



ICADE Business School

# **CAPITAL STRUCTURE: Implications of the different sources of financing**

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## CAPITAL STRUCTURE: Implications of the different sources of financing



## Summary

Through the following paper I would like to provide the lector with an overall vision of the main theories that have tried to provide a scientific and quantitative approach to the problem of the optimal capital structure. Despite seeming a relatively easy task, those who have tried to accurately quantify and measure the main drivers of the firm's sources of financing have faced many problems that are hard to solve, and that are those common to the social sciences, the difficulty to model the human behaviour. Nevertheless, some authors have succeeded in providing an approximate theory to the optimal capital structure.

The main revolution regarding capital structure theory began in 1958 with the famous paper developed by Modigliani and Miller, they analysed the main aspects that needs to be considered in order to obtain an optimal capital structure, under perfect capital markets. As a consequence of the main assumption done by this theory it is generally considered as a purely theoretical model, since it does not take into account many important aspects that are key for determining the optimal capital structure like fluctuations and uncertainty, or taxation environment that may occur in the course of financing a company. As a result, this theorem states that, in a perfect market environment, how a firm is financed has no impact in its value.

Following the Modigliani and Miller theory I would like to analyse those theories that have a more realistic approach, in which the capital markets are not considered perfect. Following their first theory, in 1963, Modigliani and Miller proposed a new version of their model in which they incorporated the effect of corporate taxes in their theory. As a result, and according to their theory the perfect capital structure would be the one composed of the higher possible amount of debt. Nevertheless this theory has been heavily criticised as it does not take into account the possible distressed cost associated with a high level of debt or the effect of personal taxation. In 1977, Miller developed a new model that incorporated the effect of both taxation effects, personal and company income tax, concluding that when tax rates are similar the capital structure does not have an impact on the economic value of a company.

The most recent theories that are currently being subject of study are those based on asymmetric information and the relation between the costs and benefits of carrying debt. The theory that has been most widely cover regarding asymmetric information is the pecking order theory, which states that the different levels of information available for the economic agents play a significant role in determining the capital structure of a company; in the other hand, the trade-off theory can be summarized as a theory that supports the existence of an optimal capital structure, which appears once the benefits of having debt equals the cost associated to that debt. As the theory seems to be contradictory, in the last chapter of this paper I will provide the lector with a quantitative analysis that tries to clarify if both theories are mutually exclusive.

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## List of Abbreviations

$\Delta LTD$	Change in Long-Term Debt
$\Delta STD$	Change in Short-Term Debt
$AbDev$	Deviation from Target Level
$D$	Debt Market Value
$D^*$	Optimal Level of Debt
$Div$	Dividends
$E$	Market Value of Equity
$EBIT$	Earnings before Interest and Taxes
$EBITDA$	Earnings before Interest, Taxes, Depreciation and Amortization
$EPS$	Earnings per Share
$EV$	Enterprise Market Value
$Fin$	Financing Deficit
$I$	Net Investment
$Info$	Information Asymmetry
$K0$	Average Cost of Capital
$Kd$	Market cost of debt
$Ke$	Markets cost of Equity
$M B$	Market to Book Ratio
$MTR$	Marginal Tax Rate
$NDTS$	Non-Debt Tax Shields
$RDAD$	R&D Expenses
$S$	Net Profit for Shareholders
$Size$	Total Amount of Assets (log)
$St$	Movements in the Value of a Stock
$T.Assets$	Total Amount of Tangible Assets
$WC$	Change in Working Capital
$X$	Earnings per Share

# 1. Introduction

In this paper, I would like to explain the different sources of financing used by companies to finance the acquisition of real assets.

There is not a universal capital structure theory, and we know very little about the reasons why firms choose a certain combination of debt, equity or hybrid securities. In my research, I would like to analyze in depth the main theories related to the optimal combination of debt-equity, its implications to the value creation process and how this combination can determine the success or failure of a corporation.

The first capital structure theoretical approaches focused on determining if there was any relation between the leverage ratio and the weighted average cost of capital of a company. These theories became more popular with the celebrated paper by Modigliani and Miller (1958). They stated that, under certain conditions, capital structure is irrelevant for the value of a firm or its cost of financing.

The main theories that I will study are based on two different streams: (a) those that rely on the Perfect Market Hypothesis, which were developed first, and (b) those theories that have a more realistic approach that do not consider capital markets as perfect, and that introduce new variables that have a great impact on the way that companies finance their assets, such as tax shield.

According to Myers (2001), most of the aggregate gross investment by U.S. nonfinancial corporations has been financed from internal cash flow (depreciation and retained earnings) while the external financing covers less than 20% of real investment, being most of that financing debt, and net stock issues negative through for example repurchasing programs. Nevertheless these figures vary depending on the industry and even among corporations. For example those companies with a intensive use of capital, such as oil companies, heavily rely on debt financing, while others in which equity is the main source of financing, tend to be riskier and have a faster growth.

In this paper, I will focus on those corporations that for different reasons such as size, or bargaining power, have access to the international financial markets, because these companies have a wider menu of options to finance their real assets.

## 1.1. Theories based on Perfect Capital Markets

Despite the models covered in this part of the essay have their own hypothesis, all of them are based on perfect capital markets, therefore is convenient to point out which are the main assumptions made under this type of market and what are the made assumptions made to measure the enterprise value and the Cost of Capital Assumptions.

### Perfect Markets Hypothesis

- a. There are no market operations costs.
- b. Markets are competitive.
- c. All participants have access to the markets.
- d. All information is public.
- e. There is no bankruptcy cost.
- f. There are no taxes.
- g. Expectations are homogenous.

### Enterprise Value and Cost of Capital Hypothesis

- a.  $EV$  = enterprise market value.
- b.  $D$  = debt market value.
- c.  $E$  = market value of equity.
- d.  $K_d$  = Market cost of debt.
- e.  $K_e$  = cost of equity.
- f.  $K_0$  = average cost of capital.
- g.  $X$  = earnings before interest and taxes.
- h.  $S$  = Net profit available for shareholders.

### Assumptions

$$EV = D + E \quad \text{Equation 1}$$

$$X = S + K_d \times D \quad \text{Equation 2}$$

$$K_0 = \frac{X}{EV} \quad \text{Equation 3}$$

$$K_e = \frac{S}{E} \quad \text{Equation 4}$$

$$K_d = \frac{K_d \times D}{D} \quad \text{Equation 5}$$

### Substituting

$$S = K_e \times E \quad \text{Equation 6}$$

$$K_d \times D = K_d \times D \quad \text{Equation 7}$$

$$X = K_e \times E + K_d \times D \quad \text{Equation 8}$$

Substituting  $X$  we obtain:

$$K_0 = \frac{K_e \times E + K_d \times D}{EV}; K_0 = \frac{K_e \times E}{EV} + \frac{K_d \times D}{EV} \quad \text{Equation 10}$$

$$K = K_0 + \frac{(K_0 - K_d) \times D}{EV} \quad \text{Equation 11}$$

Assuming  $K_d < K_0 < K_e$ , due to the different levels of risk assumed when investing in each kind of sources of funding.

## 1.2. The EBIT, EPS and Traditional Approaches to Optimal Capital Structure

In order to go deeper into these capital structure approaches we need to define a new series of hypothesis that are common to these theories.

Hypothesis Rivera, J. (1998).

- a. The level of economic risk of a company remains constant in time.
- b. All companies that pose the same level of risk are on the same stage in which their assets are not growing.
- c. Under the EBIT and EPS approaches the cash flows are constant to perpetuity.
- d. There are no taxes in the economy.
- e. Firms do not make capital increases with rights offering.

In addition, to the previous hypothesis it is important that the following conditions are met:

- a. There are no transactions costs.
- b. All agents in the economy have the same expectations
- c. Companies can modify instantly their leverage ratio

The EBIT approach theory denies that an optimal capital structure can occur, since both, the average cost of capital and the enterprise value are constant. Therefore, it would be useless any financial technique aimed to increase the value of a company by modifying its capital structure. However, for the EPS approach, which assumes that the cost of equity is higher than the cost of debt and that both are constant, the optimal capital structure is the one that has the highest amount of debt because each increase in the debt implies a lower average cost of capital.

The prevalent opinion of the economists prior to Modigliani and Miller theory regarding the debt to equity ratio is denominated as the traditional approach. According to this approach, it is possible to reach an optimal capital structure using a low leverage ratio. As a consequence the average cost of capital would decrease, due to a lower risk

profile, which will imply a maximization of the enterprise value associated with lower debt costs.

Although these theories regarding capital structure are nowadays not very useful, they provide a first approach to the concepts and to the theoretical models that will be covered on this paper later on.

**Table 1: EBIT, EPS and Traditional Approach**

	The EBIT Approach	The EPS Approach	Traditional Approach
Cost of Capital			
E.V*			

Source: *La Estructura Óptima de Capital*, J Mascareñas, 1993.

### 1.3. Modigliani and Miller Theory

The Modigliani and Miller theory was first introduced in 1958, and it can be considered as the first scientific approach to the optimal capital structure. According to this theory, markets are considered as perfect, and as a consequence the percentage of debt and equity over the total capital is irrelevant. Later on, in 1963, Modigliani and Miller introduced the tax effect in their model, revising their preliminary conclusions and stating that, in order to benefit of the tax effect, companies should have the highest possible amount of debt

The Modigliani and Miller theory requires that the Perfect Market Hypothesis are fulfilled, especially the conditions a, b, d and f. This theory also assumes that:

- Investors will focus in obtaining higher returns, but they are indifferent to obtain them via dividends or increases in stock prices.
- The utility function for the earnings before interest and taxes of a firm are the same for all investors and constant through time.
- The last assumption made under this theory is that all companies can be grouped according to similar yields given a certain level of risk; therefore the shares of these firms with same level of risk are perfect substitutes.

Considering the assumptions explained before, the Modigliani and Miller Theory introduces the following prepositions (Rivera Godoy, 2002):

### 1<sup>st</sup> Preposition

The enterprise value and its average cost of capital are independent of its capital structure.

$$EV = D + E; V = \frac{X}{K_0}; K_0 = \frac{X}{EV} \quad \text{Equation 12}$$

The possibility of arbitrage grants the equilibrium.

For two companies with equivalent risk and therefore with the same level of expected profit, X.

**Table 2: Model Variables**

Variables	Firm without debt (1)	Firm with debt (2)
Market value	EV1	EV2
Debt market value	D1 <sup>1</sup>	D2
Equity market value	E1	E2
Participation $\alpha$ of the total floating shares	s1	s2
Yield of the investor portfolio	Y1	Y2
Cost of investment	C1	C2

Source: Rivera, J. (1998). Pag. 87.

Given the information above, an investor can use two different strategies of investment:

- a. Buys a certain number of shares of enterprise 2 and gets the following yield :

$$Y_a = \alpha \times (X - K_d \times D2) \quad \text{Equation 13}$$

- b. Sells (s2) which provides the investor with  $\alpha \times E2$ , in addition, the investor borrows  $\alpha \times D2$ , which is equal to the correspondent amount of debt of the leveraged company, therefore the investor would accumulate  $\alpha \times (E2 + D2)$ , which could be used to invest in the non-leveraged company, therefore

$$s1 = \alpha \times (E2 \times D2) \quad \text{Equation 14}$$

$$s1 = \alpha \times (E2 + D2) \quad \text{Equation 15}$$

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<sup>1</sup> D1 = 0 as it is assumed that firm 1 has no debt.

The participation corresponding to the shares and earnings of the company 1 is equal to:

$$\frac{s_1}{E_1} = \frac{\alpha \times (E_1 + D_2)}{E_1} \quad \text{Equation 16}$$

And the yield of the investment would be equal to:

$$Y_1 = \frac{((\alpha \times (E_2 + D_2) \times X))}{E_1} - (K_d \times \alpha \times D_2) \quad \text{Equation 17}$$

$K_d \times \alpha \times D_2$  is the interest to be paid by the investors own debt, which is equal to the interest to be paid by the leveraged company.

As  $E_2 + D_2 = EV_2$  and  $E_1 = EV_1$  due to  $D_1 = 0$ , we obtain the following expression:

$$Y_1 = \alpha \left( \left( \frac{EV_2}{EV_1} \right) \times X - K_d \times D_2 \right) \text{ And if } EV_2 = EV_1 \text{ then } Y_2 = Y_1 \quad \text{Equation 20}$$

We can also analyze the cost of investments in which the shareholders incurs when using the two strategies shown before:

a. When investing in the leveraged company, the cost of the investments is equal to:

$$C_2 = \alpha \times E_2 \quad \text{Equation 21}$$

$$C_2 = \alpha \times (EV_2 - D_2) \quad \text{Equation 22}$$

b. If we follow the second strategie then:

$$C_1 = \alpha \times E_1 - \alpha \times D_2 \quad \text{Equation 23}$$

$$\text{As } E_1 = EV_1 \text{ therefore } C_1 = \alpha \times (EV_1 - D_2) \quad \text{Equation 24}$$

Under the equilibrium conditions we expect that  $EV_1 = EV_2$ ,  $Y_1 = Y_2$  and  $C_1 = C_2$ . If  $EV_1 \neq EV_2$ , there would be an arbitrage process until the equilibrium is met again.

**Table 3: Arbitrage Process under Modigliani and Miller Theory**

Enterprise value	Yield of the investment	Cost of investment	Arbitrage process
EV2 = EV1	Y2 = Y1	C2 = C1	Equilibrium, no arbitrage possible.
EV2 > EV1	Y2 < Y1	C2 > C1	Shareholders of firm 2 will sell and buy shares of firm 1, increasing the price of shares of firm 1 until EV1 = EV2.
EV2 < EV1	Y2 > Y1	C2 < C1	Shareholders of firm 1 will sell and buy shares of firm 2, increasing the price of shares of firm 2 until EV1 = EV2.

Source: Rivera, J. (1998). Pag. 87.

### 2<sup>nd</sup> Preposition

The cost of equity can be considered as a linear function of the leverage of a company, that can be expressed as:

$$K_e = K_0 + (K_0 - K_d) \times \frac{D}{EV} \quad \text{Equation 25}$$

Nevertheless when the amount of debt increases and the lenders increase the interest rate of the debt, the cost of equity does not follow the function shown above<sup>2</sup>.

### 3<sup>rd</sup> Preposition

The rate of return of an investment project is independent of how the company is financed, and has to be at least equal to return rate that the market applies to unleveraged companies and that carry the same level of risk of the company subject to the investment,  $K_0$ .

To summarize the theories based in perfect capital markets, and especially the Modigliani and Miller theory, the decision regarding the arose as a consequence of the tax shields originated by debt financing. Therefore, as first shown by Modigliani and Miller (1958), the value of the cash flows of a levered project equals the market value of the unlevered cash flows plus the market value of the stream of tax savings on interest payments associated with the debt employed to finance the project.

While the previous statement is completely general with respect to the processes utilized by the market to value the two components, the Modigliani and Miller theory

<sup>2</sup> Under the Modigliani and Miller theory (1958) the cost of debt for a certain company with a particular level of risk remains constant.

(1958) specified that the value of a leveraged company is equal to the present value of the levered cash flows discounted at the appropriate risk adjusted unlevered cost of capital. In addition they stated that the value of the tax savings component is equal to the present value of the tax shield of debt interest discounted at the cost of debt. Therefore, the value of a project's levered cash flows is equal to the sum of these two present values, one representing the effects of the investment decision and the other capturing the effects of the financing decision.

### **1.3.1. Criticism to the Modigliani and Miller Theory**

After reviewing the main aspects of the Modigliani and Miller Theory, I would like to summarize the main criticisms, which are mainly focused on its hypothesis about the arbitrage process, which ensures the validity of their theory.

- a. The risks associate to the leverage of a company and a person are different because the collaterals and responsibilities established for each of them are different. Therefore, the personal and the enterprise debt are not perfect substitutes.
- b. The cost of capital for an individual is usually higher than for a company.
- c. It is possible that the arbitrage process is not effective enough because there can be restrictions for the investors, such as regulation or transaction costs.
- d. The Modigliani and Miller Theory does not take into account the costs of bankruptcy and its direct and indirect costs.

## 2. Theories Based on Imperfect Capital Markets

Firstly, it is important to highlight the main issues that imply that capital markets are imperfect, such as transaction costs, limits to the level of debt, taxation schemes, asymmetric access to information, agency cost, bankruptcy cost, among others.

### 2.1. Modigliani and Miller Theory with Tax Effect (1963)

Modigliani and Miller were among the first authors who took into account the tax environment in the capital structure of a firm, which they used to amend their irrelevance theory of the capital structure regarding the value of a company, when they considered the fiscal advantages that using financial debt has, and that were underrated in their first theory.

When the profit of a leverage company after taxes and before debt interest,  $X_t$ , is equal to:

$$X_t = R + K_D \times D, \text{ being } R \text{ de utility after taxes of a leverage company} \quad \text{Equation 26}$$

$$\text{As } R = X - K_d \times D - t \times (X - K_d \times D) \quad \text{Equation 27}$$

$$\text{Then } X_t = (X - K_d \times D) - t \times (X - K_d \times D) + K_d \times D \quad \text{Equation 28}$$

$$\text{Equal to } X_t = (X - K_d \times D) \times (1 - t) + K_d \times D \quad \text{Equation 29}$$

$$X_t = (1 - t) \times X + t \times K_d \quad \text{Equation 30}$$

It can be appreciated that the expression above is the addition of two different components: the first one is uncertain and the second one is a stable income stream. Therefore to determine its equilibrium value it would be necessary to capitalize them separately.

The first term needs to be capitalized at  $K_{0t}$ , which is the rate at which the market, capitalize the benefits adjusted after taxes of an unleveraged company of the same size of  $X$  and the same level of risk. Therefore the value of the unleveraged company  $EV1$  will be equal to:

$$EV1 = \frac{X \times (1-t)}{K_{0t}} \quad \text{Equation 31}$$

The second term of the equation needs to be capitalized at a rate  $K_d$ , at which the market takes into account the returns generated by debt, then:

$$K_d = \frac{K_d \times D}{D} \quad \text{Equation 32}$$

$$D = \frac{K_d \times D}{K_d} \quad \text{Equation 33}$$

With the previous statements we can determine that the value of a leverage company with a size X and a permanent level of debt D will be equal to:

$$EV2 = \frac{X \times (1-t)}{K_{0t}} + \frac{t \times K_d \times D}{K_d} \quad \text{Equation 34}$$

$$EV2 = EV1 + t \times D \quad \text{Equation 35}$$

The previous expression shows that the value of a company can be increased by increasing the percentage of debt relative to equity, being the optimal capital structure the one only composed by debt. Therefore the 1<sup>st</sup> proposition has now the following structure<sup>4</sup>:

$$\frac{X_t}{EV2} = K_{0t} - \frac{t \times (K_{0t} - K_d) \times D}{EV2} \quad \text{Equation 36}$$

While the 2<sup>nd</sup> proposition is now<sup>5</sup>:

$$\frac{R}{E2} = K_{0t} + \frac{(1-t) \times D2}{E2} \quad \text{Equation 37}$$

**Table 4: Cost of Capital and Enterprise Value**

	<b>Traditional Approach</b>	<b>MM (1958)</b>	<b>MM (1963)</b>
<b>Cost of Capital</b>			
<b>EV</b>			

Source: *La Estructura Óptima de Capital*, J Mascareñas, 1993.

<sup>3</sup> Compared with the first version of their theory, this value involves an additional gain, due to  $t \times D \times K_d$  is capitalized at a rate  $K_d$  as it is fixed income.

<sup>4</sup>  $X_t = X \times (1-t) + t \times K_d \times D$ , by substituting in  $EV2 = \frac{X \times (1-t)}{K_{0t}} + \frac{t \times K_d \times D}{K_d}$  and both terms are multiplied by  $K_{0t}$  and divided by  $EV2$  we obtain that the weighted average cost of capital is equal to:  $\frac{X_t}{EV2} = K_{0t} - \frac{t \times (K_{0t} - K_d) \times D}{EV2}$ , being  $X_t / EV2$  the cost of capital of the leveraged company; in case the company would be unleveraged it would be equal  $\frac{X_t}{EV1} = K_{0t}$

<sup>5</sup> If in the equation on the first proposition  $X_t$  is substituted by  $R + K_d \times D$  and  $EV2$  by  $E2 + D2$  we obtain that the cost of equity is equal to  $\frac{R}{E2} = K_{0t} + \frac{(1-t) \times D2}{E2}$ , being  $R / E2$  the cost of equity of a leverage company.

### **2.1.1. Criticism to the Modigliani and Miller Theory with Taxes**

Nevertheless, this new conclusion from the Modigliani and Miller theory that affirms that, the savings obtained with the use of financial debt allow the existence of an optimal capital structure using the highest possible amount of debt that the company can attract has been very criticized; the main criticism to Modigliani and Miller theory with taxes can be summarized in the following three points.

- a. It is not consistent with the reality in which, in general, enterprises hold a moderate level of debt.
- b. It does not consider the cost of bankruptcy that probably would take place due to the high amount of debt that this theory implies.
- c. This theory does not take into account natural people taxation, which is a problem as in many countries the income generated by debt interest is taxed at higher rate than gains generated by income on movable capital.

### **2.2. Personal and Company Taxation. The Miller Model (1977)**

The sources of financing of the enterprises are not only affected by the company taxation schemes but also by the personal taxation system. This is because investors have to pay taxes both for the interest generated as lenders or for the returns obtained as shareholders. Nevertheless, while interests are only taxed as income on movable capital,  $t_d$ , the returns on equity are subject to taxation first as company income,  $t$ , and second as personal income,  $t_s$ .

It could be considered that  $t_s$  is equal to  $t_d$ , but for most of the taxation schemes of the developed countries this would only be true if all the income received by the shareholders proceed from dividends, instead from differences in prices that generate capital gains. As a result from this  $t_s$  can be smaller than  $t_d$ , because the capital gains taxation system allows tax deferral.

The different tax rates and schemes that apply to each investor difficult a company to maximize the income generated after taxes. This problem was considered by Miller concluding that the income generated due the tax shield over the debt disappears on an equilibrium market context, when the personal income tax and company income tax are considered together, having no impact the capital structure over the enterprise value.

In the next equation, Miller shows the possible income generated by the tax savings,  $G$ , which is equal to the difference of the investor's utility after taxes (IUAT<sup>6</sup>) of a leverage and an unleveraged company:

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<sup>6</sup> IUAT = investors utility after taxes.

$$G = ((X - K_d \times D) \times (1 - t) \times (1 - t_s) + K_d \times D \times (1 - t_d)) - (X \times (1 - t) \times (1 - t_s)) \quad \text{Equation 38}$$

$$G = K_d \times D \times ((1 - t_d) \times (1 - t) \times (1 - t_s)) \quad \text{Equation 39}$$

If the cost of debt after taxes is subtracted  $K_d \times (1 - t)$ , which is the opportunity cost for debt lenders, then we obtain:

$$G = \frac{K_d \times ((1 - t_d) \times (1 - t) \times (1 - t_s))}{K_d \times (1 - t_d)} \quad \text{Equation 40}$$

$$G = \frac{(1 - (1 - t) \times (1 - t_s))}{(1 - t_d) \times D} \quad \text{Equation 41}$$

Then  $EV2 = EV1 + G$ .

When  $(1 - t_d) = (1 - t) \times (1 - t_s)$ , the tax shield obtained from the debt is irrelevant because the savings achieved through debt is null,  $G = 0$ ; therefore  $EV2 = EV1$ .

### 2.2.1. Criticism to Miller's Personal and Company Taxation Model

Miller proved theoretically this hypothesis using model of equilibrium in the debt market. And despite it has been considered as a good approach to the influence of the personal and corporate taxation for enterprises and its capital structure valuation, it has also been criticized for the following reasons:

- a. Predictions of the model are only valid when taxation on personal income is lower than the taxation on corporate income, and within personal income tax, when the tax rate applied for returns on equity,  $t_s$ , is lower than the interest of the debt,  $t_d$ .
- b. Despite capital gains on equity allows tax deferral, it is unlikely that  $t_s = 0$ , as the evidence shows that the majority of companies pays dividends and therefore they are subject to personal income taxation, as income on movable capital.
- c. The model implies that unlimited deductions of interest are possible, for companies, when in reality it is adjusted to earnings, which implies to effects no recognized in this model:
  - i. That companies issue lowers amounts of debt, reducing interest rates.
  - ii. The marginal effect on debt utility. The first unit of debt increases more the value of a company than the last unit, because the last units of debt might not be deductible.

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<sup>7</sup> IUAT leveraged company =  $(X - K_d \times D) \times (1 - t) \times (1 - t_s) + K_d \times D \times (1 - t)$ ;  
 IUAT unleveraged company =  $X \times (1 - t) \times (1 - t_s)$

### **2.3. Agency Costs Theory**

The capital structure of a company is established by a series of contracts that imply an agency relationship, in which the principal<sup>8</sup> delegates its authority on a different agent, which is who effectively manages the firm. Both the principal and the agent try to maximize their utility function, but as they are driven by different factors, one lead by the property, and the other one lead by control it originates a certain costs. This difference may lead to agency costs that have an impact on the value of the company because the solution implies different costs, known as agency costs.

According to Jensen and Meckling (1976), the agency costs are the addition of the supervision costs by the principal to the agent plus the trust cost, the cost that arise as a consequence of the warranties established by the agent in order to align its interests with the principal interests.

#### Conflicts between shareholders and the management

Conflicts between shareholders and the management arise as a consequence of the separation of two concepts, property and control. More specifically, these costs arise because the management team does not custody the whole amount of profit claimed by the shareholders. Instead the management team transfers part of those flows into their personal profit, not on a direct way from the utility obtained through each project of the company, but from its participation in the profit consumption<sup>9</sup>.

These agency problems that arise as a consequence of the uncertainty that drives the markets can be reduced if the management team achieves a higher percentage of the stake of the company.

It is important to note that this conflict between capital owners and the decision taking agents increase in those situations in which the principal suffers a higher gap of information with respect to the agent.

#### Conflicts between shareholders and lenders

The limitations established in the contract between shareholders and borrowers can lead shareholders to take actions that are not optimal, in the way of not maximizing the value of the company. This effect can be a consequence of taking higher risk, for insufficient investment, or for a high exploitation of the property<sup>10</sup>. This decision would become more popular for those companies with high leverage that are under bankruptcy

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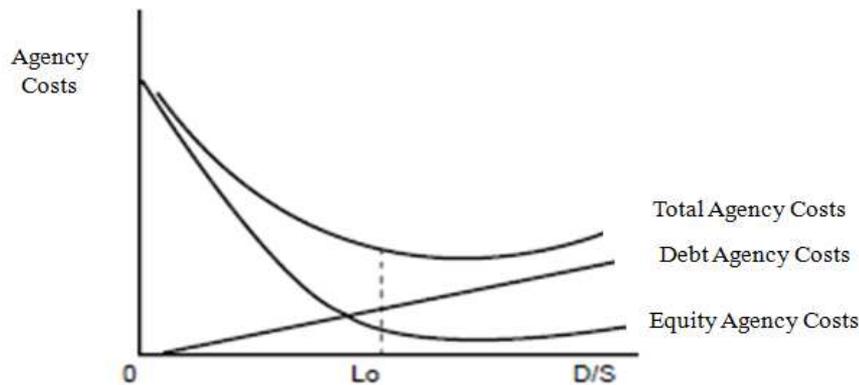
<sup>8</sup> An organization, person or group of persons

<sup>9</sup> Those costs refer to a variety of costs, such as lower effort on an appropriate management of the resources of the company.

<sup>10</sup> An example of this situation could be paying dividends while the company is suffering financial difficulties.

risk. The shareholders will be willing to accept projects that are suboptimal regardless that their particular benefits will have a negative impact over the lenders interests, or the value of the company. Therefore, a leveraged company will follow a different investment strategy comparing to an unleveraged company.

**Figure 1: Optimal Capital Structure under Agency Cost**



Source: *La Estructura Óptima de Capital*, J Mascareñas, 1993.

The figure above shows the decreasing trend of the agency costs caused by the equity capital, and the increasing trend of the agency trend that derives from the increasing leverage of the company. The combinations of both curves give us the total cost of agency of the company that on a first stage decreases with an increasing amount of debt, but from  $L_0$  the total amount of agency costs start rising again.  $L_0$  indicates the perfect capital structure, in which the agency costs have been minimized.

## 2.4. Asymmetric Information

Not all the economic agents have access to the same information of all economic variables that drives the functioning of a company, mainly because the cost and inequality of the markets participants when accessing to the information. The management has more information than the shareholders or external investors, because they are in charge of making the decisions regarding the company on a daily basis, which give them access to privileged information about future investment opportunities and the cash-flows of the company.

This market imperfection has been analyzed from the capital structure of a firm point of view, and many authors have given different approaches to this issue.

- a. According to Ross (1977), the financial structure of a company can be interpreted as a piece of information. Under normal conditions of an existing company, the issuance of debt is usually a positive sign because it means that lenders rely on the financial situation of the company and its ability to repay the debt, while a capital increase is not positive because it usually means that the company has not being

able to refinance part of their existing debt to maintain the current capital structure. The company can manage an optimal capital structure when the compensation of the management is linked to the authenticity of these signals, avoiding that those companies in trouble issue debt to pretend they are on a better shape.

- b. According to Myers (1984) the decisions about financing corresponds to a ***pecking order theory*** that states that firms do not have an optimal debt to equity ratio that can be deducted from the cost-benefits relation of carrying debt. Instead the key point about the sources of financing of a company is trying to reduce the cost of external funding generated by asymmetric information problems between the management and the external investors. Therefore, companies would first try to finance using funds generated internally, reserves or non-distributed dividends, free of asymmetric information, on a second stage; companies would choose to raise funds from debt and lastly issuing new shares because capital increases have usually a negative impact on the market.

Despite with the pecking order theory it is possible to give a satisfactory explanation between the negative relation between leverage and profitability of a company, it is not useful to demonstrate the different leverage ratios among each sector or why some companies with steady positive cash-flows prefers to maintain distributing dividends, instead of cancelling their debt.

### 3. Current Areas of Research

The aforementioned theories, specially the Modigliani and Miller Theory, are the basis of the capital structure theory. Currently, the theories that have a major impact and that are covered in most of the academic literature are the Pecking Order Theory and the Trade-off Theory, which have been partially covered in previous chapters. The mathematical model used in this chapter is the one developed by Cotei and Farhat (2009) in their paper *The Trade-Off Theory And The Pecking Order Theory: Are They Mutually Exclusive*, that I have tried to simplify in order to make it more accessible..

#### 3.1. The Pecking Order Theory

As it has been briefly stated before, the pecking order theory, (Myers,1984) and further investigation (Lucas and McDonald, 1990), focus on the idea of the conflicts that arise as a consequence of asymmetric information between the management team and investors. The management team knows more about the true value of the company and its level of risk than those investors who are less informed because they do not manage the company. As a consequence of the asymmetric information, and to avoid underinvestment problems, managers will try to fund the new acquisition of assets using securities that are not under-price by the markets, using in the first stage internal funds, subsequently debt and on the last stage equity. Therefore, this affects the decision between external and internal funding.

The pecking order theory gives a satisfactory explanation to two questions: (a) the use of internal sources of financing as a first option and (b) the preferred use of debt vs. equity in those cases in which external funding is required. Therefore, according to this theory a company leverage level is not the result of the factors covered by the trade-off theory, which will be explained on subsequent chapters, but it is just the cumulative consequence of the company's attempts to ease information asymmetry problem. The equation used by Shyam-Sunder and Myers (1999) to provide a quantitative approach to the information asymmetry problem, define financing deficit (surplus) as follows:

$$Fin = Div + I + \Delta WC - C = \Delta D + \Delta E, \text{ where:} \quad \text{Equation 42}$$

- a. Fin is the financing deficit (surplus).
- b. Div is the amount of cash dividends.
- c. I is the total amount invested.
- d. WC is the change in working capital.
- e. C is the cash flow after interest and taxes.
- f. D is the net amount of debt issued.
- g. E is the net amount of equity issued.

When Fin takes positive values, it indicates a funding deficit, while when it is positive it indicates a financing surplus.

According to this model, the financing deficit (surplus) only takes into account the long-term debt funding because the short-term debt is already recognized in the working capital needs. Therefore, the pecking order theory suggests that companies will issue different securities according to their sensitivity to the information asymmetry problem<sup>11</sup>, this means that companies will try to use first short-term debt, after long-term debt, and equity as a last resort as funding sources, Which means that all possible short-term debt should be issue before companies issue long-term debt.

A new equation is presented to include both sources of financing, during a certain period of time t:

$$Fin = Div + I + \Delta WC - C = \Delta STD + \Delta LTD + \Delta E, \text{ where:} \quad \text{Equation 43}$$

- a.  $\Delta STD$  is the net amount of short-term debt issued.
- b.  $\Delta LTD$  is the net amount of long-term debt issued.

In addition to the previous equation, it is necessary to state that:

$$i. \quad STD_t - STD_{t-1} = \mu_0 + \mu_1 Fin_t + \zeta_t \quad \text{Equation 44}$$

$$ii. \quad LTD_t - LTD_{t-1} = \pi_0 + \pi_1 Fin_t + \varepsilon_t \quad \text{Equation 45}$$

Where:

1.  $\pi_1$  is the amount of long-term debt funding increase (reduction) over the financing deficit (surplus).
2.  $\pi_1$  is the amount of short-term debt funding increase (reduction) over the funding deficit (surplus).

Following with the pecking order theory main implication, when investments exceeds the capacity of a firm for generating cash and it can no longer finance with internal funds, debt typically grows, while when investment is lower than internal funds generation debt typically decreases. Accordingly to the previous statement, the managers ' main problem in each period is to determine the source of their funding needs given the amount of their financing deficit or in other cases surplus and the market environment.

### 3.2. The Trade-off Theory

This theory is often set up as an opposite approach to capital structure comparing with the pecking order theory. De Angelo and Masulis (1980) stated that the trade-off

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<sup>11</sup> The pecking order theory suggest that the securities more sensitive to information asymmetry are first equity and in the second place debt.

theory can be considered as a theory that summarizes all those models that support that there is an optimal combination of debt and equity that maximizes a company's enterprise value that appears when the costs and benefits arising by the leverage level are in equilibrium.

The trade-off theory affirms that exists an advantage of debt funding vs. equity funding as a consequence of the tax shield, and that there are costs associated to debt funding, the costs of financial distress such as bankruptcy cost and non-bankruptcy costs. The marginal positive effect of subsequent increases of financial debt declines as the amount of debt increases, and a firm that is trying to optimize its overall value will focus on this trade-off when choosing how much equity and debt using for funding.

Although the trade-off theory clearly explains the different capital structures among different economic activities and those companies that are more susceptible of being acquired through leverage buy out (LBO), it does not give a clear view of the reasons why highly profitable companies finance themselves using internal sources instead of using its full capacity to absorb debt, or why in those economies in which there is an expansionary fiscal policy with low level of corporate tax rate, the leverage level continues been high.

As a recap of all the previous arguments, the trade-off theory predicts that companies reach an optimal capital structure once the marginal benefits of debt are equal to the marginal costs. The trade-off theory suggest that companies set a certain leverage target and they try to adjust their leverage towards the target over time.

The most common quantitative approach is the standard partial adjustment model, which focus on examining the adjustment mechanism towards a certain leverage target through the changes in debt funding that is partially absorbed by the difference between leverage target,  $D_t^*$ , and the amount of debt in the previous period,  $D_{t-1}$ , as follows:

$$D_t - D_{t-1} = \alpha_0 + \alpha_1 \times (D_t^* - D_{t-1}) + \varepsilon_1, \text{ where:} \quad \text{Equation 46}$$

- a.  $D$  is the net amount of debt issue.
- b.  $D^*$  is the optimal leverage level.
- c.  $\alpha$  is the adjustment rate coefficient towards the target level.
- d.  $\varepsilon_1$  is considered as the error term.

Splitting the amount of debt according to its maturity we obtain the following equations:

$$\text{i.} \quad STD_t - STD_{t-1} = \lambda_0 + \lambda_1 \times (D_t^* - D_{t-1}) + \xi_t \quad \text{Equation 47}$$

$$\text{ii.} \quad LTD_t - LTD_{t-1} = \delta_0 + \delta_1 \times (D_t^* - D_{t-1}) + \nu_t \quad \text{Equation 48}$$

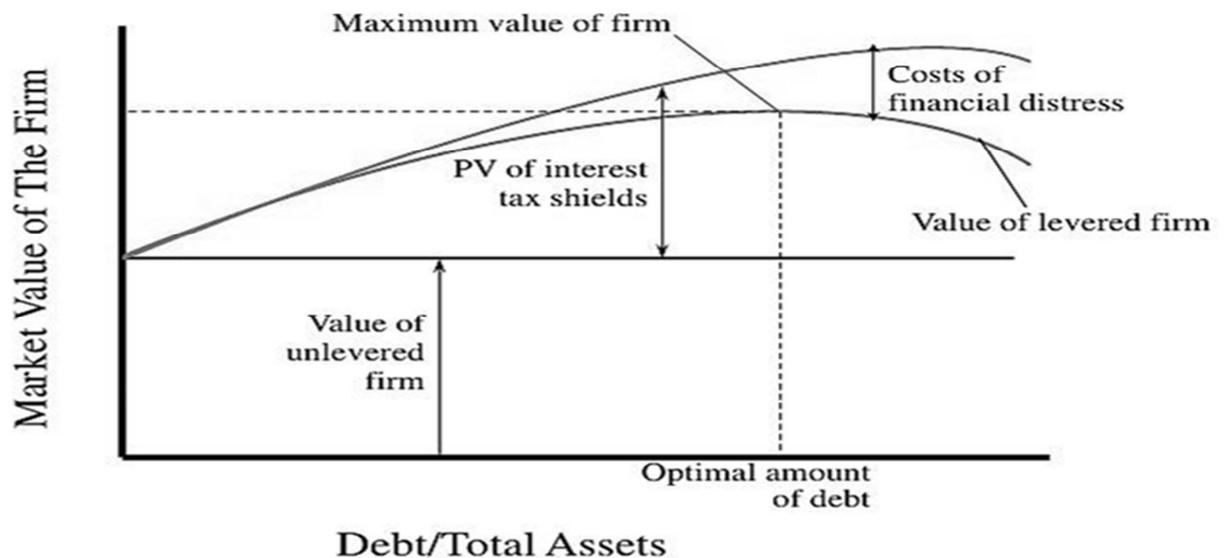
$$\text{iii.} \quad \delta_0 + \lambda_0 = \alpha_0, \delta_1 + \lambda_1 = \alpha_1 \quad \text{Equation 49}$$

Where:

- a.  $D$  is the total amount of debt.
- e.  $D^*$  is the optimal leverage level.
- b. LTD is the long-term amount of debt.
- c. STD is the short-term amount of debt.
- d.  $\delta_1$  is the contribution of long-term debt to the total adjustment rate coefficient.
- e.  $\lambda_1$  is the contribution of short-term debt to the total adjustment rate coefficient.
- f.  $\nu_t, \xi_t$  are the error terms.

If we scale all variables by the total assets yield, it gives us a comparability view of both models, the trade-off theory and the pecking order model.

**Figure 2: Cost of Financial Distress**



Source: *Principles of Corporate Finance*, RA Brealey, SC Myers, F Allen, 2012

### 3.3. Pecking Order Vs Trade-off Theory

After an introduction about the pecking order and the trade-off theory I would like to provide a deeper analysis about these two theories because they are nowadays extensively covered by most of the research papers. In addition, I would like to determine whether they are or not mutually exclusive because they have opposite views of the way companies determine their optimal capital structure, and it has been extensively covered in the literature.

#### 3.3.1. Key drivers modifying the rate of adjustment and the proportion of debt funding.

The quantitative function model for the pecking order theory can be modified to allow the financing coefficient (Fin) to be a linear equation of the main features of a certain company. This will allow us to look into the main drivers that have an impact on the proportion of debt funding (increase or decrease) relative to the financing deficit or surplus of a company and to assess the consistency of those drivers with the prediction of the trade-off theory and the pecking order theory.

To simplify the equations, the non-varying time coefficient assumption is relaxed for the pecking order model. In addition, the model includes the main drivers for the use of debt suggested by both theories and controls for the factors other than the adverse selection costs (e.g. debt capacity, equity market conditions or growth options).

To probe the main factors that drive the funding behavior patterns at a company level, firms are classified according two criteria: those that suffer a financing needs (Fin > 0), and those that have financing surplus (Fin < 0).

For the long-term the modified model is:

$$LTD_t - LTD_{t-1} = \pi_0 + \pi_i Fin_t + \varepsilon_t \quad \text{Equation 50}$$

Where:

$$\mu_i = \beta_0(M|B)_i + \beta_1 I_i + \beta_2 MTR_{t-1,i} + \beta_3 T.Assets_i + \beta_4 MTR_{t-1,i} \times D_1 + \beta_5 RDAD_i + \beta_6 NDTs_i + \beta_7 NDTs_i \times D_2 + \beta_8 Size_i + \beta_9 St_i + \beta_{10} AbDev_{t-1,i} + \beta_{11} AbDev_{t-1,i} \times D_3 \quad \text{Equation 51}$$

For the short-term the modified model is

$$STD_t - STD_{t-1} = \mu_0 + \mu_i Fin_t + \zeta_t \quad \text{Equation 52}$$

Where:

$$\mu_i = \rho_0(M|B)_i + \rho_1 I_i + \rho_2 MTR_{t-1,i} + \rho_3 T.Assets_i + \rho_4 MTR_{t-1,i} \times D_1 + \rho_5 RDAD_i + \rho_6 NDTs_i + \rho_7 NDTs_i \times D_2 + \rho_8 Size_i + \rho_9 St_i + \rho_{10} AbDev_{t-1,i} + \rho_{11} AbDev_{t-1,i} \times D_3 \quad \text{Equation 53}$$

Being:

- a. M|B is defined as the market to book ratio<sup>12</sup>.
- b. Info an approximation of the information asymmetry calculated as the standard deviation of the value weighted market adjustment returns.

<sup>12</sup> Used as a proxy of the possible future growth of a company, as the market tends to over value those companies, resulting in a big difference between the market to book value.

- c. MTR is the marginal tax rate at time  $1-t$ . And  $D_1$  is a dummy variable that takes value 1 if the company has net losses in the previous year.
- d. T.Assets is the ratio of tangible assets to total assets.
- e. RDAD is the ratio of R&D and advertisement expenses over assets.
- f. NDTS is the ratio of non-debt-related tax shields, such as depreciation, over assets, being  $D_2$  a dummy variable that takes value 1 if the non-debt-related tax shields are greater than 3 times earnings before interest and taxes.
- g. Size is the amount of assets on a logarithm base.
- h.  $\Delta S_t$  is the increase or decrease of the value of the stock of a certain company from  $1-t$  until  $t$ .
- i. AbDev is the absolute value of the deviation from the targeted leverage in period  $t-1$ , being  $D_3$  a dummy variable that takes value 1 if the company is above its targeted leverage, and 0 otherwise.

### Investment inefficiencies

We can describe investment inefficiencies as the suboptimal situation that arises as a consequence of the conflicts of interest between managers and external investors, such as shareholders and debt holders. Myers (1984) suggests that to avoid underinvestment problems, those companies with high growth potential may use less debt to preserve their debt capacity (in order to avoid increasing the cost of funding or financing them with riskier securities).

Moreover, and as stated by Myers (1984), companies with a projected high growth may prefer to finance through short-term debt to overcome the underinvestment problem. Accordingly, it is expected that those companies with a high growth, measured as the proportion of market to book ratio (M|B), will use less debt funding as a percentage of their financing needs. Consequently, there is a negative connection between the ratio of long term funding and a company growth rate, and a positive connection between the ratio of short-term debt funding and the predicted growth options.

In addition to the prior statement, the opposite relation is predicted for companies that have a financial surplus, although the trade-off theory states that such connection is only valid if debt-holders are not willing to accept guarantees of potential future growth as collateral for long-term debt. But this idea is supported by the fact that this future growth is not yet tangible and debt-holders have no control over the management team once they have received the loan. For high growth companies, the lender's potential moral hazard problem increases when those firms suffer a lack of high amounts tangible collateral.

### Debt capacity

According to the pecking order theory, companies will issue equity only if other financing options are exhausted. More precisely, firms will issue equity once their debt capacity is exhausted and the risk of a possible undervalue is not too high.

Thereby, company's debt capacity has a significant implication in the election and the amount of debt funding. To measure a firm's debt capacity it is possible to use the ratio of tangible assets to total assets an approach (T.Assets). Firms that have a higher debt capacity and lower cost of financial distress are those with a higher amount of tangible assets than can be provided as collaterals.

According to Mackie-Mason (1990) it is possible to use the level of tangible assets as a variable useful to control moral hazard problem<sup>13</sup>. The reason behind this idea is that debt must be cheaper when a company's value depends heavily in those investments that have already taken place.

The Trade-off theory suggests that tangible assets can be considered as debt collateral, therefore those companies with greater amounts of tangible assets, especially in those industrial sectors that are more capital demanding, have the capacity to absorb more debt. Summarizing the following hypothesis we can conclude that higher the amount of tangible assets, the most likely companies will use more debt as a percentage of their financing needs.

In addition, the variable Size is also a key indicator for the debt capacity, because as Frank and Goyal (2003) proposed the pecking order theory fits better for large companies as they are more diversified and are more profitable.

### Information asymmetry

The main conclusions of the pecking order theory is that companies with a higher level of information asymmetry rely more on borrowing debt, instead of issuing equity, to finance their investment projects given that the financial distress cost is low.

Opposite to long-term debt, short term debt appears to be less sensitive to problems arising from information asymmetry and according to Flannery (1986) if the information asymmetry problem is uniformly distributed over time, it should constitute a higher proportion of the debt financing. This assumption suggests that the information asymmetry problem causes a higher impact on the short-term debt as it constitutes a higher proportion.

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<sup>13</sup> The moral hazard problem arises as a consequence of information asymmetry as for example when managers make their investment decisions after the debt has been issued.

Cotei and Farhat (2009) propose to measure the degree of information asymmetry as the daily stocks returns residual volatility, calculated from the standard deviation of the value weighted market adjusted return residuals. Under the pecking order theory, the variable Info must be positive for firms in financing deficit.

### Optimal capital structure

Following to the main implications of the pecking order theory, companies do not pre-define a certain leverage level. Opposite to this, the trade-off theory suggests that the level of optimal level of debt is reached once the financial distress cost equals the advantage of the tax shield. In addition, the trade-off theory suggests that the level of internal funding needs (surplus) is affected by other factors, such as the deviation from the industry median leverage level, marginal tax rates or the net loss carry forward. In addition, other variables such as financial distress or the proportion of non-debt-related tax shields over EBIT may affect the proportion of debt funding or reduction.

If the amount of debt funding is used to reduce the deviation from the targeted level of leverage, is it expected that a company's deviation from the targeted leverage has a significant impact on the proportion of debt funding.

In order to determine the validity of this hypothesis we can use a measure the distance between last year target leverage and current leverage ratio. In addition, the trade-off theory foretells that those companies under their target level of leverage are more likely to use more debt funding, while those over their optimal leverage level will use less debt funding.

To determine the validity of this hypothesis, Cotei and Farhat (2009) propose to add a variable indicator  $D_3$  that takes value 1 if the company is above its leverage target and 0 if it is under its leverage level. Therefore it is expected that companies under financing deficit will have a positive sign for the coefficient  $AbDev$  and a negative sign coefficient for  $AbDev \times D_3$ . The opposite effect is expected for companies with financing surplus.

Continuing with the main determinants of the optimal capital structure, the trade-off theory predicts that those companies with a high marginal tax rate (MTR) have an important incentive to raise debt due to the tax shield generated by the payment of interests.

In 1980, DeAngelo and Masulis presented a model incorporating the impact of non-debt-related tax shields in the search for an optimal capital structure that maximize the enterprise value. They argue that tax credits for debt financing can be substitute by tax deductions arising from depreciation for depreciation and investment tax credits. Subsequently, it is expected that companies with large non-debt-related tax shields relative to their cash flow include less debt in their capital structures. However,

MacKie-Mason (1990) states that non-debt-related corporate tax shields do not always displace interest deductibility, this means that profitable firms tend to have large non-debt-related tax shields, high marginal tax rate, and issue more debt; meanwhile, highly distressed companies tend to avoid issuing debt since non-debt tax shields displace debt tax shields.

To summarize DeAngelo and Masulis (1980) theory, there is a negative connection between debt funding and non-debt-related tax shields, while for MacKie-Mason (1990), while for profitable firms there are a positive relation, for highly distressed firms the relation is negative. Following this reasoning, the capacity of firms to carry forward their net operating profit has an impact on the amount of debt funding. Accordingly, those companies that carry a net forward net loss (NLCF) do not have an important incentive to use more debt financing as a percentage of their deficit relative to companies that do not experience a loss.

To check whether there is a positive relation between MTR and the proportion of debt financing it is possible to include in the model a dummy variable ( $D_1$ ), connected with MTR, that has value one if the company has carried forward losses to the current t year from time t-1. In conclusion, those companies that carry forward losses are not expected to make an aggressive use of debt.

Cotei and Farhat (2009), propose including a new variable in their model in order to test the validity of MacKie-Mason's (1990) model, in which the non-debt-related tax shields do not replace interest deductibility for highly profitable firms. This new variable ( $D_2$ ) is a dummy variable that takes value 1 if the non-debt-related tax shields are greater than 3 times earnings before interest and taxes, is plotted multiplying the possible effects of the non-debt-related tax shields (NDTS).

The new variable allows the model to separate profitability and the possible effect of debt substitution regarding non-debt-related tax shields. If the MacKie-Mason's (1990) theory is proved with the data, it is expected that NTDS variable will have negative sign while the variable  $NDTS \times D_2$  will be positive.

### Market timing hypothesis

When assessing the optimal capital structure it is important that companies time their equity issuance when market conditions are favorable, and therefore it is expected that this behavior has an impact on the proportion of debt funding relative to the total funding deficit.

Lucas and MacDonald (1990) model suggests that managers who are the ones who poses more private information within a company, will delay equity issuance until their stock prices run up, and there are evidence supporting this idea because many capital increases take place when general stock prices go up.

In order to test the market timing hypothesis, it is seems convenient to set up a new variable  $St$  that is a ratio of the stock price in the current period divided by the stock price in the previous period. It is expected that, if companies time their equity issuance when markets conditions are favorable (stock prices rising), the variable will take a positive sign for the financing surplus group and a negative sign for the financing deficit group<sup>14</sup>.

$$LTD_t - LTD_{t-1} = \alpha_0 + \alpha_i \times (D_t^i - D_{t-1}) + \varepsilon_t \quad \text{Equation 54}$$

$$STD_t - STD_{t-1} = \lambda_0 + \lambda_i \times (D_t^i - D_{t-1}) + \varepsilon_t \quad \text{Equation 55}$$

Where:

$$\alpha_i\{\lambda_i\} = \beta_0(M|B)_i + \beta_1I_i + \beta_2MTR_{t-1,i} + \beta_3T.Assets_i + \beta_4MTR_{t-1,i} \times D_1 + \beta_5RDAD_i + \beta_6NDTS_i + \beta_7Dis_{t-1,i} + \beta_8Size_i + \beta_9Fin_i \times D_2 + \beta_9Fin_i \times D_3 + \beta_{11}St_i \quad \text{Equation 56}$$

Being:

- a. M|B is defined as the market to book ratio.
- b. Info an approximation of the information asymmetry calculated as the standard deviation of the value weighted market adjustment returns.
- c. MTR is the marginal tax rate at time 1-t. And  $D_1$  is an dummy variable that takes value 1 is the company has net losses in the previous year.
- d. T.Assets is the ratio of tangible assets to total assets.
- e. RDAD is the ratio of R&D and advertisement expenses over assets.
- f. NDTS is the ratio of non-debt-related tax shields, such as depreciation, over assets, being.
- g. Size is the amount of assets on a logarithm base.
- h.  $St$  is the increase or decrease of the value of the stock of a certain company from 1-t until t.
- i. Fin is a variable that measures the financing deficit or surplus a company poses, being  $D_2$  a dummy variable that takes value 1 if the company is in a financing deficit, while  $D_3$  is a dummy variable that takes value 1 if the company is a financing surplus situation.

The trade-off theory foretells that company's profitability, quantity of tangible assets, size and distance from targeted leverage level are positively correlated with the rate of adjustment for firms that adjust from below their target leverage level;

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<sup>14</sup> The main assumption under the partial adjustment model is that the rate of adjustment is equal across industries, firms and steady over time. In order to allow the adjustment rate to change depending on the company, so it captures the pecking order and the trade-off theory main factors that have an impact on the rate of adjustment, it is necessary to allow the rate of adjustment to be a function of the factors that drives both theories

meanwhile, non-debt-related tax shields, distressed costs, predictable future growth and the net loss carry forward are negatively correlated with the rate of adjustment for this group of firms.

For those companies that adjust from above their target level the profitability level, size, and financing deficit size are negatively related to the rate of adjustment, while the non-debt-related tax shields, distressed costs, predictable future growth and the net loss carry forward are positively related to the rate of adjustment for this group of companies.

The pecking order theory predicts that the market to book ratio impacts negatively on the rate of adjustment of those companies that operate under the target leverage level, meanwhile it impacts positively on the rate of adjustment of those companies that operate above their target leverage.

The size of a company and the level of tangible assets can be also used to obtain information about a company's debt capacity and financial distress costs, therefore it is expected that the coefficients have a positive sign.

For those companies under their target level, the marginal tax rate is forecasted to impact positively in the rate of adjustment; on the other hand companies with a net loss carry forward have less incentive to adjust. Whereas, the opposite effect is expected to be observed on those firms above their target leverage level.

It is expected that non-debt-related tax shields sources (depreciation, carry forward losses, etc.) reduce the rate of adjustment for those firms under their target leverage level, yet they already have a high non-debt-related tax shield, and to speed it up for companies over their leverage level.

The funding deficit or surplus main drivers are inserted in the previous model to capture the addition of external funding needs (in those cases of financing deficit) to the adjustment process. It is supposed that, for those companies below their target level that issue debt in order to balance their financing needs this will impact positively to their rate of adjustment<sup>15</sup>. In those companies that have a funding surplus this will reduce their rate of adjustment, except in those companies in which they use their financing surplus to repurchase equity.

If a firm's optimal capital structure depends from the distance between current leverage level and optimal leverage level, the probability of adjustment towards the optimal capital structure is a function, with a positive sign, of the distance between optimal and actual leverage. In order to test the validity of this theory, Cotei and Farhat (2009), propose to use as a control variable the distance from the target leverage (Dis).

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<sup>15</sup> This implies a positive sign for  $Fin \times D_2$

It is possible that those companies following a trade-off strategy in the long-run might deviate from their target leverage level in the short-run as a consequence of the factors considered in the pecking order theory. As a consequence to the previous statement, firms view the trade-off and the pecking order theory as complementary. Applying this idea, we can expect that these factors will have a positive or negative impact in the rate of adjustment.

As an example, can be expected that those companies below their target leverage level and with a big problem of information asymmetry will make an extensive use of debt funding according to the pecking order theory and therefore, such behavior will contribute in a positive manner to the rate of adjustment towards the target leverage level. Moreover, if firms time their equity issuance mainly when the stock market environment is positive, the control variable for increases/decreases in stock prices (St) will contribute positively to the rate of adjustment if they are above their target leverage and negatively if they are below their target leverage.

### 3.3.2. Data Sample

**Table 5: Data Sample**

Group	Number of Observations	% of Observations
Financing Deficit Firms	60,333	67.34%
Financing Surplus Firms	29,258	32.66%
Below the target Firms	48,220	53.82%
Above the target Firms	41,371	46.18%
All Observations	89,591	100.00%

Source: *The trade-off theory and the pecking order theory: are they mutually exclusive?* Cotei, Farhat (2009).

For the data analysis and validity of the model, Cotei and Farhat (2009) use a sample of all firms on the Compustat database for the years 1980-2001. In order to be eligible for the analysis, the following companies' information must be available: the total amount of assets, the amount of both, long-term and short-term debt, retained earnings, equity book value, equity market value, the total amount of non-debt-related tax shields such as depreciation, investments tax credits, net loss carry forward, R&D or advertising expenses, the yearly change on working capital, the total amount of net sales, tangible assets, earnings before interest and taxes, the daily change on stock prices and marginal tax rates.

Those companies that do not have any assets for any year of the study are excluded from the analysis as the results would be irrelevant. Table 5 shows the sample

distribution of those firms under financing deficit and financing surplus, and the sample data for firms below and firms above their target leverage level<sup>16</sup>.

### 3.3.3. Empirical Results

**Table 6: Variables Affecting the Share of Debt Financing**

	Financing deficit group		Financing surplus group	
	$\Delta$ Long Term Debt	$\Delta$ Short Term Debt	$\Delta$ Long Term Debt	$\Delta$ Short Term Debt
<i>Constant</i>	-0.005**	0.009**	-0.004**	-0.005**
<i>M/B</i>	-0.021**	0.001*	0.064**	0.005
<i>Tang</i>	0.341**	0.030	0.042	0.001
<i>Info</i>	0.010**	0.029**	0.009	0.031**
<i>MTR<sub>t-1</sub></i>	0.709*	0.131**	1.278*	1.541
<i>MTR<sub>t-1</sub>* D<sub>1</sub></i>	-0.207*	0.059*	-0.132*	-0.143
<i>RDAD</i>	-0.211**	-0.045	-0.591*	0.506
<i>NDTS</i>	-0.119*	0.049*	1.044**	-0.687**
<i>NDTS* D<sub>2</sub></i>	0.149*	-0.130*	-0.435**	0.221**
<i>AbDev</i>	0.016*	0.006	-0.191*	0.233
<i>AbDev* D<sub>3</sub></i>	-0.062**	-0.009*	0.311**	-0.031
<i>Size</i>	0.050**	-0.007*	0.072**	0.031**
<i>St</i>	-0.004*	-0.015**	0.011*	0.005
<i>Adj-R<sup>2</sup></i>	0.371	0.111	0.770	0.266

Source: *The trade-off theory and the pecking order theory: are they mutually exclusive?* Cotei, Farhat (2009).

The table 5 gives us the estimated results of the model for both groups of enterprises analyzed, those on financing needs and those with financing surplus. According to Myers' (1977, 1984) model, companies with higher projected growth tend to use less long-term funding, as a percentage of their funding needs. Furthermore the growth option coefficient impacts positively to the short-term debt financing, which supports Myers' (1977) solution of the underinvestment problem, in which those companies with future growth projections may continue refinancing the short-term debt to get over this problem. On the other hand, those companies with financing surplus confirm these results. It also shows that those companies with high growth potential tend to reduce their long-term debt by a higher proportion than their short term debt when they have funding surplus.

Continuing with the estimated results, we can observe that a company debt capacity, ratio of tangible assets to total assets, is positively related to the percentage of long-term debt financing, in addition the variable size is negatively correlated with the amount of short-term debt funding, which supports the idea that big companies are able to obtain funding with longer maturities, nevertheless this behavior might be changing, and those firms with high growth capacity, especially in the technological sector, are

<sup>16</sup> Companies' target leverage level is measured in comparison to the industry leverage median.

able to satisfy their funding needs with longer maturities, which can be seen in the amount of financing this companies have been able to obtain through IPOs, in comparison with similar size companies from traditional sectors.

Once determined the variables that have a major impact on the amount of debt capacity, and consistent with the pecking order theory, we can observe that the variable for information asymmetry problem is positively correlated with the percentage of long-term debt funding. In addition, it can be observed that, while the information asymmetry has no effect on the amount of long-term debt funding reduction, it has a significant impact on the proportion of short-term reduction. A possible explanation for this effect can be attributed to the different level of sensitivity of debt of different maturities to the information asymmetry problem, which could lead to less miss-pricing of the short-term debt in comparison with the long-term debt and this might be why companies prefer to decrease the proportion of short-term debt rather than the long-term-debt.

The data above also supports the idea that in an environment with high marginal tax rate companies tend to use more debt funding. Furthermore, those companies that carry net loss forward make a less intensive use of long-term debt funding, and a more aggressive use of short-term debt, which can be a consequence of their risk profile and the different cost of funding credit entities offer to those companies with a riskier debt profile, which can be linked to distressed cost that have been stated on previous chapters of this paper and its connection with the optimal capital structure. In addition, the sign and the amount of the non-debt-related tax shields coefficient supports MacKie-Mason's (1990) theory in which the variables  $NDTS \times D_2$  must be positive, as the non-debt tax shields does not displace interest deductibility for profitable firms and it does for highly distressed firms. This is consequent with the idea that highly distressed companies make a more intensive use of non-debt-related tax shields along with a higher proportion of short term debt, an once distressed firms face funding surplus, they tend to reduce the amount of long-term debt in a higher percentage than short-term debt, as for those companies long-term funding is usually very expensive.

Supporting the trade off theory main implications, companies under their leverage target level that have funding needs are more favorable to borrow debt as a percentage of their funding deficit and reduce less debt when they have funding surplus. Companies over their target leverage level are more favorable to issue less debt as a percentage of their financing deficit and reduce more debt when they have financing surplus.

To conclude with the data analysis Cotei and Farhat (2009) present some information about the market-timing theory. According to the theory, companies usually issue lower amounts of debt when stock prices are high when they have financing deficit, and to reduce more debt when they have financing surplus. The implications of the previous statement is that when stock prices are high, is more likely

that firms finance their funding deficit issuing more equity, whilst when stock prices are low, and firms have financial surplus, they tend to buy back.

Summarizing, the regression analysis shows that after determining a certain level debt financing, the information asymmetry problem is not the only key driver for the percentage of debt funding or debt reduction. Those factors signaled by the trade-off theory as key parts of the optimal capital structure plays an important role in the companies' decision of how which amount of debt to use to fill their funding needs, or the amount to be reduced when they have financial surplus. Lastly, the deviation from the targeted level of leverage also plays a determinant role in deciding the amount of debt funding or reduction.

**Table 7: Factors that Have an Impact on the Rate of Adjustment**

Independent variable	Below the target leverage group		Above the target leverage group	
	$\Delta$ Long Term Debt	$\Delta$ Short Term Debt	$\Delta$ Long Term Debt	$\Delta$ Short Term Debt
Constant	0.015**	0.007**	0.019**	0.003*
<i>M/B</i>	-0.053**	0.007*	0.051*	0.031*
<i>Tang</i>	0.232**	0.069**	-0.057**	-0.022
<i>Info</i>	0.060**	0.043	-0.016*	0.005
<i>St</i>	-0.010**	-0.007**	0.080**	0.010*
<i>MTR<sub>t-1</sub></i>	0.314*	0.257**	-0.303*	-0.009
<i>MTR<sub>t-1</sub> * D<sub>1</sub></i>	-0.231*	0.773	0.464**	-0.371
<i>NDTS</i>	-0.112*	0.236	0.267*	-0.509
<i>RDAD</i>	-0.494**	0.027	0.074*	0.216
<i>Dis</i>	0.073**	-0.051	0.112*	-0.014
<i>Fin * D<sub>2</sub></i>	1.621**	0.197**	-0.921**	-0.189*
<i>Fin * D<sub>3</sub></i>	-1.002*	-0.561*	0.328**	0.106*
<i>Size</i>	0.029**	-0.002*	0.022**	0.004
<i>Adj-R<sup>2</sup></i>	0.484	0.150	0.587	0.186

Source: *The trade-off theory and the pecking order theory: are they mutually exclusive?* Cotei, Farhat (2009).

Table 6 shows the estimated results for the main factors that drive the rate of adjustment model using the Fama-MacBeth method<sup>17</sup>. The estimation shows the model results for those companies that are over or under their targeted leverage level. Regarding debt contribution to the total rate of adjustment, high growth companies tend to significantly reduce their amount of long-term debt if they are over their optimal leverage level; meanwhile those under their target leverage level tend to accelerate it.

17 The Fama-Macbeth method is a regression method for estimating asset pricing models. The method calculates an estimation of the betas and risk premium for those risk factors that determine asset prices.

Continuing with the main results of the regression, Cotei and Farhat (2009) suggest that the ratio of tangible assets is an important coefficient for determining the rate of adjustment towards the optimal, in both long-term and short-term debt for the companies that adjust from below. The companies' size seems to impact positively to the contribution of the long-term debt in the total rate of adjustment, meanwhile it suggest to impact negatively to the contribution of the short-term debt in the total rate of adjustments. For those firms that adjust from above their target (financing surplus), the amount of tangible assets do not seem to play a major role determining the short-term debt contribution to the total rate of adjustment, but it seems to have a negative but significant impact on the contribution of the long-term debt in the total rate of adjustment.

Regarding the information asymmetry problem, according to the data, it contributes in a positive way for the rate of adjustment of those companies that adjust from below, in the other hand, for companies above their target level the information asymmetry problem has a negative impact. This supports the idea that the pecking order theory can be included in the context of the trade-off model. Yet, for the short term debt contribution to the rate of adjustment, the information asymmetry problem is not much relevant.

Another variable that plays an important role on the rate of adjustment is the market equity conditions. It can be observed that when stock prices go up the rate of adjustment is reduced for those companies below their target and increased for those companies over their leverage level.

Regarding the non-debt-related tax shields, and as predicted before, they are negatively correlated with the net addition of the long-term debt ratio to the rate of leverage adjustment for firms below their target leverage level, but it seems it does not play a major role to the net addition of the short-term debt ratio to the total rate of adjustment.

Continuing with the main variables of the model, the higher the marginal tax rate the faster companies adjust towards the target, while the data suggest that high marginal tax rates decrease the rate of adjustment towards the target leverage in those companies above their target leverage level, relative to those companies that carry forward losses. Nevertheless, the marginal tax rate has no significant impact on the short-term debt model except for firms that operate below their target leverage.

Those companies further away from their target are biased to adjust faster towards their targeted level using long-term debt. Nevertheless, the rate of adjustment of the short-term debt is not influenced by the distance from the targeted leverage.

Finally, the amount of funding deficit has a significant impact in increasing the rate of adjustment for those companies below their target level and reducing it for firms

above the target. As brief recap, we can conclude that the main factors that play a role on the percentage of debt funding and those affecting the rate of adjustment shows that the trade-off theory and the pecking order theory are not mutually exclusive, as the management team tends to adjust towards the targeted level of leverage but this does not prevent managers from deviating from the target if the equity market shows favorable conditions. Consistent with this conclusion, the factors influencing the trade-off theory are important drivers of the percentage of debt funding or debt reduction relative to the financing deficit or surplus.

## **4. Conclusions**

After the literature review of the most important theories that have tried to give a quantitative approach on the search for the optimal capital structure, I would like to present my conclusions.

On the first chapter of this paper I have focus on those theories developed during the first half on the twenty century in which certain conditions must to be fulfilled in order to be consistent with its results, mainly those related with perfect capital market.

From those first theories, is important to highlight the Modigliani and Miller theory (1958) that as result of its revolutionary approach established the basis for further investigations.

In 1958, on a first attempt to parameterize the main drivers of the capital structure, Modigliani and Miller set a series of conditions that despite not being consistent with the reality, are necessary for the model to produce a stable outcome. In this first stage of their theory the main conclusion is that the rate of return of an investment project is independent of how the company is financed, which means that the value of a company is independent of its sources of financing. Nevertheless, the main criticisms with regard with the Modigliani and Miller theory is that it does not take into account the costs of bankruptcy and its direct and indirect costs and the risks associate to the leverage of a company and a person are different because the collaterals and responsibilities established for each of them are different. Therefore, the personal and the enterprise debt are not perfect substitutes.

In the second chapter of this paper I covered those theories which try to get a better approach to the environment in which companies work, considering the capital markets as imperfect and including the effect of taxes in the value of a company derived from an optimal capital structure.

On a second version of their theory, Modigliani and Miller (1968) introduced the effect of taxes in the optimal capital structure that maximizes the value of a firm. As a

conclusion, this theory states that the value of a company can be increased by increasing the amount of debt, being the optimal capital structure the one only composed by debt. This theory has been heavily criticised mainly because it does not take into account the costs of bankruptcy and the direct and indirect costs associated with carrying a high level of debt.

Later on, in 1977, Miller developed his own capital structure theory in which he included the effect of personal taxation, concluding that the income generated due to the tax shield over the debt disappears on an equilibrium market context, when the personal income tax and company income tax are considered together, having no impact the capital structure over the enterprise value.

In further investigations, the researches realize the importance that information has in the capital structure of an enterprise. This problem has been covered in many theories that can be group into agency cost theories and information asymmetry theories.

While the agency cost theory affirms that the capital structure of a company is established by a certain number of contracts that imply an agency relationship, in which the principal delegates its authority on a different agent, which is who effectively manages the firm. Both the principal and the agent try to maximize their utility function but, as they are determined by different factors, one is led by the property, and the other one is led by control. This difference leads to agency costs that have an impact on the value of a company because the solution implies different costs of funding.

In the other hand, the information asymmetry theory as an explanation for a company capital structure states that not all the economic agents can access the same information of all economic variables that drives a company, as a consequence of the cost associated to accessing the information and the inequality of the markets participants when accessing to the information. The management has more information than the shareholders or external investors, because they are in charge of making the decisions regarding the company on a daily basis, which give them access to privileged information about investment opportunities and the cash-flows of the company, therefore and according to the previous conditions, is the information asymmetry what determines the capital structure of a company.

In the third chapter of this paper I have focused on those theories that are currently on the edge of the capital structure research, the pecking order theory and the trade-off theory.

The pecking order theory is one of the theories that derive from the information asymmetry problem. According to the pecking order theory a company capital structure is just the cumulative results of the company's attempts to mitigate information asymmetry. As a consequence of the asymmetric information, and to avoid underinvestment problems, managers will try to finance the new acquisition of assets

using securities that are not under-priced by the market, using in the first stage internal funds and subsequently riskless debt.

As it has been stated before, the trade-off theory can be seen as the opposite approach to information asymmetry theory as it ensures that there is an advantage of debt financing vs. equity financing as a consequence of the tax shield, and that there is a cost associated to debt financing, the costs of financial distress including bankruptcy costs and non-bankruptcy costs. The marginal positive effect of subsequent increases of financial debt declines as debt increases, and a company that is trying to optimize its enterprise value will focus on the trade-off when deciding the percentage of debt and equity to use for financing for value optimization.

The trade-off theory and the pecking order theory can be seen as mutually exclusive because as one of them focus on endogenous factors that can be controlled by those agents involved in the normal functioning of a company, which is what establish the capital structure of a company, the other one affirms that as a consequence of exogenous drivers, mainly the tax environment, and optimal capital structure that optimizes the value of a company is possible.

After considering the results obtained by Cotei and Farhat (2009) for the proposal of whether the trade-off theory and the pecking order are mutually exclusive, it is possible to determine that despite the pecking order theory is useful to show the negative link between profitability and a high leverage ratio, it does not give a clear explanation of why those firms with positive cash flows prefer to distribute dividends instead of amortizing debt or why there are different leverage rations among firms of the same sector.

While the trade off-off theory might be easy to related with the main factors driving the capital structure, the results obtained in the previous empirical regressions of the main drivers that have an impact on the level of debt and the rate of adjustment imply that the trade-off theory and the pecking order theory are not mutually exclusive, Cotei and Farhat (2009).

Companies may target a certain leverage ratio range and the pecking order theory can successfully describe the variations within the leverage ratio, because as proposed by Fischer and Heinkel (1989) hostile market environment can cause companies to deviate from their target leverage. A similar explanation is given by Hovakimian, Opler and Titman (2001) that stated that the pattern of leverage level, debt to equity ratio and equity issuance seems to be consistent with the pecking order theory in the short term.

Hereby, is likely that companies do not exclude from their funding decisions the main factors that drive both theories, and therefore the pecking order theory and the trade-off theory are not mutually exclusive. For example, those companies under their

target leverage level will probably borrow debt given that they have a high debt capacity and consequently speeding up their rate of adjustment. In the other hand, is those companies' stock prices would be running up, managers would most likely issue debt to finance future projects, even though it would imply to deviate from their target level.

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