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Strategic value and its assessment in the evaluation of mineral projects

Key words

Mineral project, project assessment, strategic value, real option

Abstract

Strategic value of a project (or the value of strategic opportunities) appears when the realization of a project offers additional opportunities which would not be discovered if the project had not been chosen to be realized. The projects with strategic value are often called creating options as they give the rights, but not the obligation, to use these additional opportunities, an investor will exercise the option if he finds it beneficial.

Many investment projects connected with the exploration and development of mineral resources have strategic values. The main aim of this paper is to present the importance of the complex analysis of mining investment projects which allows one to discover their strategic value. The paper demonstrates methods of the assessment of a project with strategic value through the application of the approaches based on scenario planning, simulation as well as on real options concept.

Introduction

Many companies exploring mineral recourses — similarly to the companies of other industries and sectors — are required to create and introduce the strategy aimed at the increase of shareholders' value. The proper allocation of company capital can be regarded as one of the crucial issues in the realization of such strategy. The evaluation of mineral projects is neither easy nor leads to unambiguous results and managers make different decisions on the basis of similar input assumptions, depending on their goals, experience or risk acceptance. However, it must be underlined that managers' decisions are finally verified by the market. As more and more companies exploring mineral resources are joint stock companies and have their stock traded at stock exchanges, the market, company stock prices, the interests from the part of investors (or their lack) evaluate the decisions taken during the process of projects selection (Amram, Kulatilaka 1999).

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Contemporary finance theory underlines clearly the fact that the final value of a project results from three important sources (Michalski 2001). The first and basic source of the value is connected with so called operational value. Next, the area connected with capital structure and the sources of financial means has to be considered. And finally, the opportunities connected with the flexibility of managerial decisions and actions and with the possibilities to extend the project should be analyzed as value-creating.

Indisputably, mineral projects aimed at the exploration of mineral resources have many specific features. Nevertheless, it seems to be reasonable to assess the whole value of mineral project comprising the mentioned above three sources of value creation. The operational value results from the value of mining activities and depends mostly on the deposit size, prices, costs and many other geologic and economic parameters. Similar mining activities can be, however, financed by different sources and the source of financial means and cost of capital must by also considered. Mineral projects can also create additional opportunities for future growth of the company and for further projects being undertaken — it means that they create the value of strategic advantages called 'strategic value'. Strategic value appears when the realization of investment project opens some additional opportunities to realize following projects or next stages of more complex projects, to extend the activities on a new market, or to win next profitable contracts. Strategic value of mineral project appears for instance when the exploration has a staged structure, when the development of a certain part of a mine allows to continue further works, when the purchasing of geological leases enables one to explore in a new region or when the holder of a petroleum exploration concession has the rights to extend its activities at some additional cost. Strategic value results in the increase of the value of the whole project and should be taken into consideration in the process of project assessment.

The main aim of this paper is to discuss the issue of strategic value in relation to mineral projects. In the first part of the article the concept and examples of strategic value of mineral projects will be presented. In the next part the methods of strategic value assessment, such as scenario analysis and simulation as well as real option approach will be demonstrated. It is not easy to assess the correct strategic value of a mineral project, as it is neither possible to identify precisely the extendibility of a project nor the input data required to estimate this value. Strategic value can be assessed only in an imprecise way and can be treated only as the approximation. The limits in the assessment, on the other hand, should not imply that such assessment is to be neglected. Companies exploring and developing mineral resources should be interested in uncovering and evaluating the hidden opportunities of their future growth.

1. Strategic value of investment projects

As it was mentioned in the introduction, it may be said about an investment project that it has a strategic value when its realization brings some opportunities of future development. In many sectors such projects — with strategic value — are conducted. In the literature it is possible to find the description of many examples of projects connected with research and development in pharmaceutical industry, aircraft, or complex IT projects realized as staged investments. Unquestionably, there are many examples of projects connected with mineral deposits exploration

and development which have strategic value. Nowadays the companies exploring mineral deposits more and more often become global players, competing around the world, using the achievements of technological development and applying newest management systems and techniques. It is not difficult to find many examples of staged project realized in the sector of mineral deposits exploration. A staged investment occurs when the project is conducted as a series of outlays that allows the project to be abandoned or developed in the mid-stream if the conditions become unfavorable or when additional opportunities appear. The realization of projects in multinational companies operating around the world has usually the initial stage which consists of a pilot project conducted in one chosen region. This stage shows the management whether or not the new technology, new survey or drilling system, or IT system supporting exploration could be implemented and used successfully by the whole company. If the pilot project was successful the company would continue with the next stage and extend the activities connected with the technology improvement to the other regions. The pilot project opens the new opportunity (option) for further decisions and actions.

In some countries in Europe, in Brazil and USA the holder of the petroleum exploration concession has not only the rights to exploration until the expiration date but also the possibility to extend these rights at additional cost. It means that if exploration projects conducted within the concession possessed are successful, the company has the opportunity (option) to pay for the extension of the concession and drill further wells. If the projects do not work according to expectations, the company can cease its activities in this area and do not use its further rights to explore. In result, the opportunity to extend the scope of the concession increases its value to the oil company.

It is also possible to find some interesting examples in the literature of the subject. One of such interesting examples of projects with inbuilt strategic option was presented by Moel and Tufano (1999). The project described in the paper was connected with the privatization of copper mines in Peru. In the mid of 90. Peruvian government decided to privatize a number of state-owned mines. One of the mines sold by auction was Antamina. The auction rules were as follows: the winning bidder would have two years to explore the property before deciding whether or not to develop the site. The additional geological exploration should more precisely establish the amount and quality of ore in the property. As it was mentioned, such exploration was expected to take two years and would be completed before mine construction began. If the geological work suggested the mine was economically exploitable, the property would need to be developed to extract metals. The possibility to see the results of the first stage and then take final decision gave the additional value to the project which should be incorporated into the evaluation process. Taking into account auction rules, the Antamina project had its strategic value.

2. Assessment of projects' strategic value

There is a broad range of qualitative and quantitative methods of investment assessment, which for years have been used in the practice when evaluating geological and mining projects. The most important role have been playing quantitative methods based on simple (such as

payback period or accounting rate of return) and discounted (net present value NPV, internal rate of return IRR) measures. The results of research conducted in many countries demonstrate that NPV and IRR are the most commonly used measures of projects effectiveness in all sectors and industries (see for instance Graham, Campbell 2001). NPV method is widely used as the tool of the appraisal of mineral projects. It is worth to add that in the literature there is presented a long list of factors which are quoted as the most important advantages of NPV. The crucial are: correspondence with the company goals, considering the whole period of project life and time value of money, and possibility to choose among investments in financial and non-financial assets. However, the NPV method has also some disadvantages. The drawbacks most often quoted in the literature are as follows: limiting risk analysis to the market risk comprised in the height of discounting factor, and — what is important from the point of strategic value assessment — the lack of the possibility to assess the value of the opportunities offered by the project for the future development of the company or to assess a "project chain" initiated with the project analyzed. In result, NPV method does not encourage the investor to incorporate strategic value in the valuation procedure and cannot be regarded as a tool enabling one to assess the strategic value of mineral project.

The flexibility in the project management and strategic value create opportunities to increase the potential of the project and simultaneously to limit loses and risk. The general rule is as follows — the higher strategic value and more elasticity in the project management, the higher value of the project analyzed. As to the possible tools to estimate these additional elements of project value, the usage of scenario analysis and simulation is suggested. However, the most important role in strategic value assessment seems to play the approach based on real options. The methods suggested for strategic value assessment will be presented below.

2.1. Scenario planning and simulation

Scenario planning is regarded as one of the approaches used commonly when making decisions under uncertainty and such approach may be very useful in the assessment of staged mineral project which are conducted under uncertainty as to the future prices, demand, consumer behavior, government policy etc. In general, scenario planning requires managers to envision possible future states of the environment and consider how to take advantage of opportunities and avoid potential threats (Miller, Waller 2003). When using scenario planning method investors are required to identify the stages of a mineral project, then to predict possible cost and benefits paths and estimate the results of the next stages of the project at various future scenarios.

Another approach used commonly in the assessment of mineral projects under uncertainty is simulation method. Simulation can be regarded as the next step after scenario analysis — it also requires one to estimate possible future cost and benefits, but this time in the form of probability distributions. Distributions of costs and benefits connected with project realization and thousands of repeated outcomes calculations enables one to obtain the probability distribution of the final project value. Simulation method can be used to assess the value of staged mineral project and an example of such assessment was presented by Moel and Tufano (1999) to estimate the value of Antamina project described in the previous chapter. In the concept used to value Antamina project, the simulation of a series of possible metals price paths was conducted and it

was the basis for NPV calculation model. Monte Carlo simulation generated 10000 price paths from year 0 to 2 and then NPV distributions which corresponds do high, medium and low ore deposit were calculated. It appears that almost 4 out of 10 obtained outcomes of the mine value at the year two were negative. Next, the 'additional value' resulting from the flexibility of managerial decisions and possibility to decide: proceed works or not to proceed after learning the outcome of the first stage of the project was analyzed. For the evaluation process it was assumed that the negative outcomes could be truncated as the investor would optimize his final decision. In consequence, the mean of NPV value would rise and the difference between NPVs — with and without negative values — could be treated as the value of the opportunity brought by realizing the project in the staged way. Although such method of the assessment of 'additional', i.e. strategic value of a project when it is realized in staged way may seem to be controversial, it is a valuable suggestion as to the estimation of the value of the flexibility resulting from the decision about continuing (or not) the realization of the project after two year period.

2.2. Real option approach

The concept of real option appeared in the end of 70. when Stewart Myers published an article in "Journal of Financial Economics" in which he noted that the company value results from both: assets in place and opportunities to purchase real assets at potentially favorable prices in the future. He termed the latter category 'real option' drawing attention to the similarities to financial option (Miller, Waller 2003). Whereas financial option gives rights to buy or sell financial assets, real option have physical resources as their underlying assets. Financial options have precise exercise price and fixed expiration terms. By contrast, real options are not specified contracts. However, at the heart of real option is the notion that a company that has real option has the right but not the obligation to make a potentially valuable investment. There are many examples of real options. Most often quoted examples are investments in new markets, in research and development activities, usage of temporary workers, rented plants and equipment, and provisions in joint ventures contract.

At the beginning the concept of real option was introduced into practice in oil industry to assess the value of hydrocarbon reserves and tracts in bidding process. There were some crucial reasons for such application. At first, geological leases — similarly to financial option — have certain expiration date and give the owner of oil tract the rights, but not the obligation, to use the exploration right acquired when purchasing the concession. Another important factor was that the average size of discovered petroleum reserves declined steadily over the last years and as a consequence the fields have become more marginal, and new flexible strategies have been required. The assessment methods should not only handle reservoir uncertainty and market risk but different types of flexibility as well (Lund 1999). In short time the application of real option was adopted in the assessment of mineral projects connected with exploitation of other mineral resources such as copper, zinc, or gold.

In the mineral project assessment based on real option approach the following assumptions are required:

— the price of underlying instrument is the sum of discounted cash flows generated by the mineral project in its lifetime,

— exercise price is the sum of discounted capital required to realize the project,

— expiration time equals to the time of the investment possibilities (for instance concession expiration),

— volatility is equal to the estimated variance of future cash flows,

— interest rate is risk-free interest rate (estimated for instance on the basis of long-dated bonds).

And similarly to financial option, real option has two important sources of its value:

— Intrinsic value — which is the result of the difference between estimated cash inflows and capital requirements.

— Time value — which is connected with the uncertainty as to the prices, demand, production volume etc., it means with the possibility of favorable conditions which will be used to increase investor's profit.

As to the valuation of real option, the most popular models used in financial option pricing — Black-Scholes, Merton, binomial tree models — are also used as the tools of real options valuation. The method based on binomial tree, which presents the possible scenarios of project realization, is used quite often. The valuation with this model is regarded as quite easy to apply and interpret because of the analogy to decision tree method. The more complex and difficult models, which assume continuous distribution of changes in underlying asset prices, have one important disadvantage — it is not easy to keep to the assumptions required to the proper use of such method. It is possible to find in the literature a broad range of examples of applications of mentioned models based on financial engineering, as well as some specific models constructed for certain types of real options. The issue of real option application and evaluation in mineral deposits assessments was presented by Paddock, Siegal and Smith (1998), Lund (1999), Sick (1999), Smith and McCradle (1999), Saługa (2002), Saługa, Dzieża and Kicki (2002) among the others.

Real options are a valuable tool when assessing strategic value of a mineral project. What should be underlined when analyzing real option approach is that regardless of what mathematical model is used in the assessment process, the value estimated by the means of real options concept is never lower than the value assessed by traditional NPV method. If real option connected with the realization of mineral project is neglected, the value of the project is equal to its NPV value. Similarly, when the real option expires both approaches give the same results equal to NPV. But at the moment of making the decision, when the option has certain expiration time and time value, and when it is considered in the process of assessment, the value of a mineral project will be assessed as higher. The difference in project values assessed with NPV approach and real option approach — it means with considering and employing strategic advantages — can be regarded as the estimation of flexibility and strategic value connected with the realization of the mineral project.

Conclusions

Mineral projects, especially these ones that are conducted as staged investments, have so called strategic value. The assessment of strategic value is neither easy nor precise, although both

–theorists and investors are searching for the methods of its estimation. In the article such methods as scenario planning and simulation as well as real options are suggested as the tools of strategic value assessment.

The assessment of investment projects based on real option approach seems to be quite a fashionable subject, more and more often the papers on this issue are presented in Polish literature. Proper usage of real options approach requires some mathematical knowledge and skills, but on the other hand such approach has a very important advantage — it leads to the more detailed analysis of a project. Real option concept can be regarded as an additional area in project assessment methodology which enables the investor to uncover some hidden opportunities and take into consideration such elements as flexibility of decisions and actions or expandability of the project. Real option concept offers the means used not only to assess but also to manage the project in a more active way.

REFERENCES

Amram M., Kulatilaka N., 1999 — Disciplined Decisions. Aligning Strategy with the Financial Markets. Harvard Business Review, January-February, p. 95—104.

Graham J., Campbell H., 2001 — The Theory and Practice of Corporate Finance: Evidence from the Field. Journal of Financial Economics, no 61.

Kozarkiewicz-Chlebowska A., 2001 — The Assessment of Staged Investment Projects Based on Real Option Concept. Proceedings of the International Scientific Conference „Aktualia i perspektywy gospodarki surowcami mineralnymi", Polanica Zdrój (in Polish).

Kozarkiewicz-Chlebowska A., 2001 — Application of Real Option Theory to Assess Investment Decisions under Risk and Uncertainty, In: Company Management — Theory and Practice. Selected Issues. Edited by W. Waszkielewicz. Kraków, Wydział Zarządzania AGH (in Polish).

Lund M.W., 1999 — Real Options in Offshore Oil Field Development Projects. 3rd Annual International Conference on Real Options: Theory Meets Practice, Leiden, The Netherlands.

Michalski M., 2001 — Value Based Management. Wig-Press, Warszawa (in Polish).

Miller K.D., Waller H.G., 2003 — Scenarios, Real Options and Integrated Risk Management. Long Range Planning, vol. 36, p. 93—107.

Moel A., Tufano A., 1999 — Bidding for the Antamina Mine: Valuation and Incentives in a Real Option Context. 3rd Annual International Conference on Real Options: Theory Meets Practice, Leiden, The Netherlands.

Paddock J., Siegal D., Smith J., 1998 — Option Valuation of Claims on Real Assets: The Case of Offshore Petroleum Leases. Quarterly Journal of Economics, August, p. 479—508.

Saługa P., 2002 — The New Instruments in Mineral Projects Evaluation. Gosp. Sur. Mineral. vol. 18, no 4, p. 143—148.

Saługa P., 2002 — Importance of Option Value in Mineral Project Evaluation. Gosp. Sur. Mineral., vol. 18, special issue, p. 185—191 (in Polish).

Saługa P., Dzieża J., Kicki J., 2002 — Real Options in Mineral Projects Evaluation. Gosp. Sur. Mineral., vol. 18, special issue, p. 157—173 (in Polish).

Sick G., 1999 — Analyzing a Real Option on a Petroleum Property. 3rd Annual International Conference on Real Options: Theory Meets Practice, Leiden, The Netherlands.

Smith J., McCradle K., 1999 — Options in the Real World: Lessons Learned in Evaluating Oil and Gas Investments. Operations Research, January-February, p. 1—15.

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WARTOŚĆ STRATEGICZNA I JEJ SZACOWANIE W OCENIE GÓRNICZYCH PROJEKTÓW INWESTYCYJNYCH

Słowa kluczowe

Górnicze projekty inwestycyjne, ocena projektów, wartość strategiczna, opcje rzeczowe

Streszczenie

Wartość strategiczna projektu, określana jako wartość możliwości strategicznych, dotyczy przypadków, w których realizacja projektu inwestycyjnego otwiera dodatkowe możliwości, które nie pojawiłyby się, gdyby projekt nie został skierowany do realizacji. Projekty z wartością strategiczną określane są często jako kreujące opcje — dają inwestorowi prawo (ale nie obowiązek) wykorzystania tych dodatkowych możliwości, inwestor może zrealizować opcję rzeczową, jeśli uzna, że jest to dla niego korzystne.

Wiele projektów z zakresu poszukiwań i eksploatacji surowców mineralnych posiada wartość strategiczną. Celem artykułu jest prezentacja znaczenia pełnej analizy górniczych projektów inwestycyjnych pozwalającej na odkrycie ich wartości strategicznych. W artykule przedstawiono również zasady szacowania wartości projektu z uwzględnieniem wartości strategicznej poprzez zastosowanie podejścia bazującego na analizie scenariuszy, symulacji oraz na wycenie opcji rzeczowych.