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Credit ratings and their interaction with the capital structure of Greek listed firms

Alexandra G. Grolliou

Student ID: 1103090124

Maria E. Kalaitzoglou

Student ID: 1103090110

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ABSTRACT

This study examines the effect of credit rating changes on managers' capital structure decisions in Greek listed firms. It is an attempt to combine traditional capital structure theories with the modern credit rating-capital structure hypothesis (CR-CS). Many of the theoretically proposed determinants of leverage appear insignificant in this study. Leverage ratios present on average ambiguous variations around the year of credit rating change. Firms close to a credit rating change appear to issue more debt relative to equity no matter the direction of the change. On the contrary, these results are persistent with companies that expect to be downgraded from investment to speculation grade. The overall results are partly consistent with the CR-CS theory.

Keywords: Credit ratings, agency costs, capital structure, leverage

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CHAPTER 1

1. Introduction

Corporate credit ratings are assessments of the ability and willingness of companies to meet their financial commitments. They are of paramount importance for companies, since they provide potential investors with independent (and up to a point 'personal') information about each company's credit quality that is not publicly available, hence affecting the level of investments these companies can attract. Investments are the heart and lungs of all listed companies; they are vital for their durability and one of the main capital sources. Since credit ratings signal a company's quality to potential financiers, it is at least rational to believe that credit ratings affect capital structure.

Managers themselves admit to take credit ratings into serious consideration when making capital structure decisions. In 1999 Graham and Harvey surveyed 392 CFOs in the US and Canada about the cost of capital, capital budgeting, and capital structure. The results were published in 2001 and, among others, showed that credit ratings, following financial flexibility, are with 57.1% the second most important factor that affects managers' decision on the appropriate amount of debt for their firms. Bancel and Mittoo (2002) tried to replicate the previous research employing European data and focusing primarily on capital structure. They surveyed a total of 710 firms from 17 European countries (Austria, Belgium, Greece, Denmark, Finland, Ireland, Italy, France, Germany, Luxembourg, Netherlands, Norway, Portugal, Spain, Switzerland, Sweden and the UK) and found that credit ratings play significant role to managers' decision by getting a 72.22%[1].

Hovakimian, Kayhan and Titman (2009) take a step further proving that companies not only target their ratings, but when observed ratings deviate from their targets, companies make subsequent corporate finance choices in order to rebalance their leverage.

[1] More specifically, both survey questionnaires contained the question "What factors affect how you choose the appropriate amount of debt for your firm?" where credit ratings were identified as 'important' or 'very important' by 57.1% of the American and 72.22% of the European managers.

The main objective of our study is to examine whether changes in corporate credit ratings affect the capital structure decisions of Greek managers. More specifically, we assess whether Greek companies take into account expected rating changes when determining the optimal level of leverage. Therefore, we expect to find a significant relationship between credit rating changes and capital structure, since Greek managers claimed to place great importance to credit ratings according to the survey of Bancel and Mittoo (2002).

To the best of our knowledge, this is the first study that employs data from the Greek capital market in order to draw conclusions related to the importance of credit ratings in the capital structuring process. Genimakis (2008), using data from Greek listed firms, examined the impact of several theoretically accepted factors on leverage (e.g. profitability, tangibility, firm size etc) including among these factors the credit ratings provided by ICAP S.A., a local company specialized in assessing and managing corporate credit risk. His findings demonstrated a statistically significant relationship between ratings and the level of leverage, however, his study does not provide any interpretation for the ratings used. Finally, we cast doubt for the reliability of ratings offered by ICAP since it is a small local firm without international credentials. For the above reasons, our study attempts to fill this gap by using reliable credit ratings data and test whether the latter affect corporate capital structure.

Our study is motivated by the study of Kisgen (2006) who put forward the "credit rating- capital structure hypothesis" (CR-CS). In specific, he empirically showed that credit ratings directly affect firm's capital structure decisions of managers in the US. Kisgen argues that there are discrete costs and benefits associated with different credit rating levels, even that managers' concern about credit ratings is due to these costs. He finds that firms near a rating change issue annually less net debt relative to net equity as a percentage of total assets than firms not near a rating change. However, his methodology is rather detailed and complex and beyond the scope of this thesis.

In this study we assess the relationship between credit ratings and capital structure in a much simpler way. First, we will try to assess the general reaction of Greek listed firms to credit rating changes with regard to leverage. We do this by employing data only from companies that experience a credit rating change. Then we split the full sample into two sub-samples: one sample including those firms

experiencing an upgrade and one sample with those firms that undergo credit downgrade. Using tests for equality, we find that Greek listed companies, on average, change their leverage levels in response to credit rating changes. In specific, we document that "downgraded" firms increase their total debt as scaled by total assets in the year following the credit rating change. This reaction can be attributed to rising long-term debt, as shown by the ratios of long-term debt/total assets. On the other hand, debt/equity ratios remain, on average, virtually constant, indicating that rating changes trigger increases not only in the amount of debt, but also in the amount of equity used.

Our second objective is to test the robustness of our initial results by running regression analysis. In particular, we test the relationship between credit rating changes and different expressions of leverage. We find that, under certain conditions, credit rating changes play significant role in determining capital structure. Finally, we attempt to interpret the (in)significance of other factors that are theoretically assumed to affect capital structure.

We believe that our study contributes to the scarce literature by providing data from a capital market that is characterized by limited access to finance sources and strong managerial entrenchment since major shareholders usually run their business. For that reason, we believe that the Greek capital market is a good laboratory to re-assess the so-called CR-CS hypothesis.

The rest of the thesis is organised as follows. Chapter 2 presents the importance of credit ratings for market participants and briefly refers to existing capital structure theories. Chapter 3 reports the main ideas developed in the literature concerning capital structure. Chapter 4 describes the data and methodologies we used. In Chapter 5 we present and analyse our empirical results and finally, in Chapter 6 we draw our overall conclusions.

CHAPTER 2

2. Credit ratings and capital structure theories

2.1. The importance of credit ratings

According to the definition given by Standard & Poor's, a credit rating is an opinion of the general creditworthiness of an obligor (issuer rating), or the creditworthiness of an obligor in respect of a specific debt security, or other financial obligation (issue rating), based on relevant risk factors. Corporations place a great deal of importance to their credit ratings as they largely determine their access to external financing and the cost of acquiring it. It is of paramount importance for companies to maintain proper credit ratings as they affect the investors' investment decisions. It is only after scrutinizing a company's profile that investors take the step of investing. Credit ratings act as a signal of a company's credit quality during such scrutiny.

The most important impact of credit ratings' signaling function is the fact that rating changes are often accompanied by variations in stock prices. Goh and Ederington (1993) argue that, conditional upon the type of the downgrade, there is, in general, a significant negative stock response to downgrades. To the extent such 'responses' (negative or positive) affect the firm's cost of capital, companies have serious incentives to preserve a higher rating.

Kisgen (2007) suggests that credit ratings are important for several other reasons too. There are certain regulations on bond investment directly tied to credit ratings. For instance, low credit rating levels prevent particular investor groups such as banks or pension funds from investing in a firm's bonds and pose stricter capital requirements to investor groups such as insurance companies or brokers–dealers for investing in a firm's bonds.

In the same paper he argues that credit ratings also affect a company's material relationship with third parties like other companies and their shareholders, and suppliers. Other companies may choose not to engage in any kind of long-term contract with a speculative-grade company. Suppliers may require specific credit ratings before entering into long-term supply contracts with their counterparties. Even employees may

feel unsecure working for a low rating company thus demanding higher compensation for the risk they undertake.

Above all, credit ratings provide investors with more 'inside' information about each company that is not directly available in the markets. Rating agencies enjoy access to company information, which firms, fearing that they will jeopardize their strategic position against competitors, may be uneager to disclose. This information is valuable to investors for one more reason; rating agencies or other companies providing corporate ratings like Morningstar or Amadeus specialize in gathering, elaborating and evaluating company information thereby producing reliable measures of firms' credit quality. Investors alone would most probably be incapable of successfully processing all this information before taking investment decisions.

Flannery (1986), on the other hand, argues that, in the presence of this information asymmetry, rational investors will try to infer firm's quality from its financial structure and evaluates the extent to which insiders' information is reflected upon the debt choices of companies. Nevertheless, we cannot safely accept neither that investors are rational nor that they can correctly interpret the information 'written on' the capital structure of firms; and this is the reason why they depend on credit ratings' signals.

As long as credit ratings affect the level of investments a company can attract and its cost of capital, they must play a crucial role in the capital structuring process.

2.2. Traditional capital structure theories

Capital structure refers to the mixture of debt and equity capital that a firm uses to finance its overall operations and growth. From the classical Modigliani–Miller theorem[2] to the most recent approach of market timing (firms tend to issue equity following a stock price run-up), countless studies tried to answer Myers' (1984) simple but comprehensive question "How do firms choose their capital structures?".

[2] Modigliani & Miller (1958) demonstrated that under a perfect market and in the absence of taxes, bankruptcy costs and asymmetric information, the value of a firm is irrelevant to the level of debt included in the capital mix.

Many theories of capital structure have been proposed. The most popular among them seems to be the "trade-off theory" in which managers have to evaluate the trade-off between the tax-deductibility of debt and the bankruptcy costs related to it. Myers and Majluf (1984) proposed the "pecking order theory" which states that firms prefer to issue debt rather than equity if internal finance is insufficient – equity is used only as a last resort. Another idea that has been gaining ground lately is the theory of "market timing" according to which, firms prefer equity when the relative cost of equity is low, and prefer debt otherwise. Finally, agency theory, introduced by Jensen and Meckling (1976), illustrates that a firm's capital structure is determined by agency costs, which include the costs for both debt and equity issue. These agency costs arise due to the conflicts of interest between firms' shareholders and managers.

Harris and Raviv (1991) argue that the available studies *"generally agree that leverage increases with fixed assets, non-debt tax shields, growth opportunities, and firm size and decreases with volatility, advertising expenditures, research and development expenditures, bankruptcy probability, profitability and uniqueness of the product."* Frank and Goyal (2009) examine the relative importance of several factors in the capital structure decisions of listed American firms from 1950 to 2003 and find that the most reliable among them for explaining market leverage are: industry median leverage, tangibility, profits, firm size, market-to-book assets ratio and expected inflation. On the other hand however, Titman and Wessels (1988) find that their *"results do not provide support for an effect on debt ratios arising from non-debt tax shields, volatility, collateral value, or future growth."* Taking these opposing arguments into consideration we infer that the relationship between capital structure and its determinants is not consistent. The empirical results vary, and in some times contradict.

In this study we assess the determinants of capital structure that we consider most important such as profitability, liquidity, tangibility, firm size, effective tax rate and growth opportunities and how these are affected by credit rating changes. One of the limitations of our study is the exclusion of other variables that affect capital structure such as market conditions, macroeconomic factors etc.

CHAPTER 3

3. Literature Review

Graham and Harvey (2001) shed light for a deeper investigation of corporate finance theories. In order to analyze the current practice of corporate finance they examined among others the entrepreneurs' response regarding firm size, P/E ratio, leverage, credit rating, dividend policy, industry, management ownership etc. They supported that executives care about financial flexibility and a good credit rating when they form their debt policy. In addition, when they issue equity, respondents are concerned about earnings per share dilution and recent stock price appreciation. Very little evidence is given to asset substitution, asymmetric information, transactions costs, free cash flows, or personal taxes. In their analysis of capital structure, the authors pointed out two fundamental debt policy factors which are financial flexibility and credit ratings. Empirically, numerous tests have been conducted to show that small companies have lower credit ratings, a lower incidence of paying dividends, a higher chance of being privately owned and a lower proportion of foreign revenue. Conversely, small companies are linked to lower credit ratings and higher degree of management ownership. Lastly, firms that do not pay dividends have low credit ratings.

Another strand of the literature surveys the capital structure and its determinants. Bancel and Mittoo (2002) provide data based on European firms. Carrying out a survey the authors observed that the most important factors in order to choose a debt policy are financial flexibility, credit rating and tax advantage of debt.

When reviewing the literature concerning the impact of credit ratings on capital structure, one must pay attention to the seminar study of Kisgen (2006). He was the first to show that credit ratings directly affect capital structure decisions of a firm. He primarily examined the discrete costs and benefits of different credit rating levels in order to detect their influence on capital structure. According to Kisgen (2006), managers take into consideration corporate credit ratings. Regulations regarding investments are related to credit ratings. Whether a bank or an investor group can invest in a firm's bonds depends on credit rating levels. Credit ratings signal the firm's quality thereby drawing investors' attention before acting. A credit rating change has also the property of changing the firm's cost of capital but this can happen only if the market

takes ratings into serious consideration and pools them together. Kisgen (2006) asserted that credit rating changes could become influential for a firm in several ways, for example, they may cause a change in bond coupon rate, a loss of a contract, or a loss of access to the commercial paper market. Moreover, managers are also interested in these different rating levels whereas investors use ratings data to evaluate a firm's quality and thus a firm's cost of capital. Kisgen (2006) also tried to combine the credit ratings-capital structure theory with traditional capital structure theories. For example, he found that in the tradeoff and pecking order theories credit rating dummy variables are statistically significant.

He then conducted tests to see if the percentage of net debt relative to net equity is lower for firms near a change in rating for a specific period. He found that firms which incur a credit rating upgrade or downgrade will issue less net debt relative to net equity to either avoid a downgrade or to increase the chances of an upgrade. His methodology includes a regression of net debt to net equity using dummy variables that separate the firms which undergo a credit rating change and those which do not. In specific, he found that the net debt to net equity decreases 1% as a percentage of total assets annually between firms with a rating change than those not having a change.

Through various econometric approaches he demonstrated that either upgrade or downgrade credit ratings have a strong impact on capital structure decisions. He lastly asserted through surveys that credit ratings affect managers and that in the future credit ratings could be an integral part of capital structure in case that someone wants to acquire an absolute knowledge of capital structure behaviour.

In a later study, Kisgen (2007) pointed out that a specific credit rating proves to be beneficial for shareholder's value and presents the advantages for a company. For example, the access to commercial paper, the regulations tied to ratings, ratings triggers and 'signaling' meaning that credit ratings provide information for companies not being in public domain. Referring to ratings triggers he cited as an example the case of Enron (an electricity and natural gas company) which faced high debt payments due to a credit rating downgrade.

Kisgen (2007) believes that credit ratings can also influence third parties, including firms' managers and employees, suppliers and financial counterparties. Based on the case of EDS (Electronic Data Systems) he argued that employees are less willing

to work at a firm that has a lower rating and demand higher compensation for taking the risk. There also exist companies that may require specific credit ratings before entering into long-term supply contracts, or that may insist on certain rating for taking part in a swap arrangement.

Trying to describe the benefits of credit ratings in determining the firm's optimal level of leverage he drew a graph of a firm's value as a function of leverage for a hypothetical company based on the trade-off theory and a second graph depicting the firm value with credit rating and trade-off effects. The first one depicted a continuous line as implied by the trade-off theory, whereas the second line presented "jumps" at certain levels of leverage, caused by the benefits added at discrete levels of rating. The two graphs clearly indicated that the liquidity and lower cost of debt attributed to higher credit ratings (investment grade) could outweigh the tax and incentive benefits of more debt, thereby reducing the optimal level of leverage.

Empirical evidence enhances Kisgen's view that companies close to either a downgrade or an upgrade in credit rating are more vulnerable to the reduction of leverage than companies which are far from a rating change. He also supported in his analysis that companies prefer upgrade ratings to downgrade ones. His study concluded that the higher the credit ratings the better for the shareholders. However, the argument here is that each capital structure policy represents a specific firm. He also cited an example concerning companies with a perspective to access public debt markets, which may not give so much attention to an increase in their credit ratings or may even not want to have a credit rating at all. On the other hand, companies that pay attention to credit ratings and rely on commercial paper market will certainly work hard to preserve high credit ratings. His findings lastly demonstrated that in case of a credit rating change managers try to reduce debt rather than equity and that is justified from the fact that they prefer upgrades than downgrades. Especially firms presenting downgrades are more careful and try to improve their rating from fear of falling below investment grade.

Chen and Shyu (2008) investigated how credit rating management behaviour impacts optimal capital structure decisions. Their findings were based on models which are found to outline different behaviours regarding credit rating management. These are the behaviour as targeting initial rating, the behaviour as linking firm's credit to debt's coupons and the behaviour as targeting minimum rating.

The first issue explains the reason why firms fairly abandon additional tax benefits to have low leverage ratios. Due to the fact that managers prefer "a-better-rating" benefits to traditional tax benefits they use debt conservatively and make under-levered choices without trying to maximize traditional tradeoff benefits. The other behaviour comes to the conclusion that since firms' rating at the time of debt issuance is not too low, it may offer some advantages. For example, they allow for debtholders to earn more coupons or benefit shareholders by additional tax shields. Lastly, the third choice of behaviour is known to provoke mean reversion in leverage dynamics. When a firm wants to acquire the initial target rating, by repurchasing debt it can obtain a different leverage ratio very close to the initial optimal level. It is noticeable that sometimes managers, in their attempt to reach the initial target rating, ignore the fractional loss in tradeoff benefits and make over-repurchase choices. The degree of moving leverage ratio towards the initial target and the improvements in firm's credit rating policy are the two elements of the repurchase.

Niu (2008) begins with the consensus that the components of capital structure are the debt and equity financing. His analysis includes traditional theories concerning capital structure such as Modigliani and Miller Theory, Static Trade-off Theory and Agency Costs based theory. At the end the author emphasizes the seven determinants of the capital structure which are tangibility, effective tax rate, size, profitability (ROA), growth opportunities, volatility of earnings and liquidity.

Through questionnaires Genimakis (2008) collected data for 259 Greek companies listed in the Athens Stock Exchange, excluding banks, financial services and insurance companies. He found that the majority of managers choose the theory of ranking and agree that there is information asymmetry to the market. Thus a public subscribe is linked with shareholder's value depreciation. Using different expressions of leverage, he found significant relations among leverage and ratings, level of development, depreciation, volatility of profits and the degree of consolidation. Moreover, profits are negatively affected by the age of business, whereas the number of employees is not statistically significant. Also, big companies with high fixed assets present high debt so they face low credit risk and high leverage. He then repeated his tests after separating the companies according to their industry sector and activity.

The third and most recent study of Kisgen (2009) is an answer to the question whether firms target credit ratings or leverage levels. The study is actually an extension of his first research conducted in 2006. He asserted that firm's progress is related to higher credit ratings and he continued that firms with an upper or lower rating decrease leverage compared to firms in the middle of rating categories.

Managers, in their attempt to keep good ratings, have to avoid downgrades and gain upgrades while simultaneously reducing leverage after downgrades to regain their target rating. That doesn't mean automatically that they should increase their leverage after upgrades. Kisgen (2009) tested whether leverage behaviour follows rating changes and specifically found that firms react asymmetrically to lowering leverage after downgrades while responding less to upgrades. Thus, managers desire specific minimum credit rating levels in the presence of credit ratings along with standard tax, information, agency, and financial distress factors that can shape a complete model of capital structure.

He continued by investigating the capital structure reaction before credit rating changes as well as on or after rating changes. His analysis was based on comparisons regarding managers' behaviour before and after the credit rating change. The main finding of this study that managers attempt to regain a target rating after a downgrade, is consistent with the notion presented in his previous studies that managers try to avoid downgrading. Moreover, he conducted tests to see how credit ratings form capital structure decisions and whether credit ratings affect certain channels of funding more directly. Another difference from the research in 2006 is that although his identification strategy was to omit large offerings, he now takes them into account. Therefore, we can assert that the implications of this paper cover a broader set of capital market behavior.

Next, Kisgen (2009) examined downgrade effects and how certain financial decision mechanisms influence them. The results indicated that managers consider capital structure behaviour to target minimum credit rating levels over time. In addition, firms are more likely to reduce debt and less likely to issue debt following a downgrade, and they are also less likely to reduce equity after a downgrade. He also claimed that capital structure decisions are more affected by firms' credit rating downgrades that occurred in the previous year than by changes in leverage or profitability. He also noted that firms aim at a specific credit rating and that there are rules which affect investments

in a firm's bonds and commercial paper access. Rules that determine whether banks and pension funds can invest in the bonds, the capital charges that investors like insurance companies acquire from holding the bonds and the listing and disclosure requirements for the bonds are composed according to ratings.

Hovakimian, Kayhan and Titman (2009) also analyzed credit rating targets. They believe that credit ratings are an integral part of a firm's capital structure. The authors conducted tests on the hypothesis that firms have target credit ratings that reflect the costs and benefits associated with higher bankruptcy risk. Running several regressions they pointed out that firms with higher credit ratings are more careful with their debt choices with the view to gain higher ratings. They observed that companies gain higher ratings when they experience both high market to book ratios and selling expenses. Influenced by higher ratings, customers and other stakeholders become interested in these companies' long term obligations and take a short position in the capital market. They also pointed out that firms with the lowest bankruptcy costs are not necessarily those with the lowest ratings, as the trade-off theory would imply. More tangible assets for firms, than their industry peers, mean higher ratings. Another finding from the regression analysis is that the firm presenting unexpected ratings and leverage ratios towards its targets can influence debt versus equity issuance and repurchase choices. It is strongly believed that firms make corporate finance choices to offset shocks that move them away from their target capital structures.

In addition, Hovakimian, Kayhan and Titman (2009) found that the effect of the deviation from the targets tends to be rather asymmetric, meaning that the extent to which firms are under-rated seems to have an influence on these corporate finance choices, but this is not observed with over-rated firms. Lastly, they concluded that managers are keen on higher ratings whereas they play a more important role in companies' choices when they are in boom.

Kronwald (2009) also examined the credit rating - capital structure relation. Based on Kisgen's approach, he found some evidence about the factors affecting capital structure decisions. Looking at Modigliani and Miller's theorem (1958) he claimed that the main drawback of this theorem is the exclusion from the analysis of some factors in the capital structure decision such as bankruptcy costs, taxes, agency costs and information asymmetry. Efforts of following theories like the tradeoff- and pecking-

order-theory to capture these factors were also inadequate. The first one introduced only bankruptcy costs and taxes whereas the other introduces only information asymmetry into the capital structure discussion.

Kronwald (2009) asserted that the most important feature of capital structure was credit ratings and analysed Kisgen's thought. His view was also based on the assumption that credit ratings have an impact on capital structure decisions due to discrete costs (benefits) associated with a rating change. He documented the utility of credit ratings to capital structure decisions and the situations in which they are vital. This can be explained if we measure the credit rating change of firms. He also implemented empirical tests concerning the credit rating-capital structure relation and connected them with the tradeoff- and pecking-order-theories. His results were consistent with the CR-CS theory which states that for firms near an upgrade, it is better in some situations to issue equity instead of debt to reach a higher rating level.

Gubin (2009) demonstrated that the market leverage provides more accurate predictions of ratings than book leverage. He found out that even similar models replacing book leverage with market leverage are both more accurate and precise in predicting credit ratings. He also specified that only corporate managers and academics can use market leverage as an approximation for the analysis conducted by rating agencies. He then measured if firms with growth options enjoy different treatment by rating agencies. He combined growth options with market valuations to see how they influence ratings. The results showed that in the case of growth options that present long-term value for a firm, the default probability for the firm should decrease and this happens when firms issue new equity on the option's value. In addition, rating agencies consider growth options relative to the size of assets-in-place in assessing default risk.

Gubin (2009) also stated that credit ratings are mostly influenced by decreasing leverage, and therefore managers should take it into consideration. Moreover, he separated low-growth firms from those of high growth and found that the market leverage is more significant to the first of the two groups. As a result, assets serving as guarantee for growth options can lead to ratings positively affected by the presence of additional growth options.

Frank and Goyal (2009) carried out a detailed analysis of the capital structure decisions. They noted that capital structure is closely related to leverage so they made a reference to past capital structure theories and identified which factors are reliably important for determining leverage. They outlined that these are the profitability, size, growth, industry, nature of assets, taxation, risk, supply-side constraints, stock market conditions, debt market conditions and macroeconomic conditions. They also referred to some factors which have an effect on market-based leverage, for example, firms that have more tangible assets tend to have more leverage or firms that have more profits tend to have less leverage. Their analysis led them to a set of six core factors (industry median leverage, tangibility, profits, firm size, market-to-book assets ratio) which accounted for more than 27% of the variation in leverage, while all other factors they examined (nature of assets, macroeconomic conditions etc) added only a further 2%.

CHAPTER 4

4. Data and Methodology

4.1. Data Description

The sample consists of all publicly-traded Greek firms that have credit ratings available in the Amadeus database for the period from 2001 to 2008. Amadeus is a comprehensive, pan-European database containing financial information on over 11 million public and private companies in 41 European countries. It combines data from over 35 sources with software for searching and analysis. It is provided by Bureau van Dijk, a supplier of corporate, financial, marketing and economic databases and manipulation software, directories, technical, legal and bibliographic data, today owned by a leading private equity firm named BC Partners.

The sample under question consists of 254 companies listed on the Athens Stock Exchange, excluding banks, insurances and investment companies due to data unavailability. We extract data for corporate credit ratings and capital structure from Amadeus. However, market-to-book ratios were derived from Thomson because Amadeus provided data only since 2006. As a result, we were forced to completely omit from the regression analysis, those companies which, although available in Amadeus, did not appear in the Thomson market-to-book ratio list at all. In case of missing data (e.g. Aegean Airlines 2008 Total Assets) we searched companies' websites and filled in whenever this was possible. Due to missing data, the equality tests do not possess the same number of observations for all examined variables. Both regression analysis and equality tests were carried out by the Eviews 7 software package.

4.1.1. Leverage

a. Definition of leverage

Looking at the leverage is probably the most complicated task in our analysis. Leverage appears in several different forms in the literature. The most frequently encountered definition is that the leverage ratio is any ratio used to calculate the financing methods of a company and its ability to meet its obligations, so long as it includes four main factors: debt, equity, assets and interest expenses. An official

definition is given by D'Hustler (2009), senior financial sector specialist in the Financial Systems Department of the World Bank, according to whom *"the leverage ratio is generally expressed as Tier 1 capital as a proportion of total adjusted assets. Tier 1 capital is broadly defined as the sum of capital and reserves minus some intangible assets such as goodwill, software expenses, and deferred tax assets."* Harris and Raviv (1991) used a debt ratio of book value of long-term funded debt divided by total funded capital, while Rajan and Zingales (1995) proposed several measures like debt to total or net assets and debt to capital.

Another issue that arises is whether one should use book or market values when considering leverage. Myers (1977) claimed that book values are more accurate because they refer to assets in place i.e. property that the company already owns, while significant part of market values account for the present value of future growth opportunities i.e. assets that are not yet in place. Book values are also favored by a large number of managers who claim not to readjust their capital structure in response to equity market fluctuations, due to adjustment costs (Graham & Harvey, 2001). On the other hand, the possibility of having negative book values of equity favours the use of market values.

Our primary choice for expressing leverage was the traditional debt/equity ratio because we found it easy to understand and apply and perfectly representative of the relationship between the two basic sources of finance for all companies. However, we also report results for alternative definitions of leverage. Bearing in mind that the essence of capital structure analysis is assessing the pros and cons of *long-term* debt and equity finance (the financing of current assets is not considered a factor in capital structure analysis), we also tested the following ratios: long-term debt/equity, total debt/total assets, long-term debt/total assets. However, taking into account that, for reasons of saving time and money, companies often choose short-term bank lending in order to finance their investments, we also considered a ratio of total bank lending (both short- and long-term) to equity.

b. Expressions of leverage

Ratio analysis is a useful tool both for lenders and businesses. It allows them to see how a company is doing and compare this company with other businesses they have loaned money to. The most widely used measure of leverage is the leverage ratio.

We use four different measures of leverage. After collecting all the relevant data, we calculated our leverage ratios using the following formulas.

Our basic ratio measures debt financing as a percentage of total financing and is called total debt to total equity. It is computed by dividing average total debt with average total shareholders' equity. It provides insight about the proportion of debt to equity financing. More specifically, the debt to equity ratio measures how much money a company should safely be able to borrow over long periods of time. It indicates how much the company is leveraged in debt vis-avis what is owned. In other words it measures a company's ability to borrow and pay off money. The debt to equity ratio is in the interest of creditors and investors, because it reveals the extent to which company management is willing to fund its operations with debt, rather than equity.

As a second leverage ratio, we calculate the total long-term debt to total equity ratio (also known as the gearing ratio) which is computed as average long-term debt to average total shareholders' equity. A high gearing ratio is not preferable because it indicates possible difficulty in meeting long term debt obligations and it may signify future liquidity problems. If this number is too low it can signify inefficient use of the financing alternatives available to a company. Start-up companies with access to the debt markets, often have higher ratios than more established companies.

Another ratio that we calculated is the total debt to total capital ratio which is equal to average total debt to average total assets. It is actually a measure of the percentage of assets financed with debt. This ratio is a proper way to check a company's long-term solvency. The lower the debt ratio, the less total debt the business has in comparison to its asset base. On the other hand, businesses with high total debt ratios are in danger of becoming insolvent and going bankrupt.

Finally, we used the long-term debt to total capital ratio which represents the percentage of assets financed with long-term debt. It is equal to average long-term debt to average total assets. The greater a company's leverage, the higher the ratio. Generally, companies with higher leverage ratios are thought to be more risky because they have more liabilities and less equity.

Strategies in measuring leverage extend from basic to highly sophisticated and the degree of risk varies among them. The benefits of leveraging will depend on each company's financial situation, objectives and attitude towards risk. Nonetheless, anything that has the potential to make money involves some risk. For example there may be a change in interest rates that could have an impact on the profit. There is a risk that an investment will not make enough profit to pay off the interest on a loan.

Finally, when measuring leverage ratios we should take for granted that there may be some limitations and approach them with a degree of caution. As Gill (1994) explained *"Ratios do not make decisions for you, but will provide information from which decisions may be made."* For example, ratios are based on the information which has been recorded in the financial statements that are always subject to several limitations. Consequently, ratios derived from financial statements are subject to the same limitations. In addition, ratios alone are not adequate. In fact, they are just indicators and other things need to be taken into consideration too.

4.1.2. Credit ratings

a. Empirical evidence

As it was already mentioned, companies place a great importance in credit ratings. Graham and Harvey (2001) reported that 57.1% of the 392 US CFOs questioned "What factors affect how you choose the appropriate amount of debt for your firm?" responded "Our credit rating (as assigned by rating agencies)", preceded only by financial flexibility (59.38%). Bancel and Mittoo (2002) conducted the same survey in 710 firms from 17 European countries and found that the credit rating importance exceeded 72%. Kisgen (2006) argued and empirically proved that managers' concerns about the benefits of an upgrade and costs related to a downgrade directly affect capital structure decisions. Intuitively we could state that since credit ratings are indisputably associated with a firm's reputation, they most probably affect their accessibility to external financing as well as investors' willingness to invest in their bonds. Kisgen also noted that since financial regulators rely on credit ratings – especially on the downgrade from investment to speculative grade – such changes should play a decisive role in the decision making process.

b. The MORE model

Amadeus uses the Multi Objective Rating Evaluation (MORE) model -developed by modeFinance- to assess the general creditworthiness of European companies by evaluating data included in their financial statements. The basic idea of the model is to analyze a set of financial and economic ratios in a predictive corporate bankruptcy model in order to create a fundamental credit rating model for each industrial sector. Then, the MORE rating is calculated using the company's financial data so that an indication of the company's financial risk level is created. The main idea is to assign ratings by studying, evaluating and aggregating the most important aspects of the financial and economic behaviour of a company, meaning: profitability, liquidity, solvency, interest coverage and efficiency. The MORE rating is divided into four categories as described in the following table.

Table 4.1. MORE rating categories and interpretations

Rating category	**MORE Rating**	**Assessment**
Healthy companies	AAA	- strong capacity to meet financial commitments - excellent economic and financial flow and fund equilibrium
	AA	- strong creditworthiness - good capital structure and economic and financial equilibrium - slight difference from 'AAA'
	A	- high solvency - susceptibility to the adverse effect of changes in circumstances and economic conditions than companies in higher rated categories
Balanced companies	BBB	- capital structure and economic equilibrium considered adequate - capacity to meet financial commitments could be affected by serious unfavorable events
	BB	- more vulnerable than companies rated 'BBB' - major ongoing uncertainties or exposure to adverse business, financial or economic conditions
Vulnerable companies	B	- vulnerable signals regarding the company's fundamentals - adverse business, financial, or economic conditions will be likely to impair the company's capacity or willingness to meet its financial commitments
	CCC	- dangerous disequilibrium on the capital structure and the economic and financial fundamentals of the company - adverse market events and an inadequate management could affect with high probability the company's solvency

Risky companies	CC	- signals of high vulnerability - adverse market and economic conditions could increase the company's strong disequilibrium
	C	- considerable pathological situations - very low capacity to meet financial commitments
	D	- no capacity to meet financial commitments any longer

In the present analysis we are interested in changes in the corporate credit ratings. To achieve our purpose, we create dummy variables that express these changes.

4.1.3. Profitability

Profitability is beyond doubt one of the most important determinants in capital structure decision making, however, its impact on leverage is widely disputable. According to the pecking order theory firms prefer to use retained earnings as a primary source of financing and turn to external funds only when internal ones are insufficient, suggesting an inverse relationship between profitability and leverage (Myers and Majluf, 1984). Other theories support a positive relationship between the two due to the property of leverage to act as a signal of a firm's quality and the undisputable benefits of interests' deductibility. In general, profitable firms face lower expected costs of financial distress and benefit from debt tax-shields, favoring a positive relationship between profitability and leverage (Modigliani and Miller, 1958).

In this study we use the return on assets (ROA) as it is provided by Amadeus (Net Income/Total Assets) as a proxy for profitability.

4.1.4. Liquidity

Sibilkov (2007) based on the study of DeAngelos and Wruck (2002) suggests that asset liquidity affects expected costs of financial distress and agency costs, consituting this way an important determinant of capital structure. Moreover, firms prioritize internal financing which means that if their liquid assets are sufficient to finance their operations, they will not turn to external financing, indicating a negative relationship between liquidity and leverage.

In our analysis liquidity is expressed by the ratio of current assets to current liabilities (current ratio), as given by Amadeus.

4.1.5. Tangibility

Simply put, tangible assets can be used as collateral in external borrowing, therefore, helping a firm's accessibility in bank loans at a lower cost and simultaneously reducing the risk of the lender. This could lead the firm to high levels of debt, yet agency costs of collateralized debt are always lower than those of unsecured debt. We, therefore, expect a positive relationship between tangibility (Tangible Assets/Total Assets) and leverage.

4.1.6. Firm size

Empirical evidence of the positive relationship between firm size and leverage is reported in the pertinent literature. Intuitively, we can verify this idea, since large firms systematically reduce default risk through the apportionment of operations and due to the stability of their cash flows and have lower-cost access to external financing. Economies of scale, bargaining power with creditors and low information asymmetry are some of the reasons why large firms enjoy easier and cheaper access to debt markets. Rajan and Zingales (1995) empirically proved that leverage increases with size in all G-7 countries except for Germany and attribute it to the fact that larger firms face lower expected bankruptcy costs that enable them to take on more leverage. In this thesis, we use the natural logarithm of total sales as a proxy for firms' size.

4.1.7. Effective tax rate

Since interest payments are tax deductible, we expect firms that are likely to produce higher levels of taxable income to have more debt in their capital structures, indicating a positive association between effective tax rate and leverage. On the other hand, Stickney and McGee (1982) empirically showed that firms with the lowest effective tax rates tend to be highly leveraged, while in Titman and Wessels (1988) non-debt tax shields do not appear to be related to the various measures of leverage used.

We use tax rate as the ratio of income taxes to the pretax income. Amadeus reports negative values of taxation too, possibly accounting for tax refunds. In that case we set the observation equal to zero because essentially there is no payable tax and, therefore, no observable tax rate.

4.1.8. Growth opportunities

Myers (1977) showed that firms having risky debt outstanding and acting in their shareholders' interest have incentives to under- and overinvest in future growth opportunities i.e. tend to neglect valuable opportunities that could positively contribute to the firm's market value. This loss in firm value that is due to suboptimal investment decisions constitutes a significant component of the agency cost of debt. In case of overinvestment, debt limits the agency costs of managerial discretion. So firms with high growth opportunity may not issue debt in the first place and an inverse relationship between growth opportunities and leverage is expected to hold (Niu, 2008).

Growth opportunities are broadly defined as market value of equity over book value of equity. In our study, we used the price-to-book ratio, which is virtually the same value with that of market value of equity over book value of equity. Due to data unavailability regarding this ratio, 19 companies were left out of our analysis.

4.2. Tests for equality analysis

Having estimated the ratios, we employ tests for equality for examining the equality of means and medians of different samples. With the help of these tests we can check whether changes in credit ratings induce changes in capital structure variables from year to year.

For the purpose of our analysis we categorized the companies into two samples according to their credit rating change with the terms ‘‘upgrade’’ and ‘‘downgrade’’ and separated the corresponding accounts we needed. Then we formed the final samples by putting all observations together irrespective of years (i.e. one sub-sample below the other). All firms with no available credit ratings were excluded from the analysis.

What caused the credit rating change and how the capital structure is influenced is our main goal. Note that we create three year period ratios because a credit rating is formed at the end of the every year and, therefore, we observe the impact of credit rating change in the following year. On the other hand, we need to know the previous year credit rating in order to compare it with the current credit rating. The purpose is to estimate how the debt was influenced before and after the credit rating change. In our analysis, we denote T the year which the credit rating changes, T+1 the year after the change and T-1 the year prior to the change.

The two-tailed test and the Mann-Whitney test are used for checking differences in means and medians, respectively. For instance, we can test whether the change in the proportion of debt to equity and debt to assets is important and significant. The equality test carries out simple hypothesis tests regarding the means and medians, across sub-periods of series. Mean and median are considered as the most suitable measures to describe the central tendency of our samples. They both examine where, in a data set, numbers are likely to occur with the highest frequency. The mean, or average, is calculated by summing all of the observed values and dividing by the number of observations. The median is usually the number that occurs in the middle of a set of numbers. We also winsorised our results by trimming all outliers.

We conduct two tests, one for the equality of means and one of medians by implementing it in both samples under examination on the different leverage ratios for the three-year period around the credit rating change (i.e. before, after and in the year of the change). Each test is based on the null hypothesis that the series of sub-periods have the same mean or median against the alternative that they are not the same.

In case of the first test of means the tables give us a summary for the series depicting the Anova F- test (analysis of variance) probability value which is the most important element for the equality of series. More specifically, the p-value is the benchmark for the rejection of the equality of means of series or not. In the table below is depicted the Anova F-test which is a statistical test that generalizes student's two-sample t-test which refers to more than two groups. In an Anova F-test we usually assume that the group variances are equal and that there is homogeneity. Moreover, the output gives us the category statistics of the series and more specifically the mean, the

standard deviation and the standard error of mean. However, we are actually interested in the means of the series so we chose not to present all the other results.

The second test we performed for the equality of medians refers to the same sub-samples and ratios. Looking at the outcome of the test we can examine the null hypothesis that the series of the sub-periods have the same general distribution, against the alternative that at least one series has a different distribution. We again check on the p-values to understand the relationship among the medians and whether it is significant. The Chi-square test for the median is a rank-based Anova test based on the comparison of the number of observations above and below the overall median in each subgroup. Conover (1980) notes that this test is also called 'median test'. It represents a statistical method to examine whether two or more variables are independent.

The Kruskal-Wallis test is a generalization of the Mann-Whitney test and examines the equality of more than two subgroups. The idea behind the Mann-Whitney test is to rank the series from the lowest value to the highest one. If the groups have the same median, the values should be similar. The Kruskal-Wallis test is a nonparametric (distribution free) test and is used when the assumptions of Anova are not met (more than two independent variable groups and normally distributed series).

The null hypothesis of the Kruskal-Wallis test is that the samples are derived from identical variables. We should also mention that if the calculated value of the Kruskal-Wallis test is less than the chi-square table value, then the null hypothesis will be accepted. If the calculated value of the Kruskal-Wallis test is greater than the chi-square table value, then we will reject the null hypothesis saying that the sample comes from different variables. It should also be noted that the Kruskal-Wallis test reports a statistic which is approximately distributed as X^2 with G-1 degrees of freedom under the null hypothesis. Apart from the p-values of the tests' statistics, we present the medians for the series.

4.3. Regression Analysis

We use regression analysis in order to empirically test whether changes in credit ratings affect capital structure decisions of Greek listed companies. The original conception was to regress a variable that would represent the leverage of each company

on a dummy variable that would represent the change in the credit rating. Taking into consideration that there are other factors affecting capital structure too, as well as the fact that omission of important variables in a regression could cause the estimated coefficients on all other variables to be biased and inconsistent, we decided to include selectively six more regressors, representing factors that theoretically affect the level of leverage in most companies.

Initially, we organised our data in two-year periods obviously because this was the only way to observe changes in the companies' credit ratings (from previous year to the next). This way we obtained seven pairs of years (2001-2002, 2002-2003, … , 2007-2008) each one including observation series of all the companies with a credit rating available for both years and the respective factors under analysis for the second year of the period. For example, the 2001-2002 sub-sample includes all companies with a known rating both in 2001 and 2002 (in order to detect whether there is a rating change) and the leverage, ROA, tangibility etc of those companies for year 2002. For the purpose of regression analysis we formed a full sample that contains all the pairs of years.

Putting the sub-samples together we came up against seasonality. This happened because some companies appeared in the sample more than once; for example a company that experienced changes in its rating between the years 2002-2003, 2004-2005 and 2005-2006 appeared in the sample three times and so forth. In order to cope with seasonality and examine the degree to which it is present, we created dummy variables that take the value of 1 for the two-year period they refer to and 0 for every other period. If an intercept is used in the regression, the number of dummies that can be included should be one less than the 'seasonality' of the data (Brooks, 2008). Having seven pairs of years in our analysis, the appropriate number of seasonal dummies for our sample is six, leaving without a dummy the sub-sample with the least observations i.e. the period 2001-2002.

We conduct three kinds of tests. The first one includes all companies of the sample (full sample) and tests the impact of rating changes on leverage between companies that actually had a rating change and those that did not. In this case, the dummy variable representing the credit rating, takes the value of 1 for companies that have a rating change from one year to the next and the value of 0 for companies whose

credit rating remain stable during the same period. The purpose of this test is to examine whether credit rating changes affect capital structure. A non-significant credit rating dummy would imply that companies do not restructure their financing decisions when they are either up- or downgraded.

The second test refers only to the companies that actually had a credit rating change. In this case, the credit rating dummy 'splits' the sample into companies that enjoy an upgrade (CR dummy = 1) and companies that experience a downgrade (CR dummy = 0). The seasonal dummies remain the same in both tests. The purpose of this test is to ascertain whether the direction of the change plays any role in the level of leverage that companies choose. The test acquires special importance in case the first regression produces a significant credit rating variable. If rating changes indeed affect capital structure decisions, the next step is to examine whether the direction of the change creates a specific pattern in the way companies cope with it. Hence, we expect that companies experiencing a downgrade (especially those in the lower levels of the rating scale) should be more careful with the amount of debt they choose to undertake, first because their downgrade is a sign of falling creditworthiness and second because more debt (which they will not be able to service, since they already have problems meeting their present obligations) could cause a further downgrade.

Kisgen (2006) argued that *"since several regulations are specific to the investment-grade versus speculative grade designation, effects should be greatest around this change if these regulations are significant for decision making"*. This point motivated us to conduct a third test by restricting the upgrade/downgrade test to changes from the investment grade to the speculative grade and vice versa.

The credit rating scale provided by Amadeus is identical to the one used by Standard & Poor's, one of the three dominant credit rating agencies in the market. Investment grade refers to the quality of a company's credit. Investment grade companies are rated 'BBB' or higher by S&P and are assumed to be able to meet payment obligations so that banks are allowed to invest in them. Companies rated 'BB' or lower belong to speculative grade group, meaning that the probability that the company will service its debt is deemed to be speculative.

The transition from investment to speculative grade and vice versa is deemed to play significant role in the decision making process. The reason behind this speculation is rather obvious. A company rated 'AA' will not lose much of its creditworthiness and quality if it is downgraded to 'A' hence it is possible that managers will not take any action against this change in terms of capital restructuring. A downgrade from 'A' to 'BB' though, will automatically put the sign "junk" on the bonds of this company, forcing managers to try to reverse this unpleasant situation as soon as possible. For this test we created a new sample by isolating the companies that incurred a rating change from the investment/speculative to speculative/investment grade. The seasonal dummies remain the same.

CHAPTER 5

5. Results of empirical tests

As already mentioned, the main objective of this thesis is the examination of the relationship between changes in credit ratings and capital structure. To achieve that, we have recourse to both statistical and regression analysis. In this section we present the results of the empirical analysis and provide interpretation.

5.1. Test for equality outputs

Table 5.1 presents the results from the tests of equality. In specific, we report the means and medians of four leverage ratios before (T-1), on (T) and after (T+1) changes in credit ratings. We identify two kinds of credit ratings: upgrades and downgrades. The first ratio we examine is total debt to total assets for upgraded firms. We see that the p-value is very close above the 10% level of significance but still not enough to reject the null hypothesis of means equality prior and post to credit ratings changes. Although in the year prior to the change the mean is 57.62%, it diminishes to 52.67% in year T and again rises to 53.70% after the credit rating change, we cannot argue that statistically these three numbers are different from each other. On the contrary, the median of the ratio decreases (from 61.32% to 55.80%) after the upgrading and this decrease is statistically significant according to both tests for equality of medians.

Looking at the ratio for all years we observe that on average the ratio takes values between 30% and 60% whilst good performers can get a value of less than 10%. A ratio greater than 60% means that the company's assets are financed by debt, and thus lenders bear the greatest portion of risk. This suggests that creditors may have difficulty in collecting their loan from the business in the event of bankruptcy or liquidation. Surprisingly, some companies reached a value in excess of 70%.

For example, we see that some companies (e.g. Ideal Group) have a D/A ratio of more than 100% which results in having negative shareholders equity in their balance sheets. A possible explanation is that companies may have come to the market via a reverse takeover or may have emerged from a management buy-out (Temple, 2007).

Table 5.1. Summary results of Tests for Equality

Variable	D/E Ratio	Long term Debt/ Equity ratio	Total Debt/ Total assets ratio (%)	Long term Debt/ Total assets ratio (%)	D/E Ratio	Long term Debt/ Equity ratio	Total Debt/ Total assets ratio (%)	Long term Debt/ Total assets ratio (%)
	UPGRADES *(N=220)*				**DOWNGRADES** *(N=324)*			
	Probability				***Probability***			
Anova F-test	0.9012	0.8210	0.1441	0.7485	0.6913	0.5343	0.0001	0.0179
Med.Chi-square	0.0583	0.6010	0.0259	0.3547	0.0120	0.4709	0.0002	0.3252
Kruskal-Wallis	0.3949	0.6035	0.0939	0.3154	0.0186	0.1229	0.0000	0.0674
	Value				***Value***			
Mean (T+1)	1.933540	0.722334	53.70797	16.35155	3.059500	0.808439	62.96519	19.44578
Mean (T)	2.077815	0.645878	52.67903	15.52560	2.576178	0.836758	59.49195	17.55068
Mean (T-1)	2.186727	0.793347	57.62195	15.25801	1.877097	0.537954	52.90724	15.93581
Median (T+1)	1.201529	0.292793	55.80369	13.52829	1.508875	0.379258	62.13687	16.28720
Median (T)	1.262537	0.260297	55.86493	12.51207	1.541136	0.359431	62.09583	14.28193
Median (T-1)	1.536341	0.236028	61.32542	9.75823	1.262507	0.318284	56.33077	13.53066

However, sometimes the advantage of higher leverage is that owners will reap higher returns when conditions are good and the business is profitable. On the other hand, companies with low debt to asset ratio finance the majority of assets through equity and not with debt. That's the reason why the respective accounts of assets and shareholders' in the balance sheet are changing.

Another important ratio that we analyze is total debt to total shareholders' equity. The debt to equity ratio measures how much debt is used to finance the company relative to the amount of equity used. Using debt financing is riskier for the company than using equity financing. Calculating this ratio is important because, as the proportion of debt financing increases, the risk of the firm also goes up. Looking at the ratio we see that the p-value for the upgrading companies is 0.9012 which means that we accept the null hypothesis that the series have equal means. This means that the D/E ratio is statistically constant although we may observe a 3-year decrease. Regarding the median test for equality the probability in the Chi–square is 0.0583 whereas the Kruskal-Wallis appears 0.3949. Thus, we reject the null hypothesis of equal medians before and after the credit rating change.

From a sample of 220 companies with upgrade credit ratings almost half of them have a reduction in the D/E ratio in the year after the credit rating change, in contrast to the other years where we observe an increase in the D/E ratio, implying higher risk for companies. We also observe that most ratios take values higher than one which means that assets are mainly financed with debt. Conversely, ratios of less than one imply that most of the financing is derived from equity. Some companies present a negative D/E ratio (e.g. Atermon, Ideal Group) which they can improve by increasing their profits i.e. by increasing the number of profitable activities and by increasing productivity. Moreover, there is a sharp drop in the D/E ratio of 'Praxitelio' from 47.61 to 9.11 in year T+1 and this probably attributes to shareholders' funds which almost doubled from the year prior to the credit rating change to the year after change.

Next we assess the long term debt to assets ratio which ranges between 0 and 1. We see that the p-value is 0.74 which implies no statistically significant change in the years around the credit rating change. Similarly, the p-value for the chi–square test is 0.3547, whereas the Kruskal-Wallis test decreases to 0.3154 implying that median values of the ratio did not change significantly.

We also analyze the long term debt/total shareholder equity ratio. The mean equality test accepts the null hypothesis of no statistical difference, with p-value of 0.82. Virtually, the mean falls in the year of change and then increases to 0.72 for the following year, but these changes are not statistically significant. We observe that the median follows the exact same pattern i.e. with p-values of 0.60 in both tests we assert that the medians are statistically equal too.

As a whole, we can argue that increases in the companies' credit ratings have, on average, no significant impact on any of the four different leverage ratios we chose to examine (except for the median of total debt/total assets ratio).

Regarding companies with downgrade credit ratings we also apply the test for equality for both means and medians. First, the total debt to total assets ratio leads us to reject the null hypothesis of equal means since the p-value almost approaches 0. The significantly different means escalate through the three-year period and reach 62.96%. The chi-square test and Kruskal-Wallis tests present also unequal medians. Moreover, the total debt to total assets ratio reaches high levels for the majority of companies.

However, the D/E ratio produces different results reaching a probability value equal to 0.69. Therefore, we accept the null hypothesis of mean equality although we virtually observe an improvement in means, amounting to 3.05 in the year after the credit rating change. In contrast, we reject the null hypothesis of equal medians across years since the p-values for chi-square is 0.0120 and that of Kruskal-Wallis is 0.0186. Econometrics suggests that the median may be a better indicator of the most typical value in a series if the set of data has an outlier. However, when the sample size is large and does not include outliers, the mean value usually provides a better measure of central tendency. Since our sample does not contain extreme values, we can assert that, in general, decreases in credit ratings do not have a significant impact on the D/E ratio.

We apply the test for equality of means for the long term debt to total assets. The results show that the Anova F-test value is 0.0179 and therefore we reject the hypothesis that the means are equal. On the other hand, the equality of medians is accepted as it can be inferred from the chi-square (0.3252) and Kruskal-Wallis (0.0674) tests.

Finally, we examine the long term debt to total shareholders' equity and we find a p-value of more than 0.5 for the mean implying no statistical difference among the

years of change. Moreover, the results from the chi-square and Kruskal-Wallis tests lead us to the conclusion that medians did not change significantly in the three-year period.

Our overall results indicate that, on average, downgraded companies issue more debt scaled by total assets in the year of the credit rating change as well as in the year following the downgrade. This is mostly due to a significant increase in the ratio of long-term debt scaled by assets. Insignificant differences in the debt/equity ratios indicate that the equity must have increased accordingly in order to preserve a statistically constant ratio.

Although they may seem intimidating at first glance, all ratios can be derived by simply comparing numbers that appear on a business's balance sheet. As Gill (1994) notes "*small business owners would be well-served to think of ratios as one of your best friends when scrutinizing your business*." It is true that business owners and managers could use ratios as an important tool to measure their progress toward reaching company goals or compete with larger companies. As for small businesses studying ratios give them the opportunity to adapt trends affecting their operations.

5.2. Regression analysis

To measure the effect of credit rating changes to the capital structure of Greek listed firms, we use multivariate regression analysis. As it was already mentioned, we use five measures of leverage in order to cover as many as possible interpretations of leverage known. The first four measures have already been described in the previous sub-section (4.1.1b). However, here we also include a fifth measure of leverage defined as bank lending to total shareholders' equity. Genimakis (2008) suggests that firms -in an attempt to save time and money- often finance certain investment projects with short-term funds (or/and more permanent short-term borrowing) so, for that reason, we also consider in our analysis the ratio of total bank (both long- and short-term) lending to equity.

The key point of our analysis is whether changes in credit ratings play any role in the way companies structure their capital. We find that the credit rating dummy indicating upgrade or downgrade, is statistically significant in many of the regressions. This result imply that managers take the credit rating seriously into consideration when

they are about to make finance decisions. We should also make clear that the results depend seriously on the measure of leverage used, as well as on some factors suggested in the literature. Before examining each group of tests and analysing the results, we consider appropriate an interpretation of basic statistics that appear in our tables.

5.2.1. Interpretation of basic statistics

R squared (R^2)

R^2 is the most common goodness of fit statistic i.e. a quantity that tests how well the regression function fits the data. It is defined as the square of the correlation between the values of the dependent variable and the corresponding fitted values from the model hence it lies between -1 and +1 by definition. Put in simple words, if, for example, R^2 equals 0.98 (or else 98%) this means that the model explains nearly 98% of the variability of the dependent variable about its mean value, while a value close to zero indicates that the model fits the data poorly.

Adjusted R^2

The adjusted R^2 solves one of the problems that appear when using R^2 as a goodness of fit measure. While simple R^2 will always rise as more variables are added to the model (whatever the significance of these regressors might be), the adjusted R^2 will actually fall, unless the increase in R^2 offsets the loss of degrees of freedom caused by adding an extra regressor, therefore serving as a tool for determining whether a variable should be included in the regression model.

F-statistic

The regression F-statistic tests the multiple hypotheses that all of the regressors' coefficients except the intercept coefficient are zero. The P-value attached to it must be lower than the selected level of significance for the null hypothesis to be rejected. It indicates the overall adequacy of the model.

Durbin-Watson statistic

DW is a test for first order autocorrelation in the residuals of the regression. One of the assumptions underlying the classical linear regression model is that the covariance between the errors terms must be zero i.e. that the errors are not autocorrelated. The DW test takes three important values 0, 2 and 4, corresponding to evidence of positive, zero and negative autocorrelation.

Heteroscedasticity

Another assumption of the central limit theorem (CLM) requires that the errors have a constant variance i.e. that they are homoscedastic. All regressions were estimated with heteroscedasticity-robust standard errors.

5.2.2. Full sample

The first group of regressions tests the impact of rating changes on leverage between companies that have a rating change and those that do not. The results of the tests are summarised in table 5.3. The asterisks *, **, *** indicate statistical significance at the 1%, 5%, 10%, significance levels, respectively.

Looking at the regression residuals' table we came up against a huge outlier corresponding to the 240th observation and was due to an extremely low level of equity reported for Lavipharm S.A. in 2004 that produced a D/E ratio of 5,879.3. Following Brook's suggestion (2008), in order to effectively remove this outlier, we created a dummy variable defined as dum240 = 1 for the 240th observation and zero otherwise. Because the outlier was attributed to an equity value, it was omitted from the regressions in which leverage was not expressed in terms of equity.

The opponents of outlier dummies would argue that removing outlying observations will reduce standard errors and the residual sum of squares, therefore increasing R^2 and artificially improving the apparent fit of the model to the data. Brooks (2008), however, argues that *"Dummy variables may be justifiably used to remove observations corresponding to 'one-off' or extreme events that are considered highly unlikely to be repeated, and the information content of which in deemed of no relevance of the data as a whole"*. We consider a D/E ratio of almost 6,000 to be an extreme and irrelevant piece of information that could produce rather 'junk' than representative results.

Before running the regressions, we test for the existence of multicollineraity among the employed variables. In the presence of multicollinearity the regression becomes very sensitive to small changes in the specification and significance tests and may, therefore, give inappropriate conclusions. In other words, the regression might look good as a whole (high R^2), while the individual variables might not be significant.

The outputs of the first and last regressions, where the number of insignificant regressors is relatively high, are conceived as a probable evidence of multicollinearity.

Table 5.2. Correlation matrix of explanatory variables

	CR dummy	ROA	Current Ratio	Tangibility	ln(Sales)	Effective Tax Rate	Price-to-book
CR dummy	1.0000	-0.1464	-0.0241	-0.0447	-0.1023	-0.0246	-0.0065
ROA	-0.1464	1.0000	0.0378	-0.1148	0.2419	-0.0178	0.1342
Current Ratio	-0.0241	0.0378	1.0000	-0.2049	-0.2563	-0.0082	-0.0289
Tangibility	-0.0447	-0.1148	-0.2049	1.0000	0.1124	0.0088	-0.0535
ln(Sales)	-0.1023	0.2419	-0.2563	0.1124	1.0000	-0.0214	0.0769
Effective Tax Rate	-0.0246	-0.0178	-0.0082	0.0088	-0.0214	1.0000	-0.0074
Price-to-book	-0.0065	0.1342	-0.0289	-0.0535	0.0769	-0.0074	1.0000

Table 5.2, presents the results from the correlation matrix. We see that there is no indication of high correlation among the explanatory variables of the regression.

In Table 5.3 the credit rating dummy appears significant at the 10% level in three out of five regressions. We consider the results more than satisfying since the tests producing an insignificant CR dummy have a considerably lower R^2 than the ones presenting a significant CR dummy. The positive sign of the coefficient indicates a positive relationship between credit rating changes and leverage. We can therefore argue that firms close to a rating change[3] increase the amount of debt they use relative to the amount of equity. We take a step further and argue that the debt increase is mostly attributed to the increase in short-term debt, since the CR dummy coefficient in the second regression (dependent variable is the long-term debt/equity) is significantly lower than the coefficients of regressions, in which leverage includes both long-term and short-term debt. We suppose that the magnitude of leverage is mostly due to changes in the short-term external financing of companies.

Regarding seasonal effects, we observe that using as leverage the ratio of long-term debt to equity has produced statistically significant seasonal dummies. This indicates that certain periods (i.e. 2003-2004 and 2006-2008) play a significant role in

[3] We use the expression "close to a rating change" because it best corresponds to the way we structured the tests. We used rating changes from year, let us say, T to year T+1 and values of all other variables (leverage, ROA, current ratio etc) corresponding to year T+1, meaning that all these values are reported before the rating of year T+1 is assigned. Hence we can only speak of companies being *close to* a rating change and not *after* a rating change.

Table 5.3. Sample Summary Statistics – Credit Ratings & Leverage (full sample)

	D/E Ratio		Long term Debt/Equity		Total Debt/ Total assets		Long term Debt/ Total assets		Bank Lending/ Equity	
Variable	Coef.	Prob.	Coef.	Prob.	Coef.	Prob.	Coef.	Prob.	Coef.	Prob.
Intercept	-0.1521	0.8965	-0.5818	0.0361**	0.1414	0.0083*	-0.1709	0.0000*	-0.0242	0.9835
CR dummy	0.9606	0.0136**	0.2359	0.0816***	0.0106	0.3596	-0.0076	0.3281	0.9965	0.0474**
Profitability	-6.0283	0.0735***	-1.9911	0.0381**	-1.0400	0.0000*	-0.1678	0.0005*	-4.2624	0.0850***
Liquidity	-0.0207	0.0240***	-0.0016	0.4985	-0.0068	0.0000*	-0.0003	0.1180	-0.0112	0.2899
Tangibility	-0.0118	0.9900	0.7576	0.0433**	-0.1471	0.0000*	0.2122	0.0000*	-0.0306	0.9754
Firm size	0.1227	0.2069	0.0487	0.0699***	0.0389	0.0000*	0.0198	0.0000*	0.0330	0.6300
Effective Tax Rate	0.0005	0.8154	-0.0015	0.0753***	0.0000	0.7885	-0.0004	0.0008*	-0.0003	0.9020
Growth Opportunities	0.1757	0.2557	0.0660	0.3149	0.0031	0.1986	0.0010	0.4845	0.1549	0.3003
dum240	5877.7190	0.0000	614.1236	0.0000	-	-	-	-	3431.2430	0.0000
R-squared		0.9987		0.9850		0.3461		0.2363		0.9940
Adjusted R-squared		0.9987		0.9848		0.3385		0.2274		0.9939
F-statistic		63974.7100		5256.5540		45.8026		26.7724		13287.2400
Prob(F-statistic)		0.0000		0.0000		0.0000		0.0000		0.0000
Durbin-Watson stat		2.0420		2.0615		2.0264		1.9369		2.0466

*, **, *** denote significance at the 1% , 5% and 10% level, respectively

the companies' decision to be financed with more long-term bank loans compared to equity.

We must also note that the profitability as expressed by the return on assets ratio (ROA) significantly affects leverage. Moreover, most of the variables appeared to have the predicted signs, with the exception of tangibility and growth opportunities. Tangibility is predicted to be positively related to leverage, but here appears to have negative signs. However, it has the predicted sign in the second regression, where tangibility is statistically significant and the R^2 is high. Growth opportunities appear to have the exact opposite sign from the predicted, but they are not significant in any of the regressions. It should be noted that all DW values lie around 2 indicating no autocorrelation in the residuals.

In sum, we can assert that there is strong empirical evidence that credit rating changes play a significant role in the capital structure decision process for the majority of Greek listed companies. It is surprising though, that most of the factors that are supposed to affect leverage according to the pertinent literature, appear to be insignificant in our study. To provide a justification to this "irregularity" we focus our attention to the second model that expresses leverage as long-term debt/equity. This is consistent with the capital structure analysis framework that focuses on the tradeoff between long-term debt and equity as financing sources.

5.2.3. Upgrades – Downgrades

When looking at the sample of companies that have a rating change (table 5.4) the results are completely different. It seems that the direction of the rating change plays no role in the capital structure decision making. Note that in this set of regressions the CR dummy takes the value of 1 when a company is upgraded and the value of 0 when the opposite happens.

The CR dummy appears insignificant in all regressions, indicating that the direction of the rating changes does not affect the capital structure process. Combining these results with the ones analysed above, we can clearly state that Greek listed firms about to undergo a credit rating change, restructure their capital no matter the direction of the credit rate change.

Table 5.4. Sample Summary Statistics – Credit Ratings & Leverage (upgrades-downgrades)

	D/E Ratio		Long term Debt/ Equity		Total Debt/ Total assets		Long term Debt/ Total assets		Bank Lending/ Equity	
Variable	Coef.	Prob.	Coef.	Prob.	Coef.	Prob.	Coef.	Prob.	Coef.	Prob.
Intercept	1.9111	0.3180	-0.3238	0.6121	0.1449	0.0925	-0.1707	0.0005*	2.2202	0.1837
CR dummy	-0.5383	0.3433	-0.2292	0.3489	-0.0127	0.5313	-0.0078	0.5579	-0.5835	0.4027
Profitability	-7.5651	0.0958***	-2.2865	0.0548***	-0.9673	0.0000*	-0.1088	0.0894***	-6.1073	0.0195**
Liquidity	-0.0414	0.0304**	-0.0033	0.6738	-0.0086	0.0000*	0.0002	0.5364	-0.0373	0.0993***
Tangibility	0.7659	0.6670	0.8862	0.1878	-0.1357	0.0066*	0.2232	0.0000*	-0.3139	0.8650
Firm size	-0.0119	0.9388	0.0273	0.4934	0.0385	0.0000*	0.0188	0.0000*	-0.0991	0.3021
Effective Tax Rate	-0.0473	0.5828	-0.0641	0.0475**	0.0033	0.3987	-0.0082	0.0007*	-0.0397	0.7196
Growth Opportunities	0.3498	0.1485	0.1712	0.1664	0.0137	0.0001*	0.0079	0.0060*	0.2021	0.2892
R-squared		0.0524		0.0508		0.3733		0.2569		0.0444
Adjusted R-squared		0.0274		0.0257		0.3568		0.2373		0.0192
F-statistic		2.0938		2.0245		22.5467		13.0858		1.7600
Prob(F-statistic)		0.0133		0.0174		0.0000		0.0000		0.0466
Durbin-Watson stat		2.1239		2.0963		2.2676		2.1992		2.0982

*, **, *** denote significance at the 1% , 5% and 10% level, respectively

The only significant regressor is profitability – just like in the full sample. The signs of the regressors change randomly from test to test, again with the exception of ROA coefficients, which are all negative. Hence we can empirically confirm the negative relationship between profitability and leverage that was described in the previous section. We also observe that using the D/E ratio as leverage measure, we obtain the same significant determinants of leverage.

5.2.4. Changes between investment and speculative grade

In this section we investigate the effect of changing credit ratings below or above investment grade level as it is specified in Amadeus database. In specific, we analyse companies that experience an upgrading in their credit ratings to the investment grade i.e. companies that have a credit rating higher than 'BBB' or a credit rating that is equal or lower than 'BB'. These tests have a special meaning because companies below the investment grade are considered easy targets for speculative attacks, while investment grade companies enjoy easy banks' financing. Table 5.5 depicts the results of the regressions.

The results are indeed very interesting. Initially, we rule out the last regression because the probability of the F-statistic suggests that the coefficients of all the explanatory variables are jointly equal to zero. The R^2s are again very low compared to the full sample regressions but, as mentioned above, high R^2s could be the effect of the outlier dummy.

The CR dummy is significant in three out of four regressions, implying that managers may not be interest in the direction of a rating change in general, but they are indeed concerned with falling below the investment grade. Intuitively we expect that a downgrade from investment to speculation grade would lead firms to reduce the amount of debt they use compared to equity, in an attempt to reverse this unpleasant situation. However here, the coefficient of the CR dummy is negative, indicating that downgrades have a positive impact on leverage ratios. Rauh and Sufi (2008) provide an acceptable explanation for this. They argue that such downgrades to the speculative grade could be due to inappropriate structure of debt within the firm and, as a result, companies increase the amount of secured and subordinated debt in order to return to the investment grade.

Table 5.5. Sample Summary Statistics – Credit Ratings & Leverage (investment-speculative grade**)**

	D/E Ratio		Long term Debt/ Equity		Total Debt/ Total assets		Long term Debt/ Total assets		Bank Lending/ Equity	
Variable	Coef.	Prob.	Coef.	Prob.	Coef.	Prob.	Coef.	Prob.	Coef.	Prob.
Intercept	-1.0571	0.3397	-0.8766	0.1108	0.1002	0.4639	-0.1425	0.0653***	0.4611	0.6527
CR dummy	-0.5642	0.0077*	-0.2137	0.0557***	-0.0689	0.0070*	-0.0121	0.5332	0.0931	0.8341
Profitability	0.8732	0.6421	0.8988	0.3848	-0.1638	0.4778	0.1307	0.5575	-0.3039	0.8081
Liquidity	-0.0156	0.0020*	-0.0005	0.8156	-0.0063	0.0000*	0.0001	0.9091	-0.0161	0.0504***
Tangibility	-0.5135	0.3245	0.5155	0.0686***	-0.0849	0.1889	0.2119	0.0000*	0.7377	0.4063
Firm size	0.2075	0.0351**	0.0860	0.0759***	0.0385	0.0016*	0.0164	0.0151**	-0.0046	0.9648
Effective Tax Rate	0.0086	0.9178	-0.0315	0.3289	-0.0025	0.6961	-0.0101	0.0056*	-0.0486	0.4210
Growth Opportunities	0.1596	0.0055*	0.0592	0.0059*	0.0183	0.0004*	0.0115	0.0011*	0.0447	0.3375
R-squared		0.2159		0.1743		0.4013		0.3236		0.0428
Adjusted R-squared		0.1660		0.1217		0.3631		0.2805		-0.0182
F-statistic		4.3213		3.3136		10.5180		7.5068		0.7014
Prob(F-statistic)		0.0000		0.0001		0.0000		0.0000		0.7609
Durbin-Watson stat		2.0532		2.0042		2.2379		2.0243		2.2093

*, **, *** denote significance at the 1% , 5% and 10% level, respectively

We expect seasonal effects to be apparent in such a sample. We find seasonal dummies significant in all regressions especially between years 2006-2007 and 2007-2008. The recent financial crisis, may be responsible for the alteration of many corporate credit ratings that provoked speculative attacks in the markets. A rational reaction of managers to this situation is the restructuring of capital in an attempt to gain their return to the investment grade.

The differences between simple and adjusted R^2s led us to exclude many variables in the model, so we selectively re-ran the first regression including only the significant variables. In this case, the current ratio appeared to be insignificant. Its initial significance might be due to its correlation with firm size (ln(Sales)).

In this set of regressions size and growth opportunities appear to have statistically significant coefficients. The significance of firm size is attributed to the fact that larger firms face lower risk and thus are expected to have higher credit ratings (i.e. of the investment grade). Regarding growth opportunities, Gubin (2008) argues that *"...firms might strategically direct investment allocations towards new growth opportunities or assets-in-place to affect both their ratings and, by extension, their investor clientele"*. Having already assumed that companies in this sample will take action in order to affect their rating, we can also assume that they will do this by strategically allocating their debt funds towards new growth opportunities.

5.3. Results' overview

Looking at our results as a whole, we realize that the two methodologies we use are not completely consistent with each other. The tests for equality indicate that Greek companies, responding to an impending rating change, maintain, on average, statistically stable debt/equity ratios, while presenting (again on average) statistically significant changes in leverage ratios where debt is scaled by total assets (though only for downgraded companies).

On the contrary, the sets of regressions produce statistically significant credit rating variables mostly in cases where leverage is expressed as debt scaled by equity. We have to note though, that the models which enjoy the highest R^2s and F-statistics are those having as dependent variables debt/assets ratios.

Restricting the comparison to companies that have a rating change, we discern signs of consistency. The tests for equality show that most leverage ratios are, on average, statistically constant in the years around the credit rating change. This is consistent with the results of the second regressions' set, which indicated that credit ratings do not affect any of the leverage ratios that we used. The significant changes of debt to assets ratios for downgraded companies could be due to the magnitude of companies that drop below the investment level.

Over all, we consider it reassuring that, one way or another, leverage ratios show some kind of 'sensitivity' to rating changes. This result is consistent with Kisgen's (2006) CR-CS theory and confirms managers' allegations with respect to the importance of credit ratings in capital structure decisions.

CHAPTER 6

Conclusions

This study investigates the impact of credit rating changes on the capital structure of firms around the year of change, that is, before, after and in the year of the credit rating change. Credit ratings are of utmost importance to several groups of market participants, among whom are managers, who are responsible for making capital structure decisions.

Leverage is a representative measure of capital structure and we used five different expressions of leverage in our analysis. Our methodology consists of both tests for equality in means and medians and regressions analysis. The tests for equality provided evidence of no statistical difference in means or medians for debt (total and long-term) to equity ratios for both upgraded and downgraded companies (except for the total debt to total assets ratio of upgraded companies). Conversely, the ratios of debt to total assets present statistically significant means in the case of downgraded companies. Furthermore, the equality test for medians implies that only debt to equity of upgraded and total debt to total assets of both upgraded and downgraded companies have different medians.

We then ran a set of regressions on three different samples: the full sample of all companies (having a rating change or not), the sample of companies that had a rating change and the sample of companies, whose rating change altered from the investment grade. Credit ratings appeared to be significant explanatory variable of leverage in 6 out of 14 regressions (one regression appeared to be 'junk' so we do not take it into consideration). The key points of these results are:

⇒ The CR dummy appears significant mostly in regressions where leverage is expressed in terms of debt to equity rather than total assets.

⇒ The second set of regressions produced no significant credit rating variables.

⇒ None of the theoretically proposed determinants of leverage is consistently significant in all tests (among the three samples). Each regression produces, more or less, different significant explanatory variables.

The results of the first sample imply a positive relationship between leverage and credit rating changes, whereas the third set of regressions implies a negative one.

⇒ Our results provide mixed results regarding the impact of credit ratings changes on leverage. On one hand, we obtained statistical evidence that changes in credit ratings affect the level of leverage in firms' capital structures. On the other hand, our tests appear inconsistent with each other.

Nevertheless, there are certain limitations to the data and methods that we used, which need careful consideration. First of all, the assumption of residual normality is violated in all of our regressions, implying that the inferences we make about the coefficient estimates could be wrong. Copying with outliers is a way to approach normality in the residuals, but insufficient in our case.

Nevertheless, residual normality is not a big problem because the sample is sufficiently large and in such case residual normality is almost impossible (Norusis, 2003). This study's most serious defect is the use of Amadeus ratings. We hypothesized that companies take into account these ratings that are neither announced nor certified. Disregarding the fact that most Greek companies might not even be aware of Amadeus' existence, we treated MORE ratings as if they were equal to the ratings provided by major credit rating agencies like Moody's or S&P's. This is a serious simplification that could be improved in a future research, including other European countries too.

Another problem we acknowledge is that each database uses its own identification and interpretation of the companies' accounts, and hence this could result in wrong calculations of ratios and variables. For example, Amadeus denotes as "Loans" the short-term financial debts to credit institutions; misinterpretation of this account could lead to completely wrong leverage ratios.

Despite the above limitations, we believe that our research contributes to the existing literature by providing evidence from a market that is characterized by limited access to external finance sources and high management entrenchment. Future research should take into consideration the above limitations and apply more advanced econometric methods.

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