How to Avoid the Worst Financial Outcomes in the Mining Industry

A research summary[1] by Andrew Gillis, P.Eng., MBA, Ph.D. Candidate

The mining industry has a long history of generating low shareholder returns. Over the past two decades, the average Canadian mining company has returned -8%, while the TSX composite index returned +7%. This poor performance was not driven solely by commodity price performance – over three-quarters of miners failed to outperform the commodities they were producing. Instead, significant gaps between the expected value and the realized benefits of mining projects have driven the low investor returns. These gaps eventually show up as asset write-downs and impairments. Over the past two decades, 90% of Canadian mining companies declared an impairment related to an operating mine. *On average, companies wrote off 40% of the mine's value when they reported an impairment.*

The gap between the forecasted and realized value is not unique to the mining industry. Large public infrastructure projects have recorded significant and persistent forecasting errors for over 100 years. Like the mining industry, cost overruns and benefit shortfalls of 50% are common. While this data is from large and complex projects, the root causes of forecasting errors are the same for any project size. Three things typically cause forecasting errors: technical errors, optimism bias, and 'strategic misrepresentation.'

The technical error category refers to inadequate data, lack of experience, honest mistakes, and unfortunate probabilistic outcomes. Examples include inappropriate designs, unexpected environmental conditions, and the occurrence of improbable events. The optimism bias category refers to several consistent, persistent, and predictable psychological biases that cause experts and laypeople alike to make positively biased predictions. Examples include discounting past prediction errors, anchoring to starting points or values, and underestimating the overall probability of failure when many small risks are present. (Daniel Kahneman received The Nobel Memorial Prize for his work on this topic). The strategic misrepresentation category refers to self-interested project participants lying for their own benefit, while others bear the costs. Examples include underestimating capital costs to secure follow-on construction work, intentionally overestimating ridership to advance a taxpayer-funded rail line, and massaging forecasts to achieve a target rate of return. While these causes of forecasting errors have persisted for decades, methods exist to reduce the impact.

[1] References available upon request, please contact the author for more information.

Project owners need to move from the 'inside view' of the project to the 'outside view.' The inside view is the overwhelmingly preferred, intuitive approach that focuses intensely on the details of the case at hand. Alternatively, the outside view makes predictions using distributional data from past experiences and intentionally ignores the details of the case at hand. A standard method for using distributional data from past experiences to make forecasts is 'reference class forecasting.' It involves identifying similar past projects (the 'reference class'), establishing a probability distribution of outcomes, and comparing the current project to the reference class. The current project can be compared to the reference class in two different ways.

Project owners can mandate forecasting directly through comparison to a reference class. Forecasters collect costs, benefits, and durations for similar projects and then use them to generate an expected distribution of project outcomes. The result could be something like, "There is a 50% chance the project will cost more than $200 million, and a 10% chance it will cost more than $250 million based on similar completed projects." Alternatively, project evaluators or financiers can use reference class information to add escalation factors to projects that have been forecasted using the traditional 'inside view.' Evaluators can look at the distribution of past forecasting errors and apply cost and time increase factors and benefit decrease factors to the completed forecasts. The result could be something like, "There is a 50% chance of a capital cost overrun if 15% is added to the original estimate, and a 10% chance of overrun if 60% is added based on the forecasting error of similar completed projects."

Reference class forecasting is now mandatory for the planning of public transportation projects in several European countries. Transportation, hydroelectric and building construction projects in many other regions worldwide have used reference class forecasting. The UK Department of Transportation has now used reference class forecasting for over ten years; it has shown reduced cost overruns and several major projects' cancellation. While large and complex projects have been the earliest adopters of reference class forecasting, project owners can apply distributional information from past projects to any project at risk of forecasting errors. The expected benefits of entering a new market and the anticipated costs of adopting a new information-technology system can all be evaluated through the dispassionate lens of past outcomes. Project owners can understand overall project risk much more clearly by looking at the results of completed projects rather than focusing on the details of the case at hand.

Despite the prevalence of mining project forecasting errors, Canadian mining companies do not use reference class forecasting to evaluate new projects. The data is publicly available to create accurate

reference classes for both mine costs and financial benefits. However, mining company management currently lacks the incentives necessary to reduce forecasting errors. Substantial forecasting errors have persisted for decades due to misaligned interests between project estimators and company management and between company management and investors.

Ultimately, company directors are responsible for mitigating these forecasting risks. Experience has shown that the traditional inside view of mine project forecasting has not prevented significant destruction of shareholder value and has not reduced forecasting errors over time. Therefore, dispassionate, objective information about past outcomes must support critical capital allocation decisions by adjusting forecasts to align with reality. Company boards must mandate the comparison of new mining projects to completed projects, and they must direct management to use distributional reference class information to make more accurate forecasts. More accurate forecasts will lead to fewer significant asset impairments and higher long-term returns for shareholders.