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# Risk-adjusted discount rate and its components in evaluating hard coal projects at the feasibility stage

## Introduction

A fundamental source of the company risk comes from project uncertainty. The company risk is then an individual characteristic of a business related to its specifics. Investing in mineral projects is determined by some rare features that distinct them from other activities. These include exceptionalities that come from uniqueness of a deposit as subject of labor i.e. depletability and scarcity of (finite) resources, particular location, volume, geological setting and structure of the seam, its extent, form, depth, width and strike. These, altogether with technical means and volume of mineral reserves, determine a project lifetime.

The project lifetime in the mineral industry involves exceptionally long both pre-production and mining periods. A typically grand scale of mineral investment implies im-

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mense capital expenditures, incurred in several non-productive years, and then – during the long production period itself. One of the major uncertainties is the cyclical and highly-volatile character of mineral prices in conjunction with inflexibility and diversity of mining process.

Evaluating above mentioned risks and, in consequence, a mineral project is not a trivial task then. This is because of time value of money – due to the potential losing capacity the money earned in the future is worth less than the identical sum available at the present time. So, every investor is interested in earning expected payoffs as soon as possible (time preference). They might choose to invest money in uncertain project only if they earned 'premium' compensating risk involved. That premium is normally understood in terms of an interest rate.

Well known techniques commonly used for project evaluation are within an income approach. They apply projected yearly cash flows highlighting the time value of money. These techniques are the net present value (NPV), and the internal rate of return (IRR) methods within discounted cash flow (DCF) analysis. DCF spreadsheets require expected revenues and costs for subsequent production periods. At the beginning one has to assess reserve volume and mine's yearly output, and then capital expenditures, operating costs, price paths, taxes etc. for the whole project's lifetime.

It is clear, that the level of uncertainty (and, in consequence, risk) will decrease over time as a result of obtaining additional, mainly more precise geological information. Nevertheless, the better predicted values, the more powerful results received.

Mathematical formulas used for calculating NPV and IRR are not too complicated – both require the mentioned interest rate called, in this context, the discount rate or the cost of capital. This discount rate is used as the risk-adjusted discount rate, RADR, in the NPV method and as a minimal rate in the IRR method.

The risk-adjusted discount rate is a parameter that captures both time and risk issues involved with the project. This parameter is typically compared with the opportunity cost of capital of alternative investments.

As opposite to compounding, discounting is nothing more as making time-and-risk adjustments to every cash flow arising during the project's lifetime.

Analyzing simple mathematical formula of discounting, we can draw the following conclusions:

- the present value, PV, of future cash flows strongly depends on the level of discounting factor – the higher discount rate – the lower PV;
- there is a strong inverse relation between PV vs. project's lifetime and the level of risk (i.e. discount rate) – the higher long-term project discount rate, the lower value of cash flows derived from mid- and later years of the lifetime.

The latter fact means that value of future benefits might tend to be evaluated under their real worth.

As the discount rate reflects the level of (company, project) risk it is normal it will vary depending on the project's development stage. Comparing pre- and development stages and risk levels connected to them it is clear – assuming the same structure of financing – that we shall use lower rates for projects in the latter phase.

Nevertheless, due to the discount rate strongly influences present value of the venture, proper selection of it is of a great importance.

The detailed analysis of all important issues related to discount rates in the base metals industry was delivered by L.D. Smith in his significant works from the nineties of the last century (1995, 2000). His unique and – up to this day very rare – studies submitted wide and very valuable information about the practice of evaluation and application of the discount rate in the mineral industry. Since that time not too many articles have revolved around discount rate selection for mineral project evaluations – several of them recognize it in some different way (Truong et al. 2008; Tahheri 2009; Mohutsiwa and Musingwini 2015; Nhleko and Musingwini 2016). Also the author wrote a number of studies on it (i.a. Saługa 2000, 2017) – as well as in other disciplines (e.g. Saługa and Kamiński 2018). This article tries to follow creatively some of Smith's ideas in reference to the hard coal mining in Poland. This research could be very helpful for risk management and evaluations of hard coal projects.

## 1. Methods and data

The neoclassical economy assumes that all organizations behave rationally. As it has been stated before, a rational investor expects premium for the risk they take. This premium is expressed a discount rate they apply to convert future value of cash flows into their present value.

In our considerations we use the discounted cash flow analysis, which is commonly used in economic evaluations. The simplest pattern calculating net present value, NPV, of the project is as follows:

$$NPV = \sum_{t=0}^{T} \frac{CF_t}{(1+R)^t} \tag{1}$$

$CF_t$ – cash flow (covering also capital expenditures, working capital, closure cost and closure fund),

$R$ – discount rate or cost of capital.

This formula enables to calculate the internal rate of return, which is defined as the discount rate, at which the net present value becomes zero. Then, the formula (1) is transformed into the following:

$$\sum_{t=0}^{T} \frac{CF_t}{(1+IRR)^t} = 0 \tag{2}$$

The finance theory as the most suitable discount rate, $R$, recommends using the weighted average cost of capital, WACC. WACC is an average cost of all funds available to the company, including debt; one can simply say that, generally, it comprises of two basic elements: cost of equity, and cost of the borrowed capital according to the formula:

$$WACC = V_E RADR + V_D \left(1 - TAX\right) R_D \tag{3}$$

$V_E$, $V_D$ – proportions of equity, and borrowed capital in funding,
$RADR$, $R_D$ – respectively costs of equity capital, and debt,
$TAX$ – tax rate.

It goes without saying that the level of the discount rate used is highly dependent on the debt interest rate and of its extent in funding capital. These will vary across the industry. The research gets more interesting, when viewing the project evaluation on an all equity basis ($V_E = 1.0$), focusing on the RADR only. This is a justified idea, because an evaluation should measure inherent value of a project but not the ability to finance it (Smith 1995; Pera 2011). Such an approach allows you to make comparisons between companies and projects in terms of scale and components of risk.

There are a couple of models used to determine RADR, but in the industry practice, the most recommended method is the capital asset pricing model (CAPM), according to the formula:

$$RADR = R_f + \left(R_m - R_f\right)\beta \tag{4}$$

$RADR$ – cost of equity – expected return on assets $s$,
$R_m$ – expected return on market,
$R_f$ – risk-free interest rate,
$\beta$ – beta (i.e. risk) factor for assets $s$.

This model has been widely discussed lots of times in the literature. Its commonly known vice is that it helps to assess the cost of equity of a company but not of a project itself. In addition to that, in order to evaluate the cost of capital in this way analytically, a company must be listed on a stock market. That is why some companies often use corporate hurdle rates based on proven practice resulting from years of experience.

Formula (4) means that two primary components of the risk-adjusted discount rate are:
- risk-free rate,
- project-specific risk portion.

Foreign investors would add to the domestic discount rate also a country risk premium, that can be evaluate in many ways – for example by using country ratings prepared by professional agencies such as Moody's or Standard and Poors. Actually, country risk of Poland has been assessed at 1.18% (Damodaran online 2019). Risk-free returns depend on national economy and vary with time – when it comes to long-term projects usually they are taken form long-term (10-years) government obligations; currently (2019) in Poland a risk-free-rate may be estimated at 3.8–4% (nominal) (Forbes 2019; MF 2019; Investinfo 2019). To convert this rate into real value (zero inflation), one must apply widely-used Fisher formula:

$$1 + R = (1 + r)(1 + i) \tag{5}$$

$R$, $r$ – respectively, nominal and real interest rates (nominal values are expressed using the capital letters),
$i$ – inflation rate.

Long-term inflation rate prognosis by Narodowy Bank Polski (National Bank of Poland) is around 2.5% (NBP 2019). So the real risk-free rate calculation gives a value of about 1.5%.

As mentioned above, the problem is that the risk-adjusted discount rate calculated in the CAPM is the cost of capital of a company – not of a project. Anyway, in the industry practice companies use them to all projects in their portfolios, regardless their level of risk. However, while such an approach may be in a way justified for coal companies which mainly produce just coal, it seems that using an individual CAPM discount rate for all the projects undertaken by most of multi-metal companies is incorrect. In fact, risks vary across industry, development stage and a country. E.g., a zinc-and-lead project at the feasibility stage in Canada is a subject of distinct risks than an operating copper mine in the Democratic Republic of the Congo.

The greatest need to evaluate discount rate is at the pre- and feasibility studies of a project. Of course, the latter study is more important than previous one because successful completing a 'feasibility study' implies opening the door to realizing the project.

The above mentioned remarks forced us to focus on Polish hard coal projects at the feasibility study. The main goal of this work was to evaluate risk portions within the risk-adjusted discount rate used at that stage of project development. To do this, there has been examined a typical 8-year hard coal project (1.5 years of development and almost 7 years of exploitation together with a closure period) with marketable coal reserves over 7.65 M Mg (base case). Capital expenditures, spent over 2-year investment period, were estimated at 150 M PLNs (50 M in year '0' and 100 M in year 1). Flat coal price was taken at 250 PLN/Mg, and unit operating costs – 175 PLN/Mg. A budget of the working capital was 35 M PLNs; process recovery was estimated at 86%.

Apart from the all on the equity basis, other underlying assumptions included constant coal prices and operating costs, constant money (no inflation), after tax calculation. Such an approach Smith (2000) calls 'bare bones'. However, in reality that case probably never exists, we can repeat arguments for it – this approach delivers a good reference scenario that helps to make easy comparisons between investment opportunities.

Based on own and other authors' studies (direct experiences acquired in coal projects evaluations) (Saługa 2009; Park and Matunhire 2011; Ranosz 2017), discussions with some coal mines, reports (Prairie Mining Ltd. 2016), online sources (Damodaran online 2019) and numbers published by independent consulting companies, a specific long-term risk component at the feasibility stage of hard coal projects in Poland may be estimated at 7.0% (real). So the cost of equity for such projects might be evaluated at 8.5% (real). We would like to stress, that this amount is not any effective number – but we consider such a cost of equity as a credible – neither better nor worse starting point for any hard coal project evaluations at the feasibility stage.

In order to evaluate risk components within the cost of capital used for hard coal project at the feasibility stage this paper has been followed the Smith's approach checked on base metals example (1994, 2000). Firstly, making use of literature sources (Rupprecht 2004; AusIMM 2012; Mohutsiwa 2015) and drawing on own and expert experience (Pincock et al.

Table 1. Analysis of risk components in an 11% risk-adjusted discount rate at the feasibility study of hard coal projects in Poland

Tabela 1. Analiza czynników ryzyka w obrębie 11-procentowej stopy dyskontowej „dostosowanej do ryzyka" wykorzystywanej dla oceny projektów węglowych w Polsce na etapie studium wykonalności

| Risk components | Uncertainty (accuracy) | Sensitivity (slope) | Risk product | Relative risk | Risk factor |
|---|---|---|---|---|---|
| Risk-free rate (real) | | | | | 1.5% |
| Coal price | 20% | 10.67 | 2.134 | 0.432 | 3.0% |
| Operating costs | 15% | 8.41 | 1.261 | 0.255 | 1.8% |
| Coal reserves | 20% | 0.95 | 0.189 | 0.038 | 0.3% |
| Output | 5% | 0.91 | 0.045 | 0.009 | 0.1% |
| Capital expenditures | 15% | 1.45 | 0.218 | 0.044 | 0.3% |
| Process recovery | 10% | 10.94 | 1.094 | 0.221 | 1,6% |
| Risk portion (SUM) | | | 4.942 | 1.000 | 7.0% |
| **Cost of equity – risk-adjusted discount rate (real)** | | | | | **8.5%** |
| Country risk of Poland | | | | | 1.2% |
| **Cost of equity – risk-adjusted discount rate (real) with the country risk** | | | | | **9.7%** |
| Inflation | | | | | 2.5% |
| **Cost of equity – risk-adjusted discount rate (nominal)** | | | | | **11.0%** |
| **Cost of equity – risk-adjusted discount rate (nominal) with the country risk** | | | | | **12.2%** |

2012; Alch 2013; RPM 2015), there was assigned appropriate development stage uncertainties (as a level of accuracy) of main parameters used in the project (Table 1):

- reserves (20% of accuracy),
- output (5%),
- process recovery (10%),
- marketable coal price (20%),
- operating costs (15%),
- capital expenditures (15%).

Secondly a sensitivity analysis has been performed to investigate the influence of these variables on project's feasibility (as the change of IRR – it represents a percentage rate that gets direct more accurate comparative information to the discount rate), assessing the slopes of sensitivity lines on the spider diagram (Fig. 1). Assuming that:

$$risk = uncertainty \times consequences \tag{6}$$

risk product was calculated, then relative risk of each uncertain factor, and risk portion within RADR eventually (Smith 1995, 2000). Results present Table 1 and Fig. 2.

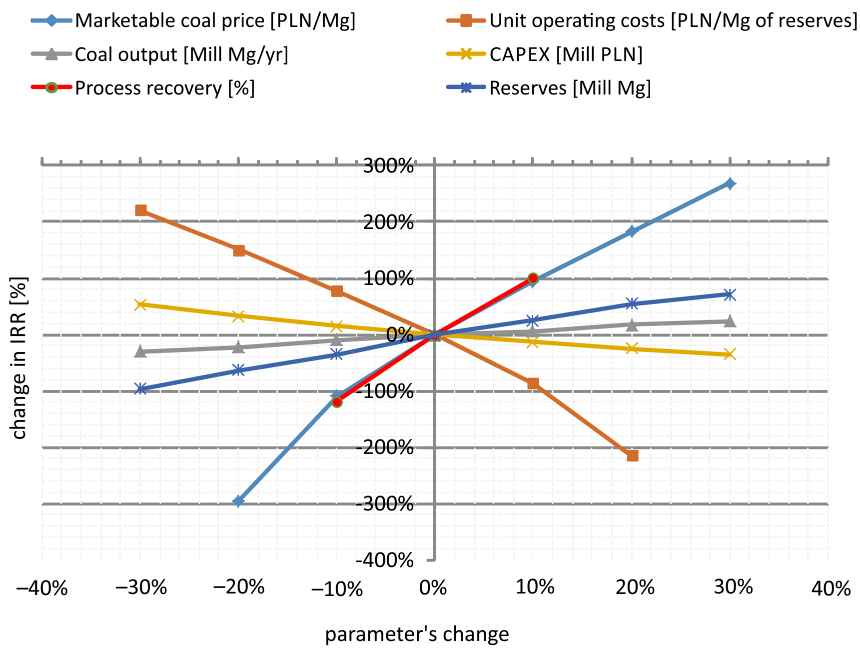


Fig. 1. The sensitivity of IRR to key coal project parameters

Rys. 1. Wrażliwość IRR na zmiany kluczowych parametrów projektów węglowych

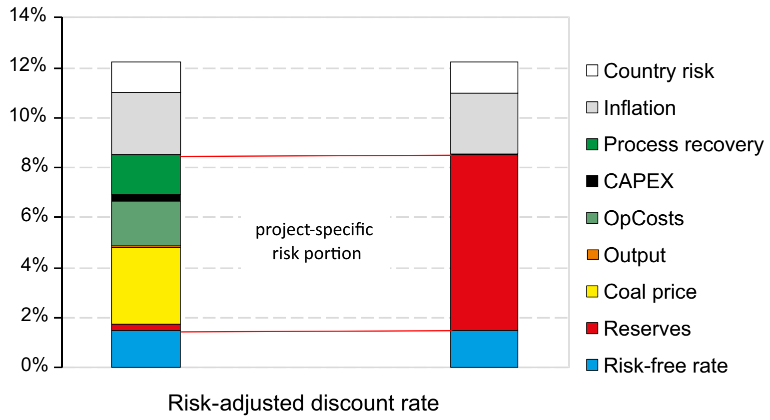


Fig. 2. Key risk factors portions of the 11% cost of equity rate of hard coal projects in Poland at the feasibility study

Rys. 2. Udział kluczowych czynników ryzyka w obrębie 11-procentowej stopy kosztu kapitału własnego stosowanego do oceny projektów węglowych na etapie studium wykonalności

## 2. Results and discussion

The obtained sensitivity values shown in Table 1 inform that for hard coal industry the coal price accounts for the largest (3%) share in the project-specific risk. The other important components of that risk at the feasibility stage are operating costs (1.8%) and process recovery (1.6%). Risks connected with coal reserves, production rate and capital expenditures are of less importance.

Results presented in Table 1 can be used, of course, for illustrative purposes only. The risk product value shows only possible proportions; it would be of little importance apart from the relative risk factor that helps to split proportionally the entire risk extent up into the distinct risk components within the 7.0% specific risk portion.

The presented approach may be used to cover uncertainty problems at other stages of project development; it can be supportive at estimating project risk factors, e.g., at the pre-feasibility or producing stages.

General knowledge about the distribution of project risks may be also useful for more advanced analyses – for example: real options analysis, ROA (Saługa 2011; Saługa and Kamiński 2016). Coal price risk can be hedged, so it might be interesting for purposes of ROA, which together with risk-free rate both represent over 50% of the risk-adjusted discount rate.

## 3. Summary and conclusions

In order to make decision an investor is motivated by two basic indicators: interest rates offered by banks or expected income rates of investment opportunities. Naturally, investing in risky alternatives has some specified consequences that call for sacrifices using the money today in order to gain a satisfactory return in the uncertain future. In the discounted cash flow analysis the parameter reflecting both time and risk involved in the project is the cost of capital. It comprises of two basic elements: cost of equity and cost of debt, and is commonly called as the weighted-average cost of capital, WACC. This discount rate reflects income expectations among the project funding bodies. Unhappily, the WACC cannot be credible discount rate to see which parameters are responsible for the amount of the discount rate – so, to eliminate this problem we took a 'bare bones' assumption (meaning calculation on all the equity basis, constant money – no debt, flat prices and costs). To evaluate risk portions within the cost of equity at the feasibility stage we had had to assess for the expected discount rate at the level of 8.5% (real). Naturally, one has to be aware that such a discount rate could be no effective for all hard coal projects at the feasibility study, but on the other hand that value is neither better nor worse than any other assumptions and can be a good starting point for present and further calculations. As a result we identified the crucial drivers of project risk at the feasibility stage – the marketable coal price (3% within the 8.5 percent cost of equity), operating costs (1.8%) and process recovery (1.6%). These parameters account for around 75% of the real risk-adjusted discount rate. This is valuable information in view of future managing hard coal projects – however, while managers are not able to influence the price volatility, they can conclude futures and forward contracts. Nevertheless, they should concentrate on activities they can affect: operating costs control and improving process capability. And it is, of course, what companies intentionally do, and this paper goes with it.

## REFERENCES

Alch, T. 2013. *Challenges, risks & opportunities for the mining industry in the Americas*. Behre Dolbear founded 1911 Minerals Industry Advisors (October 7). [Online] https://www.slideshare.net/TimAlch/alch-tim-presentation-behre-dolbear-15-august–2013-final [Accessed: 2019-10-08].

AusIMM 2012 – Australian Institute of Mining & Metallurgy. *Guidelines for technical economic evaluation of minerals industry projects* – Final draft for publication in the AusIMM Mine Managers' Handbook (due for release in November 2012). [Online] http://www.ausimm.com.au/content/docs/guidelines_tech_economic_evaluation2012.pdf [Accessed: 2019-10-08].

Damodaran Online 2019. Data. Costs of capital by industry (US, Europe, Global). Website of Aswath Damodaran. [Online] pages.stern.nyu.edu/~adamodar/ [Accessed: 2019-07-28].

Forbes 2019 – Jóźwik, T. 2019. *Ile zarabia się na obligacjach?* [Online] https://www.forbes.pl/gielda/ile-zarabia-sie-na-obligacjach-i-czy-mozna-stracic/18efbmn [Accessed: 2019-07-28] (*in Polish*).

Investinfo 2019. Średnia rentowność na przetargu obligacji skarbowych 10-letnich. [Online] https://www.inwestinfo.pl/stopy-procentowe/rentownosc-bonow-skarbowych-i-obligacji/srednia-rentownosc-na-przetargu-obligacji-skarbowych-10-letnich-27.htm [Accessed: 2019-07-28] (*in Polish*).

MF 2019 – Ministerstwo Finansów. *Obligacje Skarbowe. Obligacje 10-letnie EDO*. [Online] http://www.obligacje-skarbowe.pl/oferta-obligacji/obligacje-10-letnie-edo/edo0729/ [Accessed: 2019-07-28] (*in Polish*).

Mohutsiwa, M. 2015. *Estimation of capital costs for establishing coal mines in South Africa*, a research report, Faculty of Engineering and the Built Environment, University of the Witwatersrand, Johannesburg. [Online] http://wiredspace.wits.ac.za/jspui/bitstream/10539/18378/2/Moshe_Mohutsiwa_Estimation%20of%20Capital%20Costs%20for%20Establishing%20Coal%20Mines%20in%20South%20Africa.pdf [Accessed: 2019-07-28].

Mohutsiwa, M. and Musingwini, C. 2015. Parametric estimation of capital costs for establishing a coal mine: South Africa case study. *Journal of the Southern African Institute of Mining and Metallurgy* 115(8), pp. 789–797.

NBP 2019. *PKB i inflacja w Polsce. Prognozy na 2019–2021*. *Najnowszy raport NBP*. [Online] https://tvn24bis.pl/z-kraju,74/pkb-i-inflacja-w-polsce-prognozy-na–2019–2021-najnowszy-raport-nbp,950959.html [Accessed: 2019-07-28] (*in Polish*).

Nhleko, A.S. and Musingwini, C. 2016. Estimating cost of equity in project discount rates: comparison of the Capital Asset Pricing Model and Gordon's Wealth Growth Model. *The Journal of the Southern African Institute of Mining and Metallurgy* 116.

Park, S.J. and Matunhire I.I. 2011. Investigation of factors influencing the determination of discount rate in the economic evaluation of mineral development projects. *The Journal of The Southern African Institute of Mining and Metallurgy* 111, pp. 773–779.

Pera, K. 2011. Ways of taking into account the risk in discount methods of economic effectiveness assessment of mining investment projects (*Sposoby uwzględniania ryzyka w dyskontowych metodach oceny efektywności ekonomicznej górniczych projektów inwestycyjnych*). *Przegląd Górniczy* 67(6), pp. 7–15 (*in Polish*).

Pincock et al. 2012 – Pincock, Allen & Holt, 2012. Mineral Project Evaluation. *Pincock Perspectives*, no. 115 (July).

Prairie Mining Limited 2016. *Pre-feasibility study confirms LCP as one of the lowest cost global coal suppliers into Europe*. News Release, March 8. 73 p.

Ranosz, R. 2017. Analysis of the structure and cost of capital in mining enterprises (*Analiza struktury i kosztu kapitału w przedsiębiorstwach górniczych*). *Gospodarka Surowcami Mineralnymi – Mineral Resources Management* 33(1), pp. 77–92 (*in Polish*).

RPM 2015 – RungePincockMinarco. Minimum Engineering Study Requirements Update. *RPM Perspectives Issue*, no. 128, June.

Rupprecht, S. 2004. Establishing the feasibility of your proposed mining venture. Proceedings of the International Platinum Conference 'Platinum Adding Value'. *The South African Institute of Mining and Metallurgy*, pp. 243–247.

Saługa, P. 2000. Discount rates in mineral projects (*Stopy dyskontowe w górniczych projektach inwestycyjnych*). *Gospodarka Surowcami Mineralnymi – Mineral Resources Management* 16(3), pp. 91–112 (*in Polish*).

Saługa, P. 2009. Economic evaluation and risk analysis of mineral projects (*Ocena ekonomiczna projektów i analiza ryzyka w górnictwie*). *Studia, Rozprawy, Monografie* no. 152, Kraków: IGSMiE PAN, 278 pp. (*in Polish*).

Saługa, P. 2011. Application of real options analysis in the economic evaluation of the modernization venture of a heat-and-power plant (*Aplikacja algorytmu analizy opcji rzeczowych w procesie oceny ekonomicznej przedsięwzięcia modernizacji elektrociepłowni*). *Rynek Energii* I(VI), pp. 158–163 (*in Polish*).

Saługa, P.W. and J. Kamiński, 2016. Hard coal project valuation based on real options approach: multiplicative vs. arithmetic stochastic process. *Gospodarka Surowcami Mineralnymi – Mineral Resources Management* 32(1), pp. 25–39.

Saługa, P.W., 2017. Discount rate selection for long-term sequential mineral projects (*Dobór stopy dyskontowej dla długoterminowych projektów sekwencyjnych z branży surowców mineralnych*). *Gospodarka Surowcami Mineralnymi – Mineral Resources Management* 33(3), pp. 5–30 (*in Polish*).

Saługa, P. and Kamiński, J. 2018. The cost of equity in the energy sector. *Polityka Energetyczna – Energy Policy Journal* 21(3), pp. 81–96.

Smith, L.D. 1995. Discount rates and risk assessment in mineral project evaluations. *Canadian Institute of Mining and Metallurgical Bulletin* 88(989), pp. 34–43.

Smith, L.D. 2000. Discounted cash flow analysis and discount rates. *Proceedings of the Special Session on Valuation of Mineral Properties Mining Millennium 2000*. March, Toronto, Ontario, 2000. [Online] www.cim.org/mes/pdf/VALDAYLarrySmith.pdf [Accessed: 2019-07-28].

Taheri, M. 2009. Risk-adjusted discount rate estimation for evaluating mining projects. JASSA *The Finsia Journal Of Applied Finance* 4.

Truong et al. 2008 – Truong, G., Partington, G. and Peat, M. 2008. Cost of capital estimation and capital budgeting practice in Australia. *Australian Journal of Management* 33(1), pp. 95–122. [Online] www.agsm.edu.au/eajm/0806/pdf [Accessed: 2019-07-28].

## RISK-ADJUSTED DISCOUNT RATE AND ITS COMPONENTS IN EVALUATING HARD COAL PROJECTS AT THE FEASIBILITY STAGE

K e y w o r d s

hard coal mining, coal projects, risk-adjusted discount rate, cost of equity, feasibility study

A b s t r a c t

Because of the value of time, investors are interested in obtaining economic benefits rather early and at a highest return. But some investing opportunities, e.g. mineral projects, require from an investor to freeze their capital for several years. In exchange for this, they expect adequate remuneration for waiting, uncertainty and possible opportunities lost. This compensation is reflected in the level of interest rate they demand. Commonly used approach of project evaluation – the discounted cash flow analysis – uses this interest rate to determine present value of future cash flows. Mining investors should worry about project's cash flows with greater assiduousness – especially about those arising in first years of the project lifetime. Having regard to the mining industry, this technique views a mineral deposit as complete production project where the base sources of uncertainty are future levels of economic-financial and technical parameters. Some of them are more risky than others – this paper tries to split apart and weigh their importance by the example of Polish hard coal projects at the feasibility study. The work has been performed with the sensitivity analysis of the internal rate of return. Calculations were made using the 'bare bones' assumption (on all the equity basis, constant money, after tax, flat price and constant operating costs), which creates a good reference and starting point for comparing other investment alternatives and for future investigations. The first part introduces with the discounting issue; in the following sections the paper presents data and methods used for spinning off risk components from the feasibility-stage discount rate and, in the end, some recommendations are presented.

## STOPA DYSKONTOWA DOSTOSOWANA DO RYZYKA I JEJ SKŁADOWE W PROCESIE OCENY PROJEKTÓW BRANŻY GÓRNICTWA WĘGLA KAMIENNEGO NA ETAPIE WYKONALNOŚCI

Słowa kluczowe

węgiel kamienny, projekty górnicze, stopa dyskontowa dostosowana do ryzyka, koszt kapitału własnego, studium wykonalności

Streszczenie

Z uwagi na znaczenie czynnika czasu inwestorzy zainteresowani są jak najszybszym uzyskiwaniem korzyści z możliwie największą stopą zwrotu. Niektóre jednak inwestycje mają charakter długoterminowy i wymagają od inwestorów zamrożenia środków kapitałowych na długie lata. W zamian za oczekiwanie, niepewność i utratę potencjalnych możliwości działania inwestorzy oczekują odpowiedniego wynagrodzenia. Wynagrodzenie to znajduje odzwierciedlenie w żądanym przez nich poziomie stopy procentowej. Powszechnie stosowana metodyka oceny projektów inwestycyjnych – analiza zdyskontowanych przepływów pieniężnych (DCF) – wykorzystuje tę stopę do aktualizacji wartości przyszłych przepływów pieniężnych. Metoda DCF postrzega złoże kopaliny jako pełny projekt produkcyjny, gdzie podstawowymi źródłami niepewności są parametry ekonomiczno-finansowe oraz geologiczno-techniczne. Jedne z nich są bardziej ryzykowne od innych – niniejszy artykuł próbuje je rozdzielić i zważyć ich znaczenie na przykładzie typowego projektu górniczego (węgla kamiennego) na etapie studium wykonalności. Postawione zadanie zrealizowano stosując analizę wrażliwości wewnętrznej stopy zwrotu (IRR). Obliczenia zrealizowane zostały przy założeniu *bare bones* (finansowanie wyłącznie kapitałem własnym, kalkulacje w pieniądzu stałym, po opodatkowaniu, stała cena i koszty przez cały okres istnienia) oznaczającym w tym przypadku „czysty" projekt stanowiący bazowy wariant odniesienia do wszelkich porównań i badań. Artykuł prezentuje dane i metody wykorzystane do rozwiązania problemu wyodrębnienia porcji ryzyka w ramach stopy dyskontowej, charakterystycznej dla etapu stadium wykonalności, oraz przedstawia zalecenia i rekomendacje w kontekście przyszłego zarządzania wdrożonym projektem.