RISK AND RETURN, THE CAPM AND CAPITAL STRUCTURE CHOICES

I. Risk and return and CAPM

1. Risk and return

Assuming that we have, by nature, a risk aversion approach to investments, it is clear that bearing a higher risk would only be justified under the promise of a higher return. In this context, the question is how much more return should we expect for accepting an increased level of risk or, by other words, how can we translate the relationship between risk and return into something that we can usefully use in our investment decisions.

2. Types of risk

Let´s start by looking to the simple investment of buying a share of company ABC. The promise of return - dividends and especially the increase in the price of the share - has a risk associated – no dividends and mostly a decrease in the price of the share. In the near or more distant future many events will affect the performance of this company, some good and some eventually bad that will ultimately determine a future attractive or disappointing return. Those set of events can be classified in two different categories. One, that we may call specific company events, includes all the events that are directly related to the company and that will not automatically affect, in general, the corporate sector (for instance, on the positive side, a successful marketing campaign or a new feature in a given product and, on the negative side, a huge penalty from a regulator or a serious technical problem in a product). The second category includes all the events that affect in general the corporate sector, even if with different intensities across companies and industries (for instance, on the positive side an agreement that is established in a major international conflict and on the negative side, a widespread increase of interest rates). The first category can be labelled as company risk and the second as market or systematic risk. The company risk is a type of risk than can be mitigated through diversification. Investing in different shares will lead to an offset of specific positive and negative events across companies. If this type of risk can be almost eliminated at a residual cost, it shouldn´t be rewarded with an increased return. The systematic risk is a different matter, as it is, by definition, impossible to eliminate through diversification, and therefore it should be rewarded with an additional return.

This analysis generates two general rules for the rational investor. First, he/she should always have a diversified investment, as he/she will not want to bear a type of risk that can be eliminated at no cost, through diversification. Second, the relevant risk that should be considered in terms of the future return of the investment is the one that cannot be eliminated. Taking these rules into account, when we look to a given single share, we should always assume that the analysis will be under the assumption that this single share will be included in a diversified portfolio and therefore only the systematic risk of the share should be evaluated.

3. Linking risk and return

Having understood the relevant risk that should be considered, we need to find a way to measure it and to relate it with return.

Let´s start by identifying what is the investment in shares that offers the maximum possible diversification effect. It should be a portfolio that represents a carbon copy of the whole stock market. This portfolio completely eliminates the specific risk and only has to cope with the systematic risk. Therefore, the expected stock market risk premium, that is, the extra return over a risk free investment, is the expected reward of bearing the systematic risk. But we saw earlier that although this risk affects all shares, it doesn´t affect them all with the same level of intensity (an increase of the interest rates, for instance, will likely produce different impacts in earnings, cash flows and value of different companies). Therefore, we need to identify a measure that relates this different sensitivity of each share toward the systematic risk. Let´s call it Beta (β) and let’s assume that the β of the global market portfolio is 1. If a share has a β of 2, for instance, it means it has the double of the risk of the market portfolio and, therefore, it should contribute, in terms of return, within a diversified portfolio (to eliminate the specific risk) with the double of the market risk premium. Putting it in a simple formula:

$r_i = \quad r_f + \beta_i \times MRP$

Where:

r_i – Required return for share i

β_i – Beta of the share i

MRP – Market risk premium

In order to apply the formula in the real world we need to operationalize the underlying concepts. Regarding the risk free rate, the best proxy will be a Government bond from an AAA country[1]. Regarding the market risk premium, analysts and other market experts will likely have a consensus projection over the future[2]. Finally, regarding Beta, we can measure the sensitivity of the returns of the share over the returns of the market portfolio. From a statistical point of view we can do it by:

$$\beta_i = \frac{COV_{(i,m)}}{VARIANCE_m}$$

Where:

i - Share i

m – Stock market (using an index as a proxy)

By construction, the Beta of the market portfolio is 1 (as the overall market portfolio is the more diversified possible investment (eliminating, through offsetting, the specific risk of the shares that are included).

[1] The maturity of this Government bond is subject to controversy. For the time being let´s consider as the benchmark the time horizon of our valuation exercise (for instance, if we are analyzing a five year real investment project, this should be the maturity of the used Government bond).

[2] Alternatively, we can use the past market and risk free returns or the implicit rate of return in market prices (a concept that will be presented in the analysis of the dividend model for valuing shares).

In practice, running a long series of daily returns of the share and of the overall market it will produce the β value.[3] Many financial sources have available the computation of Beta for the listed companies.

4. The Capital Asset Pricing Model (CAPM)

The equality $r_i = r_f + \beta i \times MRP$ is designated as the capital asset pricing model[4]. In equilibrium, all shares should generate a return equal to the r_i predicted by the model.

We can rewrite the model detailing the concept of MRP:

$r_i = r_f + \beta i \times (r_m - r_f)$

Being the r_m the expected rate of return of the overall stock market.

Two final notes on the underlying concepts of the CAPM that may help to understand better this risk and return relationship.

If we compute the r_i of share i we shouldn´t expect to have this return for share i. According to the CAPM r_i will represent the contribution of i, in terms of return if included in a diversified portfolio, as the risk tool (β) only captures the systematic risk and not the specific risk of share i. To clarify this idea, let´s consider a simple

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[3] As it would be expected (being a proxy of what need to measure), the β will not be the same considering different time series (for instance 3 or 5 years). Usually, the market return is measured by using a relevant stock index of the market (for example, S&P 500).

[4] The formulation of CAPM is attributed to the independent work of Jack Treynor, William Sharpe, John Lintner and Jan Mossin, all building on the work of Harry Markowitz on diversification and modern portfolio theory. The model relies on several key assumptions, such as absence of transaction costs and taxes, investors are rational, risk averse and have homogenous expectations, all relevant information is available at same time to all investors and they can borrow and invest at the risk free rate.

stock market with only four shares and each with an equal weight[5], as detailed in the next table:

SHARE	BETA	RISK FREE RATE	MARKET RISK PREMIUM	CAPM
A	1.2	4	8	4 + 1.2 x 8 = 13.6
B	0.9	4	8	4 + 0.9 x 8 = 11.2
C	1.4	4	8	4 + 1.4 x 8 = 15.2
D	0.5	4	8	4 + 0.5 x 8 = 8
PORTFOLIO	1[(a)]			12[(b)]

(a) – The Beta of a portfolio is simply the weighted average of the beta of the shares of that portfolio. The result, 1, as mentioned before, reflects the fact that the overall portfolio is the more diversified possible investment and therefore only involving systematic risk.

(b) - This result, 12%, can be obtained as an average of the return of each share or simply by using a Beta of 1 in the CAPM formula.

One year later, we compute the real return of each of the four shares and compare it with predicted value from the CAPM, as depicted in the next table:

SHARE	RETURN	DEVIATION FROM THE CAPM
A	14.3	+0.7
B	10.1	-1.1
C	16.1	+0.9
D	7.5	-0.5
AVERAGE	12	0

We can see that all shares didn´t achieved the expected return, which makes sense as their return is influenced not only by the systematic risk but also by the

[5] The weight of each share in the market is typically defined by the market capitalization of each company.

specific risk of each company. However, in the end, the contribution of the shares for the overall return of the diversified portfolio performed the expected result (12%).

The second note enhances a different way of looking to the CAPM. Let's assume that we intend to engage in an investment with a level of risk of a Beta of 0.6. Considering a risk free rate of 4% and a MRP of 8%, we conclude, using the CAPM, that this investment should produce a return of 4 + 0.6 x 8 = 8.8%. Whatever the type of the investment, we can always replicate its risk by constructing a combination of investing in a risk free asset and in a carbon copy of the market portfolio. In this case we will invest 40% of the money in the risk free rate asset and the remaining 60% in a portfolio that mirrors the market portfolio. The risk free asset has a Beta of zero (no risk) and the market portfolio has Beta of 1. The return of our investment will be generating a global risk, for the combination of these assets of 0.6. Its expected return will be:

$r_{inv} = 4 \times 0.4 + 12^{(a)} \times 0.6 = 8.8\%$

(a) – The portfolio will generate a return equal to the risk free rate (4%) plus the MRP (8%).

If we can assure, with the elimination of any source of specific risk, a return of 8.8% through the combination of a risk free asset and a copy of the market portfolio, we shouldn´t require any less from any investment with a similar level of risk, in this case, with a beta of 0.6[6].

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[6] If we want to use an example of an investment with a Beta higher than 1, we can replicate it by investing a portfolio that mirrors the market portfolio an amount of money larger than the available amount and borrowing the difference at the risk free rate (one of the assumptions of the CAPM is the ability of investing and borrowing at the risk free rate). For instance, for a Beta of 1.4, we invest 140% of the available amount in a copy of the market portfolio and we borrow (at r_f) 40% of the available amount (the Beta of the investment will be (140/100) x 1 – (40/100) x 0 = 1.4). In the example with a risk free rate of 4% and a MRP of 8% the CAPM will generate a return of 4 + 1.4 x 8 = 15.2 and we would get a return from the investment of (140/100) x 12 -(40/100) x 4 = 15.2.

5. CAPM in practice

The CAPM has been subject to numerous empirical tests. The overall evidence points out toward a very limited power as a major source for explaining asset returns. In addition, its underlying theoretical framework has also been contested as robust predictor of assets return. Most of the criticism, supported by the empirical evidence, has focused in the too much simplicity of having just one factor (Beta) as an explanatory variable for the return. Other models have been developed to capture a more strongly prediction of returns[7], but, probably due to its simplicity and intuitivism, the CAPM is still and by far, the model used in the wide majority of valuation exercises carried out in the field.

6. The country risk premium (CRP)

The CAPM, in its simplest version assumes that it is applied in a well-developed economy, with an efficient and a long and established track record (to sustain the market risk premium) and within an AAA rating framework (to generate an appropriate risk free rate). If we are considering a country, even though with reasonable developed capital markets[8], but with a rating below AAA, we need to handle the problem of the country risk premium (by investing in a share of country X, not only we bear the systematic risk of the share but also the risk of the country).

[7] The more well-known cases are multi-factor models, namely the Arbitrage Pricing Theory of Ross (although difficult to test) and the Fama and French three factor model that add to Beta two more explanatory variables, the market capitalization (size effect) and the book-to-market ratio (growth effect).

[8] In an era of global markets we should always consider, from a Beta perspective, a more extended view. For instance, if we are computing a Beta for a Portuguese or Spanish company, it would, eventually, make more sense to consider as the market portfolio not the local stock market but the Euro market as whole.

There are two simple ways to include the CRP in the CAPM[9]:

$r_i = r_f + \beta i \times (MRP + CRP)$

or

$r_i = r_f + CRP + \beta i \times MRP$

The difference between these two alternatives is that in the first the CRP is amplified (or reduced) by the Beta and in the second it simply adds to overall expected return, meaning that all local companies are similarly exposed to the same level of country risk.

Regarding the computation of the CRP, the more common approach[10] is to compute the difference between the interest rate of the country Government bonds and the rate of similar bonds from an AAA country (being the former bonds issued in the same currency of the bonds of the AAA country, to avoid the currency risk influence)[11].

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[9] This is a subject of huge debate among scholars, not only in terms of the portfolio used to compute the Beta, but also of how should we compute the CRP and its role in the CAPM. These two simplified versions, however, are common approaches used in practice. We could add a third one:

$r_i = r_f + \beta_{BM} \times MRP_{BM} + \lambda \times CRP$

Being r_f the risk free rate of the developed market used as benchmark, β_{BM} and MRP_{BM} the Beta of a similar business and the market risk premium of this same market and λ defined by:

$\Lambda = (\beta_{BM})^2 \times (\sigma_{BM/}\sigma_{LM})^2$

Being σ_{BM} and σ_{LM} the standard deviation of equity return of the market used as benchmark (BM) and of the local market(LM).

[10] The use of credit default swaps spreads (CDS) as a benchmark for the risk premium is becoming increasingly popular.

[11] The country risk premium obtained from some sort of sovereign bond analysis (whether a yield spread or CDS) is mainly focused on the likelihood of default and the equity risk goes clearly beyond (encompassing the former but including other of sources of risk). To mitigate this narrowed risk approach, often the country risk premium obtained from sovereign bonds is multiplied by the ratio of the standard deviation of the local equity market over the local bond market).

II. Capital structure choices

1. Introduction

The choice between equity and debt or, by other words, the definition of the capital structure, is a critical issue in the definition of the firm´s financial policy as it impacts in several relevant areas such as the risk profile of the company and, consequently the cost of funding, the gathering of resources to back up the firm´s future development and the timely response to opportunities, challenges and threats that a dynamic environment tend to regularly produce.

The theory of corporate finance, in these last 40 years, has made some progress toward the definition of a guiding framework, although still far from fully overcoming and incorporating the frictions and imperfections that continue to characterize the financial world.

In the following sections we try to provide some input that may help the decision-maker to understand better some key elements that may affect the choice of the right capital structure.

2. An initial straightforward and simplified concept: financial gearing (leverage)

This simple concept, much more based in accounting values rather than in market values links the impact of the capital structure in the Return on equity (ROE = Net Income/Equity).

The key message may be viewed in the following expression of ROE:

$$ROE = (GROSS\ ROA + (GROSS\ ROA - r_D) \times \frac{D}{E}) \times (1 - t)$$

Being:

Gross ROA - EBIT/ASSETS

r_D – Average cost of debt

D/E – Debt/Equity

t – Corporate tax rate

Looking at the formula we see that if GROSS ROA is higher than the cost of debt, more debt and less equity (increasing the D/E ratio) will increase the ROE of the firm, an effect usually called financial gearing (or leverage).

This simplified concept assumes two things:

- The cost of debt will not change with the increase of debt;
- Shareholders will be pleased with the nominal increase of ROE.

These assumptions are both related with the perception of risk. But, if the company significantly increases its level of debt, changing though its risk profile, creditors will demand a higher interest rate and investors will require a higher return (that, eventually, will represent an increase larger than the growth of the ROE). Consequently, the financial gearing may be a useful concept for small changes in the firm´s capital structure, but it is not a general framework to model it.

3. The Modigliani–Miller (MM) world

3.1. The initial framework

In 1958, Franco Modigliani and Merton Miller (later, both received the Nobel Prize), developed a theory regarding the optimal capital structure of the firm. They considered a perfect economy, without taxes, no transaction costs, information asymmetries, and investors' homogenous expectations regarding the return/risk measurement and trade-off. In this perfect world they proved the irrelevancy of the capital structure. All possible D/E alternatives will end up with the same WACC and therefore not changing the value of the firm.

The idea is quite straightforward. Let´s assume a firm that replaces equity by debt, replacing though, a costlier resource (equity) by a cheaper one (debt). In terms of the WACC this positive effect will be offset by two negative effects: creditors will require an increasing interest rate (if the firm already has debt) and investors will also require an increased return because for both, the risk profile of the firm has increased and shareholders are the last ones in the pecking order to receive anything in case of financial distress. Let´s present a simple illustration.

Let´s assume a risk free rate of 4% and a market risk premium of 8%. The firm is all-equity financed its Beta is 0.8 and therefore the required rate by investors, using the CAPM is 10.4% (4 + 0.8 x 8).

Let´s now assume that the firm decides to change its D/E to 1 (50% equity and 50% debt, the latter with a cost of 6%[12]).

MM proved that the required rate of return by the investors (r_L) is a linear function of the D/E with the following expression:

$r_L = r_U + (r_U - r_D) \times D/E$

Being r_U the return required by investors of the unlevered firm and r_D the cost of debt).

In the new situation:

$r_L = 10.4 + (10.4 - 6) \times 1 = 14.8$

We could achieve the same result using a different path. It makes sense that the assets' beta (risk of the business) should not change with any modification of the capital structure and that the assets' beta should correspond to a weighted average of the Betas of the resources employed in the firm (equity + debt).

The cost of debt of 6% represents a debt Beta of 0.25. In fact, using CAPM: 6 = 4 + B_D x 8 implying that B_D =0.25. Therefore if assets' beta (or unlevered beta) is 0.8 and the business itself will not change its risk profile, the new levered Beta of the investors will be 1.35 (1.35 x 0.5 + 0.25 x 0.5 = 0.8). Using the CAPM, the new required return will be:

$R_L = 4 + 1.35 \times 8 = 14.8$

The new capital structure will provide a WACC of:

WACC = 14.8 x 0.5 + 6 x 0.5 = 10.4

Therefore, the WACC, from the initial all-equity financed scenario to the D/E=1 scenario didn´t change, and so the introduction of debt did not create any

[12] Here, it does not matter if this cost of debt is before or after taxes, because we are dealing with a world without taxes.

additional value for the firm (in a perfect world without taxes, transaction cost and with information asymmetries).

3.2. The revisited MM world with corporate taxes

In 1963, MM acknowledged the limitation of not having considered (corporate) taxes in their model. Introducing corporate taxes, which in practice reduce the effective cost of debt (as interest expense is tax deductible), the trade-off between equity and debt will favor the latter. In the previous illustration, considering a tax rate of 20%, the cost of debt will now be 4.8% (6 x (1-t)) and therefore the WACC will be only 9.8% (14.8 x 0.5 + 4.8 x 0.5), which is lower than in the all-equity financed initial case (10.4%). The conclusion is overwhelming: it would mean that the optimal capital structure is 100% debt. The consideration of taxes creates an addition to the value of the company equal to the present value of all tax savings due to debt. MM showed that Debt x tax rate corresponds to the size of this added value (the present value of a **perpetual** tax saving equal to debt x interest rate(r) x tax rate (t), using as discount rate the interest rate of debt, which means $\frac{Debt*r*t}{r} = Debt * t$).

3.3. The reality of the corporate world

If the MM model holds, we should see the wide majority of the firms highly levered. The reality is quite different with huge variations regarding the level of debt, across industries, size, profitability, indicating that there isn´t a clear pattern that may lead to the definition of an optimal single capital structure. There are several factors that may reinforce the use of equity or of debt, as described below.

<u>Financial distress costs</u>

A highly levered firm will have also a higher probability of entering in financial distress and eventually in bankruptcy, if its business, for some reason, faces a downturn. This possibility will start to produce many indirect costs (many not very visible at first sight) such as qualified employees who will seek a more secure job, more difficult hiring, suppliers who will be more demanding and offering less attractive conditions, customers leaving with the fear of the discontinuity of the firm, among several other examples. These additional costs recommend the avoidance of a highly levered situation.

Taxes

Corporate taxes are, naturally, an incentive to the use of debt. Increased taxes will favor the use of more debt. However, and more recently, there is a movement (as in France, Germany and Portugal) of the Governments to limit the tax advantage of debt (for instance, in Portugal, there is a limit of 70% of EBITDA of the amount of interest expense that can be considered as costs for tax purposes). These limitations are, in practice, a brake to use too much debt.

Nature of assets

Highly liquid (easy to trade) assets make easier (and less costly) the use of debt. For instance, firms with a relevant amount of intangible assets will find more difficult to raise debt (from a creditor perspective, illiquid assets will represent an additional risk in the case of bankruptcy, since they are not easily sold and thus exchanged for cash).

Nature of the business and competitive position

In a more volatile business (prices, margins, returns) and/or in an industry with fierce competition, in which profits can easily be eroded, debt should be used in a more conservative perspective, as there is a higher chance of a firm entering in a financial distress situation (likelihood enhanced by an increased level of debt). In fact, increased financial leverage represents increased fixed costs, which must always be paid even when margins go down. Therefore, firms in highly competitive markets (and low margins) should keep their cost structure as much flexible (and variable) as possible, which is not compatible with high levels of debt.

Risk management

A firm that has an active risk management policy, that is, a company that is actively mitigating the impact of the variation of prices (commodities, currency rates, interest rates, etc.) in its cash flow and income, has an ability (other things equal) of raising more debt than a firm that faces the impact of price variation (favorable some times, unfavorable in others). Once again, and from a creditor perspective, a more stable stream of cash flows and profits will be rewarded with eased access to debt and in better conditions.

Ownership control

Especially in private companies (or in public companies with a majority shareholder), growth strategies, which demand more raise of funds, clash against the lack of equity capital to maintain the control of the firm. This situation leads to an increased use of debt or, even worst, to the sacrifice of attractive growth opportunities. This (cultural and social) inability to share ownership and the control of the firm is a well-established characteristic of the Southern European countries.

3.4. The perspective of top management

Stuart Myers argues that there is what he called a pecking order in raising funds for the firm. The pecking sequence is determined by the managers and their will to maximize their discretionary power over the use of funds. In this context, retained earnings will be the first to be picked, debt the second and new equity the last. In practice, the latter will have a higher level of scrutiny from outsiders: shareholders and markets in general will want know what is the purpose and rationale of the capital increase. This is a level of monitoring that will exist but with a lesser extent in terms of debt and even less with the retained earnings, being the payout ratio the key feature to be controlled by the shareholders meeting. In this line of reasoning Michael Jensen argued that earnings should be fully distributed as dividends, to force managers to ask (and justify) for new equity or debt instead of using, in a discretionary way, the retained earnings of the company.