

Barra

Impact of interest rates in Capital structure of listed companies in Eurozone

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## ABSTRACT

The impact of the cost of equity has been highly discussed in the capital structure over the last 60 years. However, the impact of the cost of debt has been given as fait accompli, despite the scarce number of studies about the theme. Therefore, this dissertation intends to study the impact of the variations of the cost of debt on the capital structure. With Eurozone listed companies on Euro Stoxx 600 between 1995 and 2015 as population, this dissertation shows that contrary to the expected the weight of debt in the companies’ capital structure decreases when interest rates are low and *vice versa*. However, the results also suggest that the issue of new debt has a negative correlation with interest rates.

**Key-words**: capital structure, interest rates, trade-off, pecking order; debt; market timing; windows of opportunity;

**JEL-Codes**: G110; G210; G31; G320;

# Sumário

O impacto do custo de capital tem sido altamente discutido na estrutura de capital nos últimos 60 anos. No entanto, o impacto do custo da dívida tem sido dado como adquirido, apesar do escasso número de estudos sobre o tema. Portanto, esta dissertação pretende estudar o impacto das variações do custo da dívida na estrutura de capital. Usando as empresas da zona Euro, listadas no Euro Stoxx 600 entre 1995 e 2015 como população, esta dissertação mostra que, contrariamente ao esperado, o peso da dívida na estrutura de capital das empresas diminui quando as taxas de juro estão baixas e vice-versa. No entanto, os resultados também sugerem que a emissão de nova dívida tem uma correlação negativa com as taxas de juros.

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# INTRODUCTION

Capital Structure became, since Modigliani and Miller, a hot theme of debate and study in finance. Their concept of irrelevance of capital structure theory gave us an excellent platform to study individual variables alone and to show that capital markets weren’t perfect. These boosted new studies, and new theories emerged with frequency.

Through a robust theory, that mathematically proves the capital structure irrelevance to the firm value, Modigliani and Miller based their study on unrealistic assumptions. So, their conclusions gave to the academic world a new mood to study the improvements of firm value through changes in firms’ financing mix.

Many theories emerged, many based on the classic mathematical theory of Modigliani and Miller and some based on managers’ expected behavior. Both create a derivation of their original study and create the first study of one of the principal theories today. Removing one of the assumptions, “no taxes”, they prove that capital structure is relevant, because of the possibility of tax shields from debt. This came out as the static Trade-off-Theory.

After this moment, lots of works on capital structure came out putting to test, the many assumptions of Modigliani and Miller. One of the most important and maybe the most important for the study we conduct were, is the Market Timing of Baker and Wurgler (2002). In an analysis of the long run returns following equity issues and repurchases, they found that firms tend to time markets regarding their financial decisions, dependent on their positions in terms of levels of debt. This implicates the inexistence of an optimal capital structure since firms’ capital structure will be the pile-up of many financial decisions along the time.

However, this analysis is based on the cost of equity. And since the beginning of studies on the capital structure that debt is seen as a better financing method for the firms’ value increase. This is because of the advantage of not paying taxes (tax shields), and also because of the disclosure of information required is usually lower.

So, why aren’t studies about the impact of the cost of debt, the impact of interest rates, on the capital structure more noticed?

In this study, it is used a sample of 246 companies, on average, per year, listed in Eurozone and included in the Index Euro Stoxx 600. This sample was reached by excluding companies listed in the Euro Stoxx 600 that were not listed in Eurozone countries and excluding the years/companies that do not have information of market capitalization or total debt.

The main question that we want to answer is whether there is a negative relation between the cost of debt and the leverage ratio (H1), as suggested by the pecking order, the trade-off and implied in the market timing theories. Contrary to what was expected, this hypothesis was rejected and a positive correlation between these two variables was found. So, companies seem take advantage of the low interest rates to reduce its debt levels, which is counter-intuitive. This can be partially explained, by the covenants normally imposed by debtholders that may deter companies from increase their debt level (when compared to equity) even when interest rates are low as explained by Karpavicius and Yu (2017), or by the appreciation of the stock value of firms. The relation is controlled by windows of opportunity/economic cycle, profitability, taxes (corporate and personal), size, asset tangibility and liquidity.

Although, using an alternative dependent variable, the relative variation of the total debt with the prior year, it is found that companies indeed issue more debt when interest rate are low, which mean that companies time markets regarding their investment decisions, having in consideration the cost of debt, which may indicate that the leverage ratio may be impacted by the appreciation of the stock values of firms since, normally the cost of debt decreases when the economic conditions are better and the equity market tend to reflect that and so the equity value increases, having an opposite impact in the leverage ratio.

This study is structured as follows: Section 2, provides a literature review about the capital structure theories, the impact of interest rates in the firm value creation and the relation between these two topics. Section 3 is dedicated to the research question. In Section 4, it is presented the data and sample and in Section 5 it is presented the methodology that will support this analysis. In Section 6, there are presented the conclusions of the present study.

# LITERATURE REVIEW

In order to fully introduce and to comprehend this dissertation and the respective relation to be tested, it is important to review some previous literature about capital structure theories.

## Capital structure

Myers (2001) defines capital structure as the mix of securities and financing sources used to finance real investments

A firms’ management, to improve firm value is always searching for positive NPV projects, but to implement the project is necessary to have liquidity, and this could be a problem too. The management team of the firm has to choose the best way to finance the project, because as Myers (2001) points, “there is no universal theory of the debt-equity choice and no reason to expect one”.

Our literature review will present first the principal theories of capital structure and then will present some similar studies and expectative for the framework of this dissertation.

## Theories of capital structure

### Modigliani and Miller

It is important to mention that Capital Structure issues started with F. Modigliani and Miller (1958) and their irrelevance theory. They used several hard assumptions such as: perfect competition in the market, homogeneous expectations, homemade leverage and inexistence of arbitrage opportunities, frictions in demand and supply, agency costs, transaction costs, bankruptcy costs and principally taxes; to found that in a ‘perfect’ world, the capital structure does not impact the value of a company.

Franco Modigliani and Miller (1963) updated its study, including taxes in their analysis in order to reduce the quantitative difference between the estimates of the effects of leverage under the model and under the naive traditional view. This study opens the way for one of the most important theories of capital structure, the trade-off theory.

### Trade-off Theory

The trade-off theory was defended, especially by Kraus and Litzenberger (1973), Hirshleifer (1966), Scott (1976) and Kim (1978).

Hirshleifer (1966) was the first to suggest the inclusion of bankruptcy penalties to calculate the optimal capital structure.

Kraus and Litzenberger (1973), supported by Hirshleifer (1966) and Robichek and Myers (1965), defend that the value of a levered company is the sum of its unlevered market value and the market value of the company’s debt times the corporate tax rate less the complement of the corporate tax rate times the bankruptcy costs. In a simpler way, it is the value of the unlevered company plus the tax shield of debt less the bankruptcy costs.

Scott (1976) using the same line of thought of Kraus and Litzenberger (1973) tries to simplify this framework in order to provide managers and regulators “useful insights” without sideline the results and the testable hypothesis for empirical researchers.

### Pecking Order Theory

Myers and Majluf (1984) studied capital structure from a different perspective, based on Campbell (1979) and Campbell and Kracaw (1980) which consider the information cost inherent to the market. In a debt issue, the company just has to reveal information to the bank; in the case of issuing equity they have to reveal some information to all the public, including competitors. Myers and Majluf (1984) considering the information costs in its analysis, conclude that a company will first choose internal funds, then issue debt and, only after that they go to the market and issue equity.

### Market-timing Theory

Baker and Wurgler (2002), not convinced of the applicability of Modigliani & Miller theory in real financing policy, study the market timing theory based in “analyses of actual financing decisions, analyses of long-run returns following equity issues and repurchases, analyses of realized and forecast earnings around equity issues, and surveys of managers.” To measure market timing, they use the market-to-book ratio as an indicator. With this ratio, they find that the level of debt influences the choice of financing of firms. When a firm is high levered, they tend to raise funds when the valuation is low; when a firm is low levered, managers tend to raise funds when the valuation is high. It is so implicit in this theory the inexistence of an optimal capital structure since it is a pile-up of a variety of financing decisions based in the prices of the moment and not in the long run of capital structure.

### Stakeholder Theory

Cornell and Shapiro (1987) consider that implicit claims take an important role in the financial policies of companies. These implicit claims can be the expectations of technological innovation, “continuing supply, timely deliver, product enhancement and job security”. If some of these expectations are broken the company could suffer high losses. So, this should be an aspect to consider on the definition of firms’ financial policy.

The stakeholder theory defends that new information could create a wave of adverse reaction that can provoke damages on firms. As debt requires less information to be revealed to the general public, debt continues to be preferred to equity also in this theory.

### Managerial over-optimism Theory

Heaton (2002) adopts an explicit behavioral approach and explains how managers’ over-optimism can damage the health of a company and its stakeholders. Heaton (2002) conclude that over-optimism of managers could impact the company in two different ways. First, the managers may refuse some positive NPV projects, if outside financing is needed, because they believe that firms’ securities are undervalued by capital markets; and second, the opposite, managers may invest negative NPV projects, because they believe too much in their corporate projects. This theory wants to demonstrate that the market isn’t completely rational, and that the managerial irrationality could attach some important features to the financial markets.

### Windows of Opportunity Theory

Ritter (2003) analyses the securities issuance process, focusing on the equity issuance, namely, Initial Public Offerings (IPO’s) and Seasoned Equity Offerings (SEO’s). If firms were able to perfectly timing its decision to go to the market, the theory of Myers and Majluf (1984) would lose all sense, and debt would lose its vantages over equity. This theory tries to find the moment when firm’s value is overpriced to issue equity to invest in high return projects and the moment when the firms are under-priced to avail of a lower hurdle rate.

In a similar study, Bayless and Chaplinsky (1996) considered hot and cold markets, in a separate analysis, and found that the decision of issuing equity in the hottest markets has an average price reaction “significantly less negative” while in colder markets is the opposite.

## Behavioral approach

Graham and Harvey (2001), in a survey, found that managers are more likely to conduct a debt issue when interest rates are lower, because as Karpavicius and Yu (2017) says if the interest rate is higher, the profit of the projects will be lower, because of the higher interest payments, and so the bankruptcy costs will increase. A double loss will be registered, and this also applies for the opposite, *i.e*., a double benefit will be earned since lower interest payments cause a lower bankruptcy cost.

## Similar studies and Framework

In all these years of research about the impact of interest rates on the capital structure, it was found several different conclusions, without reaching a consensus. Karpavicius and Yu (2017) analyze this theme in a different way, in the firms’ perspective, *i.e*., analyze if firms borrow more money when borrowing costs are lower, instead of analyzing the firms’ financial policies under different macroeconomic conditions. In this paper, we will do a similar analysis to the European market.

Karpavicius and Yu (2017) didn’t find significant relations between interest rates and capital structure between 1975 and 2014 in the USA, mainly due to high adjustment costs and to the covenants imposed by debtholders. However, they found interesting aspects of the behavior of the market and the effectiveness of the monetary policy based on the reduction of interest rates.

It is expected a priori that our results will follow a junction of the market timing theory and the pecking order theory.

## Literature Gap

The objective of this dissertation is to prove that the cost of debt is a determinant variable in the choice of the investment moment. The hypothesis that we want to respond is:

*H1: The cost of debt is negatively related with the capital structure of firms*

In the two major theories of capital structure, it is expected this hypothesis to be true. In the trade-off theory as in the pecking-order theory, it is expected that firms choose the cheaper investment decision. Although in the pecking order theory, it is considered the cost of information, creating a hierarchy in which the internal funds become first, debt is second and equity is the last resource. Therefore, in the Market timing theory it is expected that companies will first time market its investments regarding the cost of debt. However, this was not study yet. It is expected so, that when the cost of debt decreases the debt issue increases.

# Methodology

### Methodological aspects of similar studies

In the literature, very few studies focus on Eurozone and most of them investigate the relation in the US market. Also, the study of the impact of interest rates in the capital structure has big lacks in the literature, most of the studies assume interest rates as a control variable, and not as a central issue regarding capital structure.

Most of the studies use panel data when concerning capital structure variations on time analysis and it will be also the case of this dissertation because as defended by Baltagi (2013) and Hsiao (1986) it catches better the heterogeneity of individuals/firms, gives more informative data, more degrees of freedom and more efficiency.

### Methodological aspects of this dissertation – Empirical Framework

In this dissertation, it was used a panel Ordinary Least Square (OLS), as in Baker and Wurgler (2002), in order to try to understand if the listed companies in Eurozone timed markets regrading investment decisions accordingly with the variations in the costs of debt.

The first model used was the following:

Yit= 𝛽0 + 𝛽1COUNTSECRP\_1it + 𝛽2TQ\_1it + 𝛽3ROA\_1it + 𝛽4CTAX\_1it + 𝛽5PTAX\_1it + 𝛽6SIZE\_1it + 𝛽7AFT\_1it + 𝛽8LIQ\_1it + ηi +*d*t + 𝜀it , i=1,2,…,n t=1,2,…,T, (3.1)

where the ηi is cross section fixed effects and *dt* is time fixed effects.

All variables vary in terms of time (*t*) and company (*i*).

The model counts with the variables as disposed in the equation (3.1) and are defined as follows:

Y: The dependent variable can assume the form of leverage ratio (LEV) or the new debt ratio (NEWDEBT). The leverage ratio is calculated based on the market value of equity and the book value of debt and means the percentage of debt in the capital structure of the firm. It was used firstly to understand the impact of interest rates on capital structure. On the other hand, the new debt ratio measures the relative variation of debt from one year to the last one. It was used to understand if, despite the controversial correlation between the leverage ratio and the market risk premium/spread, companies would time their investments having in consideration the cost of debt.

COUNTSECRP: Market risk premium resulting from the sum of the country risk premium and the sector risk premium. The country risk premium was calculated as the spread between the 10-year treasury bond of the country and the 10-year treasury bond of Germany, used as the risk-free interest rate. The sector risk premium used was taken from Aswath Damodaran’ Website[[1]](#footnote-1) from its calculation of the cost of capital of each sector. This data was calculated by Damodaran, since 1998 in two ways: if the company have a rating, this one is used, if the company does not have a rating it is used the last 5 years standard deviation of its stock prices. For the data between 1998, it was done a rollback of the 1998 data using the US T-Bill 10 Years. It is expected a negative sign of this variable, *i.e.*, companies would take advantage of the lower interest rates to loan more capital to invest in its projects.

TQ: Tobin’s Q ratio[[2]](#footnote-2), is used to measure the existence of windows of opportunity for companies, to accomplish its growth opportunities. The existent correlation could take different signs as found in Frank and Goyal (2009), dependent on the assumed theory: pecking order or trade-off. In the pecking order theory, it is expected a positive correlation between leverage and growth opportunities, since debt is considered to be the second choice of firms to finance their investments and considering that profitability is unchanged. The trade-off theory considers a negative correlation either due to the increase of financial distress and agency costs and the diminution of free cash flows. It is calculated through the division of the market value of the firm by its total assets value.

ROA: Return on Assets, measures the profitability of firms. There are two distinct theories defended in Frank and Goyal (2009) regarding the sign of this correlation with leverage. The trade-off theory defends a positive sign, *i.e*., companies would have more predisposition to incur in debt issues when profitability is high, since the tax shield created by them would be higher. However, the pecking order theory defends a negative correlation because companies will prefer first finance investments with internal funds, created by past profits, and just after that issue debt and then equity. It is calculated through the division of the net income of the firm by its total assets value.

CTAX and PTAX: Corporate and Personal taxes. Relatively to corporate tax rates is clear its use, since most of the country laws allow the companies to deduct the interest expenses of their results before taxes, creating a tax shield on debt. Although the personal tax rate variable used in this work is not so clear but makes a lot of sense. When personal interest rate on dividend income is low, it would have fewer incentives to issue corporate debt, because more incentives would be to equity investments. Faccio and Xu (2015) found, for 29 OECD countries, that corporate and personal taxes are significant determinants of capital structure choices. The analysis contemplates the time period between 1981 and 2009 and “provide more general evidence for Miller (1977) assertion that personal taxes matter for capital structure.

SIZE: The company size is also a factor of reduction of risk because it gives the company more safety in receiving the payments of the loan. A simple notice of the default of the company to some debtholders could have a big impact in the rest of the stakeholders of the company, and fear and insecurity may be installed. Therefore, it is expected a positive correlation with the capital structure ratio. It is calculated through the logarithm of the size of the firm.

AFT: The asset tangibility is an important factor of reduction of risk for debtholders because assets serve as collateral. With this reduction of risk, debtholders are able to finance the firm at a lower interest rate, expecting, because of that, a positive correlation. It is calculated through the division of the tangible fixed assets of the firm by its total assets value.

LIQ: Following a trade-off theory approach, this variable is positively correlated with the leverage ratio, since a company with higher liquidity should have a lower interest rate, because of the risk of bankruptcy is lower. However, in a pecking order theory perspective, the liquidity would be negatively correlated with the leverage ratio, because the company will prefer first uses internal funds and just then use leverage. In a analysis based in a species of market timing we will use the first one, since a company with higher liquidity will have easier access to debt because of a lower interest rate and consequently will have the tendency to have higher capital structure. It is calculated through the division of the current assets of the firm by its current liabilities.

### Other considerations

In a preliminary analysis these variables could suffer from two major problems:

First the transaction costs may be a major problem found in this paper. To issue debt or renegotiate it, it is necessary to incur in these costs that normally, for debtholders protection, wasn’t narrow. The problem is the lack of an estimator sufficiently precise to measure its impacts.

Second, endogeneity may bias our estimates due to a correlation between the variable and the error term. To mitigate this risk of endogeneity, some variables were lagged one year.

# Data

### Collection of Data, Databases and sample

The focus of this dissertation is the listed companies of Eurozone in the period between 1995 and 2015. Our data was extracted mostly from the Datastream of Thompson Reuters.

In order to reach our sample, it was used the index Euro Stoxx 600, which contains the 600 biggest stocks of Europe and filtered them, only for the companies that are quoted in Eurozone countries and from which was available information about the market capitalisation and the total debt, which gave us an average of 246 companies per year.

Other databases were used to reach to our data, as well as the OECD website for the corporate and personal taxes of each countries, and the Damodaran website to the market risk premium of debt.

### Descriptive statistics

This data was represented as follows in table 1, the results are in conformity with the expected. The leverage ratio has a mean of 34%, when the risk premium (Country + Sector) has a mean of 6%, both have a lower dispersion. All the control variables have means and intervals of variation (maximum and minimum) in accordance with the normal of the European market.

In a more accurate analysis of the principal variables, it was decided to analyse the variation along the years of the sample for the dependent and independent variables. First in table 2, for the first explained variable, LEV, in table 3 for the variable NEWDEBT, and in table 4 for COUNTSECRP.

In table 1 it could be seen that only the new debt issue has values out of the ordinary, with its standard deviation to be 1,757,37% and its max to be 125,414.50%. This is caused by the easier access of some companies to issue big amounts of debt.

**Table 1** - Variable descriptive statistics

This table presents mean, median standard deviation, maximum and minimum of all variables included in this study. The issues of new debt (NEWDEBT), the leverage ratio (LEV), the risk premium (COUNTSECRP), the Tobin-q (TQ), the return on assets (ROA), the corporate and personal taxes (CTAX and PTAX), the asset tangibility and the liquidity (LIQ) are expressed in relative terms (%)



The Figure 1 shows the average and median of the leverage ratio is constrained between 20% and 45% which indicates also that its standard deviation is very stable, without significant variations.

***Figure 1*** *– Mean and median of leverage ratio by year [[3]](#footnote-3)*



In Figure 2 is shown the median of new increases (more detail on new debt issue can be found in appendix 1). The extreme values in 1995 and 2000 are result of the Internet boom.

***Figure 2*** *– Median of new debt ratio by year [[4]](#footnote-4)*



In figure 3 is possible to see that the mean and median along the years is stable, and that the standard deviations never surpasses 2% and that we are seeing a decrease of the interest rates in this period, explained also by the negative interest rates that become normal in the Eurozone.

***Figure 3*** *– Mean and median of cost of debt by year [[5]](#footnote-5)*



To better understand the composition of the sample it was analyzed the sample for each constituent country of the sample. First in table 2, for LEV, in table 3 for NEWDEBT and in table 4 for COUNTSECRP.

In Table 2 it is possible to understand that companies of the denominated PIGS countries (Portugal, Spain and Italy) and Austria have a leverage mean higher than the others.

**Table 2** - Descriptive statistics of debt structure by country

This table presents mean, median standard deviation, maximum, minimum and the number of representative companies for the leverage ratio for each represented country.



In Table 3 it is seen that the countries with a higher average of new debt issues were not the PIGS and Austria which means that the countries with lower leverage ratio have issue more debt than the others, in a period where the interest rates decreased a lot in the Eurozone.

**Table 3** - Descriptive statistics of new debt ratio by country

This table presents mean, median standard deviation, maximum, minimum and the number of representative companies for the issues of new debt for each represented country.



In Table 4 it is seen a stable pattern between countries, which indicate lower discrepancies between countries in the cost of debt.

**Table 4** - Descriptive statistics of the cost of debt by country

This table presents mean, median standard deviation, maximum, minimum and the number of representative companies for the risk premium of debt for each represented country.



# Results

The objective of our study was to prove that the companies’ time their investment decisions in terms of debt, *i.e.*, the companies will wait for moments where the cost of debt is lower to increase their debt levels, and with that, increase its capital structure ratio (H1).

To reach the objective of this dissertation was used the panel data method, due to the fact we want to analyze cross-sectional data in a time series dimension, as explained by Wooldridge (2015). Nonetheless, the most used methods of estimation with panel data are the pooled OLS, the fixed effects and the random effects. In this dissertation, it will be present the Pooled OLS in all our results, however this method, as said by Hsiao (1986) and Baltagi (2013) in its researches, doesn’t take into account possible heterogeneity the model may suffer from serious specification error and could have large biases. Considering that we apply the Hausman test in order to understand which one will be the best estimator method, the results were pretty much conclusive with the Hausman test rejecting the null hypothesis, i.e., the random effects is not an appropriate estimator for both the regressions.

From Table 5, we could see that in the complete model, the “Fixed effects 08” most of the variables are statistically significant in all models. The start model was the “Fixed Effects 01” in which it was used only our principal explained variable, the cost of debt, measured by the risk premium of the company. From the observation of the addition of new variables between the “Fixed effects 01” and the “Fixed effects 08” models it is possible to see that the correlation between the explained variable and the principal explained variable maintains positive and statistically significant. Between the variables the results demonstrate lower correlations[[6]](#footnote-6) that give strength to the results obtained.

**Table 5** - Panel Ordinary Least Square regression results to leverage ratio.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| This table shows the results for the panel data OLS regression concerning the determinants that impact the capital structure ratio (LEV) of the Eurozone listed companies. The explained variables are being added one by one until the final equation, the "Fixed Effects 08".  In this table, it was presented the information about the t-statistics and between parentheses, the standard error. Additionally, it was presented some statistical indicators about the quality of the model, as the R-squared, the Adjusted R-squared, the size of the sample and the individual significance of each variable, where \*, \*\*, and \*\*\* represents a level of significance of 10%, 5% and 1%, respectively. | | | | | | | | | |
| **Dependent variable** | **Fixed effects 01** | **Fixed effects 02** | **Fixed effects 03** | **Fixed effects 04** | **Fixed effects 05** | **Fixed effects 06** | **Fixed effects 07** | **Fixed effects 08** | **Pooled OLS** |
| COUNTSECRP\_1 | 5.668\*\*\* | 5.572\*\*\* | 5.484\*\*\* | 5.822\*\*\* | 7.736\*\*\* | 7.710\*\*\* | 7.814\*\*\* | 6.562\*\*\* | 3.246\*\*\* |
|  | (0.002) | (0.002) | (0.002) | (0.002) | (0.002) | (0.002) | (0.002) | (0.002) | (0.002) |
| TQ\_1 |  | -3.505\*\*\* | -2.900\*\*\* | -2.851\*\*\* | -2.142\*\* | -2.174\*\* | -2.051\*\* | -2.046\*\* | -3.537\*\*\* |
|  |  | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| ROA\_1 |  |  | -9.667\*\*\* | -9.824\*\*\* | -10.720\*\*\* | -10.738\*\*\* | -10.759\*\*\* | -9.707\*\*\* | -17.856\*\*\* |
|  |  |  | (0.025) | (0.025) | (0.024) | (0.024) | (0.024) | (0.025) | (0.034) |
| CTAX\_1 |  |  |  | -1.819\* | -1.445 | -1.528 | -1.434 | -0.305 | 0.660 |
|  |  |  |  | (0.048) | (0.047) | (0.048) | (0.048) | (0.052) | (0.041) |
| SIZE\_1 |  |  |  |  | 13.186\*\*\* | 13.200\*\*\* | 13.264\*\*\* | 9.235\*\*\* | 15.218\*\*\* |
|  |  |  |  |  | (0.007) | (0.007) | (0.007) | (0.009) | (0.004) |
| PTAX\_1 |  |  |  |  |  | 0.927 | 0.868 | 0.655 | -1.273 |
|  |  |  |  |  |  | (0.019) | (0.019) | (0.022) | (0.032) |
| AFT\_1 |  |  |  |  |  |  | -1.979\* | -5.835\*\*\* | 9.822\*\*\* |
|  |  |  |  |  |  |  | (0.021) | (0.026) | (0.015) |
| LIQ\_1 |  |  |  |  |  |  |  | -5.101\*\*\* | -13.041\*\*\* |
|  |  |  |  |  |  |  |  | (0.003) | (0.004) |
| Intercept | 22.460 | 22.661 | 24.183 | 17.913 | -6.347 | -6.421 | -6.285 | -4.183 | -3.214 |
| N | 4,972 | 4,972 | 4,972 | 4,967 | 4,918 | 4,918 | 4,918 | 3,960 | 3,960 |
| R-Squared | 0.813 | 0.814 | 0.818 | 0.818 | 0.826 | 0.826 | 0.826 | 0.720 | 0.240 |
| Adjusted R-Squared | 0.800 | 0.800 | 0.804 | 0.805 | 0.813 | 0.813 | 0.813 | 0.697 | 0.238 |

The results of table 5 demonstrate a statistical significance of the majority of the variables considered in this study and, contrarily to what was expected the cost of debt (COUNTSECRP) has a positive impact in the leverage ratio (LEV). When the cost of debt is decreasing this could be explained by two factors: First, the existent covenants of debt may inhibit the companies of increasing its debt levels due the decrease of its flexibility. Second, and strongest possibility, the decrease of the cost of debt are correlated with the growing of the market, and a bull-market made the equity values of firms to increase. The impact of this appreciation of equity makes the leverage ratio to decrease. When the cost of debt is increasing this could be explained by the financial crisis that impact the Euro area in this period, *i.e.,* investors avoid the equity markets, due the risk and scarcity of liquidity. Thus, by the scarcity of the access of equity, firms will have to recur to debt even though the rates (cost of debt) are also high.

Relative to the control variables, the CTAX and the PTAX was not significantly, in contrast to Faccio and Xu (2015). The signs are almost all in accordance with the literature. The positive sign of SIZE\_1 indicates that as bigger the company is, more likely the company will have higher LEV. The negative sign of LIQ\_1 is in accordance with the pecking order theory which indicates that companies will prefer first internal funds and just then issue Debt. The AFT has a negative correlation with the capital structure which means that as more tangible assets the company has, the lower the probability of increases in debt, which diverges from the literature and of the rationality of the market, since more tangible assets a company has, more guarantees could have as collateral for the bank, reducing the risk and consequently the cost of debt. The ROA has a negative relation with the capital structure which follows a pecking order theory, *i.e.*, the Eurozone listed companies will prefer to use internal funds instead of debt to finance its investment opportunities.

Therefore, it was decided to test a new dependent variable, the relative variation of debt in one year (NEWDEBT), in order to disregard the possibility of the impact of appreciation of stocks. Such results are evidenced in Table 9, where the fixed effects corrected estimation for the impact in the NEWDEBT of the COUNTSECRP are shown. Despite the low explanatory capacity (Adjusted R-Squared = 6.4%), a negative correlation is now observed: when the cost of debt decreases, firms tend to recur even more to this kind of financing. This result meets the expectations that the results of Table 5 could be impacted by the appreciation of stocks. So, the impact of the market timing of debt will be notice in an indirect way.

Relative to the control variables in Table 6, the PTAX and the TQ are not significantly and all the variables change its type of correlation. The ROA change its sign from the previous regression, and with a positive sign means that follows a trade-off theory which means that when the company has higher return on assets, more the company will subscribe new debt, since a better ROA permit better loan conditions, and better incentives to use debt. The CTAX in this case is also significant at a 10% level, with a negative sign contrasting with the literature as, for example, Faccio and Xu (2015), that defend a positive sign due the effect of the tax-shield of debt, *i.e.*, the debt decreases the value of net income and consequently the value of corporate taxes. The SIZE also changes the sign relative to the first regression. Now with a negative sign, could mean that smallest companies tend to time markets most times concerning the cost of debt. This could introduce us to a new reality in this study’s, because despite of the fact that as smallest the company smallest is its leverage ratio (*LEV*), they tend to market timing its investments accordingly with the cost of debt. The AFT maintains its negative correlation with new debt which maintains its divergence from the literature and of the rationality of the market. The LIQ also changes its sign from one regression to the other, the positive sign could indicate similarities with trade-off theory, *i.e.,* as the company has more liquidity, the risk will decrease and consequently the cost of debt will also decrease which could make the company increase its debt.

**Table 6** - Panel Ordinary Least Square regression to new debt issues.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| This table shows the results for the panel data OLS regression concerning the determinants that impact the new debt ratio (NEWDEBT) of the Eurozone listed companies. The explained variables are being added one by one until the final equation, the "Fixed Effects 08".  In this table, it was presented the information about the t-statistics and between parentheses, the standard error. Additionally, it was presented some statistical indicators about the quality of the model, as the R-squared, the Adjusted R-squared, the size of the sample and the individual significance of each variable, where \*,\*\*, and \*\*\* represents a level of significance of 10%, 5% and 1%, respectively. | | | | | | | | | |
| **Dependent variable** | **Fixed effects 01** | **Fixed effects 09** | **Fixed effects 10** | **Fixed effects 11** | **Fixed effects 12** | **Fixed effects 13** | **Fixed effects 14** | **Fixed effects 15** | **Pooled OLS** |
| COUNTSECRP\_1 | 0.697 | 0.700 | 0.831 | 0.842 | 0.853 | 0.882 | 0.898 | -3.875\*\*\* | -1.265 |
|  | (27.501) | (27.423) | (27.513) | (28.078) | (28.228) | (28.143) | (28.178) | (1.218) | (0.673) |
| TQ\_1 |  | 0.002 | -0.167 | -0.163 | -0.160 | -0.185 | -0.114 | 0.476 | 1.702\* |
|  |  | (6.343) | (6.349) | (6.365) | (6.415) | (6.418) | (6.463) | (0.105) | (0.057) |
| ROA\_1 |  |  | 1.734\* | 1.732\* | 1.721\* | 1.713\* | 1.704\* | 2.043\*\* | -1.091 |
|  |  |  | (969.042) | (971.75) | (980.452) | (979.89) | (977.604) | (10.134) | (8.52) |
| CTAX\_1 |  |  |  | -0.256 | -0.276 | -0.471 | -0.420 | -2.356\*\* | 0.135 |
|  |  |  |  | (492.724) | (507.28) | (511.382) | (511.569) | (34.293) | (15.312) |
| SIZE\_1 |  |  |  |  | 0.311 | 0.254 | 0.407 | -7.100\*\*\* | -2.975\*\*\* |
|  |  |  |  |  | (118.005) | (118.629) | (124.242) | (6.202) | (1.538) |
| PTAX\_1 |  |  |  |  |  | 1.390 | 1.362 | -0.201 | 0.106 |
|  |  |  |  |  |  | (333.931) | (334.133) | (9.95) | (10.228) |
| AFT\_1 |  |  |  |  |  |  | -1.281 | -1.649\* | -1.361 |
|  |  |  |  |  |  |  | (426.439) | (16.558) | (5.178) |
| LIQ\_1 |  |  |  |  |  |  |  | 2.413\*\* | 1.889\* |
|  |  |  |  |  |  |  |  | (1.969) | (1.514) |
| Intercept | -0.539 | -0.539 | -1.199 | -0.869 | -0.540 | -0.698 | -0.708 | 7.769 | 2.600 |
| N | 4,823 | 4,823 | 4,823 | 4,818 | 4,769 | 4,769 | 4,769 | 3,960 | 3,953 |
| R-Squared | 0.060 | 0.060 | 0.063 | 0.063 | 0.063 | 0.064 | 0.064 | 0.136 | 0.008 |
| Adjusted R-Squared | -0.008 | -0.008 | -0.005 | -0.005 | -0.005 | -0.005 | -0.005 | 0.064 | 0.006 |

The case of Table 6 is different from Table 5, where almost all variables are non-significant until the complete model (Fixed effects 15). When it is added the liquidity to the model, the following variables turns on significant: asset tangibility (significant at 10% level), liquidity, profitability and corporate tax (significant at 5% level) and finally the size and the cost of debt (significant at 1% level). The cost of debt and the size change its correlation with the new debt issuance, and the quality of the model increase from a negative adjusted r-squared to a positive in the last model, which guide us to the conclusion that the correct correlation is the Fixed effects 15. The impact of the liquidity on the quality of the model could be explained it the pecking order theory since that this theory defends that firms will prefer internal funds to debt.

Also, in this model it was not found significant correlations between variables[[7]](#footnote-7).

# Conclusion

The initial objective of this dissertation was to found objective relations between capital structure of the Eurozone listed companies and the evolution of the interest rate in the debt market. In other words it was tried to understand if the Eurozone listed companies are timing markets regarding their investments, as well as Baker and Wurgler (2002) prove in their study, *i.e.*, that companies time their equity issues. Considering that the pecking order theory can be seen as a dynamic market timing theory as defended by Myers and Majluf (1984), the companies will prefer increase their debt issues when the cost of debt is lower, than expecting better conditions in the equity market due the costs of the information.

In a first attempt to proof that firms time markets its investments accordingly with the cost of debt, it was analysed the relation between the cost of debt and the leverage ratio. Our results suggest a counter-intuitive positive relation between both, in contradiction to previous researches. The explanations for this positive relation between both are divided in two, when the cost of debt decrease and when the cost of debt increase. When the cost of debt decrease there is two explanations for this inconsistency, first the fact that debt carries with covenants, which may inhibit firms to increase its debt due the decrease of its flexibility, second, at same time the cost of debt normally decrease when economic conditions are better (bull market) and the equity market tend to reflect that, and so the equity value increases, having an opposite impact in the leverage ratio. When the cost of debt increase[[8]](#footnote-8), which corresponds to the periods of financial distress in Eurozone, it seems legit that, in these turbulent periods, due to the distrust of investors in equity markets, firms are obliged to recur to debt even though its cost has increased.

In order to understand if these assumptions are correct, it was decided to use a new model with a new dependent variable, NEWDEBT, calculated as the relative variation between the debts of one year with the debt of its prior year.

With the new model it was possible to reach some important conclusions. First, the COUNTSECRP have a negative correlation between the two variables, with a level of significance of 99%. From where it is possible to understand that the Eurozone listed companies time their investments, despite the low explanatory capacity of the model (adjusted R-squared = 6.4%). Second, smaller companies tend to has lower leverage ratio. However, the smaller the company is, the more it will time its investments, probably because debt is the most simple and cheaper funding line following the internal funds, that most of this companies do not have in large scales.

This study seems to follows the founds of Baker and Wurgler (2002), that firms market timing its investments, now in a new perspective of the debt issues.

In this dissertation, the principal limitations was found a sufficient robust estimator to the covenants of debt and its costs, since this is the principal discouraging factor for the adjustments on the capital structure of firms, and the low explanatory capacity (adjusted R-squared = 6.4%) of the second model that measure the issues of new debt.

For future researches, it will have an added value the inclusion in this analysis of an estimator of the covenants of debt, and the division between short and long-term debt.

# REFERENCES

Baker, M., & Wurgler, J. (2002). Market Timing and Capital Structure. *The Journal of Finance, 57*(1), 1-32.

Baltagi, B. H. (2013). *Econometric analysis of panel data.* . Chichester, UK: John Wiley & Sons.

Bayless, M., & Chaplinsky, S. (1996). Is There a Window of Opportunity for Seasoned Equity Issuance? *The Journal of Finance, 51*(1), 253-278. doi:10.1111/j.1540-6261.1996.tb05209.x

Campbell, T. S. (1979). Optimal Investment Financing Decisions and the Value of Confidentiality. *The Journal of Financial and Quantitative Analysis, 14*(5), 913-924. doi:10.2307/2330297

Campbell, T. S., & Kracaw, W. A. (1980). Information Production, Market Signalling, and the Theory of Financial Intermediation. *The Journal of Finance, 35*(4), 863-882. doi:10.2307/2327206

Cornell, B., & Shapiro, A. C. (1987). Corporate Stakeholders and Corporate Finance. *Financial Management, 16*(1), 5-14. doi:10.2307/3665543

Faccio, M., & Xu, J. (2015). Taxes and Capital Structure. *Journal of Financial and Quantitative Analysis, 50*(3), 277-300. doi:10.1017/S0022109015000174

Frank, M., & Goyal, V. (2009). Capital Structure Decisions: Which Factors Are Reliably Important? *Financial Management, 38*(1), 1-37.

Graham, J. R., & Harvey, C. R. (2001). The theory and practice of corporate finance: evidence from the field. *Journal of Financial Economics, 60*(2), 187-243. doi:<https://doi.org/10.1016/S0304-405X(01)00044-7>

Heaton, J. B. (2002). Managerial Optimism and Corporate Finance. *Financial Management, 31*(2), 33-45. doi:10.2307/3666221

Hirshleifer, J. (1966). Investment Decision under Uncertainty: Applications of the State-Preference Approach. *The Quarterly Journal of Economics, 80*(2), 252-277. doi:10.2307/1880692

Hsiao, C. (1986). *Analysis of Panel Data*. Cambridge: Cambridge University Press.

Karpavicius, S., & Yu, F. (2017). The impact of interest rates on firms' financing policies. *Journal of Corporate Finance, 45*, 262-293. doi:10.1016/j.jcorpfin.2017.05.007

Kim, E. H. (1978). A Mean-Variance Theory of Optimal Capital Structure and Corporate Debt Capacity. *The Journal of Finance, 33*(1), 45-63. doi:10.2307/2326349

Kraus, A., & Litzenberger, R. H. (1973). A State-Preference Model of Optimal Financial Leverage. *The Journal of Finance, 28*(4), 911-922. doi:10.2307/2978343

Miller, M. H. (1977). Debt and Taxes. *The Journal of Finance, 32*(2), 261-275. doi:10.2307/2326758

Modigliani, F., & Miller, M. H. (1958). THE COST OF CAPITAL, CORPORATION FINANCE AND THE THEORY OF INVESTMENT. *American Economic Review, 48*(3), 261-297.

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

Myers, S. C. (2001). Capital Structure. *The Journal of Economic Perspectives, 15*(2), 81-102.

Myers, S. C., & Majluf, N. S. (1984). Corporate financing and investment decisions when firms have information that investors do not have. *Journal of Financial Economics, 13*(2), 187-221. doi:<https://doi.org/10.1016/0304-405X(84)90023-0>

Ritter, J. R. (2003). Chapter 5 - Investment Banking and Securities Issuance. In G. M. Constantinides, M. Harris, & R. M. Stulz (Eds.), *Handbook of the Economics of Finance* (Vol. 1, pp. 255-306): Elsevier.

Robichek, A. A., & Myers, S. C. (1965). *Optimal financing decisions*: Prentice Hall.

Scott, J. H. (1976). A Theory of Optimal Capital Structure. *The Bell Journal of Economics, 7*(1), 33-54. doi:10.2307/3003189

Wooldridge, J. M. (2015). *Introductory econometrics: A modern approach*: Nelson Education.

Damodaran, A. (2018). Cost of Capital. [online] Pages.stern.nyu.edu. Available at: http://pages.stern.nyu.edu/~adamodar/New\_Home\_Page/datafile/wacc.htm [Accessed 3 May 2018].

# Appendixes

***Appendix 1 –*** Variables resume

|  |  |  |
| --- | --- | --- |
| Abbreviation | Meaning: | Source: |
| LEV | Total DEBT/(Total DEBT+ Market Cap) | Datastream Thompson Reuters. |
| COUNTSECRP\_1 | Sector risk premium + Country risk premium | * Sector risk premium: Damodaran Website and rollback using the US T-BILL 10 Years (we use US, because is a risk free country). * Country risk premium: Spread of the 10 year Treasury bond, for each country (risk-free interest rate: 10 year treasury Germany bond). |
| TQ\_1 | Tobin Q ratio | Datastream Thompson Reuters. |
| ROA\_1 | Return On Assets ratio | Total Assets divided by the EBIT, both extracted from Datastream Thompson Reuters. |
| CTAX | Corporate Tax | Official oecd website. |
| PTAX | Personal Tax | Official oecd website. |
| SIZE\_1 | Company size | The logarithm of net sales extracted by Datastream Thompson Reuters. |
| AFT\_1 | Asset tangibility | Percentage of Tangible Assets on the total assets. |
| LIQ\_1 | Liquidity of the firm | Current Assets divided by Current Liabilities. |
| NEWDEBT | New Debt of the company ratio | The percentage variation of Debt of the year. |

***Appendix 2***– Correlation matrix with leverage ratio



***Appendix 3*** – Correlation matrix with new debt ratio



***Appendix 4*** *-* Descriptive statistic of leverage ratio by year

This table presents mean, median standard deviation, maximum, minimum and the number of representative companies for the leverage ratio between 1994 and 2015.



***Appendix 5*** *-* Descriptive statistic of new debt ratio by year

This table presents mean, median standard deviation, maximum, minimum and the number of representative companies for the issues of new debt between 1994 and 2015.



**Appendix 6 -** Descriptive statistic of risk premium by year

This table presents mean, median standard deviation, maximum, minimum and the number of representative companies for the risk premium of debt between 1994 and 2015.



1. Link on references [↑](#footnote-ref-1)
2. Used instead of the price to book value due to some problems of magnitude of this ratio [↑](#footnote-ref-2)
3. See: Appendix 4 [↑](#footnote-ref-3)
4. See: Appendix 5 [↑](#footnote-ref-4)
5. See: Appendix 6 [↑](#footnote-ref-5)
6. See matrix of correlations: Appendix 2 [↑](#footnote-ref-6)
7. See matrix of correlations: Appendix 3 [↑](#footnote-ref-7)
8. As seen in Figure 3, the years when the cost of debt increase was the years of financial distress in Eurozone. [↑](#footnote-ref-8)