

Limitations and issues with using the DCF NPV method for valuations of mine closure and post mine closure

KEY FINDINGS

The following key findings emerged from this project:

- The DCF NPV technique is not a suitable method for the cost estimation and evaluation of mine closure or post-mine closure economics owing to the high number of flaws it presents including the cyclical nature of the mining business.
- The technique does not adequately accommodate geological uncertainty.
- A greater emphasis on closure during the planning process is required by several legal frameworks. More financial support should be allocated at the early stage of an operation's life, to help avoid the underestimation of ultimate closure and post-closure requirements and associated expenditures.
- DCF NPV valuation techniques usually overlook and are not able to integrate market risks such as commodity price, foreign exchange rates, geological and technical risks as well as non-systematic risk, such as the effects of climate change (heavy rainfall and floods, drought) earthquakes, ESG (Environmental, Social and Governance) economics and others.
- The above risks and uncertainties are typically, and incorrectly, factored into a DCF NPV through an adjusted discount rate, beyond the weighted average cost of capital (WACC). Thus, mining closure and investor behaviour may be misleading because the mining asset, notably at closure, may be valued at an unreasonably high or even low level, creating a potential financial burden or benefit for the existing operation and ultimately for future generations and other stakeholders.
- Discount rates themselves in the DCF NPV technique generally ignore the variability of the weightings of the costs associated with debt and with equity (i.e. by using a static, non-variable discount rate), notably as an operation approaches closure when all debt should be fully repaid and returns on equity have been achieved, changing those weightings.
- A risk-based model such as the Monte Carlo Risk Simulation technique may be a better option for the economic estimation of mine closure or post-mine closure, but there remain issues around quantifying the associated risks and uncertainties (discount rate issues). Furthermore, real options or a Decoupled NPV may provide improved techniques for the valuation of mine closure or post-mine closure, which can address closer-to-real life scenarios of mining project risks and non-systematic risks for mine closure and post-mine closure activities and outcomes, but remain imperfect.



INTRODUCTION

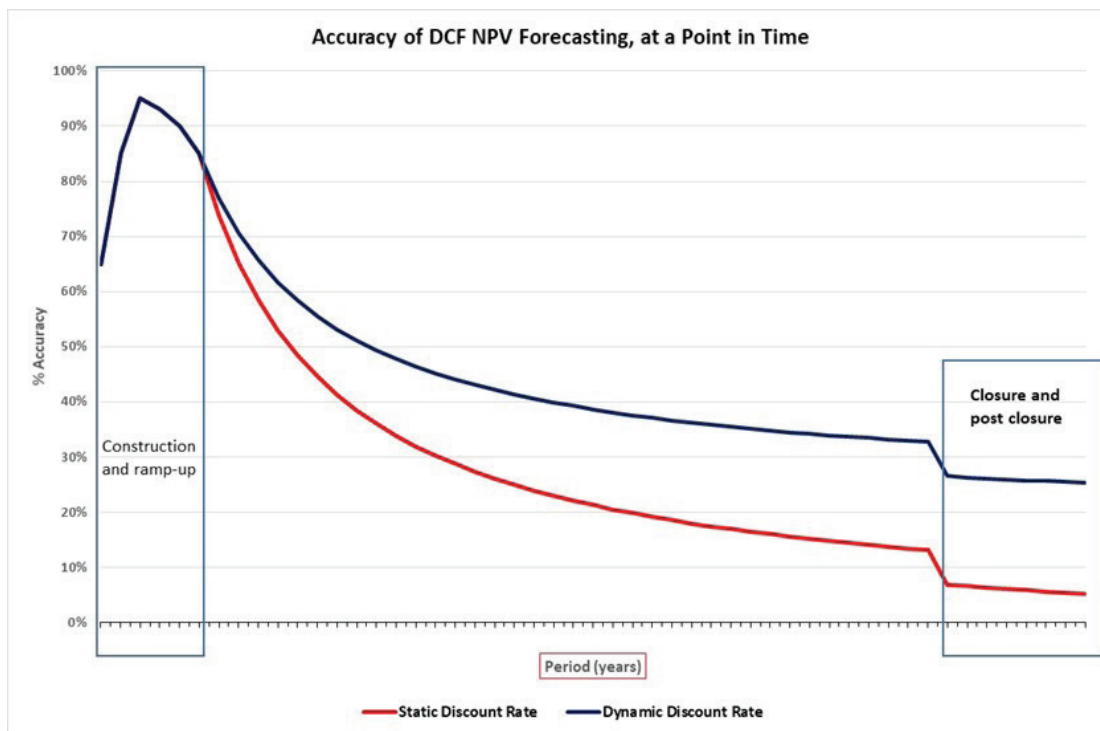
Mines close for many different reasons, with economic factors and ore depletion offering the primary reasons. The economic factors most commonly arise due to a sustained drop in the commodity-of-interest's price impacting the economic cut-off grade, or increased operating costs, or unplanned-for capital expenses to remedy an issue or to reinvigorate the asset.

Mine closure can also be due to technical occurrences, such as an unplanned drop in grade occurring (e.g., a wash-out zone, or other geologically intrusive event), or when geological conditions inhibit safe, sustainably economic ore extraction. In addition, mines may not attract adequate financial assistance to develop or operate due to issues surrounding the underestimation of closure costs and associated activities and a lack of innovation and management flexibility around these aspects.

To evaluate mine closure and post-closure activities and land-uses, the discounted cash flow (DCF) valuation method is commonly used, applying a net present value (NPV) technique, as has been conducted for many decades. However, there are numerous shortcomings in this DCF NPV technique, notably around the closure and post-closure phases on the mining lifecycle. This project investigated, and highlighted, the issues and limitations of reliance on using a DCF NPV technique for evaluating and valuing mine closure and post-mine closure assets and functions.

THE CHALLENGE

In the mining industry, reliance on traditional valuation techniques including the NPV has frequently led to contentious asset values not only in mining operations, but also in mine closure, reclamations, and post-closure activities. The mining industry is facing new problems; thus, mining companies need to alter the way they view operations, particularly closure and the associated cost discrepancies that occur from inadequate or inappropriate planning.



The Accuracy of DCF NPV Forecasting

THE OPPORTUNITY

Through this study, an opportunity has been created and justified to identify (qualify and quantify) alternative ways to achieve the economic estimation of mine closure or post-mine closure.

OUTCOMES

In summary, the DCF NPV technique is not a suitable method for the evaluation and cost estimation of mine closure or post-mine closure economics owing to the high number of flaws it presents. As such, mining companies need to alter the way they view and evaluate operations, particularly closure.

It is thought that a risk-based model, such as the Monte Carlo Risk Simulation technique or Decoupled NPV may provide a better option for the economic estimation of mine closure or post-mine closure, although notable issues remain around quantifying those risks and uncertainties. In addition, real options may provide an improved valuation technique, which can address real-life scenarios of mining project risks and non-systematic risks for mine closure and post-mine closure activities and outcomes, but issues abound with this too.

NEXT STEPS

More risk-based model case studies and discontinued projects should potentially be tested to see if the cost could have been forecast. The impact of the indices and the percentage contribution that each index makes to each cost component could also be the subject of further study.

Furthermore, the cost estimation of mine closure and post-mine closure could be further addressed depending on project-specific scenarios, such as project size, deferent state regulations, and the impact of worsening weather and environmental conditions.

Finally, further research is warranted in determining and evaluating alternative valuation methods and techniques for the closure and post-closure phases of a mine's life.

PROJECT PARTNERS

Curtin University; Mine Land Rehabilitation Authority

PROJECT PUBLICATIONS

[REVIEW FULL REPORT](#)

- 1) Lilford, E. V., Haque, Md. A. (2023). Limitations and issues with using the DCF NPV method for valuations of mine closure and post-mine closure. CRC TiME Limited, Perth, Australia.

CONTACT

E hello@crctime.com.au **T** +61 (08) 9263 9805

ABOUT US

The Cooperative Research Centre for Transformations in Mining Economies is part of Australia's national innovation ecosystem. Our diverse partnership brings scale, collaboration and coordinated investment to tackle the most complex mine closure and post-mine transition challenges. Together we're rethinking what's possible to improve outcomes for people, communities, the environment and industry.

We acknowledge the traditional custodians across all the lands on which we live and work, and we pay our respects to Elders both past and present.