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# ESTIMATION OF THE COST OF EQUITY FOR MINING COMPANIES USING THE P-LEFAC METHOD

# SZACOWANIE KOSZTU KAPITAŁU WŁASNEGO SPÓŁEK GÓRNICZYCH PRZY UŻYCIU METODY P-LEFAC

This article describes one of the methods of estimating the cost of equity, namely the LEFAC method. The name of the method is an acronym of the names of individual financial categories: *L* – Liquidity, *E* – Earnings, *F* – Franchise, *A* – Assets, *C* – Capital. It is a scoring method similar to the way used by ING Financial Markets to estimate share prices. A review of literature shows that this method is not widely known and used by enterprises, but it has certain advantages which justify its use. Its main advantages include its easy use and the stability of the results obtained: the calculated cost of equity is never lower than the adopted risk-free rate. The method is particularly useful for companies (enterprises) not listed on stock exchanges. This article is divided into five parts: an introduction, the LEFAC method, the parameterization of the LEFAC method (P-LEFAC), an example calculation and a summary. The second part of this article characterises the LEFAC method. In the third part, the method is parameterized to obtain a function described by formula 22. The following section contains an example calculation for KGHM S.A. and also presents results which mining companies would achieve if they used the discussed method to calculate the cost of their equity. The calculations were performed for mining companies listed on the Warsaw Stocks Exchange and unlisted ones. This part of the article also contains a short comparison of results obtained using the CAPM method and the discussed model. The last section consists of a summary presenting final conclusions. The article ends in a list of the literature referred to.

**Keywords:** cost of capital of mining companies, cost of equity, LEFAC method parameterization, LEFAC method

Niniejszy artykuł został poświęcony jednej z metod szacowania kosztu kapitału własnego, a mianowicie metodzie LEFAC. Nazwa metody pochodzi od pierwszych liter wyrazów z języka angielskiego, które określają poszczególne kategorie finansowe: *L* – Liquidity (płynność), *E* – Earnings (zyski), *F* – Franchise (strategia), *A* – Assets (aktywa), *C* – Capital (kapitał). Jest to metoda punktowa (scoringowa) zbliżona do sposobu określania wartości cen akcji wykorzystywana przez ING Finansial Markets. Jak wynika z przeprowadzonego przeglądu literatury, metoda ta nie jest powszechnie znana i używania przez przed-

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siębiorstwa, niemniej jednak posiada ona pewne zalety, uzasadniające jej wykorzystanie. Do jej głównych atutów należy zaliczyć łatwość zastosowania oraz „stabilność" uzyskiwanych wyników - wyliczony koszt kapitału własnego nigdy nie będzie przyjmował wartości mniejszych niż przyjęta stopa wolna od ryzyka. Omawiana metoda ma swoje szczególne zastosowanie do spółek (przedsiębiorstw), które nie są notowane na giełdach papierów wartościowych. Niniejszy artykuł składa się z pięciu części: wstępu, metody LEFAC, parametryzacji metody LEFAC (P-LEFAC), przykładu obliczeniowego oraz podsumowania. Druga cześć opracowania dotyczy charakterystyki metody LEFAC. W trzeciej części artykułu dokonano parametryzacji metody uzyskując funkcję określoną przez wzór 22. Kolejny rozdział zawiera przykład obliczeniowy dla spółki KGHM S.A., w rozdziale tym zaprezentowano również wyniki, jakie uzyskałyby spółki górnicze stosując omawianą metodę obliczania kosztu kapitału własnego - obliczeń dokonano zarówno dla spółek górniczych notowanych, jak i nie notowanych, na Warszawskiej Giełdzie Papierów Wartościowych. W tej części artykułu zaprezentowano również krótkie porównanie wyników uzyskiwanych przy zastosowaniu metody CAPM z omawianym modelem. Ostatnim rozdziałem jest podsumowanie, w którym przedstawiono wnioski końcowe. Całość artykułu została zamknięta spisem wykorzystanej literatury.

**Słowa kluczowe:** koszt kapitału spółek górniczych, koszt kapitału własnego, parametryzacja metody LEFAC, metoda LEFAC

# 1. Introduction

The last 15 years have seen Polish mining undergoing constant changes, mainly aimed at raising its production and improve its economic and financial standing (Magda, 2009). Today, mining companies are increasingly focusing on growing the shareholder value (Kustra, 2009). In this context, one of the factors determining the value of a mining company is its weighted average cost of capital (WACC), which, according to accepted rules, reflects the cost of equity and of external capital. The latter is relatively easy to estimate as it usually consists of the cost of a bank loan or corporate bonds issued by the given mining company. The cost is understood as the cost of the borrowed capital, i.e. the interest rate of the loan contracted, the bond coupon or the discount rate in case of zero-coupon bonds. This value is usually adjusted for income tax as the interest on the loan contracted is tax-deductible, so it reduces the taxation base. It should be noted here that larger mining companies enjoy an easier access to capital and incur a lower cost of it than smaller companies (Bąk, 2008). This regularity is mainly due to the lower credit risk of larger companies. The cost of external capital is not free of risk, which mainly stems from interest rate changes. This risk can be mitigated using various derivatives, including swaps and FRAs, which, although new for the Polish mining industry, gain its increasing appreciation (Brzychczy, 2012). It should also be added that the structure of corporate finance changed during the economic slowdown. The global economic crisis which began in 2007 has caused a significant change in the capital structure. Mining companies increased the share of own equity in total financial sources and intend to use long-term corporate bonds as a more flexible form of debt (Sierpińska, 2012).

Estimating the cost of equity is much more complex. It usually includes the risk-free rate (which is assumed to be the minimum return on investment) which is set at the level of the safest possible investment alternative to the investment in question. This investment is usually deemed to correspond to the interest rate of 52 week Treasury bills. The second component of the cost of equity is the risk of the specific investment, or more specifically, the premium for the risk borne by the investor when it finances the venture with its own funds. There are many methods for estimating the cost of equity, of which the most popular are certainly the Capital Assets Pricing Model (CAPM) and the Gordon method, called the Dividend Growth Model (DGM). A less known method of estimating the cost of equity is LEFAC (described in section 2).

This article focuses on two methods of estimating the cost of equity, namely CAPM and LEFAC. These methods have many advantages, but are not free of shortcomings. The main problems associated with estimating the cost of equity using the CAPM include difficulties with estimating the beta coefficient (Wyrobek, 2009; Gołębiewski & Skibińska, 2009). On the other hand, an indisputable advantage of this method is its direct reference to the market on which the enterprise runs its business. The LEFAC method, in turn, does not feature tools allowing a direct reference to the market, which constitutes its drawback, but this may be offset by the ease of use and the zero probability of obtaining a cost of equity lower than the risk-free rate, which are its advantages.

## 2. LEFAC method

The basis of the method discussed here (P-LEFAC, with P standing for 'parameterized') is the LEFAC method. This has been presented and used by ING Financial Markets to price shares. It has not been discussed widely in the literature. It was first used in Poland in 2002 by Mr D. Górski, an analyst with ING Securities (Cwynar & Dżurak, 2010).

The name of the method (LEFAC) is an acronym of the names of individual financial categories: $L$ – Liquidity, $E$ – Earnings, $F$ – Franchise, $A$ – Assets, $C$ – Capital. This method is classified as a scoring one, and apart from the above use, it is similar to the scoring methods used by banks to determine credit risk. The general way in which the cost of equity is estimated using the LEFAC method is not much different from that known from e.g. the CAPM model and looks as follows:

$$R_e = R_f + PR \tag{1}$$

where:

$R_e$ — the cost of equity,
$R_f$ — the risk-free rate,
$PR$ — the risk premium.

The difference between the presented method and the CAPM model is visible in the way the risk premium is estimated. The CAPM model is based on the beta market risk index, while the LEFAC method estimates the risk premium using the following formula:

$$PR = \left( \frac{L + E + F + A + C}{5} \right) \times j \times R_f \tag{2}$$

Risk is estimated for each of the presented financial areas. It is scored, usually within a range from 1 to 5, where 1 represents a very good situation (a low risk of the parameter) and 5 a very bad one (a high risk of the parameter). Companies using this method to estimate the risk premium do not disclose the indicators or premises according to which they assign the score. The original concept of ING Financial Markets seems to indicate that these results are based on a qualitative assessment of individual areas, whereas the first parameter (liquidity) is estimated according to the liquidity of the shares of the company. The $j$ parameter shown in formula (2) can be defined as the base premium: according to literature analysis, it is assumed at 0.25; one can also assume that this is the beta risk index for the treasury bonds of a given state (assuming that the risk-free rate was assumed based on these bonds) (Gołębiewski & Szczepankowski, 2007).

As there are no defined factors to be used to assign scores to individual financial parameters, we can set them quite flexibly, differently for various markets or economic sectors and depending on what company is being assessed. A. Cwynara and P. Dżuraka, business consulting directors at PricewaterhouseCoopers suggest the following indicators for assessing individual financial areas of the LEFAC method (Cwynar & Dżurak, 2010):

1. $L$ – liquidity – the current liquidity ratio relative to the industry average,
2. $E$ – earnings – profitability assessed based on ROE and ROA relative to the industry average,
3. $F$ – franchise – subjectively assessed by the analyst,
4. $A$ – assets – the asset turnover ratio TAT relative to the industry average,
5. $C$ – capital – the debt to asset ratio (D/A) relative to the industry average.

It is proposed to relate all ratio assessments (apart from the franchise) to the average market values, but this is not an absolute obligation, just a suggestion. If the indicators are related to the market, this produces the investment risk of the venture compared to the market average.

## 3. LEFAC method parameterization

The primary drawback of this method is that it is discretionary due to the scoring nature. An analyst assigns scores for individual financial ratios according to his/her own experience and market knowledge, thus obtaining the risk premium, and therefore also the cost of equity. The LEFAC method is mainly based on the value of financial ratios. The majority of these ratios are quotients of two financial figures ($x/y$). In the method described in section 2, these figures can be described as follows:

1. $x$ – the following figures: working assets, net profit, sales, total liabilities;
2. $y$ – external capital, equity, total assets.

For the majority of financial ratios, the $x$ and $y$ parameters fulfil the following conditions:

$$x \in (-\infty;+\infty)$$

$$y \in (0;+\infty)$$

The parameterization of this method will consist in defining:

- the value of the financial ratio $n$ for which the score $a$ reaches the minimum, i.e. is associated with the lowest risk;
- the value of the financial ratio $k$ for which the score $a$ reaches the maximum, i.e. is associated with the highest risk;

where:

1) maximum score $b$ – corresponds to the minimum value of the financial ratio and communicates the maximum risk;
2) the minimum score $b$ – corresponds to the maximum value of the financial ratio and communicates the minimum risk.

It is therefore necessary to build a function $f(m)$ which will fulfil the following conditions:

$$\lim_{\frac{x}{y}\to n} f(m) = a \tag{3}$$

and

$$\lim_{\frac{x}{y}\to k} f(m) = b \tag{4}$$

It should be noted here that the parameter $(x/y)$ constitutes a financial ratio of the mining company being assessed. In this article, these ratios consist in individual indicators making up the assessment of the risk premium itemised in the LEFAC method.

The presented value 'm' is one for which the following conditions are fulfilled:

1. Condition 1 – if $x/y$ in equation (3) tends towards $k$, the value of function $f(m)$ must be equal to $b$, and
2. Condition 2 – if $x/y$ in equation (4) tends towards $n$, the value of function $f(m)$ must be equal to $a$.

Function $f(m)$ meeting the conditions defined by relationship (3) may take the following form:

$$f(m) = a - \frac{x}{y}m + nm \tag{5}$$

Function $f(m)$ meeting the conditions defined by relationship (4) may take the following form:

$$f(m) = b - \frac{x}{y}m + km \tag{6}$$

Based on proposed functions (5) and (6) which fulfil the general assumptions, it is possible to determine a value of $m$ which must meet the following, previously adopted conditions:

**Condition 1.**

$$a - km + nm = b \tag{7}$$

hence:

$$m = \frac{b-a}{n-k} \tag{8}$$

**Condition 2.**

$$b - nm + km = a \tag{9}$$

hence:

$$m = \frac{b-a}{n-k} \tag{10}$$

If $m$ is substituted in function (5) or (6), these functions turn out to be equal, which justifies the claim that the same results should be obtained whether function (5) or (6) is used.

In accordance with the assumptions made earlier, if the $(x/y)$ ratio tends to $k$, function $f(m)$ given by formula (5) should be equal to $b$:
thus:

$$f(m) = a - km + nm \tag{11}$$

Function $f(m)$ is identical to the following form:

$$f(m) = a + nm - km \tag{12}$$

hence:

$$f(m) = a + m(n - k) \tag{13}$$

Coefficient $m$ was substituted with the relationship given by equation (8) or (10).

$$f(m) = a + \frac{b-a}{n-k}(n-k) \tag{14}$$

hence:

$$f(m) = a + b - a \tag{15}$$

hence:

$$f(m) = b \tag{16}$$

So the condition has been fulfilled.

In accordance with the assumptions made earlier, if the $(x/y)$ ratio tends to $n$, function $f(m)$ given by formula (6) should be equal to $a$:
thus:

$$f(m) = b - nm + km \tag{17}$$

hence:

$$f(m) = b - m(n - k) \tag{18}$$

Coefficient $m$ was substituted with the relationship given by equation (8) or (10).

$$f(m) = b - \frac{b-a}{n-k}(n-k) \tag{19}$$

hence:

$$f(m) = b - b + a \tag{20}$$

hence:

$$f(m) = a \tag{21}$$

So the condition has been fulfilled.

The proposed function $f(m)$ is unlimited, and the presented parameterization assumes a limited function. By introducing limits for function $f(m)$, a value $V$ given by relationship (22) was obtained.

$$V = \begin{cases} a, f(m) < a \\ f(m), a \le f(m) \le b \\ b, f(m) > b \end{cases} \tag{22}$$

where:

$V$ — the score of the parameter for individual financial figures of the P-LEFAC method.

The situation described as $a, f(m) < a$ can occur if the analyst sets the maximum and minimum values of a given ratio at a specific level, while the value of this financial ratio is below that assumed by the analyst. The situation described as $b, f(m) > b$ can occur in the opposite circumstances, namely when the value of a given financial ratio is higher than assumed by the analyst.

The presented parameterization is not free of drawbacks, so one should stay rational when using a parameterization of the described method. The proposed solution is only to support decision-taking and does not exclude the involvement of an analyst in developing individual parameters for estimating the risk premium. A good example is the first of the parameters, i.e. the quick ratio. In accordance with the assumptions presented, the higher this ratio, the lower the risk. However, this is a binary decision, because if the value of this ratio exceeds e.g. 2, then the analyst's assessment may not be high – this decision may be justified by the argument that the company is keeping surplus cash, which is not favourable from the point of view of the good commercial management of this company and can negatively impact its operations in the longer term. In this situation, however, the LEFAC (and the P-LEFAC) method tries to correct such cases using the coefficient $F$. In such circumstances, enterprise franchise $F$ will get a worse assessment and will take the value of 5, for example.

As mentioned in the introduction to this article, the LEFAC method is not very popular and is rarely used by Polish companies to estimate the cost of their equity. In the light of the discussed drawbacks and advantages of this method and also of the most popular CAPM method, one can claim that in some circumstances the P-LEFAC method can supplement CAPM, in a sense. Thus, the rate obtained from the CAPM method can be accepted as the main cost of capital, but if the values produced by this method are lower than the risk-free rate, one should assume that the cost of equity calculated using the P-LEFAC method is more realistic. The above considerations are presented in the relationship defined by formula (23).

$$R_k = \begin{cases} CAPM, CAPM \ge R_f \\ P-LEFAC, CAPM < R_f \end{cases} \tag{23}$$

where:

$R_k$ — the higher value of LEFAC and CAPM selected as the cost of equity.

## 4. Example calculation

For the purposes of this article, the cost of equity was calculated for a company listed on the Warsaw Stock Exchange: KGHM S.A. To be able to complete the calculation procedure, one must first select the appropriate financial ratios which will form the basis of the analysis. The following financial ratios were used in this example: the current ratio ($W_{bp}$), the return on assets (ROA), the total asset turnover (TAT) and the overall debt ratio (D/A). The value defined in the

method as franchise ($F$) was assumed at 2.5. Individual financial figures for KGHM S.A. are presented in Table 1. According to the assumptions shown in formulas 1 and 2, in this example the value of the coefficient $j$ was assumed at 0.25 and the risk-free rate $r_f$ was assumed as the equivalent of the yield of 52-week Treasury bills, i.e. at 4.47%. For the purposes of the P-LEFAC method, the maximum $b$ and the minimum $a$ values must be set. In this example it was assumed that $a = 1$ and $b = 5$. The minimum and maximum values of individual ratios (Table 1) were determined using figures for companies included in the WIG20 index.

TABLE 1

Basic financial figures for KGHM S.A.

| Ratio | Minimum ratio value | Maximum ratio value | KGHM S.A. ($x/y$) |
|---|---|---|---|
| WPB | 0.2522 | 0.8865 | 0,838 |
| ROA | 1.75% | 4.49% | 3.6% |
| TAT | 0.1431 | 1.0222 | 0.199 |
| D/A | 0.0028 | 0.1308 | 0.056 |

*Source:* Own development based on financial statements of WIG20 companies

For the example discussed, individual parameters of function $f(m)$ take the forms presented in Table 2. The value of the $m$ coefficient was determined from formula (8).

TABLE 2

Parameters used to calculate the value of function $f(m)$

| Ratio | $m$ | $n$ | $k$ | $x/y$ |
|---|---|---|---|---|
| $W_{PB}$ | 6.31 | 0.8865 | 0.2522 | 0.838 |
| ROA | 145.74 | 4.49% | 1.75% | 3.6% |
| TAT | -4.55 | 0.1431 | 1.0222 | 0.199 |
| D/A | -31.25 | 0.0028 | 0.1308 | 0.056 |

For the $W_{PB}$ and ROA ratios, their maximum value means a lower risk. In the case of TAT and D/A, the maximum value represents a higher risk, while the minimum value corresponds to a lower risk.

Section 3 indicates that the values of function $f(m)$ for equations (5) and (6) should be equal. Calculation results for individual functions are presented in Table 3.

TABLE 3

Function $f(m)$ values for individual ratios

| Ratio | $f(m) = a - \frac{x}{y}m + nm$ | $f(m) = b - \frac{x}{y}m + km$ |
|---|---|---|
| $W_{PB}$ | 1.3 | 1.3 |
| ROA | 2.3 | 2.3 |
| TAT | 1.3 | 1.3 |
| D/A | 2.7 | 2.7 |

*Source:* own development

It has already been mentioned that the value of franchise was adopted as 2.5 for the purposes of this example. Consequently, in accordance with formula (2), the risk premium is equal to:

$$PR = \left( \frac{1,3 + 2,3 + 2,5 + 1,3 + 2,7}{5} \right) * 0,25 * 0,0447 = 0,0224$$

Thus the risk premium *PR* equals 2.24%. The cost of equity determined using formula (1) is equal to 6.71%.

The above method can be used to calculate the cost of equity for mining companies, both those listed on the Warsaw Stock Exchange [Jastrzębska Spółka Węglowa S.A. (JSW S.A.), KGHM Polska Miedź S.A. (KGHM PM S.A.), Lubelski Węgiel „BOGDANKA" S.A. (Bogdanka S.A.)], and unlisted ones [Kompania Węglowa S.A. (KW S.A.), Katowicki Holding Węglowy S.A. (KHW S.A.)].

The above example and the methodology presented in section 3 were used to execute the said calculations, whose results are presented in Table 4.

TABLE 4

The cost of equity of mining companies calculated using the P-LEFAC method

| Company | P-LEFAC |
|---|---|
| JSW S.A. | 6.97% |
| KGHM PM S.A. | 6.71% |
| Bogdanka S.A. | 7.83% |
| KW S.A. | 7.43% |
| KHW S.A. | 8.27% |

*Source:* own development

In this section, it was also decided to present the cost of equity calculated using both the CAPM and the LEFAC methods. The example below shows this result for years 2007-2013 for a listed mining company: KGHM PM S.A. The values of the cost of equity calculated using the CAPM method are shown in Fig. 1.

As Fig. 1 shows, the cost of equity of KGHM PM S.A. ranged from approximately 1.75% (while the risk-free rate fluctuated simultaneously around 6%) to almost 16% in 2007-2013. The very low cost of equity in 2008 and 2009 was most probably caused by the beginning global financial crisis. In accordance with the rule adopted, the cost of equity should not be lower than the risk-free rate. This is guaranteed by the P-LEFAC method, whose results for the same company and the same period are shown in Fig. 2.

Fig. 2 shows that the cost of equity calculated using the LEFAC method for KGHM PM S.A. ranged from 6% to almost 14%. A comparison of results obtained using the two presented methods shows them to be similar except in years 2008 and 2009, in which the cost of equity calculated using the CAPM method fell below 2%.

The relationship described by formula (23) allows us to determine the cost of equity for KGHM PM S.A. in 2007-2013, as shown in Fig. 3.

When the relationship given by formula 23 is used, the cost of equity of KGHM PM S.A. in 2007-2013 ranges from 6% to 16%. This relationship allows the cost of equity to be limited in such a way that it does not fall below the risk-free rate.

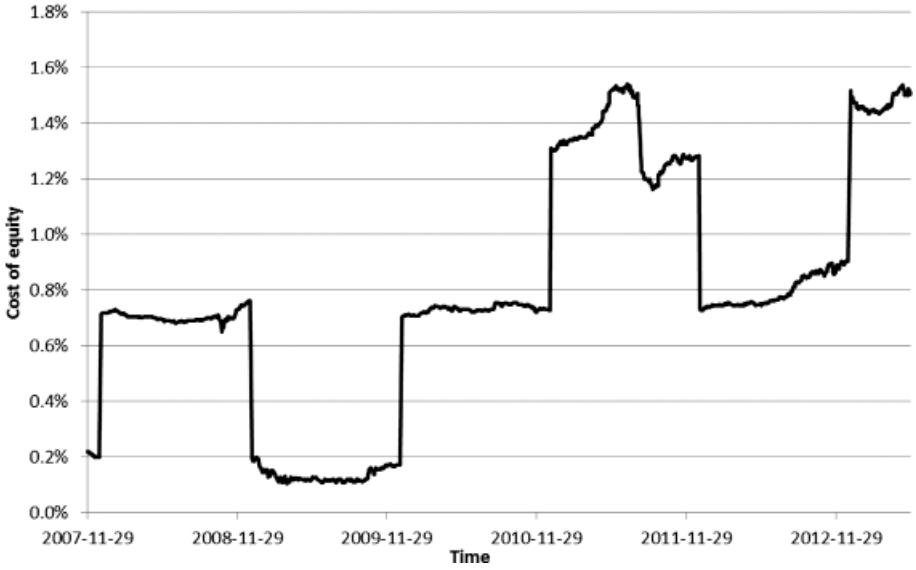


Fig. 1. The cost of equity of KGHM S.A. for 2007-2013 calculated using the CAPM method


Fig. 2. The cost of equity of KGHM S.A. in 2007-2013 calculated using the LEFAC method

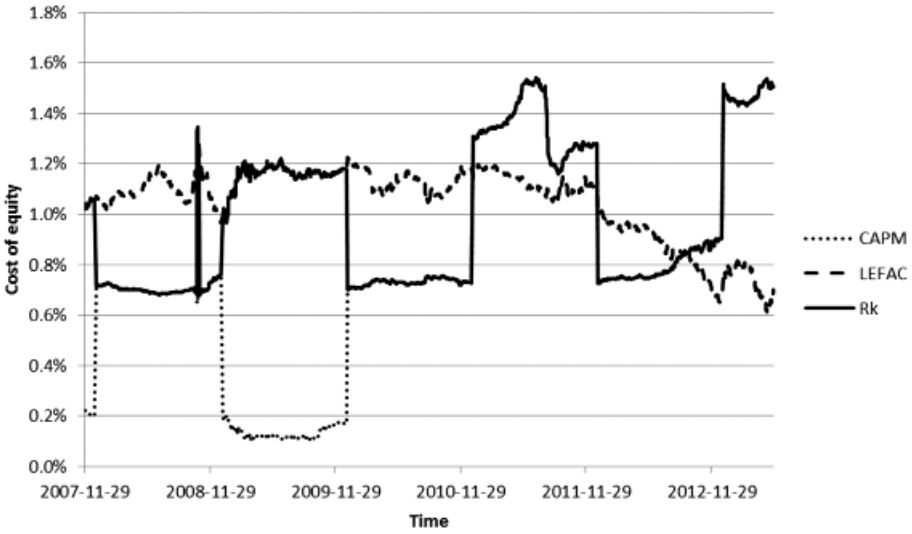


Fig. 3. The cost of equity of KGHM S.A. in 2007-2013 calculated using the relationship given by formula (23)

## 5. Summary

The presented method of estimating the cost of equity is not the only one that can be used by Polish mining companies. Neither is it the most popular method, unlike CAPM and DGM. However, it represents one of the possibilities and allows the results obtained to be compared to those from other methods. Indisputable advantages of this method include its ease of use. Another noteworthy strength of the P-LEFAC method is that unlike popular methods such as CAPM, it does not assume that one can obtain a cost of capital lower than the risk-free rate (while CAPM can even produce a negative cost of equity in extreme cases). Just like any method, the described one also has drawbacks. The main drawback of LEFAC (and P-LEFAC) is that it does not directly refer to the situation on the market on which the given company is active, but only to that company's financial results. However, the combination of the CAPM and P-LEFAC methods shown in relationship (23) allows these drawbacks to be partly eliminated, while emphasising the advantages of these methods.

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