

Mineral Economics

Valuation of mineral properties without mineral resources: A review of market-based approaches

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ABSTRACT

Comparable transaction analysis is the best known of the market approaches to valuation of exploration-stage mineral properties. The analysis of option and farm-in agreements can also provide useful guidance to valuers. While such approaches can be distorted by incomplete analysis, market-based methods are capable of providing consistent, credible results when carried out carefully with due consideration paid to all factors which buyers and sellers consider when dealing in the real market.

Introduction

Mineral properties without defined resources present one of the most challenging

tasks to the mineral valuator. This paper will concentrate on market-based approaches to valuation of such properties. Other authors at MM2000 presented papers on cost and income approaches. Sorentino (2000) also provides a useful overview with some provocative commentary on methods.

Market based-approaches are based on the principle of substitution and include such techniques as: comparable transaction analysis (sometimes referred to as sales comparison analysis); farm-in commitment (or option agreement) analysis; rules-of-thumb; and comparable market value analysis.

Are there any valuation standards available to assist the valuator? In Canada there are none that apply to the valuation of mineral assets or securities. This problem is being addressed, at least in part, by the CIMVal Committee of the Canadian Institute of Mining, Metallurgy and Petroleum (CIM)¹. Further, the recently established Canadian Association of Mineral Valuers will be giving consideration to the adoption of valuation standards.

Australia has the best developed standard, included in the VALMIN Code, which was adopted by the Australasian Institute of Mining and Metallurgy (AusIMM). This code was updated in 1998 and has now achieved widespread acceptance in Australia. While the code may be given consideration in other jurisdictions, the VALMIN Code is directed toward Australian securities and corporate law matters. As a result, it has limited application in other jurisdictions without considerable revision. Ellis (2000a) presented some interesting and provocative ideas on this topic to the SME convention in Salt Lake City in February 2000.

In the United States, the Uniform Standards of Professional Appraisal Practice

(USPAP, 1999) was written especially for the real estate sector, and is widely applied to the American mineral sector as a result of the peculiarities of U.S. mineral title practice and the licensing of valuers by state boards. The USPAP concepts are useful for American mineral valuations generally, but also need modification for wider use as Ellis (2000b) has pointed out.

The overall standard in both the Australian and American codes is that the selection of valuation methods to be used for any valuation is solely the responsibility of the valuator. Key words include materiality, transparency, independence, competence and reasonableness.

While it is convenient for the purpose of this paper to concentrate on only one approach to valuation, it is important to emphasize that in the end, the valuator must consider all appropriate valuation approaches in reaching the valuation conclusion. Indeed, if there is one strong conclusion to be drawn from a consideration of VALMIN and USPAP, it is that all three approaches (income, cost and market) must be considered. If one or two of them are excluded, the reason for exclusion has to be provided. Therefore, while this paper concentrates only on market-based approaches, the conclusion reached must be considered within the context of other values obtained using other analyses which may be found to cluster about a particular value range.

Valuation Fundamentals

The author's remarks are best understood after considering several valuation fundamentals.

The first fundamental is to define value. There are a number of different values: liquidation value, fair market value, intrinsic value, market value, fair value, investment value and so on. Each of these has a specific definition and may be required for a specific purpose. Thus, it is essential that the valuator provide a definition.



Ross D. Lawrence graduated from the University of Toronto with a B.A.Sc. in applied geology (1956) and a M.Comm. in mining finance (1959). As a student and following graduation, he worked across Canada on a variety of mineral exploration projects. In 1962, he was one of the founders of Watts, Griffis and McOuat and has practiced as a consulting engineer since then. For the past 20 years, Mr. Lawrence has headed up the WGM valuation practice, responsible for a group of professionals which has

carried out scores of valuations of mineral properties and mining companies. He is a Certified Minerals Appraiser of the AIMA and an active participant in professional affairs.

¹ The Canadian Institute of Mining, Metallurgy and Petroleum has established a special committee administered by the Mineral Economics Society of CIM with the objective of recommending standards for the valuation of mineral properties in Canada. The goal of CIMVal is to complete its work by the end of 2002.

It is usually the case that one is attempting to establish fair market value for a mineral asset. However, one would need to establish **market value** in the case of a property for which compensation is being sought under the **Expropriation Act of British Columbia**, for instance. Fair value is required in the case of dissenting shareholder actions in a corporate take-over situation.

In Canada, **fair market value** is usually defined as *the highest price available in an open and unrestricted market between informed and prudent parties, acting at arm's length and under no compulsion to act, expressed in terms of money or money's worth.*

The second fundamental is in fact a list. This list consists of certain principles of valuation. Various authors favour somewhat different lists. Indeed, these can change over time. One of the early texts on the valuation of Canadian business interests (Campbell, 1975) listed six such principles. Fifteen years later, in an expanded text (Campbell et al., 1990), the list was expanded to eleven principles. USPAP provides standards that address most of these. The principles that the author believes are important to the valuation of mineral properties are as follows:

1. Value relates to future expectations, and is the present value (or economic worth) of all future benefits expected to be received.
2. Value may have two distinct components: commercial value (transferable) and non-commercial value (value-to-owner).
3. The market dictates the required rate of return.
4. Where there exists only one "special" purchaser, that purchaser will pay only a nominal amount more than other purchasers.²
5. Absent mitigating factors, the value of a control position is usually worth more per unit than is a minority position.
6. The sum of the individual ownership parts may be less than the value of total ownership viewed en bloc.
7. Except in very limited circumstances, hindsight information is not to be used.³

The final fundamental is to define the valuation date as value relates to a specific point

in time. This seems obvious, but this important point is often forgotten once the valuator begins the analysis (Ellis, 2000b).

Having established some fundamentals, it is useful to review what it is that the valuator is actually trying to do. If the challenge is to value a townhouse located in the midst of a row of eight identical houses, and some of the other houses have been bought and sold within the past few days, then the job is easy. One can refer to the real market and find perfect proxies for the valuation of the subject property. Valuators are rarely blessed with such perfection.

Instead, we flounder around in the less familiar notional market. In the notional market, we try to replicate those kinds of values that we find in the real market and to use such values as a proxy for the subject property. But the job is not simple. Following are some of the differences between the two markets.

Open Market:

- Deals are done between parties with different abilities and financial strengths and may not be done at the highest price.
- Deal conditions are enforceable.
- Deals may result from forced sale or impudent decisions.
- Information or other factors may be imperfectly known.
- Parties may not be dealing entirely at arm's length.
- Consideration may not be for cash.
- Sale price may include a component of non-transferable goodwill which will be settled by an employment contract or a non-compete clause.

Notional Market:

- Parties are assumed to have equal skills and strengths and transactions are done at the highest available price.
- Restrictions are assumed away, in part.
- Forced sales and impudent decisions are eliminated by the definition of FMV
- Both parties are assumed to have all information.
- Parties are assumed to be dealing at arm's length.
- Transaction is assumed to be consummated for money or money's worth.
- Non-commercial goodwill is excluded from consideration.

The foregoing fundamentals apply to all valuations, and they apply whether we intend to use income, cost or market approaches.

Comparable Transactions Analysis

The market approach which is easiest to understand is the analysis of comparable trans-

actions, sometimes termed the sales comparison approach. While the concept is clear, the application is difficult.

Ellis (2000a) argues that, especially in the United States, and especially if the valuation is to be used in litigation, the courts generally consider a value estimate which relies heavily on comparable transactions to be the most reliable estimate of fair market value.

There is an old proverb that real estate values are based on three factors: location, location and location. While there are differences which distinguish mining from real estate, it is equally the case when valuing mining properties that location is a most important factor. Of course there are other important factors as well.

What is a comparable? Consider a group of 40 mining claims located on the Kirkland Lake break in northeastern Ontario on which surface prospecting and half a dozen drill holes have indicated the possibility of a gold deposit. Since the target is gold, can we value our Kirkland Lake property by comparing it to properties for which transactions have taken place in Timmins or in Zimbabwe? Since the property is relatively small, can we compare it to a geologically similar property in Burkina Faso but which is a concession of 500 km²? Since the gold on our property occurs in narrow quartz veins, can we compare it to a low-grade heap leach property in Nevada? The answer is yes and no.

Instinctively, we might disregard the examples suggested. But what if that's all there is? While it would always be nice to come close to the ideal of the townhouse situation described above, sometimes one must look much further afield. It then becomes important to be very careful in one's analysis of the similarities and differences between the target property and the comparables. A careful consideration must be given to the pluses and minuses for the comparison to be useful.

The essence of this process can be described by attempting to put oneself in the shoes of the exploration manager for a major mining company. You have been shown a property which fits your company's exploration criteria, and you want to do a deal to acquire or option the property. What price are you prepared to pay? As exploration manager, you will first take a look at the real world, which might be a deal that you did last week on an entirely different type of property, or perhaps a deal that one of your competitors did yesterday on an adjoining property. You will also assess your negotiating position (are you relatively strong or weak?), and whether or not it is a hot area with a new discovery. That is the real world.

The valuator is attempting to replicate this in the notional world in which one operates.

Throughout the process, the valuator needs to carefully assess risk. For the value of

² In *Cyprus Anvil Mining Corp vs. Dickson et al.* (1982), 20 BCLR 21; 40 BCLR 180; (1986) 8 BCLR (2nd) 145, the court considered the effect of a single special interest purchaser. In this case, Cyprus Anvil (the purchaser) already owned a mine and mill in the vicinity of the vendor's property. The court held that the vendor's mine should be valued at its highest and best use which was represented by the value accorded to it by Cyprus Anvil.

³ This principle was also raised in the *Cyprus Anvil* case where the court affirmed the use to which hindsight could be put: *A basic principle of valuation is that subsequent evidence of value (hindsight) cannot be used to prove value at the relevant time. However the court ruled that hindsight can be used to measure the accuracy of projections, to test assumptions, and to verify constant factors such as tonnage and grade rather than variable factors such as metal prices.*

the property can only be realized if these risks can be overcome by subsequent exploration work or other actions. Typical risks for exploration projects include: delays in being able to proceed with the exploration work due to property disputes, aboriginal land claims, or the inability to obtain work permits in a timely fashion; budget overruns due to a host of factors; inability to replicate the previous operator's results; lack of security due to bandits, insurgencies or outright war; ability to proceed down the long exploration road to find the pot of gold at the end of the rainbow; and all of these risks need to be assessed by the valuator and incorporated into the analysis of each comparable selected for consideration in determining value.

The valuator needs to consider certain intangible factors. The quality of infrastructure available to allow the exploration project to proceed can have a huge bearing on the geologist's ability to find a mine in a timely manner. The quality of management and the technical staff and support workers can also have an effect. While these factors are to some extent excluded from consideration by the fact that the valuator is working in a notional market, it is nevertheless important to consider the downside of exploring a property in the middle of Papua New Guinea as compared to a similar property in the middle of Timmins.

One problem frequently encountered is that relatively comparable properties are identified on the basis of their geological prospectivity, however, there is a mix of large to small properties. How does one make suitable adjustments? Ward and Lawrence (1998) examined this problem by reference to several real examples. In Labrador, following the discovery of the Voisey's Bay nickel deposits, 29 transactions were identified for the period December 1994 to May 1996. The properties ranged from 1200 ha to more than 60 000 ha with an average of about 12 000 ha. Property values indicated by an analysis of transactions ranged from \$41,000 to \$6.4 million, which equated to a range between \$2/ha to \$600/ha. A plot of value per hectare vs property size was somewhat helpful, but the spread of values for smaller properties was rather wide. It was also the case that many transactions, irrespective of the size of the property, were done on roughly the same terms and for roughly the same price, so long as the property was not immediately adjacent to the discovery property. Evaluating such properties, therefore, needs to be done with great caution.

The foregoing discussion deals with the "Principle of Substitution" which is that the economic value of a thing tends to be determined by the cost of acquiring an equally desirable substitute. There are two different strategies for identifying an "equally desir-

able substitute" for the subject property, according to Miles (2000). These are the "best fit" strategy and the "total market" strategy. The best fit strategy is based on the concept that an equally desirable substitute can best be found by selecting a few transactions which bear a close resemblance to the subject property. This is what has been discussed above.

The total market strategy uses all available transactions which involve a similar property to develop a statistical or graphic model of the entire market for all properties of the same general type. The total market strategy is about markets, not about properties.

Once the model of the market has been developed, one can then compare the subject property with the market to determine where the subject property belongs within the market spectrum. This involves analyzing the subject property to determine its relative desirability compared to the total market. The valuator can then select a range of values, within the total market spectrum, that represents his estimation of the value of the subject property.

The search for suitable total market transactions can ignore location and other factors that limit the best fit search. The number of transactions needed for a best fit strategy can be small, however the transaction data should provide a large amount of information to permit the necessary matching. For the total market strategy, the sample of the market must contain a larger number of transactions, but the data need include only a small number of value parameters.

How does the accuracy of the two strategies compare? The *relevance* of the relationship between the selected transactions for a best fit strategy is receiving increasing attention in the literature. The question of relevance continues to pose serious accuracy questions about the best fit strategy. Because it uses a large number of transactions from a larger market, the total market strategy avoids the question of relevance. The principal question is whether the number of transactions selected is sufficiently large to model the market. Although the accuracy of individual property data is often not verifiable, this is not a serious problem if the total number of transactions is large enough so that any errors do not have a material effect on the overall market statistics.

Comparable transaction analysis can be a very useful valuation tool in the right circumstances but must be approached with careful analysis of the population of available comparables. This can sometimes lead to a selection of relevant best fit transactions. In other cases, where a larger number of transactions is available, a total market approach will be more suitable. Finally, there will be situations where there are simply no comparables.

Farm-in Commitment Analysis

Sometimes referred to as the Joint Venture Terms Method, this method is often quite useful when valuing a large exploration concession where there is significant exploration potential but where little exploration has been carried out.

The method is best applied where the subject property is being explored by an arm's length joint venture, but may also be utilized where an adjoining, or otherwise comparable, property can be identified with similar characteristics.

Typically, equity in a property is earned by an incoming participant agreeing to make payments and to undertake exploration. As a rule, such commitments are firm only for a year or two. Only those commitments met or firmly budgeted and approved by a board of directors should be used in establishing a minimum value for the property. Beyond the binding period, discounts to reflect reasonable geological probabilities are usually applied to future expenditure commitments that may or may not be met. Inflation may need to be factored in and, in some cases, a premium may be applied to an operator's interest. The adjusted values can then be discounted to reflect the time value of money and the result divided by the percentage equity being earned to calculate a high value for the property.

Is it reasonable to discount non-binding costs or payments that may be incurred by an optionee? It is argued that because the probability of a mineral discovery is low, and that therefore the probability of the option actually being exercised is low, that the future payments need to be discounted according to the probabilities. Instinctively, this seems reasonable. However, some will argue that if an optionee is prepared to offer a package of fixed and conditional payments, then the total of that package (discounted only for time) is the optionee's perception of the value of the property at that time, given the optionee's assessment of probabilities. If we were to argue that the assessment of risk through probability analysis ought to be applied to other valuation techniques (such as discounted cash flow analysis, for instance), then the same argument ought to be applied to the discounting of non-binding future costs or payments when carrying out farm-in commitment analysis.

Finally, most explorationists will know of a prospector who has been able to make a decent living from farming-out his property from time to time. Over a period of years, the prospector will make deals each time the price of the commodity is on a rising trend. One may argue that the value of the property is the sum of the value of each deal suitably discounted for all the risks

and time. There is no doubt that the prospector will receive, over time, a value greater than that attributable from the most recent deal. However, at a single point in time, the same cannot be said about the incoming partner. Thus, to accept the multiple deals' value would be to ignore the definition of fair market value, namely that value is based on a negotiation completed between two parties on the valuation date. Thus, aside from the difficulty of actually doing such a calculation, it seems that the concept fails when put into the concept of the theoretical basis for fair market value.

Rules of Thumb

Advanced exploration properties are sometimes valued by utilizing rules of thumb. These yardsticks are often based on the valuator's experience and judgment in order to apply an ascribed value to in situ ounces of gold or pounds of copper. Such approaches are often to be found in the recommendations of investment analysts. Rules of thumb work if the property is of a type with a good population of similar examples.

Lawrence and Dewar (1999) refer to a valuation guideline published by the state of Arizona which specifies unit values to be used in valuing operating metalliferous mines. These values vary in accordance with operating costs. It is to be stressed that these figures are for operating mines in Arizona, and are obviously not appropriate for early exploration properties.

However, a similar set of criteria could be developed to assist in valuing an advanced property where transactions involving similar properties could be identified.

Investment analysts often use rules of thumb derived from stock market analysis. Typically, the value analysis is reduced to \$/ounce of gold in the ground. In other cases, we find investment analysts using \$/hectare for valuing junior mining companies with large exploration properties (which was discussed above).

Rules of thumb are useful sometimes as a reality test for advanced exploration properties, but rarely can they be relied upon as a useful primary approach to valuing exploration properties.

Comparable Market Value Analysis

This approach is sometimes useful in situations where a property to be valued is located in the midst of an active mining district in which a discovery has been made or where the property is the only asset owned by a junior mining company. If adjoining properties are held by junior mining companies which have only one property, the stock market value of such companies may be an indicator of value for their single properties. This approach requires good information on all aspects of the company and its property so that suitable adjustments can be made. Is the stock market putting a speculative premium (or an unreasonable discount) on the company which is not justified by all the facts? Caution is

therefore called for in taking stock prices as being an indicator of value at a point in time.

Conclusions

Comparable transaction analysis is the primary method used in market-based approaches to valuation. When carefully selected, painstakingly analyzed, properly adjusted, and transparently described, a credible and easily understood measure of value results.

Other market-based methods may be useful in more limited situations including farm-in (or joint venture) commitment analysis, comparable market value approaches and various rules of thumb.

Finally, market-based approaches must be considered within the context of other approaches (usually using cost and income methods) in order to determine a final range of values.

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NEWS IN BRIEF

CONFERENCE ON ELECTRON BEAM TECHNOLOGY

The International Conference on High-power Electron Beam Technology (ebeam 2002) will be held from October 27-29, 2002 at the Crowne Plaza Inn, Hilton Head Island, South Carolina.

The conference will review progress and achievements of the past two years in high-power electron beam technology. In particular, the conference committee is looking for papers on the following topics and related ones: advances in electron beam melting; advances in electron beam refining; new application of electron beam melting and refining; the use of electron beam processes in the production of novel materials (e.g., superconductors); practical aspects: process control, analytical

tools, quality assurance in electron beam melting and refining; safety issues in electron beam applications; modeling of electron beam sources, processes, and systems; new components in electron beam technology (guns, power supplies, vacuum systems, plasma assist); advances in high-rate PVD by electron beam evaporation; advances in thermal barrier coatings for turbine blades; emerging technologies (electron generation, beam guidance, etc.); and related and new applications for electron beams.

Those who wish to make presentations are requested to send a 200-word abstract to the conference chairman no later than July 15, 2002. Abstracts and all communication related to the event should be sent by mail, fax, or e-mail to: Siegfried W. Shulz, Surface Solutions, 120 Post Road, Enfield, Connecticut 06082-5690, U.S.A.; Tel.: (860) 745-8462; Fax: (860) 745-8459; e-mail: swshulz@surface-sol.com.