An appraiser of mineral rights or interests in a property is faced with the same three approaches to valuation as with any other real estate appraisal exercise: 1) cost, 2) comparable sales, and 3) the income method. The cost approach is typically viewed as the least reliable for valuing real estate in general, and the same holds if appraising just the subsurface mineral interests. It is extremely difficult to even estimate the amount of money spent in years past on land acquisition, geophysical prospecting, drilling, or other activities, much less distinguish between useful expenditures and those that were unwise or frivolous. As for comparable sales, this often is of little use except from a global viewpoint since the characteristics which define a given mineral deposit are unique in detail; thus attempting to compare various attributes, assign a relative worth to these characteristics (surface v. underground, room-and-pillar mining v. block caving, oxide mineralization v. sulfide, etc.) and then subjectively adjust the comparables accordingly to match the subject property is generally not prone to defensible argument.

This leaves the income method as the preferred mineral valuation approach, provided sufficient understanding of...
the deposit is available, and there is reason to believe that
development or continued production from the deposit is
expected. Generally the mining enterprise is evaluated as an
operating entity complete with requisite capital investment,
managerial technique collectively captures the value of the
minerals and of the business enterprise as well.

In certain instances, however, there is a need for identifying just
the value of the minerals as they repose in the ground, such
as allocation of a property’s purchase price across the asset
classes for tax reasons, or the mineral estate is under different
ownership from that of the surface. A preferred method can be
affected by capitalization of actual or imputed royalty income,
as this income stream is directly tied to a mineral owner’s or
lessor’s expectations of worth.

Definition of Royalty

Like most industrial minerals, the market is relatively opaque
and The word “royalty” originally referred to the rent or tax paid
to the sovereign in England for the privilege of mining. In the
United States, royalty is a reservation to the owner or lessor of a
certain portion of the minerals, or the proceeds from their sale,
at no cost to the lessor. When the payment of a mining royalty
is based on Gross Proceeds, the term typically refers to the gross
sales value received from the product, less expenses for freight,
smelting and refining

(FS&R). This concept is often stated, in regard to metallic ores,
as a royalty paid on net smelter returns to the operator or lessee
(NSR).(2) This is the most common type for metallic minerals,
and will be the principal form for discussion in this paper. Other
types of royalty arrangements include Gross Smelter Returns,
Net Value, and Net Profits Interest royalties, which may or may
not be based on a sliding scale depending upon product price
levels. In some instances an Overriding Royalty may be in effect,
which is another royalty applied in addition to an underlying
royalty on the particular property. Note that these methods of
determining a production royalty are based on some measure of
current economics; i.e., product price, present operating costs,
capital investment, etc. Certain older royalties, particularly on
non-metallic minerals such as aggregates, were predicated on
a cents/ton mined basis, which possibly contained a provision
for periodically updating the applied rate depending on some
published inflation deflation indicator such as the Producer Price
Index.

History

The valuation of mineral properties dates back many decades.
The earliest readily attainable reference work dealing with the
subject is Herbert Hoover’s 1909 book, Principles of Mining,
wherein the first six chapters cover the topic of valuing mines
and prospects.(8) Some techniques were published earlier (such
as H.D. Hoskold’s 1877 treatise, The Engineer’s Valuing Assistant),
and of course there have been numerous premises and articles
written subsequently, especially since the 1960s.

Prior to the concept of discounted cash flow (DCF) analyses
being accepted throughout the mining industry, the rate-
of-return approach dealt with discounted net income. This
was generally the case in the mid-1930s as exemplified by
an American Institute of Mining and Metallurgical Engineers
(AIME) committee that conducted an in-depth analysis of coal
valuation.(3) However, just prior to World War II, another AIME
paper was published which suggested subtracting the present
value of capital investment from the discounted value of the
income stream, thereby capitalizing the investment at the
hazard rate for the property as a whole; this effectively would
utilize discounted cash flow as the metric for valuation rather
than discounted net income.(7) Gradually this concept of DCF
gained acceptance until by the mid-1960s most of the major
mining companies were following these precepts in assessing
the worth of mining projects.

Almost all the early treatments, including recent texts by
Gentry and Stermole,(5,9) discussed the valuation of mines and
mining projects. Only recently has the topic of valuing just the
mineral interest, separate from an enterprise as a whole, been
addressed in detail (although Leith(7) did mention use of royalty
rates as a standard of value for mineral in the ground). In some
measure, this severance of mineral interests relates to federal
court decisions and reasoning whereby the present value of the
royalty income stream is accepted as a preferred, more direct
measure of the mineral interests themselves, than does a DCF
analysis performed on an operating mine or development-stage
project.

In 1984 a federal court case, Cloverport Sand & Gravel Co., Inc.,
v. U.S., noted that appraisers must take care to consider only
the income that the property itself could provide, and not the
income produced from the business enterprise conducted on
the property (i.e., the business of mining).(6) Quoting from the
Uniform Appraisal Standards for Federal Land Acquisition, we
see the following:

“In developing an estimate of value by the income capitalization
approach for a mineral property, it is generally recognized
that the most appropriate method of capitalization is yield
capitalization, most notably discounted cash flow (DCF)
analysis. The income that may be capitalized is the royalty
income, and not the income or profit generated by the business
of mining and selling the mineral. For this reason, the income
capitalization approach, when applied to mineral properties, is
sometimes referred to as the royalty income approach.”

The document goes on to state that the essential ingredients in
developing the present value of a royalty income stream (yield
capitalization) are:

- A start date when production will begin,
- An annual production rate,
- The number of production years,
- The projected selling price of the product,
- A royalty rate, and
- The discount rate to be applied.

The first four of these factors relate to specific conditions
inherent to the property itself, whereas the final two are best
obtained from the market place. The federal courts believe (and therefore mineral appraisers should as well) that royalty and discount rate selection derived from, and supported by, direct market data is the preferred approach in valuing mineral interests by the royalty income method.

Current Royalty Rates

Comparable royalty rates can be obtained from a number of sources, with the most obvious being the rates currently paid to other owners or lessors for extracting the same commodity in the immediate region as the property at issue. Often, however, the data are not forthcoming either because of the paucity of mining and/or leasing in the area, or because the parties involved believe this information is confidential.

Even if such private–party rates are obtained, care must be given in interpreting the information since there is a possibility for a disparity in the lessee/lessor understanding of reasonable royalty rates; lessees are apt to be more knowledgeable than lessors at the time of royalty rate negotiations simply because the lessee has more experience in this task as a normal course of business, whereas for the lessor it may be a one-time event.

There is a possibility that the negotiated royalty rate may be out of date, particularly if the agreement is several years old, and an escalation clause was not included. Also it may be that the lessor controls only a partial interest in the minerals, and therefore his royalty does not reflect an overall rate normally attributable to the full mineral ownership.

Each of the above conditions, should they exist, will tend to understate the current, unbiased rate considered reasonable in the industry.

Another source of rate information, particularly in the western states, may be provided by federal and state agencies involved with mineral leasing. The agencies are charged with insuring that the public receives just compensation for the production of a wasting asset, and from a broad perspective there is some uniformity among these groups. Table I is an example of certain rates for metallic minerals (as shown on pg. 4). Generally speaking, a royalty rate ranging from 3-5% of Net Smelter Returns seems appropriate in this instance.

Discount Rates

The royalty interest owner generally incurs none of the liabilities of operating expense and capital outlays, nor does he carry the burden of non-profitable prospecting and exploration. His primary risk is that of reduced income (or possibly no income) in case the mine or quarry operations slow down or suspend production. As a result, the discount rate on royalty interests should be lower than the rate used in a total property appraisal.

(2)

The topic of discount rates in real estate valuation has received considerable attention over the years, and it is equally important in the appraisal of mineral interests. There have been a number of approaches followed in deriving or justifying the most appropriate discount rate for a particular property. Included in these have been a simple canvassing of other operations to see what rate they may be employing, or using a build-up method where subjective components of the ultimate rate are added together based on perceived risk: i.e., 2% for normal business risk, 3% for mining risk, 1% for market risk, and so forth.

The Arizona Department of Revenue (ADR) is one state agency that annually researches corporate decisions regarding discount rates for natural resource properties, reviews professional literature from security analysts, and assesses changes in components comprising the capital asset pricing model. As such, ADR’s findings are believed to be a good source of data and analysis to serve as a basis in formulating a discount rate for royalty interests.

The 2011 guidelines from the Arizona Department of Revenue indicate representative discount rates for large-scale projects (> $25 million) at basically 13%, with ranges in after-tax, equity hurdle rates from 8 to 15%. Large-scale projects typically have slightly lower hurdle rates; based on commodity, precious metal projects exhibit the lowest representative rates, and new development projects with higher risk are at the upper end of the scale.

It should be noted that the above figure (+/-13%) represents the discount for an operating property where the operator carries substantial risk that is generally avoided by a royalty recipient (although not stated in the ADR guidelines, it is presumed here that this discount excludes inflation).

Royalty is a prior lien on operating profits and, as such, should not carry a rate as high as the more risky discount rate applied to the lessee’s operation. A lower bound for discounting might be the long-term AAA bond rate of roughly 4-5% pre-tax, inclusive of an inflation component. With the upper and lower limits reasonably defined, it is then up to the appraiser to identify the particular risk associated with the property of interest and to ascribe a reasonable discount rate to the annual stream of royalty revenues.

Understandably, some deposits may carry extreme risk as to timing, potential expropriation, the solving of a metallurgical problem, or other condition which would require a substantial increase in the discount rate as a compensatory measure in valuation.

Summary

Of the three accepted approaches to valuation of mineral deposits, the income method is typically practiced in industry. This most often considers the project as a whole, and in an operating mode. The U.S. court system believes that a valuation of the mineral interests can best be completed if a discounted cash flow analysis is performed on just the royalty stream of income due the owner or lessor, and not on the income or profit generated by the business of mining and selling the mineral.

This royalty income approach requires knowledge of the deposit characteristics as well as expected operating criteria including start date, production rate, mine life, and commodity selling price forecasts. Two factors need confirmation from the
marketplace: 1) a reasonable royalty rate to allow estimation of annual receipts, and 2) a discount rate to be applied to the annual stream of royalty revenues in order to arrive at a present value estimate for the mineral interests.

**Table 1: Royalties, and Valuation of Mineral Rights Government**

**Royalty Rates for Metals, Western US**

<table>
<thead>
<tr>
<th>Entity</th>
<th>Rate</th>
<th>Comments</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO</td>
<td>10% NR 5% GPR</td>
<td>On precious metals, Colorado employs either a 10% Net Returns, or a 5% Gross Profits Royalty, whichever is greater. Net Returns is close to a Net Profits Interest, except that mining costs are not deductible.</td>
<td>State Board of Land Commissioners, “General Mining Lease No. 3432,” February 20, 2004, Timothy Kelly, “Personal communication,” March 11, 2010.</td>
</tr>
<tr>
<td>UT</td>
<td>4% GSR</td>
<td>Utah leases its non-fissurean sulphide sulphur minerals at 4% royalty, which is assumed herein to represent a Gross Smelter Return base.</td>
<td>SLMA, “Competitive Lease Offering for Oil, Gas and Associated Hydrocarbons and Other Mineral Commodities,” December 31, 2009.</td>
</tr>
<tr>
<td>NV</td>
<td>N/A</td>
<td>Nevada rarely issues a lease on hardrock minerals, since most metalliciferous acreage is held by mining claims on BLM ground. Taxes on a sliding scale of 2% to 5% are levied on the royalties received by lessees.</td>
<td>Nevada Commission of Mineral Resources, <a href="http://minerals.state.nv.us">http://minerals.state.nv.us</a> Nevada Department of Taxation, “Net Proceeds of Minerals,” April 20, 2008.</td>
</tr>
<tr>
<td>MT</td>
<td>5% NSR</td>
<td>Montana’s royalty rate on metallic minerals varies between 5% and 6% of the fair market value of the minerals recovered at the mine site.</td>
<td>U.S. General Accounting Office, “Mineral Royalties,” March 1993.</td>
</tr>
</tbody>
</table>

**References**


