Valuing long-life copper-gold assets with advanced Monte Carlo simulation

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Long-life copper-gold projects tend to trade at transaction values that are significantly higher than the net present value (NPV) calculated using the discounted cash flow method. The difference in value is usually attributed (correctly) to the inability of the conventional discount cash flow method (DCF) to adequately recognize important characteristics of the project environment. In the case of copper-gold projects, a conventional DCF NPV calculation tends to undervalue these projects because it does not explicitly account for the difference in the uncertainty and risk characteristics of the gold and copper revenue streams and the ability to manage project uncertainty with operational strategies.

This paper uses an advanced method of Monte Carlo simulation to value an open pit copper-gold project in which there is flexibility to manage its development as a modular series of pushbacks. The project's net present value (NPV) is calculated using both discounted cash flow and real options, an alternative NPV approach that is gaining acceptance in the mining industry. The results highlight that presence of operational flexibility may have important value effects regardless of whether the DCF or real option NPV methods are used. They also demonstrate that copper price reversion, the presence of a long-term equilibrium price and its associated saturation of long-term copper price uncertainty, is an important influence of copper revenue stream value while investment-driven gold price uncertainty and risk has different but still important value implications for the gold revenue stream. The paper's key conclusion for mine valuation professionals and qualified persons is that advanced Monte Carlo simulation can recognize important project value influences that industry-standard static cash flow models do not.