

Discount Rate Selection Methods Applied in Appraisals of a Quarry Taken by Eminent Domain

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In July 2004, the Connecticut Department of Transportation made a complete taking of the operating Brookfield hard rock quarry property. As a result, many appraisals were developed for the resultant compensation trial. This presentation reviews the methods used in determination of the discount rates applied in these appraisals



Discount Rate

- A discount rate is a factor that is used to convert a projected income stream into a value known as a net present value.
- This is the rate to discount the value of future benefits and costs to its present value.
- A discount rate for a mining operation will vary depending upon the type of risk and other variables, such as metal prices, the mine product being produced, the mine life, the milling process, production rates, permitting and regulatory constraints, and other factors.
- Discount rates differ for different stages of a property's development. Developing a new Greenfield property would have a higher risk than the acquisition of an existing mining operation.

Discount rate selection can be done in a variety of ways:

- Such as through information derived from merger, acquisition and other mine development projects.
- From valuations prepared by consulting firms or security analysts for mergers, acquisitions and investments in a variety of mining situations.
- The data from mine development projects.
- Data from stable operating mines.
- Derivation through Capital Asset Pricing Models, Buildup Method, and Weighted Average Cost of Capital.
- Other sources are other appraisals of record, and the past experiences of the appraiser.

Discount rate selection can be done in a variety of ways (Continued):

- The Uniform Appraisal Standards for Federal Land Acquisitions, 2000 Edition (UASFLA) - discount rate should be derived from and supported by direct market data whenever possible.
- The International Valuation Standards, 2007 Edition (IVS), states, “..., deriving the Internal Rate of Return (IRR) from analysis of market transactions for similar properties having comparable income patterns is a proper method for developing market discount rates for use in valuations to arrive at Market Value.”

Methods for Determining the Discount Rates:

- **Weighted Average Cost of Capital (WACC)**
 - WACC is an important concept to an investor. An investor's cost of capital is the return that must be provided to an investor for an additional capital investment and cost of capital is directly related to the perceived risk.
- **Build Up Method**
 - The basic theory of the build-up method (sometimes referred to as the summation method). The risk elements are identified and quantified and added together to determine the ROR required on the investment.

Methods for Determining the Discount Rates: Buildup Method Example

The cost of equity is calculated by starting with the risk-free rate (R_f) and adding relevant risk premiums

Data Inputs:

1.	Risk Free Rate (R_f)	5.9%
2.	Market Risk Premium (RP_m)	5.0%
3.	Size Premium (RP_s)	3.4%
4.	Industry Risk Premium (RP_i)	3.5%
5.	Site-Specific Risk Premium (RP_M)	1.2%

The cost of equity is calculated by starting with the risk-free rate (R_f) and adding relevant risk premiums

$$\text{Cost of Equity} = R_f + RP_m + RP_s + RP_i + RP_M$$

$$\text{Cost of Equity} = 5.9\% + 5.0\% + 3.4\% + 3.5\% + 1.2\%$$

$$\text{Cost of Equity} = 0.19 \text{ or } 19\%$$

Using this method, the required rate of return (cost of equity) is 19%

Methods for Determining the Discount Rates (continued):

- **Capital Asset Pricing Model (CAPM Method)**
- The Capital Asset Pricing Model (CAPM) is based on investors requiring a rate of return, above a risk-free rate, as compensation for bearing the risks inherent in their investments.
 - The required rate of return on an asset is a function of some risk-free rate of return plus a risk “premium,” dependant upon the amount of risk associated with the asset or investment.
 - CAPM uses the concept of *beta*, defined as the measure of the volatility of the subject investment’s return relative to the volatility of returns in the marketplace as a whole. (Beta is derived from comparable companies in an industry the same as or similar to that of the subject property).

Methods for Determining the Discount Rates (continued):

- **Discount Rate Extraction from Sales**
 - The market – derived discount rate is another method for obtaining a discount rate using a known purchase price for a property similar to the subject property and the actual financial analysis used by the buyer to determine the purchase price.
- **Industry Survey Method**
 - Annual surveys of discount rates for selected industries is another method for deriving a discount rate.

Appraisal Discount Rate Analysis

- The several appraisals being analyzed in this presentation were used to appraise a subject property facing a condemnation action by the Connecticut Department of Transportation (“CDOT”) using their powers of eminent domain to condemn an operating quarry.
- Each appraiser used a selected discount rate in their DCF analysis of the subject property and their methods used in selecting this discount rate vary for different reasons.

Appraisals for Mining Company

Appraisal	A-1	A-2	A-3	A-4
Effective Appraisal Date	30-Jun-03	29-Jul-04	29-Jul-04	29-Jul-04
Date of Report	4-Aug-03	3-Apr-06	6-Feb-2007	30-Apr-07
Methods Used	Full Cashflow DCF	Full Cashflow DCF	Royalty Method	Full Cashflow DCF
Perceived Risk	Higher than Average	High	Low Risk	Low risk.
How Discount Rate Derived	Survey Method: Derived from ROR on Capital Employed of Construction material companies with US operations, for FY 1993-2002.	Survey Method: Based on Discount Rates for alternate investments in risky commercial real estate. FYE 2003	Survey Method: Derived from published sources depicting discount rates for hard rock and other sand and gravel royalty leases. Fys 1992-2004	Extracted from Transactions supported other sources
Discount Rate Used	11% Escalated \$	12% Escalated \$	9% to 10% Escalated \$	6% 2004 Const \$
Value From Income Approach	\$40.4m	\$22.9m (+\$6.2m for Backfill Op)	\$19.4m - \$21.3m	\$30m (+ \$25m for Backfill Op)
Other Approaches Used				Sales Comparison
Results from other approaches				\$55 million for mining only
Reconciled Value	\$40.4m	\$29.1m	\$19.4m - \$21.3m	\$70m

Appraisals for State

Appraisal	B-1A	B-1B	B-2A	B-2B	B-3	B-4
Effective Appraisal Date	5-Oct-99	5-Oct-99	30-Jul-04	30-Jul-04	30-Jul-04	30-Jul-04
Date of Report	18-Feb-00	18-Feb-00	6 Dec 2004.	6 Dec 2004.	~ 2006	11-Jan-08
Methods Used	Full Cashflow DCF	Royalty Method	Royalty Method	Full Cashflow DCF	Royalty Method	Royalty Method
Perceived Risk	Lower than avg risk 13% to 23%	Low risk	Low risk	High risk	High risk	High risk
How Discount Rate Derived	Survey Method: Derived from Market Survey and yields from Qtr. surveys of institutional investment criteria RE: institutional-grade real estate Acq.	Build-up Method: Derived a "safe rate" from the Wall Street Journal for data regarding prime rate and rates via high yield corp bonds.	Survey Method: Data survey of construction materials industry members. 1998, 1999, 2003, 2004	Survey Method: Data survey of construction materials industry members. 1998, 1999, 2003, 2004	Survey Method: Derived discount rate from a survey of natural resource companies	Survey Method: Derived discount rate from yield rates from various paper investments. Also IRR from real estate development projects.
Discount Rate Used	16% Escalated \$	8% Escalated \$	12% Escalated \$	18.5% Escalated \$	12% Escalated \$	20% Escalated \$
Value From Income Approach	\$13.6m	\$13.5m	\$6.5m	\$6.7m	\$5.8m	\$2.4m
Other Approaches Used	Sales Comparisons	Sales Comparisons			Sales Comparisons	
Results from other approaches	\$14.0m	\$14.0m			\$2.7m	
Reconciled Final Appraised Value from all Approaches	\$14.0m	\$14.0m	\$6.7m	\$6.7m	\$4.3m	\$2.4m

Conclusions

- State Appraisals:
 - Apparent Bias in the appraisals contracted by the State.
 - Perceived risks were low in the early state appraisals, then high in the later appraisals, resulting in high discount rates and low appraised value for the later appraisals.
 - The trend of increasing discount rates appears abusive, sourcing discount rates from high risk real estate investment projects.
 - The later appraisers argue that the quarry operation is high risk, despite the grandfathered quarry operation having virtually no current or foreseeable competition, in a highly wealthy county, ideal location, and having been in operation for many decades.
 - Royalty method was inappropriately applied. The property was owner-operated for decades. The value of the operator leasehold interest was not captured. The referenced surveys of royalties used data from distant states and dissimilar properties, because aggregate operations are rarely leased in CT and nearby states.

Conclusions Continued:

- Mining Appraisals
 - In appraisals for a takings use, the appraiser should remove the influence of the government project. The taking of the quarry property had been twice announced then delayed by the CT highway department during the 5 years prior to the takings date. Only Appraisal A-4 seriously adjusts out the negative project influence on product sales.
 - The Income Approach may not capture all supply-demand forces on the property value, as shown by Appraisal A-4's sales comparison value.
- Left out of most of the appraisals is substantial value generated by the highly profitable, concurrent backfill operation, filling mine void space by accepting disposal of clean fill.

Conclusions Continued:

- General Conclusions:
 - All the appraisers' discount rates used escalated dollars, which included inflation built in, except for A-4 that used constant dollars. The escalated discount rates will provide a lower appraised value unless the cash flow model is appropriately matched.
 - Even a government client can substantially influence appraisers' opinions of value.
 - Appraisals A-1 and A-4 by Certified Minerals Appraisers show significantly higher value opinions than all others by real estate appraisers.