Cost of Construction Enterprises' Capital in the Context of Economic Development

Vojtech Stehel
Institute of Technology & Business in Ceske Budejovice
Ceske Budejovice, Czech Republic
stehel@mail.vstecb.cz

Radimír Novotný
Institute of Technology & Business in Ceske Budejovice
Ceske Budejovice, Czech Republic
novotny@mail.vstecb.cz

Abstract—Each enterprise has sources of asset financing. Sources may be own or alien. Both categories of liabilities bear some costs. In the case of foreign sources, the cost is mainly the interest for which we borrow. Costs in the case of own resources represent alternative lost profits. The amount of capital costs and their structure affect the amount of real economic profit. The article analyzes the cost of liabilities for construction enterprises in the context of the development of the Czech economy and further analyzes the performance of these enterprises compared to other sectors. The data for the analysis will be based on the statistical survey of the Czech Statistical Office in the years 2011 to 2018. An analysis of the construction sector has been carried out showing that the cost of capital is slightly higher than the average of the rest of the industry. However, the sector performance is significantly lower.

Keywords—WACC, construction, liabilities’ costs, development of the economy

I. INTRODUCTION

The construction sector is very important for the Czech Republic [1]. The development of individual businesses in a given sector is given by a number of parameters [2]. Among these parameters, the amount of liabilities available and the source of its funding play a significant role. The amount of capital is influenced by its costs [3], [4]. Capital costs are associated with the sector and the market [5]. If the market in which the company is at risk, there is a great risk that market failure will affect the functioning of the company, regardless of its quality [6]. Beside the risk, the alternative use of capital also affects the amount of cost of capital [4]. If there are opportunities that are more profitable with a lower risk, the outflow of capital will lead to more lucrative opportunities. This will result in a change in the capital structure. The goals of the contribution is analyze the cost of capital for construction enterprises in the context of the development of the Czech economy.

There are several approaches to evaluating business performance [7]. There are also several approaches to calculating the cost of equity [6], [8], [5]. The first is the CAPM. The CAPM method is nowadays one of the most commonly used methods as in Mařík [4] for estimating the cost of equity, and it is no wonder that this term is processed in most literary sources that are related to the valuation of the enterprise. The calculation is as follows:

\[ r_e = r_f + B \cdot E(R_m - r_f) \]  

Where  
- \( r_e \) … equity costs  
- \( r_f \) … risk-free rate of return  
- \( \beta \) ... systematic risk  
- \( E(R_m - r_f) \) ... risk premium

It is then possible to calculate the weighted average cost of capital as:

\[ WACC = \frac{D}{C} \cdot r_d \cdot (1-t) + \frac{E}{C} \cdot r_e \]  

where  
- \( r_e \) – cost of equity  
- \( r_d \) – cost of foreign capital  
- \( E \) – the volume of equity  
- \( D \) – volume of foreign capital  
- \( (1-t) \) – tax shield

The CAPM model is described as the average expected return on a security that depends on the risk-free interest rate, the market risk premium, and the beta factor. The market risk premium is understood as the difference between the expected return on the security and the risk-free rate. The result of this formula is used as the cost of equity. Kislingerová [9] also states the assumptions that rely on the same expectations of all investors. When applying the model, it is necessary to know the parameters on which the model is based. It is the risk-free rate of return measure, the value of the systematic market risk of the security and the market risk premium.

Mařík [8] addresses the issue more deeply, focusing on the essential things that relate to the estimate of the cost of equity. It outlines the relationship between the factors dealt with by the equity line, which is also an important element of the CAPM. In addition, they present procedures or issues that are related to factors. An example may be a market risk premium, where possible problems such as period length, arithmetic or goniometric mean are deduced. CAPM can be used as a basis for calculating the discount rate.

According to Mařík et al. [10] The academics have reservations about the CAPM, which can be summed up into two points. The first one indicates that the model has a lot of strict conditions that cannot be met in practice, and secondly testing the model with relatively inconsistent results cannot be considered as a satisfactory confirmation of its good functioning. Finally, the CAPM single-factor model was extended to a three-factor model, supplemented by a company-size factor and a financial risk factor that takes the form of an accounting and market relationship.
The article by Zhi Da, Re-Jin Guo, and Ravi Jagannathan [11], based on Dybvig and Ingersoll [12], shows that the real ability of a firm to change and cancel established projects and implement new projects could be an important reason why CAPM is wrong is working on explaining the cross-section of revenue from size and market-focused stock portfolios. Another alternative to calculating the cost of equity is the modular method [10]. Cost calculation is as follows:

\[
WACC = \frac{r_f + \frac{r_d}{D} + r_{\text{business}} + r_{\text{FinStab}}}{A} \tag{3}
\]

Where \(A\) represents total assets (i.e., balance sheet total), \(E\) is nominal capital, \(D\) long-term bank loans (or bonds), \(r_d\) expense of (interest) long-term bank loans. The weighted average cost of capital (WACC) represents total assets (i.e., balance sheet total), and \(D\) long-term bank loans (or bonds), \(r_d\) expense of (interest) long-term bank loans. The weighted average cost of capital is then calculated as:

\[
WACC = \frac{r_f + r_{\text{LA}} + r_{\text{business}} + r_{\text{FinStab}}}{A}
\]

Where \(r_{\text{business}}\) indicator function characterizing creation of productive forces, \(r_{\text{FinStab}}\) indicator function characterizing the relationship between assets and liabilities. \(r_f\) risk-free yield determined at the level of the interest rate on government bonds.

Determining the cost of equity is appropriate for a smaller economy as it takes some of its specifics better than the CAPM method. For these reasons, the model is often used in business valuation [10].

II. METHODOLOGY

The data for the analysis will be based on the statistical survey of the Czech Statistical Office in the years 2011 to 2018. Specifically, the reports P 3-04, where enterprises of 0-19, 20-49 and over 50 employees are monitored. It is also a report P 6-04, which tracks flow indicators regardless of the number of employees. These reports are further aggregated and used by the Ministry of Industry and Trade to conduct a quarterly financial analysis of the corporate sector in industry (Financial Analysis of the Business Sector for 2018).

Statement P 3-04 is assigned by the Czech Statistical Office in accordance with Decree No. 239/2014 Coll., Which is in accordance with Regulation (EU) No 549/2013 of the European Parliament and of the Council of 21 May 2013 on the European system of national and regional accounts in the European Union. The selected economic entities report is filled 4 times a year and the subject of the findings is Labor Indicators - numbers of employees and their wages, the number of persons seconded to the labor agency. Financial flow indicators in statistical breakdown - revenues, costs and value added. Additions and decreases of intangible fixed assets and tangible assets and sales revenue. The number of cars and trucks and the number of kilometers traveled by these vehicles. The enterprises will be analyzed according to CZ NACE sections, namely they will be category F construction. When comparing individual indicators, the average of other sectors will be used. An example of the input tables is given in Table 1.

| Indicator | Name | Construction | Average of other non-financial branches | Spread |
|-----------|------|--------------|----------------------------------------|--------|
| Liquidity L1 | 1.Pol.11 | 0.28 | 0.48 | 0.12 |
| Liquidity L1 | 1.3.Q.11 | 0.28 | 0.51 | 0.13 |
| Liquidity L1 | 1.4.Q.11 | 0.45 | 0.54 | 0.17 |
| Liquidity L1 | 1.Q.12 | 0.45 | 0.53 | 0.15 |
| Liquidity L1 | 1.Pol.12 | 0.32 | 0.53 | 0.12 |
| Liquidity L1 | 1.3.Q.12 | 0.29 | 0.50 | 0.07 |
| Liquidity L1 | 1.4.Q.12 | 0.39 | 0.56 | 0.13 |
| Liquidity L1 | 1.Q.13 | 0.31 | 0.54 | 0.15 |
| Liquidity L1 | 1.HY.13 | 0.26 | 0.54 | 0.15 |
| Liquidity L1 | 1.3.Q.13 | 0.26 | 0.57 | 0.19 |
| Liquidity L1 | 1.4.Q.13 | 0.39 | 0.56 | 0.13 |
| rPOD | 1.Q.11 | 5.83% | 4.29% | 2.56% |
| rPOD | 1.Pol.11 | 4.76% | 3.93% | 1.46% |
| rPOD | 1.3.Q.11 | 4.93% | 3.70% | 1.55% |
| rPOD | 1.4.Q.11 | 3.76% | 3.57% | 0.55% |
| rPOD | 1.Q.12 | 5.71% | 4.06% | 2.42% |
| rPOD | 1.Pol.12 | 4.46% | 4.16% | 1.03% |
| rPOD | 1.3.Q.12 | 3.95% | 4.06% | 0.40% |
| rPOD | 1.4.Q.12 | 4.02% | 4.06% | 0.54% |
| rPOD | 1.Q.13 | 6.64% | 4.49% | 3.09% |
| rPOD | 1.Pol.13 | 4.95% | 4.10% | 1.52% |
| rPOD | 1.3.Q.13 | 5.17% | 3.92% | 1.91% |
| rPOD | 1.4.Q.13 | 5.43% | 3.86% | 2.34% |
| rPOD | 1.Q.14 | 5.92% | 4.05% | 2.90% |
| rPOD | 1.Pol.14 | 4.88% | 3.85% | 1.89% |
| rPOD | 1.3.Q.14 | 4.43% | 4.03% | 1.08% |
| rPOD | 1.4.Q.14 | 4.10% | 3.87% | 1.06% |

Source: Financial Analysis of the Business Sphere for 2011-2018

The average will be calculated based on the formula. The standard deviation will be calculated based on the formula:

\[
\sigma = \sqrt{\frac{\sum(x - \bar{x})^2}{n}} \tag{4}
\]

In addition to the WACC calculation, the construction sector will be compared to the liquidity to be calculated.

\[
L = \frac{\text{Current assets}}{\text{Current liabilities}} \tag{5}
\]

In addition, the return on equity will be calculated according to the formula:

\[
ROE = \frac{\text{Net profit}}{\text{Equity}} \tag{6}
\]

Work value added of one worker will also be analyzed.
III. OUTPUTS

The picture below shows a comparison of the L3 liquidity of the construction sector with other non-financial sectors.

Fig. 1. Liquidity. (source: own data creation [13])

Fig. 1 shows that the construction sector retains higher liquidity, which may be due to several factors. These may include a longer maturity and a higher material cost than is the case for other sectors on average. Higher liquidity is maintained throughout the reporting period.

The risk associated with financial stability is shown in the following Fig. 2. Here the construction sector is almost always below the average of other non-financial sectors. An exception is only part of 2015.

Fig. 2. R – financial stability. (source: own data creation [13])

Business risk is analyzed in the Fig. 3, which shows that the risk of the construction sector is almost all the time higher than in the construction sector. This does not apply at the end of the reporting period. This can be explained by the utilization of available capacities, which at the end of the monitored period are at 95% (Construction Sector Analysis 2018). Also interesting is the view of the regularly increasing risk at the beginning of the year. This is related to the seasonality of the field.

Fig. 3. Business risk. (source: own data creation [13])

The risk associated with financial stability is illustrated in the following Fig. 4. In this case, the construction sector is more at risk throughout the period under review than the average of the remaining branches. However, the difference is relatively small in terms of the nominal level of overall risk.

Fig. 4. Financial stability. (source: own data creation [13])

Using the risk analysis we can calculate the average weighted cost of capital using the modular method. These are calculated in the Fig. 5. This figure shows that capital costs have been declining for a long time. This is due to the overall development of the economy. The construction sector is
developing in line with the average of other industries. For most of the period, however, it slightly exceeds it. However, slightly higher capital costs should not cause major problems in the industry, as other major factors determine the success of companies.

Performance for owners can be evaluated using the ROE. This analysis is shown in the following Fig. 6 over the reference period. It is clear from the chart that the construction sector has been in the long run lower. In both cases, the result was even negative. Higher values than the industry average reached the construction sector only at the beginning of the reference period. The chart shows not only the average for another industry but also the standard deviation that shows that the variability of the file is not too high.

![Fig. 6. Return on equity. (source: own data creation [13])](image)

For completeness, we report the performance of the construction sector in terms of value added per worker (Fig. 7). Here, it is obvious that the construction industry lags far behind the average of the remaining sectors. However, such a big difference is mainly due to the averaging of other sectors. The distortion of the average is mainly caused by the energy sector, where we are moving between 5 and 6 million CZK/person. IT services also have a great performance. Conversely, sectors like transport are almost always a little worse than the construction sector. However, it remains a question about influence of implementation BIM processes in Czech legislation [14]/[18].

![Fig. 7. The performance of the construction sector in terms of value added per worker. (source: own data creation [13])](image)

IV. CONCLUSION

An analysis of the construction sector has been carried out showing that the cost of capital is slightly higher than the average of the rest of the industry. However, the sector performance is significantly lower. The analyses performed were compared with the rest of the industrial enterprises in the Czech Republic and categorized according to CZ NACE. This has led to an assessment of the overall performance of the sector and a critical assessment of the results achieved. Further possible directions of follow-up studies have been suggested. The study can serve as benchmarking for companies and potential investors.

LIMITS OF THE STUDY

Due to the scope of the article, the thesis does not address further possible sectoral performance analyzes, such as economic added value. An analysis of these indicators that better assess performance in the context of risk can be the subject of follow-up studies.

REFERENCES

[1] CEEC Research, (January, 2019). Kvartální analýza českého stavebnictví Q4/2018. Available: http://www.ceeec.eu/research/ [online]. Available:

[2] J. Berk and P. DeMarzo, Corporate Finance (2nd ed.). Harlow: Pearson, 2011.

[3] S. Chen and J. Dodd, “Economic Value Added (EVA™): An Empirical Examination Of A New Corporate Performance Measure,” Journal of Managerial Issues, vol. 9, no. 3, pp. 318-333, 1997.

[4] R. A. Brealey, S. C. Myers and F. Allen, Principles of corporate finance (11th ed.). New York: McGraw-Hill Irwin, 2013.

[5] E. Kiselingerová, Manažerské finance (Managerial Finance). Second revised and expanded edition. Prague: C. H. Beck, 2007.

[6] M. Malík, Metody oceňování podniku: proces ocenění - základní metody a postupy. 3. upr. a rozšíř. vyd. Praha: Ekopress, 2011.

[7] A.W. Stark, “Estimating economic performance from accounting data—A review and a synthesis,” The British Accounting Review, vol. 36, no. 4, pp. 321–343, 2004.

[8] E. Kiselingerová, Ocenování podniku (2nd ed.). Praha: C.H. Beck, 2001.

[9] M. Malík and all., Metody oceňování podniku: Pro pokrocilé (2nd ed.). Praha: Ekopress, 2018.

[10] Tz-Da, R.-J. Guo and R. I. Gangnathan, “CAPM for estimating the cost of equity capital: Interpreting the empirical evidence,” Journal of Economics and Business, vol. 103, Issue 1, pp. 204 – 220, 2012.

[11] P. H. Dybvig and J. E. Ingersoll, “Mean-variance theory in complete markets,” Journal of Business, vol. 55, no. 2 pp. 233 – 251, 1982.

[12] Ministry of Industry and Trade. Finanční analýza průmyslu a stavebnictví 2012 - 2017 (Financial analysis of industry and construction industry 2012 – 2017) [online]. Available: https://www.mpo.cz/cz/zrozcestnik/analyticky-materialy/analyticky-materialy/ [online].

[13] V. Nývlt, “Life Cycle Costing in BIM management,” in CESB2016, Central Europe Towards Sustainable Building 2016: Innovations for Sustainable Future, Prague, 2016, pp 1438-1444.

[14] I. Neumairová, Aplikace řízení hodnoty (Value Management Application), Prague: University of Economics in Prague. Faculty of Business Administration, 2003.

[15] C. A. Magni, “Investment, financing and the role of ROA and WACC in value creation,” European Journal of Operational Research, vol. 244, Issue 3, pp 855-866. 2015.

[16] J. T. O’Brien and R. Mishra, “Fama-French, CAPM, and implied cost of equity,” Journal of Economics and Business, pp. 73-85. 2019.

[17] I. Neumairová, Řízení hodnoty (Value Management), Prague: University of Economics in Prague. Faculty of Business Administration, 1998.
[18] G.B. Stewart, *The Quest for Value: A Guide for Senior Managers*. New York, NY: HarperCollins, Publishers In. 1991.