UNIVERSITEIT ◆ VAN TILBURG

DETERMINANTS OF CORPORATE CAPITAL STRUCTURE DURING CRISIS PERIODS

A Study of Capital Structure in Europe

Master Thesis

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ABSTRACT

This study investigates changes in capital structure and the determinants of capital structure in crisis periods. Specifically, it investigates how and if determinants and leverage are affected during recessionary periods in Europe and if these effects vary over the European countries France, Germany, the Netherlands and the UK. This study finds that crisis periods have a significant negative effect on leverage ratios. By comparing means of normal and crisis samples we find that the market leverage ratio changes significantly, while the book leverage ratio does not. Regression models gain explanatory power over capital structure with the addition of a dummy variable which controls for economic circumstances. However, there is a discrepancy between the positive coefficient of the control variable and the expected effect of crisis periods on leverage. With respect to changes in determinants, we find that the predictive power of the determinants firm size, market-to-book and median industry leverage decrease in crisis periods. Other determinants variables seem to be unchanged. The inclusion of firm fixed effects greatly increases the explanatory power of the regression models. Effects of crisis periods on leverage ratios are the same for all countries, as they all start deleveraging after approximately one year. The effects on determinants within countries are heterogeneous.

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1. Introduction

The subprime mortgage crisis of 2008 has had a profound impact on the worldwide economy. This global financial crisis has been called the greatest crisis since the Great Depression, since it sent the world into a global recession. Especially Europe has been hit hard due to a combination of factors. Real estate bubbles, variations in fiscal policies by EU members, international trade imbalances, high debt levels of households and governments, bailouts of financial institutions, a breakdown of the international debt market and finally the underreporting of budget deficits by Greece and its subsequent threat of bankruptcy. Collectively, these factors caused further damage to the European economy after the initial financial crisis. Eventually this resulted in a second crisis period, called the Eurozone crisis or Eurocrisis, which started in 2009 and is still ongoing during the writing of this thesis.

The recent crisis in Europe has focused a lot of attention on the capital structure of companies. During these crisis periods there have been many firms who got into financial turmoil due to a lack of refinancing options or because they were too highly leveraged to survive the recession (Poole, 2010). Coming to the subject of this thesis, there has already been quite some research done into the determinants of capital structure. Relevant papers have already compared different industries, countries and determinants over time. However, little research has been done in relation to such crisis periods like the recent ones. In light of possibly strong changes in leverage and in determinants of capital structure, it is justified to study if they are driven by the same factors during a crisis, in comparison to expansionary periods. This information would be quite valuable to researchers and policymakers alike. Consequently, the understanding of the determinants of capital structure is more relevant than ever.

This understanding of capital structure has been a fundamental issue in finance research, since the famous paper by Modigliani and Miller (1958). In order to understand which variables could be important for this study and the reasoning behind their importance, we have to look at several aspects of research related to capital structure. The main areas of research we will look at are the most important general capital structure theories, the empirical research of determinants and the influence of macroeconomic factors on capital structure. The focus will be on the most important general capital structure theoretical frameworks, the trade-off theory and the pecking-order theory.

While research into the theories and empirical determinants has been abundant, one aspect of the research into capital structure that has been slightly overlooked, up until recent years, is the relation between macroeconomic factors or business cycles and capital structure. Since

changing economic circumstances have an effect on many firm characteristics, it is logical that crisis periods should have an effect on the capital structure of the firm.

By investigating a sample of nonfinancial firm data from the European countries France, Germany, the Netherlands and the UK between the years of 1999 and 2012, we will analyze the effects of crisis periods on capital structure and their determinants. Additionally, a comparison will be made between the countries, in order to get a better understanding of capital structure and the determinants variables within individual economies. We will look at the changes a crisis periods brings to leverage ratios by using a t-test to compare the means of the leverage ratios. Finding changes in determinants will be done by incorporating a crisis dummy into regression models with proven determinants from literature and the inclusion of fixed effects.

Using a two sample independent t-test, we find that market leverage changes significantly in crisis periods, while book leverage does not significantly change. We find that leverage ratios rise slightly before the crisis periods and during the first quarters. However, within a year of the start of a crisis period the firms begin deleveraging. This points to the trade-off theory as the correct view during crisis periods, compared to the pecking-order theory. With respect to changes in determinants, we find that the predictive power of the determinants firm size, market-to-book and median industry leverage decrease in crisis periods. Other determinant variables seem to be unchanged. The inclusion of firm fixed effects greatly increases the explanatory power of the regression models. At the country level, there are only slight differences between determinants. No signs of the coefficients changed and any coefficients that turn insignificant are because of the limited number of observations. The effects on determinants within countries are heterogeneous.

The thesis is structured as follows. In the section theory, we start with a thorough explanation of the capital structure theories and look at the relation with this research. A comprehensive description of the most important early papers and the most relevant papers of the past years will follow that. Afterwards, we will look at the possible determinants that decide capital structure by means of empirical and survey studies. Under the theory section, we will summarize recent studies about macroeconomic factors and how they influence capital structure and also provide a summary of relevant papers which cover the relation between the business cycle and leverage will be presented. Together, the combination of these theories and the literature will give us an insight in how the academic world currently views how capital structure is determined. In the following section the recent crisis periods will be described in order to give a better understanding of the economic circumstances surrounding

these periods. The hypotheses for the research in this thesis will be stated in the next section. After we have established theoretical and empirical knowledge about capital structure and stated the goals for this thesis, we will discuss the data used in this research. First we discuss the methods of the obtainment and the characteristics of the obtained data. Subsequently, we will look at the chosen variables and elaborate on the choices we made, pertaining to existing literature. Then we will show the methodology to our research. Afterwards, all empirical results will be presented and analyzed. Finally, the thesis will end with a conclusion. We will recapitulate on the most important insights and findings of this study and discuss the limitations. The thesis will be closed with a recommendation for further research that can be done following the results of this research.

2. Theoretical Framework

Capital structure refers to the total of a company's debt and equity and to how they are mixed. Capital structure therefore indicates how a firm finances the revenue generating operations and all assets. Leverage is the ratio of debt to the total assets of a firm, which indicates how much of the firm is financed by outside liabilities. Over the last decades much research has been done to find an optimal capital structure or leverage ratio, with which the firm generates the most value for shareholders. Consequently, many theories have been created and many variables have been identified which have an impact on capital structure. However, no conclusive all-encompassing theory exists to date. Hence, we will have to make do with an overview of all the theories and variables that have held up in research so far. In this section we start with a thorough explanation of the capital structure theories and look at the relation with determinant variable of capital structure. A comprehensive description of the most important early papers and the most relevant papers of the past years will follow that. Afterwards, we will look at the possible determinants that decide capital structure by means of empirical and survey studies. Lastly, under the theory section, we will summarize recent studies about macroeconomic factors and how they influence capital structure and look at papers which cover the relation between the business cycle and leverage. For the empirical section we will focus on the pecking order theory and the trade-off theory as they are the most relevant theories. Other relevant theories will be briefly discussed, but will not return in the empirical analysis.

2.1 Capital Structure Theories

The two most important capital structure theories are the trade-off theory and the pecking order theory. While there are some parts of the theories that agree, there are also some opposing views. The question of which of the existing theories is right was first described by Myers (1984). We will first discuss the most important theories and the capital structure puzzle, by reviewing the history of the theories and the current state. Afterwards we will look at lesser known theories.

2.1.1 Trade-off theory

Firstly, we will discuss the trade-Off theory. This theory is used to describe a group of closely related theories, which could broadly be divided into the static-tradeoff model and the dynamic trade-off model (Frank and Goyal, 2007). The static trade-off model was derived from adding corporate income tax to the irrelevance proposition. Debt benefits firms in that it

shields earnings from taxes, because the interest payments can be deducted from income. However, firms also have an offsetting cost of bankruptcy since taking on debt inherently brings the risk of not being able to make timely payments to debtholders. The static-trade off model thus states that firm leverage is determined by a single period trade-off between the tax benefits of debt and the bankruptcy costs of the firm (Graham and Leary, 2011). This static model was very limited and recent research has focused on the dynamic trade-off model. The dynamic trade-off model continues on the same principle, but works over multiple periods. Dynamic models show a tendency of firms to move to a certain target leverage ratio and when deviations occur gradually move back to that target (Graham and Leary, 2001). This is in accordance with the empirical findings of Lemmon et al. (2008), who find evidence that there is a strong firm specific effect on leverage ratios. However, there is also empirical evidence that supports that leverage in big datasets seems to drift instead of actively rebalance. Furthermore, in order for trade-off theory models to show reasonable leverage ratios, transaction costs with very specific characteristics need to be introduced (Frank and Goyal, 2007). In order to get a more thorough understanding of this important theory, the evolution of research leading up to the current view will be briefly discussed.

The trade-off theory, as well as most of the research into capital structure, began with the important paper by Modigliani and Miller (1958). They proposed the important view that managers are not able to adjust the value of their company by adjusting the capital structure of the company. They based this statement on two propositions. The first proposition states that the value of the firm always stays the same under all possible leverage ratios. Since investors are able to take on leverage themselves, any share price changes due to differences in capital structure would present an arbitrage opportunity. However, this assumes that investors have access to the same costs of debt as the company has. The second proposition states that the expected return on equity goes up due to a premium to compensate shareholders for being exposed to more financial risk as the firm takes on leverage. Modigliani and Miller show that theoretically the higher cost of equity and the lower cost on debt cancel each other out.

While this first view was important theoretically, it was of limited empirical use. The first factor that had to be incorporated in the view was 'corporate taxes'. As interest payments are tax deductible, they cause a lower cost of taxes compared to dividends which would result in a higher value of the firm when taking on debt. Therefore, if the value of the firm rises by taking on more debt with the same expected return, the value of the firm can be determined by taking the value of a firm financed with equity and adding the value of the tax shield on debt (Modigliani and Miller, 1958). However, this relationship implied that all firms should have

very high debt levels, which was not empirically correct. A second factor was explored by Myers in his famous paper about the Capital Structure Puzzle in 1984. Myers stated that debt obligations could cause a firm to go bankrupt or suffer costs. These costs, called 'financial distress costs' or 'bankruptcy costs' could severely devalue the firm, even if bankruptcy could be avoided. They concluded that the capital structure of a firm was a trade-off between the tax benefits of debt and the costs of financial distress. Jensen and Meckling (1976) disputed this claim, reasoning that debt existed before the existence of tax benefits and that more determinants of capital structure should exist. They proposed the factor agency costs. They described that debt causes a conflict of interest between stockholders and bondholders, as stockholder only have a residual claim. Therefore, shareholders are motivated to pursue strategies that increase the chance of high residual earnings, which would transfer wealth from the bond to the stockholders. In order to prevent risky strategies with potential high payoffs, they find that the firm must incur costs for 'monitoring' in order to reduce the 'incentive effect'.

The view that capital structure was determined by trading off tax advantages against agency and bankruptcy costs was disputed by Modigliani and Miller (1977). They find that bankruptcy costs would only be a small percentage of the value of the firm. This percentage would not be sufficient to ratify the existing leverage ratios. They solved this issue by taking personal income tax into account. When the personal taxes for investors on income from stock is less than the tax on income from bonds, the return on bonds would have to be higher to compensate. They finish with the conclusion that there is no optimal debt ratio for individual firms. However, at an aggregate level there should be an equilibrium leverage ratio for the firms in general.

2.1.2 Pecking Order Theory

The second main view that we will discuss is the pecking-order theory, first described by Myers and Majluf (1984). According to the pecking-order theory a firm prefers internal to external funding and prefers debt to equity when external financing has to be used. Therefore, firms should always prefer internal funds first, taking on external debt second and raising additional equity last. Consequently, there should be no optimal capital structure for the firm to strive too. The reason that obtaining external debt is costly, is because managers have more information than external investors about the firms future prospects. To compensate for the information asymmetry, investors demand a premium. Furthermore, the outside investors discount the stock of the firm, when the firm choses to issue equity instead of debt. In the

absence of suitable investment opportunities, the company should retain earnings in order to avoid taking on external debt. According to Graham and Harvey (2001) the theory is consistent with two empirical regularities. Firstly, when equity issues are announced, the markets show a significant negative reaction. Secondly, the majority of investments are funded with retained earnings while net equity issues are generally small or negative. Nevertheless, there is also empirical evidence against the theory. Both Frank and Goyal (2003) and Fama and French (2005) find that smaller firms frequently fill financing deficits with equity issues. However, Lemmon and Zender (2008) state that these findings are not necessarily hard evidence against the theory, as small high growth firms may have difficulties in obtaining debt. Leary and Roberts (2010) find that even in subsamples where the theories are most likely to be true, the pecking-order theory cannot explain all issuance decisions. Graham and Leary (2011) conclude that the trade-off view is useful under certain conditions, but leaves many financing decisions unexplained.

The pecking order theory does leave open the options for abuse of information asymmetry between agents and bond and shareholders. Finally, the pecking order theory does not predict an optimal leverage ratio in contrast with the trade-off theory(Graham and Leary, 2011). We will discuss the next two theories that are related to the pecking order theory.

2.1.3   *Market timing theory*

The third theory on capital structure is the market timing theory, which is related to the pecking order theory. Baker and Wurgler (2002) argue that current capital structure is the cumulative outcome of past attempts to time the market. Consequently, this theory assumes that there is no optimal capital structure for the firm. There has not been much research that supports this theory. Graham and Harvey (2001) show that in a survey some management state that they do try to time the market, as some managers stated that the under or overvaluation of their stock was a consideration in the decision to issue equity. However, there is some evidence against this theory. Leary and Roberts (2005) show that the presence of adjustment costs is likely to be the reason for the persistence of sudden changes in leverage rather than an indifference by management for capital structure.

2.1.4 Signaling Theory

The fourth theory is linked to the market timing theory. This theory states that information can be transferred to outside investors, by choices management makes in the capital structure of the firm. Taking on more debt and having a higher leverage ratio would sign to outside investors that management deems the firm able to take on more debt obligations and signals increasing future cash flows (Ross, 1977). This theory is linked with information asymmetry. Recession periods would lower the ability of firms to carry debt obligations. Therefore, we assume the signaling theory would expect managers to convey this information and start deleveraging during a crisis.

2.1.5 Managerial Entrenchment

The fifth theory on capital structure that we will discuss is not particularly related to the previous theories. The dynamic theory of capital structure is based on managerial entrenchment, first described by Zwiebel (1996). The theory encompasses that certain circumstances facilitate financing with equity issues, but that these issues can allow managers to become entrenched. Baker and Wurgler (2002) state that there are two views on how entrenched management can negatively impact equity investors by refusing to issue debt after an equity issuance, which they should eventually do to rebalance. Firstly, refusing to rebalance could exploit existing investors as it dilutes their shares. Secondly, it can exploit new investors, since managers are assumed to issue equity when valuations of the company are high. Therefore, there could be wealth destruction for shareholders if leverage lowers while debt levels remain the same.

2.2 Theoretical Predictions

Now that we have discussed the most important relevant capital structure theories, we will briefly discuss the predictions that these theories will have on the coefficients of determinant variables of capital structure. Table 1 shows an overview of the predicted signs by the trade-off theory and the pecking-order theory. As firm size is an inverse proxy for risk of bankruptcy it has a predicted positive effect on leverage by both theories. Similarly, tangibility can be seen as the ability of the firm to provide collateral for debt holders. Consequently, tangibility also reduces risk to bondholders and should have a positive effect on leverage ratios (Rajan and Zingales, 1995).

However, the theories diverge on their predictions of the effect of profitability and Market-to-book (Frank and Goyal, 2008). The trade-off theory holds that the firm should

choose the optimal capital structure based on balancing the tax benefits of debt with the costs of taking on debt. As the profitability of a firm increases, the potential benefits of a debt tax shield also increases as the firm is able to utilize a bigger tax shield efficiently. Also most tax systems globally are progressive, which increase the importance of the benefits of debt as profitability of a firm increases. Therefore the trade-off theory predicts that profitability will have a positive effect on capital structure. However, the pecking-order theory states that firms will prefer internal financing to external financing. When the profitability of a firm increases, the available internal funds will also increase and the firm will take on relatively more equity compared to debt when suitable investment opportunities arise. Therefore, the trade-off theory predicts that market-to-book will have a positive effect on capital structure (Frank and Goyal, 2008).

Market-to-book can be seen as a proxy for the growth opportunities of the firm. According to Myers (1977), under the trade-off theory it could be that agency problems arise as managers may underinvest because shareholders may not earn a sufficient profit on projects with positive net present value when the debt obligations are substantial. Therefore, the trade-off theory predicts that market-to-book will have a negative effect on capital structure. However, in the pecking order theory, it is likely that firms with a lot of growth opportunities will need much more funds then they can raise with internal funds. This would force a firm with a lot of positive net present value projects to significantly raise their leverage ratio. Therefore, the pecking order theory predicts that profitability will therefore have a positive effect on capital structure.

Table 1. The predicted sign of determinants by capital structure theory. + represents a positive predicted coefficient for the variable in relation to book leverage and market leverage, while – represents a negative predicted coefficient.

Variable	Trade-off theory	Pecking order theory
Firm size	+	+
Tangibility	+	+
Profitability	+	-
Market-to-book	-	+

2.3 Crisis Periods

Next to reviewing theories and literature, it would be practical to gain an understanding about the crisis periods in Europe, which will be incorporated in this research. In this section we will look at the causes and circumstances of the global financial crisis and the Euro crisis.

2.3.1   Global Financial Crisis

The credit crunch began in 2007 when the US housing market collapsed. The housing market had been in a bubble in the previous years, which was stimulated by the US government (Gorton, 2008). The US government had provided funds to banks, so they in turn could lend more to lower income households. This had kept the demand for housing artificially high and created many lower-grade or subprime mortgages (Demyanik and van Hemert, 2008). The growth of the sub-prime mortgages was also stimulated by wrong calculations about potential losses on the mortgages (Calomiris, 2008). The reason that the US housing market could impact the global economy so strongly, was that financial products that derived their value from those mortgages, such as CDOs, were created in huge numbers. Three further problems escalated the situation. Firstly, most buyers of the financial product that securitized a underlying package of mortgages, were unable to appraise their value correctly. Secondly, it became apparent that there was substantial information asymmetry and banks incorporated increasing amounts of sub-prime mortgages in the financial products. Thirdly, financial institutions used accounting methods to hide their true investments in mortgage-backed securities(MBS) from investors and clients(Goodman et al., 2008). These practices caused international mistrust of banks in 2008. A direct cause of the further devaluation of mortgage-backed securities was the downgrading of their credit rating by the rating agencies. After the losses because of devaluations of MBS, financial institutions could no longer hide their investments from the public. The market was shocked because these losses were not anticipated and the demand for MBS dropped further, creating a downward spiral for the US financial sector (Gorton, 2008).

There were several reasons why this financial crisis turned global. Initial problems in the US cause problems worldwide firstly because the global MBS market was huge and unregulated, with many institutions having invested heavily in these former 'safe investments'. Secondly, the accounting practices exposed the true investments into the market for all financial institutions. Thirdly, information asymmetry cause the inter-bank credit market to dry up. International banks got into more trouble because of an inability to

refinance their short-term credit demand and the enormous losses which had to be taken immediately, which cause very low equity values (Poole, 2010).

2.3.2. *Eurocrisis*

During 2008 and 2009 the focus in Europe was on stabilizing the area-wide banking system. The sovereign debt markets for European countries were not in turmoil yet. This changed when in late 2009, numerous EU members reported large unanticipated budget deficits. The scale of the ongoing recession combined with fear of more losses in the banking sector cause a devaluation of sovereign bonds. The shock of the violation of EU fiscal rules from Greece decreased all bonds values in Europe even more(Lane, 2012).

A fund for bailing out countries was created by the EU and the IMF. Greece and Ireland were put out of the bond market in 2010 and Portugal in 2011, and were bailed out by mostly EU funding. Greece even had to be bailed out again in 2012 (Lane, 2012). The turmoil with these countries cause the EU to also direct strict budget deficit guidelines for other member states. Because the maximum budget deficit was capped at 3%, many countries had insufficient leeway to invest in their respective economies in order to smooth out the effects of the recession.

3. Literature Review

The section about literature review will start with a review of the most important papers which performed similar research and had relatable results in the last decades. The papers will be discussed in order of appearance. Papers about theories can be found in the section theoretical framework. After the discussion about the most important papers, the variables which will be used for empirical analysis in this thesis will be described and discussed with respect to theories and especially empirical findings. A comprehensive table with the most widely tested variables, and the regression results for the coefficients from the most important papers can be found in appendix 1.

3.1 Review of important empirical papers

Empirical research has found several determinants that consistently have a significant effect on firm leverage. Already in 1991, Harris and Raviv commented that the consensus of research up to that point was that "leverage increases with fixed assets, non-debt tax shields, investment opportunities and firm size", while "leverage decreases with volatility, advertising expenditures, probability of bankruptcy, profitability and the uniqueness of the product". In later years some of these determinants became insignificant or even changed signs due to the inclusion of other determinants and different time periods and markets.

3.1.1. Rajan and Zingales (1995)

Rajan and Zingales (1995) tried to establish two goals. First they wanted to know if the significant determinants for the US would uphold their significant relationship in other countries. Secondly they tried to get a better understanding of determinants by using cross-sectional analysis on nonfinancial firms from G7 countries. While comparing capital structure and determinants between countries, they found that the UK and Germany had lower leverage ratios then the other countries. Empirically, they tested only four variables: firm size, market-to-book, profitability and tangibility. They found that these variables stayed significant for firms outside the US. Additionally, they provided the determinants with theoretical explanations, which can be found in the next section.

3.1.2. Frank and Goyal (2007)

Frank & Goyal (2007) expanded upon the four factors identified by the paper by rajan and zingales (1995). The goal of the writers was to find a standardized set of core factors to be used in future research on capital structure decisions. These factors should be used in tests

every couple of years, in order to determine if the determinants of capital structure were changing. Frank and Goyal use observations on non-financial US corporations from 1950 to 2003. They decide to use tangibility, market-to-book ratio, size, profitability, industry median leverage and inflation. With these factors they are able to explain 27% of variation in the leverage ratios. Median industry leverage and expected inflation were added to the original four determinant variables. The authors note that median industry leverage is a very strong factor, while expected inflation is not that reliable. They left out the variables cash flow volatility and dividend payer after consideration.

3.1.3. Lemmon, Roberts & Zender (2008)

The two papers discussed above tried to find empirically sound factors that could determine the leverage ratios corporations using. Conversely, the study by Lemmon, Roberts & Zender focused more on observing patterns in capital structure. The authors conclude that leverage ratios are mostly affected by time-invariant and firm-specific factors. This follows from their finding that corporate capital structures tend to converge to more moderate levels of leverage, yet also tend to persist. Using regression models with fixed effects and variables that account for the persistence and time-invariance, they achieve to explain more then 60% of the variance in the leverage ratios.

3.1.4. Akhtar (2012)

Akhtar (2012) tried to improve upon the findings by Lemmon et al. by using firm fixed effects and dummy variables to control for economic activity in the form of the phase of the business cycle. This study finds that controlling for economic activity plays an important role in the regression model, as the explanatory power of the models increases significantly with the addition of the dummies. Furthermore, firm fixed effects improves the explanatory power, but causes variables like initial book leverage, who remain stationary over time, to become obsolete.

3.2 Determinants of Leverage

Many factors have consistently held up to be significant influences of leverage in research until now. In this section we will discuss the relevant determinant variables for this research, while relating to the capital structure literature. For a discussion about theoretical predictions about the determinants go to section 2.2. In appendix 1 you can find an overview of the measured coefficients of the most frequently used determinants in recent empirical research.

Past empirical research has found that over longer periods of time leverage is positively influenced by firm size, tangibility, initial leverage and median industry leverage. Conversely, leverage is negatively influenced by profitability, market-to-book, tax rate and cash flow volatility. Additionally, adding fixed effects to regression analysis increases the explanatory power.

3.2.1 Size

Firm size can be seen as a proxy for bankruptcy risk. The inverse relationship between firm size and the profitability of default can be attributed to multiple factors. Factually larger firms tend to be more diversified and empirically default less often (Rajan and Zingales, 1995). A more diversified firm also has a more diversified cash flow, which reduced the cost of debt obligations and enables the firm to take on more debt for the same interest cost. Additionally, larger firms are more likely to have better access to credit, which reduces the chance of bankruptcy (Dygryse, de Goei and Kappert, 2012). In crisis periods it is likely that both the size of the firms as well as the relation between size and leverage will decrease. The size of firms will decrease in general due to a drop of profitability in general. The relation between size and leverage will decrease because in crisis periods correlation between assets is higher, which makes diversification less effective. Furthermore, access to credit was harder for everyone during the recent crisis periods in Europe, so the benefit of good access to credit is likely to be diminished in comparison to smaller firms.

3.2.2 Tangibility

The reasoning behind tangibility is that if a large portion of the assets of a firm are tangible, the assets can be collateral for loans, since tangible assets have more value if the firm is liquidized then non-tangibles. This would reduce the risk for lenders, which should reduce agency costs of debt and reduce the required risk premium. Therefore, the amount of debt that can be taken on by the firm increases (Rajan and Zingales, 1995). The idea that the collateral value of assets would positively influence leverage has been around since the first empirical research into capital structure determinants (Titman and Wessels, 1988).

3.2.3 Growth

Growth is a very interesting factor if we look at the existing literature. Many variable constructions have been successfully used to capture firm growth. Proxies for growth can be divided into two categories. Measurements for past and current growth and proxy variables

for future growth. The proxy variable for future growth that has been used the most is the market-to-book ratio. This ratio was already mentioned by Myers (1977) as a way to proxy for growth opportunities. The ratio of the market value of assets compared to the book value of assets is positively related to financial distress costs, which should in theory give the ratio a negative correlation with leverage (Lemmon et al., 2008).

3.2.4 Profitability

Profitability is a factor that has a significant impact on leverage in almost all research. However, the signs and strength of the relation vary between research. This could be due to sample selection, as Frank and Goyal (2008) find significant changes over time in the relation between leverage and profitability. These changes could sometimes be attributed to the choice in using either market or book definitions of leverage. In the empirical results section, we will discuss both definitions of leverage.

3.2.5 Initial Book Leverage

Initial book leverage was an important variable in the study by Lemmon et al. (2008). However, in accordance with Akhtar (2012), we will not use this variable as the inclusion of fixed effects, and especially firm fixed effects, raises problems with collinearity and reduces the explanatory power of the regression models.

3.2.6 Industry Median Leverage

Industry Median Leverage was first suggested by Frank and Goyal (2008) to serve as a benchmark for managers in determining capital structure and would thus act as a proxy for a target leverage ratio. However, it was also another important variable in the study by Lemmon et al. (2008). Net to a proxy for target leverage ratio, this variable could help capture the convergence that leverage ratios show over time. As industry median leverage changes over time, there are no issues related to collinearity and we will incorporate this variable in our research.

3.2.7 Cash flow volatility

Cash flow volatility can be seen as a proxy for the riskiness of the firm. A proxy for the riskiness of the firm was significant in earlier research of Titman and Wessels (1988). In the study of Lemmon et al. (2008) it had a significant negative effect on leverage, but became insignificant as firm fixed effects were introduced. As the debt market gets smaller during

crisis periods and this proxy will increase the cost of debt, it is expected that cash volatility will have a negative effect on leverage ratios.

3.2.8 Tax rate

The static trade-off theory predicts that taxes should play an important role in the determination of the leverage ratio of a firm. So far the determinant tax rate has not been used much in relevant research. Degryse, De Goeij and Kappert (2012) show that the variable tax rate could have a significant effect on long-term book and market leverage.

3.2.9 Dividend payer

The determinant variable dividend has been used with significant results in related research. However, we will not incorporate this variable into our research as a result of a lack of theoretical reasoning behind it. How Frank and Goyal(2005) state it:" "the existing capital structure theories have ambiguous predictions on the relation between dividend paying status and firm leverage. In our view, the interpretation of dividends needs further development beyond that contained in the literature".

3.2.10 Fixed effects

The usage of fixed effects is a proxy for unexplained time-invariant effects. Firm fixed effects is used as a proxy for both time-invariant factors as well as firm-invariant factors. The idea to incorporate these effects has been around for decades. Titman and Wessels (1988) use the factor uniqueness to proxy for the factors. However, all research since has chosen to use fixed effects in regression analysis instead of a single variables as determinant.

3.3 Business Cycle and Macroeconomic Factors

Apart from the paper of Akhtar (2012), which we have already covered extensively in the previous section, there has been little research on the effect of business cycles and macroeconomic factors on capital structure specifically. We will discuss the relevant literature briefly. The first empirical research which linked macroeconomic factors with corporate capital structure started in the early 2000's with the work of Korajczyk and Levy (2000) and Baker and Wurgler (2002).

Hackbarth et al. (2006) state that due to cutbacks in crisis periods, most industries should see an increase in credit risk, and show that macroeconomic conditions impact the probability of default. Furthermore, they state that "the tax benefit of debt depends on the level of cash

flows, which in turn should depend on whether the economy is in an expansion or a contraction. In addition, expected bankruptcy costs depend on the probability of default and the loss on the given default, both of which should depend on the current state of the economy". Furthermore, Hackbarth et al.(2006) use a two-state Markov chain to predict that market leverage should be countercyclical.

Finally, there is also research on the effects of financial cycles and the interaction with firms. Claessens et al. (2012) find that recessions accompanied with financial disruption such as housing and equity busts have a stronger duration and amplitude. Additionally they find that economic recoveries are stronger in combination with rapid growth in credit and real estate prices. Therefore it is reasonable to assume that the recent crisis periods have had a stronger than average effect on the macroeconomic conditions.

4. Hypotheses

We have described the theoretical framework and reviewed the literature. We can now continue with developing the hypotheses on leverage and determinants of leverage during crisis periods. In the next section we will discuss and describe specifics about the data we used for this research. We will also discuss any preliminary patterns that we can decipher from just looking at characteristics of the data. However, summary statistics are not sufficient to make necessary conclusions. In the section empirical results we will summarize and interpret statistical analysis of the data, with which we will try to produce conclusions about the hypotheses presented here.

For the creation of the first hypothesis we will recapitulate on what the main capital structure theories predict about the effects of a crisis on capital structure. As we have discussed before, Lemmon et al. (2008) show that leverage ratios are firm-specific and more importantly time-invariant. However, both the static trade-off model and the pecking order theory suggest that leverage ratios could be affected during recession periods. Under the static trade-off theory, the firm has to weigh positive and negative effects of debt. The two positive effects will be reduced during a crisis as firstly, leverage ratios should fall during a recession as lower firm profits reduce the benefits of the tax shield. Additionally, the disciplinary roll of debt would be reduced as most of the cash flow that gets produced during a crisis would be distributed to the bondholders instead of being available to the managers of the firm. The negative effects on the other hand get stronger. Bankruptcy costs will increase in general as cash flow is likely to drop and interest payments take in a larger percentage of profits. Furthermore, agency costs rise due to a decrease in manager earnings and due to an increase in the probability of managerial misbehavior as bankruptcy gets more likely (Graham and Leary, 2011). Therefore, the static trade-off theory predicts that the optimal amount of leverage will decrease, which will lead to a lower level of leverage in general.

The pecking-order theory is not as clear in this respect as the trade-off theory. Under the pecking-order theory it is assumed that leverage ratio are a result of management using funds whenever investment opportunity arise, and have a preference to use internal over external funds. Consequently, there is not an optimal leverage ratio and no reason why leverage should be affected by recession periods. Conversely, if internal funds are mitigated enough by the recession, external funds would be required if investment opportunities arose and the firm would have to increase their debt levels and thus their leverage ratio (Graham and Leary, 2011). Therefore, the pecking-order theory should be able to explain no change or an increase in leverage ratios during a crisis.

After reviewing the stance of the main theories on changes in leverage during crisis periods, we can assume that it is most likely that the leverage ratios will change somewhat during a crisis. However it is still unclear if the ratio will increase in accordance with the pecking-order theory or decrease in accordance with the static trade-off theory. Therefore, our first hypothesis can be formulated.

Hypothesis 1:

The leverage ratio of nonfinancial firms changes in crisis periods

In order to gain a better view of the effects of crisis periods on leverage ratios we will look at both the financial crisis and the Euro crisis to answer this first hypothesis. However, as can be deducted from our hypothesis formulation, we will make no comparison between the crisis periods in order to make conclusions about the first hypothesis. We will attempt to find an answer to the first hypothesis by means of analyzing summary statistics and using an independent sample t-test for mean comparison between normal and crisis periods.

The second hypothesis will depend less on the explanatory value of the capital structure theories and focus more on empirical work from the existing literature. Beyond knowing if leverage itself changes, we also want to know how the determinants of leverage behave in crisis periods. As stated previously, a review of the literature found that there are four variables that have been used for multiple decades and have consistently provided significant results: size, tangibility, profitability and market-to-book ratio. More recent studies have provided more variables which showed strong significant results when regressed on leverage, which we also will incorporate in our empirical research: median industry book leverage, cash flow volatility and dividend payments.

From the description of the theories and determinants in the previous section, it is clear that changes in the coefficients of the determinants are certainly possible. Whether they really change significantly is a main research question, summarized in the next hypothesis.

Hypothesis 2:

The relationship between determinant variables and leverage ratios changes in crisis periods

To the previously described variables we will add a crisis variable in order to conclude if hypothesis 2 is correct. Next to analyzing changes in the leverage ratio and the determinants, it is also insightful to look at differences across countries. The main argument

why crisis periods should be able to change both leverage and determinants is that economic conditions change severely. Since economic conditions vary between countries, it is logical to assume any change within a country due to economic circumstances would also imply different coefficients of determinants between countries.

Hypothesis 3:

The relationship between determinant variables and leverage ratios, and the leverage ratios themselves vary between countries in crisis periods

The leverage ratios will be compared over countries by using independent sample t-tests for mean comparison between normal and crisis periods within countries. The determinant part of the third hypothesis will be tested by using the regression that provided the highest explanatory power (adjusted R²), and applying that regression on the individual country samples. Afterwards an interpretation of the results will be discussed. Additionally individual countries will be compared with the total sample, to review if patterns and results that were seen for the total sample are still applicable.

5. Data

5.1. Data accumulation

The data consists of quarterly observations of variables on nonfinancial firms in France, Germany, the Netherlands and the UK, between 1999 and 2012. The fundamental quarterly information is derived from the Compustat Database. Quarterly data was specifically chosen in order to more closely look at progression of fundamentals during the crisis. The choice of quarterly data does bring some limitations with it, such as less detail of the composition of debt and equity and debt (Hovakimian et al., 2001). However, despite the limitations, as crisis periods rarely span over more than a few years, yearly data is less suited for this research. CRSP was used for the historical industry classifications, because COMPUSTAT is limited to only current industry classifications.

The selected countries have been chosen for multiple reasons. Firstly, only European countries have been selected for this research, since they will all be affected in roughly the same manner by the Eurozone crisis of 2007 - 2008 and the succeeding recession. Secondly, the selected countries all share an efficient and sizable financial system with enough firms with data over multiple business cycles. While other European countries were eligible for this thesis, the data has been limited to these four countries in order to keep the size of the data manageable. Additionally, these four countries have managed to get through the crisis periods without significant effects on the domestic economies due to government policy. Finally, related research has also chosen these countries for researching capital structure in Europe. Antoniou, Guney and Paudyal (2002) defend the additional argument, that while these countries are similar they also have enough individual characteristics which impact CS.

For the data the period between 1999 and 2012 has been chosen. This choice was based on data from the Centre for Economic Policy Research, specifically the Business Cycle Dating Committee. This committee was created in 2002 to establish the chronology of the Euro area business cycle. For the entire European area, all complete business cycles have been established, with 5 recorded Europe-wide recessions since 1974, counting the current financial crisis. The crisis periods for the entire Eurozone are described in table 1. It should be noted that these recession periods do include the performance of European countries like Spain and Italy which were hit specifically hard by the recent Euro crisis. However, the selected countries have at best had a very weak increase in GDP and employment rate, as is the case with Germany in 2012. We will uphold these periods for this research as the differences between the selected countries are minimal and their economies are intensely linked by international trade and currency policy effects (CEPR EABCD, 2012). The choice

of using data since 1999 has been made after careful consideration of several factors. Firstly, most quarterly data for European firms before 1999 is incomplete to a level that omissions based on fundamental variables would cripple the database to an extend where the number of firms would be too small to be relevant for this research. Secondly, moving the start of the database to the next period in the business cycle would be in 2008, which is unacceptable as it would yield only 5 years of data. This is the unfortunate result of using quarterly data in Europe. Future research into crisis periods in the US or in Europe will have more business cycles to analyze. Finally, 1999 was also chosen as a starting point because the compustat depicted values of firm characteristics in the native currencies before januari 1st 1999 for France, Germany and the Netherlands.

We have several requirements for our database. We have eliminated extreme outliers that influence our results. For example a once occurring book leverage ratio of 8000 will skew the average book leverage upwards. We assume that a ratio stating that the debt is 8000 times more valuable than the assets is unlikely to be true. We therefore limit the outliers by winsorizing the appropriate variables at the 1% level. This is a process where the outer 1% of the data is replaced by the nearest extreme value. Even though we winsorize the dataset, there are still a limited amount of weird observations. A leverage ratio above 1 would indicate a negative equity, but this does not automatically mean that the firm is bankrupt, as firms have been known to survive periods of negative equity. A ratio below 0 would indicate a negative debt value, which is not likely to be possible for nonfinancial firms, and are therefore winsorized for book leverage. With market leverage it is possible to have negative ratios in times of crisis and some negative ratios stay in the sample after winsorizing.

Table 2. Recessionary and expansionary periods for the Euro zone as established by the Centre for Economic Policy Research. Established by the dating committee of the Centre for Economic Policy Research by using country specific GDP data from Eurozone member states.

Recession		Expansion	
1992Q1 -	1993Q3	1993 Q3 -	2008 Q1
2008Q1 -	2009Q2	2009 Q2 -	2011 Q2
2011Q2 -	Present		

We have also looked at making a selection based on industries to be incorporated in this research. Financial industries were omitted in advance due to projected problems with leverage ratios. Any firm which has a leverage ratio restricted by regulation obviously would be significantly less affected by both determinants and macroeconomic factors and is therefore beyond the scope of this research. In further choice of industries we have looked at papers by Toy et al. (1975) and Remmers et al. (1974), who used a selection of industries. Both these early studies used only a couple of industries in their analysis. However, most subsequent research into determinants that we have come across has either not made a choice in industries or focused specifically on comparing industries. Additionally, because this research is mainly focused on comparing countries with relatively small amounts of firms, compared to research on US firms, all nonfinancial industries will be incorporated.

5.2. Variables

The leverage ratio of firms will be used as the dependent variable for all regression analysis conducted. Previous research has shown there are significant differences between definitions of leverage, especially between the book value and the market value of leverage (Lemmon et al., 2008). Furthermore, most research into capital structure has focused on long-term leverage, as leverage is viewed as a long-term debt measure. Hence this research will use the definitions used in similar research such as Titman and Wessels (1988), Lemmon et al. (2008), Frank and Goyal (2009) and make a distinction between long-term book leverage and long-term market leverage. We will not make use of the total book leverage and total market leverage, as they are used in for example Korajczyk and Levy (2002), mainly because most of the empirical research into capital structure with relations to macroeconomic conditions used the long-term leverage as dependent variables. This choice of long-term leverage ratios in other studies could possibly be attributed to the fact that short-term debt can vary more strongly. This is likely especially true under crisis circumstances, which makes long-term leverage the better choice for this research.

Several papers, such as Titman and Wessels (1988), have incorporated the variable 'uniqueness' in their research into capital structure choice. Successive research has almost without exception used the incorporation of firm fixed effects into the regression analysis instead. Lemmon et al. (2008) has already shown empirically that adding firm fixed effects strongly increase the explanatory power of the regression model. Therefore, we will also use firm fixed effects to control for the uniqueness of the firms.

A list of all variables and their construction can be found in appendix 2.

5.3. Methodology

In this section we will describe the methodology to our empirical research. In order to test our hypotheses, we must find a statistically correct way to compare leverage and determinants of leverage between normal and crisis periods.

In order to compare if the long-term leverage ratios are different in a crisis, we must compare the long-term leverage ratio means between the two periods. We calculate and compare the means using an independent two-sample t-test. The sample sizes are unequal and it is assumed that the variances are not equal. We therefore test the following t statistic for samples of normal periods and crisis periods, for the total sample and all countries:

$$t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{S_1^2}{n_1} + \frac{S_2^2}{n_2}}}$$

In order to compare the determinants, we cannot simply run multiple regressions over all the established time periods, as the limiting factor is the number of observations in each period. Since crisis periods are generally too short to enable us to perform a statistically sound regression, we will use a solution that is similar to the solution presented in the research for the paper of Akhtar (2012). We will create a crisis dummy that will be 0 in normal periods and take on the value of 1 in crisis periods. As stated before we will focus on the long-term leverage ratios.

The OLS regression with the chosen determinants and year fixed effects.

$$Leverage_{i,t} = \alpha + \beta_1 X_{i,t} + \gamma_i + \varepsilon_{i,t}$$

OLS regression with added crisis dummy

$$Leverage_{i,t} = \alpha + \beta_1 X_{i,t} + \beta_2 Crisis_t + \gamma_i + \varepsilon_{i,t}$$

Next to OLS regressions with crisis dummies we will also fixed effect into the regressions, in accordance with Lemmon et al. (2008). Regression with fixed effects:

$$Leverage_{i,t} = \alpha + \beta_1 X_{i,t} + \beta_2 Crisis_t + \gamma_i + \eta_i + \varepsilon_{i,t}$$

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5.4. Summary Statistics

We will begin by looking at the summary statistics of the variables and analyzing them. Graphs depict the leverage ratios over time for the full sample and the countries. Afterwards the correlations of the variables will be discussed.

Graph 1 shows an overview of the long term book leverage and market leverage ratios. Like we stated earlier, the crisis periods were from 2008q1 to 2009q2 and from 2011q3 onwards. We can clearly see that previous to the credit crunch the leverage ratios went up, reaching their highest point almost a year into the financial crisis. From that point onwards the leverage ratios keep going lower and lower. Therefore, we can now cautiously predict that a crisis period will have a negative effect on the leverage ratios. We will check this assumption in the section 6.1. with the use of t-tests for mean comparison.

Graph 1. Long-term book leverage and market leverage ratios over the quarterly periods between 2007 and 2012. Book leverage and Market leverage have been depicted here for the combined European sample. Book leverage is defined as ratio of long-term debt divided by book assets. Market leverage is defined as long-term debt divided by the sum of long-term debt and market equity.
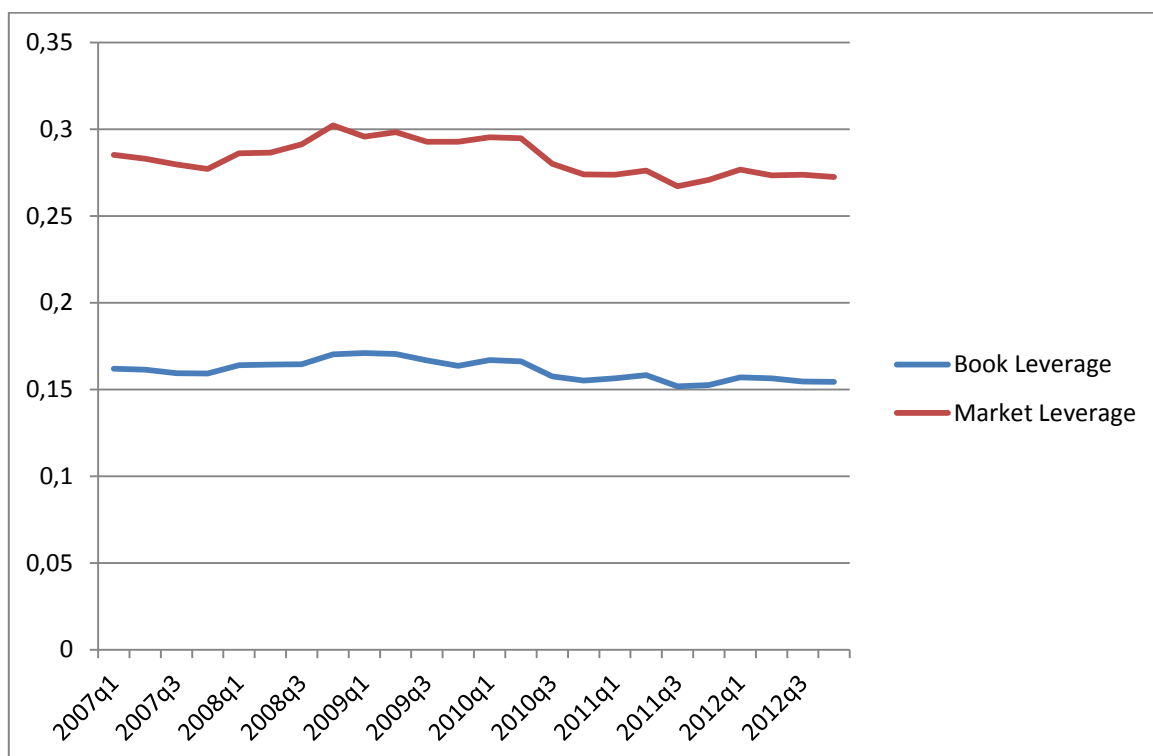
Graph 2 and 3 depict the long-term book and market leverage ratios over time for the four countries and the total sample. The first thing to notice is that the Dutch sample has significantly more volatility in both book leverage as market leverage. Additionally, for both book leverage as market leverage, the strongest changes happen since the start of the financial crisis in 2008, when both ratios strongly increase. From the end of the financial crisis in the second quarter of 2009, the leverage ratios seem to start getting lower, right up to the end of the sample timeline in the 4th quarter of 2012. Interestingly, both types of leverage behave similarly during the periods. It is likely that since the Euro Crisis is still ongoing during the writing of this thesis, the leverage ratios will continue to decrease after 2012. Any further decreases during these crisis periods would provide a clearer answer to the first hypothesis of this study. The strong volatility at the start of the financial crisis, compared with multiple quarters of increasing leverage ratios, could result in an insignificant difference between the mean leverage ratios outside and during a crisis.

Graph 2. Long-term book leverage ratios over the quarterly periods between 2005 and 2012 of individual countries and the combined dataset. Data before 2005 was not graphically depicted as the small number of observations caused high volatility in the leverage ratios. Long-term book leverage was calculated as long-term debt divided by total assets of the firm.
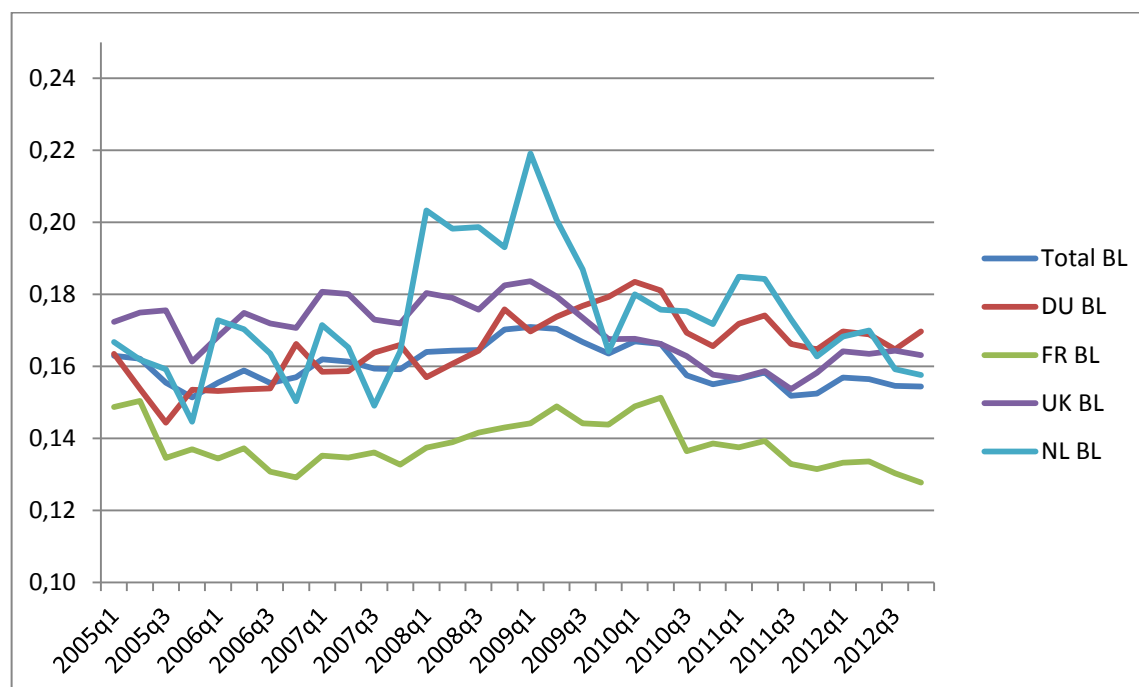
Graph 3. Long-term market leverage ratios over the quarterly periods between 2005 and 2012 of individual countries and the combined dataset. Data before 2005 was not graphically depicted as the small number of observations caused high volatility in the leverage ratios. Long-term market leverage is defined as long-term debt divided by the sum of long-term debt and market value of equity.
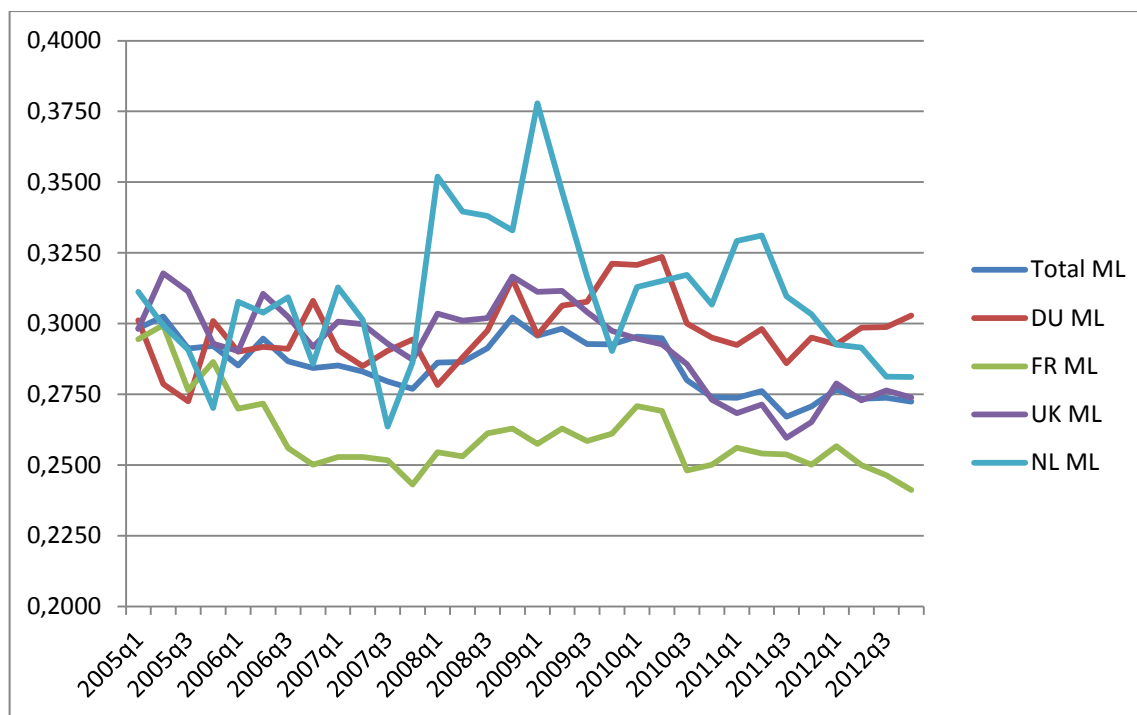
Table 3 shows an overview of the summary statistics for the variables. Table 4 Compares the summary statistics for the total sample and the sample during the crisis period. As we can see, there is are some differences between the two samples. The changes that seem significant between the two periods, seems to be a lowering of the firm size, a lowering of the profitability of the firms and a decrease in market-to-book ratio. This indicates that during a crisis the average firm size drops, the profits decrease and the expected growth for the firm decreases. We also see a sign change in the variable tax rate. However, this is insignificant when factoring in the standard deviation of the variable. It is likely that the increase in reported losses has lowered the average value of this variable, which is inherently linked to its construction, taxes paid divided by earnings. The value of incorporating this variable in times of crisis is likely to be low. However we will test this under the section empirical results. Interestingly, we also see a slight decrease in the market leverage ratios of firms, while book leverage does not seem to change. This would indicate that market leverage would change under crisis circumstances, while book leverage is not affected. We will test in the next chapter whether these changes are significant and how the coefficients of the variables will be

influenced. The decrease in leverage during a crisis would point to the trade-off theory as the correct framework, contrasting with the pecking order theory, which predicted an increase in the leverage ratios. The evolvement of the leverage ratios over time is heterogeneous across the countries

Table 3. Summary Statistics for all variables in the full sample. Variables have been winsorized at the 1% level. Variable construction is described in appendix 2. Sample includes nonfinancial firm data from 1999 to 2012.

Variable	Mean	Median	Standard Dev.	Minimum	Maximum
Book Leverage	0.16	0.12	0.15	0.00	0.72
Market Leverage	0.29	0.23	0.28	-0.15	1.64
Size	4.77	4.45	2.42	0.35	11.08
Market-to-Book	1.11	1.08	1.68	0.16	1.47
Profitability	0.11	0.09	0.10	-0.06	0.52
Tangibility	0.23	0.16	0.22	0.17	0.91
Industry Book Lev	0.13	0.13	0.04	0.05	0.26
Tax rate	0.02	0.04	0.28	-2.06	0.81
Cash Flow Vol.	87.37	4.03	308.74	0.03	2306.30

Table 4. Summary Statistics for full and crisis sample Variables have been winsorized at the 1% level. Variable construction is described in appendix 2. Sample includes nonfinancial firm data from 1999 to 2012.

Variable	Full Sample			Crisis Sample		
	Mean	Median	SD	Mean	Median	SD
Book Leverage	0.16	0.12	0.15	0.16	.13	0.15
Market Leverage	0.29	0.23	0.28	0.28	0.23	0.27
Size	4.77	4.45	2.42	4.61	4.38	2.39
Market-to-Book	1.11	1.08	1.68	1.01	0.98	1.41
Profitability	0.11	0.09	0.10	0.06	0.05	0.08
Tangibility	0.23	0.16	0.22	0.23	0.15	0.22
Industry Median Book Lev	0.13	0.13	0.04	0.13	0.13	0.04
Tax rate	0.02	0.04	0.28	-0.03	-0.04	0.34
Cash Flow Vol.	87.37	4.03	308.74	80.45	3.81	293.79

In table 5 the summary statistics for all countries are presented, in order to get an impression if the determinants are fairly similar across the countries. There are some small differences notable. The average size of UK firms is smaller, while the market-to-book ratio of UK firms is bigger when compared to the three other firms. Other than these differences, all variables stay relatively the same across countries.

Table 5. Summary statistics for all countries. Variables have been winsorized at the 1% level. Variable construction is described in appendix 2. Sample includes nonfinancial firm data from 1999 to 2012.

Variable	France		Germany		Netherlands		UK	
	Mean	Std. D	Mean	Std. D	Mean	Std. D	Mean	Std. D
Book Leverage	0.14	0.13	0.16	0.15	0.18	0.13	0.17	0.16
Market Leverage	0.27	0.24	0.30	0.28	0.29	0.23	0.29	0.31
Size	5.41	2.36	5.08	2.26	6.34	2.29	4.20	2.36
Market-to-Book	1.08	1.02	1.16	1.21	1.25	1.12	1.45	1.82
Profitability	0.10	0.13	0.12	0.15	0.12	0.11	0.08	0.17
Tangibility	0.18	0.17	0.24	0.17	0.27	0.20	0.27	0.24
Industry Book Lev	0.12	0.04	0.12	0.04	0.12	0.04	0.13	0.04
Tax rate	0.04	0.24	0.03	0.21	0.03	0.16	0.01	0.34
Cash Flow Vol.	133.29	384.49	91.93	311.65	186.85	434.77	51.12	229.71

To recapitulate, reviewing the summary statistics lead to the assumption that leverage ratios decrease in crisis periods after a lag of several quarters. Additionally, it is likely that market leverage is different during crisis periods in our sample, while book leverage is unchanged. However, this will be empirically tested in the next section. In terms of changes in determinants, reviewing the statistics showed a decrease in firm size, a lowering of the profitability of the firms and a decrease in the market-to-book ratio, which is a proxy for growth opportunities. However, these changes in the determinant variables have no clear relation with the coefficients these variables will have in the regression models. There are no notable differences across countries in summary statistics. While these insights are valuable, no definitive conclusions can be made about the hypothesis of this study.

To get a better understanding of how the variables relate to each other, and more importantly the leverage ratios, we will look at the correlation coefficients before using empirical tests to analyze our hypotheses. Table 6 shows the relations between all variables.

Table 6. Correlations between all variables in full sample. Variables have been winsorized at the 1% level. Variable construction is described in appendix 2. Sample includes nonfinancial firm data from 1999 to 2012. First two columns depict the correlation coefficients of the determinants on the leverage ratios.

Variable	**BL**	**ML**	S	MB	Prof	Tang	IMBL	Tax	CFvol
Book Leverage	**1.00**								
Market Leverage	**0.86**	**1.00**							
Size	**0.27**	**0.28**	1.00						
Market-to-Book	**-0.14**	**-0.33**	0.01	1.00					
Profitability	**-0.12**	**-0.08**	-0.12	0.05	1.00				
Tangibility	**0.28**	**0.24**	-0.09	0.01	0.12	1.00			
Indus. Med Book Lev	**0.33**	**0.31**	0.18	0.01	-0.02	0.03	1.00		
Tax rate	**-0.01**	**-0.01**	0.10	0.01	-0.02	-0.02	0.00	1.00	
Cash Flow Vol.	**0.09**	**0.15**	0.32	0.03	-0.05	-0.02	0.20	0.05	1.00

The first thing to note is that the signs of the correlation coefficients are the same per variable for both book leverage and market leverage. The second important fact, is that all variables have the predicted relationship expressed in correlation coefficients, based on past literature and theory, with the exception of cash flow volatility. Cash flow volatility does express a relationship with the leverage ratios though, as 0.09 and 0.15 are sufficiently high. Other notables are that the variable size has a high correlation with median industry book leverage and the cash flow volatility.

While this correlation table does provide us with an early view about the explanatory power of the determinants variables, correlation coefficients are not comparable with regression coefficients, since regression coefficients also control for all other independent variables in the regression model.

6. Empirical Analysis and Results

The data and the methodology have been described and will now be used to perform statistical and regression analysis in order to answer the previously stated hypotheses. We will start with a mean comparison of leverage in crisis and normal periods. Afterwards, a number of regressions with increasing amounts of variables and fixed effects for both types of leverage will be presented. We will look at the coefficients of the determinants in relation to the leverage ratio and discuss them. Afterwards we will look at the effect of crisis on determinant variables themselves. Finally we will look at the differences between countries in term of determinants.

6.1. Leverage in crisis periods

The first hypothesis of this thesis is that leverage ratios change in crisis periods. In order to compare if the long-term leverage ratios are different in a crisis, we must compare the long-term leverage ratio means between the crisis periods and the normal periods. We calculate and compare the means using an independent two-sample t-test. We calculated that the variance of the two samples are not identical, with the use of an independent two-sample variance test. Therefore, the sample sizes are unequal and variances are not equal. In table 7 the results of the mean comparison tests for book leverage and market leverage on all countries is given. The t-value given indicates the chance that the means for the two samples are different. We conclude that the book leverage is not significantly different in crisis periods compared to normal periods. However, market leverage is significantly lower at the 1% mark. As we stated previously in the section summary statistics, there is a noticeable lag in the reaction of leverage ratios to economic circumstances. Repeating this study after the completion of the Euro crisis could produce a significant change in book leverage also. For the data used in this study, we have found our first hypotheses to be partially true. Market leverage changes in crisis periods compared to normal periods, while book leverage does not significantly change.

Table 7. Mean comparison of book and market leverage between normal and crisis periods. The t values indicates with what level of certainty the means of the samples are different. Variables have been winsorized at the 1% level. ***, **, * indicate statistical significant at the 1%, 5% and 10% levels. BL normal represents a sample with all book leverage ratios outside the crisis periods. BL crisis represents a sample with all book leverage ratios during the crisis periods. ML represents similar samples for market leverage.

Variable	Observations	Mean	Std error	Std deviation	95% confidence int		t-value
			Book Leverage				
BL normal	39459	0.1612	0.0008	0.1523	0.1592	0.1632	0.8035
BL crisis	17684	0.1601	0.0011	0.1488	0.1572	0.1630	
combined	57143	0.1608	0.0006	0.1512	0.1592	0.1625	
difference		0.0011	0.0014		-0.0024	0.0046	
			Market Leverage				
ML normal	39457	0.2888	0.0014	0.2823	0.2851	0.2925	2.896***
ML crisis	17683	0.2816	0.0020	0.2720	0.2763	0.2869	
combined	57140	0.2866	0.0012	0.2792	0.2836	0.2896	
difference		0.0072	0.0025		0.0008	0.0136	

Now that we have established the answer for our first hypothesis, we can look at the implications for our third hypothesis. Since we have found that the mean comparison for book leverage has produced a very low significance, we will focus on the market leverage when we look at individual countries.

In table 8 the mean comparison of market leverage between normal and crisis periods for individual countries is presented. For Germany there seems to be no difference between the crisis and normal sample with a t statistic of 0.6. The Netherlands and the United Kingdom even seem to have reverse effects going on. Their negative t values indicate that the market leverage actually went slightly higher in the crisis period, although this finding is highly insignificant. The only significant difference can be found for the sample of firms from France, with a t statistic of 5.7 the difference between means is very significant. Again, it is expected that these results would change, when and if a similar study is perform after the end of the Euro Crisis, since leverage ratios seem to react to the economic circumstances with a lag of several quarters.

Table 8. Mean comparison of market leverage between normal and crisis periods for individual countries. The t values indicates with what level of certainty the means of the samples are different. ML normal represents a sample with all market leverage ratios outside the crisis periods. ML crisis represents a sample with all market leverage ratios during the crisis periods. Variables have been winsorized at the 1% level.***, **, * indicate statistical significant at the 1%, 5% and 10% levels.

Variable	Observations	Mean	Std error	Std dev	95% confidence int		t-value
Germany							
ML normal	9951	0.2990	0.0028	0.2784	0.2918	0.3062	0.6238
ML crisis	4494	0.2959	0.0040	0.2707	0.2855	0.3063	
combined	14445	0.2980	0.0023	0.2760	0.2921	0.3040	
difference		0.0031	0.0049		-0.0096	0.0157	
France							
ML normal	10801	0.2770	0.0024	0.2469	0.2709	0.2831	5.6948***
ML crisis	5013	0.2535	0.0034	0.2381	0.2449	0.2622	
combined	15814	0.2696	0.0019	0.2444	0.2646	0.2746	
difference		0.0234	0.0041		0.0128	0.0341	
Netherlands							
ML normal	1930	0.3162	0.0051	0.2240	0.3031	0.3293	-0.1211
ML crisis	889	0.3173	0.0080	0.2376	0.2968	0.3379	
combined	2819	0.3166	0.0043	0.2283	0.3055	0.3276	
difference		-0.0011	0.0095		-0.0255	0.0233	
United Kingdom							
ML normal	16775	0.287	0.002	0.310	0.281	0.293	-0.1099
ML crisis	7287	0.288	0.003	0.296	0.279	0.297	
combined	24062	0.287	0.002	0.306	0.282	0.292	
difference		0.000	0.004		-0.011	0.010	

6.2. Determinants of capital structure in crisis periods

The goal of this thesis is to find how leverage changes in crisis periods, but also to find how those changes are determined. By estimating the regression models that we have described in the section methodology, we can look at both the changes in leverage ratios and determinants. We begin with regressions on book leverage, afterwards we will look at market leverage. In table 9 we present the results of the regressions of determinants on different measures of leverage. As previously stated, due to the data containing both cross-sectional as well as time series aspects, we make use of year fixed effects for all our regressions. Column 1 and 3 represent a regression of the determinants on book leverage and market leverage, without the dummy variable or firm fixed effects. Column 2 and 4 include the crisis variable, to show the increase in the predictive power of the regression model with the inclusion of a variable that reflects economic circumstances without firm fixed effects. Finally, in column 3 and 6 the firm fixed effects are added, which gives the model the highest coefficient of determination.

We can state that the results presented are mostly similar to recent research such as Lemmon et al.(2008) and Akhtar(2012), in terms of the signs of the coefficients and the statistical significance. We find that the natural logarithm of total assets, which is a proxy for the size of the firm, always shows a positive sign and is strongly significant. This would support the assumption that larger firms are more diversified, have lower bankruptcy costs and easier access to credit, which increases their leverage ratio. Additionally, the coefficient of size in regression (2) is the only coefficient that seems to significantly drop in influence when the crisis dummy is added to the model. This finding implies that the influence of the size of the firm on the leverage ratios is diminished during crisis periods.

Tangibility also is significantly positive in all regressions. This supports the assumption that highly tangible firms have lower debt costs because more collateral for loans reduces the risk for the bondholders of the firm. Next to being consistent with earlier research, these findings are in accordance with both the pecking order and the trade-off theory. Market-to-book ratio, or the proxy for the growth potential of the firm, has a negative coefficient in the regressions. This is also consistent with earlier research and theoretically it supports the trade-off theory.

Table 9. Effects of crisis on leverage ratio. This table presents the results of six regression models with long-term book leverage and long-term market leverage as the dependent variables. Year fixed effects refer to the calendar fixed effects that have been added to every regression. For a listing of the variable construction see Appendix 2. For a discussion of the regression model see the section methodology. Variables have been winsorized at the 1% level.***, **, * indicate statistical significant at the 1%, 5% and 10% levels. The t statistic of the coefficients are presented below the coefficient between parenthesis.

Variables	Book Leverage			Market Leverage		
	1. OLS	2. Crisis	3. FFE+CD	4. OLS	5. Crisis	6. FFE + CD
Size	0.026***	0.016***	0.067***	0.028***	0.022***	0.084***
	(10.85)	(10.47)	(13.88)	(8.57)	(7.25)	(15.72)
Market-to-book	-0.076***	-0.064***	-0.077***	-0.095***	-0.069***	-0.122***
	(-6.36)	(-5.41)	(-7.13)	(-5.23)	(-6.94)	(-6.46)
Profitability	-0.082***	-0.078***	-0.102***	-0.015***	-0.083***	-0.088***
	(-8.57)	(-10.09)	(-10.46)	(-8.29)	(-11.20)	(-9.05)
Tangibility	0.075***	0.073***	0.077***	0.085***	0.092***	0.056***
	(5.09)	(7.27)	(3.82)	(13.69)	(15.38)	(8.14)
Med Industry	0.704***	0.657***	0.434***	0.862***	0.624***	0.526***
Leverage	(15.75)	(21.24)	(14.65)	(19.09)	(17.23)	(23.28)
Tax	-0.014***	-0.012***	-0.013***	-0.030***	-0.032***	-0.031***
	(-4.33)	(-3.82)	(-3.71)	(-5.08)	(-5.54)	(-4.87)
CF volatility	-0.001*	0.001	-0.000	-0.002***	-0.001	-0.001*
	(-1.68)	(0.34)	(0.82)	(-3.11)	(-1.23)	(-1.78)
Crisis		0.073***	0.068***		0.192***	0.184***
		(4.24)	(3.89)		(5.47)	(5.12)
Firm FE	NO	NO	YES	NO	NO	YES
Year FE	YES	YES	YES	YES	YES	YES
Adj. R^2	0.21	0.34	0.68	0.19	0.33	0.65
Obs	41045	41045	41045	41045	41045	41045

Therefore, the sign of the coefficient supports the assumption that firms with a lot of potential projects don't want to take on too much debt, as the increase in required return on equity could cause some project to have a negative net present value to the firms shareholders. Conversely, the notion that firms who have a lot of potential projects cannot find sufficient internal funds and will use external funding to take on the projects, as the pecking-order theory predicts, is not supported by these findings. The profitability of the firm has a significant negative coefficient in every regression. While this is again in accordance with previous research, it does counteract the predictions by the trade-off theory. According to the trade-off theory, a firm with higher profits should take on more debt because the increased value of the tax shield would offset any additional costs. However, it is also possible that since a relatively large portion of the sample for this research is during crisis periods, the trade-off theory could still be uphold as the increase of likelihood of bankruptcy could offset the benefits of the tax shield on higher profits. Still, our findings show that the standard prediction of the trade-off theory is not true for the firms in our sample. The findings therefore point to the pecking-order theory, which assumes that more profitable firms have a lower leverage ratio as they have more internal funds available to finance their projects.

Besides the four determinant variables of Rajan and Zingales (1995), there are three more variables that are used in the regression analysis. The median industry book leverage is a proxy for the convergence of leverage ratios found by Lemmon et al. (2008). The factor is significantly positive for all regressions which indicates primarily that firms in the same industry have a tendency to have similar leverage ratio and also that these similar leverage ratios move in alignment with each other in relation to the general leverage ratio changes in crisis periods. Possible explanations would firstly be that managers could use the industry median leverage as a target for their own capital structure decisions. Secondly this variable could capture a underlying factor that influences leverage for all firms within a certain industry. The tax rate has a negative effect on leverage for all regressions. This finding is not totally coherent with the trade-off theory, as according to that theory an increase in the amount of taxes paid per profit would call for an increase in the desirability of an increase in the debt tax shield. This finding would only be coherent with the theory if the costs of taking on additional debt would outweigh the increase in tax shield benefits. The cash flow volatility can be seen as a proxy for the riskiness of the firm. The coefficient is either insignificant or negative with a low significant level.

The crisis dummy has a significantly positive effect on both book leverage and market leverage for all available regressions. This is quite surprising, as from analyzing graph 1 we could see that both leverage ratios delever over time during a crisis period. This discrepancy between the regression coefficient and the graph analysis could possibly be due to the lag with which the deleveraging effect takes place. As we stated earlier, the reaction to the start of the crisis period came around one year later. This has some implications for future research as these findings make it likely that lagged variables could have better explanatory value in changing economic circumstances. It is to be expected, that a lagged crisis dummy would have a negative relation with leverage ratios in crisis periods. However, not only are crisis dummies likely to improve by being lagged, is would also be worth investigating if lagged determinants would have a bigger impact on leverage ratios.

Changes in determinants can be viewed by looking at the effects that the addition of a crisis dummy had on the regression model. We find that no variables changes so much as to completely change signs. However, the addition of a crisis dummy does render the coefficient of the variable cash flow volatility insignificant. This is not in accordance with the findings of Lemmon et al. (2008). When looking at book leverage we find that the coefficients of firm size, market-to-book and median industry leverage all decrease, while the other variables seem not to change. Moreover, when analyzing the regression of the determinants on market leverage, we find that these variables again become less strong with the addition of a crisis dummy. The decrease in the coefficient firm size coincides with the decrease in overall firm size during the crisis period. This could indicates that the benefits of larger corporations become mitigated in times of economic turmoil, compared to smaller firms. Therefore, firm size could have less impact on many aspects of the firm, including the capital structure.

The decrease in market-to-book, which is a proxy for the growth potential of the firm, indicates that the future growth prospects are of less importance for leverage ratios during crisis periods. The decrease in median industry leverage indicates that firms look less to other firms for assessing a possible optimal leverage ratio and other factors become more important for capital structure during crisis periods. What is also interesting is that firm size and market-to-book have lower coefficients, while their summary statistics indicate their actual mean decreases too in crisis periods. However, median industry book leverage is virtually unchanged in terms of summary statistics

The inclusion of firm fixed effects hugely increases the explanatory power of the regressions for both book leverage as market leverage. The adjusted R² increases by .34 for book leverage and .32 for market leverage. This can be interpreted as follows: in the case of

book leverage, the inclusion of firm fixed effects resulted in the regression model explaining 34% more of the total variance in the dependent leverage ratio. Lastly, when comparing the regression coefficients with the correlation coefficients presented in the correlation table in the section summary statistics, we find that the coefficients coincide in terms of positive or negative relationship with both types of leverage ratios.

Now that we have reviewed the changes of determinants during crisis periods, we can make conclusions about the second hypothesis. We can assume that for our dataset, the predictive power of the determinants firm size, market-to-book and median industry leverage have decreased during crisis periods. Other determinant variables seem to be unchanged. The inclusion of firm fixed effects greatly increases the explanatory power of the regression models.

6.3. Determinants across countries

Now that we have answered the first two hypotheses, we return to the third one. We want to know if the relationship between determinant variables and leverage ratios varies between countries in crisis periods. Therefore, we have to run regressions of determinant variables on the leverage ratios of the four countries. The results of these regressions can be seen in table 10. The variable median industry leverage was not used as some industries in the individual countries would be very small, which would cause it to be very hard to interpret any coefficients. Additionally, the variable tax was not used because it would require thorough knowledge about the countries tax systems to be able to interpret the coefficients correctly. Size is significantly positive for all four countries. Another thing that we notice is that the coefficient of the variable size in the Netherlands is significantly bigger than the other countries. This holds both for book leverage as well as market leverage, but could be due to the limited number of observations. The Market-to-book ratio is insignificant for all countries when regressed on book leverage. However, the coefficients are al significantly negative when regressed on market leverage. Profitability show a negative relationship with both leverage ratios for both countries. Tangibility is always positive, but not always significantly so. The crisis dummy shows a positive relationship with both leverage ratios, but is insignificant for the Netherlands when regressed on book leverage. Coming to our third hypothesis, we can state there are some differences in the determinant variables, but they are not forming a pattern worth mentioning. Additionally, we can state that some determinants of

capital structure show outliers when comparing countries, but no signs of coefficients change. Therefore the effects of crisis periods on determinants are small and heterogeneous.

Table 10. Leverage and determinants across countries during crisis periods. This table presents the results of a regression model with firm fixed effects and a crisis dummy on long-term book leverage and long-term market leverage as the dependent variables. Year fixed effects refer to the calendar fixed effects that have been added to every regression. For a listing of the variable construction see Appendix 2. For a discussion of the regression model see the section methodology. Variables have been winsorized at the 1% level.***, **, * indicate statistical significant at the 1%, 5% and 10% levels.

Variable \ Country	France	Germany	Netherlands	UK
		Book Leverage		
Size	0.051***	0.053***	0.116***	0.057***
	(3.36)	(3.17)	(4.34)	(7.43)
Market-to-Book	0.004	0.004	-0.000	-0.002
	(1.18)	(0.81)	(-0.06)	(-0.93)
Profitability	-0.024***	-0.041***	-0.032***	-0.022***
	(-3.34)	(-5.34)	(-3.72)	(-4.46)
Tangibility	0.019*	0.036***	0.039***	0.029***
	(1.73)	(4.42)	(2.20)	(3.06)
Crisis dummy	0.014***	0.013***	0.002	0.018***
	(2.86)	(3.28)	(0.65)	(5.02)
Firm FE	YES	YES	YES	YES
Adj. R^2	0.680	0.686	0.647	0.612
OBS	6,578	5,426	1,614	15,835
		Market Leverage		
Size	0.139***	0.119***	0.182***	0.113***
	(7.67)	(5.76)	(8.31)	(8.32)
Market-to-Book	-0.015***	-0.021***	-0.020**	-0.020***
	(-3.31)	(-4.12)	(-3.52)	(-6.26)
Profitability	-0.038***	-0.023***	-0.029***	-0.026***
	(-7.94)	(-4.26)	(-3.50)	(-5.42)
Tangibility	0.024***	0.038***	0.036	0.014*
	(3.1)	(3.45)	(1.24)	(1.87)
Crisis dummy	0.068***	0.043***	0.031***	0.077***
	(14.30)	(9.34)	(3.89)	(16.68)
Firm FE	YES	YES	YES	YES
Adj. R^2	0.716	0.664	0.618	0.601
OBS	6,418	5,312	1,586	14,921

7. Conclusion

This study investigates changes in capital structure in crisis periods. Specifically, it investigates how and if determinants and leverage are affected during recessionary periods in Europe and compare this over the European countries France, Germany, the Netherlands and the UK. In order to reach those goals this study investigates a sample of nonfinancial firm data from the European countries between the years of 1999 and 2012. Next to analyzing the effects of crisis periods on capital structure and their determinants, a comparison is made between the countries, in order to get a better understanding of capital structure and the determinants variables within individual economies. This study also looks at the changes a crisis periods brings by incorporating a crisis dummy into regression models with proven determinants from literature and the inclusion of fixed effects.

Using a two sample independent t-test, we find that market leverage changes significantly in crisis periods, while book leverage does not significantly change. Additionally, we find that leverage ratios rise slightly before the crisis periods and during the first quarters. However, within a year of the start of a crisis period the firms begin deleveraging. This finding points to the trade-off theory as the correct view during crisis periods, instead of the pecking-order theory. With respect to changes in determinants, we find that the predictive power of the determinants firm size, market-to-book and median industry leverage decrease in crisis periods. Other determinant variables seem to be unchanged. The inclusion of firm fixed effects greatly increases the explanatory power of the regression models. At the country level, there are only slight differences between determinants. No signs of the coefficients change and any coefficients that turn insignificant are likely due to the limited number of observations. Effects on leverage ratios are similar for all countries, as they all start delivering after approximately one year. The effects of crisis periods on determinants are small and heterogeneous.

This study has created some important insights for future researchers and policy makers. However, this study also had some limitations. Firstly, the second crisis period, better known as the Eurocrisis, that is used in our empirical analysis is still ongoing as of the completion of this thesis. If the trend of deleverage should continue after the end of 2012, it is likely that the determinants will change more significantly in the complete crisis period, compared with our research. Therefore, it would be useful to repeat a similar study after the recession in Europe has ended. Another limitation of this study is the relatively short space of time that is being investigated. This is due to the choice of taking quarterly data. Quarterly data does give researchers a much better ability to research time periods that only last a few

years such as crisis periods. However, the Compustat database does not currently provide enough historical observations for firm data in Europe, to allow researchers to investigate a longer time span.

In light of the findings in this research, there are also some recommendations. Firstly, future researchers should try to experiment with lagged versions of variables. It is likely that a lagged crisis dummy would provide a negative relationship with the leverage ratios. However, also lagged versions of determinant variables show promise. Additionally, incorporating the variable tax rate was of limited use, as the losses in crisis periods cause negative tax rates due to the construction of the variable. While this variable construction was used in other research, it has severe limitations during a recession. Future research should try to find a way to construct a variable that proxies the effect of taxes on capital structure. Finally, this study has had empirical results that supported the trade-off theory as well as results that supported the pecking-order theory. The findings in this thesis should make it possible for future researchers to do theory crafting about combining the aspects of these important theory into a single all-encompassing theory of capital structure.

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APPENDIX 1

Table of determinant coefficients in empirical research

Paper	Lev	Sample Period	Country	Size	Tangibility	Growth	Profitability	Tax	CF volatility
Titman & Wessels (1988)	Blev	1974-1982	US	0		0	0	-	0
	Mlev			0		0	0	-	0
Rajan & Zingales (1995)	Blev	1987-1991	G7	+	+	-	-		
	Mlev			+	+	-	-		
Antoniou et al. (2001)	Blev	1969-2000	FR, DU, UK	+		-	-	-	+
	Mlev			+		-	-	-	+
Hovakimian (2006)	Blev	1983-2002	Global	0	+	-	-		
	Mlev								
Lemmon et al. (2008)	Blev	1965-2003	Global	+	+	-	-		-
	Mlev			+	+	-	-		-
Frank et al. (2009)	Blev	1950-2003	US						
	Mlev			+	+	-	-	0	
Dygryse et al. (2012)	Blev	2002-2005	NL	+	+	+		0	
	Mlev								
Akhtar (2012)	Blev	1950-2010	US						
	Mlev			+	+	-	-		-

APPENDIX 2

Description of construction of all variables used in statistical analysis for this study

Long-term Book Leverage	=	Long-term debt / Total assets
Long-term Market Leverage	=	Long-term debt / (Long-term debt + market value of equity)
Size	=	Natural logarithm of total assets
Market-to-book	=	Proxy for growth: market value of equity/ book value of equity or: *change in assets* (Degryse and de Goeij, 2012)
Profitability	=	Operating income before depreciation/ total assets
Tangibility	=	Net property plant and equipment / total assets
Cash flow volatility	=	Standard deviation of operating income from the previous 3 years of operation
Median Industry Leverage	=	Median book leverage per firm-year for each industry
Tax rate	=	Taxes paid / earnings before tax
Industry	=	Dummies per industry, industries are identified with their SIC codes (exclusion of SIC 6000-7000)
Country	=	Dummies per country
Crisis	=	Dummy for recession and expansion period as determined by the CEPR after looking at country GDP data