire sample (β) are affected by economic crises periods and will therefore give an indication of whether the economic significance of the existing determinants is affected by crises. The sum of the β and φ for each factor will then give the actual coefficient for the factors for recessions periods only.

Although the interaction terms provide us with information on the effect of crises on the leverage determinants, the inclusion of too many interaction terms in one regression model is also accompanied by multicollinearity problems. This problem arises because all interaction terms are constructed in the same way, where each leverage determinant interacts with the same crisis dummy variable. Since most of this dummy variable's observations have a value of 0, the interaction terms will also generate many zero values, leading to high correlations between the different interaction variables. By including all these correlating interaction terms in one and the same regression, multicollinearity problems would lead to larger standard errors, lowering the t-values and thereby the statistical importance of the interaction terms. This problem of multicollinearity is solved by running the regression depicted above with just one interaction term at a time, instead of running simply one regression including all interaction variables. This means that separate

regression equations are computed for each level of the interaction variable to provide a more robust interpretation of the interaction effect. Another reason for running these separate regressions is that the number of variables within the model does not get too high. Adding variables, like these interaction terms, to a model that do not add much to the R^2 can increase the size of the standard errors, which on its turn tends to reduce the precision of all estimates within the model. For both book and market leverage the following six regression models have therefore been estimated:

$$Leverage_{i,t}=\alpha+ \beta X_{i,t-1}+ \gamma D_{crisis,t} + \delta D_{crisis,t-1}+ \varphi Size_{i,t-1} * D_{crisis,t-1} +\eta_i+ \varepsilon_{i,t}$$

$$Leverage_{i,t}=\alpha+ \beta X_{i,t-1}+ \gamma D_{crisis,t} + \delta D_{crisis,t-1}+ \varphi MTB_{i,t-1} * D_{crisis,t-1} +\eta_i+ \varepsilon_{i,t}$$

$$Leverage_{i,t}=\alpha+ \beta X_{i,t-1}+ \gamma D_{crisis,t} + \delta D_{crisis,t-1}+ \varphi Profitability_{i,t-1} * D_{crisis,t-1} +\eta_i+ \varepsilon_{i,t}$$

$$Leverage_{i,t}=\alpha+ \beta X_{i,t-1}+ \gamma D_{crisis,t} + \delta D_{crisis,t-1}+ \varphi Tangibility_{i,t-1} * D_{crisis,t-1} +\eta_i+ \varepsilon_{i,t}$$

$$Leverage_{i,t}=\alpha+ \beta X_{i,t-1}+ \gamma D_{crisis,t} + \delta D_{crisis,t-1}+ \varphi Median\ Industry\ Lev_{i,t-1} * D_{crisis,t-1} +\eta_i+ \varepsilon_{i,t}$$

$$Leverage_{i,t}=\alpha+ \beta X_{i,t-1}+ \gamma D_{crisis,t} + \delta D_{crisis,t-1}+ \varphi Cash\ flow\ vol_{i,t-1} * D_{crisis,t-1} +\eta_i+ \varepsilon_{i,t}$$

As can be seen from the regression models, there has no difference been made anymore between a regression with and without the inclusion of firm fixed effects. As the importance of the unobserved time invariant part has already been demonstrated at the former section, it has been decided to include firm fixed effects in every model from now on. Running these estimation models without controlling for firm fixed effects would probably result in inconsistent estimators as they would suffer from the omitted variables bias. The inclusion of firm fixed effects does unfortunately lead to the exclusion of initial leverage as a determinant as well as an interaction variable. In table 5, the results of the six regression models on both book and market leverage have been depicted. As the general effect of the stylized leverage determinants on leverage already has been discussed at the previous part, and the focus of this section is to understand how these relations change during recession periods, the discussion of the results will be limited to the coefficients of the interaction terms and the crisis dummy variables.

Table 5. The effect of crisis on leverage determinants. The table reports the estimates of the model: $Leverage_{i,t}=\alpha+\beta X_{i,t-1}+\gamma D_{crisis,t}+\delta D_{crisis,t-1}+\varphi X_{i,t-1}*D_{crisis,t-1}+\eta_i+\varepsilon_{i,t}$ The interaction term $X_{i,t-1}*D_{crisis,t-1}$ captures how much and in which direction the coefficients of the stylized leverage determinants on the entire sample (β) are affected by economic crises periods and will therefore give an indication of whether the relation of the existing determinants with leverage is affected by crises. The sum of β and φ for each factor will give the actual coefficient for the factors during recession periods only. For each interaction term, consisting out of one leverage determinant multiplied by the lagged crisis dummy variable, a separate regression has been run to avoid multicollinearity issues. Apart from the inclusion of the interaction term, the regression estimates has been build up in the same way as was done at table 3. A detailed description of the construction of all variables has been reported at appendix A. The focus for this section is on the coefficients of the interaction terms. A statistically significant interaction term would suggest that the leverage determinant, where the interaction term is based on, has another relation with leverage during crises periods compared to normal times. The t-statistics are presented between parentheses and calculated using clustered standard error around firms following Petersen (2009). Again, all observations have been winsorized at the 0.5% level in both tails of the distribution. The coefficients of the factors have *not* been scaled by the standard deviation of the factor this time because the coefficients of the interaction variables and factors would not have been comparable. The symbols *, **, and *** denote the statistical significance at the 10%, 5% and 1% level.

	Book leverage						**Market leverage**					
Variable	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Log(sales)	0.023***	0.023***	0.023***	0.023***	0.023***	0.023***	0.046***	0.046***	0.046***	0.046***	0.046***	0.046***
	(10.47)	(10.34)	(10.33)	(10.32)	(10.33)	(10.33)	(15.91)	(15.95)	(15.89)	(15.84)	(15.91)	(15.88)
MTB	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.009***	-0.009***	-0.009***	-0.009***	-0.009***	-0.009***
	(-0.99)	(-1.08)	(-1.06)	(-1.12)	(-1.07)	(-1.09)	(-3.75)	(-3.87)	(-3.77)	(-3.77)	(-3.77)	(-3.77)
Profitability	-0.066***	-0.066***	-0.062***	-0.065***	-0.066***	-0.066***	-0.112***	-0.112***	-0.114***	-0.111***	-0.111***	-0.111***
	(-6.52)	(-6.52)	(-5.93)	(-6.50)	(-6.51)	(-6.51)	(-10.27)	(-10.31)	(-10.09)	(-10.24)	(-10.27)	(-10.27)
Tangibility	0.088***	0.088***	0.088***	0.087***	0.088***	0.089***	0.072***	0.072***	0.072***	0.068***	0.073***	0.072***
	(5.09)	(5.13)	(5.10)	(5.03)	(5.12)	(5.14)	(3.65)	(3.67)	(3.69)	(3.45)	(3.71)	(3.66)
Median ind lev.	0.318***	0.318***	0.318***	0.317***	0.319***	0.318***	0.372***	0.372***	0.372***	0.371***	0.361***	0.372***
	(16.00)	(15.95)	(15.97)	(15.93)	(15.71)	(15.95)	(15.07)	(15.06)	(15.04)	(15.03)	(14.65)	(15.05)
Cash flow vol.	0.002	0.002	0.002	0.002	0.002	0.001	0.007	0.007	0.007	0.007	0.007	0.007
	(1.03)	(0.95)	(0.97)	(0.95)	(0.96)	(0.79)	(3.01)	(3.00)	(2.98)	(2.99)	(2.98)	(2.98)
*Log(sales) * Crisis*	-0.002**						-0.003					
	(-2.22)						(-0.46)					
*MTB * Crisis*		-0.001						-0.003				
		(-0.35)						(-0.67)				
*Profit. * Crisis*			-0.023						0.018			
			(-1.54)						(1.39)			
*Tang * Crisis*				0.014						0.033**		
				(1.24)						(2.29)		
Median ind. Crisis*					-0.009						0.066***	
					(-0.50)						(2.78)	
*Cash Flow vol * Crisis*						0.000						0.000
						(1.11)						(0.08)
$Crisis_t$	0.013***	0.013***	0.013***	0.013***	0.013***	0.013***	0.064***	0.064***	0.064***	0.064***	0.064***	0.064***
	(3.18)	(6.66)	(6.70)	(6.68)	(6.69)	(6.67)	(21.74)	(21.47)	(21.75)	(21.74)	(21.69)	(21.74)
$Crisis_{t-1}$	0.003	-0.006***	-0.006**	-0.010***	-0.005	-0.007***	-0.003	-0.003	-0.007**	-0.013***	-0.017***	-0.006**
	(0.56)	(-2.69)	(-2.40)	(-3.18)	(-1.45)	(-3.47)	(-0.46)	(-0.55)	(-2.18)	(-3.03)	(-3.45)	(-1.98)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R^2	0.671	0.671	0.671	0.671	0.671	0.671	0.671	0.671	0.671	0.671	0.671	0.672
Observations	30,667	30,667	30,667	30,667	30,667	30,667	29,928	29,928	29,928	29,928	29,928	29,928

When first focusing on the interaction terms of the regressions on *book leverage*, it can be noticed that only one out of the six interaction terms depicts a statistically significant result. This implies that the coefficients of the remaining five traditional factors' do not significantly change during recession periods, indicating that their relation and thereby their sensitivity with leverage is not significantly affected by crises. This finding consequently implies that the existing theories on how these five leverage determinants are related to leverage remain valid in recession periods. Not only in the direction the relation goes, but even the magnitudes of the five effects stay more or less the same. As we have seen at the previous part that leverage ratios do tend to decrease as a result of 'deleveraging' during recessions, but since the existing leverage determinants' coefficients do not predict lower leverage ratios during recessions, there must be another variable that captures this negative effect. As the lagged crisis dummy variable itself still depicts statistically significant negative values in table 5, it seems that most or all of this negative effect of crises periods on leverage has been captured by this dummy variable instead of by the stylized five, unchanged, leverage determinants. Although the majority of the stylized leverage determinants' coefficients remain unchanged, the interaction coefficient for size is statistically significant negative, indicating that the size coefficient seems to become less positive during crises. Apparently, large firms still tend to have higher leverage ratios than small firms during recessions, but the size effect becomes smaller during recessions. This finding could be explained by considering that, according to the European Central Bank, larger firms tend to deleverage more and at a higher pace than smaller firms.[103] It could therefore be that the leverage ratios of large and small firms get closer to each other during recessions.

When attention is shifted away from book leverage to the regressions on market leverage, it can be noticed that the interaction results are quite different. The 'size' interaction coefficient is not statistically different from zero anymore, while the tangibility and median industry book leverage interaction coefficients suddenly are. Both coefficients depict statistically significant positive values, indicating that the relationships of these variables with market leverage have become even more positive during recessions. The positive coefficient of the tangibility interaction term can be explained by realizing that tangible assets serve as collateral, diminishing the risk of the lender suffering the agency costs of debt. As the agency costs of debt are expected to be higher during recessions, it seems plausible that lenders are more likely to provide money to firms that hold many tangible assets, thereby increasing the positive effect of tangibility on leverage. The increasing positive effect of the median industry book leverage variable on market leverage cannot directly be

[103]European Central Bank. (2012). 'Corporate Indebtedness in the Euro Area', *Monthly Bulletin (Feb),* p.98

explained by the increase in bankruptcy or agency costs of debt. As the median industry leverage ratio is generally seen as an industry target leverage ratio for managers, it could that managers hold on even more to this target during recessions than during normal times. Although the explanations on the changing coefficients for the regressions on market leverage sound plausible, they do not necessarily have to be true. This again has to do with the construction of the market leverage ratio. As the denominator of the ratio consists out of total debt plus market equity, the ratio is largely driven by valuation effects owing to movements in equity prices, making it difficult to draw any credible conclusions on this leverage ratio. The answer on the second hypothesis, which states that the relations of the well known leverage determinants with leverage are different during recession periods, will therefore, be based on just the book leverage regressions. Taken from the interaction results on book leverage, it is concluded that only the size factors' relation with leverage is affected by recessions. For the other five factors, the relations remain the same.

At the appendix, the results of an additional regression on book leverage have been depicted. This time, the leverage determinants do not interact with the lagged crisis dummy variable, but with the continuous GDP-growth rate variable. By taking the GDP-growth rate as an indication of the state of the economy instead of the crisis dummy, two things change. At first, as the GDP-growth rate is a continuous variable which can take on any value, the severity of a crisis can be taken into account. With the crisis dummy variable, the magnitude of a recession was not considered as the variable could only take on a zero or a one. Also, by using the GDP-growth rate variable instead of the crisis dummies, year fixed effects can be included in the model, to control for unobserved variables that may vary over the years. Because of space considerations and as this regression is just an extra check, the results of this regression model are discussed at appendix D.

4.3 Effects across countries

Now both hypotheses have been tested on the full sample, a side step will be made to the country level effects. At this subsection, it will first be investigated how in each individual country the firms' capital structure is affected and thereafter how the relations of the leverage determinants with leverage change during recessions. This will be done by estimating almost the same models which have been used at the former sections, but than per country. As has been found at section 4.1 that the effects of both the recessions resulting from the dot-com crisis and the financial crisis on leverage did not differ too much, and as only two countries from this sample actually experienced a recession as a result of the dot-com crisis, it has been decided to include dummy variables that capture the effect of crises in general and do not make any distinction between the two crises.

Another difference stems from the fact that the *median industry book leverage* factor has not been included here as a controlling variable. The reason for the exclusion of this factor is that the number of firms per industry on the country level is too low to generate accurate results. In some cases there are only one or two firms per industry, making it almost impossible to draw credible conclusions on the effect of the median industry book leverage factor on leverage. This expectation on inaccurate results is even strengthened when looking at the correlations of this factor with both book and market leverage on the country level. The correlation values range from 0.4 for the United Kingdom to almost 0.9 for the Netherlands. An unfortunate implication of the exclusion of the median industry book leverage factor is that the regression results of this section cannot be compared on a one-to-one basis with the ones of the former section, where the median industry book leverage factor was included. Nevertheless, some very interesting conclusions can still be drawn from the regression results depicted at table 6.

Again, attention will first be paid to the coefficients and statistical significance of the traditional leverage determinants included in the model. The factor log(sales) as a proxy for size is always positively related to both book and market leverage. Also, profitability shows a consistent relation, but then negative, as it enters with a negative coefficient in all countries. The market-to-book ratio shows different results for book and market leverage as it depicts no statistical significant effect on book leverage, while five negative significant coefficients are found for market leverage. This weak relationship of market-to-book with book leverage is in line with the study of Lemmon et al, where they state that market-to-book is clearly the weakest explanatory variable for book leverage.[104] The last out of the four factors found by Rajan & Zingales is tangibility, which is positively correlated with book leverage for only three out of six countries and with market leverage at five countries. This observation is in line with Rajan & Zingales' study, as some countries like Italy also lacked significant coefficients for tangibility. The cash flow volatility factor only depicts one statistically significant coefficient for book leverage and four on market leverage. Although the individual countries do not portray the exact similar results, it can generally be concluded that the five factors included in this model are more or less similarly related to book and market leverage across countries. In case the coefficients have shown to be statistically significantly correlated with leverage, they always indicate the same direction of the relation with leverage. Besides, when comparing the findings of Rajan & Zingales on Germany, France and Italy with the results of this study, it can even be noticed that these countries show more similar significant results now. It

[104] Lemmon, M.L., Roberts, M.R., Zender, J.F. (2008). 'Back to the Beginning: Persistence and the Cross-Section of Corporate Capital Structure', *The Journal of Finance, 63 (4),* p.1598

therefore seems that the statement of Rajan & Zingales about the similarity across countries still holds or has even gained force.

Table 6. The effect of crisis on leverage across countries. The table reports the estimates of the model: $Leverage_{i,t}$=α+ $\beta X_{i,t-1}$+ $\delta D_{crisis,t}$ + $\varphi D_{crisis,t-1}$+ η_i+ $\varepsilon_{i,t}$for each individual country. The incorporated variables are constructed in the same way as they were at the earlier performed estimation models. The exact construction can be found at appendix A. For every regression, firm fixed effects are included. The main difference between this model and the one from table 3 is that the vector $X_{i,t-1}$ does not longer consist out of six controlling variables. As the number of firms per industry on the country level is too low to generate accurate results for the median industry book leverage factor, it has been decided to exclude this variable. The t-statistics are presented between parentheses and calculated using clustered standard error at the firm level following Petersen (2009). The reported coefficients do not apply to the full, European sample anymore but to the individual countries. The observations have been winsorized at the 0,5% level in both tails of the distribution to smooth the effect of outliers and eradicate errors in the data. The reported coefficients (except for the crisis dummy variables) are scaled by the standard deviation of the factor. The symbols *, **, and *** denote statistical significance at the 10%, 5% and 1% levels.

Country **Variable**	**Germany**	**France**	**United Kingdom**	**Italy**	**Spain**	**Netherlands**
			Panel A: Book leverage			
Log(sales)	0.052***	0.052***	0.058***	0.052*	0.116***	0.112***
	(3.27)	(3.38)	(8.63)	(1.81)	(4.55)	(4.92)
Market-to-book	0.005	0.005	-0.003	-0.010	0.012	-0.001
	(0.96)	(1.14)	(-1.02)	(-1.30)	(1.46)	(-0.09)
Profitability	-0.023***	-0.037***	-0.015***	-0.021**	-0.042***	-0.028***
	(-3.75)	(-6.32)	(-4.14)	(-2.37)	(-4.33)	(-2.70)
Tangibility	0.042***	0.013	0.023***	0.022	-0.003	0.038***
	(4.01)	(1.32)	(4.13)	(1.61)	(-0.12)	(2.65)
Cash flow vol.	0.007*	-0.002	0.003	-0.003	-0.003	0.005
	(1.66)	(-0.06)	(1.10)	(-0.11)	(-0.45)	(0.55)
$Crisis_t$	*0.015****	*0.012****	*0.016****	*0.033****	*0.004*	*0.002*
	(3.80)	*(3.09)*	*(5.00)*	*(5.38)*	*(0.45)*	*(0.15)*
$Crisis_{t-1}$	*0.006*	*-0.013****	*-0.007***	*0.013**	*0.015**	*-0.021***
	(1.46)	*(-3.12)*	*(-1.99)*	*(1.72)*	*(1.88)*	*(-2.15)*
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R^2	0.683	0.696	0.622	0.723	0.663	0.630
Observations	5,328	6,494	15,404	1,891	1,292	1,596
			Panel B: Market leverage			
Log(sales)	0.109***	0.141***	0.106***	0.128***	0.164***	0.191***
	(5.39)	(8.43)	(12.01)	(3.11)	(6.22)	(7.40)
Market-to-book	-0.018***	-0.014***	-0.019***	0.007	-0.027***	-0.018**
	(-3.68)	(-3.47)	(-7.51)	(0.97)	(-1.96)	(-2.50)
Profitability	-0.028***	-0.051***	-0.028***	-0.154***	-0.062***	-0.034***
	(-4.88)	(-8.93)	(-7.67)	(-3.09)	(-4.45)	(-3.52)
Tangibility	0.037***	0.027**	0.010*	0.028*	-0.007	0.036*
	(3.45)	(2.27)	(1.70)	(1.66)	(-0.36)	(1.95)
Cash flow vol.	0.012**	0.004	0.007***	0.013***	0.012**	0.005
	(2.08)	(0.50)	(2.78)	(3.36)	(1.96)	(0.42)
$Crisis_t$	*0.048****	*0.065****	*0.076****	*0.099****	*0.029***	*0.054****
	(8.74)	*(11.92)*	*(14.68)*	*(10.87)*	*(2.15)*	*(3.39)*
$Crisis_{t-1}$	*0.009*	*-0.026****	*-0.011***	*0.036****	*0.015*	*-0.044****
	(1.59)	*(-4.86)*	*(-2.23)*	*(5.09)*	*(1.28)*	*(-2.99)*
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R^2	0.687	0.735	0.586	0.698	0.654	0.614
Observations	5,266	6,411	14,870	1,855	1,2171	1,574

Although the deleveraging process at the European level was clearly confirmed, when focusing on the regression coefficients of the crisis dummy variables of table 6, it can be concluded that the effect of recession periods on leverage ratios is heterogeneous across countries. At the country level, most countries indeed started deleveraging. Nevertheless Spanish and to a lesser extent, Italian companies reported that they kept on increasing their leverage ratios one year after a recession. These positive coefficients for Italy and Spain are in line with figure 2 and 3 and with what has been found by a study of the European Central Bank, as their leverage ratios have continued to increase ever since the collapse of the housing bubble.[105] Once again, the effects on market leverage seem to be larger, but this can be explained by considering the construction of both ratios. Another interesting finding is that especially Spain and the Netherlands generate very weak results for the crisis dummies. Of course this could be the case because these countries reacted differently to a recession, but it could also be explained by noticing that a crisis dummy variable is a variable which can only take on two values. Zero, in case a country does not face a recession and a one otherwise. A direct consequence of only being able to take on a one or a zero is that the crises variable cannot take the magnitude or severance of the recession into account. When looking back at the graph on page 35, where the yearly GDP growth rates per country have been depicted, it can be seen that exactly Spain and the Netherlands are the countries that have experienced the weakest recessions. The GDP growth rates of Spain and the Netherlands during the 2008 and 2009 recessions where somewhere around -3% to -4%, while the other countries faced negative growth rates of about -5% to -6%. Although we have not controlled for the severity of a recession at this section, it can still be concluded that the effect of recessions on firms' leverage ratios is not totally homogenous across countries. Nevertheless, most countries did report negative coefficients for the lagged dummy variable, indicating that firms do seem to start deleveraging after or during a recession. This finding is therefore partially in line with what has already been found at section 4.1.

After this finding, it is time to shift attention again to the effect of crises on the relationships of the stylized leverage determinants with leverage on the country level. To see if the coefficients of the controlling variables are significantly different during crisis, the same estimation models which were used at section 4.2 will be applied here per country, however, with the exclusion of the median industry book leverage factor for the same reason as before. The most important results of the five regression models on both book and market leverage per country are depicted in table 7.[106]

[105] European Central Bank. (2012). 'Corporate Indebtedness in the Euro Area', *Monthly Bulletin (Feb),* p.87-103

[106] It has been decided to only depict the coefficients of the interaction terms as the focus for this section is on these coefficients. If all regression coefficients per country would have been depicted in the same way as was done at table 4 it would require too much space.

Table 7. The effect of crisis on leverage determinants across countries. The table reports the estimates of the model: $Leverage_{i,t}=\alpha+ \beta X_{i,t-1}+ \gamma D_{crisis,t} + \delta D_{crisis,t-1}+ \varphi X_{i,t-1} * D_{crisis,t-1} +\eta_i + \varepsilon_{i,t}$ The interaction term $X_{i,t-1}*D_{crisis,t-1}$ captures how much and in which direction the coefficients of the stylized leverage determinants on the entire sample (β) are affected by economic crises periods and will therefore give an indication of whether the relation of the existing determinants with leverage is affected by crises. This regression model is different from the one used at section 4.2 as the median industry book leverage variable is not included. Firm fixed effects are included at every regression. The t-statistics are presented between parentheses and calculated using clustered standard error around firms following Petersen (2009). Again, all observations have been winsorized at the 0.5% level in both tails of the distribution. The symbols *, **, and *** denote the statistical significance at the 10%, 5% and 1% level.

Country Variable	Germany	France	United Kingdom	Italy	Spain	Netherlands
Panel A: Book leverage						
*Log(sales) * Crisis*	-0.000	-0.000	-0.003**	-0.000	-0.008*	-0.002
	(-0.14)	(-0.42)	(-2.31)	(-0.13)	(-1.85)	(-0.48)
*MTB * Crisis*	0.006	-0.004	0.002	-0.003	0.019	-0.037
	(0.95)	(-0.43)	(0.55)	(-1.43)	(1.09)	(-1.62)
*Profit. * Crisis*	0.006	-0.023	-0.026*	-0.052	0.037	-0.090
	(0.15)	(-0.44)	(-1.65)	(-0.88)	(0.26)	(-0.63)
*Tang. * Crisis*	-0.010	-0.035	0.029	0.034	-0.022	-0.054
	(-0.51)	(-1.04)	(1.59)	(1.44)	(-0.47)	(-1.01)
*CF vol. * Crisis*	0.000***	0.000	0.000	-0.000**	-0.000	0.000
	(3.30)	(1.06)	(0.42)	(-2.36)	(-1.20)	(0.45)
Panel B: Market leverage						
*Log(sales) * Crisis*	0.019	-0.001	-0.000	-0.003	-0.000	-0.007
	(0.91)	(-0.41)	(-0.12)	(-0.98)	(-0.07)	(-1.07)
*MTB * Crisis*	-0.011**	-0.038	-0.007***	0.000	-0.038**	-0.074*
	(-2.09)	(-0.53)	(-2.58)	(0.01)	(-2.28)	(-1.85)
*Profit. * Crisis*	0.011	-0.015	0.030**	-0.101	-0.158	-0.182
	(0.27)	(-0.22)	(2.38)	(-1.28)	(-0.94)	(-1.05)
*Tang. * Crisis*	0.015	-0.013	0.045**	0.033	0.058	-0.055
	(0.57)	(-0.35)	(1.97)	(1.04)	(0.96)	(-0.54)
*CF vol. * Crisis*	0.000**	-0.000	0.000	0.000	-0.000	-0.000
	(2.41)	(-0.05)	(0.04)	(0.57)	(-0.96)	(-0.78)

From the results on both book and market leverage it can be noticed that the different interaction coefficients do not show a very clear or homogeneous picture. For France, Italy and The Netherlands it seems that their factors are hardly affected by recession periods as none or only one statistically significant interaction coefficient is shown. Germany, the United Kingdom and Spain however do depict several significant results, indicating that their factors' relationship with leverage do seem to change. When comparing the statistical significant coefficients per factor, it can be noticed that the absolute values and sometimes even the direction of the effects are quite different. To be able to interpret and get a better understanding of these differences across the individual countries, the institutional differences like tax codes, bankruptcy laws, the state of development of bond markets, and patterns of ownership but also the differences in accounting standard should be studied first.[107] As the purpose of this last section was only to check whether the regularities found at section 4.2 also hold at the country level and thereby to check for

Although the interaction coefficients are depicted in one column per country, it should be noticed that this has also been done because of space considerations. For each interaction term a separate regressions has been run to solve the multicollinearity problem.

[107] Rajan, R.G. & Zingales, L. (1995). 'What Do We Know About Capital Structure? Some Evidence from International Data. *The Journal of Finance, 50 (5),* p.1440

homogeneity across European countries, delving deeper into the characteristics of each country goes beyond the scope of this study. It might however be an interesting issue for future research. As no clear regularities are depicted in table 6, the only conclusion that can be drawn here is that leverage determinants are not affected in the same way by crises across countries.

Section 5: Conclusion

The main goal of this thesis has been to study the effects of economic recessions on firms' capital structures and leverage determinants and consequently to develop a conclusion on which underlying theoretical mechanism is right on this issue. Besides, this study has also served as a check to see whether the stylized leverage determinants found by Rajan & Zingales and Lemmon, Roberts & Zender hold their quantitative importance on a different dataset; on other countries, under different circumstances and over a different timeframe. In this way, this empirical study responds to the call to make 'structural estimations on leverage ratios and its leverage determinants'[108] or to 'examine the changes over time'[109], to get a better understanding of how capital structures and their determinants behave under different circumstances.

To fulfill these objectives, empirical tests have been done on a sample of 4,451 firms from the six largest economies of European Union between the years 1993 and 2011. At first, these tests have been done on the full sample to get a general understanding of the effects on leverage and its determinants within Europe. After this, the empirical tests have partially been replicated on the individual countries to identify whether large differences exist across countries on the effect of crises on both leverage and its determinants.

From the study on the entire sample, it can be concluded that, although leverage ratios tend to rise considerably in the years prior to a recession, a period of deleveraging is initiated about one year after the start of both recessions resulting from the dot-com and financial crisis, pointing at the static trade-off theory as the theoretical framework that is right on this matter. The high debt levels that have been built up prior to the recessions actually become a burden to the firm by the time an economy is actually in a recession, as they require high obligatory debt payments, making leveraged firms highly vulnerable to changes in the state of the economy and interest rates. As income falls during recessions, the indebtedness to firms' income increases sharply, raising concerns regarding corporate debt sustainability and creditworthiness, which consequently raises bankruptcy risks and costs. The increase in bankruptcy costs, in combination with tightening lending terms of the suppliers of debt, substantially increases the costs of debt, while the beneficial effects of leverage, like the tax shield and the disciplinary effects of debt seem to decrease. As the debt trade-off becomes more unfavorable in times of recessions, the optimal leverage ratio decreases, forcing firms to deleverage. When shifting attention to the country level, it can be

[108] Lemmon, M.L., Roberts, M.R., Zender, J.F. (2008). 'Back to the Beginning: Persistence and the Cross-Section of Corporate Capital Structure', *The Journal of Finance, 63 (4),* p.1605
[109] Frank, M.Z. & Goyal, V.K. (2007). 'Capital Structure Decisions: Which Factors Are Reliably Important?', p.2

concluded that, although the deleveraging process at the European sample was clearly confirmed, the effect of recessions on leverage ratios is heterogeneous across countries. At the country level, most countries indeed started deleveraging, but Spanish, and to a lesser extent, Italian companies reported that they kept on increasing their leverage ratios one year after a recession. Investigating whether these differences can be devoted to, for example, institutional differences would be an interesting task for future research.

Conclusions on how the relationships of the stylized leverage determinants with leverage are affected during recession periods are based on the book leverage ratio only. This has been decided as the market leverage ratio is, because of its construction, largely driven by valuation effects owing to movements in equity prices, making it difficult to draw any credible conclusions on this leverage ratio. Taken from the interaction results on the book leverage ratio, it can be concluded that the only factors' relationship with leverage that has been affected during recessions is the size factor. All other relations of the well known leverage determinants with leverage remain unaffected during recessions. For the size factor is has been found that the effect of size on book leverage becomes less positive in times of recessions. A possible explanation for this observation could be that, according to the European Central Bank, larger firms tend to deleverage more and at a higher pace than smaller firms.[110] It could therefore be that the leverage ratios of large and small firms get closer to each other during recessions, lowering the total positive effect of size on leverage. When letting the factors interact with the lagged GDP-growth rate instead of with the lagged crisis dummy, an additional effect has been found. Next to the less positive effect of size on leverage, it has also been found that profitability becomes more negatively related to book leverage in times of negative GDP-growth rates. This more negative effect would mean that the pecking order theory, which suggests that firms prefer to use internal funds before external funds, holds even more during recessions. As recessions tend to go hand in hand with tightened lending terms and standards, this observation seems to make sense. At the country level, no clear homogeneous effects have been found. For France, Italy and the Netherlands it seems that their factors are hardly affected by recession periods while for Germany, the United Kingdom and Spain several significant results do appear. A deeper understanding of the institutional differences of the individual countries, which goes beyond the scope of this study, would be needed to be able to interpret or understand the differing results and could therefore be an interesting task for future studies.

[110]European Central Bank. (2012). 'Corporate Indebtedness in the Euro Area', *Monthly Bulletin (Feb),* p.98

The last conclusion that can be drawn based upon this study is that the stylized leverage determinants found by Rajan & Zingales and Lemmon, Roberts & Zender hold their statistical importance when predicting leverage ratios, both at the European sample as across the individual countries, also after incorporating the crisis dummy variable. Even the directions of the determinants' relations with leverage seem to be the same, confirming Rajan & Zingales' expectation about similarity of the factors correlation with leverage across countries. Especially the initial leverage and median industry book leverage variables have proved to very important with t-statistics of over 15.00, indicating that these variables were indeed the two most important ones missing in Rajan & Zingales' study. The only factor which has not confirmed its importance and thereby clashes with Lemmon et al. is the cash flow volatility factor. At last, the importance of a firm fixed, time-invariant effect in explaining firms' leverage ratios, already pointed out by Lemmon et al, has been confirmed on this sample as well. By including the fixed effects estimator in the model, the R^2 increases by about 0.3.

Although this study provides the capital structure stream of research with some interesting insights, there is still much work to do before the capital structure puzzle is fully understood. Still, even after including the crisis dummy variable, only 40% of the variability in leverage is explained by the incorporated leverage determinants, leaving much room for the discovery of other factors that correlate with leverage to improve future estimation models. Also, although the importance of a firm-fixed time-invariant effect has been shown to be important when explaining corporate leverage, the underlying time invariant variables are still to be identified. Besides, although the static trade-off theory does provide pleasing explanations for the decrease in leverage during recession periods and the positive effects of tangibility and size on leverage, the theory does not directly predict the importance of initial leverage, industry leverage ratios and the negative effect of profitability on leverage. Considerable theoretical development should therefore be needed to let the static trade-off, or any another theory, account for all of the evidence found. Additionally, it would be interesting to perform this study on other proxies of leverage to check how much the way of constructing leverage proxies matters for the robustness of the results found. Finally, there are of course many other interesting countries on which this study could be applied to. By doing this, it could be tested whether Rajans & Zingales' statement, about the similarity across countries, continues to hold.

References

- Altman, E.I. (1984). A further Empirical Investigation of the Bankruptcy Cost Question. *Journal of Finance, 39,* 1067-1089

- Andrade, G. & Kaplan, S.N. (1998) How Costly is Financial (Not Economic) Distress? Evidence from Highly Leveraged Transactions that Became Distressed. *Journal of Finance*.

- Bar-Or. (2000). An Investigation of Expected Financial Distress Costs. Unpublished paper, Wharton School, University of Pennsylvania.

- Brealey, R.A. & S.C. Myers. (1984). Principles of Corporate Finance. 2nd Edition. McGraw-Hill Book Co. New York.

- Demers, E. & Lev, B. (2001). A Rude Awakening: Internet Shakeout in 2000. *Review of Accounting Studies*, *6*, 331-359

- European Central Bank. (2012). 'Corporate Indebtedness in the Euro Area', *Monthly Bulletin (Feb.),* p.87-103

- Frank, M.Z. & Goyal, V.K. (2007). Capital Structure Decisions: Which Factors Are Reliably Important? *Financial Management, 38 (1),* 1-37

- Geanakoplos, J. (2010). Solving the Present Crisis and Managing the Leverage Cycle. *FRBNY Economic Policy Review*, 101-131

- Haidar, J.I. (2012). Sovereign Credit Risk in the Eurozone. *World Economics, 13(1),* 123-136,

- Hovakimian, A., Hovakimian, G. & Tehranian, H. (2004). Determinants of Target Capital Structure: The Case of Dual Debt and Equity Issues. *Journal of Financial Economics, 71*, 517-540

- International Monetary Fund (2012). Report for Selected Countries and Subjects.

- Ivashina, V. & Schaftstein, D. (2010). Bank Lending During The Financial Crisis of 2008. *Journal of Financial Economics, 97*, 319-338

- Jensen, M.C. & Meckling, W.H. (1976). Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure. *Journal of Financial Economics, 3 (4),* 305-360

- Jensen, M.C. (1986). Agency costs of Free Cash Flow, Corporate Finance and Takeovers. *American Economic Review, 76 (2),* 323-239

- Kwan, S.H. (2010). Financial Crisis and Bank Lending. *Federal Reserve Bank of San Francisco*, 1 - 43

- Lemmon, M.L., Roberts, M.R., Zender, J.F. (2008). Back to the Beginning: Persistence and the Cross-Section of Corporate Capital Structure. *The Journal of Finance, 63 (4),* 1575-1608

- Masulis, R.W. (1980). The Effects of Capital Structure Change on Security Prices: A Study of Exchange Offers. *Journal of Financial Economics*, 139-177

-

- McKinsey Global Institute (2010). 'Debt and Deleveraging: The Global Credit Bubble and Its Economics Consequences', p.1-94.

- Miller, M.H. (1977). Debt and Taxes. *Journal of Finance, 32,* 261-275

- Modigliani, F. & Miller, M.H. (1958). The Costs of Capital, Corporation Finance and the Theory of Investment. *The American Economic Review, 48 (3),* 261-275

- Modigliani, F. & Miller, M.H. (1963). Corporate Income Taxes and the Cost of Capital: a Correction. *The American Economic Review, 53, (3),* 433-443

- Murphy, A. (2008). An analysis of the Financial Crisis of 2008: Causes and Solutions. Oakland University, 1-28

- Myers, S.C. (1984). Capital Structure Puzzle. *Journal of Finance, 39 (3),* 575-592

- Petersen, M.A. (2009). Estimating Standard Errors in Finance Panel Data Sets: Comparing Approaches. *The Review of Financial Studies, 22 (1),* 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 (5),* 1421-1460

- Ross, S.A., Hillier, D., Westerfield, R.W., Jaffe, J. & Jordan B.D. (2010). Corporate Finance. 9th Edition, McGraw-Hill Book Co., New York

- Shiller, R.J. (2005). Irrational Exuberance. 2nd Edition, Princeton University Press

- Simkovic, M. (2011). Competition and Crisis in Mortgage Securitization. *Indiana Law Journal, 88*

- Warner, J. (1976). Bankruptcy Costs, Absolute Priority and the Pricing of Risky Debt Claims. University of Chicago

- Weiss, L.A. (1990). Bankruptcy Resolution: Direct Costs and Violation of Priority of Claims. *Journal of Financial Economics 27 (2),* 285-314

- White, M.J. (1983). Bankruptcy Costs and the New Bankruptcy Code. *Journal of Finance, 38 (2),* 477-488

- Wooldridge, J.M. (2006). Introductory Econometrics: a Modern Approach. Third Edition, Thomson South-Western

Appendix A

At this appendix, a detailed description of the construction of all variables used for this study is given. A few additional variables are included to get a better understanding of how some ratios are constructed. Data on stock price and shares outstanding have been retrieved from CRSP, all other data was available via Compustat Global. The construction of most variables is based on the paper of Lemmon, Roberts & Zender (2008).

Total Debt	=	short-term debt + long-term debt
Market Equity	=	stock price * shares outstanding
Book Leverage	=	total debt / book assets
Market Leverage	=	total debt / (total debt + market equity)
Net Debt Issuance	=	Change in total debt from year *t-1* to year *t* divided by the end of year *t-1* total assets
Log(sales)	=	log(book assets)
Market-to-Book	=	(market equity + total debt + total preferred stock – deferred taxes) / book assets
Profitability	=	operating income before depreciation / book assets
Tangibility	=	net PPE / book assets
Cash flow volatility	=	deviation from mean historical operating income
Initial Leverage	=	first observation of book leverage
Median Industry leverage	=	median book leverage per firm-year for each industry
Crisis Dummy	=	dummy variable which takes on the value of 1 if a country faces two consecutive quarters of decline in real GDP in a year

Appendix B

Extended version of Table 1. Next to the summary statistics on the full sample, the statistics for each individual country are depicted here. The construction and data preparation is exactly the same as described at table 1 at the main body of this study. Initial book leverage and median industry book leverage have not been depicted in this table because of space considerations and because they do not provide much information as a summary statistic.

	Full sample (1993 – 2011)			Crisis sample		
Variable	**Mean**	**(SD)**	**Number of observations**	**Mean**	**(SD)**	**Number of Observations**
Book leverage						
Full sample	*0.19*	(0.18)	*50,188*	*0.21*	*(0.19)*	*6,691*
Germany	0.19	(0.19)	9,362	0.21	(0.21)	1,278
France	0.22	(0.17)	9,330	0.22	(0.19)	1,178
United Kingdom	0.17	(0.18)	24,526	0.18	(0.19)	2,691
Italy	0.26	(0.16)	3,104	0.28	(0.16)	1,077
Spain	0.26	(0.17)	1,842	0.31	(0.18)	223
Netherlands	0.22	(0.17)	2,024	0.22	(0.16)	244
Market leverage						
Full sample	*0.23*	*(0.23)*	*38,191*	*0.29*	*(0.26)*	*5,554*
Germany	0.25	(0.25)	6,399	0.29	(0.27)	906
France	0.29	(0.24)	7,676	0.33	(0.26)	1,087
United Kingdom	0.18	(0.22)	18,507	0.23	(0.25)	2,303
Italy	0.34	(0.24)	2,221	0.40	(0.25)	840
Spain	0.31	(0.23)	1,532	0.39	(0.24)	196
Netherlands	0.25	(0.21)	1,856	0.29	(0.21)	222
Log(sales)						
Full sample	*4.75*	*(2.47)*	*48,463*	*4.71*	*(2.54)*	*6,364*
Germany	5.02	(2.31)	9,194	4.77	(2.30)	1,249
France	5.12	(2.31)	9,252	4.97	(2.36)	1,161
United Kingdom	4.17	(2.58)	23,078	3.85	(2.72)	2,415
Italy	5.66	(1.95)	3,099	5.65	(1.95)	1,077
Spain	5.99	(1.87)	1,837	6.30	(1.98)	223
Netherlands	6.03	(2.00)	2,004	6.14	(2.29)	239
Market-to-Book						
Full sample	*1.37*	*(1.70)*	*37,958*	*1.04*	*(1.42)*	*5,530*
Germany	1.16	(1.20)	6,388	0.97	(0.88)	904
France	1.09	(1.02)	7,659	0.88	(0.81)	1,087
United Kingdom	1.62	(1.94)	18,340	1.20	(1.72)	2,291
Italy	1.16	(2.75)	2,218	0.93	(1.76)	837
Spain	1.17	(1.04)	1, 516	1.03	(0.92)	195
Netherlands	1.25	(1.12)	1,837	0.86	(0.49)	216
Profitability						
Full sample	*0.05*	*(0.28)*	*50,076*	*0.01*	*(0.30)*	*6,675*
Germany	0.07	(0.17)	9,314	0.05	(0.18)	1,269
France	0.09	(0.13)	9,299	0.05	(0.14)	1,175
United Kingdom	0.01	(0.37)	24,498	-0.05	(0.44)	2,688
Italy	0.08	(0.10)	3,102	0.07	(0.10)	1,076
Spain	0.10	(0.09)	1,842	0.08	(0.09)	223
Netherlands	0.11	(0.13)	2,023	0.08	(0.14)	244
Tangibility						
Full sample	*0.25*	*(0.23)*	*50,187*	*0.21*	*(0.21)*	*6,691*
Germany	0.23	(0.19)	9,362	0.22	(0.19)	1,278
France	0.18	(0.17)	9,329	0.16	(0.18)	1,178
United Kingdom	0.27	(0.26)	24,526	0.20	(0.23)	2,691
Italy	0.26	(0.20)	3,104	0.25	(0.20)	1,076
Spain	0.36	(0.23)	1,842	0.31	(0.21)	223
Netherlands	0.27	(0.19)	2,024	0.20	(0.17)	244
Cash flow volatility						
Full sample	*84.67*	*(387.61)*	*50,076*	*91.54*	*(442.99)*	*6,675*
Germany	90.08	(377.82)	9,314	65.36	(295.53)	1,269
France	109.74	(434.34)	9,299	108.80	(439.08)	1,175
United Kingdom	54.81	(262.14)	24,498	53.98	(278.51)	2,688
Italy	154.91	(727.79)	3,102	156.47	(731.46)	1,076
Spain	206.09	(692.43)	1,840	273.84	(836.80)	223
Netherlands	87.97	(259.47)	2,024	105.90	(261.67)	244

Appendix C

Extended version of Table 2. Correlation between the leverage determinants and book and market leverage for the full and crisis sample. The median industry book leverage factor has not been included as it provides too few observations at the country level.

	Full sample (1993 – 2011)		Crisis sample	
Variable	**Book Leverage**	**Market Leverage**	**Book Leverage**	**Market Leverage**
Initial Leverage				
Full sample	*0.523*	*0.410*	*0.536*	*0.422*
Germany	0.627	0.561	0.646	0.609
France	0.531	0.427	0.375	0.360
United Kingdom	0.466	0.338	0.493	0.344
Italy	0.637	0.500	0.647	0.527
Spain	0.575	0.403	0.631	0.431
Netherlands	0.611	0.497	0.535	0.348
Log(sales)				
Full sample	*0.214*	*0.256*	*0.250*	*0.289*
Germany	0.097	0.179	0.157	0.207
France	0.166	0.230	0.184	0.266
United Kingdom	0.239	0.253	0.269	0.278
Italy	0.191	0.230	0.163	0.226
Spain	0.126	0.146	0.125	0.194
Netherlands	0.164	0.190	0.184	0.280
Market-to-Book				
Full sample	*-0.116*	*-0.316*	*-0.069*	*-0.255*
Germany	-0.094	-0.331	-0.005	-0.288
France	-0.116	-0.330	-0.084	-0.273
United Kingdom	0.099	-0.283	0.300	-0.184
Italy	-0.018	-0.057	-0.035	-0.125
Spain	-0.130	-0.411	-0.108	-0.424
Netherlands	-0.125	-0.412	0.019	-0.385
Profitability				
Full sample	*0.065*	*0.050*	*0.087*	*0.099*
Germany	-0.021	-0.019	0.025	0.009
France	-0.086	-0.142	-0.048	-0.118
United Kingdom	0.098	0.105	0.112	0.153
Italy	-0.098	-0.269	-0.109	-0.216
Spain	-0.251	-0.383	-0.179	-0.262
Netherlands	-0.106	-0.164	-0.169	-0.130
Tangibility				
Full sample	*0.279*	*0.239*	*0.303*	*0.271*
Germany	0.310	0.341	0.329	0.346
France	0.369	0.288	0.341	0.283
United Kingdom	0.300	0.283	0.309	0.269
Italy	0.163	0.136	0.173	0.158
Spain	0.129	0.118	0.109	0.181
Netherlands	0.289	0.282	0.429	0.307
Cash flow volatility				
Full sample	*0.079*	*0.064*	*0.098*	*0.075*
Germany	0.028	0.032	0.050	0.054
France	0.051	0.052	0.064	0.048
United Kingdom	0.087	0.044	0.101	0.064
Italy	0.078	0.057	0.079	0.064
Spain	0.154	0.118	0.177	0.122
Netherlands	0.107	-0.006	0.185	0.086

Appendix D

The effect of GDP-growth on leverage determinants. The table reports the coefficients of the model: $Leverage_{i,t}=\alpha+\beta X_{i,t-1}+\delta GDP_{t-1}+\varphi X_{i,t-1}*GDP_{t-1}+\nu_t+\eta_i+\varepsilon_{i,t}$ The interaction term $X_{i,t-1}*GDP_{,t-1}$ captures how much and in which direction the coefficients of the stylized leverage determinants on the entire sample (β) are affected by changing GDP-growth rates and will therefore give an indication of whether the relation of the existing determinants with leverage is affected by changing growth rates. For each interaction term, consisting out of one leverage determinant multiplied by the GDP-growth rate, a separate regression has been run to avoid multicollinearity issues. Apart from the inclusion of the interaction term, the regression estimates has been build up in the same way as was done at table 3. A detailed description of the construction of all variables has been reported at appendix A. The focus for this section is on the coefficients of the interaction terms. The t-statistics are presented between parentheses and calculated using clustered standard error around firms following Petersen (2009). Again, all observations have been winsorized at the 0.5% level in both tails of the distribution. The coefficients of the GDP growth factor and interaction term have been scaled by the GDP growth rates' standard deviation. The first 6 six rows depict the results of the regression model without the inclusion of time fixed effects, while the last six rows depict the result of the regression model with year fixed effects. The symbols *, **, and *** denote the statistical significance at the 10%, 5% and 1% level.

	Book leverage						Book leverage					
Variable	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Log(sales)	0.023***	0.024***	0.024***	0.024***	0.024***	0.024***	0.020***	0.021***	0.021***	0.021***	0.021***	0.021***
	(10.02)	(10.75)	(10.73)	(10.71)	(10.70)	(10.73)	(7.98)	(8.62)	(8.59)	(8.60)	(8.58)	(8.61)
MTB	-0.001	-0.002	-0.002	-0.002	-0.002	-0.002	-0.001	-0.002	-0.001	-0.002	-0.001	-0.002
	(-1.39)	(-1.35)	(-1.48)	(-1.58)	(-1.49)	(-1.52)	(-1.27)	(-1.09)	(-1.36)	(-1.47)	(-1.38)	(-1.41)
Profitability	-0.067***	-0.067***	-0.084***	-0.067***	-0.067***	-0.067***	-0.063***	-0.062***	-0.081***	-0.062***	-0.062***	-0.062***
	(-6.65)	(-6.61)	(-7.18)	(-6.60)	(-6.61)	(-6.61)	(-6.18)	(-6.14)	(-6.85)	(-6.13)	(-6.14)	(-6.14)
Tangibility	0.083***	0.083***	0.082***	0.090***	0.083***	0.083***	0.098***	0.098***	0.097***	0.103***	0.098***	0.098***
	(4.76)	(4.18)	(4.75)	(5.02)	(4.80)	(4.81)	(5.65)	(5.69)	(5.64)	(5.78)	(5.67)	(5.69)
Median ind lev.	0.324***	0.323***	0.324***	0.323***	0.318***	0.323***	0.318***	0.317***	0.317***	0.316***	0.310***	0.317***
	(16.32)	(16.25)	(16.29)	(16.23)	(15.63)	(16.26)	(15.94)	(15.89)	(15.93)	(15.87)	(15.24)	(15.90)
Cash flow vol.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(1.35)	(1.16)	(1.20)	(1.15)	(1.44)	(1.03)	(1.23)	(1.05)	(1.09)	(1.04)	(1.07)	(0.95)
GDP growth	-0.002	0.003***	0.002**	0.005***	0.002	0.003***	-0.007**	-0.002	-0.004	-0.001	-0.004	-0.002
	(-0.95)	(2.65)	(2.17)	(3.83)	(1.44)	(3.69)	(-2.22)	(-0.84)	(-1.30)	(-0.26)	(-1.18)	(-0.87)
*Log(sales) * GDP*	0.000***						0.001***					
	(3.01)						(2.96)					
*MTB * GDP*		0.000						0.000				
		(0.39)						(0.14)				
*Profit. * GDP*			0.017***						0.018***			
			(2.67)						(2.80)			
*Tang * GDP*				-0.006						-0.006		
				(-1.53)						(-1.32)		
Median ind. GDP*					0.006						0.007	
					(0.81)						(1.01)	
*Cash Flow vol * GDP*						0.000						0.000
						(0.80)						(0.65)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	No	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R^2	0.670	0.670	0.671	0.670	0.670	0.670	0.672	0.672	0.672	0.672	0.672	0.672
Observations	30,667	30,667	30,667	30,667	30,667	30,667	30,667	30,667	30,667	30,667	30,667	30,667

From the results depicted at the former table, three things should be noticed. At first, attention should be paid to the coefficients of the GDP growth factor, then on the interaction terms and at last at the inclusion of time fixed effects. When first focusing on the coefficients of the (lagged) GDP-growth rate, it can be seen that the GDP-growth rate seems to have a positive effect on leverage. This finding is in line with what we have already found as this relationship would suggest higher leverage ratios in times of economic growth and lower ratios during negative growth periods, or recessions. When time fixed effects are included in the regression model, to control for unobserved time variant variables, it can be seen that the GDP-growth variable loses its statistical significance. This indicates that it is not the GDP-growth factor that affects leverage ratios, but other, unobserved time variant variables that are captured by the time fixed effect estimator.

Focusing on the interaction terms, it can be noticed that the relationships of two factors with leverage are affected by changes in GDP-growth rate; size and profit. The positive effect found for size is in line with what has already been found at table 5. In times of negative growth (recessions) the coefficient of the size variable moves closer to zero, indicating a less positive effect of size on leverage. An explanation for this effect has been given at section 4.2. The other significant effect, which has not been found at the crisis dummy interaction terms, it the statistically significant positive value of the interaction term with profit. This effect illustrates that in times of recessions or negative GDP-growth, the coefficient of the profitability factor is negatively affected, making the general effect of profitability on leverage even more negative. This effect seems to make perfectly sense, as we have found that lending terms and standards are tightened during recessions, making it even more attractive to, as the pecking order theory suggest, use internal funds before using external funds. Also, as we found that firms try to deleverage during recessions, more profitable firms can more easily deleverage, lowering leverage ratios at a higher pace. Based on the interaction variables with the lagged GDP-growth rate variable, it can be concluded that the relation of both size and profitability with leverage is affected by changes in growth rates. All other factors' relations with leverage remain unchanged.

At last, attention will be paid to the coefficients of the time fixed effects, or year dummies, which have not been showed in the table because of space considerations. Based on the regression results from stata, it was found that for two individual years a significant positive value was found for every regression. This was for the years 2001 and 2008, which are exactly the years in which the leverage ratios depicted a peak. This finding suggests that some unobserved time variant variables had a significant positive effect on leverage in these years. Investigating which factors, would be an

interest task for future research. One such a factor could for example be fear about the futures' state of the economy, which could encourage firms to leverage up to secure financial flexibility in the future.