Applying the Cost Approach to Valuation of Exploration Stage Mineral Assets

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Contents

Value

In this discussion, "Value" is meant to be "fair value" or "market value" as considered in SAMVAL 2016.

Introduction

Estimating a Value for an early stage mineral exploration property can be problematic – mainly because most of the value is perceived, and little quantified. This makes it tough to satisfy one of the three pillars on which the usual valuation codes are based: Transparency.

As soon as an exploration asset has demonstrated, quantifiable results such as a Mineral Resource, it becomes easier to develop a valuation methodology that transparently ties the estimated Value to concrete realities. Although the Cost Approach can be applied, with variable success, to all classes of Mineral Assets, it is particularly useful when considering properties that are in the earlier stages of exploration. These early stage exploration assets are generally the most challenging to value, hence any transparent method to do so should be embraced. In this discussion, the focus will be on this category of Mineral Assets, which are transacted mainly on the basis of their perceived potential to host a financially viable mineral deposit.

A few acronyms are used regularly in this discussion:

EB - Expenditure Base
MEE - Multiple of Exploration Expenditure, a valuation method based on the Cost Approach
PEM - Prospectivity Enhancement Multiplier, an adjustment factor employed in the MEE method.

What is the Cost Approach?

The classic justification for the Cost Approach, as given in the IVSC Glossary and repeated in SAMVAL, is that a buyer will **pay no more** for an asset than the cost to obtain an asset of equal value, whether by purchase or by construction. The emphasis is mine, because this turn of phrase implies that "*the cost to*

obtain an asset" is a maximum value. We shall return to this tenet later, when we discuss Prospectivity Enhancement Multipliers.

Although the term "construction" above may be interpreted as a (tenuous) connection between value and exploration expenditure, the basis, or justification, for use of the Cost Approach in valuing exploration properties, resides mainly in a relation between the perceived potential of the Asset and the amount of funds that are *reasonable* to spend on exploring the Asset for a viable deposit. In other words, the "better" (more valuable) an Asset is, the more spending it attracts. This approach, which links potential to value, is not quite the same as the classic Cost basis for value, which has in mind a pure replacement or substitution cost.

The term "reasonable" is crucial in properly applying the Cost Approach to exploration properties, and needs to be applied with particular diligence when considering both the "cost" (e.g. the exploration expenditure base) and any manipulation thereof (e.g. any adjustment factor that may be applied to the cost base). Rarely would expenditure equal Value, and when we employ manipulations to derive a Value based on cost, such as Multiples of Exploration Expenditure (MEE) and Prospectivity Enhancement Multipliers (PEM), we take a distinct step onwards from the basic definition of the Cost Approach. Quoting Bilbo Baggins: **"It's a dangerous business, Frodo, going out of your door. You may step into the Road, and if you don't keep your feet, there is no telling where you might be swept off to."**, may remind us that we are not only venturing into unchartered waters, but we may also end up muddying the waters to such an extent that very little Transparency remains. Or as stated in a guideline publication of the UASFLA **"The cost approach is generally recognised as the least reliable method of valuation"** (UASFLA, 1992, p.17).

Such misgivings about the Cost Approach should act as an incentive to the Valuator to be technically and logically as diligent and transparent as possible when applying this approach.

The Cost Approach is sometimes called the "Appraised Value" method ("approaches" and "methods" are readily conflated in valuation reports and industry publications… alas!). Of course, the terminology indicates that the Appraised Value method is a methodology based on the Cost Approach. Its origins relate to real estate and enterprise valuations, for which it is eminently suited. However, as soon as we introduce deductive aspects (manipulations) we depart from a basic Appraisal. Hence Valuators often prefer the phrase Multiples of Exploration Expenditure to describe the methodology used to estimate a Value for an exploration stage asset.

Multiples of Exploration Expenditure (MEE) Method

The MEE method has been described and commented on by a number of authors (Baxter & Chisholm, 1990; Buttler, 1994; Lawrence, 1994; Onley, 1994 amongst others). Its essence consists of three phases:

i. *establish a Cost Base of reasonable and relevant exploration expenditure;*
ii. *determine a relevant adjustment factor (Prospectivity Enhancement Multiplier) to put the Cost Base into perspective; and*
iii. *combine the Cost Base and the Prospectivity Enhancement Multiplier to derive a Value for the particular asset.*

Determining the Cost Base

The Cost or Expenditure Base is a deceptive entity, with various important aspects to be considered:

- *Which expenditures should be included or excluded, i.e. what are reasonable and relevant expenditures?*
- *What if the actual costs for an historic exploration activity are not available?*
- *How far back should one consider historical exploration costs to still be relevant?*
- *Does one adjust historical costs to reflect the Valuation date? How?*
- *Does one include projected future exploration expenditure?*

To give a unique label to the final cost or expenditure base on which the Valuation will be based, it is termed the Expenditure Base (EB) in this discussion.

Reasonable and Relevant

In various published articles the author has found a number of descriptors intended to guide the Valuator when considering what historical expenditure should be included in the EB: reasonable, relevant, applicable, effective, efficient, productive. Scanning these adjectives, it becomes clear that the Valuator will be expected to exercise his/her judgement, based on experience, in deciding what expenditure should be included and what should be excluded from the EB. The author endeavours to compile some more specific guidelines below, but in each case the Valuator much convince themselves (and by extension, their peers) on the best way to manage historical costs. Transparency requires that whatever the Valuator decides should be discussed and justified.

Relevance: for expenditure to be relevant, it must be directly applicable and specific to the mineral asset as well as the commodity. Instances of non-relevance include:

- *Historic exploration for which the results are lost or unknown.*
- *Regional surveys which did not have the asset as a specific entity in mind, such as government sponsored surveys and mapping.*
- *Exploration that have been superseded by publicly funded work.*
- *Exploration funded/done by a non-owner of the asset.*
- *Exploration efforts directed at a commodity to which the asset does not have a right, unless such efforts delivered results contributing to the prospectivity of the asset in its current configuration (e.g. detailed geological mapping applies to all commodities).*
- *Head office (or other) expenses which are not directly related to the exploration efforts and results. Reasonable administrative costs directly applicable to the asset may be included.*
- *If an historical purchase price of the asset is available, it is better to include this as an historic cost. In such a case, all historic exploration predating the purchase is presumed to reflect in the acquisition price and hence of no further relevance.*
- *Some practitioners apply an expiry limit on historic expenditure (e.g. a limit of five years is imposed by Roscoe, 2001), while others will include older exploration if it is deemed to have a material effect on the perceived prospectivity of the asset.*
- *Some practitioners (e.g. Lawrence, 1994) prefer to consider only the exploration expenditure of the most recent owner of the asset.*

Reasonableness: for expenditure to be reasonable, the type of exploration, the amount of exploration and the cost of the exploration must be appropriate to the nature and exploration status of the mineral asset itself.

Determining Historical Expenditure if not Available

It may be the case that relevant historical exploration activities may not be documented in full. The usual simple case is that the work and results are known, but the costs not. The Valuator then has to estimate a current equivalent based on reigning costs.

Sometimes, the details of the actual historical activities also may not be available. For example, it may be known that a number of drillholes were completed and an historic mineral resource declared. The Valuator can reconstruct the costs by compiling a typical exploration programme that could have delivered the reported results: e.g. a field camp for a number of months, typical quantity and type of assays, an independent mineral resource estimate, etc.

Some historic exploration methods have been superseded or significantly altered over time. When faced with such out-of-date historic work, and if the results of such work have a material bearing on the prospectivity of the asset, the Valuator will have to find a way to substitute a modern day technique and cost that could have delivered the same result. Since exploration techniques tend to become more effective and efficient over time, it is unlikely that the substituted cost will be more than the historic cost (in constant money).

Adjusting Costs to the Valuation Date

The cost of an exploration activity included in the EB often needs to be adjusted for time and inflation to bring it in line with the typical costs prevailing at the date of valuation. The Valuator has to decide by which means to bring the costs up to date. Generally two courses of action are available:

i. *Use the historical cost as documented and adjust it for monetary inflation. There are free available resources on Internet with historic tables for most currencies.*
ii. *Re-cost the work in current prices. Determine or estimate the details of the work completed, e.g. 30 diamond drill holes drilled to average depth of 600m, logged, sampled and assayed for gold, silver and sulphur, etc. This technique has the benefit of giving reasonably accurate current costs for historical exploration activities. The drawbacks include somewhat more effort by the Valuator and potentially a lack of transparency if the Valuator does not disclose the details of how the costs were determined.*

The cost of many exploration techniques has not moved in parallel with monetary inflation, hence the practice of re-costing is considered more appropriate, especially when there is a significant hiatus between the date of exploration and the date of valuation.

Future Exploration Expenditure

The validity of including future exploration expenditure is an on-going debate. The author is of the opinion that this debate often confuses two issues: valuation based on the MEE method (Cost Approach) and valuation based on comparable transactions (Market Approach) where the comparable transactions are based on Joint Venture and Farm-in – Farm-out transactional terms. When analysing a farm-in – farm-out transaction, a value is usually assigned to "committed" future expenditure. This has led to some valuation practitioners applying the same analysis to cases where the owner (or prospective new owner) of an exploration property **intends** to carry out specific future exploration. The inclusion of future exploration expenditure (whether "committed" or not) should be carefully weighed up when using the Cost Approach for valuation. There is no consistent consensus view from the industry, and several aspects of incorporating future expenditure into the MEE methods are discussed in the following paragraphs.

Often a practitioner will include "warranted future expenditure", usually in the absence of committed future exploration expenditure. Warranted future costs require the Valuator to compile a reasonable budget to test the **identified potential** of the assets. The qualifier "identified" is critical, signalling that a warranted exploration budget should be built on what is already known regarding the asset, following up on concrete targets. The practitioner should consider only future expenditure that will add directly to the present value of the asset. It should not include "pie in the sky" or "long shot" blind exploration activities.

If the future expenditure is based on a committed exploration work programme and budget, such a commitment is almost always given in future money terms (i.e. inflated terms) and hence requires that such budget be adjusted to the money terms of the Valuation Date. If "warranted future exploration expenditure" is considered as part of the Expenditure Base, it is usually compiled in current money terms and it will not require adjusting for monetary inflation.

Committed Future Expenditure:

For future expenditure to be "committed" there should be some form contractual obligation on the spender to actually expend the funds required to carry out the work described. Including up to two years of future expenditure is generally accepted. Due to the uncertainties inherent to exploration results, the Valuator should carefully consider the appropriateness of including expenditure intended beyond the initial two years. Future expenditure should be discounted for monetary inflation. If dependent on the outcome of preceding activities, the Valuator should carefully assess the likelihood of exploration progressing to subsequent stages and assign appropriate probabilities to such expenditure eventuating.

To limit the scope for "creating" value, future expenditure should be limited in general to one or two years.

The Expenditure or Cost Base

Once the Valuator has adjudicated which expenditures to include in the allowable cost base, and has adjusted such to reflect the Valuation Date, this number forms the base cost, often termed the Expenditure Base ("EB"). The EB is similar to the "Appraised Value" in real estate valuation. It rarely reflects a fair value for an exploration asset, due to various factors:

- *Exploration costs for different commodities and different styles of deposits can vary by orders of magnitude. For instance, the typical exploration cost to deliver a (shallow) coal deposit to an Indicated or Measured Resource is a fraction of the cost to deliver a (deep) greenstone gold deposit to the same level of confidence. Similarly, there is usual a huge difference in the relative cost to progress a base metal deposit from Inferred to Indicated, and doing the same with a kimberlite diamond deposit.*
- *The exploration of a mineral property rarely takes a predictable route: some deposits are found by "striking it lucky", with a relatively modest effort returning an exceptional bounty in known mineralisation; while other deposits, some truly world class, may require many years, even decades, of sustained effort and expenditure.*

- *The results from any specific exploration effort are not guaranteed (thank goodness!) and may detract or add to the perceived value of the assets in various ways. Hence the effective contribution to value by a quantum of exploration is not a linear function relating effort to value.*

Therefore, the EB requires judicious manipulation by a competent Valuator to reflect the Value of the asset.

Determining the Multiplier

The *Prospectivity Enhancement Multiplier* (PEM) is the most common adjustment made to the Expenditure Base. Its intent and purpose are to even out the variables that influence the EB, so that a final "cost" can be found: reflecting the cost of buying a "similar" exploration asset, which is accepted as the Value of the asset.

A guideline to consider when contemplating the magnitude of the PEM, can be found in the terminology mentioned before (from IVSC Glossary and SAMVAL): a buyer will pay no more than the cost to obtain an asset of equal value. A way to apply this dictum to a particular PEM is by considering what premium (or discount) a buyer would be likely to assign to a specific exploration effort, given the outcome of that effort. In other words, what perceived return has been delivered on the investment (exploration)?

PEM values greater than one will reflect that the exploration work increased the potential (perceived value or desirability) of the asset, while a value less than one should be considered if the exploration has diminished the potential of the asset.

> *If the Valuator is considering* **future expenditure** *as part of the Expenditure Base, then such costs* **must not be adjusted by any multiplier**, *since the Valuator has no knowledge of the outcome of the future expenditure! Using a future PEM to reflect the probability of the future expenditure realizing is muddled logic.*

Since not all the different exploration activities undertaken on a specific asset are likely to have the same outcome (in terms of adding/subtracting value), it is recommended that each exploration activity be assigned its own PEM. Onley, 1994, offers an example of this.

Reflecting the many unknowns and uncertainties inherent to exploration, it is common practice to derive lower and higher PEM values for each exploration activity. This has the benefit of automatically satisfying the requirement by the Code for estimating a Value range (lower and higher limits).

Lawrence & Dewar (1999) analysed 106 valuations that used the MEE method and found the following:

Type of PEM	Minimum	Maximum	Average
Lower Case	0.3	4.0	1.7
Higher Case	0.7	5.0	2.4
Preferred	0.5	3.7	1.8

They concluded that the "range of reason" comprises PEMs between 0 and 5, while "usual" values would be between 0.5 and 3.

Duncan (1994) offered some guidance on when PEMs greater than one may be considered (what Onley, 1994, refers to as "effective" exploration):

- *Work to date or historic data justifies the next stage of exploration.*
- *Strong indications of potential for economic mineralisation have been identified.*
- *"Ore grade" intersections or exposures indicative of economic mineralisation have been found.*

In the case where an asset has been abandoned by a previous owner, the Valuator should take great care to justify applying a PEM greater than one to exploration pre-dating the abandonment.

Recently, PEM values as high as 30 has been applied in South Africa. These are exceptionally high values, which poses the question of whether the MEE method was the appropriate method to use. In such an instance the discounted cashflow method (of the Income Approach) may have been more appropriate.

Roscoe (2001) published a guide being used by Roscoe Postle Associates Inc (RPA) when applying the Appraised Value method:

Guideline	Retained Portion of Past Expenditures
Property with Mineral Resources but no work done for some years. Some future work is warranted. Usually a property with marginal Resources and potential for more but not quite exciting enough to attract exploration expenditures easily. May be at the sub-surface exploration stage.	75 %
Property with sub-economic mineralisation, but may have some potential in future, conditional on commodity prices, infrastructure, improved technology, economic conditions, etc. No work recommended at time of valuation. Could be a property with potential for a commodity with a low price or low demand at the time of valuation.	50 %
Inactive property with sub-economic mineralisation with very little hope for development, but cannot write it of completely. The mineralisation represents in situ mineral inventory with a long shot at eventual development. No work recommended.	25 %
Inactive property with no Resources or known mineralisation and negligible or very little exploration potential. Could be a property with all the geophysical targets tested that will be dropped when assessment credits run out.	0 % to 10 %
Inactive property with indeterminate but low or negligible exploration potential. Could be a property with little or no data available, but in a geologically uninteresting area.	nominal value (C$5,000 – C$10,000)

There are a couple of interesting points regarding the RPA methodology:

- *RPA treats all expenditure as a single quantum.*
- *RPA does not apply a multiplier larger than unity (i.e. Value cannot be more than expenditure). However, do keep in mind that RPA also assigns "warranted future costs" to the estimated Value, so the final Value can indeed be more than the historical expenditure..*

Both Buttler (1994) and Baxter & Chisholm (1990) raise the issue of the quality of the historical exploration. Onley (1994) offered an example of tabulating individual exploration activities, with justification for each the PEM assigned to each activity. The author proposes to take this a step further by splitting the PEM into two attributes:

- *A multiplier based on the outcome of the work, which is termed the Result Factor (FR).*
- *A multiplier based on the availability and quality of the work, data and reports documenting the exploration work, termed the Quality Factor (FQ). Logic dictates that FQ cannot be more than unity.*

The final PEM to be applied to the exploration activity is the product of the two factors:

PEM = FR × FQ.

Note that FR and FQ can also be estimated as lower and higher values to give a range to the PEMs to be used in estimated the Value of the asset.

The reason for assessing the availability and quality of the historical exploration work and documentation is to allow for the effect this may have on the Buyer's confidence in the Result of the exploration.

The results of the MEE Method can then be reported in the following tabular format:

Explorer	Activity	Cost	Quality	Result	PEM (lower)	PEM (higher)	Value (lower)	Value (higher)
Company or Contractor details	Description of Exploration Activity	Estimated cost of exploration activity in current terms	Discussion on the availability, quality and integrity of the exploration information. Justify selection of FQ values.	Discussion on the impact of the result of the exploration on the prospectivity. Justify selection of FR values.	FQ×FR (lower values)	FQ×FR (higher values)	Cost × PEM (lower)	Cost × PEM (higher)

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