Aven mine extension 1

Whitemud Mining Corp. is about to make a decision about whether to close its Aven Mine as planned or to extend the mine life by one more year. The extension would result in the production and sale of 100M lbs of Cu in the following year.

Whitemud has identified two possible ways of going about this extension. The first involves an investment of $13M at the time and costs in the next year of $160M. The second requires more investment now, $50M, but lower future costs, $120M. Both the projected production and the costs had very little uncertainty in them. However the Cu price, projected to be $2 per lb next year, is very uncertain. Historically this uncertainty has been in the range of 25%.

The main metric that informs investment decisions at Whitemud is the DCF value determined using a conservative annual discount rate of 15%.

 laughton.david@davidlaughtonconsulting.ca

Trillium windfall profits tax 1

NSask Mining Corp. is planning to produce 100M lbs of Cu each year for the next 3 years from the Trillium mine before closing it down. There is very little uncertainty left in this production profile.

NSask has just learned that the host government plans to introduce a windfall profits tax and it wants to determine its exposure. The tax would take 20% of revenues resulting from the extent to which the price is above the current price of $2.00 per lb.

The main metric that informs such analyses at NSask is the DCF value determined using an annual discount rate of 10%.

Using the projected Cu price, this value is 0, which they know has to be wrong.

Angela Doucette, one of their Planning Analysts, has made the observation that the future Cu price is uncertain, and has suggested redoing the analysis with equiprobable high and low flat price decks of $1.30 and $2.70 per lb.

Puzzled about what to do, NSask has contacted the Westmount Group for advice.

 laughton.david@davidlaughtonconsulting.ca

Crocus mine development lease 1

NSask Mining Corp. has a two-year lease to develop a mine at the Crocus Cu deposit. They want to test the use of decision tree analysis to explore how they should manage this lease, and have contacted the Westmount Group for advice on how to go about doing this.

The main metric that informs such analyses at NSask is the DCF value determined using an annual discount rate of 10%. NSask also wants to use the MBV method that Westmount had shown them on a previous consulting assignment.

The geological and technical uncertainty has largely been resolved in previous work. The key remaining uncertainty is in the Cu price. Westmount has already helped NSask develop a dynamic model of that uncertainty suitable for use in this type of analysis. It is based on past spot and forward Cu prices. The expected price is flat at $2 per lb. There is a 25% uncertainty in each 1-year forecast, and a 20% uncertainty during the penultimate year in each 2-year forecast.

 laughton.david@davidlaughtonconsulting.ca

Crocus mine development lease 1 (cont'd)

Previous work has suggested that the value of the deposit at the time of sanction would be roughly linear in the concurrent Cu price with a slope of 500 million pounds and an intercept of -$870 million. Therefore if the mine were sanctioned now it would be worth $130 million. NSask has decided to use this information for a preliminary look at the decision tree analysis.

The MBV analysis is to be based on the Cu forward price and t-bill price data in Table 1.

Table 1

Term	Cu forward price	t-bill price
0	2.000	1.0000
1	1.800	0.9709
2	1.656	0.9426

 laughton.david@davidlaughtonconsulting.ca

Crocus mine development lease 2

NSask Mining Corp. is now ready to take the next step in their decision tree analysis of the two-year lease to develop a mine based on the Crocus Cu deposit.

They have just completed a preliminary analysis using both their standard DCF metric and the MBV method, to which their consultant on this project, the Westmount Group, has introduced them. It is based on previous work, which has suggested that the value of the deposit at the time of sanction would be roughly linear in the concurrent Cu price with a slope of 500 million pounds and an intercept of -$870 million.

They have decided now to look more closely at the value of the deposit at sanction, realizing that the MBV value and the DCF values are likely to be different and that, with price reversion, the linear relationship is probably wrong.

 laughton.david@davidlaughtonconsulting.ca

Crocus mine development lease 2 (cont'd)

The previous analysis of these values was based on a DCF analysis using flat price forecasts. There is a 3 year development phase followed by a 20 year mine life. The production profile is flat at 75 million lbs per year. The development cost are $200 million per year, the operating costs $47.5 million per year and the cost of decommissioning $60 million all at current prices.

With the exception of the development costs, they intend to use this data in their new analysis. The development costs have increased by 20% since the previous analysis had been done.

They have also added in a cost index that was linear in the ratio of the concurrent Cu price to the current Cu price with a slope of 0.2

.They now have to extend the time horizon for their price model from 2 years to 24 years. The original binary branching tree model that they have developed with the advice of the Westmount Group would be untenable over this time scale.

 laughton.david@davidlaughtonconsulting.ca

Crocus mine development lease 2 (cont'd)

After some conversations with their consultant, they have decided to use a continuous time model with exponentially decaying volatility in the price forecast movements. A short-term volatility of 30% (annualised) and a decay half-life of 3 years fit the data that they have. They have decided to keep the flat initial price forecast of $2 per lb.

The MBV analysis uses a constant risk-free rate of 3% per year, and Cu forward prices with a price of risk of 0.4 (annualised), which means a long-term forward price of $1.19 per lb.

They have adjusted the discrete volatilities in their 2-year binary branching tree to reproduce the variance in the log of the prices and the discrete price of risk to reproduce the 2-year forward price.

 laughton.david@davidlaughtonconsulting.ca