Correlation of Corporate Income Categories and their Relation to Cost of Capital

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Abstract

This paper attempts to present the correlation of the capital based enterprise income categories. Also an aim to show some methodologically wrong point of view which are widely recommended in the literature. The article uses a special graphical analytic framework developed by the authors. The paper presents the meaning of net income, earnings before interest and taxes, economic profit and market risk premium, and shows their relationships as well as their connection to the cost of capital from a microeconomic point of view and also lay out the possible corporate scenarios and a summarising illustration. The developed graphical representation framework can be applied very well also in the field of education as a comprehension-aiding tool. It is also greatly useful to understand the reasons for the connections behind the income categories, and through that to evaluate the usability of the capital-based profitability indices. The properly chosen profitability indices help in the making of the right business decision, through it improving the competitiveness of the company.

Key words: net income, earnings before interest and taxes, economic profit, market risk premium, cost of capital, required rate of return, weighted average cost of capital

JEL Classification: D24, G31, M21

Introduction, Objectives

When measuring the income created by the company **we subtract some type of corporate input from some type of corporate output.** The calculation of certain income categories, due to their simplicity, does not normally cause any issues; however, the correlation between these as well as the exploration of their relation to the corporate cost of capital often does. The aim of the study therefore is to present the correlation of certain income categories together with the graphical analytic framework developed by the authors that serves to present the correlations of income categories and capital-based profitability indices. We also lay out the possible corporate scenarios and a summarising illustration. The paper uses a conceptual point of view. Understanding the reasons for the connections behind the income categories provides a proper basis for the evaluation of the usability of the vast amount of capital-based profitability indices that can be found in the literature. The properly chosen profitability indices help in the making of the right business decision, through it improving the competitiveness of the company.

1 Required rate of return (cost of capital)

The net income produced by the company is interpreted as the difference between income and costs. In case the value is positive, the company is profitable, if negative, it makes a loss. However, this is very little information regarding whether it is worth it for the owner of the capital to operate this enterprise on the long run.

Let's assume that the enterprise achieves a 30-million EUR income with 29 million EUR costs by tying up 50 million EUR of total capital. Therefore it is profitable, the net income is 1 million EUR. However, this only means a 2% return on assets. Naturally, this is not sufficient for the capital owner since his capital yields more even if he does not run an enterprise but deposits his money in the bank. The question is, how much is enough then?

When investing capital, we preform two things at once.

We invest the available amount in a given opportunity on the long run, possibly **risk-free** (i.e. without the chance of losing the capital). **For tying up our capital we expect compensation, we can call it the cost of equity.** For instance, if we put the amount in question in the bank, we would get interest paid after it. However, bank deposits themselves also hold risks since even a bank can go bankrupt (as the crisis of the past years has proven this right).

Economic experts view investments in the government bonds market as the least risky (Vernimmen et al., 2009) (Berk and DeMarzo, 2014). Of course, even here we can find a counterexample – there are countries in whose bonds investments are risky – but in general it can be said that assets invested in government bonds guarantee risk-free (or at least the least risky) interest rate (r_f). In our enterprise we tie up capital for the long run, therefore we choose the appropriate long-term interest rate such as the 10-year government benchmark bond yield.

It is not likely, however, that we would be content with this, since we take risks when running an enterprise. For higher risk-taking one expects greater compensation**. Having an own enterprise comes with higher risks than government bond-market investments viewed as zero-risk, so it is justifiable to expect some sort of premium for taking risks. The risk premium investors earn by holding market risk is the difference between the market portfolio's expected return and the risk-free interest rate ($r_m - r_f$).** Normally by this we mean the average market risk premium of the chosen industry. It is logical to make the comparison within the industry since it holds different risks to open up a grocery store than to start a factory that produces bearings.

It can happen, however, that the risk of our own enterprise differs from the industry risk. For example, we are further away from the resources or possess no established distribution channel, maybe there is an insufficient supply of skilled labour force in the region, etc., so our risk is greater. On the other hand, it can also be smaller. These individual factors can be included in our calculations if the systematic risk is adjusted by a ß value. If $ß < 1$, then our risk goes below the average industry risk and in case $ß > 1$, it goes above it.

Therefore, the required rate on return can be calculated in the following way:[1]

$$i = r_f + (r_m - r_f) * ß$$

Does this apply only to our own money (the value of equity, V_E) or also to the loans credited for the operation of the enterprise (the value of debt, V_D)?

The success of the enterprise depends on whether it can manage to offer the right product or service to customers at a price for which they are willing to purchase it while the company's costs are also recovered. To achieve this, a shop chooses the location, determines the opening hours, employs staff, purchases goods and so on for example. If the shop is located at the wrong place, the opening hours are inadequate, the employee is careless, its goods are of worse quality than those of its competitor or there are always supply shortages, the customers will lag behind and the enterprise will fail.

Naturally, we could find a rare example where the success of the enterprise can depend on a specifically skilled co-worker (i.e. the success is determined by the labour market), but in the case of the vast majority of enterprises the determinant factor is the goods market.

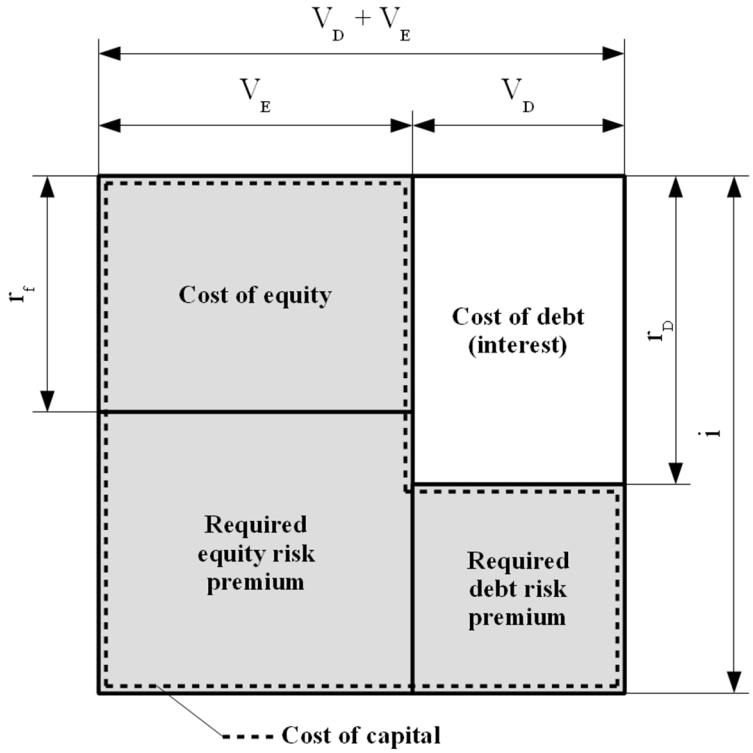
[1] See also: (Illés, 2008); (Juhász, 2012).

Everything comes down to whether an appropriate number of customers purchase the product/service or not.

The customer of the company clearly does not consider whether the entrepreneur has financed their firm from equity or debt when purchasing a product. The customer is indifferent about the company's capital structure (the ratio of equity and debt) and since risk is determined on the goods market where the customer is king (Illés, 2008), **the capital structure should be indifferent in terms of taking risks as well. Therefore we should expect the same rate of return on debts as on equity.**

In the case of debt, however, the internal breakdown of the required rate of return is a little different. Namely, in case of debt, a part of the total required return has to be submitted to the owner of the capital (e.g. to the bank from whom we received the credit). This interest rate on debt (r_D) is actually the cost of foreign capital. The entrepreneur has to pay interest to the bank so, based on the line of reasoning above, only the sum on top of the interest rate ($i - r_D$) is left of the required rate of return on debt (which is equal to that on equity).

The previous thoughts are summarised in Figure 1 which presents the cost of capital (required amount of return) graphically (grey area).



	Cost of debt (interest)	$V_D * r_D$
Cost of capital	Required debt risk premium (consideration for risk-taking)	$V_D * (i - r_D)$
	Cost of equity (nominal risk-free rate of return)	$V_E * r_f$
	Required equity risk premium (consideration for risk-taking)	$V_E * (i - r_f)$

Figure 1: The components of required rate of return

Source: Own edition

Featuring the weighted average cost of capital (WACC) as the required rate of return is widely spread. The calculation method of WACC is the following (Koller et al., 2010):

$$WACC = \frac{V_E}{V_E + V_D} * i + \frac{V_D}{V_E + V_D} * r_D * (1 - T_C)$$

where T_C is the corporate tax rate.

The concept of the weighted average cost of capital takes as starting point the fact that it is sufficient to require only the interest costs on debt as return. Moreover, since interest cost and therefore interest reduce net income, the required return on interest can be reduced by its share of income tax; it is sufficient if it only generates the reduced value proportional to (1 - t). Namely, if we used equity instead of debt, the required return would become the required rate of return on equity as opposed to paying interest, from which we would have to pay taxes which does not have to be done after the interest. From this we can conclude that the required return of the interest can be reduced by the tax rate.[2]

This approach, however, is wrong! The different treatment of debt and equity assumes that we take out a loan so that we can pay its interest. If we thought that way, where would the gain of the entrepreneur be? They would only take out a loan to pay its interest? Or in order to achieve additional income by involving it in the enterprise? If we accept that the entrepreneur's risk is realised on the goods market which does not differentiate between the involvement of equity and debt, then neither can we do so. It is wrong to say that it is sufficient for debt to only pay off its interests. **This methodologically wrong point of view makes debt seem relatively cheaper** since the interest of a loan is normally below the aggregate required rate of return, so **this drives enterprises towards taking out loans – and therefore towards indebtedness – while it shows investment opportunities that would not be economic in case of levying the real required rate of return as appropriate.**[3]

2 Income categories

2.1 Net income

To put it simple, **it means the company's earnings before taxes**, so it measures the difference between all incomes and all costs and so it quantifies the profit or loss achieved by the company.

Net Income = Income – Expenses

If the net income is positive, the enterprise is profitable, if it is negative, it makes a loss.

We cannot compare the return on capital of two companies since it is almost sure that they operate with different capital structures, so their required rate of return also differs. Furthermore, this statement also stands for comparing an enterprise's performance over the years since, due to new borrowings and paybacks of loans, the company operates with a different capital structure each year.

If, however, we add (back) interest to the net income, we arrive at such an income category (EBIT) that, at a given amount of capital, can be compared at given required returns. The EBIT-value per unit capital therefore provides an opportunity to compare enterprises since it is independent of the capital structure.

[2] See also: Rappaport (1998).
[3] See also: Illés (2002).

2.2 Earnings before interest and taxes (EBIT)

EBIT therefore bypasses the aforementioned problem and **refers to the return on all capital**.

$$EBIT = \text{Net income} + \text{Interest}$$

Since it is **unrelated to capital structure**, the EBIT-value per unit capital **provides a possibility to compare enterprises**. Net income does not make this possible; with that, "only" investigations based on the comparison with the required rate of return can be made intra-company in the field of economic profitability.

But why? We expect a certain cost of capital related to the use of our capital ($V_E * r_f$) as well as our risk-taking ($V_E * (i - r_f)$ and $V_D * (i - r_D)$). While the cost of equity is only an expense, the cost of debt (i.e. interest: $V_D * r_D$) is also a cost which appears in the total costs. Therefore, when calculating net income, we also subtract interest from the production value. However, if we operated the enterprise with the same amount of capital, but the ratio of equity and debt were different, the extent of interest would also change accordingly:

more debt → more interest and lower cost of capital,
more equity → less interest and higher cost of capital.

This is shown in Figure 2 (the grey area shows the cost of capital), on which the ratio of equity is much higher in the figure on the left than in that on the right at equal amounts of total capital. Even though we expect the amount related to the required rate of return on every capital unit in both cases, this will obviously be a greater sum in the case of the left-hand side scenario due to the differences in capital structure.

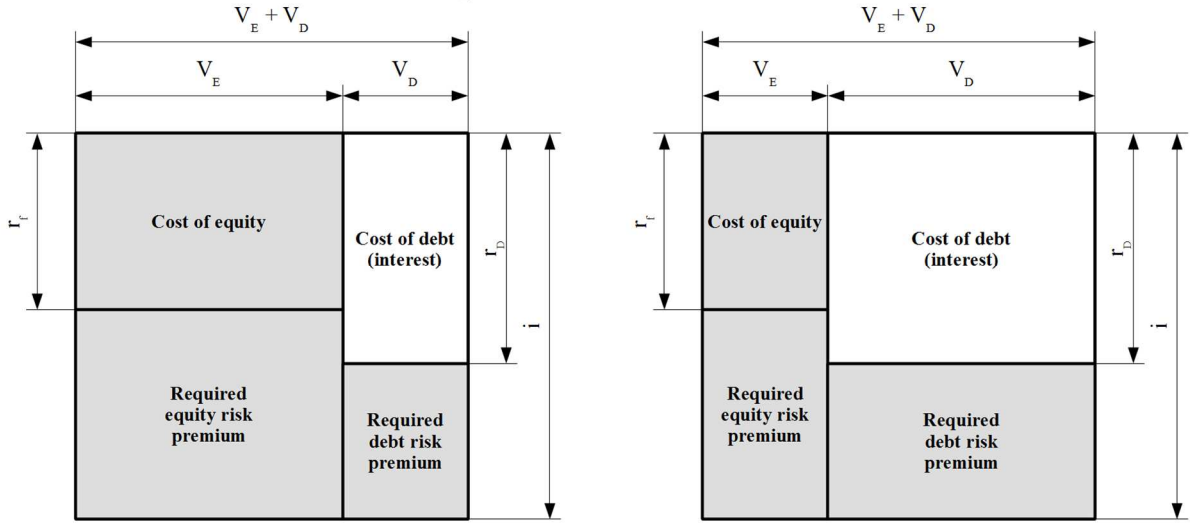


Figure 2: The development of cost of capital as a function of capital structure

Source: Own edition

The two extremes can only occur in case of a company relying solely on equity or solely on debt, even if the latter is more of a theoretical category (Figure 3).

If there is only equity involved in the enterprise, no interest is being paid; on the other hand, the cost of capital increases since the cost of equity applies for all capital units. In case of debt-financing only, however, exactly this component does not appear so the cost of capital will be lower but the interest cost that decreases income will be more substantia.

In both cases, the size of the boxes is exactly the same as in earlier cases. **The total required yield on capital defined for a given amount of capital is the same for all types of capital structure.**

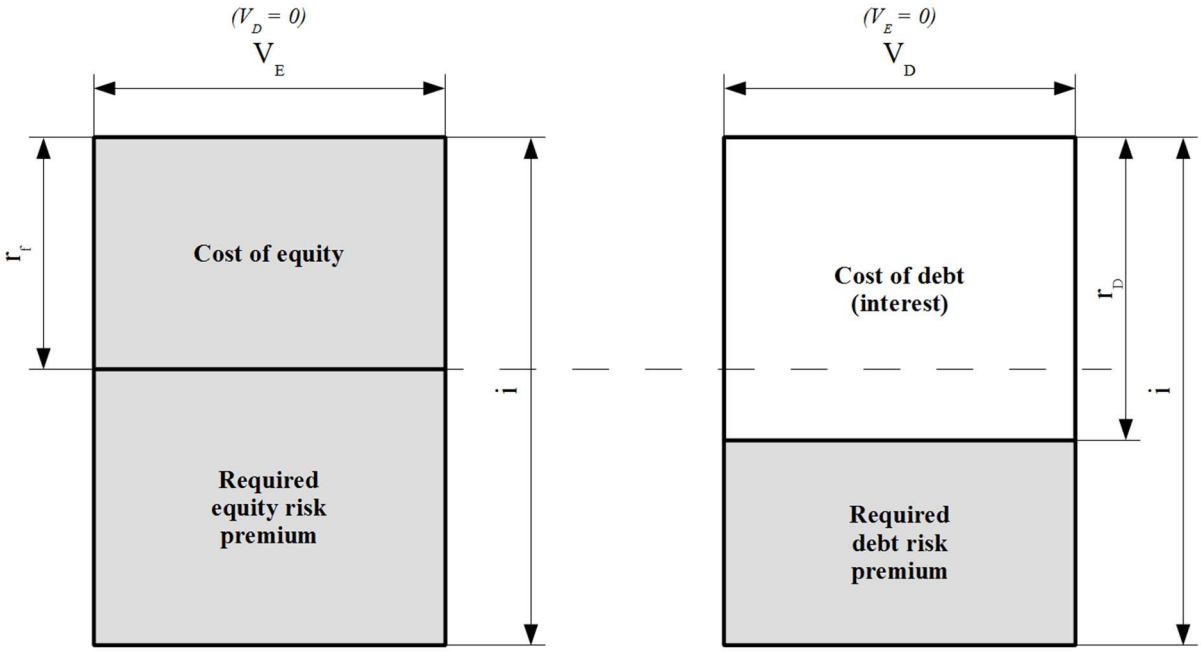
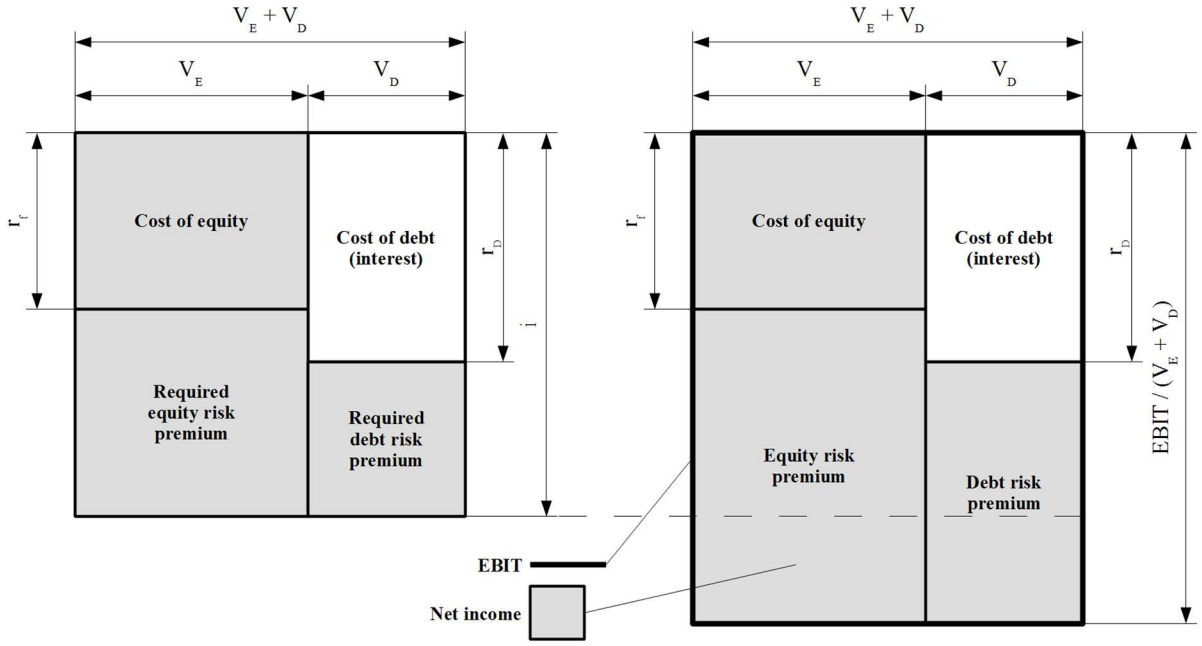


Figure 3: The development of cost of capital in case of equity-based and debt-based enterprises
Source: Own edition

In case of a given amount of total capital, the amount of cost of capital therefore **depends on the capital structure**, i.e. on the ratio of equity and debt. Two companies' net income (determined for one EUR capital) cannot be compared for this reason since it is almost sure that they operate with different capital structures so their cost of capital also differs. Furthermore, this statement also stands for comparing an enterprise's performance over the years since, due to new borrowings and paybacks of loans, the company operates with a different capital structure each year; i.e. **the comparison of net incomes is not possible**.

In the following Figure (4),[4] EBIT means the size of the entire box on the right which is always the same size. The net income is the grey area on the right which can be compared to the cost of capital on the left. However, the size of these grey areas depends on the capital structure.

[4] In order to make all components easy to overview, we first present the correlations through the example of a profitable and economic enterprise.



Cost of debt		$V_D * r_D$	Earnings before interest and taxes	Cost of debt	$V_D * r_D$
cost of capital	Required debt risk premium	$V_D * (i - r_D)$		Debt risk premium	$V_D * (EBIT / (V_E + V_D) - r_D)$
	Cost of equity	$V_E * r_f$		Cost of equity	$V_E * r_f$
	Required equity risk premium	$V_E * (i - r_f)$		Equity risk premium	$V_E * (EBIT / (V_E + V_D) - r_f)$

Figure 4: Earnings before interest and taxes (EBIT) and Net income

Source: Own edition

2.3 Economic profit

This measure shows how well the company did in comparison with the entrepreneur's expectations. **We can speak of economic profitability when the enterprise's net income is greater than the cost of capital.**

economic profit = net income – cost of capital

Positive economic profit is actually the reward for innovation and we can realise it because we are further ahead in the quality of management – this can mean a number of things: in cost management, in marketing, in quality and so on – than our competitors. This additional sum, paired with appropriate investment, can be the base of the innovative advantage of the following years.

Negative economic profit signals the lack of our realised net income in comparison to our expectations.

In Figure 5 we can see a positive economic profit whose realisation exceeded expectations.

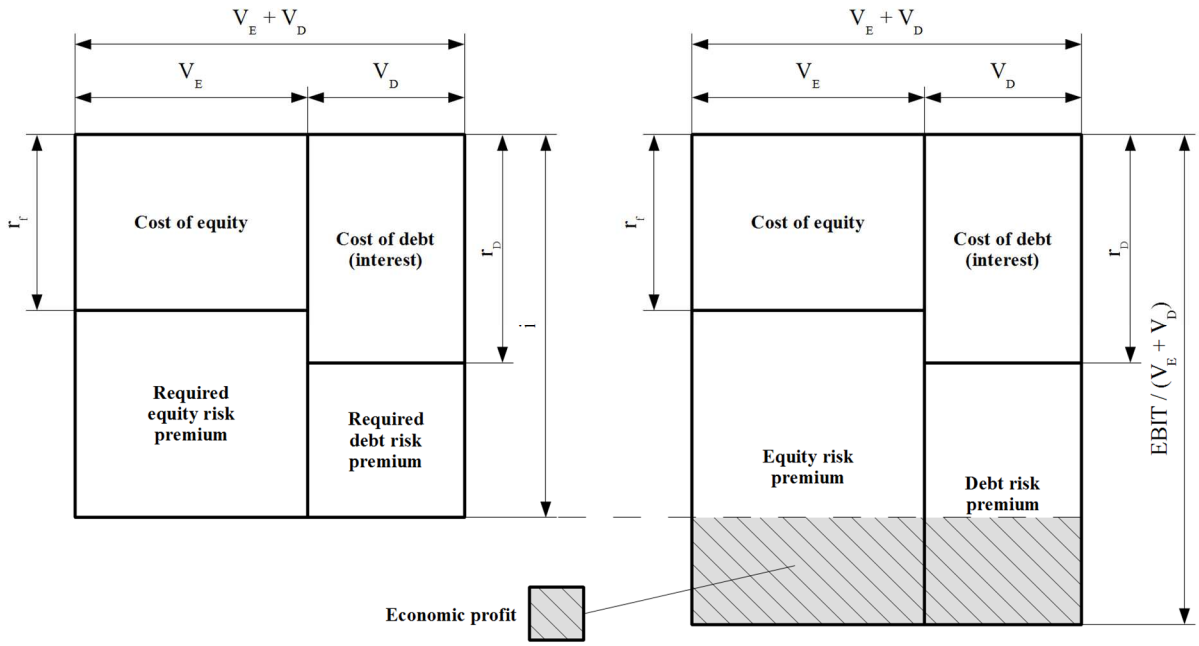


Figure 5: Economic profit
Source: Own edition

From this we can conclude that it can be even calculated the following way:

$$\text{Economic Profit} = \left(\frac{\text{EBIT}}{V_E + V_D} - i\right) * (V_E + V_D)$$

2.4 Market risk premium (MRP)

Market risk premium is the amount of profit generated as consideration for risk (Berk and DeMarzo, 2014). The cost of equity is the part we would receive risk-free if we invested the capital in an available risk-free option (e.g. government bonds) instead of an enterprise. The amount of profit generated above this is the consideration for taking risks (Illés, 1997).

The owner of debt also takes risks with the investment, they are the secondary risk-takers. This means that for lending their capital they also want to realise higher returns than the returns that are available risk-free. This is why the interest rate is higher than the risk-free rate of return ($r_D > r_f$). The additional amount is the market premium of the creditors – for taking risks – which the entrepreneurial activity also has to generate. **Therefore, the market premium will be the sum of the market premiums generated for the entrepreneur (MRP_E, MRP_D) and for the owner of debt (MRP_I).**

$$MRP_I = V_D * (r_D - r_f)$$

$$MRP = MRP_E + MRP_D + MRP_I$$

This is what we can see in the following Figure (6) (the grey area in the right-hand side figure).

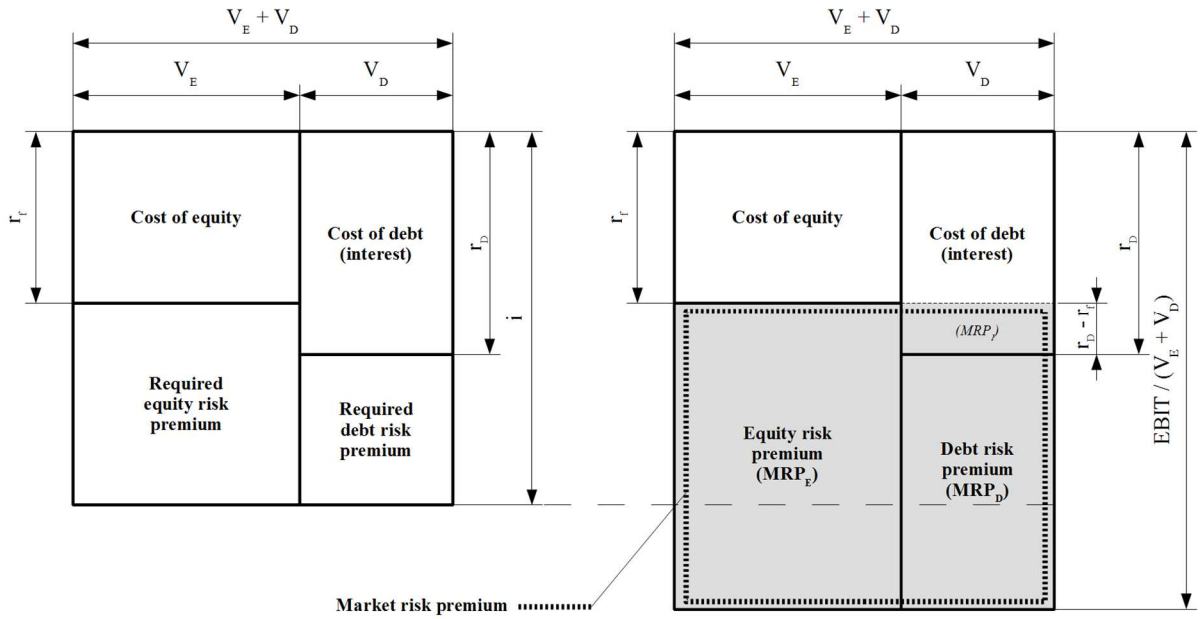


Figure 6: Market risk premium (MRP)
Source: Own edition

As it can be seen from the figure, we can approach market risk premium as the return generated as the consideration for risk by subtracting the risk-free returns [$(V_D + V_E) * r_f$] from the return on total capital (EBIT):

$$MRP = EBIT – (V_D + V_E) * r_f$$

3 Potential scenarios in the comparison of corporate income and cost of capital

Of course not all companies achieve positive economic profit. In the followings let us overview all the possible scenarios:

First scenario [i < EBIT / (V_D + V_E)]

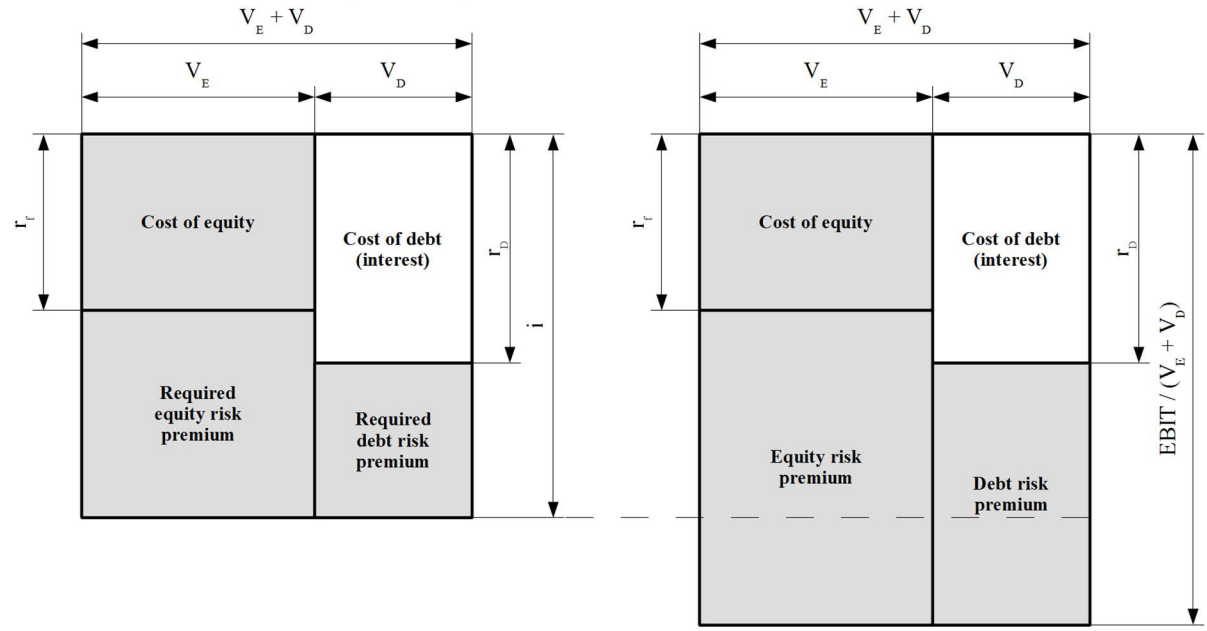


Figure 7: First scenario
Source: Own edition

The first case is the already introduced basic scenario where positive economic profit is generated by the company.

Second scenario [i > EBIT / (V_D + V_E); EBIT / (V_D + V_E) > r_D]

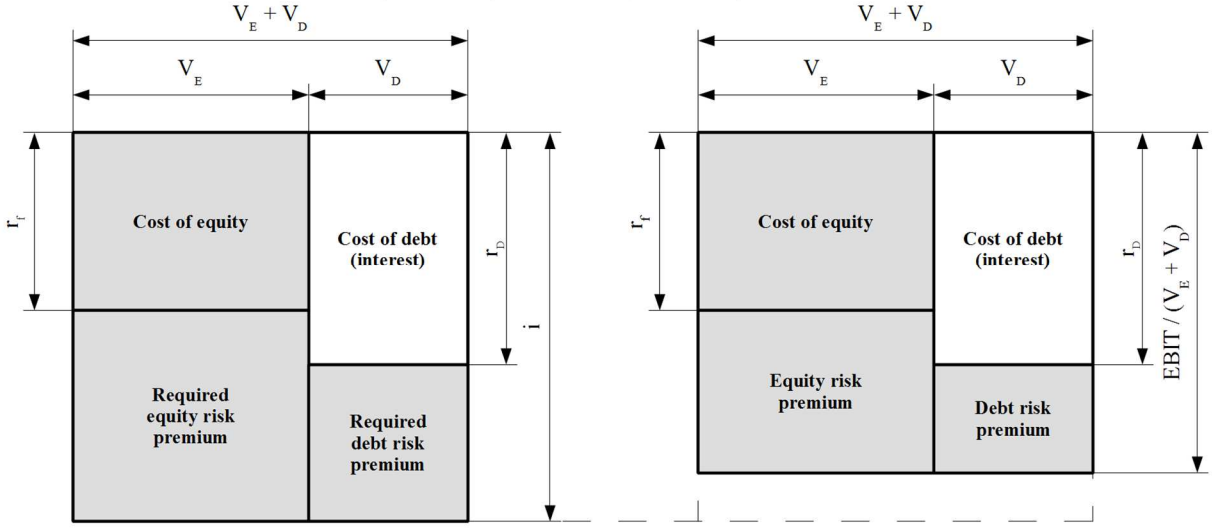


Figure 8: Second scenario
Source: Own edition

In the second scenario, no positive economic profit is generated. Though the company produces more than the risk-free return and the debt also yields enough to cover interest, the realised consideration for risk falls short of the required value (Required equity risk premium > Equity risk premium and Required debt risk premium > Debt risk premium).

Third scenario [i > EBIT / (V_D + V_E); EBIT / (V_D + V_E) < r_D; EBIT / (V_D + V_E) > r_f]

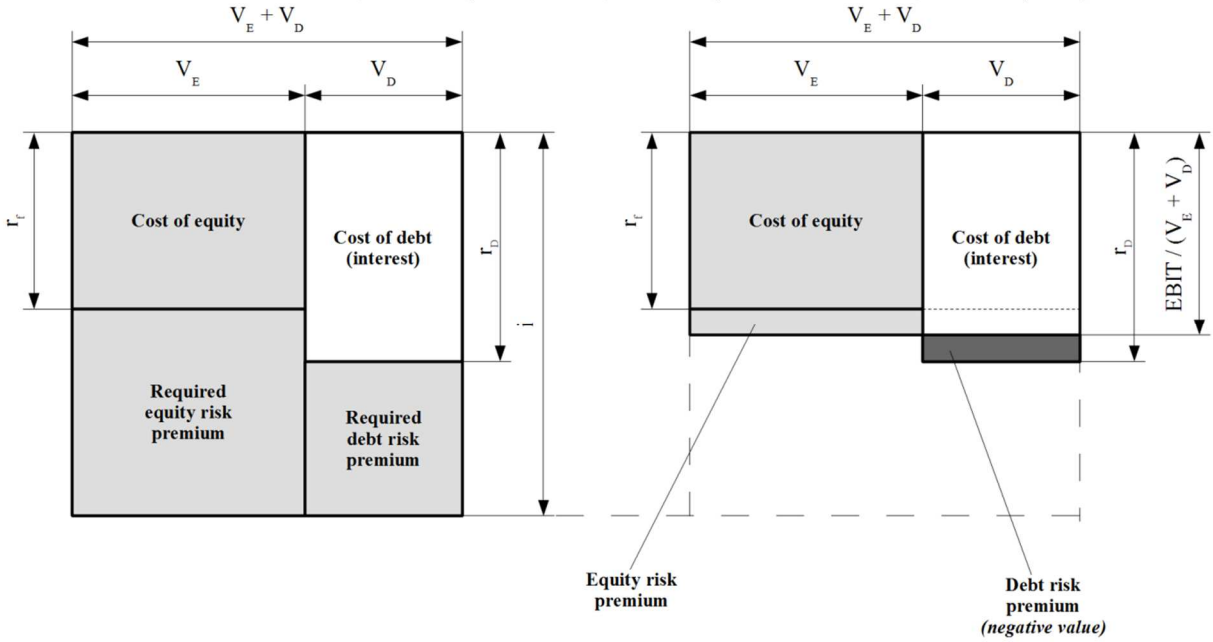


Figure 9: Third scenario
Source: Own edition

In this scenario, the equity risk premium is extremely low but still positive, but the debt risk premium is already negative so the debt could not yield enough to cover its cost

(interest); the leverage was unsuccessful. The interest must be paid nonetheless, its amount does not decrease. The missing part of interest appears as the negative value of market risk premium which must be paid from the cost of eguity.

Fourth scenario [i > EBIT / (V_D + V_E); EBIT / (V_D + V_E) < r_D; EBIT / (V_D + V_E) < r_f]

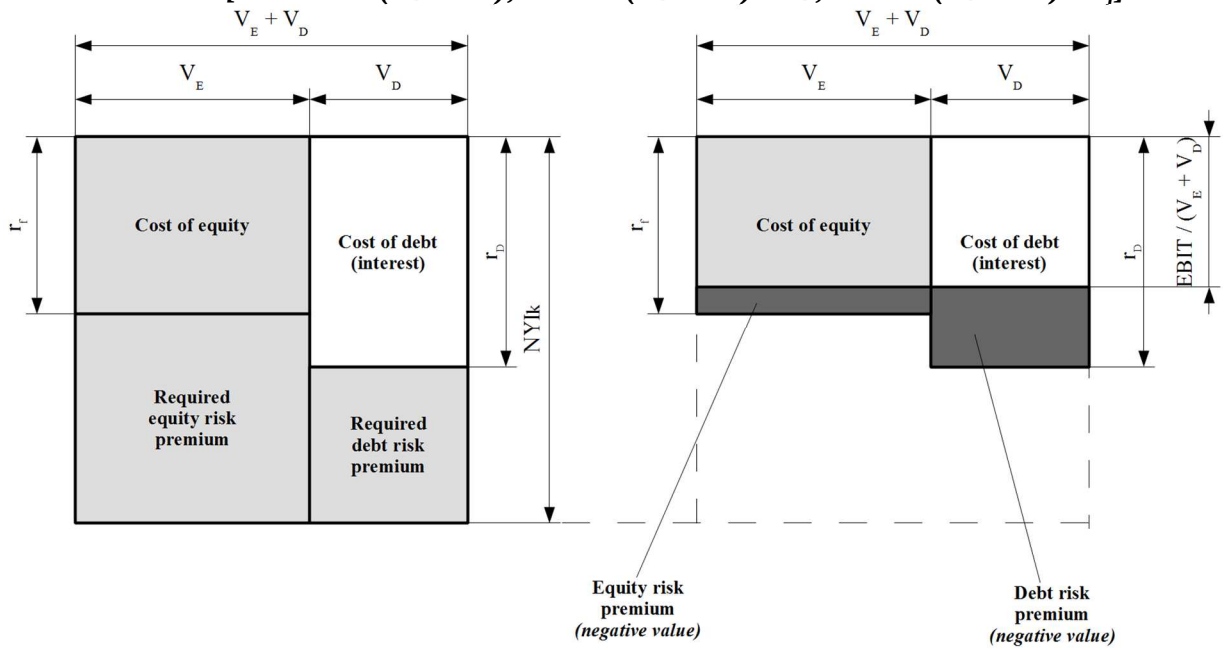


Figure 10: Fourth scenario
Source: Own edition

In the fourth scenario, we could have achieved higher returns if we had put the equity in a risk-free investment than we did by investing it in the enterprise. The quality of our economic activity was distinctly poor since the market risk premium is negative. But are we still profitable in the illustrated case? For the first glance we could say yes since the EBIT / (V_D + V_E) value is still positive, the area of the box shows profits. However, let's not forget that the interest takes the form of cost which means an expenditure that actually has to be paid. The negative value of debt risk premium shows the part that could not be generated out of the interest cost and has to be covered from other sources (from the remaining portion of cost of equity).

Here are the four possible scenarios summarised:

	Equity				Debt			
	Cost of equity		Equity risk premium		Cost of debt		Debt risk premium	
First scenario	+	generated	+	generated	+	generated	+	generated
Second scenario	+	generated	+	not generated	+	generated	+	not generated
Third scenario	+	generated	+	not generated	+	not generated	-	does not exist
Fourth scenario	+	not generated	-	does not exist	+	not generated	-	does not exist

4 Discussion

We pointed out that the risk is determined on the goods market. In terms of the goods market the company's capital structure is indifferent, so **the capital structure should be**

indifferent in terms of taking risks as well. Therefore, we should expect the same rate of return on debts than on equity. The cost of capital should be formulated based on this.

Based on the microeconomic point of view we built our graphical representation framework, that makes the Correlation of Corporate Income Categories and their Relation to Cost of Capital perspicuous through the vizualization of the complex topic. It is utilizable to understand the reasons for the connections behind the income categories, and through that to evaluate the usability of the capital-based profitability indices.

For example in the graphical framework it is visible that using the Return on Equity is not always practical, because the value of the debt risk premium, which is part of the numerator of the indicator, is accounted as the equity's performance. This means that aside from the part that was generated from the net income by the equity, the debt risk premium generated by the debt is part of the numerator, thus if the investment of the debt is successful, in a way that it was successful in investing above the level of the debt interest, then the indicator deforms upwards compared to the real yield of capital because of the leverage. In this case the indicator from companies with same efficiencies shows the one that has more debt to be the more beneficial. In case the investment of the debt is not successful (you couldn't invest above the level of the debt interest), then the indicator deforms in the opposite way. This time the debt risk premium after the debt take a negative value. This means that the debt was unable to produce the cost of the usage (the interest), so the missing pieces has to be covered from a different source. This source is primary the profit generated by the equity. The unsuccessful borrowing trims down the profit generated by the equity. In this case from the two companies, the one that has more debt is have a lower Return on Equity indicator, because the unsuccessful borrowing means a bigger income decrease in retrospect.

Thus, **the indicator is not capable to compare the efficiency of companies**. The structure of the capital is usually different in different business years for a given company, because the companies for example pay off their previous debts constantly, while they can bring in new sources as well. Because of this, the indicator **cannot be used for the comparison of the efficiencies in different business years for a given company**.

The indicator is not suitable to determine the reach of economic profitability, because we cannot construct comparable scale with the indicator. However the profitablity is visible from its value, but this is also easily ascertainable from the net income without calculation.

The properly chosen profitability indices help in the making of the right business decision, through it improving the competitiveness of the company.

Conclusion

In the following Figure (11) we summarised the certain income categories following the example of a profitable and economic enterprise.

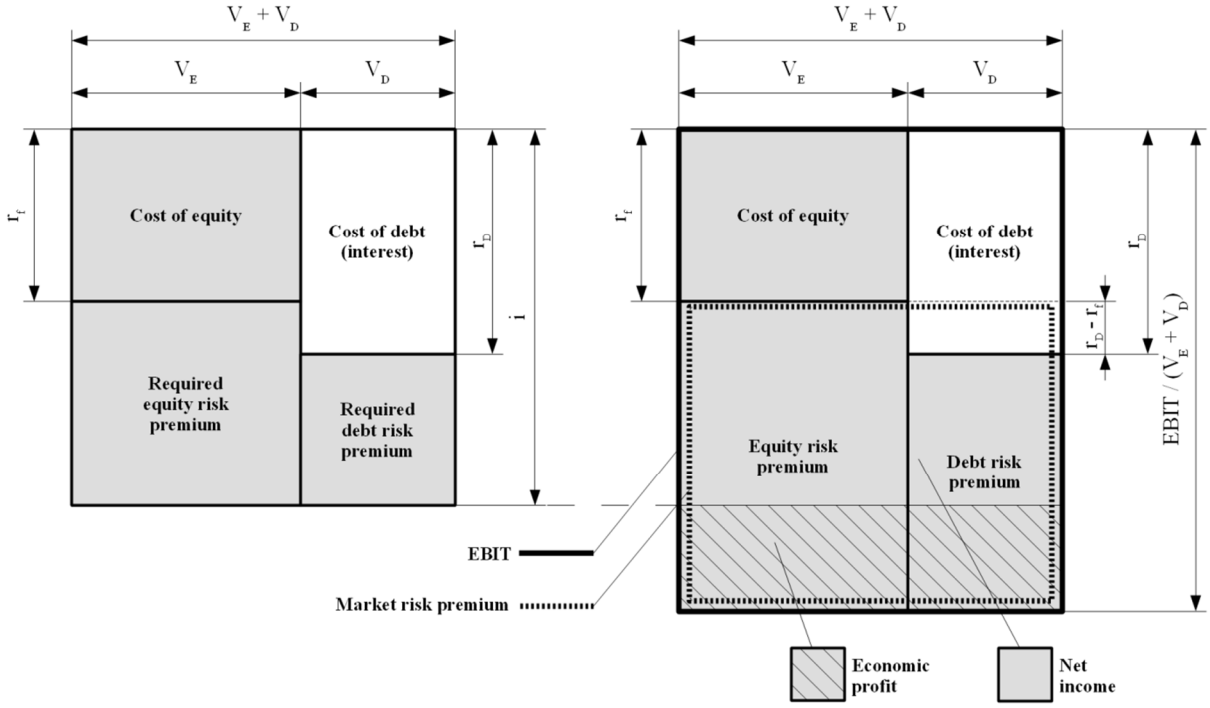


Figure 11: Summary of income categories
Source: Own edition

The graphical representation framework based on the microeconomic point of view, according to the previously expressed discussion, is a good basis for the detailed evaluation of the capital-based profitability indices. The elaboration of this is not among the objectives of this paper.

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SEPTEMBER
DECEMBER

Obsah