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"Capital Structure Determinants According to Risk Periods in Shipping Companies"

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ΧΙΟΣ

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Διπλωματική Εργασία για το Μεταπτυχιακό Πρόγραμμα
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ΧΙΟΣ

Preface

This particular research was developed under Professor Theodore Syriopoulos' supervision who I deeply thank for his guidance, his patience and of course his precious knowledge.

I cannot but to thank Professors Ioannis Theotokas and Ioannis Lagoudis, whose help and contribution was really precious, too.

Finally, I want to thank my friends and family for their support during all this period. I really appreciate it all.

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Summary

This thesis consists a research about capital structure determinants according to risk periods in shipping companies. Shipping industry is of eminent importance, because it is, undoubtedly, a global industry with a characteristic cyclical behavior and a variety of special characteristics that constitute and influence its performance. Through this project we want to study what kind of financing do these companies use and how are they affected according to capital structure theories. At first we are going to analyze different projects on capital structure some of which are focused on companies of other business sectors and some other projects that are about shipping industry. Each one of them though focuses on different factors and sets variables accordingly.

We chose five basic ones and we studied them in relevance to debt in our research which is the dependent variable. These five determinants or our five independent variables are assets, size, growth, profitability and risk, the latter consists the innovative+ part in comparison to other similar researches. Risk is a variable difficult to measure and interpret, especially in cyclical shipping sector. Our sample consisted of 48 listed shipping companies for the period 2006 - 2016.

Capital Structure theories used are trade – off, pecking order, agency and asymmetry of information. Then follows the econometric model and its analysis in order to interpret and compare our results to relevant researches and assumptions. The econometric part though is analyzed in relevance to pecking order and trade – off theories, with some references on agency theory and asymmetry of information.

Literature review was the basic pillar of analysis and interpretation of our hypotheses and results. In some cases our results came in accordance to our hypotheses and literature review while in some other did not.

Although, during last 50 years many researchers have investigated the optimal capital structure mix it seems that they did not have specific results, so this research intents to contribute to this effort effectively. Myers (2001) about this says in his academic research that there is not really a specific optimal structure mix for all cases (one-size-fits-all) but he believes that some basics from each theory help management team handle each situation separately.

Then follows conclusion and propositions of possible future research. For example a similar research could have a closer investigation in smaller risk periods, maybe three months or six months in order to have better results.

Keywords: Shipping, Finance, Risk, Capital Structure, Modigliani and Miller Approach, VaR

Introduction

The objective of this particular project is to examine the Capital Structure Determinants According to Risk Periods in Shipping companies. Shipping companies are involved in about 90% of global trade, no one can argue that shipping industry is a very interesting, for the international economy, sector to investigate as far as the quantities of goods transferred by shipping are huge.

In this case, we want to observe the way that these companies along with their cyclical economic behavior handle their capitals, referring to globally listed shipping companies. Talking about capital structure decisions we refer to the magnitudes of liabilities and owners' equity.

A number of theoretical and empirical studies investigated the optimal capital structure of a firm. These studies pointed out the importance of the relationships among capital structure, asset structure, firm size, growth opportunities, profitability and risk. According to researches, for the shipping industry, more than 80% of all external funding needs have been covered by debt financing. This is why we used debt as dependent variable, to examine the influence of the five independent variables on that.

The two basic theories that this research is based on are, Trade-off and Pecking order, which consist a modern version of Modigliani and Miler approach; Modigliani and Miller (MM) approach which has its roots in 1950s, advocates capital structure irrelevancy theory. Although, we make a quick reference to agency and asymmetric theory but our model is based on the other two.

At first, we are going to analyze each financial definition used in this research and of course each version of the theories. We are going to introduce each variable of our economic model and a sample of companies used for the results. This research depicts the most influential ratios and indicators and company's speed of adjustment demonstrating the importance of capital structure decisions for financial sources.

Talking about capital structure decisions we refer to three financing decisions – investment, financing, and dividend decisions – finance managers have to make (Van Horne and Wachowicz, 1995).

Research has been based on determinants in relation to the trade-off and pecking order theories, with a range of studies to confirm this, such as Flannery and Rangan (2006), Triantafyllou, Laios (2015), Arvanitis, Tzigkounaki, Stamatopoulos and Thalassinos (2012), Drobetz, Gounopoulos, Merikas and Schrod-er (2013), Merika, Theodoropoulou. These theories though come to oppose to conclusions between leverage and each of the determinants, so empirical evidence is mixed.

Under the trade-off hypothesis, the optimal financing policy is consisted in making adjustments toward the optimal debt level or we could say the target debt level provided that deviation costs exceed adjustment costs. The target leverage ratio is a point of balance between the marginal tax benefit with the marginal financial distress cost of debt.

Under the pecking order hypothesis, which is based on informational asymmetries we have that information about investment policy which in turn affects the firm value is not equal for managers and shareholders. Often, selection discount leads to rejecting positive net present value projects.

Under the agency hypothesis, firms also face financial distress costs, but the level of debt becomes a governance device due to informational asymmetries and divergences in the utility functions of stakeholders. We are not going, though, to further analyze the agency hypothesis, it is just a basic one to mention.

The least sensitive financing source is firstly exhausted according to the resulting, which means internal financing, then debt and, as a last resort, equity. On the contrary, a low or negative discount leads to favoring the most sensitive financing source, which is external equity. It is really difficult to document specific effects relating to one of the three hypotheses because a significant impact of a given proxy is often consistent with several theoretical explanations.

Until lately, capital structure was not of main importance for the financing of the shipping companies so this study aims to contribute this way to the literature investigating each factor separately for a representative sample of companies.

There is no perfect world and the current crisis along with taxation, agency costs, bankruptcy distress have caused uncertainty to companies which strive to find the optimal capital structure choice in these imperfect markets.

Debt capital has been the main source of external financing for shipping companies, this is the reason we relate the capital structure determinants to the debt. For them financing is vital, but what we want to know is the circumstances under which it is done and the factors that influence the final decision, because when the internal financing is not enough debt helps the companies invest and robust their activities. The tax advantage of debt motivates the optimal capital structure theory, which implies that firms may attain optimal capital structure and increase firm value by altering their capital structures. Bankruptcy and financial distress costs (Myers, 1977) and agency costs (Jensen and Meckling, 1976) constitute the basics of trade-off theory. Further analysis is following.

CHAPTER 1

Shipping Industry

1. Shipping Industry

Shipping industry is a very ancient way of transporting goods or passengers. It has developed and expanded significantly through decades and has passed through different socioeconomic phases. It could not stay unaffected. Each era had its impact on shipping and as we have to do with a global market, influences from all around the world created different conditions and obstacles that had to overcome every time.

I believe that Mr. Rudyard Kipling could not be more precise when in an only three - words moto gave expression to something that is very true for every nation, "Transportation is Civilization". Anyone could doubt it though, but the truth is that any nation could not have done it on its own. We often hear about the desirability of nations being "self-sufficient" but in reality the term can be used only in a very limited sense. Even if it was possible for agricultural products under the appropriate climatic conditions to grow, no form of economic policy will enable any nation to raise coal, iron, copper, tin, or manganese where nature has not chosen to put them, or to grow cotton, tea, or rubber where the conditions of soil and climate are unsuitable. The truth is that the original country of any product is actually the original producer and without having something to transport or sell there were neither transportations nor marketing. Nevertheless, a very large proportion of products would be useless if there were not the means of transport to take them beyond the limits of the production area. Except of products, though, they started sharing ideas, innovations, culture and of course staff that come along with all the above. Anyone can imagine the contribution of shipping in the whole world.

Greece has a very special bond with shipping. Some of the most important personalities of this industry come from Greece and no one can dispute about our big love, the sea! Our devotion and dedication to the sea is indisputable from the very first trip until today. A big part of our economy is based on this industry.

Nowadays, new methods of transport and different fuels with lower environmental impact are used, port facilities and policies support new activities, automated ships and ports, cybersecurity and blockchain have passed shipping sector in a new era of evolution and development, based on technology and environmental policies.

The question that arises from all the above is how the shipping companies can handle all these? Does the State finance them? In case there is no policy to finance how do they manage to self-finance? Do these innovations influence positively or negatively their performance?

Shipping companies do really need to evaluate and base their activities on technology, always in accordance to environmental policies, they cannot avoid that if they want to remain competitive. They also need to build ships that comply with regulations and can support new technology and their needs, so they need to find ways of investment and financing. Is their equity enough for that? Do they need debts? According to researches, for the shipping industry, more than 80% of all external funding needs have been covered by debt financing, which we are going to analyze later.

1.2 Need for Capital Structure Analysis

It is well known that the ultimate goal of any organization is to maximize the wealth of the shareholders by generating greater amounts of profit, which cannot be managed without managing costs efficiently; Always aiming for a sustainable and consistent growth in profits.

Capital structure consists the simplest term to refer to the proportion of debt and equity that represent the total capital of the business which is required to fund the investments and day to day operational activities.

Therefore, companies must be careful to employ such proportion of debt, the cost of which does not outweigh the returns on investments, consequently leaving a greater chunk of returns for the shareholders. That kind of analysis is considered as "Capital Structure Analysis". This kind of analysis is, obviously, the same such for small businesses as for huge corporations. We consider a capital structure ideal when it balances the risk and returns, seeking to maximize the price of the stock while minimizing the cost of capital.

CHAPTER 2

Capital Structure

2.1 Capital Structure Definition

Capital Structure is the combination of long-term liabilities and equity of a company and it shows us if the activities of that company are financed from long-term sources. Financial Structure, though, is the combination of liabilities, long-term and short-term, and equity of a company.

So we have the following:

Financial Structure – Short-term liabilities = Capital Structure

It is worth mentioning, at this point, that the distinction between Financial Structure and Capital Structure is not approved by everyone and some use capital structure exactly for the same reason as financial structure; in other words they do not include the notion of short-term liabilities in capital structure. For this particular project we will consider it the same and we are not going to focus on this distinction, it could be though a proposal for a further research.

The existence of the ultimate capital structure is a little controversial, we are not sure if there really is an optimal capital structure but every company strives for that. Management team focuses on the optimal capital structure and tries to succeed it, which means that tries to find a perfect combination for equity and liabilities that maximizes the value of the company or minimizes the total cost of capital. Most common methods used for this determination is EBIT-EPS analysis and different financial indicators.

More specifically, EBIT-EPS analysis investigates the impact that alternative methods of financing may have at earnings per share (EPS) under different possible earnings before interest and tax (EBIT) that the company could have. At this point, we should note that the basic disadvantage of this method is that it takes no consideration at the impact of debt on the cost of capital. It only examines, this way, earnings before interest and taxes no matter what their volatility could provoke, meaning the risk.

As we said before, the other possible method is that of financial indicators. More often used are the followings: long-term liabilities / total liabilities, long-term liabilities / equity. Usually companies calculate these indicators under different possible scenarios of financing and compare them with existing indicators of the company and of course always in relevance with the sector that the company belongs, in our case, with the shipping sector. This determines the optimal choice of the capital structure.

2.2 Financing and Value of the company

Capital Structure Theory studies if the company can influence share value, changing the composition of sources of long-term financing. Long term financing could originate from two basic sources of capital, internal and external. Referring to internal we mean retained earnings and with the term of external sources we obviously refer to debt.

Long-term financing includes bank loans and bonds, where the company has the obligation to pay for interest and the initial capital no matter what the earnings are in financial statement or if there even exist. In case that the company does not have the ability to pay all the above, we say that is in financial distress and could be led to bankruptcy. Using loans and bonds as a basic method of financing is called leverage. Most financial managers believe that debt to equity ratio has great impact on the total cost of capital, which means the total value. On the other hand, financing based on equity does not include the same difficulties and risk.

In general, capital structure is a very controversial topic, one of the most difficult to give a specific answer in Financial Management. Economists have developed different theories in their effort to contribute decisively to an optimal capital structure mix. A very prominent effort is that of Modigliani Miller, who proved that, under specific circumstances, company value is independent of what kind of financing uses.

In fact, these hypotheses of MM do not really exist in a real world, but MM theory is considered to be a great achievement in Finance and consisted the very first step to the development of a sequence of capital structure theories. On the next chapter follows an analysis of Modigliani and Miller theory and some other ones.

CHAPTER 3

Capital Structure Theories

3.1 Traditional Approach

The traditional approach to capital structure suggests the existence of an optimal debt to equity ratio where the overall cost of capital is considered to be at the minimum and market value of the firm at the maximum. On any side of this point, changes in the financing mix can bring either positive or negative change to the value of the firm. Before this point, the marginal cost of debt is lower than cost of equity and after this point happens the opposite. We could say that when the company has not exceed the limits of loan charges, shareholders should choose debt as a financing source. All the above, declare that the appropriate use of debt has impact on the increase of company value and the opposite on the decrease of total company cost.

One popular alternative to traditional capital structure theory is the Modigliani and Miller (MM) approach that has two central propositions. The first assumes that capital structure and company value have no direct correlation; instead the firm value is dependent on expected future earnings, while the second proposition asserts that
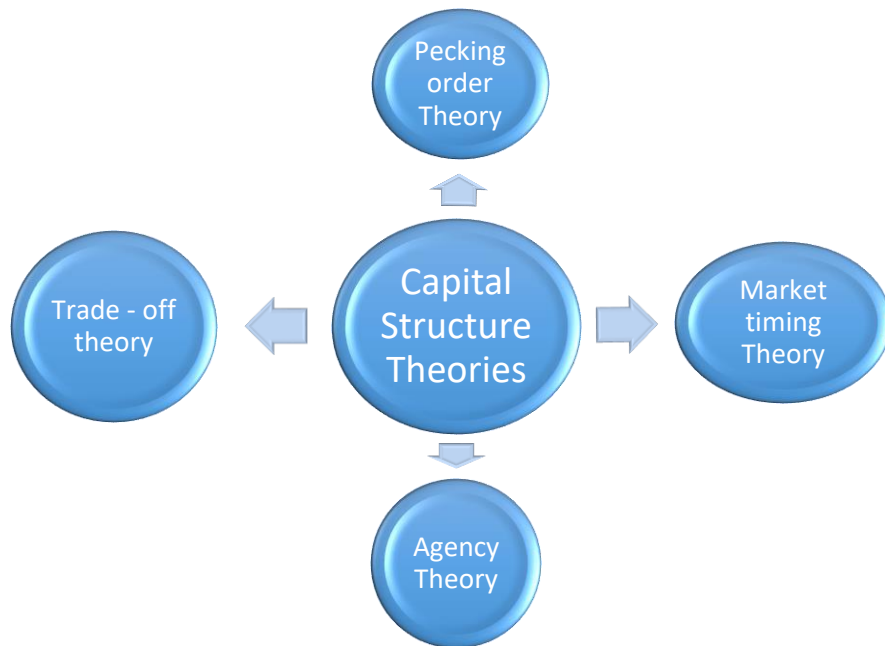
financial leverage increases expected future earnings but not the value of the firm. This is because leverage-based future earnings are offset by corresponding increases in the required rate of return.

3.2 Modigliani and Miller Approach

This approach was developed during 1950s and its fundamentals resemble that of Net Operating Income Approach, which you can see at the following chart:
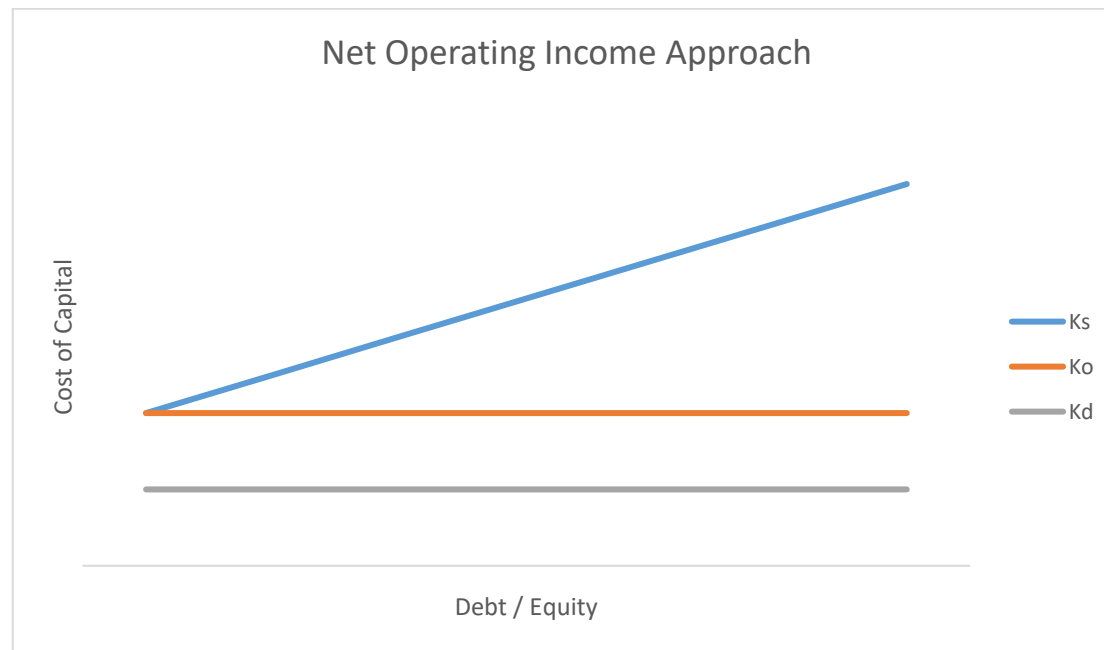
Presentation of Net Operating Income Approach

Where,

Ks: Cost of Shareholders' Capital

Ko: Weighted Average Cost of Capital (WACC[1])

Kd: Cost of Debt

The chart clearly shows that Weighted Average Cost of Capital (WACC) of both Debt and Equity of a company remains stable no matter what kind of financing the company will choose.

MM suggests that the valuation of a firm is irrelevant to the capital structure of a company, whether a firm is highly leveraged or has lower debt component in the financing mix, it has no bearing on the value of a firm. Moreover, it is stated that the market value of a firm is affected by its future growth prospect apart from the risk involved in the investment. Market value of the company is high and hence its stock price would be high, if this company has high growth prospect. If investors do not see attractive growth prospects in a firm, the market value of that firm would not be that great.

3.2.1 Assumptions of Modigliani and Miller Approach

MM approach assumes that:

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[1] Weighted average cost of capital (WACC) is a calculation of a firm's cost of capital in which each category of capital is proportionately weighted. All sources of capital, including common stock, preferred stock, bonds and any other long-term debt, are included in a WACC calculation. A firm's WACC increases as the beta and rate of return on equity increase, because an increase in WACC denotes a decrease in valuation and an increase in risk.
To calculate WACC, multiply the cost of each capital component by its proportional weight and take the sum of the results. The method for calculating WACC can be expressed in the following formula:

Formula for Weighted Average Cost Of Capital (WACC): WACC = E/V * Re + D/V * Rd * (1 – Tc)
Where: Re = cost of equity, Rd = cost of debt, E = market value of the firm's equity, D = market value of the firm's debt,
V = E +D = total market value of the firm's financing (equity and debt), E/V = percentage of financing that is equity, D/V = percentage of financing that is debt, Tc = corporate tax rate
www.investopedia.gr

- There are no taxes.

- Transaction cost for buying and selling securities as well as bankruptcy cost is zero.

- There is a symmetry of information, which means that an investors will have access to the same information that a corporation would and investors' behavior would be rational.

- The cost of borrowing is the same for investors as well as companies.

- Debt financing[2] does not affect companies EBIT.

- Companies with the same level of business risk belong in one category, homogeneous risk class. Business risk is measured by standard deviation of earnings (SDe) to earnings before interest and taxes (EBIT).

- All investors have homogeneous expectations as it has to with future earnings and risk.

- All companies expect earnings before and after taxes to be stable and bonds to be perennial, which means that they assume zero level of growth.

- There exist perfect capital markets, which means: (a) investors and companies can lend and borrow money with the same interest, (b) there are no transaction costs, (c) there is no agency cost and / or financial distress.

- The cost of a loan for an investor or a company is the same for the interest in case of no potential risk and there is no fluctuation during all loan period.

According to MM assumption, total cost of capital of a company remains stable. This happens because the increase of earnings and share dividends that comes from debt increase, is totally balanced from the cost shareholders' capital increase cause to risk taken.

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[2] Debt Financing is a means of borrowing money from retail or institutional investors. Such funds are raised through the issue of bonds, bills or securities in consideration for coupon or interest payments. The funds raised through debt no not form a part of the permanent capital structure of the firm. (www.efinancemanagement.com)

We come up with the following assumption according to MM theory, the value of a firm that has a mix of debt and equity, a leveraged firm, is the same as this of a firm which is wholly financed by equity, meaning an unleveraged firm, under the assumption of operating profits and future prospects being the same.

3.2.2 Modigliani and Miller Approach: Two propositions without taxes

Proposition 1

Under the MM proposition 1 we have that leveraging the company does not automatically increase the market value of that company, under the assumption of "no taxes". It is also suggested that, debt holders in the company and equity shareholders have the same priority i.e. earnings are split equally amongst them.

Proposition 2

Under the MM proposition 2 we have that financial leverage is in direct proportion to the cost of equity[3]. This means that, with an increase in debt component, the equity shareholders perceive a higher risk for the company. Hence, in return, the shareholders for the risk taken expect a higher return, thereby increasing the cost of equity. A key distinction here is that under proposition 2 is assumed that debt-shareholders have upper-hand as far as the claim on earnings is concerned. Thus, the cost of debt reduces.

3.2.3 Modigliani and Miller Approach: Propositions with taxes

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[3] The cost of equity can be defined as the required rate of return an investor would expect against supplying capital. The expected rate of return has a direct relation with risk. Higher the risk, higher would be the expected returns. (www.efinancemanagement.com)

3.2.3.1 Trade-off theory of Leverage

The Modigliani and Miller Approach is a theory that, as we said before, refers to a world without taxes, but in the real world this is far from the truth. Most countries, if not all, tax a company and this particular theory recognizes the tax benefits accrued by interest payments. The interest paid on borrowed funds is tax deductible. However, the same is not the case with dividends paid on equity. In other words, the actual cost of debt is less than the nominal cost of debt because of tax benefits.

The trade-off theory advocates that a company can capitalize its requirements with debts as long as the cost of distress, or in other words the cost of bankruptcy is not exceeded by the value of tax benefits. This could mean that the increased debts, until a given threshold value will actually add value to a company.

More specifically, the trade-off model equilibrates tax advantages and negative effects of financial distress and agency cost. Debt on its own can offer tax relief because interests exempt from taxation but on the same time possibility of bankruptcy increases if the company does not meet the requirements and go further the optimal point of debt ratio.

The equilibrium is not going to exist forever which means that after a specific point of debt, tax advantage from extra debt will be less as a
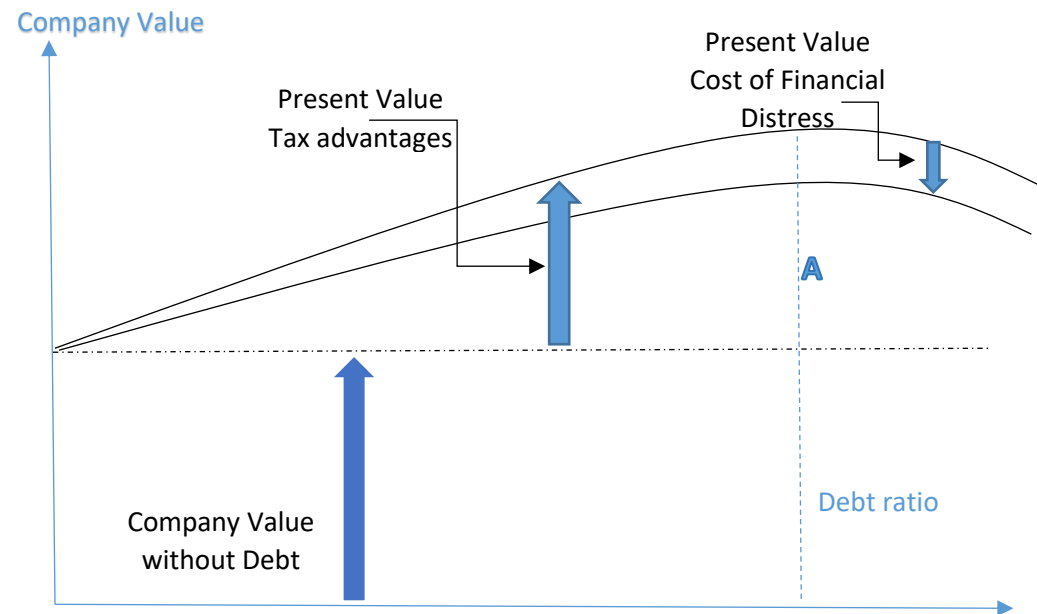
result of negative impacts of financial distress and agency cost. The point that consist that limit can be specifically determined, this point is the one of optimal capital structure and in which company value is maximized.

3.2.3.2 The pecking order theory

This theory focuses on asymmetrical information cost and assumes that companies prioritize their financing strategy based on the path of least resistance. Internal financing is the first preferred method, followed by debt and external equity financing as a last resort. This particular theory was structure by Gordon Donalson, who published an empirical research during 1961 and ended up to the conclusion that companies do not follow the balancing model of all factors (trade-off theory) but prefer to follow a different kind of drawing capitals.

According to the research above, most companies prefer internal financing which means retained earnings and depreciations after debt capitals and only if they have exhausted all their sources of funding they go to a loan. This comes to total conflict with trade-off theory which considers debt capital to be the same with retained earnings.

At the following Hierarchy for Pecking Order Theory we observe that as Risk increases Cost of finance increases:

Pecking order hierarchy of financing
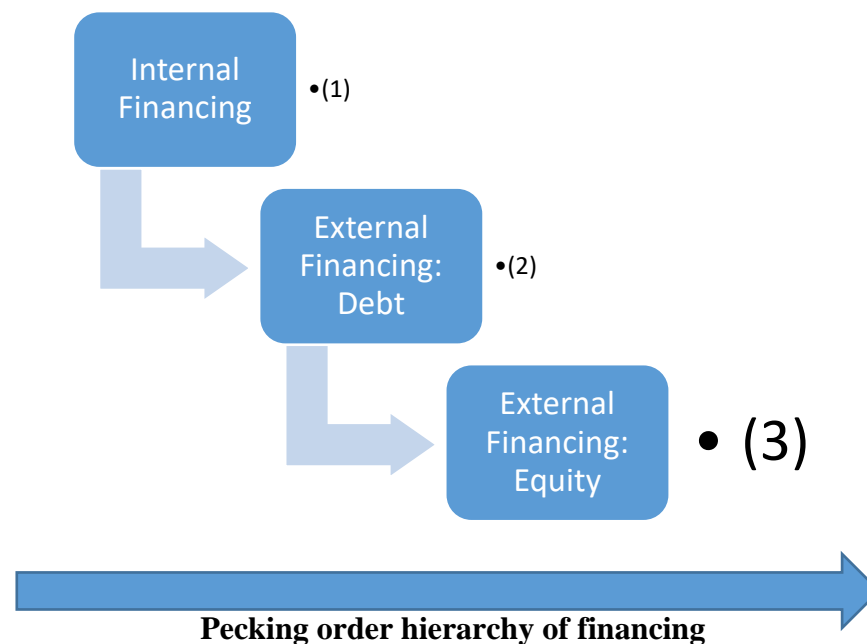
It is totally reasonable because there is a number of companies having a high level of asymmetric information like companies with a complex or technical product or those with less accounting transparency. In such a case, a creditor or an investor has less information about the company and he / she will demand higher returns against the risk taken. In other words, the company will have to cover that costs and also some agency cost like paying fees the board of directors to ensure shareholders' interests are maximized. All the above make retained earnings a cheaper and more convenient source of finance instead of external sources.

It is admitted that the method of finance used depicts an impression of the company in the market. If a company is able to finance itself internally, it is consider to be a strong signal because it reflects that has enough reserves to take care of funding needs. If a company issues a debt, it shows that management is confident to meet the fixed payments and if a company finances itself with new stock, it seems that issues new stock when it perceives the stock to be overvalued, so it is a negative signal.

All the above-mentioned logics are applied to develop hierarchy of pecking order theory. This hierarchy should be followed while taking decisions related to capital structure.

Myers(1984) ascertains that difference between pecking order and trade-off theory is attributed to the fact that trade-off theory does not take into consideration that management teams of each company has usually more and better information than shareholders.

Noting this difference has led to the development of asymmetric information theory, which is considered to be a different one of pecking order theory.

We are now going to analyze how pecking order theory concludes not to a target indicator but to a sequence of financing methods, which as mentioned before is:

1) retained earnings and depreciations

2) debt capital

3) new share capital.

In an environment of asymmetric information, it is possible for a company to be underestimated. When assets are considered to be underestimated then management takes the responsibility of transmitting this information to the shareholders in order to increase share value. Raising debt could be considered as a reliable mechanism to the market instead of publishing new shares.

According to what we have analyzed above, board of directors should publish new shares only if they do not have another way of financing their activities and they consider their shares overestimated.

Shareholders, having this information, consider the announcement of new shares as a negative indication or signal as it has to do with future company prospects, so they provoke declining share price. Falling share price during the announcement is higher in combination with asymmetric information. Furthermore, publishing new shares comes with a high cost that could be avoided if the company uses retained earnings.

As a result, asymmetric information do really affect capital structure provided that financing decisions are taken from investors as future prospects for the company. Moreover, they defend the opinion that company should retain a big part of its earnings so that it is easier to choose and move forward to a prosper investment program with debt.

We should refer after that, that pecking order theory explains why most profitable companies usually borrow less; not because debt ratio is low (after all pecking order theory does not have an optimal debt ratio) but because profitable business companies have enough internal financing.

To sum up we have the following, according to MM theory:

MM Proposition I (No taxes)	MM proposition I (With Taxes)
- Value of Firm is unaffected by the capital structure - $VL = VU$	- Value is maximized at 100% debt - $VL = VU + t*d$
MM Proposition II (No taxes) - Cost of equity increases linearly as the proportion of debt increases - $Ke = Ko + D/E * (Ko - Kd)$	**MM proposition II (With Taxes)** - WACC is minimized at 100% debt - $Ke = Ko + D/E * (Ko - Kd) * (1-t)$

Summary of MM theory, Πηγή: www.efinancemanagement.com

Where,

VL: Value of levered firm
VU: Value of unlevered firm
$(t*d)$: Tax shield on interest
Ko: Overall Cost of Capital
Ke: Cost of Equity
Kd: Cost of Debt

3.2.4 Judging Modigliani – Miller Approach

As we said before MM approach is based on very restricting circumstances while some believe that these circumstances are unrealistic. Some of the most basic arguments are the following:

There is no possibility companies and investors to take loans with the same interest. Sometimes, institutional investors are not allowed to take loans in order to buy shares and the assumption of no stock fees does not exist.

MM assumption about no existence of agency costs and financial distress is unrealistic. Furthermore, MM theory takes no consideration on bankruptcy of the company in case of debt. If the case of bankruptcy was really considered, the financial management would never take the decision to take loans that exceed its range, because such cost of shareholders' capital as cost of debt and as a result cost of the company would be negatively influenced.

When tax advantage exists is the same for all companies, which is something that does not correspond to reality. Tax discount differs within companies depending on their budget for instance.

The risk that prevails for investors from arbitrage is in contrast with MM assumption, which supports the opinion of shareholders running the same risk in case of companies with debt capital as in those without. That is justified by the latter category having invested her capital plus a debt one in comparison with the other category that does not use debt capitals.

3.2.5 Financial distress and bankruptcy

According to MM theory with taxes any kind of capital structure is perfect. These "extreme" results are consequence of the fact that Modigliani and Miller did not take into consideration financial distress situation – bankruptcy and agency costs. We are now going to examine that kind of consequences of real facts at the cost of capital.

3.2.5.1 Financial Distress Situation

It is generally approved that as much as a company uses debt financing, that much increases the possibility of bankruptcy. The problems, though, start showing up a long time ago bankruptcy, when we say that the company is financially distressed. This happens when it is incapable of paying interest rates which leads to failure of concluding to new agreements or use another loan from the bank and even if the company manages that, the interest rate will be very high. All the above have several impact to the company:

Capable executives usually abandon company when circumstances turn to be extremely bad. This is when really good employees and executives look for a better company and a more stable working environment.

Suppliers deny to offer products or services on credit, which constitutes this situation even worse. Company gets trapped in a vicious circle until it goes bankruptcy.

Clients do not trust the company anymore and they often cancel orders or even co-operations. It is reasonable for clients to be anxious and feel uncomfortable with that though.

Without capitals company cannot move on investments or be part of attractive co-operations and programs, under which it could have earned capitals and even profits.

Debt terms now get more strict and hard to follow and as we said before, interest rates are definitely higher. It is reasonable from a bank to do something like that, but for sure it is a difficult situation for the company that is financially distressed. Moreover, tax advantages are out of the map.

3.2.5.2 Cost of bankruptcy

When company is unable to meet its obligations results in bankruptcy. Usually, these are companies with low cash flows in comparison to their payment obligations. Debt ratio and income variability, positively influence possibility of bankruptcy.

When the company eventually goes bankrupt will have to handle more problems:

➢ Sale of its assets after long time in price much lower than their real worth. These procedures take too much time and of course the result is always difficult for the company.

➢ Lawyers, court fees and management costs absorb a big financial part of bankrupt company.

It is worth mentioning that companies we usually expect to have a high bankruptcy cost are those that their products demand continuous maintenance, for example cars, copy machines, spare parts. Also, companies that their products or services depend on their brand name such as airline companies. Researches have shown that companies with monopoly activities and stable income flows, such as electricity companies, turn to the debt, while companies protected from the government, such as banks, get more debt.

From all these, we conclude that danger of getting into a financial distress situation and bankruptcy risk, increases cost of shareholders' capital and debt capital and without doubt cost of total company capital. As a result, cost of total company capital is not independent of capital structure and that proves that there is an optimal capital structure mix.

3.3 Agency Theory

Another theory that we are going to use in our research is that of Agency. The agency theory is a supposition that explains the relationship between principals and agents in business. Agency theory focuses on resolving problems that can exist in agency relationships due to unaligned

goals or maybe different aversion levels to risk. The principal and agent may each be inclined to take different actions cause to different risk tolerances. The most common agency relationship in finance occurs between shareholders (principal) and company executives (agents).

Problems often arise in the agency relationship when the agent does not make decisions that are in the best interest of the principal, but provide some benefit to the agent themselves at the principal's expense. This is what we call agency loss. This situation may occur because the principal is not aware of the actions of the agent or is prohibited by resources from acquiring the information.

3.3.1 Contrasting Risk Appetites

Another central issue that has to be handled by agency theory is the various levels of risk between a principal and an agent, who utilizes resources from a principal, in some situations. They are incurring little to no risk because all losses will be the burden of the principal. This is most commonly seen when shareholders contribute financial support to an entity that corporate executives use at their discretion. The agent is very possible to be tolerant in a different risk level than the principal because of the uneven distribution of risk.

Moreover, an agency, in general terms, is the relationship between two parties, where one is a principal and the other is an agent, whose role is to represent the principal in transactions with a third party. Usually, principals hire agents and delegate to them contracts and decisions and give them the authority of a deal and this is where agency problems can arise, cause to benefits or second deals or under terms of influencing agent's opinion. Agency theory handles numerous situations in which one party acts on the behalf of the other.

3.3.2 Agency Cost

Companies have as an objective purpose maximizing their shareholders' earnings. They can manage that by choosing all those investments that their net value is higher than zero. It is possible though, management decisions and intentions not to comply with this.

It is a difficult situation that could happen, if management executives work inefficiently after too many years at the company. They maybe avoid taking risky investment or even overinvest in projects with negative net value. This could provoke conflict between shareholders and management team. It is easily understood that company executives cannot totally represent shareholders and creditors, satisfying both. So both of them, in order to control management decisions, track down management actions. This kind of control has a cost that is called agency costs.

As a result, the main axis of agency theory, Jensen and Meckling (1976) is interest conflicts between shareholders and managers. This theory focuses on the management to remain in the first line and even if they do not always act trying to benefit shareholders, both sides try to remain active.

Finally, agency theory is called to face and handle three basic problems:

(1) Free cash flow availability
(2) Overinvestment
(3) Underinvestment

1. Free Cash Flow Theory

Free Cash Flow is the cash flow that remains to the company after financing all projects with positive net present value calculated with WACC (M. Jensen 1986, 1988). Free cash flow should be distributed to the shareholders, as dividends for example, if the company is characterized as profitable.

Moreover, management has incentives to extent the company over this point that maximizes shareholders' profits, while an expansion of the company will bring great prosperity. Although, it is observed that sometimes management chooses investments with output lower than cost of capital or cash flow spent in non-profitable activities, satisfying its personal interest.

The problem lies in a solution that motivates managers to efficiently use free cash flows. After Jensen, debt binds company to pay back its financial obligations and therefore limits management. So conflicts between the two parts can lead executives in overinvestment or underinvestment.

2. Overinvestment Problem

Management is interested in high sales and assets size, which does not necessarily mean higher profits for shareholders. As we said, often, moves to investments with negative net present value. This way management team has under its supervision more assets to control. This is what we call overinvestment.

3. Underinvestment Problem

Management is apt to make little effort in order to succeed same profits. This has as a result, investment opportunities to go untapped so company value decreases.

So underinvestment, in a main proportion, comes from management personal cost and not at all cause to shareholders. We should note that sometimes projects with positive net present value and high risk are avoided by executives.

Shareholders though do not handle the same risk because they can avoid a bad situation diversifying their portfolio in contrast with managers that every investment project has several impact in their job and puts in jeopardy their salary, even their job. This better explains the fact that multinational company shareholders are only interested in systematic danger, while general managers take into consideration the total risk.

Management team should be closely watched, as anyone could easily assume. It is mandatory to thoroughly examine their behavior, their judgement and anything else that could provide us any kind of useful information about their professionalism.

Consequently, the need of management check and capital structure study, set the base for extra expenses for two reasons:

(a) Opportunity cost
(b) Delivery cost

3.3.3 Shareholders – Management conflict

At this point it is worth mentioning that agency cost, which has direct interaction with capital structure and furthermore with debt, has impact to shareholders' – creditors' relationship and co-operation.

In an environment of asymmetric information, where it is totally reasonable shareholders to be well informed about company performance; it could act to their advantage in order to damage creditors in three different ways:

(a) Investment decisions: an investment project of high risk benefits more shareholders than creditors who just want to secure their money. Shareholders get benefit through high fluctuations at assets price and investments that have control through management team.
(b) Financing decisions: the company is possible to place its assets as pledge in order to draw capitals from new creditors. Although, contracting new creditors increase the risk and damage the last ones.
(c) Dividend decisions: the company could decide paying high dividends or use massive stockpiles to buy back shares. This dividend policy does not benefit creditors at all.

Afterwards, company creditors try to secure their interests paying a lot of money to law specialists, accountants and analysts in finance. They manage contracts for the benefit of borrowers. Company should not exceed specific limits of debt and not get involved in some project categories of high risk.

As it is perceived agency costs and the total cost that is concluded for the debt increase and the decrease of company value, reduce the advantage of debt capital.

Concluding in this section it is important to make reference to three important agency cost projects:

- M. Jensen & W. Meckling (1976) investigates ownership structure in comparison with capital structure that reflects debt and equity; including how management team controls and adjust shareholders' rights with those of owners'.
- E. Fama negotiates the role of effective capital market and labor market as information mechanism used to control management team behavior.
- E. Fama & M. Jensen (1983) describe board of directors as an information system which shareholders can use in order to control opportunism of management team.

3.4 Market timing theory

Market timing theory refers to the close study and evaluation of the market. Managers have a close watch on the market so that in right timing and under the appropriate circumstances to take the final decisions, always depending on the investment planning. Final decisions, meaning the source of finance which means the lower cost of financing between debt and equity.

This theory, which was formed by Baker Wurgler (2002), explains companies' intention of publishing new shares in high price and buying them back in lower price. Baker Wurgler drew the conclusion that companies tend to publish new shares when market value is high in comparison to book value and values of the past. Companies with low leverage publish new share when indicators of market to book value increase, while companies with high leverage go to the choice of debt when indicators of market to book value decrease.

Researchers estimate that their conclusions about market timing theory are supported by the inefficiency of market rather that asymmetric information. This is difficult to controvert as Graham and Harvey support in their project (2001). These clues show us that market timing theory is an important aspect of financing decisions and seems to have important explanatory force and substantial influence in capital structure results. Nevertheless, this does not mean that the other theories are reversed. This particular theory should be taken into consideration in combination with some of the others.

CHAPTER 4

Literature Review

4.1 Literature Review of Capital Structure Theories

Empirical studies on capital structure theories, such in National as in International bibliography, contribute to getting a better picture of capital structure determinants and their impact.

Through each study, researchers note each theory's characteristics and different approach is pointed out which actually lead them in different results. It is important for researchers to follow the numbers and the facts in order to conclude to a valid result. A broader image can give them important answers and validate or cancel their hypotheses. Now follows a quick review of key points of each theory and their use in basic researchers, along with a quick explanation of these studies.

Trade-off theory, first introduced by Kraus and Litzenberger (1973), asserts that firms set a target debt to value ratio and gradually move towards it. According to this theory, choosing a capital structure, a company has the ability to balance extra charges of interest and tax benefit with the present value of the cost of financial distress. We could call a capital structure mix optimal when incremental tax shield benefit is equal to the incremental costs of financial distress. Any increase in the level of debt causes an increase in bankruptcy, financial distress and agency costs, and hence decreases firm value.

In other words, a firm's target leverage is driven by the following three factors: (i) bankruptcy costs and generally costs of financial distress (ii) taxes (iii) agency costs. Thus, an optimal capital structure mix would be ideal for any company to have, establishing equilibrium between advantages (tax advantages) and disadvantages (financial distress and bankruptcy costs) of debt. In order to establish this equilibrium firms should seek debt levels at which the cost of possible financial distress offsets the tax advantages of additional debt.

Analysing the three factors above:

When a firm is not capable of covering its operations with self-financing, it results in raising debt, but what is not desirable to happen is to raise excessive debt. It does not mean bankruptcy itself, though; what really concerns is what happens after that. If the bond payments are not met the firm is simply transferred to the bondholders and this is where the company starts facing problems. This is what we call financial distress costs. Adding debt to a firm's capital structure has impact on its tax liability which lowers and on the same time increases the after-tax cash flow available to the providers of capital.

Jensen and Meckling (1976) define agency costs as the sum of the monitoring expenditure by the principal, bonding costs by the agent and the residual loss. The three basic agency problems are (i) risk shifting (ii) underinvestment problem and (iii) the free cash flow hypothesis.

Thanks to Modigliani and Miller (1958), we know that in the absence of taxes, financial distress or agency costs, company's value is not affected by the choice of capital structure and the cost of equity is linearly related to the firm's leverage.

An alternative to the trade-off theory is the pecking order theory (Myers and Majluf, 1984). Moreover, firms do not have target capital structures. It depends though on what each theory supports. The pecking order theory states that firms prefer internal to external financing and debt to equity, if they issue securities.

This theory claims that between managers and investors with asymmetric information and with managers having the most of it, their choice will be the source of capital that gives out the least amount of information. This explains why retained earnings is the most preferable way of raising capital and in case that they are inadequate to cover this financing debt is the most preferred to equity. When firms use external funds, they first prefer issuing the safest security that is debt, then convertible securities, and equity as a last resort. They use external financing only when their internal funds are insufficient. This renders new equity issuance the least preferred method of raising capital. The pecking order theory, first introduced by Donaldson (1961), emphasizes on asymmetric information. The starting point is that managers know more about their own company when they need funding, instead of outside investors. The pecking order theory does not assume the existence of an optimal leverage ratio (Frank & Goyal, 2009), but supports counter-cyclical behavior of leverage ratios (Halling et al, 2012). Psilaki and Daskalaki (2009) find empirical evidence consistent with the pecking order theory.

Agency theory is an important, yet controversial, theory. It offers unique insight into information systems, outcome uncertainty, incentives, and risk and is an empirically valid perspective, particularly when coupled with complementary perspectives. The principal recommendation is to incorporate an agency perspective in studies of the many problems having a cooperative structure.

What companies need to decide is the optimal debt/equity mix, they all need to find ways of building capital. Capital structure totally affects company value cause to its relation to the financial risk. Comparing these two theories the obtained results are mixed. Different researches get results that are not correlated.

For instance, Shyam-Sunder and Myers (1999) who test the static trade-off against the pecking order theory find that the pecking order model has greater time-series explanatory power than the trade-off model, taking into consideration 157 listed companies in the US, during 1971 - 1998.

More recently, Huang and Ritter (2009) carrying out research on a sample of US publicly traded companies during 1963 - 2001 concluded that firms turn to equity when its cost is low. This is related to their current capital structure and their decisions in the past. Their findings indicate that both, market timing model and trade-off model, can explain and contribute to the optimal choice of capital structure. At the same time, Frank and Goyal (2009) test the pecking order theory analyzing US companies for the period 1971 - 1998. Their results indicated that on average, net equity issues usually exceed net debt issues and dispute the trade-off theory, because the group of large sized companies in the early years provides enough support for the pecking order theory.

A few years earlier, Flannery and Rangan (2006), assert that firms target a specific capital structure, but their results indicated that market timing and pecking order considerations were able to explain only 10% or less each. Their sample consisted of annual observations and their database was that of Compustat for 1965 – 2001. They do not include companies of the financial sector or companies that data are not available for two years in a row.

In their model, leverage is the depended variable and the independents are profitability, growth opportunities, size, fixed assets, tax advantages and product uniqueness. They use partial adjustment model to study different capital structure theories and interpret their results.

Flannery and Rangan conclude in verifying trade – off theory instead of pecking order and market timing. In other words, for them companies set a target leverage ratio and move to that; more specifically, companies that over or under indebted move to that target leverage with rate of convergence at about 30%, much higher than last researches.

Kayhan & Titman (2007) investigate capital structure with a sample of companies for the period 1971 – 2007. The use data from Compustat database and share prices from CRSP files. Companies of financial sector, public services and companies with assets book value lower than $ 10 million, are excluded.

Their analysis contains regression that is executed in two steps. At the first one there are the independent variables growth perspectives, profitability, growth, product uniqueness and the capability of company to offer loan assurance. At the second one, as independent variables are used financial deficit, shares performance for a 5 - year time interval, Baker & Wurgler variable, timing measure and a variable that reflects the difference within real and optimal leverage. Their results indicated that:

(a) Companies set a target leverage level and move long-term towards that (trade-off theory). During this effort, cash flow, investments and share prices consist obstacles.
(b) Shares performance significantly affect company's capital structure.

Fama & French (2002) study long-term capital structure in relevance to share dividends using trade-off and pecking order theories in their hypothesis. Their sample consisted of 3000 companies from Compustat database.

Methodology used is that of regression analysis in two stages. At the first one, for the determination of optimal leverage ratio, they followed regression analysis of leverage, which is investigated through market and book values. As independent variables are used profitability, total assets and tax advantages, excluding those coming from Debt.

At the second stage, they used first stage's data, determining leverage as dependent variable within two sequential time intervals against variables that represent profits and investments.

Their final results confirm bibliography of that period; they confirm trade – off theory. In this particular research, rate of convergence differentiates to a much lower one, 7 - 10 % annually for companies that offer dividends and at 15 – 18 % for those that do not.

Some other conclusions are, the negative impact between leverage and profitability and leverage and growth opportunities. On the contrary, positive seems to be the relevance between leverage and company size.

Drobetz & Fix (2003) use 124 Swiss listed companies and examine pecking order and trade – off theories' power and impact. Then, they compare their results with those of Rajan & Zingales (1995) who have chosen as sample G7 countries.

They use regression analysis with panel data method. Leverage which consist the dependent variable is formed as it follows:

LVLTA total debt to total assets

LVDTA total debt (long-term and short-term) to total assets

LVDNA total debt to net assets

LVDC total debt to (debt + equity)

The Independent variables are firm size, investment opportunities, profitability, profits fluctuation, product uniqueness and total assets.

Final results advocate to Swiss companies following trade – off theory and resemble to those results of Barcay, Smith & Watts (1995) and Shyam – Shunder & Myers (1999) for the USA and Rejan & Zingales (1995) for the G7 sample. Their results also indicated that companies with more investment opportunities apply less leverage which is supported in trade – off theory. Most profitable companies use less debt which confirms pecking order instead of trade – off. Finally, they observe a general lower level of leverage during last years.

Lemon & Zender (2004) compare trade – off and pecking order theories. They examine how debt capacity influences capital structure. Their sample comes from Compustat and CRSP and refers to 1971 – 2001.

They use regression analysis with leverage variable as dependent and growth opportunities, profitability, shares performance fluctuation, company size and age as independent. Leverage is calculated as total debt to total assets.

Taking into consideration companies' debt capacity, they confirm pecking order theory through their research. Large profitable companies with low leverage ratio use internal financing for their growth in contrast to smaller ones of high development, that seems to have as unique financing method that of publishing new shares.

Rajan & ZIngalas (1995), also, researched capital structure determinants. Their sample consisted of G7 countries, covering about 30 – 70 % of listed companies of each country and representing more than 50% of market capitalization of each country.

They followed regression analysis, with dependent variable leverage, debt to net assets. They had a second dependent variable, interest coverage indicator, earnings before interests and taxes to debt payment interests' depreciations. As independent variables are used the percentage of assets, profitability, investment opportunities and firm size.

The results indicated positive relation between leverage and assets percentage and size. Negative relation is observed between profitability and investment opportunities with debt. It is worth mentioning that no matter the institutional framework of each G7 country and their substantial differences leverage determinants resemble significantly to those of companies of the USA.

Chen (2004) made his research in China and more specifically in 77 Chinese listed companies. Regression analysis and panel data were used with dependent variable that of leverage. As independent were used the profitability, calculated as EBIT to assets, size, calculated as the physical logarithm of total assets, growth opportunities, calculated through sales rate, asset structure, calculated as assets and inventory to total assets, cost of financial distress, calculated as the absolute value of the first difference in the percentage change in operating income. In addition, non – debt tax advantages (depreciation indicator to total assets) and different dummy variables to help them express efficiently the special characteristics of Chinese companies.

Chen proved a positive relation between leverage with assets and growth opportunities. In contrast, a negative one for leverage with profitability and growth. The basic result is that Chinese companies follow their own financing hierarchy. First choice is use of retained earnings, then publication of new shares and third way is long-term debt. According to this hierarchy, it seems that Chinese companies use part of asymmetric information and pecking order theories but have very limited relevance to trade – off theory. This could be attributed to the fact that main shareholder of Chinese companies remains the State which reduces significantly financial distress impact.

Nevertheless, Chinese companies and these of the West world, explain capital structure through very similar determinants, no matter if their bank and stock markets are different in operation and institutional framework.

Alti (2006) made a different kind of research using data from companies that went public. He examined market timing influence in capital structure through IPOs using a sample of American companies from 1971 to 1999.

He used regression analysis, with dependent variables leverage change within two periods, leverage change before and after going public, profitability and investments for a period of four years after going public. As independent are used growth opportunities, profitability, the kind of assets, product uniqueness and fluctuation of profits.

Alti ascertains that companies with IPO in markets of high demands publish more shares reducing leverage indicators more than companies with shares of lower demand. Although, exactly after their entrance in Stocks, companies' shares with high demand increase leverage indicators,

publishing more debentures and less shares in comparison to companies' shares of low demand. At the end of the second year, after IPO, market timing impact in leverage totally disappears.

Companies with shares of big demand experience greater reduction of leverage indicators during the IPO year. Moreover, leverage ratios are very low to be explained from the subject characteristics of the companies. Negative impact is quickly reversed, though.

Consequence of this reversal policy that companies of high demand adopt, is to increase leverage indicators at the two following years, after IPO. On the contrary, companies of low demand seem to be satisfied by leverage ratios that manage during the IPO, without dramatically change their leverage after that.

In the end, results indicate market timing a very determining factor of long-term financing, until the end of the second year after going public for the first time (IPO), while long-term consequences are limited.

Voulgaris, Asteriou & Agiomirgianakis (2004) study capital structure determinants of Greek construction companies and form some specific policies that could improve financial performance of that sector.

More specifically, in their study they use regression analysis with panel data method from two samples, one for small – medium enterprises (SMEs) and another one for large-sized companies (LSEs). Determinants that were studied were size, profitability, growth opportunities, cash flow.

Their findings indicate that there are differences at the determinants of capital structure between these two categories. They observe that such for SMEs as for LSEs: debt grows along with size, leverage is negatively related to profitability as declares Pecking order theory. Growth opportunities are positively related to leverage.

Although, differences between these two types are summarized to the followings: increase of inventory and accounts receivable are considered as determinants only for SMEs. Cash flow does not influence debt leverage of LSEs, in contrast to SMEs. Assets' price and employees' productivity influence capital structure of SMEs but not that of LSEs.

Also, authors note that Greek SMEs should focus their efforts on: (a) cash flow increase through more effective asset management and managing more exports and (b) assuring good and prosperous relations with Banks but on the same time with the financing sources available. On

the same time Greek LSEs would be good to adopt strategies that would contribute in competitiveness improvement and securing new forms of financing. State Government should plan policies to encourage changes that will induce economic efficiency and development.

It is important to mention the existence of another category of researches based on investigation and analysis of qualitative characteristics and not that much on econometric analysis of quantitative characteristics. Common point of this category is that they are based on questionnaires and analyze according to them.

An interesting research in Greece is that of Daskalakis (2005) who ended up in different conclusions using questionnaires for 89 listed Greek companies for period 2002 – 2003. The most significant findings are that Greek companies of the sample (about 80%) maintain a perfect capital structure as long-term target. Also, most of them avoid long-term debt while long-term liabilities to equity indicator is 0 – 30%.

Furthermore, all of them use short-term debt and some of them have short-term liabilities to equity indicator higher than 100%. Optimal capital structure mix is a really controversial topic, while many companies consider that debt capitals do not reduce total cost of capital.

Vasiliou (2004) came to the conclusion that Greek companies seem to prefer internal instead of external financing and when it comes to external financing they prefer to issue new share capital instead of debt, which indicates a preference to pecking order theory.

Graham & Harvey (2001) investigated the practice followed by American companies, as it has to do with their capital structure. Graham & Harvey examined 392 Financial CEOs and noticed that long-term debt distribution is stable. One third of sample companies have a long-term to total capitals indicator lower than 20%, the other one third of the companies have the same indicator between 20 - 40% and the rest of them higher than 40%.

Concerning capital structure determinants, Graham & Harvey found that financial flexibility came first to a sequence of various answers. Second in this hierarchy was the creditworthiness rate and third choice was financial distress cost.

Bancel & Mittoo (2004) investigate capital structure determinants for 16 European countries. They noticed that European companies turn to long – term debt in preference while long – term to total debt indicator is 66%.

It seems that for European companies main determinant is financial flexibility, then follows the creditworthiness and finally the tax advantage. After that, we could say that European companies emphasize more on debt advantages than Greek companies. Similar research is that of Brounen de Jong & Koedijk (2006) which analyzes 313 answers of Financial CEOs from four different European countries.

In conclusion, all three researches for Greek, European and American companies get the same results. In none of them agency cost matters, while tax advantage seems to be of modest importance. Market timing factors, though, seem to have great importance in capital structure determinacy, mainly in Greece.

It still remains hard to choose an optimal capital structure across industries during different periods. It is an open issue, especially for the cyclical shipping sector with unique and distinct features and international character, strongly dependent upon the international economic environment; it does not follow the business cycles of individual economies rather than that global economic cycles.

According to Drobetz et al. (2013) research shipping companies have twice as high a leverage ratio compared to listed industrial firms. This high level of leverage is what makes it more interesting for these companies to examine their capital decisions, while profitability and leverage are inversely related. They have little indications for a relationship between firm size and leverage and assert that growth and leverage are inversely related. Moreover, they find that speed of adjustment is higher than other industries, except in periods of economic downturn which is even lower.

Finally, Arvanitis et al. (2012) findings suggest that the pecking order theory is able to explain financial decisions, investigating a sample of 32 European traded companies during 2005-2010. The authors support the opinion of a negative correlation between profitability and debt and a positive one between tax benefits arising from depreciations and the debt ratio. In addition, size and growth are negatively correlated with leverage and tangibility positively, while profitability, according to them, is found to be negatively related to the leverage ratio.

It well worth it investigating the relationship between profitability and leverage through a set of theoretical statements that are specific to the shipping sector. Literature offers rich insights into the optimal capital structure choice and through the econometric model of panel data and pecking & trade-off theories, we intend to come to conclusions enriching the overall research. If it is hard to manage for a general business sector, though, just imagine how hard is it for shipping industry which is characterized by volatility, global impact and cyclical behavior and in general gets influenced by many different factors.

CHAPTER 5

Debt & Equity Financing

5.1 Debt & Equity Financing

In this section we are going to analyze debt and equity financing and the determinants of capital structure. Referring to determinants we mean what we considered in our particular research as determinants that actually consist the five variables of our econometric part, in order to get a better picture and explain each one separately.

5.2 Debt Financing

"Debt financing occurs when a firm raises money for working capital or capital expenditures by selling debt instruments to individuals and/or institutional investors. In return for lending the money, the individuals or institutions become creditors and receive a promise that the principal and interest on the debt will be repaid."

5.2.1 BREAKING DOWN 'Debt Financing'

When a company needs money, it can take three routes to obtain financing, these are equity, debt, or some hybrid of these two. Equity represents an ownership stake in the company. It is a financing method which gives the shareholder a claim on future earnings, but it does not need to be paid back. It is a fact that if the company goes bankrupt, equity holders are the last in line to receive money. Another way of financing that a company can take to raise capital for its business is by issuing debt - a process known as debt financing.

Debt financing occurs when a firm sells fixed income products, such as bonds, bills, or notes, to investors to obtain the capital needed to grow and expand its operations, maybe in order to proceed to an investment. When any investor purchase a bond from a company automatically he / she become a lender, that could either be a retail or institutional investor who provide the company that has issued a bond with debt financing. The amount of the investment loan, which is referred to as the principal, must be paid back sometime in the future, usually at some specified date they have agreed on the contract. If the company goes bankrupt, lenders have a higher claim on any liquidated assets than shareholders.

5.2.2 Cost of Debt Financing

Referring to a firm's capital structure we mean equity and debt. The cost of debt is the interest payment to bondholders, and the cost of equity is the dividend payments to shareholders. In case that a company issues a debt, not only does it promise to repay the principal amount, but also promises bondholders' compensation by making interest payments to them annually, known also as coupon payments. The cost of borrowing to the issuer is represented through the interest rate paid on these debt instruments.

A company's cost of capital is consisted in the sum of the cost of equity financing and debt financing. It represents the minimum amount that a company must earn on its capital to satisfy its shareholders, creditors, and other providers of capital. It is reasonable that a company's investment decisions relating to new projects and operations should always generate returns that are greater than the cost of capital. If returns on its capital expenditures are below its cost of capital, then the firm is considered not to generate positive earnings for its investors. In this case, company's capital structure may need to be re-evaluated and re-balanced.

The formula for the cost of debt financing is:

$$KD = Interest\ Expense\ x\ (1 - Tax\ Rate)$$

where KD = cost of debt

Since the interest on debt is tax deductible in most cases, the interest expense is calculated on an after-tax basis to make it more comparable to the cost of equity as earnings on stocks are taxed.

5.2.3 Measuring Debt Financing

Analysts use one metric to measure and compare how much of a company's capital is being financed with debt financing and this is the debt-to-equity ratio, or D/E ratio. For example, we have total debt that is $1 billion and total stockholders' equity that is $10 billion, the D/E ratio is $1 billion / $10 billion = 1/10, or 10%. We could say that for every $1 of debt financing, there is $10 of equity. In general, a low D/E ratio is more preferable to a high one, but it is worth mentioning that certain industries can more easily tolerate debt than others. Both, though, debt and equity are found on the balance sheet statement.

5.2.4 Interest Rates on Debt Financing

Some investors of debt are only interested in principal protection, while others want a return in the form of interest. Market rates and borrower's creditworthiness determine the rate of interest. It is totally reasonable that higher rates of interest imply a greater chance of default and, therefore, a higher level of risk but actually it is a way of compensating the borrower for the increased risk. Debt financing often requires the borrower to adhere to certain rules regarding financial performance that known as covenants, in addition to the interest rates.

Sometimes, debt financing can be difficult to obtain, but for many companies it is a way of funding at lower rates than equity financing, especially for interest rates that in certain periods are historically low. Another important perk to debt financing has to do with tax advantages and more specifically, that the interest on debt is tax deductible. Therefore, it will make trouble for the company because adding too much debt could increase the cost of capital, which could reduce the present value of the company.

5.2.5 Advantages and Disadvantages of Debt Financing

5.2.5.1 Advantages

Some important advantages of debt financing are the following:

Retain control: When you agree to debt financing from a lending institution, the lender has no right to check up on how you manage your company. You make all the decisions. Once you repay the loan in total, the business relationship comes to an end.

Tax advantage: The amount paid for interest is tax deductible, effectively reducing your net obligation.

Easier planning: You know in advance the exact amount of principal and interest that you will be asked to pay back each month. This makes it easier to schedule your budget and your financial plans.

5.2.5.2 Disadvantages

Indeed, debt financing has its limitations and drawbacks. These are the following:

Qualification requirements: You need a good enough credit rating to receive financing.

Discipline: You will need to have the financial discipline to make repayments on time, it is necessary to use good financial judgement when you use debt. A business that is overly dependent on debt is considered as "high risk" by potential investors and the truth is that something like that could limit access to equity financing at some point.

Collateral: By providing collateral to the lender you could put some business assets at potential risk. You might also be asked to personally guarantee the loan, potentially putting your own assets at risk.

It is very important to decide the importance of having full control of your business, if the debt financing is a real need for your company and if you feel comfortable using something as collateral. Moreover, the credit history will provide to the lender the ability to check your credit rating. A good rating could give you the ability to get a better deal.

5.3 Equity Financing

Another way of raising capital in the debt markets is to issue shares of stock in a public offering; this is called equity financing.

5.3.1 Advantages and Disadvantages of Equity Financing

5.3.1.1 Advantages

Some important advantages of equity financing are:

Less burden: Using equity financing there is no loan to repay. The business does not have to program a monthly payment for the loan, which is very important in case the business does not initially generate profit. Without having that kind of obligations, this gives you the opportunity to channel more money into your business, either investing or just saving.

Credit issues gone: If you lack creditworthiness – through a poor credit history or lack of a financial track record – equity could be more suitable than debt financing.

Learn and gain from partners: Equity financing gives you the ability to form informal partnerships when sometimes comes with more knowledgeable and experienced individuals. Some might be well-connected, allowing your business to potentially benefit from their knowledge and their business network.

5.3.1.2 Disadvantages

Equity financing has its problems too. Some basic ones are the following:

Share profit: Your investors will expect – and deserve – a piece of your profits. However, it could be a worthwhile trade-off if you are getting benefit from the value they bring as financial backers and/or their business acumen and experience.

Loss of control: The price to pay for equity financing and all of its potential advantages is that you need to share control of the company.

Potential conflict: Sharing ownership and having to work with others could lead to some tension and even conflict if there are differences in vision, management strategy and in general ways of running your business. It can be an issue to consider carefully.

In other words, it depends on your needs, on your company profile, your financial needs and of course on your creditworthiness. Each choice has its advantages and its disadvantages.

CHAPTER 6

Capital Structure Determinants

6.1 Determinants of Capital Structure according to bibliography

According to literature review, we observe that according to each author and each research different results are formed but often with different methods or samples or even optical angle.

Remarkable researches have enlightened managers but very often authors suggest that there is not really a clear distinction between trade-off and pecking order theory, as it has to do with right or wrong choice, actually on many issues there is no conflict at all. For example, Wolfgang Drobetz (April 25, 2003) studied companies in Switzerland and after examining a representative sample of Swiss firms concluded that firms with more investment opportunities apply less leverage, which support both the trade-off model and a complex version of the pecking order model. It is interesting to refer to the adjustment speed and its correlation to the well-known business cycle variables which seems to be higher when economic prospects are good. (Wolfgang Drobetz and Gabrielle Wanzenried, 2006). Literature review and methodology vary from article to article; different assumptions, various methodologies and variables and finally interpretation according to the sample and the results. We are going to make more specific references a little later according to the results.

6.2 Capital Structure Determinants according to our research

This project, after making a cross check through a representative volume of bibliography suggests five variables which are assumed to affect optimal capital structure mix either negatively or positively. It remains to examine the impact of those variables which are considered to be the dominant ones, while the innovative part in this section is the variable of risk and the way of measuring it.

These five variables are (1) asset structure, (2) growth opportunities, (3) firm size, (4) profitability and as we said before (5) risk.

We are going to analyze each one of them and how are they calculated for the econometric model.

Asset structure

It refers to the proportions of various types of assets held by a firm as shown in the Balance Sheet. A firm's asset structure helps to determine the way that raises its finance.

We measure the variable "asset structure" using all assets from the balance sheet and more specifically it is expressed as the relation of fixed assets to total assets.

Growth opportunities

Using the financial term "growth opportunities" we mean the potential that an investment or a project have to grow significantly, leading to a profit for the investor. Often, new investments are presented to potential investors as growth opportunities.

We measure the variable "growth opportunities" using the annual change of earnings from the balance sheet.

Firm size

In any kind of industry there are firms of varying sizes but how can we really measure it? It remains a poorly defined concept but we are going to set the variable "firm size" according to the natural logarithm of sales for this particular project.

Profitability

It is a situation in which a company or even a product is producing any kind of profit. For this project we are going to use ROA (return on assets) to measure profitability. It consists an indicator of how profitable a company is relatively to its total assets. It gives as an idea of how efficiently a company's management is at using its assets to generate earnings. It is calculated as:

ROA = Net Income / Total Assets

Risk

Risk is a definition hard to measure and define, it has to do with a situation which involves exposure to danger. We are going to interpret the notion of risk through the standard deviation of EAT (earnings after tax).

After-tax income is the net income and represents the amount of disposal income that a firm has available to spend.

CHAPTER 7

Hypotheses

7.1 Hypotheses

Several studies investigated the empirical validity and practical relevance of these theories. In these studies, capital structure of firms is related to factors such asset structure, firm size, growth opportunities, profitability and risk.

These factors are briefly explained below:

Asset structure is expressed as the relation of fixed assets to total assets. It seems to be positively related to debt. (H1) The type of assets possessed can be considered as an ambiguous factor for the determination of the debt-equity ratio. If a firm retains large investments in land, equipment and other tangible assets, it will have smaller costs of financial distress than a firm dependent on intangible assets. Securable assets are considered to be tangible assets such as plant and machinery. Furthermore, Van der Wijst and Thurik (1993) suggest that fixed assets seem to offer more security that current assets. However, firms owning more tangible assets issue more debt. From a trade-off standpoint, assets are positively related because they can be used as collateral and decrease the cost of debt. Pecking order theory inversely correlates them to leverage. Empirical studies support the trade-off theory (Frank & Goyal 2009) while others the pecking order theory (Bauer 2004) or produce inclusive results (Serrasqueiro & Nunes 2009). Same perspective seems to dominate for shipping too, study of Drobetz et al. (2013).

Growth opportunities can produce moral hazard effects and push companies to become risky and face difficulties in raising debt capital on favorable terms. Based on Myers (1977) they tend to have lower leverage, so we propose that growth will be negatively related to debt (H2)

Firm size is measured through the sales of the company. According to the trade-off theory the optimal capital structure for any company will reflect the balance between tax shield benefit of debt and the increasing agency and financial distress costs, meaning bankruptcy or

reorganisation costs associated with high debt levels (Jensen and Meckling 1976, Myers 1977, Harris and Raviv 1990). In case companies are profitable, debt must be preferred in order to benefit from the tax shield; trade-off theory cannot account for the correlation between high profitability and low debt ratios. From a financial distress perspective, as larger firms are more diversified they are expected to go bankrupt less often than smaller ones (Warner 1977, Ang. et al. 1982, Pettit and Singer 1985) so size must be positively related to leverage. We could say that the optimal size of a firm can be influenced by the quality of a country's financial and legal system and the relationship between firm size and institutional development could be depended on these two effects. Moreover, larger firms is likely to incur lower transaction costs associated with debt. Finally, firm size is positively related to debt. (H3)

Profitability seems to be negatively related to debt (H4 a). Profitability is calculated with ROA (Return on Assets). Pecking order theory predicts that more profitable firms have more internal financing available, while managers have as financing policy internal instead of external financing and risky debt to equity trying to minimize associated debt. In fact according to the pecking order theory where internal cash flows (retained earnings) are the preferred form of financing new investments, we should expect a negative relationship between leverage and profitability (Harris and Raviv 1991, Rajan and Zingales 1995, Booth et al. 2001). In contrast, according to trade-off theory framework, tax benefits of debt will induce profitable firms to use more debt (Jensen and Meckling 1976, Myers 1977, Harris and Raviv 1990), so profitability will be positively related to debt. (H4 b). Most empirical studies support the pecking order theory (Fama & French 2002, Titman & Wessels 1998, Wald 1999). In the shipping industry, Drobetz et al. (2013) assume that profitability and leverage are inversely related.

Risk will be negatively related to debt (H5a) according to pecking order theory (Psillaki and Daskalakis, 2015). Leverage increases volatility of the net profit. More risky firms can lower the volatility of the net profit by reducing the level of debt. Risk is calculated using standard deviation of earnings. Pecking order theory supports the perspective of firms with high volatility on earnings try to accumulate cash, in order to avoid underinvestment issues in the future, so a negative relation is expected between risk and leverage. On the other hand, from an agency costs or asymmetric information theory perspective we expect a positive relationship (H5b) (Harris and Ravin, 1990; Ross, 1977).

To sum up we have the following hypotheses:

(H1) Asset structure is positively related to debt.

(H2) Growth opportunities are negatively related to debt.

(H3) Firm Size is positively related to debt.

(H4 a) Profitability is negatively related to debt according to pecking order theory.

(H4 b) Profitability is positively related to debt according to trade-off theory.

(H5 a) Risk is negatively related to debt according to pecking order theory.

(H5 b) Risk is positively related to debt according to agency costs or asymmetric information theory.

Carrying out our research, results will provide us important and useful information in order to exam if our hypotheses are verified or not.

CHAPTER 8

Sample description and Methodology

8.1 Presentation of the listed Shipping Companies used in our sample

The total of the Shipping companies used in our research is 48 listed companies in Stock Exchange Markets of America, Canada, Japan, Germany, Spain, Australia and so on. Some of them are NYSE, NASDAQ, JPX, SSE, EURONEXT, LSE, TSX, FSX, HKEX, SIX, ASX, BME and other that kind of range Stock markets.

Below follows the list of them used in the sample analysis. The blue color is used for those that have Greek ownership and the column next to each company declares the sector that they base their activities.

No	Shipping Companies	Sector	Ownership
1	Diana Shipping	Bulk	
2	Euroseas LTD	Bulk	
3	Golden Ocean	Bulk	
4	Star Bulk	Bulk	
5	Navios Maritime	Bulk	
6	Globus Maritime	Bulk	
7	Seanergy Maritime	Bulk	
8	Safe Bulkers Inc.	Bulk	
9	Eagle Bulk Shipping Inc.	Bulk	

10	Genco Shipping & Trading Limited	Bulk	
11	Dryships Inc.	Bulk	████
12	Ship Finance Intern, Limited	Bulk	
13	Scorpio Bulkers	Bulk	
14	Songa Bulk ASA	Bulk	
15	Western Bulk ASA	Bulk	
16	Costamare Inc.	Container	████
17	Diana Containerships Inc.	Container	████
18	Global Ship Lease Inc.	Container	
19	Seaspan Corporation	Container	
20	Danaos Shipping Inc.	Container	████
21	Box Ships Inc.	Container	████
22	HAPAG-LLOYD	Container	
23	Top Ships	Tanker	████
24	Capital	Tanker	████
25	Ardmore Shipping Corporation	Tanker	
26	DHT Holdings Inc.	Tanker	
27	Euronav	Tanker	
28	Frontline Ltd.	Tanker	
29	Knot Offshore Partners LP	Tanker	
30	Navios Maritime Acqusition Corporation	Tanker	████
31	Nordic American Tankers Limited	Tanker	
32	OSG (Overseas Shipholding Group)	Tanker	
33	Scorpio Tankers Inc.	Tanker	
34	Teekay Offshore Partners L.P.	Tanker	
35	Teekay Tankers Ltd.	Tanker	
36	Tsakos Energy Navigation Ltd.	Tanker	████
37	Saga Tankers ASA	Tanker	
38	Freeseas Inc.	Bulk	████

39	Gaslog Ltd.	LNG	
40	Goldenport Shipmanagement Ltd.	Bulk / Container	
41	Newlead Holdings Ltd.	Bulk	
42	Ocean Rig UDW Inc.	Drillships	
43	Paragon Shipping & Logistics W.L.L.	Logistics services	
44	Teekay LNG Partners L.P.	LNG	
45	AP Moller – Maersk	Container	
46	Hoegh LNG Holdings Ltd.	LNG	
47	BW LPG Limited	LPG	
48	Golar LNG Energy Ltd	LNG	

Listed shipping companies consisting our sample

*blue color indicates shipping companies with Greek ownership

We have a representative sample for our research with companies from different shipping sectors and we can easily observe that Greek Shipping Companies consist a large amount of shipping companies worldwide.

The truth is that ownership could actually change within months, we sea Merges and Acquisitions lately to dominate in the shipping industry or alliances. Indeed, it has to do with strategic decisions that set a new image and change perspectives or investments. This will influence of course the capital structure and it could also be a criterion of such a strategic option between companies or group of companies.

8.2 Explaining VaR

The risk definition of the periods in this research was made using historical VaR method. The first step was to estimate the historical VaR in yearly window using daily values of Baltic Dry Index (BDI). We are going to explain how VaR works in general in order to give our reader a better picture and understand our econometric model. When using the value – at – risk measure, we are interested in making a statement of the following form:

We are X percent certain that we will not lose more than V dollars in the next N days.

The variable V is the VaR of the portfolio.

We have a function of two parameters:

- ✓ The first is TIME horizon (N days)
- ✓ The second is CONFIDENCE level (X%).

So the equation in general shows when N days is the time horizon and X% is the confidence level VaR is the loss corresponding to the (100-X)th percentile of the distribution of the change in the value of the portfolio over the next N days.

Let's see an example.

When we have N=5 and X=97% VaR is the 3rd (100-97) percentile of the distribution of changes in value of the portfolio over the next 5 days.

VaR is an attractive measure because it's easy to understand, and furthermore because it's very comfortable with the idea of compressing all the Greek Letters for all market variables underlying a portfolio into one single number.

But, what if we don't have a normal distribution?

In this case VaR is the same but this portfolio is much riskier because potential losses are much larger. So, instead of VaR, a measure that deals with that problem is Conditional VaR (C – VaR). The different point of view between the two measures is that, whereas VaR asks the question "How bad can things get?", C – VaR asks "If things do get bad, how much can we expect to lose?"

C – VaR is the expected loss during a N – day period, conditional that we are in the (100-X)% left tail of the distribution.

Let's see an example to make clear what C – VaR is. Suppose we have X=99 and N=10, C – VaR is the average amount we lose over a 10 – day period assuming that a 1% (100-99) worst – case event occurs.

8.2.1 How VaR can be measured?

8.2.1.1 The Time Horizon

In theory VaR has two parameters as we have already mentioned. N the time horizon measured in days and X the confidence interval.

In practice analysts set N=1 and this is because there is not enough data to estimate directly the behavior of the market variables over periods of time larger than 1 day.

So, the usual assumption is: (N – day VaR) = (1 – day VaR)*√N

The formula is exactly true when the changes in the value of the portfolio on successive days have independent identical normal distribution with mean zero. In other cases it is a good approximation.

8.2.1.2 Historical Simulation

Historical simulation is one popular way of estimating VaR. We use past data in a very direct way as a guide to what might happen in the future.

Suppose that we wish to calculate VaR for a portfolio using 1 – day horizon, a 99% confidence level and 500 days of data. The first step is to identify the market variables affecting portfolio, such as exchange rates, equity prices, interest rates etc. We collect data for the 500 recent days and thus provide us 500 different scenarios for what can happen between today and tomorrow. Scenario 1 is where the percentage changes in the values of all variables are the same as they were on the 1st day. Scenario 2 is where they are the same as on the second day and so on.

Thus we define a probability distribution for daily changes (daily changes can be measured with day 501 price minus the forcasted price of portfolio) in the value of our portfolio. The 5th – worst daily change (1% of 500 observations = 5th) is the 1% percentile of the distribution and this is the estimation of VaR because VaR is the loss when we are at the first percentile point.

In order to make the simulation for Day 501 we use either

$X\_500 \cdot X\_i / X\_(i\text{-}1)$, where i = day i and i-1=the previous one

Or

$X\_500 \cdot (1\text{-}(X\_i\text{-}X\_(i\text{-}1))/X\_(i\text{-}1))$

For each Scenario i .

Then we can estimate a N – day VaR through the formula:

$(N – day\ VaR) = (1 – day\ VaR) * \sqrt{N}$

An alternative to historical simulation is *model building approach*.

So this section gave us a clear impression of how VaR functions.

8.3 Baltic Dry Index (BDI) Indicator

The BDI is a shipping and trade index used to measure change in the cost of transporting various materials. The BDI includes component ships: Capesizes, Panamaxes and Supramaxes. Capesize ships are the largest ships in the BDI with 100.000 dwt or greater, while the average size of a Capesize is 156.000 dwt. Let us note that this category could include some very large ships with a capacity of 400.000 dwt. They are mainly used to transport coal and iron ore and occasionally used to transport grains. Panamax ships have a 60.000 to 80.000 dwt capacity and are used

mostly to transport coal, grains and minor bulk products, such as sugar and cement. They require specialized equipment for loading and unloading. The smallest ships included in the BDI are Supramaxes with a carrying capacity of 50.000 to 59.999 dwt. Although, they are close in size to Panamaxes, Supramaxes normally have specialized equipment for loading and unloading and can be used at ports where Panamaxes cannot.

8.3.1 The BDI as an Economic Indicator

Any kind of change in the Baltic Dry Index (BDI) can give investors insight into global supply and demand trends and many consider a rising or contracting index leading indicator of future economic growth. If the index is falling, it might be because the goods shipped are raw, pre-production material, which is typically an area with very low levels of speculation. Cause to the fact that the supply of large carriers tends to be small with long lead times and high production costs, the index can experience high levels of volatility if global demand increases or suddenly drops off.

In fact, the BDI operates as a determinant of markets in freight derivatives, including types of financial forward contracts known as forward freight agreements.

8.4 Sample Description and Methodology

Our sample consists of 48 shipping companies, as we said a little earlier, operating in shipping sector with either in bulk or in liner shipping. The data we use cover the period from 2006 to 2016 with a total of over 600 observations. This fact makes our sample considerably strong and the results statistically significant. We choose this specific sample based on operation of shipping companies so as to study the financing decisions of this specific sector in periods before and after economic crisis with a totally new method, as far as we know, examining capital structure determinants in different periods of risk.

The risk definition of these periods was made using historical VaR method. The first step was to estimate the historical VaR in yearly window using daily values of Baltic Dry Index (BDI)[4]. The next step was to evaluate the critical values with which we are going to define the different risk periods. The critical values were estimated using percentile function. The lower 25% percentile defines the critical value of a low risk period. The mid percentile of 50% defines the critical value of medium risk period and the higher 25% percentile (75%) defines the critical value of high risk period.

With this methodology we have three different periods of risk Low, Medium and High. For statistical robustness of our results we have merge the periods in Low – Medium Low and High – Medium High risk.

Critical Values of VaR	Risk Definition	Years
< 3.52%	Low	2006 – 2007
3.53% - 3.60%	Medium Low	2009 2012 2014 – 2016
3.61% - 3.93%	Medium High	2008
> 3.94%	High	2010 – 2011 2013

Definition of risk rate for 2006 - 2016

For our research we use one dependent and five independent and explanatory variables. The definition of the variables is as follow. The dependent variable is Total Debt Ratio which is equal to (Total Debt)/(Total Assets). Following the empirical hypothesis, the first determinant we are going to investigate is the Asset Structure of the firm. Asset Structure is defined as (Fixed Assets)/(Total Assets) according to Frank and Goyal (2003). The next control variable is the size of the company which is measured as the natural logarithm of Sales (Ozkan 2001). The third determinant of the capital structure we are going to investigate is Firm's Growth. This variable is measured as the annual change on Earnings. The

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[4] The Baltic Dry Index (BDI) is a shipping and trade index created by the London-based Baltic Exchange that measures change in the cost of transporting various raw materials. The exchange directly contacts shipping brokers to assess price levels for a given route, a product to transport and time to delivery, or speed. The Baltic Dry Index is a composite of three sub-indices that measure different sizes of dry bulk carriers or merchant ships: Capesize, Panamax and Supramax. (www.investopedia.com)

forth determinant of capital structure is a profitability index. For this purpose, we use Return on Assets (ROA). The last variable was chosen, so as to consider the effect of risk on company's capital structure. RISK variable is defined as the standard deviation of each year's Earnings After Tax (EAT) for the research period.

Dependent Variable	Definition
Total Debt Ratio	(Total Debt)/(Total Assets)
Independent/Control Variables	Definition
Asset Structure	(Fixed Assets)/(Total Assets)
Size	Natural Logarithm of Sales
Growth	Annual Change of Earnings
Profitability	Return on Assets
Risk	Standard Deviation of EAT

Model used for our variables

The methodology used is that of panel data. Panel data methodology combines time series with cross-sectional data; this type of data thus refers to multidimensional data frequently involving measurements over multiple time periods. This methodology is one of the most exciting fields in econometrics today. The possibility of modelling more realistic behavioral hypotheses and challenging methodological issues, together with increasing availability of panel data have led to the phenomenal proliferation of studies on panel data.

Given that capital structure determination is a dynamic procedure and not a static one, the use of panel data allows us to account for this dynamic nature, capturing Shipping Companies capital structure determination during different economic cycles defined by VaR criteria.

There are several econometric advantages associated with the use of panel models in comparison to the cross-sectional models employed in most capital structure studies.

First the use of panel data reduces collinearity among the explanatory variables thus improving the efficiency of econometric estimates. Second, panel data models can consider a greater degree of the heterogeneity that characterizes firms. The third reason for using panel data methodology is that panel models also allow the presence of dynamic effects.

The model we are going to estimate so as to test the hypotheses analyzed in previous section is:

$$Debt\_Ratio_{i,t} = b_0 + b_1 \cdot ASSET\_STR_{i,t} + b_2 \cdot SIZE_{i,t} + b_3 \cdot GROWTH_{i,t} + b_4 \cdot ROA_{i,t} + b_5 \cdot RISK_{i,t} + e_{i,t}$$

Where:

$Debt_{Ratio_{i,t}} = Total\ Debt\ Ratio\ of\ firm\ i\ at\ time\ t$

$ASSET\_STR_{i,t} = the\ Asset\ Structure\ of\ firm\ i\ at\ t$

$SIZE_{i,t} = the\ Size\ of\ firm\ i\ at\ time\ t$

$GROWTH_{i,t} = the\ percentage\ change\ in\ earnings\ of\ firm\ i\ at\ research\ period$

$ROA_{i,t} = Return\ on\ Assets\ of\ firm\ i\ at\ time\ t$

$RISK_{i,t} = the\ risk\ of\ firm\ i\ at\ time\ t$

CHAPTER 9

Results

9.1 Results of our sample

In this chapter we are going to present you the charts with our results and comment on them according to what we expected and what other researches indicated.

2006-2007

Risk Period	Variable	Coefficient
Low – Medium Low		
	Structure	0.767
Year	Size	0.026
2006 – 2007	Growth	-0.011
	ROA	0.104

	Volatility	7.87E-10

For the first examined period 2006-2007, characterized as Low – Medium Low period, the results are as expected in our hypotheses. Asset structure and Firm size is positively correlated to debt as dictated by H1 and H3. Growth opportunities are negatively related to debt (H2). About profitability we have verification of Trade – Off theory, where as Risk isn't statistically significant so H5 isn't confirmed.

2008

Risk Period	Variable	Coefficient
High		
	Structure	130.828
Year	Size	-13.225
2008	Growth	0.258
	ROA	224.936
	Volatility	-3.04E-07

The second period (2008) is a high risk period. Hypothesis 1 is confirmed. Also Trade –Off theory is verified (H4b) and Risk is negatively related to Debt (H5). On the other hand, Size and growth opportunities seem to have opposite relation in this risk period.

2009

Risk Period	Variable	Coefficient
Low – Medium Low		
	Structure	186.582
Year	Size	-25.542
2009	Growth	-5.865
	ROA	-129.38
	Volatility	-9.47E-08

Third period is also a Low – Medium Low risk period. Asset structure has a positive relation to debt (H1). Growth opportunities have negative relation to debt (H2). Firm size seem to have negative relation to debt which is not in relevance with H3. Pecking Order theory seems to verified about profitability's relation to debt and high volatility has a negative impact in Debt.

2010-2011

Risk Period	Variable	Coefficient
High – Medium High		
	Structure	57.775
Years	Size	-18.954

Risk Period	Variable	Coefficient
2010 – 2011	Growth	-0.068
	ROA	3.228
	Volatility	3.44E-09

The next period (2010 – 2011) is a high risk period. The results are similar to previous high risk period (2008). Hypothesis 1 is confirmed. Also Trade –Off theory is verified (H4b). Risk is negatively related to Debt (H5) but it isn't statistically significant. On the other hand, Size and growth opportunities seem to have opposite relation in this risk period.

2012

Risk Period	Variable	Coefficient
Low		
	Structure	-1.151
Years	Size	-17.719
2012	Growth	0.138
	ROA	3.824
	Volatility	1.06E-08

2012 is a year of low risk but unfortunately the results aren't statically significant and furthermore the relation of the determinants and debt are in contrast with our hypotheses.

2013

Risk Period	Variable	Coefficient
High		
	Structure	42.936
Years	Size	-19.330
2013	Growth	-2.702
	ROA	14.093
	Volatility	8.35E-09

The next period (2013) is a high risk period. The results are similar to previous high risk periods (2008, 2010 – 2011). Hypothesis 1 is confirmed. Also Trade –Off theory is verified (H4b). Risk is negatively related to Debt (H5). On the other hand, Size and growth opportunities seem to have opposite relation in this risk period.

2014-2016

Risk Period	Variable	Coefficient
Low – Medium Low		
	Structure	9.249

Years	Size	-7.857
2014 – 2016	Growth	-0.585
	ROA	0.207
	Volatility	-2.53E-09

The last period is also a Low – Medium Low risk period. Asset structure has a positive relation to debt (H1). Growth opportunities have negative relation to debt (H2). Firm size seem to have negative relation to debt which is not in relevance with H3. Trade off theory seems to verified about profitability's relation to debt and high volatility has a negative impact in Debt.

To sum up, according to our hypotheses we expected asset structure to be positively affected as it happens in all periods except of 2012. Growth opportunities to be negatively related to debt which did not happen in some periods of both high and low risk, more specifically in 2008 and 2012 but all the other periods confirmed our hypothesis. Firm size to be positively related to debt, which happened only for 2006-2007, a period of low – medium low risk. For all the other periods firm size is negatively related to debt. We expected profitability to be either negatively related to debt according to pecking order theory or positively according to trade-off theory, in our research we find trade-off theory to be right, we only find profitability related negatively to debt in 2009, a period of low – medium low risk. Finally, risk was expected to be negatively affected or positively related according to pecking order theory and agency costs or asymmetric information theories respectively. In half of the cases we observe a positive relation and in other cases a negative one. Risk, though, is a variable which does not easily correspond to any theory because it is unstable and is better observed in shorter time periods; in this case it would be interesting to examine the flexibility and adaptability of firms.

In relevance to other recent researches, our results agree with Paun & Topan (2015) as it has to do with variables Asset Structure, Growth and Profitability, and with Merika et al. (2015) as it has to do with variables Profitability (ROA) and Asset Structure.

We get similar results to the determinants Asset Structure, Profitability and Size with Drobetz et al. (2015) and in some cases in Risk, although the mathematical sign cannot be explained in any theory. Finally, Psillaki & Daskalakis (2015) have the same results with ours for variables Size, Growth, Profitability and Risk but only for the cases of Greece and Italy.

CHAPTER 10

Conclusion

10.1 Conclusion

Capital structure is a key issue for financial decision makers and through empirical evidence as well as evidence from surveys, it is indicated that firms seek a target debt to equity ratio. Often, companies may deviate from their target capital structure cause to random events or market changes and then they gradually move back to their optimum mix. There is, though, little evidence about their speed adjustment and any kind of macroeconomic variables that could influence this process.

We find similarities to some of our hypotheses while not in some other, interpreting the results in a statistically significant sample.

Our sample consisted of 48 shipping companies operating in shipping sector either in bulk or in liner shipping, collecting data from period 2006 - 2016. We wanted to explore the dimension of capital structure and how important is it in firm decisions. Talking about capital structure decisions we refer to three financing decisions – investment, financing, and dividend decisions – finance managers have to make (Van Horne and Wachowicz, 1995).

Throughout literature there are many different theories and aspects of study, but the two dominant and most used are the pecking order and the trade-off theories. The econometric model that was followed was the panel data as most reliable; there are several econometric advantages associated with the use of panel models in comparison to the cross-sectional models employed in most capital structure studies, as mentioned before.

The innovative part of this study is the use of a risk definition in different time periods. The risk definition of these periods was made using historical VaR method. We estimated the historical VaR in yearly window using daily values of Baltic Dry Index (BDI). Then we evaluated the

critical values with which we define the different risk periods. The critical values were estimated using percentile function. The lower 25% percentile defines the critical value of a low risk period. The mid percentile of 50% defines the critical value of medium risk period and the higher 25% percentile (75%) defines the critical value of high risk period. With this first time used methodology we have three different periods of risk Low, Medium and High. For statistical robustness of our results we have merge the periods in Low – Medium Low and High – Medium High risk.

According to our hypotheses we expected asset structure to be positively affected as it happens in all periods except of 2012. Growth opportunities to be negatively related to debt which did not happen in some periods of both high and low risk, more specifically in 2008 and 2012 but all the other periods confirmed our hypothesis. Firm size to be positively related to debt, which happened only for 2006-2007, a period of low – medium low risk. For all the other periods firm size is negatively related to debt. We expected profitability to be either negatively related to debt according to pecking order theory or positively according to trade-off theory, in our research we find trade-off theory to be right, we only find profitability related negatively to debt in 2009, a period of low – medium low risk. It's worth noticed that in Low risk periods size is negatively related to debt. This means that large companies in low risk periods prefer equity to debt.

Finally, risk was expected to be negatively affected assuming pecking order theory or positively affected according to agency costs or asymmetric information theories but it did not happen in all periods of risk. Risk, though, is a variable which does not easily correspond to any theory because it is unstable and is better observed in shorter time periods; in this case it would be interesting to examine the flexibility and adaptability of firms.

Future research could be directed to the general shipping sector for periods of different volatility and risk studying and analyzing all those special characteristics of risk and more specifically for those periods and the adaptability of the shipping companies. Optimal capital structure choice for this cyclical industry gains great interest of study. Furthermore, other econometric models could be used and interpreted, in order to examine the preciseness of our results and our model

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