

# Financial crisis and capital structure

**Bachelor thesis**

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## **Abstract**

This research analyzes different determinants of capital structure of nonfinancial firms in the United States and investigates the impact of the financial crisis of 2007 on the capital structure. Size, growth, profitability and tangibility have been used as determinants of the capital structure. Each determinant becomes less or more important when it is related to the leverage during the crisis. The empirical results indicate that growth and tangibility become more important when these determinants are related to the leverage during the crisis. Size is more important in relation to the book leverage during the crisis and less important when it is related to market leverage. With profitability the opposite is the case, because profitability is less important when it is related to book leverage during the crisis and more important when it is related to market leverage. The research treats also the agency theory, Modigliani and Miller theory, and Pecking order theory because these theories explain the capital structure.

## Index

Abstract.....	2
1. Introduction.....	4
2. Literature review .....	6
2.1 Crisis .....	6
2.2 Agency Theory .....	8
2.3 Modigliani and Miller theory .....	9
2.4 Pecking order theory.....	10
2.5 Determinants.....	11
2.5.1 Size.....	11
2.5.2 Growth.....	12
2.5.3 Profitability.....	13
2.5.4 Tangibility .....	14
2.5.5. Book leverage vs. Market leverage.....	15
3. Data and Methodology.....	16
3.1 Data.....	16
3.2 The Model .....	16
3.3 Hypotheses approach .....	17
4. Empirical Results.....	18
4.1 Descriptive Statistics.....	18
4.2 Multicollinearity .....	19
4.3 Test of hypotheses .....	21
5. Conclusion and Recommendations .....	25
Bibliography.....	27
Appendix A.....	31

## 1. Introduction

This quote of Glick and Lansing (2010) describes the causes of the financial crisis in 2007 as:

In the years leading up to the crisis, a combination of factors, including low interest rates, lax lending standards, a proliferation of exotic mortgage products, and the growth of a global market for securitized loans fueled a rapid increase in household borrowing. An influx of new and often speculative homebuyers with access to easy credit helped bid up U.S. house prices to unprecedented levels relative to rents or disposable income (p.1).

Another name for the crisis is the US Subprime Mortgage Crisis, because subprime mortgage is one of the major causes of the crisis. The financial crisis had a big impact on firms and banks in America and influenced other countries. Therefore, it became a global crisis (Kalse, 2008). One of the consequences of the financial crisis on banks was that they suffered with a liquidity lack. Therefore, banks required more security when they issued loans to firms (Berg, & Kirschenmann, 2010) and banks became stricter when they issued loans to others banks, citizens and firms (Kalse, 2008). Firms received fewer loans and the worldwide crisis was spread to other firms. Adrian and Shin (2008) have showed that leverage increases when a subprime boom exists. The financial crisis of 2007 was the opposite of a subprime boom and that was one of the causes that firms changed their capital structure. A lot of research have tried to find the optimal capital structure for different firms and the question is still unknown (Myers, 1984). The knowledge about the empirical relevance of the different theories is limited (Rajan, & Zingales, 1995). Many theories explicate the optimal debt/equity ratio. The theories indicate that firms choose their capital structure depending on attributes that provide cost and benefits associated with capital structure (Titman, & Wessels, 1988). Empirical studies conclude some facts about the choice of the capital structure, but it is unclear how these facts are related with different theories, also called the gap (Rajan, & Zingales, 1995). Rajan and Zingales (1995) start to analyze this gap, the relation between theory and empirical results, based on the G-7 countries (the United States, Japan, Germany, France, Italy, the United Kingdom, and Canada) with different determinants. This research has the same regression as Rajan and Zingales (1995) but over two different periods, first period is before the crisis, and the second period is during the crisis. These two periods are compared with each other and the influence of the financial crisis is showed. The financial crisis of 2007 has probably a big impact on the capital structure and this research indicates the effect of the

crisis on different variables. The financial crisis is an important issue because the crisis has influenced the worldwide economy.

This paper aims to answer the question, what the impact of the financial crisis of 2007 is on the capital structure of nonfinancial firms in the United States.

Relevant to know the answer to this question is to find out what were some causes of the financial crisis of 2007? What do different theories suggest about the influences on the capital structure? What are the determinants of the capital structure? And what was the effect on these determinants during the crisis?

The determinants of capital structure are the size of the firm, growth, profitability and tangibility. The empirical results indicate that growth and tangibility become more important when these determinants are related to the leverage during the crisis. Size is more important in relation to the book leverage during the crisis and less important when it is related to market leverage. With profitability the opposite is the case, namely profitability is less important when it is related to book leverage during the crisis and more important when it is related to the market leverage. Thus, the financial crisis of 2007 has indeed influenced the capital structure of nonfinancial firms in the United States.

In the first part of chapter two, this research explains the financial crisis and what different theories suggest about capital structure. The second part of chapter two explains different determinants on capital structure. Chapter three describes the methodology of collecting data. Chapter four consists of empirical results and tests the hypotheses. The last chapter of this research gives the conclusion and recommendation.

## 2. Literature review

The knowledge about the choice of capital structure is limited. Capital structure is a ratio of debt over equity which indicates how the firm finances its operations. A lot of theories describe the capital structure of firms. It is important to know what different theories tell about the capital structure and what different causes are of the financial crisis. This information is relevant to understand this research. That is why this research treats the agency theory, Modigliani and Miller theory, and Pecking order theory. The second part of this chapter explains different determinants of the capital structure.

### 2.1 Crisis

The financial crisis started in the US. To understand the financial crisis it is important to understand what happened in the period of 2001-2005. When the tech bubble of 2001 came to an end, there was a long period of low interest rates (Goodhart, 2008). Bernanke, Gertler and Gilchrist (1996) found that low interest rates may result in banks that issue loans to borrowers that are deemed to be risky (Bernanke, Gertler, & Gilchrist, 1996). In other words, new loans, so called “subprime mortgages”, were provided to people or companies who had a higher default probability. Due to a competitive market, they want to keep their financing cost as low as possible and therefore, banks did not want to calculate the extra risk (Ioannidou, Ongena, & Peydró, 2009).

In August 2007 the Federal Reserve System, the central banking system of US, increased the interest rate (Goodhart, 2008). For the customers it became more difficult to pay the interest and their loans back to the banks. Their houses were used as collateral for the loan instead of cash to the banks (Kalse, 2008). Due to this problem, the prices of the houses declined and a housing bust took place (Taylor, 2008). It became uncertain for the banks whether it would receive all their issued loans. Therefore, banks suffered with a liquidity<sup>1</sup> lack (Berg, & Kirschenmann, 2010). Goodhart (2008) suggests that banks were depending entirely on the support of central banks and third parties to help them through any liquidity crisis. And that was one of the reasons why the crisis became a global crisis and that the crisis spread to most of the firms.

Another important factor causing the crisis were the rating agencies<sup>2</sup> and the lack of transparency. The subprime mortgages were relatively new to the financial market. Therefore, it was hard to determine the risk of these loans (Calomiris, 2008). Also, the financial

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<sup>1</sup> Liquidity is the ability or the susceptibility to pay directly debts in cash (Koenen, Drewes, 1996).

<sup>2</sup> Rating agencies estimate the risks of the securitization products (Calomiris, 2008).

institutions created Collateralized debt obligations (CDO) (Van der Kwast, & Van Oosterhout, 2008). CDOs packages were determined to take into account all the resources of a firm that had any value, such as corporate loans or mortgages. These values were transformed into bonds, which were resold to investors (Van der Kwast, & Van Oosterhout, 2008). But also the risks of these packages were hard to determine because it was new to the financial market. The banks were depending on rating agencies to determine the risk of their investments (Van der Kwast, & Van Oosterhout, 2008). If rating agencies were too careful to give favorable ratings to the CDO, financial institutions chose another rating agency, also called ratings shopping (Calomiris, 2008). To prevent firms institutions from switching, rating agencies tended to high quality ratings (AAA, AA and A)<sup>3</sup>, but actually they had a higher risk, and therefore the quality ratings should be lower (Calomiris, 2008). The managers were aware of these risks, but most of the managers did not act due of the agency problem and still sold the CDOs (Calomiris, 2008).

The problem of asymmetric information over the real position of the borrowers caused a reduction of lending. So, the willingness of parties to lend money to each other becomes less, which caused a decline in trust and ultimately in liquidity (Calomiris, 2008).

It is still debatable when the crisis started. According to Taylor (2008), the crisis flared up in August 2007 because around that time the housing bust<sup>4</sup> took place. Chari, Christiano and Khoe (2008) examined data provided by Bloomberg, and they suggest the crisis started at the end of 2007 because global investors stopped findings CDOs<sup>5</sup>. This is caused by the main rating agency, which decreased the value of the quality ratings and therefore, CDOs had no value anymore (Van der Kwast, & van Oosterhout, 2008). The confidence in the CDO gradually disappeared. In the summer of 2007 Americans banks had remarked the increasing numbers of missing payments of their clients (Kalse, 2008). The stock market noted this a year later. NYSE (New York stock exchange) is the biggest stock market worldwide. Many stocks are traded on the NYSE every day (Berk, & DeMarzo, 2007). According to the history line of the prices of NYSE, the progress gives an extreme decline in September 2008 (“iShares NYSE Composite Index (NYC)”, n.d.). The bankruptcy of Lehman Brothers is possible the cause of the extreme decline in September 2008. This had influenced the NYSE

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<sup>3</sup> The quality rating AAA indicates high reliability of the CDO (Van der Kwast, & Van Oosterhout, 2008).

<sup>4</sup> Housing bust is when price of houses decline severely.

<sup>5</sup> CDOs packages were determined to take into account all the resources of a firm that have any value, such as corporate loans or mortgages. These values were transformed in bonds, which were resold to investors (Van der Kwast, & Van Oosterhout, 2008).

because Lehman Brothers was one of the largest investment banks in the United States (Kalse, & Van Lent, 2009). This is also another possible start date of the financial crisis.

Probably, not all firms were affected by the financial crisis and some firms were less damaged by the crisis than others. Also, when firms were hit by the crisis, firms not experienced the crisis at the same moment. These factors are disregarded in this research.

To be sure to include the start of the financial crisis, the start date of August 2007 is chosen, as proposed by Taylor (2008) and Chari et al. (2008). The crisis has damaged the world a lot and the global economy takes many years to recover.

## 2.2 Agency Theory

The agency theory could be an explanation for the change in the capital structure. The theory describes the separation between principals and the agents (Jensen, & Meckling, 1976). The principal and the agent have their own goals. For instance in a firm, the principals are the stockholders and the agents are the managers, who make decisions for the firms. When both parties maximize their utility, there is enough evidence to believe that the agent not always acts in the interest of the principal, because of the different goals (Jensen, & Meckling, 1976). The following example gives an indication of the different goals of the principal and the agent. Managers (agents) have strong incentives to invest in activities, which expect to have high payoffs if it is successful, even if it has a low probability of success (Jensen, & Meckling, 1976). When the outcome is positive, the manager earns the gains, when its turn out badly, the principals suffer most of the cost (Jensen, & Meckling, 1976).

Therefore, it is important to find solutions to control the agent, which can be done with different tools. For instance, there are monitoring costs and bonding costs of the agent (Jensen, & Meckling, 1976). Jensen and Meckling (1976) describe bonding costs as “it will pay the agent to expend resources (bonding costs) to guarantee that he will not take certain actions which would harm the principal or to ensure that the principal will be compensated if he does take such actions” (p.5). Due to bonding costs, the agent will be more reliable in the eyes of the principal.

A second solution is to issue more debt, so that the managers are more monitored by outsiders (Barros, & Ibrahim, 2009).

Thus, there are different solutions to control the agent. A solution is to make monitoring and bonding costs and a solution is to issue more debt due that are more outsiders. Therefore, the agency theory could be an explanation for the change in the capital structure.



### 2.3 Modigliani and Miller theory

The first theorem of capital structure is by Modigliani and Miller (1958) and it suggests that “market value of any firm is independent of its capital structure and is given by capitalizing its expected return at the rate appropriate to its class” (p. 268). With other words, capital structure has no effect on the total cash flow that a firm can divide to its equity and debt holders and has also no influenced on the total value of the firm’s debt and equity (Grinblatt, & Titman, 2004). This theory is also called the financing irrelevance theorem. For instance, the manager has no doubt anymore how he finances the firm. It does not matter to finance the firm with high-risk debt or equity, or high-quality debt. There is not any superior decision to the other (Grinblatt, & Titman, 2004). The theorem also assumes that there is a perfect capital market; there are no transaction costs, no taxes and asymmetric information, no bankruptcy costs, no agency cost, full competition and there exist no arbitrage opportunities (Berk, & DeMarzo, 2007). Derive from these requirements, the following equation is formulated:

$$V_U = V_L \text{ (Modigliani, \& Miller, 1958)}$$

From proposition I, Modigliani and Miller (1958) suggest proposition II, “The cost of capital of levered equity is equal to the cost of capital<sup>6</sup> of unlevered equity plus a premium that is proportional to the market value debt-equity ratio” (p.438). Proposition II suggests when firms become more leveraged, there is more risk for the equity-holders because of the absolute priority rule. The rule notices that debt holders have to pay fully first, and then the equity holders receive any profit of the bankruptcy (Grinblatt, & Titman, 2004). The premium compensates the extra risk, which the equity-holders bear. Also, proposition II assumes that there is a perfect capital market.

When the propositions deal with taxes ( $T_C$ ), there is a benefit for the levered firms because of the tax shield. The tax shield notes that interest on debt is deductible (Grinblatt, & Titman, 2004). For example by proposition I, the new equation is:

$$V_L = V_U + T_C D \text{ (Modigliani, \& Miller, 1958)}$$

According to the equation, a corporate tax is linear related with the debt. Firms have a preference for finance with debt, because of the interest shield. The interest shield leads firms to prefer debt over equity financing, and that explains why propositions I & II not valid in the real word (Grinblatt, & Titman, 2004).

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<sup>6</sup> Berk and DeMarzo (2007) describe the cost of capital as “the expected return available on securities with equivalent risk and term to a particular investment” (Glossary G-4).

The propositions are the first assumption of capital structure. Although they are not applicable in the real world, it was the first step to give a view about factors, which might influence the optimal capital structure (Grinblatt, & Titman, 2004).

## 2.4 Pecking order theory

The second theory is the Pecking order theory. The theory is about how the firm finances new investments. This is associated with the capital structure. The pecking order theory is developed by Myers (1984). The theory suggests that the firms finance a new investments first with internal funds (retained earnings) and then with external financing (debt) (Myers, 1984). External financing is associated with information asymmetry. Informational asymmetry is a problem that managers (agents) have more knowledge than the investors (principals). When the firm finances more with internal funds than external funds, there are less investors and the problem of informational asymmetric will decrease (Myers, & Majluf, 1983).

Information asymmetry suggests a financing-hierarchies approach, firms prefer internal finance over external finance, and have a preference for debt over equity (Myers, 1984). If firms use external finance, first they issue the safest security. They start with debt, then probably hybrid securities, and as last equity (Myers, 1984).

Information asymmetry can create costs. This occurs when firms not choose a positive NPV project because of the cost of debt or equity (Myers, & Majluf, 1983). NPV is the net present value of a project, which creates value for the firm when the outcome of the calculation is positive (Berk, & DeMarzo, 2007). It is to the managers to choose the right decision between the cost of debt or equity (Myers, & Majluf, 1983). It is relevant to finance the firm with debt because of the agency problem. This problem is in more detail explained in part 2.2. When a firm issues debt, the firm has more outsiders who test the agents (managers) (Barros, & Ibrahim, 2009). The problem of information asymmetry is solved when managers can report costless their information to investors, so that there is transparency (Myers, & Majluf, 1983).

How the firm finances, internal or external, is also depends of the growth opportunities. Firms with more growth opportunities have the flexibility to choose how they finance their investments (Titman, & Wessels, 1988). According to pecking order theory, growing firms choose internal funds over external funds to finance their investments.

In short, pecking order theory suggests a 'pecking order' in finance of investments, prefer internal over external, and when they use external funds, they prefer debt over equity. Therefore, this theory explains an aspect of the capital structure.

## 2.5 Determinants

This section explains how different determinants influence the capital structure. Size, growth, profitability, tangibility, book leverage and market leverage will be discussed, because these determinants are used in previous studies, like the research of Rajan and Zingales (1995), Titman and Wessels (1988), Baker and Wurgler (2002) and Lemmon, Roberts and Zender (2008).

### 2.5.1 Size

Size of the firm influences the capital structure. Many researchers have different opinions over the relationship between size and capital structure. For example, Ferri and Jones (1979) suggest that the size of the firm is related with the capital structure, but it has not a positive, linear relationship. The exact relationship between size and capital structure is unclear. Kim and Sorensen (1986) indicate there is not a relation at all; size is uncorrelated with the leverage.

On the other hand, there are researchers with another conclusion. For instance, Titman and Wessels (1988) conclude there is a relation between size and capital structure. They expect that large firms are to be more diversified and less susceptible for bankruptcy. Size should be a proxy for the possibility of bankruptcy. These arguments propose that large firms have more leverage. Also, the research of Rajan and Zingales (1995) shows with an empirical research, that size is positive related to the capital structure. The reason about the correlation between these variables is unclear. All these reasons note that large firms should have more leverage and therefore, there is a positive relation between size and leverage.

The agency theory indicates a positive relation between size and agency cost. The theory suggests that agency costs occur more often in large firms, because large firms are more complex (Jensen, & Meckling, 1976). Large firms are less transparent and therefore have more agency costs than small firms (Douka, McKnight, & Pantzalis, 2005). The monitoring in small firms is easier because it is not so complex and the communication is more direct; the levels of the firm are less than in large firms. Therefore, it is important that the managers should be more controlled in large firms. Monitoring cost and bonding costs increase. When firms issue debt, managers are more monitored by outsiders (Barros, & Ibrahim, 2009). It is difficult for managers to aim their own goals, and the agency problem is less. Therefore, the agency theory suggests also a positive relation between size and leverage.

The empirical part of the research of Rajan and Zingales (1976) and Titman and Wessels (1988) concludes a positive relation between size and leverage. Therefore, it is chosen for a positive relation between size and leverage.

In part 2.1, the financial crisis is explained. One of the consequences of the crisis is that banks suffered with a liquidity lack and so discouraged borrowers to applying new loans. In other words, banks had less credit, and they could not fully meet the demand of issue loans. Berg and Kirschenmann (2010) also said “We find that the impact of the financial crisis on credit availability strongly depends on firm size and on the industry a firm operates in” (p. 21). They suggest when banks have less credit; banks look to the size of the firm when they issue loans. Banks have more interests in large firms to issue a loan, because the chance of get loans back is larger. And that gives banks more certainty. Because of these arguments, the first hypothesis is formulated:

*H1: During the crisis, size is more important because it is safer for creditors to lend to large firms.*

### **2.5.2 Growth**

Growth opportunities also influence the capital structure. This is suggested by different researchers and theories. For example, Titman and Wessels suggest (1988) that growing firms have more flexibility to choose their future investment. According to the pecking order theory, in the first place the preference to finance a new investment is with internal funds and the second place with external financing (see part 2.4). This predicts that growing firms have a lower leverage, so a negative relation between growth and leverage.

Also, the agency problem applies by the relation between growth and leverage. The choices of investment are made by managers (the agent). When there is more flexibility in finance of investments, what Titman and Wessels (1988) suggest, than have managers more flexibility in how they finance their investments. Managers have a preference to satisfied first their own goal; maximize their utility, and second that of the shareholders (principals) (Jensen, & Meckling, 1976). To mitigate this problem, the control of the managers is required. A solution for this problem is to issue more debt (see part 2.2) and therefore, it suggests a positive relation between growth and leverage.

These two theories contradict each other. The empirical part of the research of Rajan and Zingales (1976) and Titman and Wessels (1988) concludes a negative relation between

growing firms and leverage. Therefore, it is chosen for a negative relation between growth and leverage.

The growth opportunities can be linked with the financial crisis. Baily and Elliott (2009) suggest that in times of a decline in the economy, there is less or no growth for several quarters. This is the case during the financial crisis. There is a decline in the economy and due to that, there are less growth opportunities. Therefore, growth opportunities will be less importance in time of crisis. The second hypothesis is therefore formulated as following:

*H2: During the crisis, the importance of growth opportunities will decrease associated with capital structure.*

### **2.5.3 Profitability**

Also, profitability influences the capital structure, which is often discussed by different theories and researchers. Ozkan (2001) suggest a negative relation between profitability and leverage, what is explained by the pecking order theory. The pecking order theory suggests that firms prefer to finance with internal funds over outside finance (Myers, 1984). Therefore, this theory predicts a negative relation between the profitability and leverage (Myers 1984; Myers, & Majluf, 1983).

Empirical research of Rajan and Zingales (1995) and Titman and Wessels (1988) report that the influence of profitability in the United States on leverage is most of the time negative related. Therefore, it is chosen for a negative relation between profitability and leverage.

The prices of the stock market and GDP had a deep decline in the years 2007 and 2008 (Chairman, 2011). First aspect of decline is the GDP, which is a meter for the welfare of the economy (Gleditsch, 2002). A low GDP reflects to less expenditure of firms and consumers. When consumers decrease their expenditure and firms decrease their expenditures to each other, firms remark this in their profitability, which also declines.

The second aspect is the stock market. The stock market is related to the profitability of the firm, therefore a downturn in the stock market's prices reflects to a decline in profitability of the firms (Chairman, 2011). The quantity of the profitability gives more certainty to the creditors, because the chance is higher that the creditors receive their money. This becomes more important in hard times, because the chance to receive their invested money is lower.

Therefore, the third hypothesis is formulated:

*H3: During the crisis, the importance of profitability will increase associated with capital structure since profitability plays even a large role to creditors.*

#### **2.5.4 Tangibility**

The choice of the type of the firm's assets affects the capital structure. There are two types of assets, namely tangible and intangible assets. A tangible asset can be touched and see by humans senses (Bruggencate, 1997). An intangible asset is the opposite, which is an asset that the human's senses not see (Bruggencate, 1997). The context of tangibility can also serve more abstract, this means when an asset is tangible, it can be used as collateral on a loan (Myers, & Majluf, 1984). That is applied in this research.

Myers and Majluf (1984) suggest that costs are related with issuing debt due to the information asymmetry problem; managers are more informed than the outside shareholders. These costs can avoid by issuing debt secured by collateral, because the value is know of the collateral. Therefore, when firms have the opportunity to take this advantage to use assets as collateral, it may be expected that these firms issue more debt (Myers, & Majluf, 1984). Myers and Majluf (1984) expect a positive relation between the tangibility and leverage.

The empirical part of the research of Rajan and Zingales (1995) and Titman and Wessels (1988) concludes a positive relation between tangibility and leverage. Myers and Majluf (1984) demonstrate also a positive relation (see explanation above). Therefore, it is chosen for a positive relation between tangibility and leverage.

In part 2.1 it is explained that banks constraint their loans to firms in times of crisis, because banks suffered with a liquidity lack. Banks required more security when they issue loans to firms (Berg, & Kirschenmann, 2010). Also, outside investors have preference to invest in firms who have assets that can be used as collateral. It gives investors more certainty, especially in difficult times, when the chance is lower of receive their invested money (Stigliz & Weiss, 1981). Therefore, tangible assets become more important in hard times. The following hypothesis is formulated:

*H4: During the crisis, the importance of tangibility will increase associated with capital structure.*

### 2.5.5. Book leverage vs. Market leverage

The capital structure is another word for the equity-debt ratio. Book leverage and market leverage are both measurements for capital structure. The difference between these two, is the calculation of these variables. With market leverage is used the current stock prices and book leverage is determined by early listed stock prices (Lemmon, Roberts, & Zender, 2008). These measurements are used by different research, like Rajan and Zingales (1995), Lemmon et al. (2008).

The stock prices are declined a lot during the financial crisis. One of the causes of the declining is a decrease in the profitability of firms, which is related to the stock prices (more detail description in part 2.5.3). Also, the bankruptcy of Lehman Brothers, 15 September 2008, had big impact on the stock market. The prices of the stocks dropped dramatically (Bellon, Koolen, Van Tendeloo, Vannaste, & Verniers, 2009) (see part 2.1). According of these reasons, the last hypothesis is formulated:

*H5: During the crisis, the book leverage is relatively higher compared with market leverage than before the crisis.*

### **3. Data and Methodology**

This section explains the sources of the collected data, how the variables are measured and which methods are used to test the hypotheses.

#### **3.1 Data**

This research uses a dataset from CRSP/COMPUSTAT Merged - Fundamentals Annual of North America, which is a program that has data of financial and market firms. CRSP, which stands for Center for Research Security Prices, contains an extensive collection of stock price information, profitability and volume data from NYSE, AMEX and Nasdaq stock markets. Investment rates are important to calculate the market value of equity.

To answer the central question (chapter 1), the data from August 2004 until July 2007, and August 2007 until July 2010 of the United States are collected. According to the literature, the crisis started in August 2007 (Taylor, 2008; Chari et al., 2008). Therefore is assumed to use the data from August 2007 until July 2010 (the latest data, which is available). Seasons could influence the data especially for the agricultural sector; therefore the collections are based on three full years.

Only nonfinancial firms are used, because financial firms have a different capital structure (Rajan, & Zingales, 1995). Therefore, it is relevant to remove the financial firms. This is executed by selecting and removing the SIC (Standard Industrial Codes) codes 6000 until 6999. Furthermore, there are no differences observed between sectors. The outliers of the data are removed, because it influences the statistics. An OLS regression express the influence of the independent variables on the dependent variables and descriptive statistics provides helpful insights. Also, this research tested of the independent variables are highly correlated. This statistical phenomenon calls multicollinearity, which makes the estimation of the regression coefficients not reliable (Bougie, & Sekaran, 2010). An equal variance test compares two populations with each other. OLS, descriptive statistics, and an equal variance test are implemented of the two periods (2004-2007 and 2007-2010) with SPSS as calculation tool. According to these results, the research question is answerable.

#### **3.2 The Model**

The research uses different variables which are measured on different ways. The dependent variables are the book leverage, which is a ratio of total debt divide by book value of assets, and the market leverage, which is a ratio of total debt divided by total debt plus market value of equity. The independent variables are logarithm of sales; the market-to-book is the ratio



that measured as the market value of assets (market equity) divided by book value of assets; profitability is a ratio that measured as the EBITDA (earnings before interest, taxes, depreciation, and amortization) divided by book value of assets; and tangibility is a ratio of fixed assets divided by the book value of assets. Log (sales) is the logarithm of net sales; it is a proxy for firm size. Market-to-book measures the growth opportunities of the firm. Market equity is used by the calculation of market leverage and is defined by shares outstanding multiplied by the current stock price. The current stock price is founded by CRSP (Rajan, & Zingales, 1995; Lemmon et al., 2008).

According to the dependent and independent variables, the next equation is formulated (Rajan & Zingales, 1995):

*Leverage (Firm)*

$$= \alpha + \beta_1 \text{Log Sales} + \beta_2 \text{Market to book Ratio} + \beta_3 \text{Profitability} \\ + \beta_4 \text{Tangible Assets} + \varepsilon$$

### 3.3 Hypotheses approach

The hypotheses are formulated based on the literature (see chapter 2). This part explains how the hypotheses are tested.

The equation is used for the regression for this research. The dependent variables are book leverage and market leverages. The independent variables are log (sales), market-to-book, profitability and tangibility.

There are two periods, August 2004 until July 2007 and August 2007 until July 2010. This research implements the OLS of two periods. Book leverage as well as the market leverage are used as dependent variables for each period. The independent variables remain the same. The number of the coefficient reflects the strength of the independent variable on the dependent variable and this indicates the importance of the variable (Rajan, & Zingales, 1995). The relative change reflects the difference between the first and second period. These steps are used to test the hypotheses 1, 2, 3 and 4.

Another method is used for the last hypothesis. The mean of book leverage and the mean of market leverage of the first and second period are compared with each other. This is done with an equal variance test for the first and second period. The equal variance method tests or the mean of book leverage is higher than the mean of market leverage.

## 4. Empirical Results

This chapter presents descriptive statistics, collinearity statistics, OLS regression and an equal variance test.

The first period refers to the period before the crisis, August 2004 until July 2007. The second period refers to the period during the crisis, August 2007 until July 2010.

### 4.1 Descriptive Statistics

Descriptive statistics provide descriptive information about the observations. These tables are used to derive interesting information about the observations (Bougi, & Sekaran, 2010).

**Table 1**  
**Descriptive Statistics of the first period**

The data consists of non-financial firms of the United States for the period August 2004 until July 2007. The data is from COMPUSTAT. The variable book leverage is the ratio of total debt divided by book value of assets. Market leverage is the ratio total debt divided by total debt plus market value of equity. Log (sales) is the logarithm of sales. Market-to-book is the ratio of the market value of assets divided by book value of assets. Profitability is the ratio of the EBITDA divided by book value of assets. Tangibility is the ratio of fixed assets divided by the book value of total assets.

Variable	N	Mean	Median	SD	Minimum	Maximum
Book leverage	13466	0,203	0,1507	0,276	0,000	14,500
Market leverage	13420	0,174	0,100	0,209	0,000	1,000
Log (sales)	13013	5,778	5,789	2,284	0,000	12,754
Market-to-book	13466	1,796	1,200	2,882	0,000	172,500
Profitability	13466	0,034	0,101	0,353	-13,000	1,818
Tangibility	13466	0,256	0,168	0,239	0,000	1,000

According to table 1, there are a lot of differences between the observations per variable. By book leverage is the probability high that some outliers influence the statistics. According to table 1, the maximum of book leverage is 14,500 and this number will have an impact later on the regression. According to Lemmon et al. (2008) a solution to this problem is to remove outcomes of book leverage that are higher than 1, because total debt is a part of the book value of assets, and therefore it is impossible that book leverage is higher than 1. The minimum of profitability is -13,0, which deviates from the mean value. This outlier will distort the analyses. Market-to-book notes a maximum of 172,500, which is far away from the mean value. This would indicate that the market value of assets is 172,500 times larger than the book value of assets. This indicates that the stock is extremely overvalued and what is probably not feasible in practice. Therefore, it is important to remove these outliers so that the outliers are not influence the results (Bougie, & Sekaran, 2010).

**Table 2**  
**Descriptive Statistics of the second period**

The data consists of non-financial firms of the United States for the period August 2007 until July 2010. The data is from COMPUSTAT. The variable book leverage is the ratio of total debt divided by book value of assets. Market leverage is the ratio total debt divided by total debt plus market value of equity. Log (sales) is the logarithm of sales. Market-to-book is the ratio of the market value of assets divided by book value of assets. Profitability is the ratio of the EBITDA divided by book value of assets. Tangibility is the ratio of fixed assets divided by the book value of total assets.

Variable	N	Mean	Median	SD	Minimum	Maximum
Book leverage	11975	0,233	0,167	0,559	0,000	35,000
Market leverage	11806	0,241	0,147	0,270	0,000	1,000
Log (sales)	11427	5,993	6,014	2,249	0,000	13,035
Market-to-book	11975	1,340	0,851	2,552	0,000	155,000
Profitability	11975	0,001	0,094	0,545	-19,000	2,000
Tangibility	11975	0,272	0,175	0,257	0,000	1,000

According to table 2, there are also a lot of differences between the observations per variable. The outliers occur with the same sort of variables as in table 1: book leverage, profitability and market-to-book. It is important to remove these outliers at the same method as table 1 so that the outliers have no impact on the statistics (Bougie, & Sekaran, 2010).

#### **4.2 Multicollinearity**

Multicollinearity is statistical phenomenon, which indicates how much the independent variables are correlated. When this statistical phenomenon appears, there is a change that the estimation of regression coefficients is unreliable (Bougie & Sekaran, 2010).

**Table 3****Multicollinearity of the first period**

The data consists of non-financial firms of the United States for the period August 2004 until July 2007. The data is from COMPUSTAT. Multicollinearity is a statistical phenomenon which indicates of independent variables are highly correlated. The variable book leverage is the ratio of total debt divided by book value of assets. Market leverage is the ratio total debt divided by total debt plus market value of equity. Log (sales) is the logarithm of sales. Market-to-book is the ratio of the market value of assets divided by book value of assets. Profitability is the ratio of the EBITDA divided by book value of assets. Tangibility is the ratio of fixed assets divided by the book value of total assets.

	Book leverage			Market leverage		
Collinearity Statistics	Tolerance	VIF	Sig.	Tolerance	VIF	Sig.
Log (sales)	,905	1,105	,000	,905	1,105	,000
Market-to-book	,913	1,096	,000	,912	1,097	,000
Profitability	,987	1,013	,000	,987	1,013	,000
Tangibility	,924	1,082	,027	,925	1,081	,000

According to table 3, the independent variables of the first period are not highly correlated because the tolerance is less than 0,10 and the variance inflation factor (VIF) is not higher than 10 (Bougie & Sekaran, 2010).

**Table 4****Multicollinearity of the first period**

The data consist of non-financial firms of the United States for the period August 2004 until July 2007. The data is from COMPUSTAT. Multicollinearity is a statistical phenomenon which indicates of independent variables are highly correlated. The variable book leverage is the ratio of total debt divided by book value of assets. Market leverage is the ratio total debt divided by total debt plus market value of equity. Log (sales) is the logarithm of sales. Market-to-book is the ratio of the market value of assets divided by book value of assets. Profitability is the ratio of the EBITDA divided by book value of assets. Tangibility is the ratio of fixed assets divided by the book value of total assets.

	Book leverage			Market leverage		
Collinearity Statistics	Tolerance	VIF	Sig.	Tolerance	VIF	Sig.
Log (sales)	,750	1,333	,000	,763	1,310	,000
Market-to-book	,945	1,058	,000	,939	1,065	,000
Profitability	,741	1,349	,000	,747	1,339	,000
Tangibility	,929	1,077	,000	,934	1,070	,000

The conclusion of table 3 is the same as for table 4. The independent variables of the period during the crisis are not highly correlated because the tolerance is less than 0,10 and the variance inflation factor (VIF) is not higher than 10 (Bougie & Sekaran, 2010).

### 4.3 Test of hypotheses

In this section a regression and equal variance test are implemented and the hypotheses are tested.

**Table 5**  
**Regression**

The data is from COMPUSTAT. The dependent variable is book leverage, which is the ratio of total debt divided by book value of assets and market leverage is the ratio of total debt divided by total debt plus market value of equity. Log (sales) is the logarithm of sales. Market-to-book is the ratio of the market value of assets divided by book value of assets. Profitability is the ratio of the EBITDA divided by book value of assets. Tangibility is the ratio of fixed assets divided by the book value of total assets. The significance is in parentheses. (I) reflects to the period August 2004 until July 2007 an (II) reflects to the period of August 2007 until July 2010. The relative change is defined by (II) min (I) divided by (I) and convert in percentage numbers. It reflects the differences between the periods. The regression contains an intercept, which is not reported. The estimated model is:

$$Leverage (Firm) = \alpha + \beta_1 Log Sales + \beta_2 Market to book ratio + \beta_3 Profitability + \beta_4 Tangibility + \varepsilon$$

Model	(I) OLS	(II) OLS	relative change	(I) OLS	(II) OLS	relative change
Dependent Variable	Book leverage	Book leverage	Book leverage	Market leverage	Market leverage	Market leverage
Log (sales)	,016 (0,000)	,018 (0,000)	8,93%	,016 (0,000)	,013 (0,000)	-19,75%
Market-to-book	-,024 (0,000)	-,032 (0,000)	31,29%	-,043 (0,000)	-,080 (0,000)	85,38%
Profitability	-,098 (0,000)	-,066 (0,000)	-32,74%	-,155 (0,000)	-,174 (0,000)	12,52%
Tangibility	,233 (0,000)	,248 (0,000)	6,54%	,213 (0,000)	,259 (0,000)	21,56%
Number of observations	12898	11300		12985	11321	
R <sup>2</sup>	,208	,218		,279	,307	

According to table 5, the size of the firm is positive related to the dependent variables. For instance, the number 0,016 means that when log (sales) increases with one unit, book leverage increases with 0,016. There is some difference between the coefficient of the first and second period related to book leverage and market leverage. The coefficient of size has a relative increase in relation to book leverage. This means that firm size has become more related to book leverage in the second period; therefore size is more important associated with book leverage during the crisis. On the other hand, there is a relative decrease by firm size in relation to the market leverage. This means that firm size has become less related to market leverage in the second period; therefore size is less important when it is related to the market leverage during the crisis.

Growth opportunities are negative related to the dependent variables. The coefficient of growth has a relative increase in relation to book leverage and market leverage. This means that growth is more related in the second period; therefore growth opportunities are more important associated with book and market leverage during the crisis.

Profitability is negative related to the dependent variables. Also, probability has a relative decrease in relation to book leverage, which suggests that profitability is less related to book leverage in the second period. Therefore, profitability is less importance associated with book leverage during the crisis. Meanwhile, the coefficient of profitability has a relative increase in relation to market leverage. This means that profitability becomes more important when it is related to the market leverage during the crisis.

Tangibility is positive related to the dependent variables. The coefficient of tangibility has a relative increase in relation to book leverage and market leverage. This means that tangibility is more related in the second period, therefore tangibility is more important associated with book and market leverage during the crisis.

The coefficient of determination,  $R^2$ , reflects the goodness of fit of the regression (Bougie, & Sekaran, 2010). According to table 5, the  $R^2$  is near to 0,2 en 0,3. This suggests that the regression model do not fit the data well (Bougie, & Sekaran, 2010). For instance, when the  $R^2$  is 0,208, it means that 20,8% of the variance of book leverage is explained by the model and 79,20% is unexplained.

**Table 6**  
**Equal variance test**

The data is from COMPUSTAT. Book leverage is defined as total debt divided by book value of assets and market leverage is defined as total debt divided by total debt plus market value of equity. (I) reflects to the period August 2004 until July 2007 an (II) reflects to the period of August 2007 until July 2010. The assumption, of book leverage is larger than market leverage, is tested with t-value and the val. See appendix A for more information.

	I			II		
	mean	N	SD	mean	N	SD
Book leverage	0,189	13339	0,196	0,207	18829	0,210
Market leverage	0,174	13420	0,209	0,241	11806	0,270
	t $\geq$	val	Significant	t $\geq$	val	Significant
Book leverage > Market leverage	2,241	5,971	Yes	2,242	-0,977	No

The mean of the book and the market leverage are presented from the first and second period in table 6. Book leverage is larger than market leverage in the first period. In the second

period it cannot conclude that book leverage is larger than market leverage, because the comparison is not significant.

According to the hypotheses that are formulated in chapter 2, the results can be associated with the hypotheses.

*H1: During the crisis, size is more important because it is safer for creditors to lend to large firms.*

According to table 5, firm size is indeed more important when it is related to book leverage. When size is related to market leverage, it has become less important.

*H2: During the crisis, the importance of growth opportunities will decrease associated with capital structure.*

Growth opportunities has just become more important when it is related to book and market leverage (see table 5).

*H3: During the crisis, the importance of profitability will increase associated with capital structure since profitability plays even a large role to creditors.*

According to table 5, profitability is less important when it is related to book leverage. When profitability is related to market leverage, it has become more important.

*H4: During the crisis, the importance of tangibility will increase associated with capital structure.*

Tangibility has become important when it is related to book and market leverage (see table 5).

*H5: During the crisis, the book leverage is relatively higher compared with market leverage than before the crisis.*

According to table 6, book leverage is relatively higher compared with market leverage in the period before the crisis. During the crisis, it cannot be conclude that book leverage is relatively higher than market leverage because this comparison is not significant.

The results do not always correspond with the expectations. For instance hypothesis one, the results suggest that firm size is more important to book leverage and less important to market leverage during the crisis. A reason for this difference could be that their exists different methods for the calculation of market leverage. Baker and Wurgler (2002) suggest that market leverage is defined as total debt divided by book value of assets minus book equity plus market equity. This paper defined market leverage as total debt divided by total debt plus market value of equity (Lemmon et al., 2008). Besides, market equity is used by current stock price multiplied with shares outstanding (Compustat item number 54). Baker and Wurgler

(2002) use for shares outstanding Compustat item number 25. These reasons could be an effect on the observations of market leverage. Therefore, it could have an impact on the regression, which indicates the relation between the independent variables and the leverage.

$R^2$  reflects the degree of the fit of the regression, which is not very high according to table 5. This suggests that the regression model do not fit the data well (Bougie, & Sekaran, 2010). Causes could be that the variables are poorly measured, or the model must be extended with more variables. These causes could have also an effect on the observations and outcomes of the regression.

Moreover, the start date of the financial crisis remains a discussion point. Taylor (2008), Chari et al. (2008) suggest that the crisis flared up around August 2007. The NYSE notes an extreme decline in September 2008, when Lehman Brothers bankrupted. This could be also a start date of the financial crisis. Therefore, the uncertainty about the start date of the crisis could influence the statistics as well.



## 5. Conclusion and Recommendations

This research has investigated the influence of the financial crisis on the capital structure with the size, growth, profitability and tangibility as determinants. Therefore, the central question is what the impact of the financial crisis of 2007 was on the capital structure of nonfinancial firms in the United States.

The variables on the capital structure are tested. The empirical results suggest that there is a positive relation between firm size and leverage because large firm are probably more diversified and less likely to go bankrupt. Size becomes also more important in relation to the book leverage during the crisis. A reason for this is that it is safer for creditors to lend to large firms. Growth has a negative relation on leverage, because growing firms have more flexibility to choose their future investments and choose rather internal funds than external financing. During the crisis, growth opportunities becomes more important associated to the leverage. Profitability is negative related to leverage. An argument for this relation is that firms prefer to finance with internal funds over outside finance to avoid asymmetric costs. During the crisis, profitability is more important associated with market leverage because it gives creditors more certainty to receive their invested money. The last variable is tangibility, which has a positive relation on leverage. Because the firms can avoid asymmetric costs when they issue debt secured by collateral. Tangibility is more important when it is related to the leverage during the crisis. Because it gives investors more certainty to invest in firms who have assets that can be used as collateral.

In short, the financial crisis of 2007 has impact on the capital structure of nonfinancial firms in the United States. The crisis has damaged the world a lot and the global economy takes many years to recover.

For further research it is possible to relate the results more with the theory. This is probably only possible when the research uses more data and variables (Rajan, & Zingales, 1995). Moreover, the usage of more important variables, can increase the  $R^2$ . For example, Ozkan (2001) and Titman and Wessels (1988) use non-debt tax shields and liquidity. And the goodness of the fit of the regression would be higher.

In the part of the empirical results, it is possible to analyze the data more in detail by making a distinction between different sectors, and to research which sectors are affected the most by

the crisis. Probably, not all firms experience the crisis at the same moment, which is also an opportunity for further research.

Also, different calculation of the market leverage can be used. For example, Baker and Wurgler (2002) suggest that market leverage is defined as total debt divided by book value of assets minus book equity plus market equity. This gives probably other outcomes when the regression is implemented.

In part 2.5.2, the literature suggest that growth opportunities become less important related to leverage during the crisis, while the empirical results (part 4.3) indicate that growth becomes more important when it is related to leverage. This problem is a task for further research.

The financial crisis of 2007 is a crisis which is one of the many crises that took place in the world. It is very interesting to compare difference crises with each other, such like the Wall Street Crash of 1929. A crisis that also started in the United States but a crisis which had completely different causes than the financial crisis of 2007.

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## Appendix A

The equal variance test is implemented by hypothesis 5, which measures of book leverage  $\mu_1$  larger is than market leverage  $\mu_2$  in the period before the crisis.

1.  $H_0: \mu_1 - \mu_2 \leq 0$  and  $H_1: \mu_1 - \mu_2 > 0$

2. Test statistics:  $T = \frac{X_1 - X_2}{\sqrt{Sp^2 \left( \frac{1}{n_1} + \frac{1}{n_2} \right)}}$  with  $S_p^2 = \frac{n_1 - 1}{n_1 + n_2 - 2} \times \sigma_1^2 + \frac{n_2 - 1}{n_1 + n_2 - 2} \times \sigma_2^2$

This gives  $S_p^2 = 0,041088$

3. Reject  $t \geq (0,05/2; 13339 + 13420 - 2) = 2,241529$

4. The val is 5,971821

5. Reject  $H_0$ , and  $H_1$  is significant. Therefore, book leverage is larger than market leverage in the period before the crisis.

The test measures of book leverage  $\mu_1$  larger is than market leverage  $\mu_2$  in the period during the crisis.

1.  $H_0: \mu_1 - \mu_2 \leq 0$  and  $H_1: \mu_1 - \mu_2 > 0$

2. Test statistics:  $T = \frac{X_1 - X_2}{\sqrt{Sp^2 \left( \frac{1}{n_1} + \frac{1}{n_2} \right)}}$  with  $S_p^2 = \frac{n_1 - 1}{n_1 + n_2 - 2} \times \sigma_1^2 + \frac{n_2 - 1}{n_1 + n_2 - 2} \times \sigma_2^2$

This gives  $S_p^2 = 0,071634$

3. Reject  $t \geq (0,05/2; 11829 + 11806 - 2) = 2,241546$

4. The val is -9,76488

5. Do not reject  $H_0$ . Therefore, it cannot conclude that book leverage is larger than market leverage during the crisis.