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Assessing the Non-financial Investment Profitability with Variable Discount Rate**

JEL Classification: *G11; G31; G32*

Keywords: *cost of equity capital; risk premium; CAPM*

Abstract: *In the work, the subject of the discount rate assessment is presented. The discount rate is usually considered as constant in the whole investment period, which seems to be the main problem. The constant discount rate does not take into account the actual money loses value in time. Moreover, the discount rate elements can change in time, and it should be remembered that many factors, which could also change, influence the value of those elements. The research confirms that the assumption of using the constant discount rate is erroneous. In the work one can find i.a. the methods of own capital assessment or the proposal of different techniques of risk premium valuation.*

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Introduction

The main aim of the work is to present that the use of constant discount rate at assessing non-financial investment profitability is incorrect. To fulfill the goal, empirical research was conducted on the basis of construction area. Such research allowed to take a stance on thusly formulated aim. The incorrect discount rate value or mismatched assumption, connected with its constancy throughout the whole period of investment realization, can lead to incorrect assessment of non-financial investment value. The acceptance of an unprofitable investment or rejection of a profitable one can be the effect of such an activity. An investor should realize profitable investments which can give extra profits in the future. It should be remembered that the aim of each company is the maximization of its value, and it is possible because of investing. Thus, correct investment assessment is really important.

The Research Method

The aim of the research was to show the inconsistency with assumptions of assessment methods of the non-financial investment profitability, regarding the use of constant discount rate. The research concerned ten-year period of time, and included the period before and after the economic crisis (2004–2013). The analysis was realized on the example of construction industry[1]. The companies target screening concerned the defined period when the enterprise was traded on the Polish stock exchange. The first part of the work reads the theoretical interpretation of the discount rate at assessing the non-financial investment profitability. Then, the methods of equity capital cost are discussed. The last part presents the measurements of conducted analysis to assess the cost of capital, especially the own one. This part of the work mainly focused on determining the risk premium.

The Discount Rate Used in the Evaluation of Non-financial Investment Profitability

The decisions referring to the non-financial investments concern the expending determined sum at present, in exchange for the income flow in the determined, future years. The process which allows to bring future cash flows into one comparable period is called discounting. The discount rate

[1] According to the WIG-BUDOW enterprises condition in August 2014.

itself is a measure of used interest which should be gained to pay the credit interest, or equalize the interest on alternative deposit which was disclaimed in order to invest cash, as well as defray equity risk premium (Michalak, 2007 p.88). The discount rate at assessing non-financial investment profitability is usually set as a constant one in the whole period of investment realization. The discount rate takes into account time preferences, as well as the opportunity costs. It presents the possible profits from capital, invested in alternative investments. So, the whole discount rate value does not reflect the appropriate money loses value in time. The discount rate, used i.a. to assess the non-financial investment profitability, is also a part of capital cost.

As Szczepankowski shows (2007, p. 85), the cost of capital can be defined in several ways (compare Hucik-Gaicka, 2007; Duliniec, 2001; Blanke-Ławniczak *et. al*., 2007):

- It is the value of expected return rate from alternative ventures in assets. It has got identical investment risk.
- It is the price that should be paid by an enterprise for the right to administer every single coin from the received capital.
- It is the hurdle rate of return that should be generated by a company to maintain its value.
- This is both the minimum and risk-considering return rate that should be gained from possessed assets, and realized investments to have the presents ventures accepted by owners.
- This is the minimum profitability represented by interest. By this profitability, the investors can plough their equity capital into enterprise to get the expected profits.

The definition of capital cost was also taken up by Byrk-Kita (2007, pp. 89-90) who, besides the definitions presented by Szczepankowski (2007), additionally emphasized that the cost of capital is e.g.:

- The cost of enterprise financing
- The price of engaging funds
- The expenses borne by a company as a result of managing capital, in relation to its market value
- The discount rate used to discounting company cash flows which would have been generated if it had not been funded with debt.

In the literature, the most common definition of equity capital cost is to determine it as the desired return rate from invested capital by investors (Duliniec, 2011; Blanke-Ławniczak *et.al*., 2007; Pęksyk *et al*., 2010). The way of setting the discount rate is conditional upon the structure of invested capital, which can come from own or foreign sources. The cost of each funding source is related to assessing both equity and debt capital cost.

The Cost of Equity Capital

The most known methods to assess the cost of equity capital are:

- build-up method – which consist in determining a risk-free rate and adding different, predetermined risk premiums (risk premium, value premium, sector-risk premium, specific-risk premium, peculiar-risk premium),
- Dividend Discount Model (DDM) – which consists in the assumption that the shares value is determined by the flow of dividends paid in the future,
- Capital Assets Pricing Models (CAPM) – connected with the modern portfolio theory, where the main investors' aim is to maximize the return rate in relation to borne risk,
- Arbitrage Pricing Theory (APT) – based on almost one price and an arbitrage, this is the co-efficient model.

The process of determining equity capital rate that reflects its cost can be a problem. The difficulties can be caused not only by choosing the appropriate technique. More important is that the attention should be paid to the method's imperfection. This defect can cause incorrect level of assessed equity capital cost. Above all, limitations and assumptions are the whole methods group fault. The problem concerns not only their amount, but also the impossibility to verify them in reality. The build-up method is proved only with smaller, non-traded enterprises. The majority of the method elements lie in subjective value calculations, which are not empirically proven. Many assumptions are out of touch with reality. For example, using the Gordon growth model (DDM), it is hard to predict and expect the constant dividend growth for longer period of time. It should be added that Gordon growth model can be used for mature enterprises with stabilized policy of dividend payments. On the other hand, nobody can agree with the optimistic assumptions of CAPM method concerning the lack of transaction costs (the lack of extra fees) and no limits in relation to incurring and granting loans with risk-free rate. It could cause over-liability, which would reflect the lack of solvency, and thereby the possibility of bankruptcy. The point at issue is i.a. the assumption that all investors have an aversion for risk. Only one investor's attitude cannot be a limitation, because it should be remembered that an investor can also be neutral or take a risk.

The mostly used method to assess the rate of equity capital cost is CAPM model. It was the subject matter of numerous research, but it is not free of criticism. Some of the researchers called into question the linear relationship between the expected return rate and systematical risk - beta (Fama, 1996). Other factors which explain return rates configuration are

determined e.g. business value effect, Price Earnings Ratio, price-to-book ratio (Banz, 1981; Basu, 1977; Chan & Yasushi 1991). Some research appealed in favour of CAPM model (Black *et al*., 1972; Fama & MacBeth, 1973). In the literature, besides the criticism of CAPM model, there are methodological problems connected with particular elements. In this case, the way of setting the risk premium is generally remarked. The difficulty in assessing the Equity Risk Premium (ERP) concerns not only the selection of appropriate data or the calculation period, but also the way of its determining. In the face of the wide range of problems, the assessment of Equity Risk Premium has been an interesting issue to examine.

The Research Analysis – the Chosen Model to Assess the Rate of Equity Capital Cost and Assumptions

The research subject to analyze the assessment of equity capital cost was the Capital Assets Pricing Model. On the other hand, the build-up method is used for non-traded company, and it was counted out of using the method to assess the rate of equity capital cost. Meanwhile, in the Dividend Discount Model the assumption of constant dividend growth rate is presumed. The lack of stability within the policy of paying out dividends for the construction sector is confirmed by the analysis of enterprises' reports. From among thirteen companies in the analyzed period, only one of them pays out the dividend every year, whereas half of the companies pay out the dividend from five to ten years' time (figure 1). Other companies did not pay out any dividends, or did it once or at least three times. That is why the Dividend Discount Model cannot be used to assess the rate of equity capital cost for the analyzed sector.

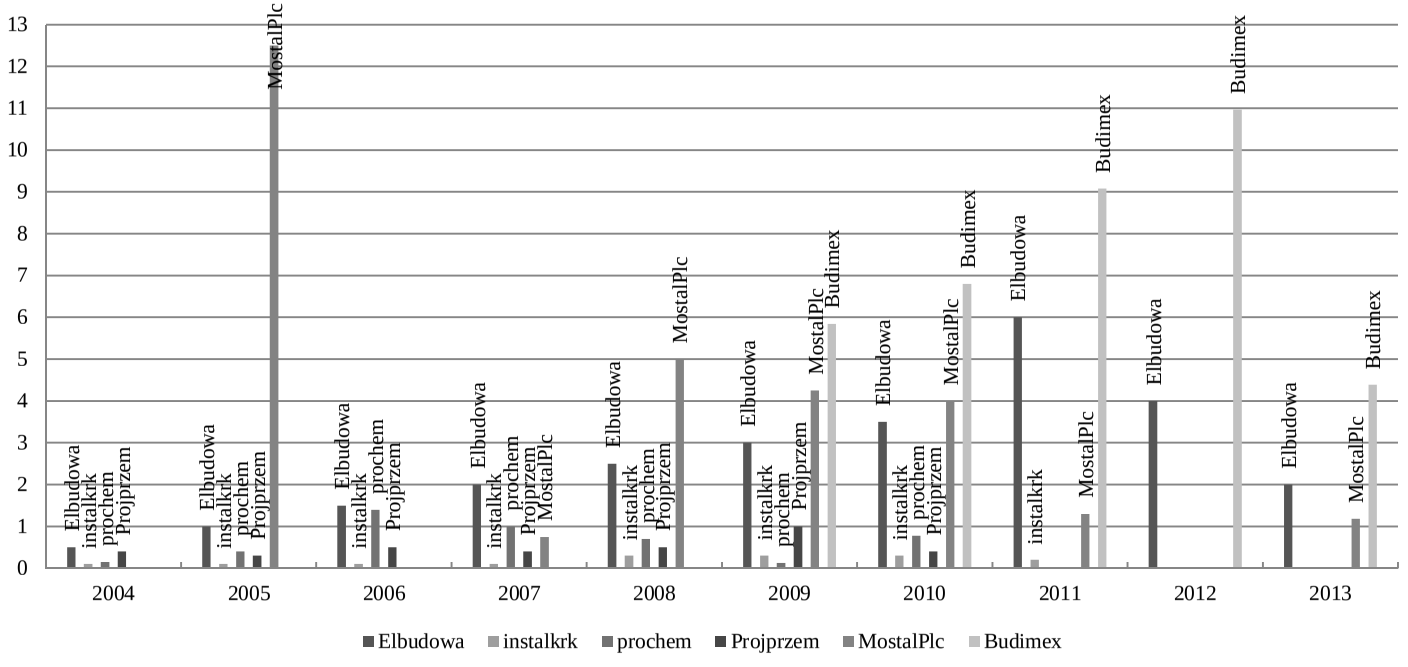
The Arbitrage Pricing Theory was not considered, because it needs the same assumptions as the CAPM model.

The Capital Assets Pricing Model is based on Sharpe's, Lintner's and Mossin's works (cf. Sharpe, 1964; Lintner, 1965, 1965a; Mossin, 1966), but the best known model formula was created on the basis of Fama's proposal (1968):

$$E(R)=R_f+\beta^2(R_m-R_f)$$

[2] Enterprise systematic risk

Figure 1. The dividends paid out for the period of five to ten years' in the construction sector (PLN)



Source: own study on the basis of financial reports.

In the conducted research, the risk-free return rate of an asset (R_f) equals the profitability of 52-week[3] country treasury bills. In the literature, the way of choosing an asset that represents the return rate of a free-risk one is discussed. On the one hand, the return rate of long-term securities guaranteed by the country (debentures) is mentioned. On the other hand, the researchers indicate that the risk-free return rate is the return rate value of short-term treasury bill. The advantage of long-term assets is better time horizon match for long-term investments taken by an enterprise. The flaw is the sensitivity of interest rate future fluctuations. The investors are certain of purchasing power, as well as of the reinvestment rate which will be available for their reinvestment of interest payment, gained from the debentures. However, short-term treasury bills are more influenced by short-term fluctuations than the debentures. But there are the treasury bills whose both the risk of issuer insolvency and the risk of interest rate changing equal almost zero. So, the treasury bills can be described as the purest base risk-free return rate, because they actually have not got the risk of interest rate uncertainty. The treasury bills contains the compensation of inflation uncertainty. However, debentures are free of insolvency risk but they are not "risk-free" (Pratt & Grabowski, 2008 p. 92).

Equity Risk Premium and Capital Cost – the Research Results

Equity risk premium is reflected by the difference between the return rate and the risk-free rate. The return rate, which is measured by the appropriate stock market index, is gained from the whole capital market (in Poland it is Warsaw Stock Exchange Index – WIG). The main aim of the conducted research was to set a premium, which was calculated in several ways:

- The difference between the market asset represented by WIG return rate, according to the beginning of the year (in accordance to the methodology of calculation the WIG annual return rate by Warsaw Stock Exchange - GWP), and the return rate from a risk-free asset at the given day.
- The difference between the daily WIG return rate and the return rate from a risk-free asset at the given day.
- The difference between the average value of the WIG return rate in the year and the return rate from a risk-free asset at the given day.

[3]According to the Ministry of Finance, http://www.finanse.mf.gov.pl/dlug-publiczny/bony-i-obligacje-hurtowe/baza-transakcji, 52-week country treasury bills were issued till 28th of March 2012. Then, the bills with the nearest period of time, in relation to the previously analyzed ones, were chosen.

– The average premium from 10 years' time which is the average from the differences between WIG return rate, in accordance to the beginning of the year, and the return rate from a risk-free asset[4] at the given day (it is called the average from Premium (1)). It should be added that the analysis which treasure bills' profitability was calculated on the basis of their daily interest rate was excluded, because the goal of the research was to gain value "at" the given day, not "for" one given day.[5]

The risk premium can be assessed as an arithmetic or geometric mean of the differences between the return rates which are considered to assess a premium. The arithmetic mean is a historical mean of assessments of the differences between rates – it is the simplest solution and also the most popular one among analysts, and it matches the designated Premium (4). The Premium designation in an arithmetical way is correct when annual return rates are not correlated[6], otherwise a better idea is to use the geometric mean, but the weight for a geometric mean should increase including the impending of the period in hand (Prusak, 2009; Hucik-Gaicka, 2007). Using the geometric mean is conditioned by positive values of the analyzed variables, and it was not achieved when we considered the WIG return rate. That is why the arithmetic mean was taken into consideration in the work. That mean is also coherent with the method of determining the beta coefficient (Szczepankowski, 2007). What is more, the weak[7] correlation between examined return rates is in favour of using arithmetic mean.

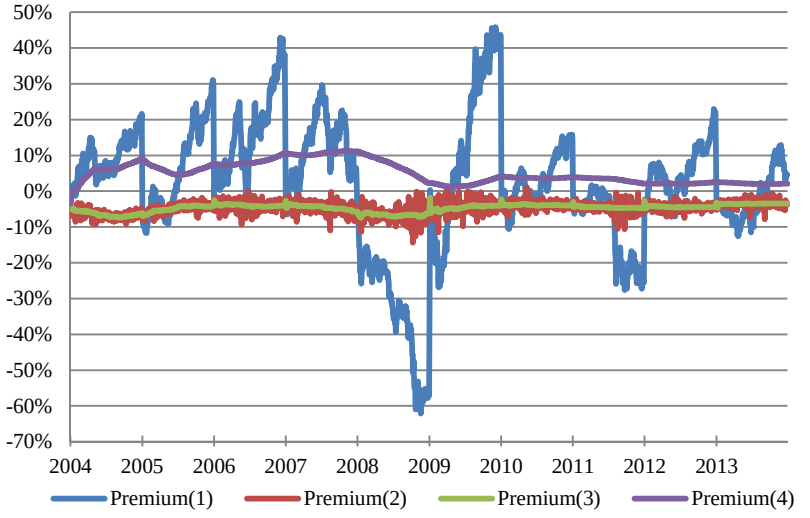
[4] The average is calculated within the limits of the given year because 1) it comes out of the short history of Warsaw Stock Exchange (GWP), which is still not well developed, 2) in the past, there was another system of quotations, the Warset system, and it was implemented in 2003, 3) running into the past can remarkably deform the results, considering the short history of GWP.

[5] Moreover, the incoherence between calculation interest rate should be noticed – to calculate the annual interest rate, when we have got *m*-number of capitalizations during the year, the formula for the effective annual interest rate should be used. The rate bases on involution. On the other hand – to get the daily rate from the annual one, the rate should be divided by the number of days in a year, which is not the opposite of involution and what our intuition can suggest.

[6] The correlations co-efficient for annual return rates equaled -0,36. The arithmetic mean was used to calculated the premium (4) which was calculated for the given day between 2004 and 2013 – the correlation co-efficient (according to the daily data) was -0,28. Both values should be found as weak correlation.

[7] According to the widely published interpretation of Guilford's relationships correlation power.

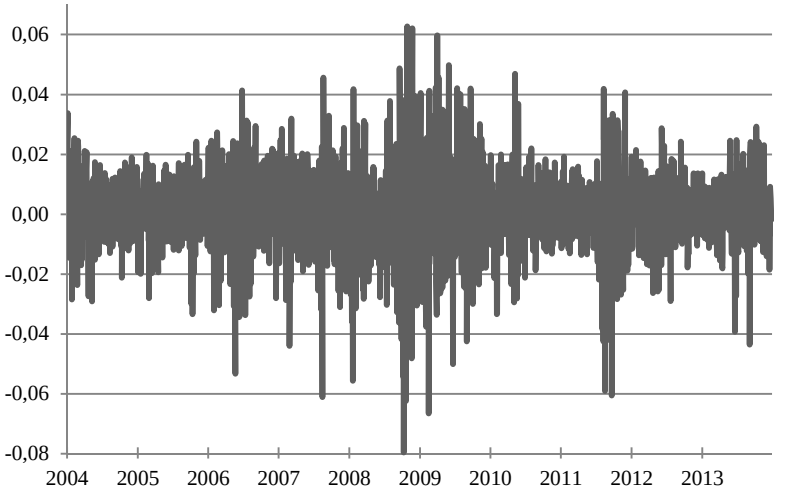
Figure 2. Risk premium assessed in four ways



Source: own study on the basis of market data.

GWP has got a comparatively short history of operating. The characteristic issue is that after periods of hossas, a lot of bessa periods can be expected. That is why the premium determination, as a difference between average market return rate and fisk-free rate, was not considered in the analysis. The average return rate from the whole market would be the average of very high positive return rates and very low ones. In the figure 2, the results of the analysis of assessing market premium with the established methods were presented. The Premium (2) and the Premium (3) are characterized by negative values. They are caused by extremely low WIG values, which referred to daily changes. In the analyzed period, WIG-2 value (which is Rm) was changing in the range of <-7,95%;6,27%>, which is shown in the figure 3. However, the treasury bills value was always positive and in the range of <3,47%;7,51%>, which caused the low premiums, assessed with those methods.

Figure 3. WIG value – daily changes



Source: own study on the basis of market data.

A much better assessment way is considering the WIG changes in accordance to the begining of the year, which is coherent with the methodology of annual WIG[8] value calculation, according to GWP.

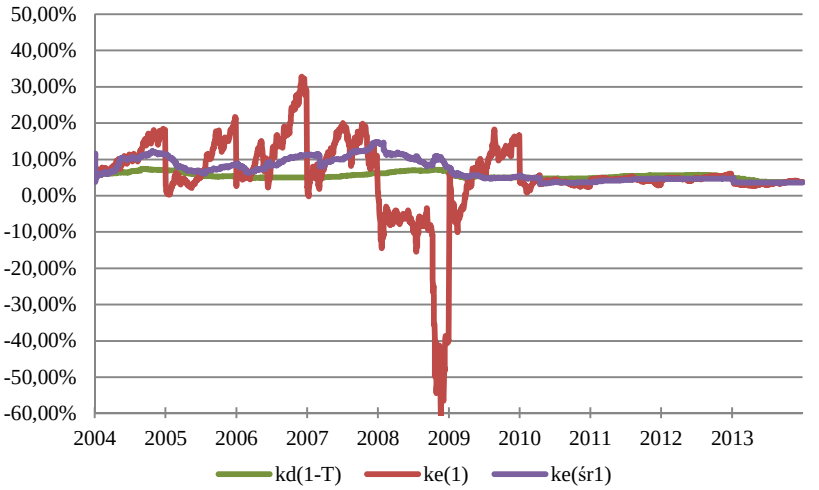
Premium (1) reflects the capital market behaviour. Considering the premium, the period of crisis can be noticed, which strongly left na imprint on the premium value. So, it should be considered that Premium (1) is the best variant to imitate the situation in the market. Notwithstanding, considering non-financial investment, which are characterized by long time of realization, the best assessment of risk premium is Premium (4). The last of the analyzed possibilities of determining the premium "flattens" the temporary return rates fluctuations, and this is the premium for the given period – the long-term one. Moreover, the values premium assessed in that way are best suitable for long-term investments. It is proven by research conducted by a number of analyzers. Those values determine the premium value, up to a few percent for longer periods. What is more, the risk premium, deter-

[8] According to GWP, the value of WIG return rate for the given year is calculated as a difference between a closing bell from the last day of the year in relation to a closing bell from the last day of the previous year. The closing bell from the last day of the year equals an opening bell from the first day of a year – that is why, the concept "according to the beginning of the year" is used.

mined with this method for several-years period, is consistent with using the arithmetic mean.

Determination and selection of risk premium allow to assess the rate of equity capital cost. Next, the cost of debt capital was determined. It caused the determining of WACC rate for the analyzed companies. The results are going to be discussed for all[9] examined companies, however the figures are going to be presented only for 3 previously selected companies – figures 4, 5, 6.

Figure 4. The rate of equity capital cost[10] (for premium(1) and premium(4)) and the cost of debt capital – Elkop

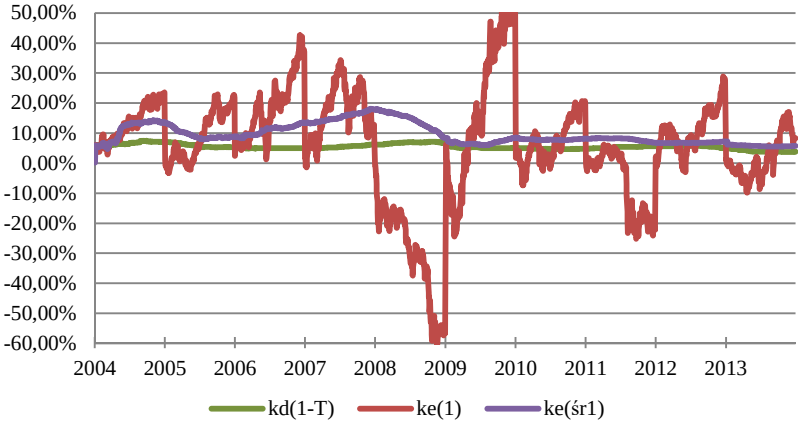


Source: own study.

[9] Analyzed companies from the construction sector: Awbud, Budimex, Elbudowa, Elkop, Enap, InstalKrk, MostalPlc, MostalWar, MostalZab, Prochem, Projprzem, Ulma, CNT.

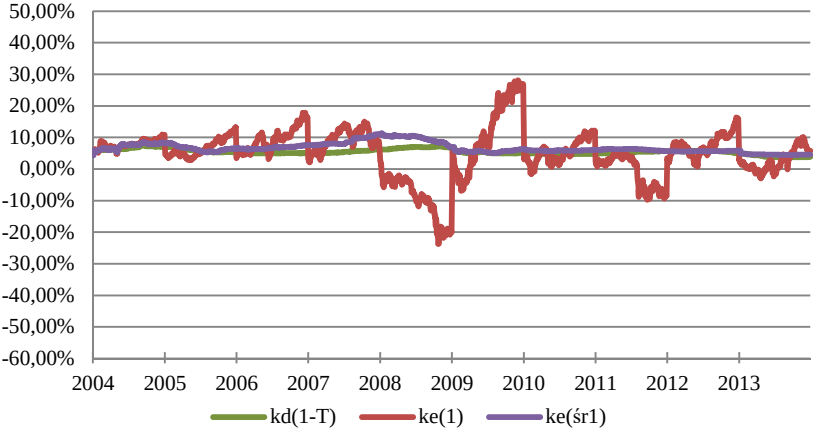
[10] Ke(1) for premium(1), ke(śr1) for premium(4) because it is the average of premium(1).

Figure 5. The rate of equity capital cost[11] (for premium(1) and premium(4)) and the cost of debt capital – MostalZab



Source: own study.

Figure 6. The rate of equity capital cost[12] (for premium(1) and premium(4)) and the cost of debt capital – Prochem



Source: own study.

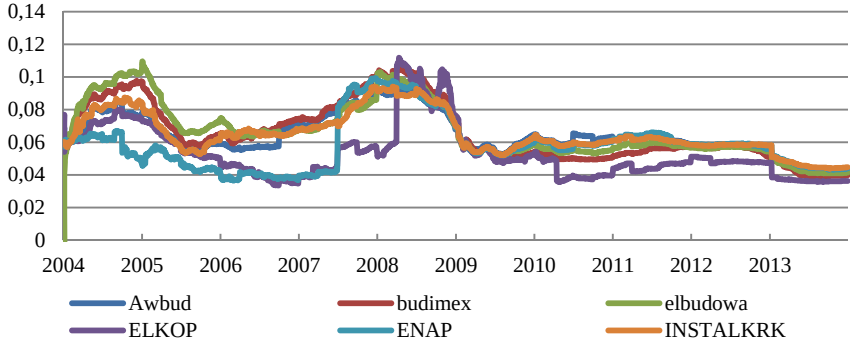
[11] Ke(1) for premium(1), ke(śr1) for premium(4) because it is the average of premium(1).

[12] Ke(1) for premium(1), ke(śr1) for premium(4) because it is the average of premium(1).

Since the assessed values of risk premium concern WIG return rates and treasury bills, the risk premium does not change for each company. Within the limits, the differences in capital cost are related to beta co-efficient[13], which is the reflection of systematic risk of the given company. So, the systematic risk has the biggest influence on the value of equity capital cost in CAPM model. However, the same tendency of changing the rate of equity capital cost is determined by assessed risk premium. Additionally, it should be noticed that, in the years of economic crisis, the cost of equity capital (ke(1)) for all companies was negative, which results from the calculations. It confirms the belief that the best assessing method of risk premium, for the needs of non-financial investments, is Premium(4). That premium is related to the characteristic feature of non-financial investment which is long-term. The negative cost of equity capital would not reflect in the interpretation of equity capital cost, which is the demanding return rate from the invested capital. The negative value would mean negatively about the invested capital of the enterprise. It should be noticed that the equity capital cost at the given day can differ remarkably.

The analysis of capital cost was enriched by the determining debt capital cost (calculated on the basis of the rate of Warsaw Interbank Offered Rate (WIBOR)3m and 2% margin), reduced by tax shield. It allowed to determine WACC for each company. The results of assessing the discount rate with WACC method are presented in the figure 7 and figure 8.

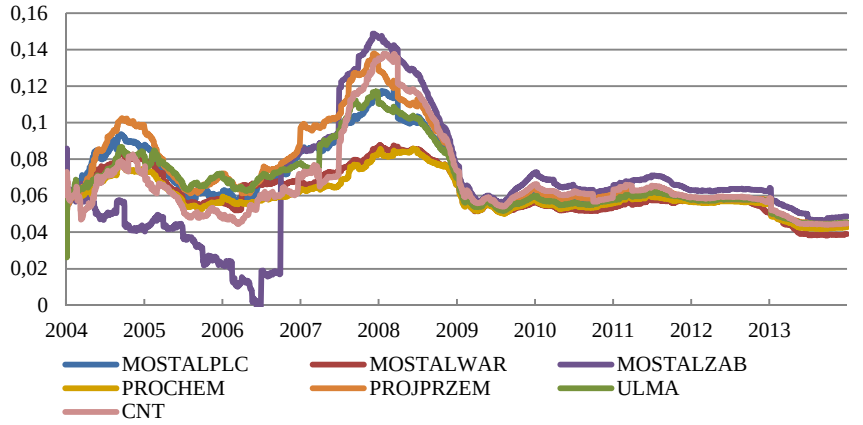
Figure 7. The value of the discount rate (WACC) in the analyzed period part 1



Source: own study.

[13] Co-efficient beta was measured as co-variance of investment returns, together with the return in the portfolio market. To save the comparison of co-variances for particular investments, the comparison of co-variance is divided by the returns from the whole market.

Figure 8. The value of the discount rate (WACC) in the analyzed period part 2



Source: own study.

The results present that sometimes the debt capital cost can be higher than the equity capital cost (it depends on the situation in the market) which happens very often during the years of crisis. The assumed methods of calculation of the risk premium allow to take such situations into consideration. Among conducted research for 13 companies, it was the most significant for: Elkop (figure 4), MostalPlc, MostalWar, CNT, Prochem (figure 6). Nevertheless, the most important conclusion is the assumption that the capital cost rate (calculated with WACC), which is the discount rate, is not constant in the analyzed period – figure 7 and figure 8. Over the ten years, the capital cost measured with WACC (assumptions: k_e(śr1) for equity capital cost, because it is the best match to the long-term investment character) was changing. Over the course of time, the difference minimized (using average premium "flattened" the values), however the value of capital cost was changing with time.

Conclusions

The conducted research allows to calculate equity capital cost considering several different possibilities of assessing risk premium. The value of risk premium can differ remarkably, not only considering the choice of the premium assessing methods. The value differs every day. The conducted research allows to select the market premium assessing method. Premium(1) exemplifies the situation in the market well, which is short-term as

well. In the case of decision-making, concerning non-financial investments, which are long-term, the best solution is premium(4). Premium(4) is the average value of premium(1) for the given period. The average value is better for long-term period because, when assessing the discount rate for the needs of non-financial investments, the investor should consider long-wave market information.

In the analyzed period, it was presented that the capital cost of examined companies, calculated on any given day in the examined period, changes. The conducted research allowed to show that the discount rate (determined by WACC) varies in time and the constant discount rate should not be determined during the assessment of non-financial investment profitability for the whole period of investment realization. The variable discount rate can cause that so far considered investment will be unprofitable. However, if a constant discount rate were used, the investment would be profitable.

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