THE APPLICATION OF BUILD-UP APPROACH IN COST OF EQUITY CALCULATION OF MINING ENTERPRISES

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Abstract:
Cost of equity calculation is a complex problem in corporate finance management. In practice such calculation is most often based on CAPM (Capital Asset Pricing Model), however, world literature and experience of developed countries indicate a possibility to use many derivatives of this method as well as new alternative methods, among which Build-up Approach is worth analyzing. Similarly to CAPM method, a starting point of this method is to determine a risk-free discount rate. Next, as in CAPM method, there is risk premium calculated. The other steps are different in Build-up Approach from CAPM, and they consists in making adjustments for specific risk factors related to a particular enterprise. In the hereby paper there is an attempt made to implement the Build-up Approach in cost of capital calculation in the Polish mining enterprises. These are specific enterprises that require high capital outlays and are characterized by a high immobilization of assets. Considering their role in the energy policy of particular countries, it often happens that they are less determined by legal regulations and co-financing by public capital. Additionally, the largest enterprises in the mining industry are listed on stock exchange, what makes it difficult to estimate their cost of equity using classical CAPM.

Keywords: cost of equity, build-up approach, mining

1. INTRODUCTION

The cost of equity calculation, due to its importance, is a subject of many theoretical considerations and empirical research in all of the countries with free-market economy. The problem becomes particularly complex in the emerging markets, especially in some specific branches of industry, that are poorly represented on the capital market, often with a large share of the state. In practice, the cost of equity calculation is most often based on the CAPM (Capital Asset Pricing Model) method, however, in case of emerging markets and specific branches of industry there is a number of restrictions in the application of this method. Global literature and experience of developed countries indicate a possibility of using in such case a derivative of CAPM method, that is an alternative for it. It is the Build-up Approach. In this paper an attempt was made to implement the Build-up Approach in the cost of equity calculation in the Polish mining enterprises. These are specific enterprises, requiring a high level of capital expenditures, being characterized by mainly immobilized assets of high value, which for the most part are very hard to be turned into cash (buildings and objects of subterranean engineering, excavations, specialized mining equipment etc.). Often due to the role of those enterprises in the energy policy of particular countries, they are to a smaller or larger degree determined by the applicable provisions of law and they are co-financed by public capital. Additionally, the largest enterprises in the Polish mining industry are not yet listed on stock exchange, which makes the calculation of their cost of equity by using the classic CAPM method more difficult.

2. THE PROCEDURE OF BUILD-UP APPROACH APPLICATION

The Build-up Approach is a method based on building-up particular elements of risk, that constitute the discount rate in a given enterprise. The risk factors, added to each other, express the total return which may be expected by a rational investor due to the purchase of a given enterprise. It may be expressed by using the following formula (Saługa, 2006, p. 55):

$$c = r_{RF} + \beta \times (r_M - r_{RF}) + r_{S1} + r_{S2} + ... + r_{Sn} \quad [1]$$

where:
c – cost of equity coming from retained profits,
r_{RF} –return rate required from risk-free investments,
r_M –return rate on investments representative to the market portfolio,
$r_{S1} \ldots r_{Sn}$ – types of specific risk included as adjustments,
β - coefficient determining the level of systematic risk (measure of relations between the return rate obtained on equity in a given enterprises and the return rate obtained on the market).

The methodology of Build-up Approach assumes, analogically as in the CAPM method, determination of the risk-free return rate. This assumption stems from the conviction that each investment should generate a return rate at least equal to the risk-free return rate. The risk-free return rate (r_{RF}) is usually determined based on the yield of the government-issued securities, which are considered to be the safest financial instrument. In practice, the interest return rate on Treasury bonds or Treasury bills is used (Hawawini & Viallet, 2011, p. 278).

As the next step, beta coefficient is determined. The β coefficient describes the level of market risk connected to investing in assets of specific enterprises (Michalak, 2012, pp. 1008-1019). The β coefficient in practice reflects the volatility of share prices of a given enterprise against the background of the volatility of the market index, and its value is calculated based on the following formula (Ogier et al., 2004, p. 43):

$$\beta = \frac{\mathrm{cov}(r_{it}, r_{Mt})}{\mathrm{var}(r_{Mt})} = \frac{\sum_{t=1}^{n} (r_{Mt} - \bar{r}_M) \times (r_{it} - \bar{r}_i)}{\sum_{t=1}^{n} (r_{Mt} - \bar{r}_M)^2} \quad [2]$$

where:
β - beta coefficient,

$\mathrm{cov}(r_{it}, r_{Mt})$ – covariance between return rate on the enterprise's stock and return rate on the market portfolio,
$\mathrm{var}(r_{Mt})$ – variance of return rate on the market portfolio,
r_{it} – return rate on the enterprise's stock in the t period,
r_{Mt} - return rate on the market portfolio in the t period,
$\bar{r}_M$ - average return rate on the market portfolio in the t period,
$\bar{r}_i$ - average return rate on the enterprise's stock in the t period,
t – the period based on which the parameters of the model are determined.

The β coefficient equal to one means a typical level of risk (equal to the market risk), higher than one characterizes investments with enhanced risk (higher than the market risk), while lower than one characterizes undertakings with risk being relatively lower than the market risk (Melich, 2004, pp. 167-168; Mayo, 1997, p. 193). Similarly, the enterprises with a higher level of β are more risky than the subjects with lower β (Rakow, 2010, pp. 37-46). It is worth noting that the β values that are close to zero are usually accepted to be characteristic for risk-free securities.

Next, as in the CAPM method, the risk premium is determined. Calculating premium due to the risk is a matter that raises a lot of doubts, especially in regards to the emerging markets that have short history and are characterized by large volatility. This premium is traditionally determined as the difference between the market return rate (calculated based on stock market indixes) and the risk-free return rate (r_M-r_{RF}). Very often, in order avoid complications in the area of estimating r_M the total difference (r_M-r_{RF}) is calculated, which is described as the market risk premium (*MRP*). In such situation it is assumed that it is suitable for all undertakings on the market, as it is determined by objective macroeconomic factors (Cwynar & Cwynar, 2003, p. 412). Such methodology is suggested by A. Damodaran in the situation of estimating risk premium on capital markets, the level of development of which is not as advanced as in case of the American market. In such situation he suggests summing the basic premium for mature capital market with the risk premium in a given country (Byrka-Kita, 2008, p.166).

Further stages differentiate the Build-up Approach from CAPM and are based on making adjustments due to the specific risk factors referring to a given enterprise. The premium due to specific risk factors should include (Fishman et al., 1992):
- the branch of industry in which the enterprise operates,
- the size of the enterprise.
- financial risk (determined by classic measures such as financial leverage, the indicator of debt ratio, indicator of liquidity etc.),
- the degree of diversification of the activity (assortment diversity, territorial distribution, outlets, the degree of dependence of suppliers and recipients etc.),
- other operational factors, such as competencies of the management, qualifications of the staff, the power of trade unions etc.

Decisions regarding the adjustments of risk premiums due to the specific factors may be based on the comparisons of the examined enterprise with the stock market index which is assumed to be the averaged 'market representative'. In case of the Polish stock exchange this may be WIG, WIG 20 etc. The comparison may also be made in regards to the selected representative of the branch of industry or to a relevant sector index, in Poland e.g. *WIG SUROWCE* (basic minerals). A comparison to a chosen benchmark enterprise allows to relate the characteristics of the analyzed enterprise to a real subject operating in the same sector. As a result of the comparisons the deviations may be pointed out. On this basis one can make reasoned decisions regarding increasing or decreasing the discount rate. In this area one may also use industry (branch) risk premium suggested by A. Damodaran.

The Build-up Approach is a subjective method, based to a large degree on the analyst's knowledge and experience. On the grounds of the Build-up Approach the assumptions of a certain procedure appeared, adapted to the needs of the enterprises the stock of which is not traded on the stock exchange. It was suggested by J. H. Schilt (Schilt, 1991, pp. 51-52). This procedure may be considered as one of the variants of building-up risk. It is based on the risk premium scale designed by Schilt and used for enterprises not quoted on the stock exchange. The scale consists of five categories of risk. A given enterprise is assigned to one of them depending on the qualitative (descriptive) assessment. Each category corresponds to a different range of risk premiums which is

added to the risk-free rate, obtaining the cost of equity. The range of risk premium in each of the risk categories has several points on Schilt's scale, therefore this variant of the Build-up Approach is accompanied, as is its basic version, by a rather large degree of subjectivism, related to the choice of the proper premium from the suggested interval. Schilt's guidelines concerning the choice of risk categories for a given enterprise and of determination of risk premium is presented in table 1.

Table 1: The scale of risk according to Schilt

Category	Description	Risk premium [%]
First	Enterprises that have strong position in their industry, set and safe financing structure, experienced management staff and stable income. The future of the enterprises is predictable to a large degree.	6-10
Second	Enterprises with strong market position, stable financing structure and stable income that also have experienced management staff, however, also operating in a more competitive branch of industry. The future of the enterprise is less predictable than in case of the enterprises that belong to the first category.	11-15
Third	Enterprises operating in highly competitive branches of industry, with low capital barriers for entering the market, management staff with low qualifications and low experience. The future of the enterprise is of enhanced risk, however, its historical results are satisfactory.	16-20
Fourth	Small enterprise, managed by one or two people or a larger enterprise but characterized by seasonality of operations. In both cases projected income is very risky.	21-25
Fifth	Small, one-man enterprises, mostly operating in the service industry, with questionable projected income.	25-30

Source: Schilt, 1991, p.51 following Wilson & Wilson, 2012, p. 148.

3. EXAMPLE OF COST OF EQUITY CALCULATION IN THE CHOSEN MINING ENTERPRISE

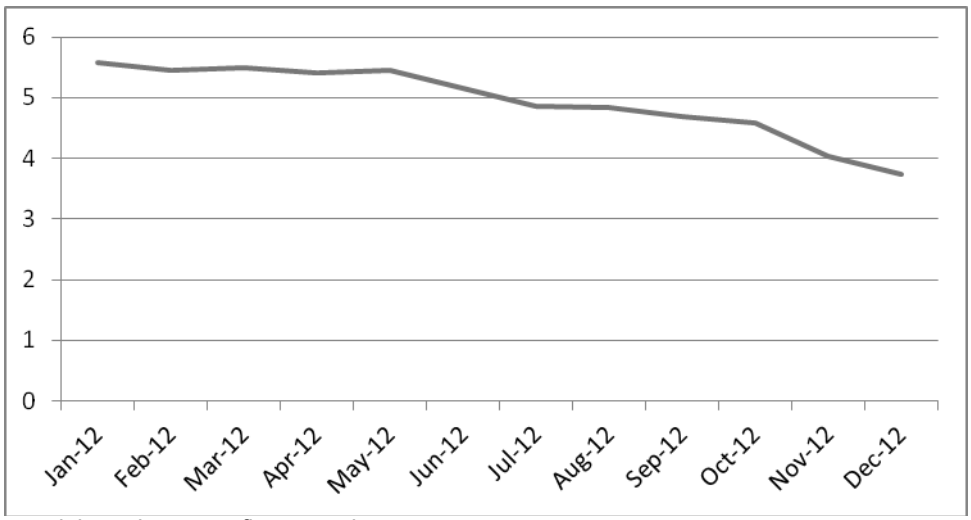
Application of the Build-up Approach in mining enterprises causes many difficulties connected with the scale of their activity and large number of risk factors that accompany the activity. Moreover, many risk factors are hard to measure and treated in a qualitative way by analysts dealing with this problem (Michalak, 2011, pp. 268-269; Jonek-Kowalska, 2011, pp. 244-268). Nevertheless, in the conditions of good knowledge about the branch of industry it is possible to use this approach.

The mining industry in Poland is represented by several large mining enterprises that possess from one to several mines in their structures. Only two enterprises from this branch are currently listed on stock exchange. Therefore, calculating the cost of equity is more difficult in such conditions. In the hereby research there is an attempt made to estimate the cost of equity in the chosen mining enterprise. The research object is Kompania Węglowa S.A. (Mining Company JSC. short – KW SA). It is the largest mining enterprise in Poland and in Europe. The owner of the majority shareholding of this enterprise is the State Treasury. The enterprise is not listed on stock exchange, but its financial reports are made public, what provides a possibility to conduct an analysis on the basic financial ratios. Having applied the subsequent steps suggested in the Build-up Approach, the examined enterprise was compared to the only representatives of the Polish mining branch listed on the Warsaw Stock Exchange, that is to Bogdanka S.A. and Jastrzębska Spółka Węglowa S.A. (short - JSW SA). The first of the chosen benchmark enterprises has been listed on the stock exchange since the second half of 2009 and the second one entered the stock exchange at the end of 2011. Basing on the daily return rates on stock of the examined enterprises there was their Beta coefficient calculated and other components of the cost of equity. Ratio analysis was conducted on financial data obtained from the financial results of the examined enterprises dated 31.12.2012.

In the first stage of the research process there was a risk-free rate determined. In the hereby research the risk free rate was adopted as a return rate on 10-year Treasury bonds issued in the country where the examined enterprise performs, that is Poland. In 2012 the return rate on the chosen securities was

shaped as in figure 1. In this period the average return rate on the 10-year Treasury bonds equaled to 4.94 %, and on the day of 31.12.2012 it was 3.73 %.

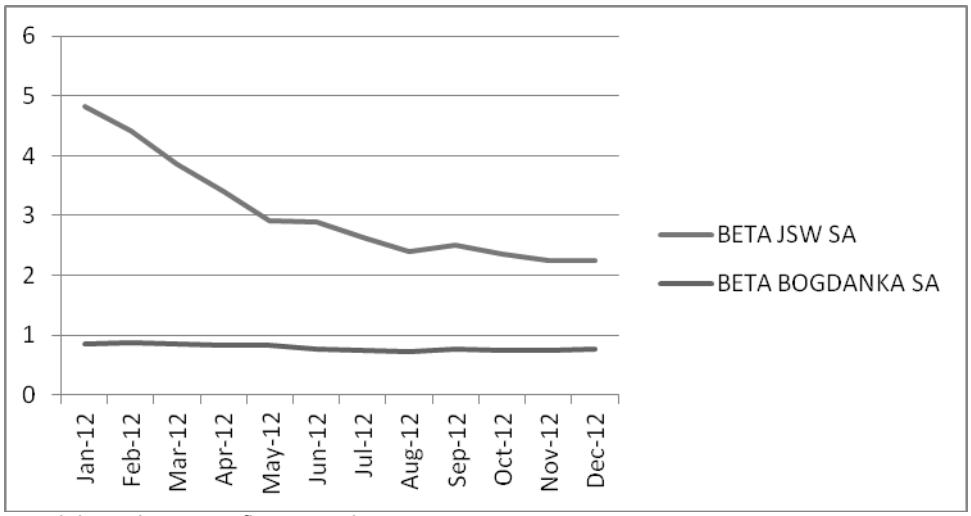
Figure 1: Return rate on 10-year Treasury bonds in 2012 [%]



Source: own work based on www.finance.yahoo.com.

In the second stage of the research process there was beta coefficient indicated in the benchmark enterprises and risk premium. On the day of 31.12.2012 beta for JSW SA amounted to 2.24, and for BOGDANKA SA 0.76. The average values of beta coefficient for the examined enterprises in 2012 are as follows:3.06 in JSW SA and 0.79 in BOGDANKA SA. The changes of beta coefficient in the analyzed enterprises are presented in figure 2. The results presented indicate that risk in the mining industry is quite varied, depending on the particular enterprise. JSW is the enterprise characterized by risk much higher than the market value. The average annual value of the beta coefficient on the level about 3 means that the return rate on stock of this enterprise is very sensitive to changes in the return rates on the main market index (in this case it is WIG). If the return rates on this index increase by about 2% then the return rate on stock of JSW increases by about 6% and the other way round, WIG fall by 2% triggers decrease of the return rate on JSW stock by 6%. In turn, the enterprise BOGDANKA has the beta coefficient lower than one. This shows that risk in its case is lower than the market risk. The return rates on stock of BOGDANKA react in a less degree to market changes.

Figure 2: Beta coefficient in JSW SA and BOGDANKA SA in 2012



Source: own work based on www.finance.yahoo.com.

The next step in determining the cost of equity in CAPM is risk premium. In the hereby research, instead of risk premium indicated in a traditional way as a difference between the market return rate and risk-free rate, it is proposed to use an approach by A. Damodaran in which risk premium is

indicated on the basis of risk index of a particular country where stocks of the examined enterprises are listed[1]. Total Equity Risk Premium for Poland equaled to 7.3% in 2012.

In the Build-up Approach the increase or decrease of discount rate due to specific risk factors related to a particular enterprise is of key significance. For this purpose, there was the following method applied: in accordance to J.H. Schilt, there were five areas of company-specific risk indicated, however, they were adjusted to the specific features of activity of mining enterprises. To each of the areas there is the risk premium assigned in the scale from 0% (when the risk does not occur) to 5% (when the risk is high). During the risk assessment appearing in the indicated areas there was research by A. Damodaran of help as well as benchmark comparisons to the chosen representatives of the mining industry listed on the stock exchange. The indicated areas of specific risk and risk premium are included in table 2.

Table 2: The areas of specific risk of the mining enterprises

No.	Risk area	Risk premium
1.	Branch (industry)	0-5 %
2.	Enterprise's size	0-5 %
3.	Financial risk	0-5 %
4.	Activity diversification	0-5 %
5.	Other factors	0-5 %
Total		0-25 %

Source: own work.

The first of the determined risk areas is branch (industry) in which the enterprise performs. The mining industry is thought to be one of the most risky. A. Damodaran assigns beta coefficient on the level of 1.26 to the industry, comparing to the average level of 0.58 in all the examined industries (the research taken into account is limited to the territory of Europe). The lowest risk is characteristic for "Thrift" branch, according to research by A. Damodaran, where the beta coefficient equals to 0.13, however, the highest value is in the Insurance (Life branch) – 1.95. As beta characterizing the mining industry is higher than one, this means that the industry has an enhanced risk (higher than market risk), therefore, there should be risk premium higher than zero added. It was assumed that the highest risk premium connected with an industry, that is 5%, corresponds to the most risky industry, namely Insurance (Life) with beta 1.95. The risk premium for the mining industry with beta = 1.26 was proportionally decreased (in relation with the most risky beta for the industry of Insurance Life) to 3.2 %.

The next examined component is enterprise's size. The highest risk premium is assigned to small enterprises. According to J.H. Schilt, the larger enterprise the lower risk. KW SA is the largest mining enterprise in Poland and in Europe. Therefore, it thought to have **zero** risk premium.
In the next step there was financial risk examined, specific for KW SA. In order to determine the financial risk in the hereby research, there were several financial ratios selected that characterize the financial risk of KW SA and they were compared with the average values of the ratios obtained in the benchmark enterprises and with literature recommendations. There were the following ratios chosen describing the financial risk:

- Times Interest Earned = net income/interest charges,
- Debt ratio = total liabilities/total assets,
- Current ratio = current assets/current liabilities,
- Return on assets (ROA) = net income/total assets,
- Return on equity (ROE) = net income/equity.

All the ratios mentioned above were calculated on the basis of the accounting data resulting from the balance sheet and the income statement of the examined enterprises. It was decided to use the book value, not the market value, as the market value undergoes numerous fluctuations affected by a situation on the capital market. The book value is more stable and may be a better reference point in the comparative analyses.
The values of the selected ratios in KW SA and benchmark enterprises are presented in table 3.

[1] Data avialable on the website: http://pages.stern.nyu.edu/~adamodar/ (accessed: January 2013)

Table 3: The level of selected ratios characterizing specific risk of the examined enterprises in 2012

Specification	KW SA	JSW SA	BOGDANKA SA
Times Interest Earned	2.02	8.02	26.69
Debt ratio	0.84	0.39	0.34
Current ratio	1.02	1.74	1.01
Return on assets	2.2 %	7.1 %	8.9 %
Return on equity	11.1%	11.6 %	13.1 %

Source: own work.

In the next step there was financial risk premium determined for KW SA. It may equal from 0 to 5 %. As the premium consists of 5 ratios, each of the examined ratio may have from 0 to 1% of risk premium assigned. The average value of the examined ratios was calculated in the benchmark enterprises and there was a relation between the ratios in KW SA and their level in the benchmark enterprises analyzed and then the level suggested in literature was taken into consideration. The risk premium assigned is included in table 4.

Table 4: Determination of financial risk premium in KW SA

Specification	KW SA	Benchmark average	Specific risk premium
Times Interest Earned	2.02	17.35	1%
Debt ratio	0.84	0.36	1%
Current ratio	1.02	1.37	1%
Return on assets	2.2 %	8 %	1%
Return on equity	11.1%	12.35 %	0%

Source: own work.

Times Interest Earned in KW SA is a few times lower than in the benchmark enterprises. Such low level of this ratio is a sign of the fact that the cost of debt service constitutes a very high burden for the operating income. KW SA, in the range of this ratio between 0-1%, has the 1% risk premium ascribed.

Debt ratio informs about the level of debt incurred by the subject, that is how much assets are burdened by liabilities. In KW SA the level of this ratio equals to 0.84, what means that 84% of assets is financed by debt capital. In the benchmark enterprises it is about 36%. For this reason KW SA obtains 1% risk premium for debt risk.

Current ratio indicates ability of the enterprise to settle current due liabilities with the help of current liquid assets. An optimal level of this ratio is in the range from 1.5 to 2.5. In the benchmark enterprises this ratio is close to the level recommended in literature, however, it is definitely too low in KW SA. This proves high insolvency risk and means assigning risk premium in the top level of the range, that is 1%.

Return on assets ratio, similarly to the above, is considerably different from the average branch level and literature recommendations. Consequently, KW SA has 1% risk premium ascribed for effectiveness of assets use.

The last of the examined ratio looks relatively well in the view of the others. It is return on equity that determines the return rate on equity invested in the enterprise. This ratio should be at least on the level of inflation rate (in such case we talk about maintaining the real value of equity on the same level). Kompania Węglowa is a joint-stock enterprise and its only stockholder is the State Treasury. As it was mentioned before, the value of equity of this enterprise is a yearly average book value resulting from the balance sheet under the position called “Total Stockholder Equity”. The return on equity in KW SA is on the level much higher than inflation and close to the branch average. Because of this, risk premium is not appointed in this area.
On the basis of five examined ratios, the financial risk premium was determined on the level of 4%.

In the next step two more factors were examined that generate specific risk of the examined mining enterprise. One of them is a degree of activity diversification. KW SA is mostly a hard coal producer. However, it should be mentioned that it is both power coal (for the purpose of the power industry) and

high-power coal (for the purpose of individual recipients). Apart from the main activity, the enterprise also makes an attempt to extend its activity in terms of industrial use of methane, energy distribution, or sales of side products e.g. slag. In frames of the strategic aims, the enterprise also considers investment in the power industry. Due to domination of the mining activity and hard coal sales, risk premium in this area equals to 4%.

Specific risk in KW SA is also affected by two other factors. The influence of trade unions on enterprise's activity should be assessed in a negative way. The enterprise employs almost 60 thousand people and 99% of them belongs to trade unions. In Poland there are 160 trade unions active. On the other hand, this risk is positively affected by experience of the management staff and workers employed. For all the risk factors, KW SA obtains 4% specific risk premium.
In total, specific risk premium of KW SA amounts to 15.2%, what is presented in table 5.

Table 5: The areas of specific risk in KW SA

No.	Risk area	Risk premium
1.	Industry (branch)	3.2 %
2.	Enterprise's size	0 %
3.	Financial risk	4 %
4.	Activity diversification	4 %
5.	Other factors	4 %
Total		15.2 %

Source: own work.

On the basis of analysis conducted there may be the total cost of equity in KW SA calculated. As the financial risk was determined on the grounds of the day of 31.12.2012, the value of risk-free rate and beta coefficient was also adopted in this period. As it was indicated above, the risk free rate amounted to 3.73%. Beta was indicated as the average of two benchmark enterprises (in JSW beta equaled to 2.24 and in BOGDANKA 0.76). Consequently, the average beta amounts to 1.5. Then cost of equity in the examined enterprise equals:

$$c = 3.73\% + 1.5 * 7.3\% + 15.2\% = 29.88\%.$$

4. SUMMARY

Build-up Approach method seems to be the best option in cost of equity calculation in the mining enterprises. In its current version it is criticized for too large range of subjective assessment of analysts. However, in the conditions of deep knowledge of specificity of the examined enterprises and having made many comparisons to the market as a total and to other enterprises of similar scale of activity, it seems to be a proper method. The cost of equity in the examined enterprise equals to almost 30%. This value consists of: risk-free rate, systematic risk measured by the beta coefficient and specific risk. The specific risk is determined by the industry in which the particular enterprise functions, by the size of this enterprise, financial parameters characterizing the enterprise and the degree of activity's diversification. The cost of equity calculated in this case is quite high. It is a value justified by a very high company-specific risk and the branch of activity. The economic-financial situation of the analyzed enterprise is not very good. The enterprise is in huge debt and is considerably burdened by the cost of debt capital, it performs on the border of financial liquidity. The enterprise showed a slight return on assets which are mostly immobilized. Moreover, a very big problem becomes the influence of trade unions on the enterprise's activity and a low degree of activity diversification.
The example above indicates that there are some solutions that may be implemented in calculation of the cost of equity in the enterprises performing in the specific industries, not listed on the capital market. Such solution is the Build-up Approach.

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