COMPLEX MODULAR METHOD OF EVALUATION OF EQUITY CAPITAL AND ITS SOFTWARE SUPPORT

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Abstract

The cost of capital determines how a company can raise money through stock issue, borrowing, or a mix of the two. The cost of equity is determined by investors' expectations. Problems occur when we want to find out how much equity capital actually costs. European way of detecting costs of equity was based on estimates, relying on Anglo-Saxon countries for concepts based on market theories. In the cost survey on equity we must first determine the impact of the value being measured and the discount rate. In the case of market value, it is necessary to rely on the discount rate for capital market data. In the survey the total cost of equity must also take into account the nature of investors. Publicly traded companies have the possibility of diversification, therefore the discount rate includes only systematic risk. In other companies, they don´t have this option, the specific risk is taken into account in addition to systemic risk. The problem with the market valuation is the calculation of the risk premium that must be at least partly by market data. To demonstrate how to calculate and the company's cost of capital, especially the cost of equity, we will use in this article a complex methodological approach based on the modular concept of the authors Garbett and Hill, as well as the M&M model.

Keywords: modular method, risk premium, asset pricing model, equity costs

1 INTRODUCTION

These days are characterized by optimizing business processes – leading to costs lowering. The prosperity of companies in such a highly competitive environment brought in the global market is largely dependent on company´s ability to effectively deal with available funding. (Vagner, 2017)

The financial performance and efficiency of an enterprise are influenced by a whole range of factors with different weights. Some of these factors, considering their significance, are defined as factors of financial decision making while defining the spheres of their business activity and mathematically expressing their relationships with other key economic variables. The company´s capital costs are such a category. Valaskova et al. (2018) focused on management of financial risks in Slovak enterprises.

Irrespective of the approach being applied, an estimate of the equity cost is a complicated problem in the

financial management of an enterprise. The offer of financial theory is limited and also does not provide universal procedures applicable in a variety of conditions of business entities. The most common problem in choosing methods of estimating equity costs and their practical application is the absence of necessary data, inability to calculate some key items in the calculations (estimate of dividend growth rate, estimation of beta coefficients, statement of risk premium ...).

In view of the underdeveloped stock market in the SR, it is hard to make a calculation for estimating the beta coefficient, thus the calculation of equity cost using the CAPM (Capital Asset Pricing Model) is still unrealistic. It is also problematic to forecast profits and estimate the rate of dividend growth which is used by dividend models.

Understanding the equity costs is important in many areas. They are necessary for investments in private equity and a better methods for determining cost of capital might lead to a grow in PE investments because Slovakia is lagging behind. (Popp et al., 2018). Cost of equity is also important for determining financial status of a company. Kovacova et al. (2018) focused on bankruptcy models.

Other proposed researches on this topic are Rybicka et al. (2018), Bolton et al. (2018), Fielden et al. (2018), Lehutova et al. (2013)

1.1 Determination of Equity Costs

Capital costs reflect the cost of capital used to finance business´ needs. At the same time, it is in the interest of the owners that these costs exceed a certain amount. They represent a level of profitability when they do not reduce their value. The WACC's impact (weighted average cost of capital, weighted quantity and percentage) are commonly expressed. Since the cost of capital is an important part of calculating the value of a business, it is necessary to calculate them correctly, which is possible through basic several methods: Capital Asset Valuation Model (CAPM), Arbitration Valuation Model (APM), modular model.

The modular model was created by the Ministry of Industry and Trade of the Czech Republic for small and medium-sized enterprises in the Czech Republic, taking into account certain specificities of the Czech economy. In general, CAPM and APM models are not used in economies with imperfect capital market economy and a short period of functioning of the market economy (Dluhosova, et al. 2010).

2 METHODOLOGY

The starting point for enterprises, that do not act actively on the capital market, or do not have the data needed to carry out the calculations, are approaches based on a diametrically different principle when compared to the capital asset pricing models and dividend models. Financial theory and practice recognize them as modular methods, considering the principle of quantification of the equity cost that they apply. A common element of these methods and models of valuation of capital assets is the risk-free return, which forms the basis for calculating the capital cost in either case.

A specific feature of modular models in general is that the risk premium is created as a sum of risk margins depending on the risk of the rated entity. The literature provides various modifications of modular models with different numbers of risk premium components, which only confirms the flexibility of this method in relation to the accepted risk and its structure (Kislingerova, 2004; Neumaierova & Neumaier, 2002; Pavelkova, 2000).

The formalized form of equity cost is as follows:

$$C_{ec} = r_f + r_1 + r_2 + \ldots + r_n \quad (1)$$

Where:

C_{ec} = cost of equity capital in %

r_f = risk-free rate of return in %

$r_{1,} \ldots r_n$ = components of the risk premium in %

The biggest precedence of these models is the fact that they accept not only systematic risks but also specific risks, which makes it possible to more objectively determine the cost of capital under the different conditions of the particular enterprise compared to other estimation procedures.

The particular form of the relationship (1) depends on the choice of the criteria for determining r_f = risk-free rate of return in %, the risk margins, i.e.it depends on the identification of significant risk factors. One of the methods of calculating the risk premium is based on a comparison of the calculated values of the decisive

indicators of the company's activity (the selection is based on the groups of indicators, with at least one selected in each group being the highest in the hierarchy of the group) with the chosen criterial value, thus an interval of values, e.g. for an economic sector. We can find such a technique, for example, in the INFA model by Neumaiers.

For some models, the rating is based on expert appreciation, taking into account not only the quantitative characteristics but also a number of qualitative factors which are quantified through a chosen evaluation scale. The algorithm for determining the final rating of equity costs, therefore, is based on a qualified and sufficiently detailed financial analysis as well as a fundamental analysis. This is an approach that is applied in the complex modular method of Garnett & Hill Company, and also in the method coming out of it by Marik & Marikova.

2.1 Complex Modular Method and its Software Solution:

In business practice, the calculation of capital costs is a partial problem in the more complex, multi-layered role of financial management. For complex tasks, there are more demanding program products (in terms of procedures used and costs incurred), by means of which it is possible not only to quantify the cost of capital and to transform financial decisions into the resulting financial position through applying different methodological procedures to ensure higher objectivity of the results, but also simulate changes of individual assumptions at different levels of problem solving. This software category also includes the EVALENT program for determining the market value of the enterprise[1].

Part of its modular structure is a module for calculating Weighted Average Cost of Capital (WACC). The methodology for calculating the cost of equity consists of several pricing models in EVALENT with varying degrees of difficulty: a user has a dividend model, several versions of the asset valuation model, and modular models, or a user can use his own timeline of these costs.

Modular model group is created by the INFA model representing the approach of the Ministry of Industry and Trade of the Czech Republic and two versions of the complex modular method (CMM I. and CMM II.).

2.2 Common Elements of CMM I. and CMM II.

A common element of both versions of a complex modular method is the calculation of the risk premium on the basis of a number of factors that in their summary characterize the degree of the risk of the business of the rated enterprise. Each factor is assigned a rating according to the four-step scale: grade 1 (low risk), grade 2 (reasonable risk), grade 3 (increased risk), and grade 4 (high risk). The overall risk is quantified as the weighted arithmetic average of the individual risk factors (the degree of overall risk therefore also ranges from 1 to 4).

Another common feature is the way in which the overall risk of the rated entity is transformed into a risk premium. This transfer is based on the risk-free rate of return. If the business activity was totally risk-free (overall risk level 0), the risk premium would be equal to zero (the risk premium is in this case zero to the risk-free yield rate). If the rated entity's risk is rated as the highest (overall risk level 4), then the risk premium is a multiple of the risk-free yield rate (different from zero). This variable can be selected by the user himself; by default, a value of 3 is entered into the system, the risk premium is three times the risk-free rate.

A modified exponential function a^x, where x is the degree of overall risk, is used to transform the degree of total risk from interval <1,4>; the size of parameter a, the basis of exponential function, is derived from the above assumptions: for a zero risk enterprise, $a^0 = 1$, which can be expressed in the form $a^0 - 1 = 0$. Since in this case the risk premium is zero by the risk-free rate r0, we can state it in this form $(a^0 - 1)$. For the highest risk level 4, then $a^4 - 1 = 3$ (assuming that the risk premium is three times r0) will apply. The basis of the exponential function is calculated from the relation $a^4 = 4$, a = 1,414. We calculate 4 as a multiple of the risk-free rate of return and we calculate “a” from the relation $a^4 - 1 = 4$, i.e. $a^4 = 5$, a = 1.495. In general, the size of the risk premium can be expressed in relation to the degree of risk of an enterprise:

$$RP = (a^x - 1).r_0 \quad (2)$$

Where:

RP = risk premium in %

a = constant

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x = the total risk (degree of risk) of a rated entity

r_0 = risk-free rate of return in%

For costs of equity capital $C_{ec,}$ it is valid:

$$C_{ec} = r_0 + RP \quad (3)$$

These mathematical relationships are illustrated by the example (Table 1). The columns of the table contain the risk premium values expressed as a multiple of the risk-free rate of yield, the absolute risk premium (%) and the equity costs (%) under assumption that for the highest degree of risk, parameters 3 (variant A) and 4 (variant B) are set.

Table 1: Dependence of the risk premium on the degree of risk of the enterprise

Risk degree	**A** (a = 1,414)			**B** (a = 1,495)		
	RPn	RP (%)	C_{ec} (%)	RPn	RP (%)	C_{ec} (%)
0	0	0	6,5	0	0	6,5
1	0,414	2,69	9,19	0,495	3,22	9,72
2	1,0	6,5	13,0	1,235	8,03	14,53
3	1,828	11,88	18,38	2,341	15,22	21,72
4	3,0	19,5	26,0	4,0	26,0	32,5

Source: processed by the authors

Explanatory notes:

RPn = a risk premium expressed as a multiple of the risk-free rate of yield; [RPn = (ax - 1) where x = 1,2,3,4]

RP = a risk premium

C_{ec} = cost of equity capital in %

In order to determine the contributions of individual risk factors or their groups to the risk premium of the valued entity, the program calculates them on the basis of the mathematical relationship (2) in both versions of the complex modular method. If we consider all the risk factors to be equally significant, i.e. having the same weight, then we calculate the contribution of the i-th factor:

$$RP_i = \frac{\left(a^{xi} - 1\right) \cdot r_0}{n} \quad (4)$$ Where:

RPi = the contribution of the i-th risk factor to the risk premium in%

x_i = risk assessment of the i-th risk factor

n = number of risk factors

r_0 = risk-free rate of return in%

If the risk factors are not equally significant, it is necessary to determine their differential weights (more precisely, Calculate the Risk Premium). As long as risk factors are grouped, the contribution of each group to the risk premium will be determined as the sum of the contributions of all the factors constituting it, calculated according to the relationship (4). The risk premium of the rated entity is then calculated either as the sum of the contributions of all risk factors or the sum of the contributions of the different groups of risk factors.

2.3 Risk Factors of CMM I. and CMM II.

Complex modular method I. determines the company's risk on the basis of a set of 32 risk factors, which are divided into two groups: business risk and financial risk factors. The group of business risk factors consists of six subgroups of factors: 1. Risks at the level of the business department (4 factors), 2. Risks at the market level (3 factors), 3. Risks from competition (7 factors), 4. Risks of management (3 factors), 5. Production process risks (4 factors), 6. Specific factors for profit margins (4 factors). In addition, the user has the option of extending each subgroup of factors by one defined risk factor (additional risk factor). The group of financial risk factors contains a total of 7 risk factors. As in the case of business risk, the user can extend the group by one additional risk factor.

The second version of the method works with the original set of 36 risk factors designed by Garnett & Hill Company. Two core groups of factors are: a group of business risk factors and a group of financial risk factors. Business risk is represented by subgroups of factors: 1. Market risks (12 factors), 2. Production risks (6 factors), 3. Risks of the business division (4 factors), 4. Risks of management (6 factors), i.e. together 28 factors. Financial risks are represented by eight risk factors. In this case, the user has the option of adding one additional risk factor to each group.

The costs of equity capital are determined as the sum of the risk-free rate of return and the risk premium. The risk premium found reflects both the systemic and the specific risk and therefore it is not necessary to increase it by a specific risk premium, like by CAPM models.

3 RESULTS

As we have already mentioned, in order to determine the risk premium, the user has to rate each risk factor by a degree, one of the values from 1 to 4.

The next step is to assign weight to risk factors. This approach is based on the assumption that the user assigns the business risk and the financial risk ratio (default value is 4, i.e. 4:1 is the ratio of business and financial risk to the user, which can be edited by the user). If the weight of each business risk factor is equal to 1, it means that in the number of 25 business and 7 financial risk factors, the total weight of the business risk will be 25 and the total weight of the financial risk will be 25/4, i.e. 6,25. Because the financial risk group has 7 factors, the weight of each of these factors will be 6,25/7, i.e. 0,893. Entering the weight ratio of a group of business and financial risk factors means that this ratio does not change even when the number of factors in these groups changes. If, in their 4:1 mutual relationship, the user adds to each group an additional risk factor, the total weight of the business risk will be 26 and the total weight of the financial risk will be 26/4, i.e. 6,5.

Considering the differentiated weights of business and financial risk factors, the relationship (4) needs to be adjusted to calculate the contribution of each risk factor to the risk premium. Starting from 4:1, we determine the contributions of the various business risk factors according to the relationship:

$$RPP_i = \frac{(a^{xi}-1)\cdot r_0}{p+0{,}893\cdot f} \quad (5)$$

Where:

RPP_i = contribution of the i-th factor of the entrepreneurial risk to the risk premium in %

p = number of business risk factors

f = number of financial risk factors

In order to calculate the contributions of the individual financial risk factors, we use following mathematical relation:

$$RPF_i = \frac{(a^{xi}-1)\cdot r_0\cdot 0{,}893}{p+0{,}893\cdot f} \quad (6)$$

We will illustrate this again with the example in Table 1. First we calculate the contribution of the individual risk factors for the first group of business risk. This group presents the risks at union level using 4 risk factors. Assume that the value rated the first risk factor x1 by degree 1 (low risk), the second and third factor - x2 and x3 –by grade 3 (increased risk) and the risk factor x4 by level 2 (reasonable risk).If we consider all the factors of business and financial risk to be equally significant, we calculate the contributions of factors x1 to x4 (by relationship (4)) as follows:

$$RP_1 = \frac{(1{,}414^1-1)\cdot 6{,}5}{32} = \frac{2{,}691}{32} = 0{,}084\ (\%) \quad \ldots\ x_1$$

$$RP_{2,3} = \frac{(1{,}414^3-1)\cdot 6{,}5}{32} = \frac{11{,}876}{32} = 0{,}371\ (\%) \quad \ldots\ x_2, x_3$$

$$RP_4 = \frac{(1{,}414^2-1)\cdot 6{,}5}{32} = \frac{6{,}5}{32} = 0{,}203\ (\%) \quad \ldots\ x_4$$

The total contribution of a given group of risk factors (risk at union level) is then 0,084 + 2 · 0,371 + 0,203 = 1,029 (%).

Assuming a business and financial risk weight ratio of 4: 1, the contributions of risk factors of business risk (Group 1, union level risks) will be calculated according to the relationship (5) as follows:

$$RPP_1 = \frac{\left(1{,}414^{1} - 1\right) \cdot 6{,}5}{25 + 0{,}893 \cdot 7} = \frac{2{,}691}{31{,}251} = 0{,}086\ (\%) \quad \ldots\ x_1$$

$$RPP_{2,3} = \frac{\left(1{,}414^{3} - 1\right) \cdot 6{,}5}{25 + 0{,}893 \cdot 7} = \frac{11{,}876}{31{,}251} = 0{,}380\ (\%) \quad \ldots\ x_2, x_3$$

$$RPP_4 = \frac{\left(1{,}414^{2} - 1\right) \cdot 6{,}5}{25 + 0{,}893 \cdot 7} = \frac{6{,}496}{31{,}251} = 0{,}208\ (\%) \quad \ldots\ x_4$$

The total contribution of a given group of risk factors is: 0,086 + 2 · 0,380 + 0,208 = 1,054 (%).

CONCLUSION

The methodology for determining the cost of equity capital is quite diverse. The disqualifying factor in our conditions is the high interconnectedness of known (and in the developed economies commonly used) methodical procedures with information on the underdeveloped capital market. Determination of the cost of equity for the purposes of measuring the performance of the company (especially the so-called modern methods) is not an easy task in today's corporate management practice. In comparison with determining the cost of foreign capital, the determination of the cost of in-house capital seems to be sometimes more than an impossible task. Use of market models to determine capital costs is to a large extent prevented by the underdevelopment of the Slovak capital market.

Therefore, the absence of data is the main application problem of these methods. Another category of problems is the failure to respect the specific conditions of an enterprise given by its own individuality as a business entity, but also by the particularities of the business department and the sectoral framework for which a certain level of risk is typical. Only a small set of models is a category of universal practices applicable regardless of the specific risk of the business. However, these are mostly methods of quantifying the cost of liabilities, or methods intended only for a rough, indicative estimate of the equity.

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