

## Evaluation of Mineral Assets: Interconnection of Financial and Managerial Aspects

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### ABSTRACT

Mining business makes no sense without mineral assets comprising mineral rights, exploration and evaluation expenditures, development costs, ore reserves and resources. The paper is aimed at investigation of how mineral reserves and resources are evaluated and represented in financial statements of mining companies, and what kind of influence do these mineral assets exert on the market value of a company. We concluded that application of so called accounting and managerial approaches to estimation of mineral resources base gave completely different results. Despite this, ore reserves and resources are not recognized in the financial reports. This leads to occurrence of difference between market and book value of a company, which should be taken into account in business combinations. Using correlation analysis we determined the dependence of capitalization and mineral resources base indicators and factors exerting influence on it. The evaluation of mineral assets as a very important part of business combination deal should be prepared on a basis of income and cost approach. The advantage of such a combination is the ability to take into account as many financial, organizational, managerial and technological factors as possible.

### KEYWORDS

Mineral assets, international financial reporting standards, fair value, mining company, value based management

### ARTICLE HISTORY

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## Introduction

The value of mineral deposits is a substantial component of market capitalization of mining companies. In the modern economics, mineral assets often become the main reason of acquisition or selling companies owning them. This is a reason why the potential parties of such deals should possess the most accurate information on the market value of assets purchased, including mineral ones, as possible (Baurens, 2010; Yachina, 2014).

Obviously, there are two contrary points of view on the value of company's assets (including mineral asset): those, which accountants and managers adhere. In the first case, the actual incurred expenses for "creation" of an asset

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are considered as the basis of its value, according to the other approach the value of an asset is associated with the expected cash flows generated over the period of the asset's commercial use. Naturally, application of these approaches results in different value estimates. This difference conceals a very important content – how market estimates the possible efficiency of acquisition and further development of a mineral deposit along with the rest of company's assets (Coetsee, 2010).

The key purpose of financial reports is to provide all interested users with the information on financial statement of a company, its assets and activities based on principles of materiality, transparency, completeness and timeliness. Relying on this public financial reports investors make their decisions on acquisitions or sales of companies, participation in long-run projects in the field of minerals exploration, deposit development and mining, as well as on deals with securities of issuers.

Activities of mining companies are characterized by specificity conditioned by the nature of their key production asset – ore reserves and mineral resources and the rights for their development. The term “mineral asset” is not a novelty. It is widely used in the world recognized guidelines and codes devoted to minerals valuation and estimation (VALMIN Code, JORC Code and etc.), accordingly, there is no doubt among the experts engaged in exploration, evaluation and mining activities in answering the question whether ore reserves can be treated as assets.

A special attention has been paid to the issues of specific assets of mining companies reporting recently. In 2004 the temporary financial reporting standard was issued (IFRS 6 “Exploration and Evaluation of Mineral Resources”), intended to cover the questions on one part of mineral assets. A few years later the investigation devoted to extractive activities was carried out due to the joint efforts of four national committees on financial reporting standards development – those of Australia, Canada, Norway and the South Africa. The project was concentrated on the nature of mining companies' unique assets (ore reserves and mineral resources valuation, mineral rights reporting, particularly). In 2010 the project was placed on the website by IASB for getting feedback from competent persons all over the world, further analyses and discussion of the project's results. Since 2012, the development of the international financial reporting standard on extractive activities has been carried out by IASB solely (Altynalmas Gold Ltd, 2014).

The main purpose of economic evaluation of mineral properties, which a mining company intends to develop, is to measure potential benefits from realization of the investment project (in the form of net cash flows). Numerous papers are dedicated to examination of different aspects of properties evaluation (Graham, 2002; Ellis, 2001).

### Literature Review

The up-to-date practice of properties economic evaluation involves application of three methodological approaches, namely cost, comparative (market) and income ones, which were implemented in technical and economic guidelines on mineral assets evaluation. Different issues relating to the mentioned approaches have been substantially investigated (Eves, 2013).



The discounted cash flow method (DCF-method, or NPV-method), based on income approach, is recognized as the fundamental method of mineral assets evaluation, both in international and the Russian practice (VALMIN, IVSs, Methodical Guidelines of the State Commission on Reserves) due to its universal nature, theoretical underpinnings and application usability.

The choice of estimation method is conditioned by the valuation aim and the asset's nature. This statement totally justifies itself in case of investment projects relating to mining sector. If to identify the exact project with the mineral asset, which makes its basis, it is reasonable to choose a methodical approach to economic valuation using the classification of properties presented in the paper "Valuation of metals and mining companies" (Baurens, 2010). On the base of projects classification offered by the Canadian Institute of Mining, Metallurgy and Oil (CIM), Baurens described the conformity of income, market and cost approaches to three types of projects, which significantly differ by reliance of geological information and availability of technical and economic assessment. The types of projects comprise those that correspond to exploration properties; projects ready for realization but not provided for financing (development properties) and projects in action, which are exploited (production properties). Graham A. Davis in the paper "Economic Methods of Mineral Assets Evaluation" developed the typology of mineral assets, which includes four classes (Graham, 2002). In addition to three project types coinciding with the before mentioned categories, the typology includes the class of speculative mineral assets characterized by uncertainty of mineral potential. Australasian Code for Technical and Economic Valuation of Mineral Assets (VALMIN Code, 2015) proposes five categories of projects: Early-stage Exploration Projects; Advanced Exploration Projects; Pre-Development Projects; Development Projects; Production Projects.

According to the existing viewpoint, assets valuation methods based on income approach, i.e. DCF / NPV – method and Real Option Valuation method (ROV), are not appropriate for estimation of speculative and exploration projects. They are worth applying if the future economic benefits associated with exploitation of mineral asset can be reliably estimated. Such certainty appears in case of projects going through feasibility studies, development and production projects. The widespread use of in-come approach in respect of these types of projects is accepted worldwide, with priority given to discounted cash flow method and auxiliary support of real option valuation method (Graham, 2002).

An alternative approach to valuation of projects, the commercial viability of which has been proved by the detailed calculations, as well as projects at the operation stage is market approach. Obviously, comparable transactions / sales method applied within the mentioned approach allows obtaining the estimates of mineral assets and mining companies, which fit the market conditions in a best way since the input data relates to the actual market deals. At the same time, comparable sales method is usually associated with many application issues. Among them are lack of numerous transactions of the same type, lack of adequate data on such deals and unique geological and mining parameters of each mineral asset (Ellis, 2001). This limits the scope of comparable sales method.

In the context of this study, the Value Based Management concept is of special importance. Its target management function is maximization of

company's value. The latter is defined by the future discounted cash flows. The value added is created under condition that the return on investment exceeds the cost of capital.

The efficiency of company's management aimed at market value growth is usually estimated by means of different indicators – EVA (Economic Value Added), MVA (Market Value Added), SVA (Shareholders Value added), CVA (Cash Value Added) and CFROI (Cash flow return on investment).

Martin J.D., Petty W.J., Wallace J.C., (2009), Damodaran A. (2006) made significant contribution to the development of Value Based Management theory and methods of value added estimation. They paid attention to the different value creation factors, which allowed getting the complex estimation. Of all existing indicators designed for evaluation of a company's value creation process Damodaran A. emphasized the importance of EVA. The indicator allows to define, a company's value, to assess the efficiency of its activities and the performance of the exact units.

A certain contribution to a mining company's value is provided by a quality of information included in its financial reports. In accordance with the decision usefulness theory, the information provided by accounting can contribute to decision-making of managers and potential investors (Coetsee, 2010; Inanga & Schneider, 2005; Ironkwe & Promise, 2015).

Being widely used by the international professional community IFRS offer the accurate algorithm of identification, initial recognition and reporting of key elements of financial statements. IFRS were designed to ensure quality of financial data, thus the standards are being developed continuously.

For forty-year history of IFRS some specialized standards have appeared. They cover the issues of financial reports preparing in such sectors as banking, non-profitable and infrastructure organizations, small and medium sized enterprises (Cortese & Irvine, 2010). However, a special IFRS for mining industries has not been validated yet. Practically every publication dedicated to preparation of financial reports by mining companies emphasizes lack of IFRS guidance on issues of specialized mining assets accounting and reporting New guidance on accounting for extractive activities, 2011; KPMG Limited, 2010; Uwaoma & Promise, 2015).

The IFRS "Extractive Activities" was intended to fill the gap, its discussion paper was published in 2010 (Extractive Activities, 2010). International auditing companies and Committee for Mineral Reserves International Reporting Standards (CRIRSCO) carried out the critical analyses of the discussion paper and identified those statements, which clearly distinguish the draft standard from the existing practice and the previous versions of the document. They refer to such key points as scope of the standard, recognition of mineral assets, their measurement and accounting (PwC, 2011; KPMG, 2010; PwC, 2012, CRIRSCO, 2010) (International Reporting Template for the Public Reporting of Exploration Results, Mineral Resources and Mineral Reserves, 2013; New Guidance on Accounting for Extractive Activities, 2011; KPMG Limited, 2010).

According to the results of the mentioned reviews, experts, business representatives and regulatory authorities have not come to an agreement on some principal issues. In a word, there are still some unsolved problems, especially those referred to the industries with a strong specificity.



The critical review of literature demonstrated that there is a lack of papers concentrated on finding the solution on the problem of incomplete reflection of properties values in mining companies' financial reports (development properties, in particular). Besides, little consideration has been given to the problem of economic evaluation of gold ore reserves and resources, especially in countries with emerging and developing economies.

### **Aim of the Study**

The investigation is aimed at analysis of development of international financial statements, which are widely used by major players of the mining industry

### **Research questions**

1. To what extent do financial statements contain overall economic information on mineral assets, which is of crucial importance to actual and potential investors and shareholders of a mining company? What are the main directions of financial statements development?

2. What are the objects of estimation in mergers and acquisitions deals: are they particular properties which can be legally developed and exploited by a mining company in future, or is it a company as a complex of existing assets, or both properties and company's available assets?

3. How is the difference between book value of a mining company and its market value established?

### **Method**

The tasks of the investigation were to large extent theoretical by the nature, thus their solution required application of critical analysis of research publications devoted to the issues of geological and economic evaluation of properties and development of international financial reporting standards applicable to extractive activities.

The methods of abstraction, comparative analysis, analysis of corporate financial statements and deals on business combination were applied while adjusting the theoretical results.

In order to confirm the hypothesis of substantial influence of mineral assets on a mining company's market value we used the methods and instruments of statistical and mathematical analysis, correlation analysis, in particular. These methods were applied to three international gold-mining companies.

Research publications, texts of currently valid International Financial Reporting Standards (IFRS), analytical reviews of mining industry, reports on ore reserves and mineral resources of gold-mining companies and their financial reports covering the period from 2003 to 2014 constituted the information basis of the investigation.

### **Data, Analysis, and Results**

The analysis of the actual IFRS allowed us to conclude that there is a gap in their scope. The standards do not cover the substantial parts of mineral assets in the form of development costs arising since the commercial use of a property has been confirmed, and the value of ore reserves themselves. The paradox is that

the value of the latter is not reported in the financial statements despite the recognition of ore re-serves as mineral assets by nature (from economic point of view). As a result, financial statements fail in providing the interested users with the complete picture of the present condition of a mining company and its prospects.

The IFRS designed for mining companies exactly is necessary for the unification of their accounting policies and for presentation of unbiased information, which can be useful for all categories of interested users in case of making decisions on participation in companies' activities (establishment of joint-ventures, purchase of shares or company's acquisition).

The difficulty of such a standard development is in need to address two principal issues relating to ore reserves. The first one concerns the correspondence of ore reserves and mineral resources with the definition of asset as an element of financial statements. The other one refers to ability of mineral reserves and resources to meet those criteria of asset's recognition established by the Conceptual Framework for Financial Reporting 2010.

This Conceptual Framework defines an asset as "resource controlled by a company as a result of past events the use of which will bring expected economic benefits in future" (Conceptual Framework for Financial Reporting, 2010).

From our point of view, the sense of all types of mineral assets – from exploration costs to proven ore reserves at production stage – corresponds to the mentioned definition. Having finished some exploration work resulted in evaluation of ore re-serves (or having obtained the results through purchasing a contract) the company is able to apply for a right to develop a deposit. It means that the company has a control over the economic resource in the form of ore reserves based on the legal right to carry out the corresponding activity. The expert community has not agreed yet whether control is an absolute right to extract minerals or is it the ability to apply for corresponding right.

Getting back to the issue of mineral reserves and resources recognition as elements of the financial statements (balance sheet or financial statement report) we should point out that it is not enough just to satisfy the definition of an asset. Reserves and resources should meet two basic recognition criteria established by Conceptual Framework for Financial Reporting:

- 1) future economic benefits associated with the object will be obtained by the company with a high degree of probability;
- 2) costs incurred or the value of the object can be reliably estimated.

Reliability of reserves evaluation is largely a sticking point in solving the problem of their treatment as assets in the financial statements. On the one hand, mining companies actually operate in conditions where neither quantity nor quality of ore reserves is definitely known and they can be reliably estimated just during extraction process. On the other hand, these estimates of reserves are widely used for accounting purposes as a basis of other indicators calculation (for example, amortization of mine workings). The financial statements also include some figures, which in fact are estimates (for instance, estimated value of provision for rehabilitation of environment and provision for production closing, which will probably take place in decades).

In our opinion, there are some prerequisites for successful solving the task of ore reserves estimates inclusion in financial statements. First of all, much has



been done by the Committee for Mineral Reserves International Reporting Standards (CRIRSCO) in the sphere of unification, development and application of universal reporting template applicable to exploration results, reserves and mineral resources and appropriate for competent persons all over the world (the CRIRSCO International Reporting Template) (International reporting template for the public reporting of exploration results, mineral resources and mineral reserves, 2013).

Thus, the international professional community admits the unified definitions of different types of mineral resources and ore reserves, as well as the unified requirements to their identification and public reporting. This decreases the level of un-certainty associated with estimates of what can be considered as mineral reserves, which can reasonably be regarded as asset in terms of financial statements.

Secondly, International Accounting Standards Board (IASB) developed and validated the methodology approaches to assets fair value measurement (IFRS 13), that is, the methodological background for economic evaluation of mineral reserves aimed at financial reporting, has already been provided.

Thirdly, the major world stock exchanges acknowledge reports on mineral re-serves and resources prepared in accordance with the international Codes (JORC Code for London Stock Exchange, for instance) and require mining companies to submit such reports for the listing procedures. Accordingly, the detailed information on ore reserves and mineral resources is of crucial importance to investors, because they make decisions on sale or purchase of financial instruments issued by mining companies relying on this information, too.

Let us return to the question on the estimation object in case of entire mining company acquisition (or share in its capital). In general, fair value of net assets constitutes the basis for the deal pricing (in accordance with requirements of IFRS 3 “Business combinations” the acquirer should represent the fair value of an acquires identifiable assets and assumed liabilities at the acquisition date) (Technical Summary, 2014). IFRS 13 “Fair Value Measurement” determines the fair value as the “...price that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date”. It is not important in this case whether such a price is really observed on the market or it is determined by calculation (with the methods applicable within market, income and cost approaches).

The premise of acquires assets correct fair value measurement is an assumption on their use in the best and the most effective manner, which means technical feasibility, legal permissibility and financial justification (IFRS 13). Proceeding from this condition and relying on the represented fair value definition we made a conclusion as follows. While acquiring a mining company, an investor identifies all the as-sets which meet recognition criteria and the mineral rights and / or exploration & evaluation assets can definitely be found among them.

Despite the fact that proved and evaluated ore reserves are missing in a mining company’s list of assets recognized by IFRS, the measurement of mineral rights’ and exploration assets’ fair value is based on the data reflecting quantity of ore reserves, available for efficient exploitation under the current market

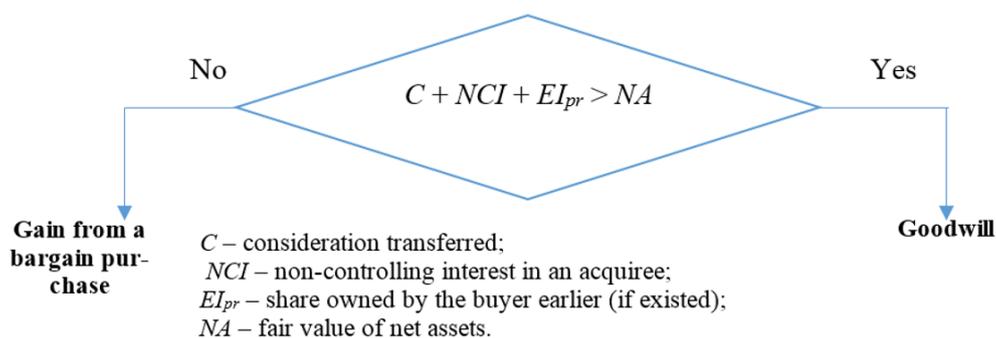
conditions. This statement explains the occurrence of difference between the “historical” value of rights obtained and exploration assets created (book value demonstrated in the financial reports) and their fair value.

The deal between the Russian gold mining producer Polymetal International PLC (the acquirer) and the Kazakhstan Sumeru Gold on acquisition of 100% share capital of Altynalmas Gold Ltd (the acquiree) can serve as a confirmation of our conclusions. The entity acquisition took place in September 2014.

According to the financial statements of Altynalmas Gold Ltd (AAG) prepared as of June 30, 2014, the book value of total assets was \$100,176 million, while the book value of net assets reached - \$720 thousand (2014). Despite this fact Polymetal International PLC acquired AAG for \$618,5 million (\$318,5 million as a cash consideration, \$300 million were paid by newly issued ordinary shares) (Polymetal Acquires Altynalmas Gold, 2014). The fair value of AAG exploration and development assets the acquirer estimated in \$853,6 million (while their book value was slightly more than \$91 million), and the entire amount of the excess of fair value over the net assets of AAG was added by Polymetal to mineral rights (Polymetal International PLC, 2014).

The importance (and consequently the high fair value estimate) of such an acquisition for Polymetal International is explained by the obtained possibility to double the mineral resources base having enriched it with high quality production asset (gold ore reserves – 6,7 million ounces in total, the average grade of gold – 7,5 g per ton, according to JORC) (Polymetal International PLC, 2014). The fair value of the right for the development of these reserves was measured taking into account competence of Polymetal in the sphere of unique technologies of mining and ore processing.

In addition to the difference between the book or historical value of net assets acquired and their fair value, the difference between the amount of consideration transferred by the buyer and the total fair value of net assets purchased may occur as a result of a business combination. Either goodwill or gain from a bargain purchase can be recognized depending on the ratio of fair value and the amount of consideration (see Figure 1).



Source: designed by authors on the base of IFRS 3

**Figure 1.** Formation of possible results of deals on business combinations.

A gain from a bargain purchase is considered to be a rare phenomenon, which may occur due to a forced character of a deal or lack of information on acquired business. It is possible to demonstrate how such a gain is formed using



the following example. The deal was aimed at acquisition of 50% capital of Amikan Holding Limited – the joint venture of AngloGold Ashanti and Polymetal International – by the latter. The key parameters of the acquisition that took place in February 2012 are represented in Table 1.

According to the data of the acquirer, “the gain from a bargain purchase occurred as a consequence of strategic decision of AngloGold Ashanti Limited on termination of its activity in the Russian Federation” (Polymetal International PLC, 2012).

**Table 1.** Allocation of Amikan Holding Limited purchase price by Polymetal International

Indicator	Preliminary book value, (thousands \$)	Fair value adjustment, (thousands \$)	Fair value, (thousands \$)
Exploration and evaluation assets	20188	47654	67842
Differed tax asset	3577	-	3577
Other net assets	230	-	230
Loan	(8464)	-	(8464)
Differed tax liability	-	(9531)	(9531)
<i>Net assets purchased</i>	<i>15531</i>	<i>38123</i>	<i>53654</i>
<i>Debt purchased</i>	<i>-</i>	<i>-</i>	<i>1572</i>
<b>Total</b>			<b>55226</b>
Consideration in cash			20000
Credited against book value of investment in joint venture with Polymetal International			14175
<i>Adjustment of share's fair value belonged to Polymetal International before</i>			<i>12651</i>
<i>Gain from a bargain purchase</i>			<i>8400</i>
<b>Total</b>			<b>55226</b>

Source: The annual Report of Polymetal International 2012 (Polymetal International PLC, 2012).

Goodwill represents a kind of premium to a fair value of net assets, which an acquirer consciously pays for a company expecting some extra benefits from purchased business. These additional benefits are associated with the complex of those advantages and company's characteristics that cannot be identified as separate assets. Proved and probable mineral reserves contribute to a goodwill formation definitely. For example, a company acquires some mineral deposit for exploration and expects that the scale of its mineral base will be enough for further development and construction of self-sufficient mining enterprise. The company also expects that reserves of nearby small deposits will be involved in processing at newly constructed facilities (in this case goodwill may arise as a reflection of synergetic effects from the acquisition). A premium to a fair value of net assets an acquirer may also pay expecting that the conveniently located processing facilities of an acquire will be totally loaded by means of additional processing of third parties' ore. The acquirer in this case may get some extra benefits through compensation for high costs related to processing of low-grade ore, which is mined in this field exactly.

We analyzed the dynamics of goodwill represented in the financial statements of Polymetal International, examined the reasons of its change over several years and came to a conclusion that the goodwill, which initially emerged during the acquisitions of mineral assets and mining companies, was later written off as a result of impairment test. For example, in 2013 due to a rapid decrease in gold and silver prices the goodwill was impaired as well as

some mining and metallurgical assets of Polymetal International (table 2). Another reason of the goodwill amount change was conversion of indicators from rubles to the currency used for presentation of the consolidated financial statements (US dollars).

**Table 2.** Dynamics of goodwill and impairment of mining and metallurgical assets of Polymetal International in 2012-2014

Indicator	2012	2013	2014
Goodwill (as of beginning of a year), thousand \$	108 587	115 105	30 889
Goodwill change at the expense of currency conversion, thousand \$	6 518	-8 241	-12 919
Impairment of goodwill, thousand \$	0	75 975	0
Goodwill (as of the end of a year), thousand \$	115 105	30 889	17 970
Impairment of assets related to mining, thousand \$	-	125 129	-
Average gold price, \$ per ounce	1 669,0	1 409,2	1 266,4

*Source: compiled by the authors on a basis of the annual reports of Polymetal (Polymetal International PLC, 2012; Baurens, 2010; Coetsee, 2010).*

On assumption that goodwill is a premium, which an acquirer pays for the company in anticipation of additional economic benefits from ownership, it is possible to suppose that goodwill amount is strongly correlated to the high investment estimates of the business and mineral assets estimates largely.

A potential acquirer examines the option of mineral assets acquisition (and business combination as well) based on the following optimization task:

$$MV_q = q^{t-1} \sum_{i=1}^n \sum_{t=1}^T Z_{it} - S_{it} \rightarrow \max$$

where  $MV_q$  – potential value of a mineral asset (deposit e.g.);

$q^{t-1}$  – discounting factor;

$Z_{it}$  – value of minerals produced by  $i$ -type of production;

$S_{it}$  – capital expenditures and operating costs in period  $t$ , by types of production;

$t_i$  – period of development and extraction of minerals by  $i$ -type of production from evaluation stage ( $t = 1$ ) till the last year extraction ( $t = T$ );

$n$  – a number of possible ways and systems of development of a deposit (number of types of production).

The indicator  $S_{it}$  includes both incurred costs reflected in financial statements and future expenditures, estimates of which are prospective in nature. Any efficient owner of a company is eager to minimize the future expenses (by introducing innovative technologies, reducing infrastructure expenditures and so on) thereby increasing the value of mineral asset.

The specificity of mining companies' operations is a strong interconnection of a company's assets and the deposits developed and mined. It is possible to contingently divide all the assets relating to mining and metallurgical production into two components: 1) fixed assets comprising buildings, facilities, machinery and equipment etc. and intangible assets in a form of mineral rights for exploration, development of a property and mineral extraction; 2) ore reserves and mineral resources, extraction of which constitutes the basis of mining production. Strict dependence of both components of assets can be considered as the distinguish feature of mining business.



It is logical to assume that mineral assets play a significant role in establishment of the market value of a mining company, especially in case of extremely low level of mineral reserves provision. According to the calculations, which we made on the basis of the financial statements of gold mining companies (Barrick Gold, AngloGold Ashanti, and Kinross Gold Corporation), two of three companies demonstrate a strong correlation between mineral reserves and resources and market capitalization (Table 3, Figures 2-4).

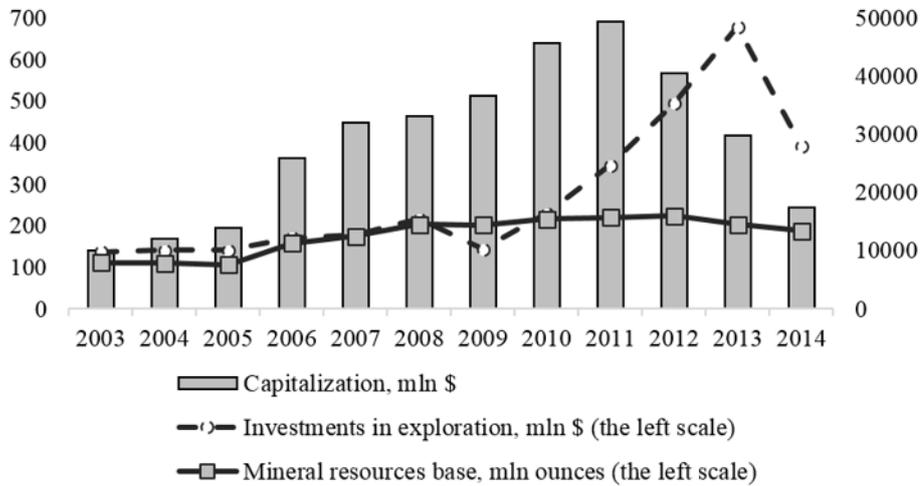
Besides, we found out that the lower a ratio “reserves / production” was and the less the share of reserves in the total amount of mineral resources base was, the stronger was the correlation between capitalization and investments in exploration.

**Table 3.** Indicators of companies’ mineral resources base condition and their influence on capitalization

Indicator	Gold mining companies		
	Barrick Gold	AngloGold Ashanti	Kinross Gold
Provision of extraction activity with proved ore reserves (R/P ratio), years (as of 2014)	15	13	13
Share of reserves in mineral resources base, %	50.35	36.03	59.88
Relative change of production volume over the period 2003-2014, %	13.41	-21.01	69.03
Relative change of reserves and resources over the period 2003-2014, %, total, including:	69.32	77.50	116.36
relative change of reserves in 2003-2014, %	8.22	123.74	112.86
relative change of mineral resources in 2003-2014, %	282.05	58.99	121.81
Relative change of investments in exploration and evaluation over the period from 2003 to 2014	186.13	278.95	334.57
Calculated correlation coefficients reflecting dependence between:			
total ore reserves and capitalization	0.63	0.47	0.93
mineral-resources base and capitalization	0.89	0.13	0.89
ore reserves and investments in exploration	0.09	0.38	0.76
mineral-resources base and investments in exploration	0.57	0.23	0.81
capitalization and investments in exploration	0.31	0.40	0.60
provision of reserves and investments in exploration	-0.13	0.80	0.34

Source: authors’ calculation based on the financial reports of gold mining companies

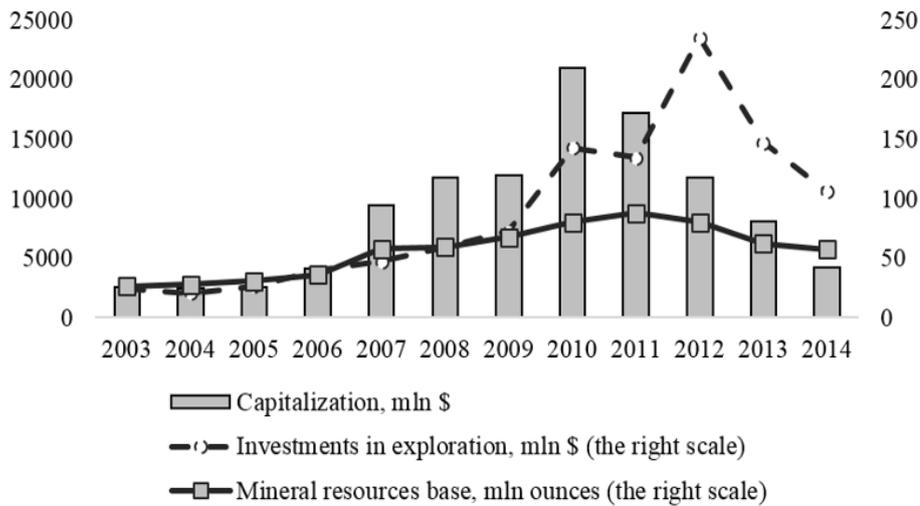
For example, the structure of mineral resources base of AngloGold Ashanti differs significantly from that of Barrick Gold and Kinross (the share of its ore reserves is 36 %) while proved reserves are enough for 13 years of extraction (Kinross has the same R / P ratio).



Source: compiled by the authors on the base of financial statement of the company

**Figure 2.** The dynamics of reserves, mineral resources, investments in exploration and capitalization of Barrick Gold

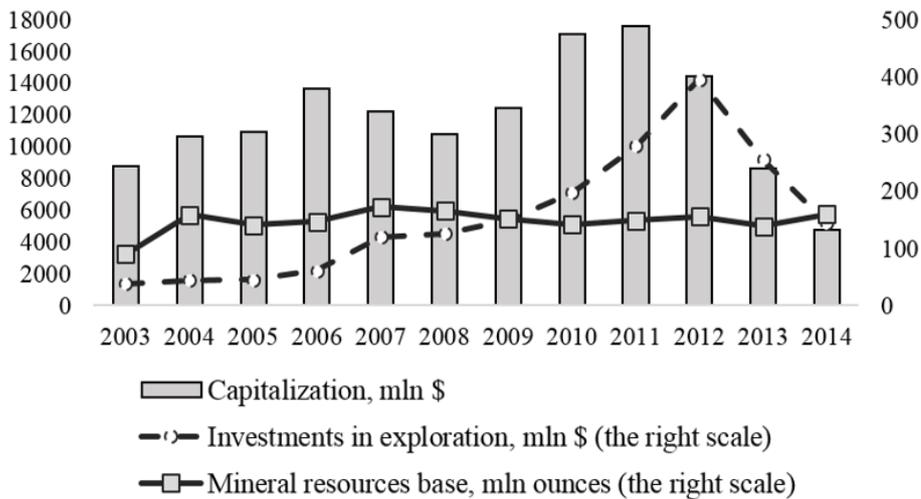
The interdependence of capitalization and investments in exploration for the mentioned companies is stronger than for Barrick Gold (Table 3).



Source: compiled by the authors on the base of financial statement of the company

**Figure 3.** The dynamics of reserves, mineral resources, investments in exploration and capitalization of Kinross Gold

It is possible to explain the high correlation between provision of production with proved reserves – R/P ratio – and investments in exploration (correlation coefficient equals 0,8) by the specific feature of mineral resource base of AngloGold Ashanti, low proportion of reserves in it, particularly.



Source: compiled by the authors on the base of financial statement of the company

**Figure 4.** The dynamics of reserves, mineral resources, investments in exploration and capitalization of AngloGold Ashanti

During the period under review, all companies increased their investments in exploration by two – four times depending on the scale and dynamics of production activities and availability of ore reserves. We can estimate the efficiency of investments in exploration using the ratio “relative change of investments / relative change of ore reserves and mineral resources”. For example, 1% growth of investments by AngloGold Ashanti and Kinross led to 0,3 % growth of reserves and resources. As for Barrick Gold its efficiency of investments in exploration was 0,4 %.

### Discussion

In order to explain the range of correlation coefficients it is necessary to analyze the influence of other factors on capitalization (indicators of debt burden, profit, dividends yield and so on). However, even preliminary interdependence analysis of ore reserves, mineral resources, investments in exploration and company’s capitalization allows to conclude that mineral assets play the essential role in creation of a mining company’s value.

It is worth noting that the papers devoted to investigation of market value dependence on mineral reserves and resources quantity are not numerous. As a rule, the chosen objects of investigation are oil and gas companies (Abdo & Al-Gabery, 2013; Kaiser & Yunke, 2012; Mazen, 2014). In these papers the interdependence of company’s capitalization and amount of oil and gas reserves was revealed by means of correlation analysis, and the authors’ conclusions confirmed the hypothesis of substantial influence of the value and the amount of mineral reserves and resources on the market value of oil and gas companies.

Our quantitative estimates of link between capitalization and mineral-raw base of a company were performed on example of gold-mining companies; the similar re-searches in this sector have not been identified.

Reliability of estimates is provided by usage of official financial reports data, reports on mineral ore reserves and resources, stock exchange information

on share prices. The results of correlation analysis can be considered as reliable since the method was applied to a long-term data set (from 2003 to 2014).

Theoretical conclusions of our investigation do not counter worldwide-accepted concepts and methodical approaches, and develop up-to-date viewpoints on the nature of mineral assets and their role in raising mining company's value. The results obtained contribute to development of corporate reporting standards and the Value Based Management theory.

## Conclusion

At present, there are few regulations on financial reporting of mineral assets. Development and validation of the complex international financial reporting standard covering all kinds of extractive activities from exploration to minerals processing and environmental remediation will contribute much to provision the interested users with complete information on the current mineral resource base and its prospective development. The inclusion of ore reserves value in the financial reports could also assist in making decisions on deals with mineral assets and mining business.

The evaluation of mineral assets as a very important part of business combination deal should be prepared on a basis of two methodological approaches – cost and income approach. The advantage of such a combination is the ability to take into account as many financial, organizational, managerial and technological factors as possible.

Economic evaluation of mineral deposits in market conditions is strongly related to technical, human and financial resources of a particular mining company. Thus, evaluation results will be individual for different companies (especially in respect of operating costs). The object of estimation regarding an acquisition of entire mining company is not only mineral deposits, which can be legally developed and mined, but the company as a property complex.

The differences in the level of management and technological development, production scale, financial, intellectual and production resources determine the amount of difference between a book value of a mining company and its capitalization as a cash equivalent of expected additional economic benefits associated with the acquired business. In this way the hypothesis on crucial importance of mineral assets as a factor providing the stable company's value growth is confirmed and consistent with the basic statements of Value Based Management theory.

In our opinion, the further research should be concentrated on the specific features of mineral assets usage. They differ significantly from the ordinary production assets like buildings, facilities, equipment due to some issues relating to ownership, necessity to invest in exploration, high dependence of economic results from infra-structure development level and so on. Such an investigation is especially vital for the mining companies operating in countries with emerging and developing economies, to which Russia still should be referred.

## Disclosure statement

No potential conflict of interest was reported by the authors.



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