

STRESS TESTING MINE PLANS

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ABSTRACT

In the current capital-constrained financial climate mining projects that can demonstrate superior financial returns with limited downside risk stand a better chance of obtaining corporate and funding approval. Typically, calculation of the financial return for a given mine plan relies on estimates of numerous parameters, including (but not restricted to) the mineral grades, extraction sequence and timing, mineral recovery, prevailing commodity price, and capital and operating costs. All of these parameters are uncertain and should be modelled stochastically by some form of Monte Carlo-based simulation technique. For example, mineral grade values by geostatistical conditional simulation, operating costs with a growth function, and commodity prices using a long-term mean reverting model that accounts for periodicity (price cycles). However, the traditional sensitivity analysis approach is to independently vary each uncertain parameter by a fixed set of potential outcomes (eg $\pm 5\%$, $\pm 10\%$ and $\pm 20\%$) and calculate the impact on the financial return. This approach will invariably underestimate the possibility of an undesirable or catastrophic financial outcome. Combining a series of Monte Carlo-based simulation outcomes is more likely to adequately “stress test” any given mine plan and quantify the likelihood of achieving a desirable financial return. This paper discusses a Monte Carlo-based simulation approach to “stress testing” mine plans, which is demonstrated for a number of mineral projects.