Unit 4. The Choice of Corporate Capital Structure
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ROSS, WESTERFIELD and JAFFE. Corporate Finance. Tenth edition. McGraw-Hill 2013. Chapters 16 and 17 pp. 494-553

1. Introduction

To finance their productive activities, companies can turn to **several financial sources**. A simplification involves grouping a company's financial sources into two large groups: (i) **external resources or debts,** and (ii) **its own resources or equity**. The relationship between debt and equity determines the company's **financial or capital structure**, which affects its **value** and **financial risk**.

In this sense, the **cost of company capital (debt + equity)** (which may also be understood as its **economic profitability**) is calculated as a **weighted average**, at market values, of the cost of each financial source.

In this module we will learn how to analyze whether **financing decisions can create value** in the company through selection of one **financial structure** or another. In this sense, the company's financial manager wonders whether a combination of financial resources exists that enables the company to maximize its market value for its shareholders, i.e. whether there is an **optimal financial structure**.

The first rigorous analysis of how indebtedness influences a company's market value was made in 1958 by Franco **Modigliani** and Merton **Miller** (hereinafter MM) in a paper that **revolutionized** the prevailing conception regarding **financing decisions**. In that paper, MM demonstrated that, **under** certain initial **assumptions**, the **cost of capital** and the company's **market value** are **independent** of the company's **financial structure**. They therefore proved that, under these assumptions, **no financial structure is better than another**, thus demonstrating the **irrelevance of basing financing decisions** on the company's market value.

Starting from MM's initial proposals, we will gradually incorporate the factors that seem to affect the company's market value through its **financing policy**. Specifically, we will refer to the effects of **taxes**, **costs** derived from **financial distress**, and **information asymmetries**.

2. Capital structure in perfect capital markets

In their classic 1958 article, Modigliani and Miller demonstrated that **a company cannot change** the total **value** of its **outstanding stocks** by **changing** the proportions of its **financial structure**, i.e. they showed that the company's **market value** does **not depend** on its **financial structure**.

To reach this conclusion, they assumed the following **hypotheses**:

1. **Capital markets** are **perfect** so there are **no taxes, transaction costs**, **or information asymmetries**, and individuals and companies can get into **debt** at the **same interest rate**.

2. **Investors** behave **rationally**. They **prefer more wealth** to less wealth and are **indifferent** to an **increase** in **dividends** or to an equivalent **increase** in the **price** of their stocks.

3. Investors have **homogeneous expectations** about the **benefits** and **risk** of each company, so the expected value of the operating result for each company, $[E(\tilde{X})]$, is the same for all investors. Since the company is assumed to be in a situation of stationary growth or non-growth, this **expected value** is considered **constant** and **in perpetuity**, as is the company's economic risk.

4. **Companies** can be **divided** into **groups** of **equivalent economic risk**. This assumption makes it possible to classify companies into homogeneous groups according to the variability of their gross results.

With these hypotheses, which determine the behavior of the market and investors, MM established their thesis by structuring it into three fundamental propositions, where propositions II and III are a consequence of the first.

To present these three propositions, we use the following notation:

S	**The market value of the company's own resources** For simplicity, the company's own resources are considered to be materialized in stocks. The market value is therefore given by the stock market value.
B	**The market value of the company's external resources** This is given by the stock market value of the bonds in case all the indebtedness is represented by this type of securities with quotation in the secondary market. Otherwise, either the book value or an estimate of its market value, if a clear divergence existed between the two, is used.
$V = S + B$	**The market value of the company**

B/S	**Coefficient or ratio of indebtedness** This could also be defined as B/V.
$\tilde{X}$	This is a random variable that represents the company's annual operating result, i.e. profit before interest and taxes.
$E(\tilde{X})$	**Expected gross profit** This is assumed to be constant and in perpetuity.
r_B	**Cost of external resources to the company**
$E(\tilde{X}) - r_B B$	**Expected profit of the company's own resources before taxes are deducted**
$r_S = [E(\tilde{X}) - r_B B]/S$	**Cost of equity**
$r_{wacc} = [r_S S + r_B B]/(S + B)$	**Weighted average cost of capital for the company**
r_0	**Weighted average cost of company capital without debt** or, in other words, expected profitability of a class "i" share belonging to a non-indebted company. The company's economic profitability.

Proposition I: In equilibrium, a company's market value is independent of its financial structure and is given by discounting the expected flow of benefits – before the deduction of interest – at the discount rate appropriate to its class of economic risk.

That is, for any company of the same performance class, and irrespective of its financial structure, in **equilibrium** it is verified that:

$$V = S + D = \frac{E(\tilde{X})}{r_0}$$

The **demonstration** of Proposition I is based on an **arbitration process** that balances the market value of companies belonging to the same economic risk class.

To study how this arbitrage works, we will consider two companies that are identical in all but their financial structures. These companies, U and L, therefore belong to the same class and have the same average expected pre-tax profit, which is denoted by $E(\tilde{X})$. However, while **company U** is entirely financed by **shares**, **company L** has a **loan** in its liabilities.

Let us suppose that an **investor** is considering **investing** in **shares** of **company L** with a participation of **S_L monetary units**, which represents an α fraction of the total stocks in circulation.

Since the **company** does **not pay taxes**, the investment and its return will be (taking into account remuneration for the bondholders):

Investment in company L	**Return** in company L
$s_L = \alpha S_L = \alpha(V_L - B_L)$	$Y_L = \alpha(E(\tilde{X}) - r_B B_L)$

This **investment** would give the investor the **right** to a **portion** a of the **income** available to the shareholders of company L. Therefore, the investor receives the return for their participation as a shareholder in the indebted company.

Let us now suppose that this **investor** wants to compare the above investment with another investment that provides the same level of economic and financial risk. They therefore **borrow** the amount $\boldsymbol{\alpha B_L}$ at a rate of interest r_B and **use both the money from this loan** and **their own funds** to **invest in company $\boldsymbol{U}$**, acquiring a share of s_U monetary units, which represents a fraction a of the total outstanding stocks (since company U is not in debt):

	Investment in company U	Return in company U
Loan	$-\alpha B_L$	$-\alpha r_B B_L$
Purchase αV_U	αV_U	$\alpha E(\tilde{X})$
Total	$S_U = \alpha(V_U - B_L)$	$Y_U = \alpha(E(\tilde{X}) - r_B B_L)$

The **income** the investor will obtain for their new portfolio is given, on one hand, by their **participation** in the **result** of the **non-indebted company** U and, on the other, by the **payment of interest** on their personal loan.

Therefore, if the individual investor can get into debt under the **same conditions** as the company at r_B, the **return on investment in both $\boldsymbol{L}$ and $\boldsymbol{U}$ is identical** and equal to $\alpha(E(\tilde{X}) - r_B B_L)$. Moreover, the **risk** of each investment is also **identical**: each company has the same economic risk because they belong to the same class and, since both investments bear the same amount of debt and at the same cost, they have the same financial risk.

The cost of each investment is:

Investment in company L	Investment in company U
$s_L = \alpha S_L = \alpha(V_L - B_L)$	$S_U = \alpha(V_U - B_L)$

If the **risk and return** of each investment are **identical**, in a perfect market the **cost** of each investment **must also be identical**. The cost of each investment will be identical **only when $\boldsymbol{V_L = V_U}$**.

- **If** the market value of the indebted company were actually higher than the market value of the non-indebted company ($\boldsymbol{V_L > V_U}$), arbitration would begin until $V_L = V_U$.

An investor could therefore apply for a loan on their own and invest in stocks of the non-indebted company. They would get the same return as if they had invested in the indebted company. However, its cost would be lower because $V_L > V_U$. This arbitration strategy would not be feasible for that investor alone. Anyone who wanted stocks in the indebted company would obtain the same return at a lower cost by obtaining a loan to finance the purchase of stocks in the non-indebted company.

The **value** of the **indebted company** would **decrease** and the **value** of the **non-indebted company** would **increase** until $V_L = V_U$. At this point, investors would not have a greater preference for investment in either the indebted company or the non-indebted company.

- Similarly, **if** the market value of the non-indebted company were actually higher than the market value of the indebted company ($\boldsymbol{V_L > V_U}$), arbitration would begin until $V_L = V_U$.

Indeed, investors could invest in stocks of the indebted company. They would get the same return as if they had invested in the non-indebted company and borrowed on their own. However, their cost would be lower because $\boldsymbol{V_L > V_U}$. Thus, the **shareholders** of the **non-indebted company** would **sell** their **stocks** and **buy stocks** in the **indebted company**, a move that would **balance** the market value of both companies.

This may be one of the most important reasonings of the company's financial management. In fact, it is considered the **starting point of modern Financial Management**[1]. Before MM's thesis, the existence of a complicated effect of indebtedness on the company's market value was accepted. However, Modigliani and Miller demonstrated a simple result: if indebted companies are valued above non-indebted ones, rational investors will seek personal loans to buy stocks of non-indebted companies.

As long as **individuals borrow** (and **lend**) on the **same terms** as firms, they can **replicate** the effects of **corporate indebtedness** on their own behalf.

Thus, as a derivation of the equilibrium that exists in perfect capital markets, it is demonstrated that indebtedness does not affect a company's market value.

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[1] The validity of its original arbitration test is not only not questioned but has been transferred to other fields of finance, such as Black and Scholes' thesis (1973) on option pricing and Ross's model (1976) on the structure of asset pricing.

Proposition II: The expected return on a stock is equal to the economic profitability of a non-indebted company belonging to the same performance class, plus a premium for financial risk equal to the debt ratio multiplied by the difference between the discount rate and the interest rate on the debt.

$$r_S = r_0 + (r_0 - r_B) \cdot \frac{B}{S}$$

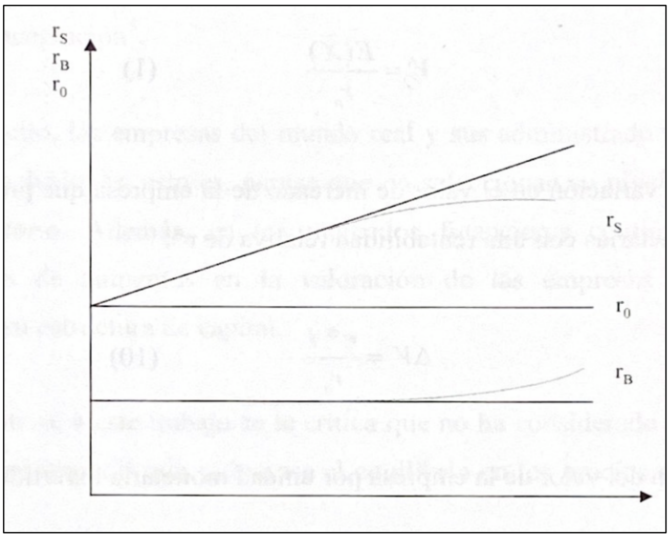
This equation tells us that if, as should happen, $\boldsymbol{r_0}$ is **higher** than the cost of debt $\boldsymbol{r_B}$, **shareholders demand a higher return on their stocks** when the company **increases** its **debt** ratio as compensation for the higher financial risk they bear.

Thus, MM maintains that the **total cost of the company's capital cannot be reduced since equity is replaced by debt**, even when debt is cheaper than equity. This is because as the company increases its level of debt, equity presents more risk. As this risk increases, so does the cost of equity. The increase in the **cost of equity offsets the higher proportion of low-cost debt financing**. In fact, MM proves that the **two effects balance each other out**, so that the weighted average of these costs remains constant regardless of which combination of financing sources the company uses.

It also follows from this equation that the return on the stocks of an indebted company, $\boldsymbol{r_s}$, belonging to a certain performance class, is a **linear function of its debt ratio**.

However, as Modigliani and Miller specified, **this ratio may not be strictly linear**. This would occur if the return demanded by lenders were not constant but tended to increase as the company's level of indebtedness increased. Indeed, as the debt ratio grows, the company should have a greater financial risk, so creditors may demand a higher interest rate.

According to MM, therefore, the fact that r_B increases as the level of indebtedness increases does not affect the company's market value or its capital cost, r_0, because the increase in r_B is offset by the lower correlative increase in r_S.



Proposition III: Any company seeking to maximize the wealth of its shareholders will make only those investments whose internal rate of return, r^*, is at least equal to the discount rate, r_0, which the financial market applies to the income streams of non-indebted companies of the same class of economic risk.[2]

Invest as long as $r^* \geq r_0$

Up to this point, MM results indicate that:

- the **company's market value cannot** be **changed** with **financing policies**.
- there is **no interrelation** between **investment** and **financing decisions** in the **company**.

Although these ideas were considered revolutionary when they were originally proposed, the Modigliani and Miller thesis and its arbitration test have since received wide acceptance.[3]

However, **real-world companies** and their managers do not seem to be following these conclusions, i.e. they do **not appear** to **select** their level of **debt** in a **random way**. Moreover, **examples** of **increases** in the **valuation** of companies after **changes** in their **capital structure** are **constantly found** in financial markets.

[2] According to the initial hypotheses, the company's economic risk remains constant, so it is assumed that the new investment does not alter the type of risk to which the company belongs.
[3] Both Franco Modigliani and Merton Miller received (in different editions) the Nobel Prize in Economics, largely due to their work on financial structure.

For this reason, Modigliani and Miller's **paper** is **criticized** for **not considering** market **imperfections** that could prevent equilibrium in the prices of company securities from being achieved.

For example, it is sometimes criticized that MM's performance is based on the **assumption** that **individuals can borrow under the same amount and cost conditions as the company**. It is indicated that investors are not willing to take on personal debt in the same proportion as the company, since the guarantees offered in each case are different. Or that the interest rate on personal debt does not have to coincide with that of the companies.

If this were the case, the company's debt would not be replaceable by personal debt, which would condition the arbitration process needed to reach equilibrium. If individuals could borrow only at a higher rate, it could be shown that companies could increase their value by increasing their level of debt.

In reality, however, **individuals** who want to **buy stocks** and apply for **loans** can do so by buying stocks on credit from the broker. Since the procedures for the broker to protect the investor and recover their full credit have been developed over many years and the broker has the **stocks** as **collateral**, the **broker** assumes **little risk** of **default**. As a result, they generally charge **low interest**, with rates slightly higher than the risk-free rate. In contrast, **companies** often **borrow against illiquid assets** such as equipment or plant. The **costs** that the lender assumes in these cases for the initial negotiation and supervision, as well as for the agreements in case of financial difficulties, **can be very high**. It is therefore difficult to argue that individuals will borrow at higher rates than companies.

However, other imperfections exist that could affect the price balance of corporate securities:

1. **Taxes**.
2. The costs of **insolvency**.
3. **Information asymmetries** between investors and company managers.

The importance of Modigliani and Miller's initial thesis lies precisely in the fact that by clearly demonstrating the conditions under which financing decisions do not affect a company's market value, it provides the basis for examining how these types of decisions can create or reduce that value.

3. Debt and taxes

In 1963, Modigliani and Miller made a **correction** to their initial position by including the effect of **Corporate Income Tax**. The authors demonstrated that, because the

interest paid on debts is deductible from the tax base and the profits intended for shareholders are not, the market value of the company increases as its level of debt increases.

To understand this result, we again consider **two companies**, U and L, belonging to the **same performance class**, and whose expected profit before interest, $\boldsymbol{E(\tilde{X})}$, is the **same**. Company U is financed exclusively by shares, while company L has debts in its liabilities.

When introducing the corporate tax we find ourselves in the following situation:

	Company U (non-indebted)	**Company L** (indebted)
Profit before taxes and interest	$E(\tilde{X})$	$E(\tilde{X})$
Interest	-	$r_B B$
Profit before taxes	$E(\tilde{X})$	$E(\tilde{X}) - r_B B$
Taxes	$t \cdot E(\tilde{X})$	$t \cdot [E(\tilde{X}) - r_B B]$
Profit after taxes and interest	$(1-t) \cdot E(\tilde{X})$	$(1-t) \cdot [E(\tilde{X}) - r_B B]$

The profit after taxes expected by the investors of Company U, which has **no debts** in its liabilities, is therefore:

$$E(\tilde{X}^t{}_U) = E(\tilde{X}) \cdot (1-t)$$

This **income** belongs entirely to the **shareholders** since there are **no lenders**.

On the other hand, the expected income after taxes for the investors of the **indebted company** L is:

Shareholders	$(1-t) \cdot (E(\tilde{X}) - r_B B) = [E(\tilde{X}) \cdot (1-t)] - [r_B B \cdot (1-t)]$
Lenders	$r_B B$

The sum of the two remunerations is the total cash flow corresponding to the investors of company L (income after taxes but before interest):

$$E(\tilde{X}^t{}_L) = [E(\tilde{X}) \cdot (1-t)] + [t \cdot r_B \cdot B)]$$

As we can see, the income generated by the assets of an indebted company for its investors, after corporate tax, is equal to that generated by the non-indebted company plus $t \cdot r_B \cdot B$, which represents the **tax savings of the indebted company**.

These tax savings occur because **Corporate Tax** treats the interest on debts differently from the benefits to the shareholders. The **remuneration of debt** has a **tax advantage** or, equally, the **remuneration** of **equity** has a **tax disadvantage**.

To calculate the market value of the indebted company after taxes, the net tax income of the indebted company must be discounted at the appropriate risk rate. This income must therefore be considered to have two components of a different nature:

1. An *uncertain income flow*: $E(\tilde{X}) \cdot (1-t)$, which presents the after-tax cash flow of the non-indebted company. This must be discounted with the rate that the financial market applies to the income of a company of the same class financed only with its own resources: r_0.
2. A *certain income* (which we also assume to be constant and perpetual): $t \cdot r_B \cdot B$, which represents the tax savings of debt. As long as the company is in a positive tax position, it can be assumed that this cash flow presents the same risk as the company's debt, so it should be updated at the same rate as the debt: r_B.

Therefore, the market value of the indebted company will be:

$$V'_L = \frac{E(\tilde{X}) \cdot (1-t)}{r_0} + \frac{t \cdot r_B \cdot B}{r_B} = V'_U + t \cdot B$$

$$\boxed{V'_L = V'_U + t \cdot B}$$

This **relationship** is the **main contribution** of the 1963 corrected article. The **value of a company** (taking into account corporate tax) is equal to the **value of a company of the same class without debts plus the multiplication of the tax rate by the value of the debts**. The tB component represents the current value of the tax savings if the debt is constant and in perpetuity.

Since interest payments are tax deductible, the higher the level of debt, the greater the tax savings and, consequently, the more income the company generates to be distributed among owners and lenders. By increasing the debt/equity ratio, therefore, the company can reduce the taxes it pays and thus increase its total value.

On the other hand, when **Corporate Tax** is introduced, it has been observed that the company's market value is a growing function of the debt. This conclusion can also be reached by examining the total cost of capital of the indebted company, r_{wacc}.

The optimal financial structure should therefore correspond to that of maximum indebtedness.

However, real companies choose more moderate debt levels. As indicated above, the advantage of MM theory is that it indicates where to look when trying to identify the determinants of the financial structure.

As Modigliani himself (1988) later explained, at least **two assumptions** in the 1963 article do not fit reality, i.e.:

1. The fact that **personal taxes** are **not taken into account**.
2. The **assumption** regarding the **suitable discount rate** for calculating the present value of the income derived from tax savings.

With regard to the second aspect above, Modigliani points out that the results obtained in 1963 **assume** that, once their capital structure is decided, companies keep their **debt volume constant**. However, this assumption does **not appear to be admissible** in practice, so we could also consider B to be a random variable, $\tilde{B}$. Therefore, r_B does not always have to be the suitable discount rate for discounting the tax savings derived from the debt.

4. Personal taxes (the Miller model)

Once the hypothesis regarding the existence of taxes has been assumed, we must bear in mind that the **income the company distributes among owners (shareholders) and lenders** (in the form of capital gains, dividends and interest) is also **taxed** by **Personal Income Tax**. Investors will therefore value the company according to the income they obtain once both Corporate Tax and their own Personal Tax have been paid.

In these circumstances, the **optimal financial structure** will be that which, taking into account this taxation, achieves the **maximum income** available to the company's investors or, in other words, the **minimum income deducted** by the taxes.

The **differences** between the **tax treatment** of **interest**, **dividends** and **capital gains**, both in corporate and personal taxes, means that the **total return net of taxes received by investors can vary** depending on the financial structure of the company.

Generally speaking, we can say that capital gains, dividends, other forms of owner remuneration, and interest income are subject to Personal Income Tax, though the **effective tax rate on the different types of income usually varies** in most tax systems.

We therefore differentiate between:

- t_c: The Corporate Tax rate.

- t_{ps}: The tax rate on personal income from shareholder remuneration, i.e. the weighted average effective personal rate of dividends and capital gains.
- t_{pb}: The tax rate on personal income from interest collected on funds lent to the company.

The net income from corporate tax in an indebted company and a non-indebted company is therefore:

	Company U (non-indebted)	**Company L** (indebted)
Profit before taxes and interest	$E(\tilde{X})$	$E(\tilde{X})$
Interest	-	$r_B B$
Profit before taxes	$E(\tilde{X})$	$E(\tilde{X}) - r_B B$
Profit after taxes and interest	$(1 - t_c) \cdot E(\tilde{X})$	$(1 - t_c) \cdot (E(\tilde{X}) - r_B B)$

After payment of personal taxes:

	Company U (non-indebted)	**Company L** (indebted)
Income for shareholders	$E(\tilde{X}) \cdot (1 - t_c) \cdot (1 - t_{ps})$	$[E(\tilde{X}) - r_B B] \cdot (1 - t_c) \cdot (1 - t_{ps})$
Income for lenders	-	$r_B B \cdot (1 - t_{pb})$
Total income for shareholders and lenders	$E(\tilde{X}) \cdot (1 - t_c) \cdot (1 - t_{ps})$	$[E(\tilde{X}) - r_B B] \cdot (1 - t_c) \cdot (1 - t_{ps}) + r_B B \cdot (1 - t_{pb})$

The **total income** allocated to shareholders and lenders in an **indebted company** can be formulated as:

$$E(\tilde{X}) \cdot (1 - t_c) \cdot (1 - t_{ps}) + r_B B \cdot (1 - t_{pb}) \cdot \left[1 - \frac{(1 - t_c) \cdot (1 - t_{ps})}{(1 - t_{pb})}\right]$$

The **first term** in the above expression is the **income** that **investors receive** from a non-indebted company after all taxes have been deducted. Therefore, its market value should be V_U, the market value of the non-indebted company.

On the other hand, an individual who **purchases a bond** for B monetary units receives $r_B B \cdot (1 - t_{pb})$ after all taxes have been deducted. Therefore, the **market value of the second term of the expression** should be:

$$G = B \cdot \left[1 - \frac{(1 - t_c) \cdot (1 - t_{ps})}{(1 - t_{pb})}\right]$$

As a result, the **present value of the expression**, which is the **market value of the indebted company**, is:

$$V_L = V_U + B \cdot \left[1 - \frac{(1 - t_c) \cdot (1 - t_{ps})}{(1 - t_{pb})}\right]$$

From the formula for the total income allocated to shareholders and lenders in a non-indebted company, which defines the Miller model, we can see that the joint effect of corporate tax and personal income tax depends on the relationships established in the tax rates of both taxes.

Therefore, two situations can occur:

- If $t_{ps} = t_{pb} \rightarrow (1 - t_{ps}) = (1 - t_{pb}) \rightarrow V_L = V_U + t_c \cdot B$

by including the personal tax effect, the market value of the indebted company is equal to that obtained by considering only the Corporate Tax (MM Model, 1963). The **integration of personal taxes does not affect the value of the company** as long as the personal taxes tax dividends and interest received at the same rate.

- If $t_{ps} < t_{pb} \rightarrow \frac{(1-t_{ps})}{(1-t_{pb})} > 1$

In this case, in the personal sphere, more taxes are paid when the company is in debt than when it has no debts. Therefore, the **market value of the company when including the personal tax effect is lower** than the market value of the company obtained when only the Corporate Tax is considered.

This effect could even be **negative**:

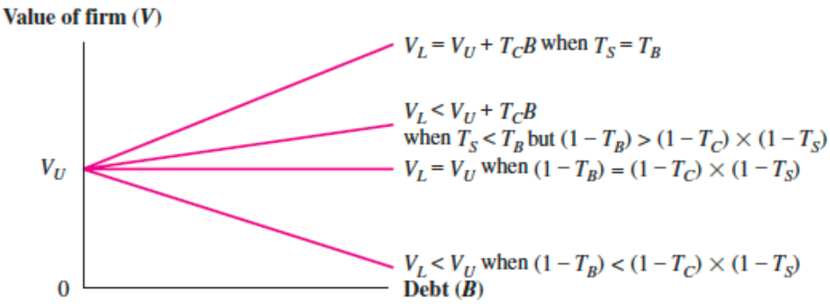
- If $(1 - t_c)(1 - t_{ps}) > (1 - t_{pb}) \rightarrow \frac{(1-t_c)(1-t_{ps})}{(1-t_{pb})} > 1 \rightarrow V_L < V_U$

It could also be that the higher personal taxes applied to the indebted company balance out the tax savings of this indebted company in the Corporate Tax exactly:

- If $(1 - t_c)(1 - t_{ps}) = (1 - t_{pb}) \rightarrow \frac{(1-t_c)(1-t_{ps})}{(1-t_{pb})} = 1 \rightarrow V_L = V_U$

In the latter case, the debt would not generate any loss or gain in the company's market value, the **debt would be neutral**, and the situation described in the original MM model (1958) regarding the irrelevance of the company's financial structure on its market value would arise.

However, in both the Miller model and the earlier Modigliani and Miller 1963 corrected model it is implicitly assumed that **companies enjoy an unlimited deduction of interest**. In reality, however, companies can deduct interest only to the extent of their profits. As a result, the **expected tax benefits of debt financing are lower** than those presented by these models.



T_C is the corporate tax rate.
T_B is the personal tax rate on interest.
T_S is the personal tax rate on dividends and other equity distributions.
Both personal taxes and corporate taxes are included. Bankruptcy costs and agency costs are ignored.
The effect of debt on firm value depends on T_S, T_C, and T_B.

5. The costs of bankruptcy and financial distress

As we saw in the previous section, the tax system can cause changes in the market value of a company depending on its level of debt. Given the tax systems in force in Western countries, it is generally accepted that indebtedness allows for tax savings that increase the company's market value.

However, **debt also applies pressure on companies** because they are compelled to meet their obligations with regard to payment of interest and principal. In an uncertain world, the company's gross results are a random variable. If these results do not enable the company to meet its debt payment obligations, **it would find itself in some kind of financial difficulty**. Therefore, if the company maintains debt in its financial structure, it must anticipate the possibility that its results may at some point be insufficient to satisfy its obligations with regard to the payment of interest and the repayment of principal to its lenders.

The probability of insolvency has a negative influence on a company's value. However, it is not the risk of insolvency itself that diminishes the company's value but the costs associated with those financial difficulties. These costs decrease the wealth available to the company's investors, thus reducing the company's market value.

Insolvency costs can be direct (or explicit). These are costs incurred by a company when implementing the mechanisms for suspension of payments and bankruptcy. They include administrative costs and fees for lawyers and other experts and technicians who intervene in the process at the company's request before and during the declaration of insolvency.

Insolvency also often involves indirect (or implicit) costs. These include costs generated by the loss of customers on account of their fear of a deterioration in the company's service and their loss of confidence caused by the company's financial problems or the possibility of those problems occurring. These costs may be incurred, therefore, even if insolvency does not occur. Moreover, these costs increase as the probability of insolvency, which is directly related to the level of debt, increases.

Debt agency costs are also indirect insolvency costs. When a company has debts, conflicts of interest arise between shareholders and creditors. These conflicts of interest are amplified as insolvency becomes more likely. When such conflicts lead to decisions that are not aimed at maximizing the company's market value, agency costs are incurred as a result of those debts [4].

Therefore, **as the company's debt level increases**, **shareholders** are more **tempted to follow selfish strategies**. For example, when a company is approaching a definitive insolvency or bankruptcy, shareholders have incentives to accept significant risks that may provide high returns if they are successful because they believe they are working with other people's money. If the project is successful, shareholders may perceive the increase in the company's value after the bondholders have been paid in full. On the other hand, if the project is not successful, the losses are absorbed by the bondholders, since the shareholders already expected not to receive anything given the proximity of the definitive insolvency.

Moreover, in a company with a high probability of bankruptcy, **shareholders also have an incentive to invest insufficiently in the company and to withdraw money** from the company in the form of **dividends** or **other distributions**, thus leaving the company with less wealth for its lenders. This is because bondholders get most of the income from the project in the event of a recession, whereas shareholders receive the benefit in times of prosperity and have their liability limited in times of recession.

These selfish strategies caused by proximity to a position of insolvency generate a series of costs that eventually result in a loss in the company's value. Aware of these possible owner strategies, creditors may design debt contracts that incorporate **protection clauses** against such behavior, such as restrictions on dividend policy or a reduction in working capital. These clauses, which can sometimes result in costs, may reduce total debt agency costs.

Another type of agency cost exists, though it has much less impact on the company's market value: **agency costs for the company's own resources**, which arise from the **separation of ownership and control** and, more specifically, from the agency

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[4] The agency relationship is defined as a contract between two parties, whereby one of the parties (the agent) undertakes to carry out an activity or provide a service on behalf of the other party (the principal), for which the principal delegates part of their decision-making power to the agent. Since both the agent and the principal try to maximize their respective utility functions, as long as the interests of the parties do not coincide, agency problems arise. These will lead to agency costs provided they lead to decisions that do not maximize the company’s market value.

relationship that gives managers discretion to pursue their own objectives rather than maximizing the company's value for its owners. Some authors argue that **a higher level of indebtedness** (and therefore a lower issue of shares and distribution of property) **forces the company to pay rent to bondholders instead of spending it on wasteful benefits**. According to Jensen (1986), therefore, interest payments on debt can absorb surplus income that firms may be tempted to spend on bonuses.

The **costs** derived from **indebtedness** can therefore have a **double effect**: while an increase in the level of indebtedness could accentuate the conflict between shareholders and bondholders, at the same time it helps to mitigate divergences between external shareholders and the company's management. However, since debt agency costs are so high in relation to equity agency costs, the latter do not imply a financial structure made up almost entirely of debt.

In short, since increases in the level of debt increase the current value of the insolvency costs and since these have a negative impact on the company's value, we have:

$$V_L = V_U + G - Q(B)$$

where $\boldsymbol{G}$ represents the current value of the possible **tax savings** derived from the indebtedness and $\boldsymbol{Q(B)}$ represents the current value of the **costs of the financial difficulties**, which are an increasing, but not linear, function of the level of indebtedness.

Graphically, the combined effect of these two opposite consequences can be seen in graph 6. For low debt levels, the present value of the costs of financial difficulties is practically zero. However, as the level of indebtedness increases, the present value of these insolvency costs increases. At some point B'_Q, the increase in the present value of these costs will be equal to the increase in the present value of the tax savings, thus neutralizing their opposite effects. This is the level of debt that maximizes the company's market value, i.e. the optimal level of debt. From this point on, the insolvency costs increase faster than the tax savings, which implies a decrease in the value of the company as a result of the additional debt.

Certain regularities observed in studies carried out with real data seem to **support** this **model**. On one hand, some **empirical studies reveal** that **changes** in the level of **debt affect the company's market value**. Specifically, Shah (1994) examined how changes in the financial structure of companies affect share prices[5] and revealed that the share price increased substantially when a change in capital structure was announced that increased the level of debt, and vice versa. This result is consistent

[5] See also Masulis (1980), Cronett and Travlos (1989), Copeland and Won Heum Lee (1991), among others.

with the tax benefits of debt. However, it may also be due to the existence of information asymmetries that favor the emission of signals to the market.

Differences between the financial structures of different industries have also been empirically observed. For example, industries such as those that manufacture pharmaceutical or electronic products, which have large investments in research and development (investments with a high level of economic risk), tend to maintain very low levels of indebtedness despite being high-growth industries with ample investment opportunities and, therefore, a greater need for external financing. On the other hand, companies with low-variability gross profits tend to use a larger amount of debt than other companies. These results also appear to be consistent with the trade-off between tax savings and insolvency costs, since companies with higher variability in gross results are more likely to be insolvent.

However, authors such as Miller (1977), Haugen and Senbet (1978) and Haugen and Senbet (1988) **criticize this model that contrasts tax benefits and insolvency costs**. They point out that **the latter costs are, in business reality, much less than tax savings**, which should imply that the optimal financial structure is close to that which is made up almost entirely of debt. However, this is not in line with business practice.