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The Determinants of the Capital Structure of Listed on Stock Market Nonfinancial Firms: Evidence for Portugal

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The determinants of the capital structure of listed on stock market non-financial firms: Evidence for Portugal

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Abstract

The capital structure of companies has given rise to many works of analysis of its determinants. The research has evaluated the relevance of the determinants of managers' options when making a decision on the type of financing. The present study evaluates the effects on debt, of the determinants of capital structure, developed by the four main schools of thought in this field: the *trade-off* theory, *pecking order* theory, *agency costs* theory and the *market timing* theory. The sample consisted of the Portuguese non-financial companies listed on *Euronext Lisbon* index over the period 2005 to 2012. There were used the panel data and were estimated the models with fixed effects. The determinants analyzed were, namely, tangibility, profitability, other sources of tax optimization, growth opportunities, size and market valuation. Empirical results demonstrate the ability of profitability (-), growth opportunities (+), and other sources of tax optimization (+) in explaining the debt. These results highlight the presence of the postulated by the *pecking order* theory. Additionally, it is evident that there are significant changes in the determinants of market valuation, growth opportunities and tangibility, as result of the 2008 financial crisis.

Keywords: Capital Structure, Panel Data, Pecking Order Theory; Trade-off theory; Agency Costs Theory, Market Timing Theory

JEL Codes: C33, G32

1.   Introduction

The work focuses on the analysis of the determinants of capital structure of companies and evaluates the explanatory capacity of the major theoretical perspectives, namely, the *trade-off* theory, the *pecking order* theory, the *agency costs* theory, and the *market timing* theory. Modigliani & Miller (1958) analyze the management option for the type of financing that maximizes the value of the company as well as the determinants that influence this great structure. This work enabled enriching theoretical developments of the literature on capital structure, arousing intense debate in corporate financial management in the last five decades. During this period, most of the work done focuses on the research in the economies of most developed countries or economic areas, in emerging market economies or comparing countries or regions in particular.

Portuguese companies have received little attention in this matter, being the analysis of the underlying factors of the decision makers on the options on the capital structure of Rogão & Serrasqueiro (2008), one of the most recent studies factors. Thus, it is intended to fill the gap in the literature on the Portuguese market and make its upgrade, because it is a current issue and with renewed relevance, with the onset of the financial crisis in 2008 and constraints observed on credit, as found in economic indicators published by the Bank of Portugal.

This study fits into the category of research on the determinants of capital structure of the company and develops its analysis with the theoretical support of Cortez & Susanto (2012), the introduction of inventories in the tangibility as proposed in Sayilgan et al (2006) and the market valuation according to Baker & Wurgler (2002). In the definition of the empirical model, we use models with fixed effects, panel data and the estimator Ordinary Least Squares. The sample is composed of accounting and market information collected on Thomson Datastream, covering the periods from 2005 to 2012.

We present several contributions to the literature of financial management on the determinants of capital structure of firms. Firstly, it is an investigation on the Portuguese business market characterized by high leverage - as found in the analysis of the Bank of Portugal – being, therefore, with difficulty in the access to new external funding sources; Secondly, compared to the previous studies on the Portuguese market, inventories were added to the sustained tangible variable in the vicinity of Portuguese economic development to that

seen in Turkey (Sayilgan et al, 2006); a third aspect relates to the introduction of a new variable in order to capture the effect of the capital market, adding variables to the accounting valuation of companies in the capital market proposed by Baker and Wurgler (2002); Finally, we identify the predominant theories in management decisions about the capital structure of companies, with a simultaneous analysis of the four major theoretical perspectives, we analyze the effects of the financial crisis.

The results of empirical tests show the existence of the positive effect of tangibility variables, other sources of tax optimization, opportunities for growth and market valuation, and the negative effect of the variables, size and profitability relative to debt. Profitability, other sources of tax optimization and growth opportunities present relevant and significant results, showing the presence of the *pecking order* theory in the options of managers on the capital structure of companies. The financial crisis shows significant effects in the determinants, with greater significance in the valuation of the company in the market, persisting the statistical significance alongside the reversal of the sign of the coefficient that of a negative effect before the crisis becomes positive in the post crisis period. The theory of *market timing* is observed before the crisis, in which case the debt relates in the opposite direction to the valuation of companies.

Past the introduction, the work assumes the following structure. In chapter two, there shall be a review of the main literature references on this matter and the theories underlying to the determinants of capital structure of the company; then, it is carried out the development of the variables, in the theoretical assumptions, the construction of the sample and it is explained the methodology used. The fourth chapter presents the statistical analysis and empirical results, and finally, it is made a summary of the conclusions of the work and suggestions for future research are presented.

2.   Literature review

At present, the problems on the capital structure keep on debate and high qualitative importance as they can be seen in several studies, including the work of Cohn et al (2014), where the authors analyze the evolution of capital structure and the performance of the companies after their acquisition in the USA; Lin et al (2013), who study the relationship of the type of corporate structure with the type of business financing - bank debt or issuing of shares - in Asia and Western Europe; Rampini & Viswanathan (2013) who analyze the relation of the side in the capital structure of the companies and their leverage effect on debt levels in the United States of America (USA).

This theme was originally boosted by Modligliani & Miller (1958) originating, since then, a vast literature with relevant empirical and theoretical developments. These authors were based on a set of assumptions, such as: absence of taxes; absence of transaction costs to borrow or lend at the interest rate without risk; the absence of bankruptcy costs; the companies can only seek loans with risk or no risk; the issuance of debt is used to buy stocks, and whenever there is the issue of shares, this serves to repay debt; corporate earnings are fully distributed to shareholders; cash flows are perpetual and constant, and all market participants can anticipate the company's operating results.

In the context of an economy without taxes, these authors formulate two propositions: first, consider that the company's value is independent of indebtedness; in the second, consider that the cost of an indebted company equity equals the cost of capital of a not indebted company plus a risk premium. They consider, therefore, that the value of the company and the average cost of capital are unaffected by the capital structure of the company. In 1963, Modigliani & Miller added to the initial model, the effects of taxes on businesses and the possibility of tax deduction of finance charges, concluding that the company's value will be greater the higher the level of debt. This theory was challenged in several subsequent investigations, with successive deletions of the initial assumptions, yielding different theoretical perspectives on the determinants of capital structure of the companies: *trade-off* theory, *agency costs* theory, *pecking order* theory and *market timing* theory.

The theory of *trade-off* was developed by Kraus and Litzenberger (1973) arguing that the companies choose their optimal capital structure by by evaluating the revenue and costs, debt

and equity. These authors introduced bankruptcy costs in determining the value of the company. In research development, DeAngelo & Masulis (1980) argue that the companies aim to achieve the optimal capital structure considering the benefits and costs of debt compared to equity - the tax saving arising from the use of debt, combined with the costs of bankruptcy expected due to the increase in debt.

Myers (1984) argues that managers at the time of decision making weigh the benefits and costs associated with different financing alternatives and conclude that the companies increase their debt while increasing the tax benefits that, in turn, should increase the own company value. As the company increases debt, financial costs and the risk of bankruptcy (direct and indirect) also increase, eventually reaching the equilibrium (ie optimum point).

Bradley et al (1984) conclude that the level of debt is inversely related to the costs of financial risk, including the risk of bankruptcy and agency costs. Fama & French (2001) and Beattie et al (2006), supporting in the theory of the *trade-off*, determine the optimal level of debt, the interaction between benefits and costs, with the analysis of the effect of an additional unit of debt. More recently, Xu Jin (2012) relying on the same theory evaluates the effect of future expectation of return on the capital structure (in the debt) of domestic industrial companies in the United States, subject to increased import competition.

In another perspective, Jensen & Meckling (1976) developed the study of Modigliani & Miller (1963) and present the theory of *agency costs* that emphasizes the opportunity cost caused by the impact of debt on investment decisions of the company, on monitoring costs and control costs with the managers and agents and the costs of bankruptcy and reorganization. So, they feel that exists two types of agency costs: agency costs between shareholders and managers, and agency costs between shareholders and bondholders. The former are related to the control of management, as the owners of capital seek to ensure that managers act in accordance with their interests, and one of the measures is to increase the accountability of managers by increasing the level of debt in the company - increased debt decreases the funds available and the possibility of managers make investments without positive return or promote personal compensation (Sayilgan et al, 2006 and Grossman & Hart, 1982).

On the other hand, agency costs between shareholders and bondholders are reflected in expropriation of wealth from shareholders and their capacity to influence the management of

the company. The existence of agency costs caused by information asymmetry is considered important, and several studies argue that the fact that the investors have less information than the shareholders, it is verified the persistence of inflationary effect on the interest rate because the investor is more pessimistic (Cortez & Susanto, 2012).

Contrary to the assumptions of analysis of Modigliani & Miller (1963) as well as models of *trade-off* where i tis possible to establish a good relationship between debt and equity, and in a given level of debt, identify the tax benefits and bankruptcy costs, arises a new approach developed by Myers and Majluf (1984) that came to be known as the pecking order theory. This current does not admit the existence of an optimal capital structure or optimal level of debt, but that companies follow a hierarchical order of preference by types of debt - are first used internal resources available, and when these are insufficient, make use of to external funds (debt capital, subordinated debt, and last, issue of shares).

This order is justified by the absence of additional costs on internally generated funds. Additionally, Fama & French (2001) consider the existence of costs of hierarchical order as the costs of issuing shares and related costs to provide information to managers and, thus, to avoid problems with costs and asymmetric information, argue that the companies should start by financing with retained earnings and only then the debt in the market and, finally, with the issuance of capital.

The issue of capital may occur in two situations, without contradicting the theory: the first when the companies need reserves for future events not yet provided, as is admitted by Shyam-Sunder & Myers (1999); the second, when information asymmetry ceases to exist, even momentarily for any reason, encouraging companies to issue equity at a fair price, according to the scenario advocated by Myers (1984). Finally, Frank & Goyal (2004), supporting the study of Myers (1984) consider that the *pecking order* theory comes from the existence of asymmetric information between managers and investors, and is not established a great structure capital, concluding that exists three sources of business financing: retained earnings, equity and debt capital. These authors consider the possibility of company stock are incorrectly assessed by the market (under or overvalued) and, in a situation of undervaluation, the resource of issuance of shares to finance the company allows new shareholders to appropriating of a value higher than the fair.

More recently and with a new building on the capital markets approach, the study of Baker & Wurgler (2002) giving rise to the theory of *market timing* appears. More recently and with a new approach based on the capital markets, appears the study of Baker & Wurgler (2002) giving rise to the theory of market timing appears. These authors consider the capital structure of the companies as a function of the managers' options when looking to make the changes in the share price in the capital market and, thus, optimize the cash inflow - new issues of capital when the stock is overvalued and repurchase when the action is undervalued. The practice of *market timing* suggests that the choice of optimal moment to issue new shares is the decisive factor in the corporate financing strategy.

Funding decisions depend on factors external to the company - such as share appreciation in the market - dependent on the perceptions of the agents: positive or negative expectations of the investors will correspond to times when the company's shares are overvalued or undervalued, respectively. Companies seek to issue new shares when the market value is high relative to accounting value and historical value. The practice of *market timing* by the companies was evident in the work of Frankel & Lee (1998) and La Porta (1996) when they studied the growth opportunities and their relationship (inverse) to the profitability of actions and relationship with the expectation of investors. Finally, Aydogan Alti (2006) evaluates the effects of the market timing theory for the non-financial companies in the USA and confirms the negative correlation between debt and market overvaluation.

3.   Research design

This chapter is devoted to the underlying research model. First, we present a selection of the variables with respective definitions and theoretical support, then the hypotheses under study, as well as the expected sign. Finally, we describe the selection of the sample and the econometric model defined.

Variables

The dependent variable in the study is the level of indebtedness of the company. In the literature, we find several definitions for the level of debt incurred by industry characteristics and the specific market. Xu Jin (2012) and Rogão & Serrasqueiro (2008) identify the debt by the ratio of total liabilities over total assets. Rajan & Zingales (1995) and Harris & Raviv (1991) use the ratio of debt expressed by the total liabilities over total net assets, in which the total assets are purged of cash and other debtors.

Padron et al (2005) used a measure of market expressed in the ratio of the total liabilities over the market value of capital and Cortez & Susanto (2012) and Sayilgan et al (2006) basing on Gaud et al (2005), in the research on non-financial companies in Japan and Turkey respectively, use the ratio of total liabilities over total equity. In the present study, according to the theoretical arguments, the characterization of the market and the defined the model, we used the variable (LEV_A):

$LEV\_A_{i,t}$ = Total Liabilities$_{i,t}$ / Total Assets$_{i,t}$, of the company i in year t

The literature presents several determinants of capital structure. This paper analyzes the effects of six determinants of the capital structure in corporate debt: tangibility, profitability, other sources of tax optimization, size, growth opportunities and the market valuation of the company.

Tangibility

The tangible assets of the company are considered one of the main guarantees for the creditors, and the importance of these assets in the capital structure of the company has

increased relevance over the debt (Padron et al, 2005). Sayilgan et al (2006) and Gaud et al (2005) add inventories to fixed assets by considering that companies resort to borrowing, total or partial, for their funding and emphasize that in many situations inventories have significant value at the time of liquidation of the company. In this paper, we use the variable (TANG_I):

$TANG\_I_{i,t}$= Fixed Assets +Inventory$_{i,t}$/ Total Assets$_{i,t}$, of the company i in year t

Profitability

Titman & Wessels (1988) define the variable by the operating profit on the sales or operating income on the assets. Sayilgan et al (2006), Rajan & Zingales (1995) and Myers (1984) define the variable for the return on assets (ROA, calculated by the ratio of EBITDA over total net assets). At this paper is used the profitability variable (PROF):

$PROF_{i,t} = EBITDA_{i,t}$ / Total Assets$_{i,t}$, of the company i in year t

Other Sources of Fiscal Optimization

Musulis & DeAngelo (1980) characterize the tax optimization by depreciation and amortization when they do not consider the financial burden. In the study we use the interpretation of Cortez & Susanto (2012), Sayilgan et al (2006) and Titman & Wessels (1988) measured by the ratio of total depreciation and amortization over total assets (NTDS):

$NDTS_{i,t}$ = Depreciation and Amortisation$_{i,t}$/Total Assets$_{i,t}$, of the company i in year t

Dimension

The size of the companies is an indicator commonly used to explain the levels of debt and the ability of companies to obtain new financing on the market. Large companies have more stability, less volatility in cash flow and can exploit economies of scale (Gaud et al, 2005 and Graham et al, 1998).

The larger companies can get lower financing costs because they presented a lower risk of failure and the size is a good *proxy* for the probability of default (Rajan & Zingales, 1995). In the research have been used different indicators to represent the companies' size, the logarithm of net sales (Cortez & Susanto, 2012; Sayilgan et al, 2006; Gaud et al, 2005;

Titman & Wessels, 1988 and Rajan & Zingales, 1995) or the logarithm of total assets (Padron et al, 2005). In the present study, we use the following variable of company size (SIZE):

$SIZE_{i,t} = Ln \ Net \ Sales_{i,t}$, of the company i in year t

Growth opportunities

In the literature, the growth opportunities are related to new investments and the market valuation of the companies. Some indicators such as the ratio of the market value of the company over the total liabilities (Padron et al, 2005), the annual growth in total assets or total fixed assets of the companies (Cortez & Susanto, 2012, Sayilgan et al, 2006 and Titman & Wessels, 1988), the ratio of investment expenditure over total assets (Titman & Wessels, 1988), the ratio of market value over the accounting value of the assets (Gaud et al, 2005, Rajan & Zingales, 1995 and Myers, 1977) are considered suitable for measuring the effects of growth opportunities. In this paper, we use the variable (GRA):

$GRA_{i,t} = Annual \ Growth \ of \ Total \ Assets_{i,t}$, of the company i in year t

Market Valuation

The work of Baker & Wurgler (2002) proposes the *market-to-book* ratio as a *proxy* in the analysis of the relationship of the company with the debt *market timing* practice in the stock market and assess the impact of short and long term effects on the structure capital of the companies. The findings demonstrate the suitability of this ratio in the analysis of its effects on corporate debt and in order to test the theory of *market timing*, we use the variable (MTB):

$MTB_{i,t} = Market \ Value \ of \ Assets_{i,t} \ / \ Book \ Value \ of \ Assets_{i,t}$, of the company i in year

Where, market value of assets = total assets − common equity + market capitalization and book value of assets = total assets.

Hypotesis Development

Effect of tangibility on indebtedness

Cortez & Susanto (2012), Xu Jin (2012) and Rajan & Zingales (1995) supported in the theory of the *trade-off* and verify the positive relationship of tangible assets with indebtedness and with reducing the financial burden in the indebtedness due to the existence of higher guarantees from the assets. Companies in need of high fixed assets have greater financing needs and of other funders, so the level of debt tends to be higher (Rajan & Zingales, 1995 and Harris & Raviv, 1991).

Framed in the *pecking order* theory, Gaud et al (2005) confirm that tangible assets have a positive impact on management decisions on funding because they are less subject to the problems of information asymmetry and reduce credit risk (have greater value in the event bankruptcy) - the higher the tangible asset, the greater the indebtedness, because it serves as guarantee on the loan. In addition, Rampini & Viswanathan (2013) find a positive effect of tangible assets in corporate indebtedness.

For the theory of *agency costs*, debt has a disciplining role of managers because it reduces the cash flows available (Harris & Raviv, 1991 and Grossman & Hart, 1982) and tangible assets reduces agency costs because it allows to increase the level debt with in support in the collateral of these assets (Cortez & Susanto, 2012). According to the above theory, we evaluate the relation of tangible and inventories (Sayilgan et al, 2006 and Gaud et al, 2005) in indebtedness, with the hypothesis under study:

H1 - The tangibility has a positive impact on indebtedness

The effect of profitability on indebtedness

Fama & French (2002) develop a comparison between the theories of *trade-off* and of *pecking order* and conclude that companies with higher taxes, more profitable and with reduced volatility in profits, have a higher level of indebtedness.

The theory of *trade-off* considers the that business decisions on indebtedness are influenced by the benefits from tax savings and high levels of results influence the ability to obtain financing in the market, with expected positive relationship between profitability and debt

(Rogão & Serrasqueiro, 2008). Gaud et al (2005) argue that past earnings are a good *proxy* for the expectation of future profits concluding that the most profitable companies can increase access to finance due to the positive expectation in the fulfillment by the debtor (Sayilgan et al, 2006).

However, Jin Xu (2012) testing the postulate of the theory of *trade-off* in the USA market finds evidence of a negative relationship between profitability in indebtedness. Framed in the *pecking order* theory, Nakamura et al (2007) and Rajan & Zingales (1995) found evidence of a lower level of indebtedness in the most profitable companies justified by the fact that companies with high results prefer to use the internal resources to finance their projects.

Finally, in the theory of *agency costs*, the increase in indebtedness to shareholders provides mechanisms to monitor and control the problem of *cash flows* available, whereas the funding is a way to reduce the financial resources available and strengthen the accountability of managers in the development of new projects and not on percussion of individual goals (Jensen, 1986). Also, Grossman & Hart (1982) argue that *agency costs* can be reduced by reducing liquidity and dividends, just by raising indebtedness in the capital structure of the company and considering the information asymmetry, concluding that there is a positive relationship between profitability and debt.

Supported by the findings of several investigations in different markets and the postulated by the theory of the *Pecking Order*, we evaluate the hypothesis:

H2 - Profitability has a negative impact on indebtedness

The effect of other sources of tax optimization in indebtedness

The theory of *trade-off* considers the depreciation and amortization in fiscal management, as a direct replacement of the financial burden associated with indebtedness (Cortez & Susanto, 2012). Miguel & Pindado (2001) analyze the relation of depreciation and amortization with indebtedness as an alternative to financial charges, and conclude that companies with high levels of depreciation and amortization have a lower level of indebtedness in the capital structure.

On the other hand, Titman & Wessels (1988) obtained different conclusions because they could not confirm the relevance of the effect of depreciation and amortization on the debt.

Bradley et al (1984) confirm the positive effect in companies of specific sectors, with higher investments in assets, at the same time validate the negative relationship when classify companies with two-digit SIC code. Graham (2005) explains the positive relationship evidenced by the ratio of investment to profitability because profitable companies realize greater investments with recourse to external financing, verifying the existence of a positive relationship between depreciation and amortization with indebtedness. According to the theory and the conclusions in the work of Cortez & Susanto (2012), Sayilgan et al (2006) and Miguel & Pindado (2001), confirming the existence of the negative effect on the non-financial corporate sector in Japan, Turkey and Spain respectively, we evaluate the following hypothesis in the study:

H3 – A non-debt tax shields has a negative impact on indebtedness

The effect company size on indebtedness

The theory of *trade-off* sustains the positive relationship between size and the indebtedness of the company. Graham et al (1998) argue that large companies are less likely to bankruptcies, so that they can obtain financing more easily in the market and Sayilgan et al (2006) argue that large companies have government protection and / or market, allowing assume greater risk, boosting borrowing. Lopez-Garcia & Sogorb-Mira (2008) confirm the positive relationship in small and medium companies and the risk of bankruptcy relates inversely with the size. Jin Xu (2012) shows a positive relationship between the variable size of companies with financial leverage. Framed in the *pecking order* theory, Harris & Raviv (1991) consider the existence of positive relationship because large companies (with greater tangible assets) provide more information to market participants, obtaining therefore greater trust and openness to new funding from creditors.

The authors, Gaud et al (2005) argue that the expected size effect on the indebtedness is positive in companies choosing to resort to external financing, but if they choose the equity issue, the expected sign is negative. Finally, Cortez & Susanto (2012) and Titman & Wessels (1988) found a negative relationship between the level of debt and the size of companies, Baker & Wurgler (2002) found the positive relation between size and indebtedness, while Rajan & Zingales (1995) obtained inconclusive results despite most countries show a positive relationship between size and indebtedness, a negative relationship was verified in companies

of Germany. They concluded by the ambiguity of the effect of scale that justify the large companies to use a greater diversity funding sources (internal and external).

By the postulated by the theories of *trade-off* and taking into account the work of Sayilgan et al (2006) we will be studying the following hypothesis:

H4 - Company size has a positive impact on indebtedness

The effect of growth opportunities in indebtedness

The work supported by the theory of the *trade-off* consider that indebtedness in companies with high growth is lower because companies and creditors have a lower propensity for new loans - vulnerability, cost and risk associated with these projects have a higher uncertainty (Cortez & Susanto, 2012). Gaud et al (2005), Fama and French (2002), Rajan & Zingales (1995) and Titman & Wessels (1988) concluded the existence of a negative relationship between growth opportunities and debt levels.

On the other hand, Jensen (1986) supports on the theory of *agency costs* to conclude that the greater growth opportunities, the greater the indebtedness, in order to minimize *agency costs* between managers and shareholders because they use the debt to discipline managers. Framed in the *pecking order* theory, companies with high growth opportunities have need for large amounts of funding, encouraging managers to resort to external sources of capital and generate a greater return to creditors (Song, HS, 2005). Sayilgan et al (2006) found the positive relationship between growth opportunities and indebtedness in companies of Turkey. Thus, with the support of the exposed theoretical approaches, we evaluate the following hypothesis:

H5 - Growth opportunities have a positive effect on indebtedness

The effect of the appreciation of the company in the market on indebtedness

Baker and Wurgler (2002) find that companies tend to increase the funds available through new issues of equity when the market value is high, and companies increment indebtedness when its market valuation is low. Companies with high *market to book* reduce their level of indebtedness, while companies with low *market to book* tend to increase the indebtedness instead of using the capital market.

Rajan & Zingales (1995) conclude there is a negative relationship between growth opportunities - these expressed by MTB - and the indebtedness, arguing that companies resort to the issue of new shares to finance, especially when the company's market value is high (overvalued company) and, thus, reduce the level of indebtedness.

To test the theory of *market timing*, we evaluate the following hypothesis:

H6 - The valuation of the stock market has a negative effect on indebtedness

Table 1 - Definition of independent variables and expected signs

Hypotesys	Variable	Definition	Trade-Off Theory	Pecking Order Theory	Agency Costs Theory	Market Timing Theory	Expected Sign
H1	TANG_I	Tangible Assets plus Inventories / Total Assets	+	+	+		+
H2	PROF	Earnings before interest, tax and depreciation / Total Assets	+/-	-	+		-
H3	NDTS	Annual Depreciation Expense / Total Assets	-				-
H4	SIZE	Log (Net Sales)	+	+/-			+
H5	GRA	Percentage change in Total Assets	-	+	+		+
H6	MTB	Market-to-book (market value / book value)				-	-

Sample

The sample was constructed with support in the financial and market information available on Thomson Datastream, where there is a extensive historical financial information. The initial sample contains statistical data of 45 companies listed on Euronext Lisbon, with financial and market information, during the period 2005-2012.

From the initial database, we excluded three companies of the financial sector and insurance due to the specificity of their activity, accounting rules and type of debt and because a company does not have complete information for at least six periods. In the end, remains a sample of 41 non-financial listed companies, representing 11 industry sectors and 277 observations. Table 2 summarizes the statistical sample of the companies considered.

Table 2 – Business indu stry

Type of companies	Number of companies (Start)	Number of companies (End)
Wholesale trade	8	7
Retail trade	2	2
Construction and real estate	5	5
Electric power and gas	3	3
Hotel and restaurants	2	2
Manufacturer and machinery	10	10
IT and services	2	2
Sports institutions	3	3
Banks, securities and financing	3	0
Information and communication	6	6
Transportation	1	1
TOTAL	**45**	**41**

Methodology

The research hypotheses were tested using panel data by estimating the specific model represented as follows:

$$LEV\_A_{i,t} = B0 + B1*TANG\_I_{i,t} + B2*PROF_{i,t} + B3*NDTS_{i,t} + B4*SIZE_{i,t} + B5*GRA_{i,t} + B6*MTB_{i,t} + U_i + V_t + E_{i,t} \qquad (3.1)$$

Where "i" represents the individual companies and "t" the year, we added the *dummy* variables, "U" and "V", incorporating the fixed effects of the companies (cross-section) and of the years (time series), respectively; "E" represents the error of the model designated as disturbance term. We estimate by the method of least squares (OLS) with fixed effects, applied to the panel data and admit the existence of fixed, unobservable effects for the companies, individually, and for years (details attached).

The panel data method is developed in order to determine the type of relationship of the determinants of capital structure in corporate debt. The hypotheses are confirmed when obtaining significant results and coefficients with the sign in accordance with the expectation formulated theoretically.

Finally, and considering the fixed effects obtained in the time series, it was decided to divide the sample into two sub-samples, the first covering the period from 2005 to 2008 and the second for the period 2009-2012, in order to evaluate the changes occurred and we identify the effects of the financial crisis on the determinants of capital structure of the companies. The use of panel data models, static sectionals through linear multivariable regression

assumes the exogeneity of the independent variables and the COV (Xi, Ei) = 0 (Lopez-Garcia & Sogorb-Mira, 2008).

Estimation method of the evaluation

In assessing the choice of method with fixed or random effects is done the Hausman test to analyze the possible existence of correlation between unobservable individual effects and the explanatory variables.

Table 3 – Additional test to the method

	Random effects
Hausman (χ^2)	13.239039**

*, ** and *** denote coefficents significance at 10%, 5% and 1% levels, respectively

By the results explained in Table 3, it is concluded, with a 5% level of significance, there is a irrelevance of correlation between unobservable individual effects and the explanatory variables, and thus the most appropriate way is to estimate the determinants of the relationship with indebtedness through the model with fixed effects.

4. Empirical results discussion

The empirical results are presented in this chapter. Initially the information of the descriptive statistics and the correlation matrix between the variables is presented. Subsequently, the statistical results are analyzed, evaluated and findings based on the theory and expectations considered.

Univariate analysis

The information on sales is taken to its logarithms. to make the effect of the linear variable dimension. The variable that captures the growth opportunities is the percentage of annual variation; the remaining variables are fractional, in terms of total assets or in terms of book value, in the case of the *market-to-book* ratio. The descriptive statistics of the variables included in equation (3.1) are exposed in Table 4 and Table 5 presents the correlations between variables. Variables, TANG_I, PROF, NTDS have average values of approximately 41.08%, 8.33% and 4.68%, respectively, of total assets.

The market valuation is approximately 117% on average book value of the companies. In the reporting period, the assets of companies grow approximately 5.7% on average. The variables are, generally, one standard deviation below its mean (except in variable GRA) and we conclude there is a reduced volatility of the observations. The difference between the maximum and the minimum is not relevant. Additionally we can conclude by the existence of companies in over indebtedness (greater than 1 LEV_A).

Table 4 – Descriptive statistics

Variable	Mean	Median	Maximum	Minimum	Std. Dev.	Observations
TANG_I	0,410827	0,452338	0,816557	0,000810	0,226705	277
PROF	0,083394	0,091294	0,276657	-0,252756	0,075734	277
NDTS	0,046828	0,037772	0,157583	0,001119	0,034424	277
SIZE	12,601910	12,744570	16,741040	7,354362	2,090741	277
GRA	0,057004	0,015044	2,677112	-0,520783	0,277065	277
MTB	1,170523	1,060053	3,926573	0,481767	0,462060	277
LEV_A	0,426514	0,417451	1,504635	0,000000	0,205097	277

The analysis of correlations between the independent variables shows that there are no problems of collinearity. As the coefficients are, generally, less than 0,30 the correlation is not

high so it is not a serious problem (Aivazian et al, 2005). It can be seen that the explained variable (LEV_A), in the sample used, has a positive correlation with NTDS, MTB and GRA and a negative correlation with TANG_I SIZE and PROF.

Table 5 – Pearson correlation coefficients between variables

	TANG_I	PROF	NDTS	SIZE	GRA	MTB	LEV_A
TANG_I	1,000000						
PROF	0,096205	1,000000					
NDTS	0,008740	0,176464	1,000000				
SIZE	0,257010	0,370530	0,027001	1,000000			
GRA	-0,053095	0,066898	-0,089672	0,092532	1,000000		
MTB	0,062657	0,355856	0,246716	0,235805	0,064162	1,000000	
LEV_A	-0,029088	-0,324554	0,203907	-0,196530	0,004200	0,039363	1,000000

Multivariate results

Equation (3.1) is calculated for explaining the measurement of the selected indebtedness in this investigation. The results obtained from the fixed effects model are presented in Table 6. We conclude by the relevance of the model given the results obtained in the F, test with a 1% significance level. Table 7 summarizes the results and we can verify the consistency with prior expectation, with some exceptions. It is found that when the company's operating results increase by 100 bps (bases point), the company reduces debt by about 43 bps (bases points) and a variation of the asset has an effect of 5 bps (bases points) in the same sense in indebtedness.

The coefficients of profitability and growth opportunities are statistically significant at 1% and 5%, respectively, and have the expected signs and, therefore, the underlying hypotheses (H2 and H5) are validated. Validation of H2 is according the results obtained in Cortez & Susanto (2012), Rogão & Serrasqueiro (2008), Sayilgan et al (2006), Gaud et al (2005), Frank & Goyal (2004) and Miguel & Pindado (2001) and the validation of H5 is according to the result obtained by Sayilgan et al (2006) for non-financial companies in Turkey.

Table 6 – Equation (3.1) estimation results I

Variable	Expected Sign	2005 - 2012
TANG_I	+	0,103225 (1.458128)
PROF	-	-0,42983*** (-3.431451)
NDTS	-	3,088476*** (4.749085)
SIZE	+	-0,014262 (-0.575214)
GRA	+	0,054899** (2.203533)
MTB	-	0,02049 (0.841173)
Number of observations		277
F statistic		18.18936***
R^2		0,808522

This table reports OLS estimation results os equation (3.1), as well redundant fixed effects tests. *, ** and *** denote coefficents significance at 10%, 5% and 1% levels, respectively. Values below coefficients are corresponding t-statistics. The panel sample covers the period from 2005 to 2012. Consult the table 1 for variable definitions.

The 100 bps (bases points) increase in NTDS is related to an increase of 309 bps (bases points) in indebtedness and the NTDS variable is statistically significant at 1%, however, the coefficient has a positive sign, contrary to the theoretical expectation, so that does not validate the H3. The same conclusion was obtained by Bradley et al (1984) justifying the result by the interconnection of amortization and depreciation for investments in tangible assets, in harmony with the Portuguese economic reality, in a stage of development and modernization.

Table 7 – Comparison of the test results with the expectations theories I

Variable	Trade-Off Theory	Pecking Order Theory	Agency Costs Theory	Market Timing Theory	Expected Sign	Results 2005-2012
TANG_I	+	+	+		+	+
PROF	+	-	+		-	-***
NDTS	-				-	+***
SIZE	+	?			+	-
GRA	-	+	+		+	+**
MTB				-	-	+

*, ** and *** denote coefficents significance at 10%, 5% and 1% levels, respectively

This result was also verified by Song HS (2005) when explains that the short term indebtedness is suitable for structural characteristic of the indebtedness of Portuguese companies. The variables of tangibility, size and market-to-book are not significant and our model did not confirm H1, H4 and H6 hypothesis.

The R2 is situated approximately at 80.85%, meaning that our model has an explanatory capacity of about 80% of the variation in corporate debt. The results show the supremacy of the *pecking order* theory in the choices of managers regarding the capital structure of the companies. Fixed effects in the period and the cross-sectional data in all the evaluations, in order to consider the companies individually controlled and the specific effects of each year were included.

Financial crisis effects analysis

It is intended now to evaluate the impact of financial crisis on the determinants of capital structure of Portuguese companies. The answer has been achieved with the development of research by splitting the sample into two periods (before and after 2008) and in the evaluation of empirical evidence obtained (Table 8). Table 9 presents a summary of the results, with some interesting conclusions. Evidence of the relevance and persistence of the *pecking order* theory, revalidating the significance of profitability variable at a level of 5% significance level and by the maintenance of the negative sign of the coefficient.

Table 8 – Equation (3.1) estimation results II

Variable	Expected Sign	2005 - 2008	2009 - 2012
TANG_I	+	0,148248 (0.870863)	0,170931** (2.262815)
PROF	–	-0,313909** (-2.377269)	-0,417606** (-2.323114)
NDTS	–	0,517456 (0.472131)	1,456597 (1.534897)
SIZE	+	-0,022064 (-0.429534)	0,005353 (0.188771)
GRA	+	0,063642** (2.398915)	0,069014 (1.433504)
MTB	–	-0,10934*** (-3.604427)	0,206216*** (4.986021)
Number of observations		116	161
F statistic		16.66825***	26.34627***
R^2		0,922729	0,920826

This table reports OLS estimation results os equation (3.1), as well redundant fixed effects tests. *, ** and *** denote coefficents significance at 10%, 5% and 1% levels, respectively. Values below coefficients are corresponding t-statistics. The panel sample covers the period from 2005 to 2012. Consult the table 1 for variable definitions.

The effects of the financial crisis are relevant in the *market-to-book*, evidenced by the statistical significance at 1% and by changing the sign of the coefficient, which negative, in the period before the crisis, to positive post-crisis. The theory of *market timing* is validated in the period before the crisis where the variation of 1% in MTB is related to the decrease of 0.1% in indebtedness, validating H6.

Table 9 – Comparison of the test results with the expectations theories II

Variable	Trade-Off Theory	Pecking Order Theory	Agency Costs Theory	Market Timing Theory	Expected Sign	Results 2005 – 2008	Results 2009 – 2012
TANG_I	+	+	+		+	+	+**
PROF	+	-	+		-	-**	-**
NDTS	-				-	+	+
SIZE	+	?			+	-	+
GRA	-	+	+		+	+**	+
MTB				-	-	-***	+***

*, ** and *** denote coefficents significance at 10%, 5% and 1% levels, respectively

Evidence of the relevance and persistence of the *pecking order* theory, revalidating the significance of profitability variable at a level of 5% significance level and by the maintenance of the negative sign of the coefficient. The effects of the financial crisis are relevant in the *market-to-book*, evidenced by the statistical significance at 1% and by changing the sign of the coefficient, which negative, in the period before the crisis, to positive post-crisis. The theory of *market timing* is validated in the period before the crisis where the variation of 1% in MTB is related to the decrease of 0.1% in indebtedness, validating H6.

In the post crisis period, there is a reversal of the sign of the coefficient, thus, when the MTB decreases by 100 bps (bases points), debt accompanies at 21 bps (bases points), which can be explained by the simultaneous effects of the credit crisis and the devaluation of the stock markets.

Another important result in the post crisis period is verified on TANG_I variable with statistical significance at 5% and positive sign; it reflects its positive relationship with debt and confirms H1.

The results obtained after the crisis for the variables profitability, tangibility and *market-to-book* show great caution in granting credit, the shortage of capital available in the market and the profound crisis affecting the capital markets.

5.   Conclusion

There are multiple studies on the effects of the determinants of capital structure in corporate debt. Empirical studies on the determinants of capital structure have shown the relevance of these factors in the decision making of managers, when they have to perform options on financing activity or new projects (internal or external resources and funding in the short, medium or long period). This paper aims to highlight the choices made by non-financial Portuguese companies, listed on stock market, regarding how to finance their needs preconized by their managers.

The group of variables used by Cortez & Susanto (2012), with the adjustment proposed in its tangibility by Sayilgan et al (2006) and with the introduction of the company's valuation in the market of Baker & Wurgler (2002), can explain the level of indebtedness of the companies expressed in the value of the F statistic and R2. We used the models with fixed effects and a panel data for a sample of non-financial Portuguese companies, listed on stock market, in the period 2005 to 2012 (277 observations). The equation of the model includes the variables of the determinants represented of tangibility, profitability, other sources of tax optimization, size, growth opportunities and market valuation. Additionally, the sample data was subdivided to capture the effects of the determinants from the financial and capital market crisis.

The estimation results show the supremacy of the *pecking order* theory, in the choices of managers, with relevance and significance in the determinants of profitability (-) and growth opportunities (+) as main factors of corporate debt. Additionally, the changes in the determinants of market valuation and tangibility are highlighted, as the main effects of the financial crisis in the period under analysis; statistical tests can validate hypotheses H2 and H5. However, with the division of the sample, it was possible to validate H6 in the period before the crisis and H1 in the post crisis period.

This research has some limitations; First, the sample is reduced due to the size of the business market in Portugal (listed on the stock market, non-financial), so it may be important to expand the criteria for the sample selection and to develop the study by industry; then, the specific fixed effects of companies and years can have a significant importance in the results, and may be relevant to include additional information representative of the specificities of the

market in question (eg, activity sector, macroeconomic conditions or corporate structure); Finally, the results of this study should be used with caution in comparison with other works of a similar nature but which use specific and different variables, with different samples of quite different contexts of the Portuguese.

In future research, with the development of these limitations, we can improve the understanding of the determinants of capital structure on indebtedness. Additionally, the results obtained in the MTB variable in the period before and after the crisis, may allow developments of new analysis on the dynamics of the capital market and the addition of the liquidity risk in the capital structure of the companies. Nevertheless, this work opens the way for understanding the relevant determinants and effects of the financial crisis, in the management of financing options by Portuguese companies.

6.   References

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7.   Appendix

Table 10 – Fixed effects information - Time series

	DATEID	Effect
1	2006-01-01	-0.025673
2	2007-01-01	-0.016384
3	2008-01-01	0.001355
4	2009-01-01	-0.008296
5	2010-01-01	0.004758
6	2011-01-01	0.024787
7	2012-01-01	0.019453

Table 11 – Fixed effects information – Cross-section

	EMPRESA	Effect
1	ALTRI SGPS S.A.	0.33594
2	CIMENTOS DE PORTUGAL	0.06560
3	CIPAN-ANTIBIOTICOS	-0.17919
4	COFINA SGPS, SA	0.40735
5	COMPTA-EQUIPAMENTOS	0.32958
6	COPAM-PORTUGUESA SA	-0.31842
7	CORTICEIRA AMORIM	-0.08177
8	EDP - ENERGIAS DE	0.07488
9	ESTORIL-SOL, SA	-0.05398
10	F. RAMADA INVES	0.25888
11	FUTEBOL CLUB PORTO	-0.18344
12	GALP ENERGIA	-0.08261
13	GLINTT GLOBAL	-0.09507
14	IBERSOL SGPS SA	-0.11889
15	IMOBILIARIA GRAO, SA	0.05565
16	IMPRESA SGPS SA	0.19368
17	INAPA-INVESTIMENTOS	0.33601
18	JERONIMO MARTINS SA	-0.17031
19	LISGRAFICA - ARTES	0.12691
20	LITHO FORMAS SA	-0.33940
21	MARTIFER SGPS, S.A.	0.03312
22	MOTA-ENGIL SGPS SA	0.10422
23	NOVABASE SGPS SA	-0.25499
24	SOC. COMERCIAL O ANTUNES	-0.01424
25	PORTUCEL SA	-0.08852
26	PORTUGAL TELECOM SA	0.06732
27	REN - REDES ENER	0.14981
28	SAG GEST - SOLUCOES	0.19783
29	SEMAPA-INVESTIMENTOS	0.01347
30	GRUPO SOARES DA COSTA	0.13727
31	SONAE CAPITAL	-0.00573
32	SONAECOM SGPS S.A.	-0.23600
33	SONAE INDUSTRIA	0.01068
34	SONAE SGPS SA	0.06181
35	SONAGI SGPS SA	-0.12954
36	SPORT LISBOA E BENFICA	-0.03314
37	SPORTING CLUBE DE PORTUGAL	-0.15056
38	SUMOL COMPAL SA	0.02618
39	TOYOTA CAETANO	-0.20270
40	VAA-VISTA ALEGRE	-0.20711
41	ZON OPTIMUS SGPS SA	-0.06046