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A comparison of real options and discounted cash flow valuation techniques on a gold mining project

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ABSTRACT

Valuation of mineral assets is done for several purposes including for investment-decision making. There are three main valuation approaches used in mineral projects valuation including the income approach. Within the income approach, the static discounted cash flow (DCF) is the widely used technique. However, it has several limitations, the main one being that it is deterministic. To try and overcome this limitation Monte Carlo simulation is done on the input parameters to result in a Monte Carlo DCF (MCDCF) technique. Nonetheless, the MCDCF also has limitations, the main one being that it neglects the value of flexibility that management has due to those uncertainties during the life of mine (LoM). All these limitations may lead to undervaluing or overvaluing mineral projects, resulting in unrealistic projects values. Real Options Analysis (ROA) technique has been recognised as a better mineral projects valuation technique that considers uncertainty and managerial flexibility.

The research study applied and compared the results of the static DCF, MCDCF and ROA techniques on an underground mining project with two possible extraction scenarios. The static DCF was used as the basis for the economic value of the mining project, while the MCDCF incorporated uncertainty in its input variables and quantified the risk associated with the project using @RISK software. The Binomial-Lattice was used to value managerial flexibility to defer the start of the project.

The research study found that the static DCF resulted in an NPV of US$9.60 million and an IRR of 8.67% for Scenario 1 while Scenario 2 has an NPV of US$11.35 million and an IRR of 8.95%. These results show that the project is viable since the NPV is positive and the IRR is greater than the 5% discount rate. However, the MCDCF found that there is a chance that the project is unviable which could change the decision made based on the static DCF results from the MCDCF analysis, there is a probability of 0.21 that the project's NPV and IRR will be negative and less than the discount rate, respectively for Scenario 1. For Scenario 2 there is a probability of 0.17 that the project's NPV and IRR will be negative and less than the discount rate, respectively. The Binomial-Lattice model resulted in a higher NPV for both scenarios; US$17.34 million and US$21.52 million for Scenario 1 and Scenario 2, respectively. This is because the Binomial-Lattice uses a risk-free rate to discount cash flows, whereas the static DCF and MCDCF use risk-adjust discount rate. From these findings it can be concluded that the project is viable and that there is more value created when mining projects have the flexibility to delay the start of a project. Therefore, the company should proceed to a full

feasibility study. Also, mineral projects valuators must use the MCDCF and ROA to quantify risk in mineral projects and to valuate flexibility in the face of uncertainty.