



AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search

<http://ageconsearch.umn.edu>

aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

Cost of equity on the Polish and global coal market - comparative analysis

Aneta Michalak

*Faculty of Organization and Management
Silesian University of Technology, Poland*

e-mail: michalak.aneta@interia.pl

address: Roosevelta 26-28, 41-800 Zabrze, Poland

The mining industry in Poland as well as in the world is considered to be a strategic industry, of special significance for the economy. At the same time it is an industry requiring high capital outlays. Equity plays an important role in financing of the mining enterprises. The objective of the article is to compare the cost of equity on the Polish and global coal market. The object of the research are the Polish and foreign mining enterprises listed on the stock markets. The basic research method is CAPM.

JEL Classifications: F01, G12, L71

Keywords: Cost of equity, mining, CAPM

Introduction

The mining industry in Poland and in the world is considered to be a strategic industry, of special significance for the economy. At the same time it is an industry requiring high capital outlays, characteristic for a high degree of assets immobilization (Jonek-Kowalska 2011). This means that the assets are permanently fixed in a particular longwall and they are difficult to cash as they are usually constructed for the specific longwall conditions (Vínătoru et al., 2008, p.2473). In such situation financing by equity gains a great importance. The objective of the hereby research is to conduct a comparative analysis of the cost of equity of mining enterprises in Poland and in the world. Achievement of the objective ordered the article structure where firstly, there is a methodology of equity pricing presented. Next, there is a calculation of the cost of equity made in the Polish and foreign mining enterprises. The results obtained allowed conducting a comparative analysis in the international approach.

Among the basic methods used in the research process one may distinguish statistical analysis above all. The research process was enhanced by a synthesis, which was used in order to draw the final conclusions. The research was based on the literature studies and the analysis of primary data concerning the stock quotes of the examined mining enterprises as well as of stock exchange indexes that constitute benchmarks for them.

The object of the research are two Polish and three foreign mining enterprises listed on the Warsaw Stock Exchange and fourteen foreign mining enterprises listed on the global markets. The basis criterion for selection of the enterprises was a category of activity assigned to the enterprise by the stock exchange where it is listed. The research sample included the enterprises with the category of "Mining, quarrying, resources excavation". In case of the enterprises listed on the global markets, an additional selection criterion was data availability concerning the quotes in a defined research period. The basic research period is a range of time from January to December 2013 with the cost of equity

¹ The paper was reported at XVth ZAFIN Conference, "Financial Management - Theory and Practice", May 19-21, Wrocław, Poland

calculated. The calculation was based on daily return rates on stock of the examined enterprises from the period of two years before the research period. The length of estimation period, so called *estimation window* mostly depends on a market character that the observations come from as well as on the length of the range used for return rates calculation. In case of the first factor it is commonly known that financial markets are specific for high development dynamics. The longer the estimation period that we adopt for these markets, the more unstable beta coefficient is (Tarczyński, Witkowska, and Kompa, 2013). The second factor affecting the choice of time horizon is the frequency of observation. Having daily return rates at disposal it is possible to obtain a sufficient number of observations in the estimation sample from a two-year period (Damodaran, 2002). Moreover, the choice of a two-year research period was determined by an available sequence of quotes. In order to enable comparison of the particular global and Polish enterprises, that have been present on the stock exchange for a relatively short period of time, it was assumed that each of the examined enterprises has had to be listed in the time equaling at least 24 months since the beginning of the research period, that is since January 2013. In the course of preliminary (evaluative) research it was verified that the daily return rates on shares and on the benchmark index fulfill the requirement of normal distribution in the selected time range. Consequently, the analysis involved the data series from January 2011 to December 2013.¹

CAPM as a method of estimating the cost of equity

Equity is a capital set for enterprise's disposal by its owners or worked out by the enterprise in a form of income. This capital is considered to be one of the most expensive financing sources if it is measured in a category of alternative cost (Michalak, 2007, p.75). Calculation of the cost of equity, due to its significance, constitutes a subject of many theoretical considerations and empirical research. In practice calculation is most often based on the CAPM method (Capital Asset Pricing Model) (Sharpe, 1964), which is also used in the hereby research.

The CAPM model is a part of a larger theory called Capital Market Theory (CMT). The basic assumption of CAPM is the fact that a part of risk premium from the expected return on investment in securities is a function of market risk of these securities (Kapil, 2011). In terms of the analysis of market relationships that lead to a particular behavior of investors, CAPM is related to the portfolio theory (Grabowski et al., 2008).

The link between the return on the individual stock and on the market is expressed by the formula (1) (Amadi, 2010, p.8):

$$k = r_{RF} + \beta \times (r_M - r_{RF}), \quad (1)$$

Where, k - cost of equity from the retained income; r_{RF} - return rate on a risk-free investment; r_M - return rate on investment representative for the market portfolio; β - coefficient determining the level of systematic risk.

Risk-free rate (r_{RF}) is indicated on the basis of return on the state debt securities (Grabowski and Pratt 2008, p.80). In turn, β coefficient determines the level of market risk connected with investment in the assets of a particular enterprise (Hawawini and Viallet, 2011, p.278). There are many methods of β coefficient estimation possible. In the hereby

¹ One of the examined Polish enterprises is an exception - JSW SA as well as one foreign mining enterprise - Coal Energy SA that have been listed on the Warsaw Stock Exchange only since July and August 2011, nevertheless, they have been included in the research sample because of a not numerous representation of mining enterprises on the Polish capital market.

article the Least Squares Method was used. In practice β coefficient informs how strong the return rates on stock of a particular enterprise react on changes in the market index (most often the basic market index e.g. WIG is chosen as the benchmark market index but there may also be other indexes, e.g. sectoral ones). The value of β coefficient is indicated on the basis of the following formula (Ogier et al., 2004, p.43):

$$\beta = \frac{\text{cov}(r_{it}, r_{mt})}{\text{var}(r_{mt})} = \frac{\sum_{t=1}^n (r_{mt} - \bar{r}_m) \times (r_{it} - \bar{r}_i)}{\sum_{t=1}^n (r_{mt} - \bar{r}_m)^2} \quad (2)$$

Where, β - beta coefficient; $\text{cov}(r_{it}, r_{mt})$ - covariance between the return rate on enterprise's stock and the return rate on the market portfolio; $\text{var}(r_{mt})$ - variation of the return rate on the market portfolio; t - period on the basis of which the model parameters are indicated, r_{it} - return rate on enterprise's shares in t period, r_{mt} - return rate on market portfolio in t period, \bar{r}_m - average return rate on market portfolio in t period, \bar{r}_i - average return rate on enterprise's shares in t period.

If the β coefficient of the particular stock is higher than 1 the return rate on the stock changes in the same direction but in a higher degree than the return rate on the market index (that is so called an aggressive profile, characteristic for high risk). If the β coefficient of the particular stock is a fraction in the range (0.1) the return rate on the stock is changing in the same direction but in a lower degree than the return rate on the market index (that is so called defensive profile). If on the other hand, the β coefficient of the particular stock is a negative value the return rate on this share behaves in the opposite way to the return rate on the market index. For example, it increases when the return rate on the market index decreases and the other way round.

The next element indicating the cost of equity in the CAPM method is the expected market return rate r_M . The market return rate is very often adopted as the return rate from the basic stock index which constitutes a reference point for the analyzed security (Rakow, 2010, p.43). Usually, in order to avoid problems related to r_M estimation there is a total difference calculated ($r_M - r_{RF}$), which is called Market Risk Premium (MRP). Then it is assumed that it is specific for all undertakings on the market as it is determined by the objective macroeconomic factors (Elton and Gruber, 1998, p.371).

CAPM is connected with a number of methodological problems that are emphasized in the subject literature and economic practice. Above all, its use is hindered on emerging markets where capital market does not provide appropriate data. Such problems are solved through moving calculation to developed capital markets and next making adjustments that lead to data comparability with developing markets. Another problem indicated in literature is meeting the basic model assumptions and including its limitations (Hope, 2002). A classical CAPM version is based on the assumptions formulated in 60s of the previous century and in the current economic conditions not all the assumptions may be considered to be realistic (Michalak, 2012).

However, it is not a reason to reject CAPM. Some differences between the assumptions and reality turn out to be insignificant and do not decrease the model quality (Elton et al., 1998). The construction of CAPM in the present reality is broadly presented in the literature on finance (Byrka-Kita, 2008). Also on the grounds of economic practice CAPM has reached recognition and remains the most often chosen method of the cost of equity estimation by managers (Arnold et al., 2000).

Characteristics of the research sample and research stages

The hard coal mining industry in Poland is only represented by a few mining enterprises of a very high production capacities. Two of them are listed on the capital market: LW “Bogdanka” SA and Jastrzębska Spółka Węglowa SA. Apart from them, on the Warsaw Stock Exchange (GPW) there are also three foreign mining enterprises listed, conducting their mining activity mainly in Ukraine and Czech Republic. These are: Sadovaya Group SA, New World Resources NV and Coal Energy SA. All these enterprises are included in the research sample.

For the sample of the remaining foreign enterprises there were the largest American, Chinese and Australian enterprises selected, listed on the global markets such as:

- New York Stock Exchange (NYSE) in USA,
- National Association of Securities Dealers Automated Quotations (NASDAQ) - over the counter, regulated stock market in USA,
- Shanghai Stock Exchange (SSE) in China,
- Australian Securities Exchange (ASX) in Australia.

The Polish and foreign enterprises, being the research object, are presented in Table 1.

The procedure of the cost of equity calculation was conducted according to the algorithm consistent with CAPM but for the β coefficient calculation there was a period of daily quotes adopted from the last two years. The following stock indexes were accepted as benchmarks:

- for the enterprises listed on GPW - WIG Index,
- for the enterprises listed on NYSE - S&P500 Index,
- for the enterprises listed on ASX - All Ordinaries Index,
- for the enterprises listed on SSE - Shanghai Composite Index,
- for the enterprises listed on NASDAQ - S&P500 Index.

The risk-free securities were considered to be the 10-year State Treasury bonds issued in the country where the stock of the particular enterprise is listed. The risk premium was indicated basing on the risk indexes of the particular country, using ratings published by Damodaran (<http://pages.stern.nyu.edu/~adamodar/>, accessed 03. 2014).

Determination of the cost of equity in the selected mining enterprises

According to the assumptions, the calculation started from gathering the basic information about stock quotes and benchmark market indexes characterizing the particular stock markets. On their basis there were the daily return rates on stock of the examined enterprises determined as well as on benchmark indexes. Next, there was the covariance (stock of the examined enterprises) and variance (stock indexes) of return rates calculated in the period of 2011-2013. After completing the research stages above, the β coefficient was calculated. An average annual value of the β coefficient in the year 2013 in the examined enterprises, along with the other parameters necessary for determining the cost of equity, according to formula (1) are presented in table 1 (the average annual values were determined on the basis of daily data).

Apart from the β coefficient, in table 1 there is also the return rate included, required for the risk-free investment (r_{RF}), which is considered to be the return on 10-year State Treasury bonds issued in the country where the stock of the particular enterprises is listed. In 2013 in Poland it equaled 4.06%, in China 3.87%, in Australia 3.71% and in USA 2.36%.

The third parameter included in table 1 is risk premium, adopted in accordance with the research results by Damodaran. In 2013 Damodaran assigned the highest risk premium to the Chinese economy - it was 6.85%. In case of Poland this premium equaled to 6.75%. The American and Australian economy were characteristic for accordingly lower risk and the premium ascribed to them amounted to 5.8% in 2013.

In the last column of table 1 there was the cost of equity calculated with the inclusion of the parameters above for the examined mining enterprises.

TABLE 1. CHARACTERISTICS OF THE EXAMINED POLISH AND FOREIGN MINING ENTERPRISES AND THE BASIC PARAMETERS OF THE COST OF EQUITY DETERMINATION IN THE EXAMINED ENTERPRISES IN 2013

No	Name	Headquarters	Listed since	Stock exchange	β coefficient	Risk-free rate r_{RF} [%]	Risk premium [%]	Cost of equity [%]
1	Jastrzębska Spółka Węglowa SA (JSW SA)	Poland	2011	GPW Poland	1.29	4.06	6.75	13.01
2	Lubelski Węgiel Bogdanka SA (LWB SA)	Poland	2009	GPW Poland	0.77	4.06	6.75	9.25
3	Coal Energy SA	Luxembourg	2011	GPW Poland	0.44	4.06	6.75	4.67
4	Sadovaya Group SA	Luxembourg	2010	GPW Poland	0.86	4.06	6.75	9.89
5	New World Resources NV	Holland	2008	GPW Poland	-0.05	4.06	6.75	3.68
6	Arch Coal	USA	1988	NYSE USA	2.18	2.33	5.8	14.97
7	Coal of Africa	Australia	2003	ASX Australia	-0.24	3.74	5.8	2.37
8	Coalspur Mines	Australia	2000	ASX Australia	-0.005	3.74	5.8	3.71
9	CONSOL Energy	USA	1999	NYSE USA	1.55	2.33	5.8	11.32
10	Guizhou Panjiang Refined Coal	China	2001	SSE China	-0.06	3.81	6.85	3.38
11	Inner Mongolia Yitai Coal	China	2011	SSE China	-0.25	3.81	6.85	2.11
12	New Hope Corporation	Australia	2003	ASX Australia	0.09	3.74	5.8	4.28
13	Peabody Energy Corp.	USA	2001	NYSE USA	1.8	2.33	5.8	12.76
14	James River Coal Company	USA	2005	NASDAQ USA	2.28	2.33	5.8	15.59
15	Shanxi Coal International Energy	China	2003	SSE China	-0.07	3.81	6.85	3.34
16	Walter Energy	USA	1995	NYSE USA	1.86	2.33	5.8	13.15
17	Westmoreland Coal	USA	1999	NASDAQ USA	1.82	2.33	5.8	12.89
18	Whitehaven Coal Ltd	Australia	2007	ASX Australia	-0.04	3.74	5.8	3.52
19	Yanzhou Coal Mining	China	1998	SSE China	-0.14	3.81	6.85	2.87

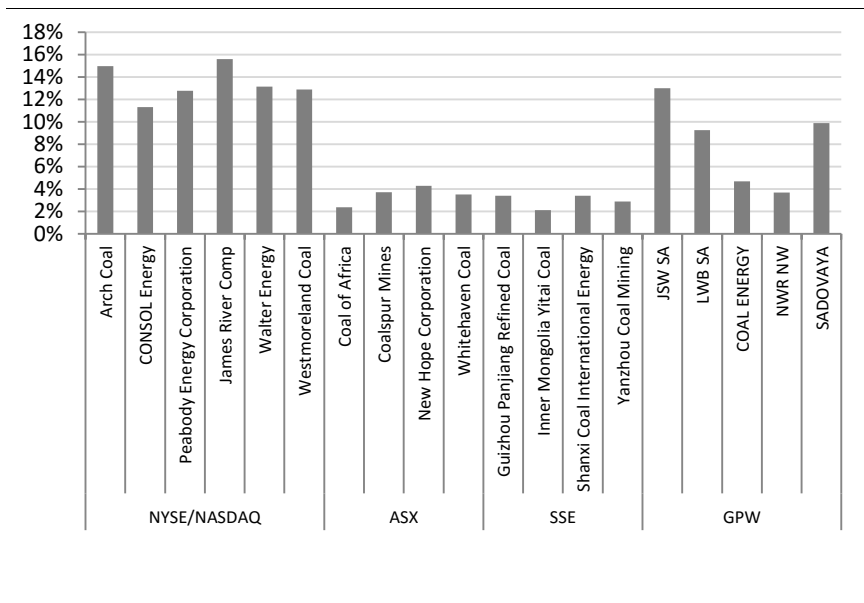
Source: Own work based on the financial portal yahoo.com and www stock exchange of Financial Times: accessible in World Wide Web: <http://finance.yahoo.com/>, <http://www.ft.com/intl/markets> [accessed: March 2013].

The cost of equity in the mining enterprises listed on the Warsaw Stock Exchange fluctuated in the range from 3.68% to 13.01% in 2013. In average it equaled to 7.48% on this market, however, it was much higher in case of the Polish enterprises. The highest cost of equity was noted in JSW SA, it amounted to 13.01% and the second Polish

enterprise, LW “Bogdanka”, had the cost of equity at the level of 9.25%. It was a similar level to the enterprise Sadovaya Group listed on the Polish stock exchange, in which the cost of equity equaled to 9.89% in 2013. In the remaining foreign enterprises listed on the Polish capital market the cost of equity was much lower and amounted to 3.68% for New World Resources and 4.67% for Coal Energy. Apart from JSW SA, all the mining enterprises listed on the Polish market are specific for the β coefficient lower than 1. It means that their securities characterize low market risk.

The average annual cost of equity in the particular mining enterprises, with a division into the separate economies and correspondent stock exchange markets, is presented in Figure 1. Furthermore, in Figure 2 there is the level of β coefficients presented in the examined mining enterprises.

FIGURE 1. AVERAGE ANNUAL COST OF EQUITY IN THE EXAMINED MINING ENTERPRISES ON THE PARTICULAR MARKETS IN 2013

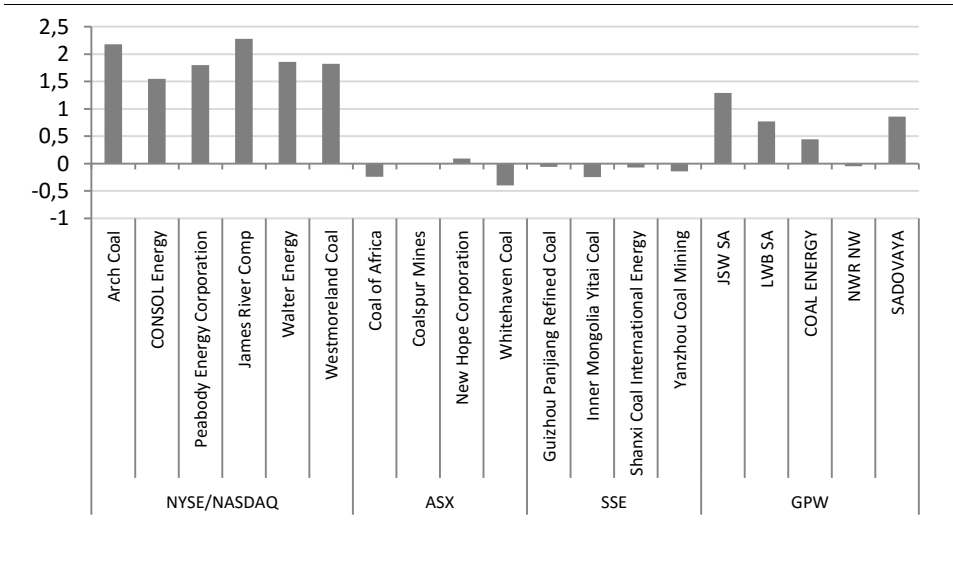


Source: Own work.

On the global markets there is a clear division outlining into more risky enterprises, characterized by the β coefficient on the level from 1.5 to 2.3 and relatively high cost of equity (on the level from 11.3% to 15.6%). These are enterprises listed on the American market (NYSE and NASDAQ). On the opposite side there are enterprises listed on the Australian and Chinese market. It is an interesting phenomenon that all the Chinese and Australian enterprises (apart from Australian New Hope Corporation) are specific for a negative β coefficient. This means that the direction of stock quotes changes of the mining enterprises on these markets is opposite in relation with the market index changes. The return rates on stock of the mining enterprises in Australia and China do not react directly on the trends indicated by the main stock indexes and to general market changes. This is confirmed by the reports on global mining. For instance, during the period of financial crisis that started in the second half of the year 2007, despite prices fall of real estate and financial problems of the investment banks, the quotes of resources on these markets remained high. In Australia, at the turn of 2007 and 2008, the coal prices increased by about 40% and then in the first quarter of the year 2009, when the market received the first news about the end of financial crisis, the coal prices reached the level lower by half

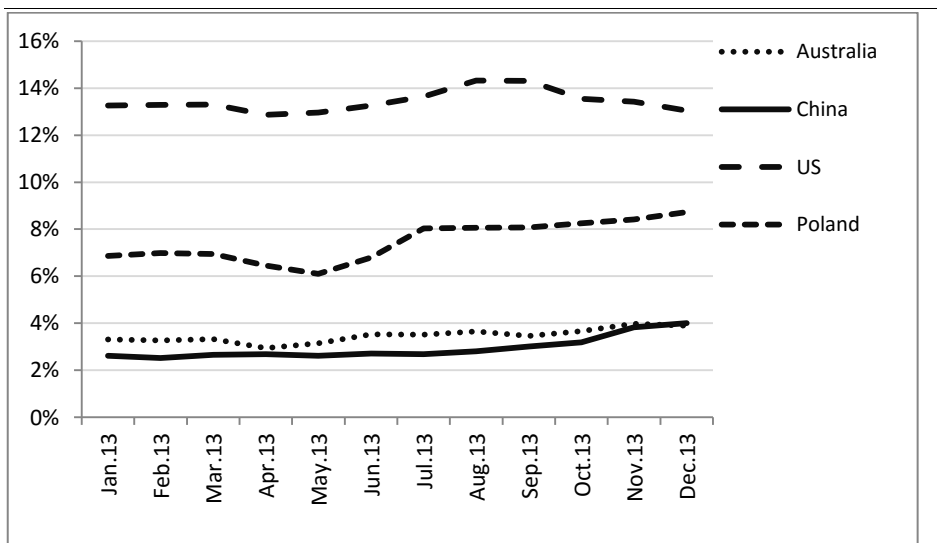
than in the same period of 2008 (World Energy Outlook 2012, International Energy Agency).

FIGURE 2. AVERAGE ANNUAL VALUE OF B COEFFICIENT IN THE EXAMINED MINING ENTERPRISES ON THE PARTICULAR MARKETS IN 2013



Source: Own work.

FIGURE 3. AVERAGE COST OF EQUITY OF THE MINING ENTERPRISES IN THE PARTICULAR COUNTRIES IN THE YEAR 2013



Source: Own work.

Such reactions to the market trend concern only the Australian and Chinese markets where we may observe the negative β coefficients. On the American market, a high level

of the β coefficients shows that the American enterprises strongly react to the general market trends. In case of the β coefficient on the level of about 2 (as it occurs in the case of the American enterprises) the decrease of the return rates on the market index for example about 3% causes the decrease of the return rate on stock of a particular enterprise by 6% and the other way round. Investing in these enterprises is burdened with high risk. In turn, the negative β coefficient in the Australian and Chinese enterprises means that the return rate on their stock decreases (increases) when the return rate on the market index increases (decreases). Therefore, it is recommended to possess their securities in the period of economic recession and not to possess them in the time of economic improvement. An average annual cost of equity in the Australian enterprises amounted to 3.47% in 2013 and in the Chinese enterprises 2.95%, what has turned out to be slightly less than the risk-free return rates which were adopted as the return rate on the 10-year State Treasury bonds of these countries. The average cost of equity of the mining enterprises in the analyzed countries is presented in Figure 3.

Conclusion

The cost of equity of the mining enterprises is quite varied, depending on the market of activity. The differences between the particular markets are very clear. The highest cost of equity in 2013 was observed on the American market, it equaled to 13.43% in average. The American mining enterprises are characterized by the highest β coefficients among the examined enterprises. In their case this coefficient amounted to 1.9 in average. It is proved by the high risk assigned to these enterprises. Furthermore, the lowest cost of equity is specific for the Chinese mining enterprises (average annual cost of equity in the analyzed sample of the Chinese enterprises equaled to 2.95%). Not much higher cost of equity occurs on the Australian market, it amounted to 3.47% in average. The β coefficients in the group of the mining enterprises listed on these two markets is low but negative (in average it was -0.13 on the Chinese market and -0.14 on the Australian market). Risk of investment in the stock of mining enterprises on these markets is not high, however, one should remember that changes in the return rates on these securities are opposite to the general market trend (they will fall slightly in the time of a good economic situation and slightly increase during the economic recession). Such situation is a little ambiguous on the Polish market when compared to the other examined markets. The cost of equity in the mining enterprises listed in Poland is quite varied. It is higher in case of the Polish enterprises and lower in case of the enterprises with the foreign headquarters but listed on the Polish capital market. The Polish mining enterprises as well as Sadovaya, listed on the Warsaw Stock Exchange but conducting its mining activity in Ukraine, are rather close to the American market in the view of the markets presented (with β coefficient higher or about one). Nevertheless, the two remaining mining enterprises listed in Poland are characterized by risk comparable with the Australian enterprises (β coefficients low and negative in one case). Generally, the Polish market is placed between the American and Australian market in terms of risk characterizing mining enterprises. The average cost of equity on the Polish market equals 7.48%. Consequently, it is about twice as high as the cost of equity of the Australian mining enterprises and almost twice as low as the cost of equity of the American enterprises.

Large differentiation of the cost of equity in mining enterprises performing on the particular markets is an inspiration for further research. It should follow two directions. Above all, there should be an attempt made to test other research methods that allow answering a question whether the alternative methods of the cost of equity estimation provide the significant differences in the results obtained. On the other hand, one should concentrate on searching for the reasons of occurring differences in the phenomenon observed on the particular markets. Such research is not common in literature. Both issues are a subject of further, detailed research of the Author.

References

- Amadi, C.W., 2010. "Estimation of the cost of equity: A chance of a loss approach", *Business Quest*, Iss. 2010, pp.1-25
- Arnold, G.C., Hatzopoulos, P.D. 2000. "The Theory Practice Gap in Capital Budgeting: Evidence from the United Kingdom", *Journal of Business Finance & Accounting*, Vol. 2, No. 5-6, pp.603-626
- Byrka-Kita, K., 2008. *Metody szacowania kosztu kapitału własnego. Teoria a praktyka. Rozprawy i Studia Uniwersytetu Szczecińskiego t. 689.* Wyd. Naukowe Uniwersytetu Szczecińskiego, Szczecin.
- Damodaran, A., 2002, *Investment Valuation*, 2nd ed. John Wiley, New York
- Elton, E.J., Gruber, M.J., 1998. *Nowoczesna teoria portfelową i analiza papierów wartościowych*, Wyd. WIG-Press, Warszawa
- Grabowski, R.J., Pratt, S.P., 2008. *Cost of capital: applications and examples*, John Wiley and Sons, New Jersey
- Hawawini, G., Viallet, C., 2011. *Finance for executives: Managing for value creation*, 4th edition, South-Western Cengage Learning, USA, Mason
- Hope, C.A. 2002. "Finding a Realistic Cost of Capital", *Bank Accounting & Finance*, December, pp.27-32
- Jonek-Kowalska, I., 2011. Environmental factors as a source of operational risk in mining enterprises, [in:] *Management under conditions of risk and uncertainty*, B. Domańska-Szaruga, W. Wereda, Wydawnictwo Studio Emka, Warszawa
- Kapil, S., 2011. *Financial Management*, Dorling Kinderlsey, India, licensees of Pearson Education in South Asia, New Delhi
- Michalak, A., 2007. *Finansowanie inwestycji w teorii i praktyce*, PWN, Warszawa.
- Michalak, A. 2012. Krytyczne refleksje nad problemem zastosowania modelu CAPM w wycenie kosztu kapitału własnego, *Studia i Prace Kolegium Zarządzania i Finansów, Zeszyt naukowy nr 115*, Szkoła Główna Handlowa, Warszawa
- Ogier, T., Rugman, J., Spicer, L., 2004. *The real cost of capital: a business field guide to better financial decisions*, Pearson Education
- Rakow, K.C., 2010. "The effect of management earning forecast characteristics on cost of equity capital", *Advances in Accounting, incorporating Advances in International Accounting*, Vol. 26, No.1, pp.37-46
- Sharpe, W., 1964. "Capital Asset Prices: A Theory of Market Equilibrium", *Journal of Finance*, Vol. 19, No.3, pp.425-442
- Tarczyński, W., Witkowska, D., Kompa, K., 2013. *Współczynnik beta: teoria i praktyka*, Pielaszek Research Publishing, Warszawa, p.208
- Vinătoru, S.S., Domnișoru, S., Giurescu, D., 2008. "The corporal immobilized assets from accounting and fiscality point of view", *Annals of the University of Craiova, Economic Sciences Series*, Vol. 5, No. 36, pp.2473-2479
- World Energy Outlook 2012, International Energy Agency, www.worldenergyoutlook.org