MINERAL INVESTMENT DECISION MAKING
A Study of Mining Company Practices

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Risks associated with technical and commercial aspects of mining investments have always been high. Recently, however, the new elements of political risks have increased, especially in the United States due to possible changes in the mining law and increasingly stringent permitting regulations. Recognizing that domestic political risks are changing and that mining companies must look at foreign projects, a survey of 20 mining companies was taken to determine what current practice is being used when evaluating minerals investments. Specifically, this survey attempts to determine which capital budgeting tools are most commonly used, what methods of analyzing cost of capital are being employed and how companies are evaluating foreign projects and mitigating country risk. The survey also reports the average cost of capital and minimum rate of return for the mining companies. Similar surveys have been performed on oil and gas industry practices (Dougherty, 1993 and Boyle, 1985); however, no similar study has been performed on mining industry investment analysis. Results of this survey are compared to those reported for the oil and gas industry.

Capital Budgeting Methods

Although DCF methods are still overwhelmingly the choice of mining companies, recently, practitioners have shown increasing concern with the traditional approaches to investment analysis. While DCF techniques may be useful and appropriate in valuing safe businesses with predictable cash generation, they fail in the valuation of businesses with significant growth opportunities or intangible assets. DCF methods are unable to capture the value of flexibility introduced by managerial response to events external to the project such as commodity price fluctuations in a mining project. A new class of investment analysis techniques appears to be emerging based on the concept of options and fostered by the development of an option valuation mechanism. It seems that these new techniques exhibit improved ability to replicate market values where DCF methods typically undervalue projects.

Very little has been published on actual practice by mining companies when performing economic evaluations of capital budgeting alternatives. Numerous articles and surveys, however, have been published about capital budgeting practice in the oil and gas industry. Most notably are two articles, one by Boyle and Schenck (1985) and the other by Dougherty and Sarkar (1993). These two articles report the results of surveys of oil and gas producers with regard to investment practice. The numerical results of these two surveys are compared with the results of this survey and are included in the article’s conclusions.

A telephone survey of 20 mining companies located in the United States, Canada, Mexico, Australia, and Great Britain was made. The companies surveyed ranged in size from almost no annual revenue to $15B in annual sales. The survey dealt almost exclusively with the current capital budgeting practice being utilized and included producers of coal, copper, gold, iron ore, lead, talc, and zinc.

The survey explored how the company in question treated foreign projects and how their economic evaluation might change depending on the geographical location of a project. Most of the companies surveyed had, at the very least, evaluated foreign projects, and many were operating projects outside North America. The methods of adjusting their evaluation included increasing discount rates, increasing required rates of return and/or reducing the required payback period. In almost every case, the subject of the increased risk of doing new projects in the United States was raised.

The final series of questions for the survey related to the company’s cost of capital, the methods of calculation and the annual amount of capital budgeted. These questions centered around how the calculations were performed (if at all) and how the calculated costs of capital were used. Questions were asked about who performed the calculations and whether they were done in-house or by outside firms. The relationship between the cost of capital and the hurdle rates used for economic analysis were explored.

Numerical Results

The average annual sales of the 20 companies is $1.7B; however, this is largely biased by one very large multinational company. The median annual sales is $700 million. The following table lists the number of companies surveyed for each of the primary commodities produced.

* This article is based on a paper by the authors first presented at the Mineral Economic Management Meeting in Washington, DC.
Primary Product | Number in Survey
---|---
Gold | 9
Copper | 5
Iron Ore | 3
Talc | 1
Very Diversified | 2

Capital Budgeting Criteria. Some 95% of the companies surveyed reported using some form of discounted cash flow technique (internal rate of return or net present value) in their capital budgeting decision making. The major criteria and valuation tools by which the mining companies evaluated their capital budgeting were a combination of internal rate of return, payback period and net present value. The following table summarizes the primary, secondary, and tertiary requirements which were provided by the companies being surveyed.

| Number of Companies Using Capital Budget Priority |
|---|---|---|---|
| IRR | Payback | NPV | Other |
| Primary | 11 | 3 | 8 | 3 |
| Secondary | 3 | 6 | 5 |  |
| Tertiary | 1 | 2 |  |  |

Some 55% of the companies surveyed use internal rate of return as the primary capital budgeting criterion and 40% use net present value as the preferred tool. When combining primary and secondary priorities, internal rate of return is used by 70% of the companies surveyed, net present value by 65%, and payback period is used by 45%.

The total number of primary responses is greater than the number of companies surveyed because some reported more than one primary criterion. Responses for the “other” column included one company which only invests in “distressed properties,” another which evaluates investments based on ability to maximize shareholder value and a third which considers the impact of an investment on maximizing earnings per share. The third company looks at conventional discounted cash flow analysis but bases its investment decisions on incremental effects on earnings.

Internal rate of return and net present value were the most widely used tools for evaluating investments by the surveyed mining companies. Payback period and net present value were both widely used as secondary criteria. In addition to the above listed investment decision criteria and tools utilized, many companies have additional criteria which must be met before an investment will be made. Some of these include:

- The project must have costs which are in the lower one-third when placed on a world cost curve
- The project must generate positive cash flows at the lowest price projection in sensitivity analyses
- The project will not invest in countries with high political risk
- The project must be able to be project-financed
- The payback period must be under two years
- The project must produce a minimum of 200K oz/yr gold

Most companies indicated that capital constraints were not binding and that if the project was “good enough” then they would find a way to finance it. Two companies, however, indicated that they were capital constrained and that investments were limited to their ability to raise funds.

The survey clearly indicates that the larger companies are more sophisticated in their capital budgeting analyses. With only one exception, all of the companies with annual sales greater than $500M used a combination of all three DCF techniques. In addition, most of these companies performed combinations of constant and escalated dollar analyses depending on time constraints and financing alternatives. Two of the companies surveyed used more advanced techniques, although not on a consistent basis, in performing their evaluations. These techniques include the use of options pricing in valuing copper properties and computer simulation similar to Monte Carlo analyses on all investment activity.

Minimum Required Rate of Return. The companies that utilize DCF analyses were asked about their minimum required rate of return and its relationship to their cost of capital. Fourteen of the companies provided actual minimum real rates of return. The average required rate was 12.5% with a standard deviation of 3.5%. The following table summarizes the results by primary commodity produced.

<table>
<thead>
<tr>
<th>Primary Commodity</th>
<th>Minimum Real Required Rate (%)</th>
<th>Standard Deviation (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gold</td>
<td>11.1</td>
<td>3.6</td>
</tr>
<tr>
<td>Copper</td>
<td>11.8</td>
<td>2.5</td>
</tr>
<tr>
<td>Iron Ore</td>
<td>16.0</td>
<td>1.4</td>
</tr>
<tr>
<td>Others</td>
<td>13.0</td>
<td>2.3</td>
</tr>
<tr>
<td>Total Group</td>
<td>12.5</td>
<td>3.5</td>
</tr>
</tbody>
</table>

Many of the respondents indicated that the minimum required rate of return was highly project-dependent with the primary factors being political risk, commodity risk and, to a lesser extent, technological risk.

It is interesting to note that the average minimum real required rate of return for the companies with annual sales greater than $1B is 12.8% and the standard deviation is 3.3%, while the companies with annual sales less than $1B in annual sales had an average required rate of return of 11.8% with a standard deviation of 3.6%. This is largely due to the iron-ore producers which, in general, require a higher rate of return and which are some of the largest mining companies in terms of annual sales. Excluding the iron-ore producers, the average required rate of return for the larger companies is 11.7%.

Foreign Risk Assessment. Companies were asked how they evaluated foreign projects and how they dealt with country risk. Almost without exception, they indicated that the risk of future mining projects in the United States was greater than in many other countries. Most companies indicated that their exploration activities were geared towards offshore projects with the most common area being South and Central America. It is interesting to note that four companies commented that the risk of starting a new mine in Mexico was less than that in the United States.

Evaluations of projects in countries with high political risk generally resulted in companies increasing the required rate of return. Two companies said that they do not change anything when evaluating foreign projects but rather they let upper management decide what, if any, premium to assess on the project. A number of companies stated that they strive to mitigate political and foreign risk through the following:

- Include the host government as joint venture partners
- Utilize IFC participation either through debt and/or equity
- Obtain political risk insurance through the MIGA
- Use local participation in project equity, construction/operation

Almost all of the companies indicated that they perform a greater number of sensitivity analyses on foreign projects than on domestic projects, and most said that the payback period becomes more important in evaluating foreign investments.

Cost of Capital. Questions regarding the individual company’s cost of capital varied widely. Many of the respondents did
not know their actual cost of capital nor were they involved in its calculation. The following summarizes the responses to questions regarding the cost of capital:

<table>
<thead>
<tr>
<th>Cost of Capital Response</th>
<th>Number of Companies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weighted avg. cost of debt/equity</td>
<td>5</td>
</tr>
<tr>
<td>Weighted avg. cost using CAPM</td>
<td>5</td>
</tr>
<tr>
<td>Provided by upper management</td>
<td>6</td>
</tr>
<tr>
<td>Average cost of debt</td>
<td>1</td>
</tr>
<tr>
<td>Calculated by outside consultant</td>
<td>1</td>
</tr>
</tbody>
</table>

The average cost of capital, for the nine companies which provided a value, was 10.3% with a standard deviation of 3.4%.

A number of companies use a discount rate, which is different than the cost of capital for evaluating projects. While most of the companies calculate or estimate their cost of capital, eight companies (40%) said that they use a subjective discount rate which is not the same as the calculated cost of capital which is based on past experience. In general, the larger companies (greater than $500M in annual sales) were more rigorous in the determination and use of cost of capital.

Constant or Escalated Dollar Analysis. Fourteen out of the 20 companies surveyed stated that they perform their analyses in constant dollars. Four companies use a combination of constant and escalated dollar analyses and one company performs only escalated dollar analyses. It should be noted that all of the companies who use constant dollar analysis do so by simply projecting today’s costs and revenues forward without regard for inflation. Some experts argue that this is an incorrect method of performing constant dollar analysis. They claim that the costs and revenues should be escalated at their forecast “real” escalation rates and then the resultant cash flow should be discounted using the forecast inflation rate.

It is interesting to note that none of the companies surveyed use the adjusted net present value approach (ANPV) to valuation of projects. ANPV is a method where a project’s value is based on the sum of the present values of cash streams, each discounted at a different real or nominal rate which is more reflective of its “true” rate.

Most of the companies that perform constant dollar analyses indicated that they will perform escalated dollar analysis when incorporating financing alternatives. Most said, however, that they do not have the time and/or the resources to properly perform escalated dollar analysis.

In Conclusion

This article has tried to gain insight into the methods currently being employed by mining companies when evaluating their mineral investments. The results of the survey are tabulated and are compared to the published results for the oil and gas industry.

The comparison between the oil and gas surveys with this survey of mining companies indicates that mining companies are, in general, as sophisticated in evaluating investments as the oil and gas industry. The use of DCF techniques to project valuations appears to be the industry standard. One disturbing result of this study, however, is the inability to explain the high premiums that market values command over DCF valuations. The well known and used DCF analysis does not allow for placing premium values on projects under consideration. Perhaps the newer techniques such as options pricing methods of valuation may provide more accurate market value results.

Some investment analysts will say that the current level of premiums being paid is an aberration in the market and that the trend will reverse itself. This argument, however, does not seem to be valid. Large premiums on precious-metal properties have been the norm for many years and current premiums on base-metal properties appears to be commonplace. It appears that the premiums are a result of mining company management making judgment calls on the potential of projects to exceed their feasibility study projections or the expectation that commodity prices will exceed forecast. The use of judgment calls in placing a premium value on a project can be justified for the following reasons:

- Typical economic evaluation of mining properties assumes constant mining an processing rates along with constant cut-off grades and head grades to the processing plants. In practice these variables are not static but rather are very dynamic and move with both market and technology changes;
- DCF techniques do not account for the ability of managers to take advantage of price volatility and use hedging and forward sales programs;
- Typical economic evaluation does not accurately forecast general improvements in plant efficiency; and
- Most mining companies evaluate hedging programs as distinct economic decisions and do not incorporate them into the value of a project.

One can only assume that future mining project transactions will have premium values attached to the discounted cash flow valuation that is calculated.