



## Benchmarking of mining companies extracting hard coal in the Upper Silesian Coal Basin

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### ARTICLE INFO

**Keywords:**

Benchmarking  
Hard coal mining  
Financial analysis  
Upper Silesian Coal Basin

### ABSTRACT

The article presents findings derived from the benchmarking comparison of four mining companies extracting hard coal in the Upper Silesian Coal Basin located on the border of the Czech Republic and Poland: OKD a.s. operating in the Czech Republic and three Polish entities Jastrzębska Spółka Węglowa S. A. (JSW), Katowicki Holding Węglowy S. A., and Kompania Węglowa S. A. Although all companies extract the same mineral resource in analogous mining-geological conditions, their economic results differ significantly. The article benchmarks the mining companies in a 5-year period: from 2009 to 2014. Six financial indicators were used in order to achieve the goal: ROE, ROS, ROA, Debt to Equity Ratio, Assets Turnover, and Cash Flow Liquidity Ratio. In addition, the standard variable method was used together with Fuller's method to determine the weights of the different criteria. The benchmarking results, based on the values of integral ratio, show JSW as the leading company in 2009, while in 2014 Czech OKD gained the prime position. In general, during the 5-year observation period, JSW achieved the best financial results. The study presents JSW as the benchmarking leader due to the best performance achieved among the four mining companies extracting hard coal in the Upper Silesian Coal Basin positioned in Central-Eastern Europe.

### 1. Introduction

As quality exists by comparison, benchmarking has long been popular and developed into many types. It is strongly related to quality management (Zairi, 2011). Drucker (1999) describes benchmarking as a tool to compare one's own efficiency with the best efficiency in the branch. Pojasek (2010) interprets benchmarking so that it identifies differences in efficiency, helps to determine corporate strategy, maintains stimulation for improvement and compares own processes to other companies' practices. Benchmarking also includes knowledge, learning from other companies, and improvements to own production programs (Pojasek, 2010). Benchmarking is usually applied throughout the sectors, including the heavy industry and mining. For example, in 2013 Vaněk et al. compared the major limestone producers in the Czech Republic. Pomykalski et al. (2014) benchmarked Polish metal manufacturing companies, while Antošová et al. (2013) did benchmarking of steel companies in Europe.

The subject of benchmarking herein is the mining enterprises in the Upper Silesian Coal Basin. The Upper Silesian Coal Basin belongs to important European territories where hard coal is being extracted. The exploitation began in the second half of the 18th century. In the

past, the Upper Silesian Coal Basin belonged to one country – the Austria-Hungarian Empire. The contemporary basin spreads in two countries – the Czech Republic and Poland. Overall, the Upper Silesian Coal Basin covers an area of about 7400 km<sup>2</sup> in southern Poland and Ostrava-Karviná Region in the north of the Czech Republic (CR), with about 5800 km<sup>2</sup> in Poland and 1600 km<sup>2</sup> in the CR. It is the most important coal basin in Poland and CR, and also one of the largest in Europe. Up to 30% of the deposit have been extracted within the recent mining operations. The reserve deposits amount to 23% of the area and the prospective areas cover about 27% of the whole area. Over 80% of the Polish coal deposits are located in this area (Paszcza, 2012).

OKD, a subsidiary company of NWR (New World Resources Plc.), is the only mining company exploiting hard coal in the Czech Republic. In Poland three mining companies extract hard coal in the Upper Silesian Coal Basin. They are JSW (Jastrzębska Spółka Węglowa S. A.), KHW (Katowicki Holding Węglowy S. A.), and KW (Kompania Węglowa S. A.). More detailed information about the companies is presented in Section 2 of the article. All four companies encompassed into benchmarking do business in the same geographical territory under the similar mining and geological conditions.

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The aim of benchmarking was to assess each company's overall competitiveness, efficiency and show the ranges of financial performance by the chosen companies in hard coal mining industry between 2009 and 2014. The article contributes to the previous literature with a description of the industry conditions and explanation how each company compares to other companies in a selected group of hard coal producers. This way, it may be interesting to observe how the positions of the concerned mining companies have changed in the market as a consequence of the economic turndown and the changes in the hard coal sector as well.

## 2. Material and methods

The evaluation of data gathered in a benchmarking process is a multifaceted process that combines qualitative and quantitative criteria. Factors considered in the study generally fall under financial data and include, among others, the size of the company, performance indicators, and measures describing the value of assets and liabilities. The financial data used in the study were derived from financial reports, governmental documents and from publicly available sources, including newspaper articles.

Because of the comparison of four different companies doing business in hard coal mining sector in the Upper Silesian Coal Basin, the benchmark conducted is of an external type. Due to the financial analysis used in the benchmarking process, the research study can be called a financial or performance benchmarking. Furthermore, based on the methodology set out by [Camp \(1989\)](#), authors followed a twelve-stage approach to benchmarking and selected four hard coal companies doing business in the Upper Silesian Coal Basin: OKD in the Czech Republic and JSW, KHW, and KW in Poland. We identified the data sources, collected data, determined the gap and established the process differences.

The benchmark data were used not only to evaluate the four selected companies, but also to assess the future earning potential of each company and identify any weaknesses that need to be improved by the enterprises ([Camp, 1989, 1995](#)). The period of analysis encompasses financial crisis years and a big decrease in world's hard coal selling prices: 2009–2014. Particularly, the benchmarking process analyses mining companies doing business in the same geographical region and dealing with changing and difficult economic turmoil. [Table 1](#) summarizes the main characteristics of the four hard coal enterprises in the Upper Silesian Coal Basin.

As it is vital to engage relevant sources and data while performing

benchmarking process, annual financial reports were used as main source of financial and non-financial information. Besides using financial reports for external benchmarking, many companies carry out their internal benchmarking built upon financial data. Usually they apply at least quarterly benchmarking that issues from quarterly financial documents, which thus become the key source of information for the financial managers' decision-making. The popularity of quarterly benchmarking may be confirmed by a survey of the National Investors Relations Institute. The research showed that as much as 95% of respondent companies made annual or quarterly earnings forecasts in 2006, as opposed to 45% in 1999 ([Brigham and Ehrhardt, 2014](#)).

On the other hand, although it is advisable to combine internal and external information in benchmarking process, authors used only data from publicly available sources of financial and non-financial information with regard to trade secrets. The above substantially influence the benchmarking process making it an independent and objective analysis. It is in accordance with the literature emphasizing the core role of financial reports ([Bradford et al., 2014](#)) as well as with the American Securities and Exchange Commission that emphasizes "timely dissemination" of financial statements to the public. Opinions presented above legitimize financial analyses and benchmarking carried out based on accounting data in order to compare companies' efficiency.

For the purposes of benchmarking herein, suitable indicators (ratios) were selected. [Brigham and Ehrhardt \(2014\)](#) defines financial ratios as to be designed to extract significant data that need not be that clear from mere reading the financial reports. However, it is also important to mention some limitations of ratios, such as ([Lee, 2007](#)):

1. financial ratios are mainly based on accounting numbers disclosed in corporate financial reports; these numbers include the flexibility and subjectivity of accounting norms.
2. financial ratios are essentially used in a comparative context over time and between the companies although consistency under nowadays accounting regulations is ambiguous.

Despite the limitations, financial ratios are the most reliable source of information for external investors. [Brealey et al. \(2012\)](#) suggests that financial ratios are "no substitute for a crystal ball", thus being a useful design how high amounts of financial data may be summarized and company performance contrasted.

Among six financial ratios chosen for the benchmarking analysis, three are related to the profit/loss of an entity. Profit (or loss) is

**Table 1**

Main characteristics of hard coal enterprises in the Upper Silesian Coal Basin.

Source: [Annual Reports of OKD, 2009](#); [Consolidated Annual Report of Jastrzębska Spółka Węglowa S.A., 2011](#); [Euracoal Market Report, 2013](#); [Maruszewska et al., 2014](#); [Prospekt Emisjny Jastrzębska Spółka Węglowa S.A., 2010, 2013](#); [Restructuring of the Hard Coal Mining Sector during the Period, 2004](#)

	JSW	KHW	KW	OKD
Name	Jastrzębska Spółka Węglowa S.A.	Katowicki Holding Węglowy S.A.	Kompania Węglowa S.A.	OKD a.s.
Country of business operations	Republic of Poland	Republic of Poland	Republic of Poland	Czech Republic
Owners' structure [31.12.2015]	Publicly traded on Warsaw Stock Exchange; 5.5% of shares belong to the State Treasury of the Republic of Poland	State Treasury of the Republic of Poland	State Treasury of the Republic of Poland	The sole shareholder is New World Resources N.V. registered in Amsterdam, the Kingdom of Netherlands. New World Resources is publicly traded in Warsaw, London, and Prague.
Number of mines [31.12.2014]	5	11	4	4
Hard coal operational reserves [Mt]	3 900			56.5
Employment [2014]	100,675			11,099
Production [Mt]				
2014	72.5			8.3
2013	76.5			8.8
2012	79.2			11.2
2009	77.4			11.0

compared to equity (ROE), to sales (ROS), and to total assets (ROA). Asset turnover ratio is based on the relation between revenues and total assets, while debt to equity ratio compares the value of debt to the value of total equity. The last ratio, cash flow liquidity ratio, measures cash generated from operating activity in relation to total current liabilities. Due to the wide range of ratios included in the benchmarking process, the analysis is a multi-factor study with the biggest weight attached to ROE ratio. The next weight amounts to 23.81% and it is a characteristic assigned to debt to equity ratio. ROA and assets turnover are the two least important ratios in the benchmarking process.

A number of specific methods may be applied for the purposes of benchmarking comparisons. In this study, we used a standard variable method as described by Sedláček (2011) and already applied by Vaněk et al. (2013) in benchmarking procedure.

The original ratios,  $x_{ij}$ , were transformed in accordance with the standard variable theory to provide for standard variables,  $u_{ij}$ . Along, the transformation of ratios,  $x_{ij}$  to  $u_{ij}$ , as regards ratio characteristics, +1 ("plus two"), was executed by use of the formula (1).

$$u_{ij} = \frac{x_{ij} - x_{pj}}{s_{xj}}, \quad (1)$$

where:

$x_{ij}$  Ratio, j, of organization, i,  
 $x_{pj}$  Arithmetic average calculated from ratio, j,  
 $s_{xj}$  Standard deviation calculated from ratio, j.

The ratio,  $x_{ij}$  was transformed to a standard variable,  $u_{ij}$ , regarding ratio characteristics, -1("minus one") by the formula, (2).

$$u_{ij} = \frac{x_{pj} - x_{ij}}{s_{xj}}, \quad (2)$$

In the next step, the integral ratio,  $d_{4i}$ , was calculated as a weighted arithmetic mean by use of standard variables calculated for individual ratios of the organization, i; see formula (3).

$$d_{4i} = \frac{\sum_{j=1}^m u_{ij} * p_j}{\sum_{j=1}^m p_j} \quad (3)$$

Where:

$p_j$  Weight of ratio, j,  
 $u_{ij}$  Transformed ratio.

The benchmarking information value can be increased if the ratios of comparison are weighed. This can be done in many different ways. To determine the weights of criteria and risks in the decision-making issues, the Fuller's method, the so-called Fuller's triangle, is often used. Its application appears in a number of publications, for example in selecting technological options of an energy mix (Černý et al., 2013).

The application of the above mentioned procedure enables a

**Table 2**  
Ratios used in the analysis with weights assigned to each ratio.

Preference of authors						
Financial ratios	ROE	ROS	ROA	Debt to equity ratio	Assets turnover	Cash Flow Liquidity Ratio
Weight	2/7	4/21	2/21	5/21	1/21	1/7
Weight in [%]	28.57%	19.05%	9.52%	23.81%	4.76%	14.29%
Index of character	1	1	1	-1	1	1
Symbol	P <sub>j1</sub>	P <sub>j2</sub>	P <sub>j3</sub>	P <sub>j3</sub>	P <sub>j5</sub>	P <sub>j6</sub>

comparison of mining companies in the different years. However, it does not offer an overall conclusion on the efficiency of the discrete mining companies. This may be answered by a value number (VN) assessing each of the four mining companies between 2009 and 2014. VN is obtained by means of the formula below (4):

$$VN = \sum_{i=1}^n d_{4i} \quad (4)$$

Where:

$d_{4i}$  – The integral ratio calculated as a weighted arithmetic mean by use of standard variables;  
 $n$  – Total number of benchmarking mining enterprises.

### 3. Calculation

Based on the chosen methodology described above, we set the weight of each ratio used in the analysis. The determined weight ratios are presented in Table 2.

Applying the above, the four mining companies extracting hard coal in the Upper Silesian Coal Basin were benchmarked. Tables 3–6 give partial results for the first and last years of the observed period, particularly 2009 and 2014.

Tables 3 and 5 present starting matrices comparing the mining companies in 2009 and in 2014, while Tables 4 and 6 demonstrate the index values that arose via the transformation, using the method of a standard variable, while the values are given at unitary weights and differential weights. Applying the relation (3), the values of integral ratio for each evaluated mining company were obtained. The values were decisive for the final ranking of the mining companies.

The evaluation of mining companies benchmarking is presented in Table 7 and it aggregates the results for 2009–2014.

### 4. Results

The information gained from benchmarking process allows the authors to determine how well each company performed in comparison with other hard coal enterprises operating in the Upper Silesia Coal Basin. The benchmarking produced very interesting findings (Table 8) that – together with in-depth financial analysis encompassing 5-year period – show the leader entity among the four analyzed companies and discrepancies between them in each year of analysis (Fig. 1).

The analysis of the amount of shareholders' capital engaged in each company shows that the largest one is KW, Polish state-owned enterprise operating 11 mines. The other two Polish companies are of a similar size (JSW is operating 5 mines, while KHW is operating 4). JSW is a publicly traded company quoted on Warsaw Stock Exchange. The only Czech company included in the analyzed group, OKD, is the smallest one, judging by the amount of capital invested in the entity, the amount of annual production volume and the number of employees. Same as JSW, OKD is listed on the stock exchange (London-listed as a subsidiary of NWR).<sup>1</sup> The total value of KHW assets (EUR 1214 m) is 2551 times bigger than the assets of the smallest company: OKD (kEUR 476). The changes in the volume of assets among 4 mining companies show that the greatest decrease in the assets occurred in OKD. In 2009 the total assets amounted to kEUR 1913 while in 2014, assets totaled only kEUR 476, which resulted in a 75% decrease of assets. In contrast to OKD, two Polish companies' total assets remained constant (KW & KHW), while JSW invested, thus increasing the value

<sup>1</sup> NWR NEWS SERVICE (Amsterdam, 4 May 2016) – Further to the announcement on 3 May 2016 regarding the filing of an insolvency petition on behalf of OKD with the Czech court, the shares in NWR Plc have been suspended from the London Stock Exchange with immediate effect. Prague Stock Exchange and Warsaw Stock Exchange are currently processing a request from NWR Plc to suspend the shares.

**Table 3**

Starting matrix to benchmark the mining companies in 2009.

Ratios						
Company	Profitability Ratios			Coverage ratios	Turnover Ratios	Liquidity Ratios
	ROE	ROS	ROA	Debt to equity ratio	Assets turnover	Cash Flow Liquidity Ratio
	EAT/Total Equity	EAT/Sales	EBIT/Assets	Total Liabilities/Total equity	Sales or Revenues/Total Assets	Cash generated from operating activities/Total current liabilities
OKD	0.052	0.042	0.053	768.654	0.7	0.001
JSW	-0.139	-0.15	-0.078	0.903	0.489	-0.029
KW	0.044	0.006	0.042	5.723	1.038	0.140
KHW	0.064	0.024	0.082	2.436	0.776	0.270
Index of character	1	1	1	-1	1	1
Weight	28.57%	19.05%	9.52%	23.81%	4.76%	14.29%

**Table 4**

Matrix of transformed values using the standard variable method in 2009.

Standard Variable Method						
$x_{pj}$	0.005	-0.020	0.025	194.429	0.751	0.096
$s_{sj}$	0.097	0.088	0.071	382.822	0.227	0.138
<b>Standard values <math>u_{ij}</math></b>						
<b>Unitary weight</b>						
OKD	0.4845	0.7045	0.3944	-1.5000	-0.2247	-0.6884
JSW	-1.4845	-1.4773	-1.4507	0.5055	-1.1542	-0.9058
KW	0.4021	0.2955	0.2394	0.4929	1.2643	0.3188
KHW	0.6082	0.5000	0.8028	0.5015	0.1101	1.2609
<b>Differential weight</b>						
OKD	0.1384	0.1342	0.0376	-0.3571	-0.0107	-0.0983
JSW	-0.4241	-0.2814	-0.1382	0.1204	-0.0550	-0.1294
KW	0.1149	0.0563	0.0228	0.1174	0.0602	0.0455
KHW	0.1738	0.0952	0.0765	0.1194	0.0052	0.1801
					<b>Sum</b>	<b>Average</b>
					-0.8297	-0.1383
					-5.9670	-0.9945
					3.0130	0.5022
					3.7835	0.6306
					<b>Sum</b>	<b>Average</b>
					-0.1559	-0.1560
					-0.9077	-0.9077
					0.4171	0.4171
					0.6502	0.6502
						<b>Rank</b>
						3.
						4.
						2.
						1.

**Table 5**

Starting matrix to benchmark the mining companies in 2014.

Ratios						
Company	Profitability Ratios			Coverage ratios	Turnover Ratios	Liquidity Ratios
	ROE	ROS	ROA	Debt to equity ratio	Assets turnover	Cash Flow Liquidity Ratio
	EAT/Total Equity	EAT/Sales	EBIT/Assets	Total Liabilities/Total equity	Sales or Revenues/Total Assets	Cash generated from operating activities/Total current liabilities
OKD	5.279	-0.073	-0.645	-7815.896	10.584	0.000
JSW	-0.090	-0.096	-0.050	1.115	0.443	0.157
KW	3.656	-0.143	-0.125	-31.254	0.836	0.009
KHW	-0.781	-0.138	-0.041	7.658	0.655	0.402
Index of character	1	1	1	-1	1	1
Weight	28.57%	19.05%	9.52%	23.81%	4.76%	14.29%

**Table 6**

Matrix of transformed values using the standard variable method in 2014.

Standard Variable Method						
$x_{pj}$	2.016	-0.113	-0.215	-1959.594	3.130	0.142
$s_{sj}$	2.921	0.034	0.289	3904.238	4.972	0.188
<b>Standard values <math>u_{ij}</math></b>						
<b>Unitary weights</b>						
OKD	1.1171	1.1765	-1.4879	1.5000	1.4992	-0.7553
JSW	-0.7210	0.5000	0.5709	-0.5022	-0.5404	0.0798
KW	0.5615	-0.8824	0.3114	-0.4939	-0.4614	-0.7074
KHW	-0.9575	-0.7353	0.6021	-0.5039	-0.4978	1.3830
<b>Differential weights</b>						
OKD	0.3192	0.2241	-0.1417	0.3571	0.0714	-0.1079
JSW	-0.2060	0.0952	0.0544	-0.1196	-0.0257	0.0114
KW	0.1604	-0.1681	0.0297	-0.1176	-0.0220	-0.1011
KHW	-0.2736	-0.1401	0.0573	-0.1200	-0.0237	0.1976
					<b>Sum</b>	<b>Average</b>
					3.0496	0.5083
					-0.6129	-0.1022
					-1.6722	-0.2787
					-0.7094	-0.1182
					<b>Sum</b>	<b>Average</b>
					0.7222	0.7222
					-0.1903	-0.1903
					-0.2187	-0.2186
					-0.3025	-0.3024
						<b>Rank</b>
						1.
						2.
						4.
						3.
						4.

**Table 7**  
Summary of calculations.

Company	2009		2010		2011		2012		2013		2014	
	Average	Rank										
<b>Unitary weights</b>												
OKD	-0.1383	3.	0.3183	2.	-0.0373	2.	0.2944	1.	-0.9135	4.	0.5083	1.
JSW	-0.9945	4.	0.3968	1.	0.6341	1.	0.2883	2.	0.3911	1.	-0.1022	2.
KW	0.5022	2.	-0.3086	3.	-0.1015	3.	-0.1721	3.	0.1694	3.	-0.2787	4.
KHW	0.6306	1.	-0.4077	4.	-0.5074	4.	-0.4071	4.	0.3503	2.	-0.1182	3.
<b>Differential weights</b>												
OKD	-0.1560	3.	0.0237	2.	-0.1254	2.	0.3106	1.	-1.2745	4.	0.7222	1.
JSW	-0.9077	4.	0.8183	1.	0.8249	1.	0.2862	2.	0.5518	1.	-0.1903	2.
KW	0.4171	2.	-0.4355	4.	-0.1757	3.	-0.2129	3.	0.2619	3.	-0.2186	3.
KHW	0.6502	1.	-0.4074	3.	-0.5355	4.	-0.3810	4.	0.4594	2.	-0.3024	4.

**Table 8**  
Final results of benchmarking.

Results	2009	2010	2011	2012	2013	2014	Sum	Rank
OKD	-0.1560	0.0237	-0.1254	0.3106	-1.2745	0.7222	-0.4994	3.
JSW	-0.9077	0.8183	0.8249	0.2862	0.5518	-0.1903	1.3832	1.
KW	0.4171	-0.4355	-0.1757	-0.2129	0.2619	-0.2186	-0.3637	2.
KHW	0.6502	-0.4074	-0.5355	-0.3810	0.4594	-0.3024	-0.5167	4.

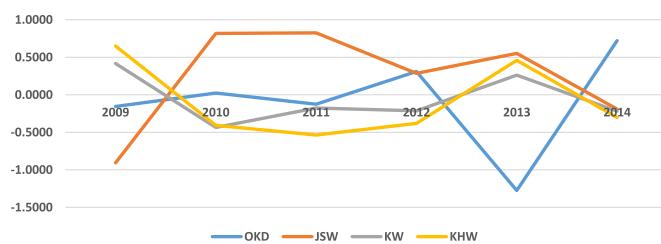


Fig. 1. Development of mining company ranking between 2009 and 2014.

of total assets by 62% (total assets in 2014 amounted EUR 3 605 m).

A decreasing trend in revenues and EBIT can be observed among all entities included in the benchmarking. Although there was a small increase in revenues during 2009–2011, starting 2012 all four companies struggled with a negative trend, resulting in losses reported in 2014. The negative trend came from decreasing coal prices on the world hard coal market, the decline in production volume, and reduction in the size of coal sale, which even exceeded the production curtail. Despite the adverse trend in production volume and sales numbers, the cost of production increased mainly due to the raise of unit production cost.

Despite the fact that the amount of negative EBIT of OKD was the lowest, its relation to equity, total assets or incomes indicate an unfavorable financial situation of OKD. Moreover, Polish hard coal mines were granted governmental financial supports each year, while OKD, was a self-financing entity during the years. All four entities ended the accounting period of 2014 with a loss. Although the loss of OKD was the smallest in volume, it exceeded five times the amount of equity of OKD. The loss of KW was almost four times bigger than the total equity of the company as of 31.12.2014.

The above indicators of business performance of four hard coal mines of Upper Silesian Coal Basin reveal a risk of bankruptcy in the near future. Negative structure of assets and capital, decrease in revenues, increase in stock, unfavorable operational profitability, upturns in financial liquidity, etc. mark insolvency problems as well as a high danger of liquidation in prospective years. Granting all this, the Czech OKD with no public support is most exposed to financial problems. Performance benchmarking described in the previous sec-

tion also shows that OKD is the feeblest entity among the Upper Silesia hard coal enterprises. On the other hand, Polish JSW seems to be the leader of financial position of the four chosen companies. Based on the financial rating built on the past performance, the leader entity also has the best prospects for the future earnings, i.e. the relation between liabilities and total assets shows that external financing amounts c. 50% of total assets. In comparison, OKD's liabilities exceed their total assets, thus resulting in negative equity.

## 5. Discussion

It is not easy to draw the benchmarking conclusion because the findings are ambiguous. It is JSW that achieved the best financial results based on the chosen methodology and selected evaluation indicators. KW company is the entity with the second best results. Although OKD ranks third, the difference between OKD and the last company, KHW, is insignificant (0.0173).

On the other hand, comparing the position of the companies throughout the period under observation, JSW (-0.9077) had the worst position in 2009 based on the value of integral ratio. The best results were achieved by two Polish mining companies: KW (0.4171) and KHW (0.6502). The Czech corporation OKD (-0.1560) ranked within the average benchmarking results of the Polish companies' efficiency.

In 2010 and 2012 all the hard coal mining companies experienced price shocks followed by a decline in sales, which was caused by a fall in energetic and coking coal spot prices on the world stock exchanges. It may be stated that the new price level of hard coal is so low that further mining executed by the four examined companies in the Upper Silesian Coal Basin would not be cost-effective under the existing cost intensity of extraction. After the decrease in world hard coal prices, each company began to reduce the cost of goods sold. As it is clear from the further development of the companies' efficiency, JSW was the most successful, and its performance started to grow. Between 2010 and 2012 JSW was an undeniable economic leader among the observed companies.

As for OKD, between 2009 and 2012 the economic development was rather stable. The conducted analysis suggests that OKD managed to reduce its production costs during the period. At that time, a new and more effective (hi-tech) mining technology helped in that respect,

which was a result of massive investments between 2005 and 2008. However, this positive trend set out by OKD management was in the end followed by a financial situation in 2013, when the company experienced financial liquidity problems caused by the high debt financing expenses. Furthermore, based on many publicly expressed opinions, it is considered that failed management decisions taken by the parent company NWR significantly influenced the business of OKD. As a consequence of the above mentioned issues, OKD dropped far behind its Polish competitors in 2013. While the results of the Polish mining companies ranged in the interval  $<0.2616; 0.5518>$ , the integral ratio of OKD was -1.2745. On the other hand, the deficient financial situation of the parent company NWR commenced a collapse of NWR stock prices on the trading markets. A decrease in stock prices of NWR was intensified by the forthcoming maturity of NWR bonds and exchange of bonds for NWR shares and dilution of equity capital. In 2014, not only OKD, but also parent company NWR suffered from financial liquidity problems, which ended up with insolvency proceedings.

The Polish companies did not encounter such dramatic situations between 2012 and 2014. Nevertheless, the economies regarding operating costs and payroll in Polish mines led to strikes. The last big strike took place in 2015. Hence, the values of Polish shares have also gone down. But still, the shareholders may take into account the fact that the mines need not necessarily get in loss or suffer from insolvency, as in case of OKD in 2016. Because the Polish coal sector is parastatal, the Polish government helps the hard coal companies within the limits of approved support, especially for the sake of employment in the mining sector.

At 2014 the results of OKD are also very captivating from the benchmarking point of view as OKD reached the best results in extraction (integral ratio 0.7222). At the same time period, the position of the Polish mining companies worsened and levelled off, which is documented by the values of the integral ratio (JSW – 0.1903, KW – 0.2186, KHW – 0.3024).

## 6. Conclusions

In conclusion, the hard coal mining sector in Europe is suffering from serious problems that are difficult to solve using only the forces of free market economy. The findings suggest that in case of a controlled phase-out of hard coal industry in Europe, identical or even higher subsidies on the part of the state will be necessary as compared to the situation in Western Europe in the 1970s to 1990s. However, this will hold true under the condition that the Czech Republic and Poland do not completely abandon their raw material policies that include hard coal from national sources in the energy mix. Hence, on top of the problem of hard coal mining in the Upper Silesian Coal Basin there is a question about the future of hard coal in general. Hard coal is a stable source of energy in that European region. On the other hand, safety requirements together with difficult geological and mining conditions of hard coal extracting augment the production costs making hard coal extraction non profitable when compared to cheap exported coal and decrease in world prices of coal. The above is an argument for proponents of governmental help for hard-coal mining. The only Czech's hard coal enterprise, which did not get any direct help from government, ended up with insolvency procedure in May 2016. On the contrary, Polish mining entities are granted with financial help but their financial position is not satisfactory and opponents express the opinion that they should be privatized and governmental help should be ceased. The study is consistent with publicly expressed opinions that hard coal mining in the region is a source of open-ended problems with profitability, liquidity and other social issues. Authors express an opinion that OKD is the first company in the region to suffer from lack of coherent and thought-out strategy referring to the energy safety in the region and describing business model of hard coal mining entities. The benchmarking analysis revealed that mining companies

had been struggling with profitability problems since the beginning of the studied period. Too little was done to solve the problems or too late were the solutions implemented, which turned out to OKD's bankruptcy (published in the summer of 2016) and solvency problems of Polish mines observed in 2015.

Paradoxically, the benchmarking leader JSW should learn its lesson from bankruptcy of OKD, the second entity in the benchmarking. For JSW it might be a chance to enter Czech local hard coal market due to the close proximity. In-depth analysis of investments done by OKD in the year prior to financial problems might also be an exercise worth doing in order to avoid the same managerial mistakes. Although we indicated the leader that should serve as a model business, we also stress that the leader should analyze deeply the management decisions taken in the entity taking second place due to the specific situation on the hard coal market and increasing amounts of liabilities observed in financial reports.

Because of the above, it will be interesting to analyze the financial and market position of Polish entities within few years in the absence of OKD or when a new company takes over Czech hard coal deposits and continues extracting them.

## Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

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