

A Review of the Many Cost Approach Methods for Minerals Valuation

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Cost Approach Historical Context in Minerals Appraisal

- Cost Approach Methods used extensively by Canadian and Australian practitioners
- For raw exploration land through early resource assessment stage
- In USA – almost exclusively only *depreciated replacement cost method (DRC)* for buildings, plant, and equipment

The Three Approaches to Value – Primary Economic Principles

- Sales Comparison Approach – The principle of *substitution* of value
- Income Approach – The principle of *anticipation* of value
- Cost Approach – The principle of *contribution* to value

(ASFMRA; CIMVal)

Theoretical Basis

- “The cost approach employs the technique of summing all the land and building components.”
- “The principle of contribution states that the value of a particular component is measured in terms of its contribution to the value of the whole property, ...”

The Appraisal of Rural Property, Second Edition, ASFMRA and AI

Appraising Mineral Property with Cost Approach

- DRC method is for buildings, plant, other surface improvements
- Other methods are for minerals estate, land surface, water rights

Standards and Regulatory Setting

- In the USA, Cost Approach use not significantly inhibited
 - Courts averse to reliance on only the DRC method or Depreciated *Reproduction* Cost
- Globally, national and international standards setters are inhibiting use of other than DRC
 - International Financial Reporting Standard IAS 16
 - International Valuation Standard GN 8
- But, TSX-V only allows a “modified *appraised value* method”

Appraisal Body of Knowledge Documents – Author's Observation

- Usually closely held by major appraisal standards setting and education bodies
- Do not differentiate the three approaches to value on economic principles
- Cost approach factors pertaining directly to land, only pertain to use for site value
 - Nothing relevant to the mineral content of land
- Should modify to accommodate minerals and rural appraiser profession needs

Main Cost Approach Methods

- Depreciated Replacement Cost (DRC)
- Multiple of Exploration Expenditure (MEE)
- Appraised Value
- Geoscience Matrix
- Rural Cost (a.k.a. Land Mix)

Depreciated Replacement Cost (DRC) Method

Commonly applied to buildings and other surface structures, plant and equipment

Value = Replacement Cost – (Physical Depreciation + Functional Obsolescence + External Obsolescence)

Multiples of Exploration Expenditure (MEE) Method

- A Prospective Enhancement Multiplier (PEM), based upon a Valuer's assessment of the property's prospectivity to date, is applied to the relevant and effective past exploration expenditure on the property
 - Applicable for exploration properties without delineated resources
- $\text{Value} = \text{Effective Expenditure} \times \text{PEM}$

M. Lawrence and P. Onley, 1994

Appraised Value Method

- Sum of warranted future expenditures and effective past exploration expenditures
- Warranted future expenditures:
 - comprised by a “reasonable exploration budget” to test the remaining exploration potential of the exploration property.
- Applicable to exploration and marginal development properties

Value = Effective Expenditure + Warranted Expenditure

W.E. Roscoe, 1986

Geoscience Matrix Method

- Originated by Woodcock 1985 as a rating system for the Securities Commission, BC, Canada
- Enhanced by L.C. Kilburn 1990 for valuation of non-producing mineral properties for TSX listings.
- To the cost of acquiring an unexplored mining claim, apply 4 prioritized adjustment factors from a matrix of 19. Adjusting for the subject property's characteristics of:
 - location
 - known valuable mineralization
 - geophysical, geochemical, and geological targets
- The adjustment factors are multiplicative.

Geoscience Matrix method

Subject claim value = (unexplored claim cost)
x (location factor) x (grade factor) x
(geophys/geochem factor) x (geology factor)

Calculate for each claim in the tract, then sum.

Cautions for MEE, Appraised Value, and Geoscience Matrix Methods

- Only designed for exploration properties and marginal development properties.
- Generally applied without market transaction reference. To be a market-based method, need a means of market measurement to calibrate adjustment factors.
- Use in combination with another method, preferably from another approach.
- Best done by or with someone who has a good knowledge of the geology of the subject property and of deals involving similar exploration properties.

Rural Cost Method

- An adaptation of the land mix method taught by the American Society of Farm Managers and Rural Appraisers (ASFMRRA).
- Generally requires plentiful transaction data, such as is available for gold properties.
 - More transactions than typically used in sales comparison approach.

Rural Cost Method

- First adjust transactions for time and commodity prices, location, financing
- Ratio analyses or simultaneous equations are used to calculate the unit value of the components of the subject property -- developed reserves, undeveloped reserves, resources, exploration land, water rights, and other assets.
- The quantitatively adjusted values of the components are then summed.
- Add DRC value of buildings, plant, etc.

Rural Cost Appraisal method

Value \approx $au + bv + cw + dx + ey + fz + \text{land surface} + \text{DRC (buildings + P\&E)}$

$u = \text{\$/developed Reserve unit}$

$v = \text{\$/P+P undeveloped Reserve unit}$

$w = \text{\$/M+I Resource unit}$

$x = \text{\$/Indicated Resource unit}$

$y = \text{\$/acre exploration}$

$z = \text{\$/ac-ft annual water rights}$

Rural Cost Method

To derive unit values:

- Find puritan transactions – e.g., having only M&I Resource, or exploration acreage, or water rights.
- Solve simultaneous equations constructed for transacted properties.

Suitable for application on complex properties, from exploration tracts to operating mining properties

Conclusions

- The economic principle of *contribution to value* is predominant in the Cost Approach
- The Cost Approach has many methods available, not just DRC
- The major national and international valuation standards setting and education bodies should modify their *body of knowledge documents* to accommodate the needs of the minerals and rural appraiser professions
- For market valuations, most Cost Approach methods should be used in combination with another approach if possible
- The Rural Cost Appraisal method is a particularly powerful valuation method, available for exploration through operating properties