

Aug 18, 2005

one body

Supply? Uncertainty

Market Demand Uncertainty

Team Optimization

stake? stake?

$$Q = \underline{\underline{\text{Max}}} = \frac{1}{50} \left\{ W(h) - W(h) \right\} + \frac{L}{S}$$

Metal

$$W(h) = F_2 \{ X, z_1, I_2, D \}$$

$$(r, S, D) E \{ I(r, S, D) \mid S_k / D_k \}, k=1, 2, 3$$

COLIN O'CONNOR / CANWEST NEWS SERVICE

Professor Roussos Dimitrakopoulos applies a kind of mathematics called stochastic modelling to try to reduce the uncertainties in mining.

It's mining by the numbers

BY DREW HASSELBACK

Mining is a numbers game and Roussos Dimitrakopoulos of Montreal's McGill University is out to change the rules. With the financial help of the federal government, the McGill University professor of mineral engineering has a \$3.5-million budget to study the way mining companies value their mining projects.

Dr. Dimitrakopoulos uses a form of mathematics called stochastic modeling that helps companies make decisions when confronted with uncertainty. It's cutting-edge stuff, and McGill lobbied hard to recruit Dr. Dimitrakopoulos from the University of Queensland in Australia.

Conventional modelling focuses on the data that is known, such as the number of minerals collected from drill holes poked throughout an exploration property. A stochastic model looks at the vast array of unknown things that could lurk between those drill holes, such as the amount of potential mineralization between holes.

"You drill a few holes, you think you understand something, but what you know is very, very little," Dr. Dimitrakopoulos explained. "Uncertainty means probabilistic models, and there are a gazillion types of them."

Stochastic modelling helps with more than estimating the value of an ore deposit. It can also be used to assemble the mining plan the company will use to get the ore out of the ground.

Dr. Dimitrakopoulos cited a 1990 study by the World Bank that said 73% of North American mines had failed, either because they had gone bankrupt or because they failed to live up to their financial expectations. He said miners

would make better economic decisions if they used his stochastic models, rather than conventional methods.

Dr. Dimitrakopoulos said published research in the area proves this approach raises the net present value of a mine, even though this goes against conventional wisdom in the mining industry.

"This is why I find this fascinating," Dr. Dimitrakopoulos said. "If you have higher risk, you would expect a higher reward. It turns out that if you manage risk in the process, as opposed to ignoring it, you have higher value and lower risk."

Dr. Dimitrakopoulos' research has got the attention of some in the industry.

*This work brings
another dimension
to risk-based
decision-making'*

try. Peter Ravenscroft, a senior executive with Rio Tinto in Australia and an expert at geostatistics, said Dr. Dimitrakopoulos' approach is revolutionary.

"Roussos' work in this area is paving the way for mine planners to truly take account of uncertainty and risk," Dr. Ravenscroft said. "Using approaches that have been mostly buried in academia for 30 years, this work brings another dimension to risk-based decision-making."

BHP-Billiton, based in Melbourne, and which at one time employed Dr. Dimitrakopoulos, has conducted studies that compare a conventional mining plan with one prepared using a stochastic process. In one study published this

year, BHP-Billiton determined that the net present value for one of its mining projects rose between 5% and 20% using the stochastic approach. The report doesn't identify the specific BHP-Billiton project, citing confidential requirements.

Not everyone is convinced. Asked about Dr. Dimitrakopoulos' ideas, geologists at one of Canada's largest mining companies broke into laughter. Another described stochastic modelling with a two-syllable word that begins with "bull."

Critics say the problem is that a stochastic approach overemphasizes risk, and, therefore, undervalues deposits. Dr. Dimitrakopoulos understands this criticism — but said it's dead wrong.

"By accounting for the various risks, you would expect the valuation would be less. But the answer is quite the opposite, and this is definitely counter intuitive. We published studies that consistently show that these kinds of models provide better value for projects and deposits."

Dr. Dimitrakopoulos said he's merely trying to study mineral deposits in the same way hedge-fund traders use advanced mathematics to profit from the uncertainties and volatility of the prices for options and other exotic derivatives.

Hassan El-Ramly, a geotechnical engineer at Edmonton-based consultants Amec Canada, said it would make sense to use stochastic models when trying to analyze the value of a mineral deposit.

"You take your inputs, you go through the analysis of the design, then you come up with a prediction of the outcome. The inputs aren't always firm: you can have a range of values," he said.

"That's the whole idea of stochastic analysis, conventionally, whether it's engineering or even a financial exercise."

Financial Post

dhasselback@nationalpost.com