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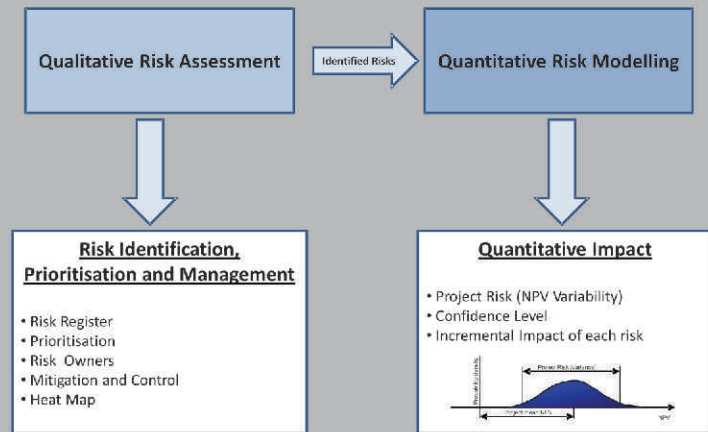
Quantitative Risk Modelling

"As far as the laws of mathematics refer to reality, they are not certain; And as far as they are certain, they do not refer to reality." - Albert Einstein.

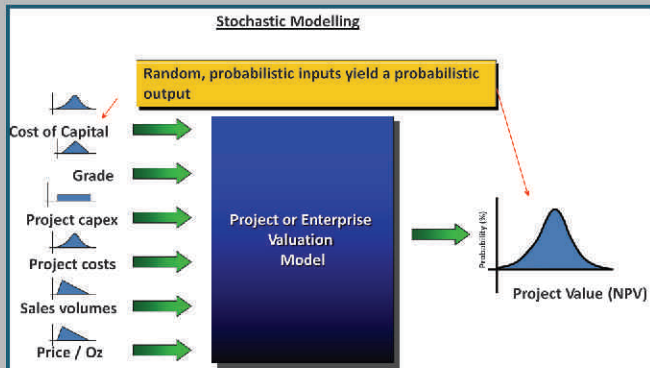
The quantitative impact of the inherent uncertainties associated with any project or current operation are often not modelled or even understood, with the result that decision-makers do not appreciate the variability in output that can be expected due to these risks (e.g. variability in production, costs, revenue and NPV). The traditional qualitative risk assessment process identifies and objectively prioritises risks to be managed through the project life cycle or operation, without a quantitative view on the impact.

Cyest Analytics identified the need for a rigorous quantitative risk modelling approach and has applied the actuarial methodologies such as dynamic financial analysis (DFA) and Monte Carlo simulation to assess risk accurately.

Cyest's approach to quantitative risk modelling incorporates a stochastic methodology that provides a probabilistic range (or distribution) of values, as opposed to a single 'crisp' or discrete value such as a single NPV, IRR or ROI. The resultant output is then calculated as a distribution, which means that a minimum and maximum range within confidence levels can be expressed (NPV, Tonnes, costs etc). The project's downside risk (NPV<0) can also be accurately assessed and quantified.



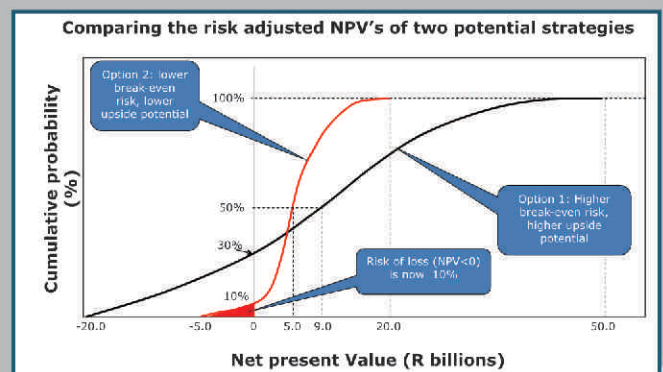
Analysis can be taken one step further to allow for the probabilistic modelling of the dynamics between the different input variables. For example, historical analysis may show that there is a relationship between exchange rate, commodity price and inflation, or between the scale of the operation and efficiencies achievable. The use of 'copulas' quantifies the relationship between different variables and, as such, results in more accurate risk and value modelling.



Alternative mitigation strategies can now be tested to determine the impact on the project valuation, variability and downside risk.

Risk attribution is another output of the risk model that clearly indicates where the areas of highest risk are. In so doing, it indicates where the greatest management attention must be focused.

Risk attribution differs from sensitivity analyses where each variable is tested in isolation in order to assess their impact on the mean NPV. Risk attribution is a measure of 'how much' that variable contributes to the total risk (variance) of the NPV distribution, relative to the exposure of the other considered risks.



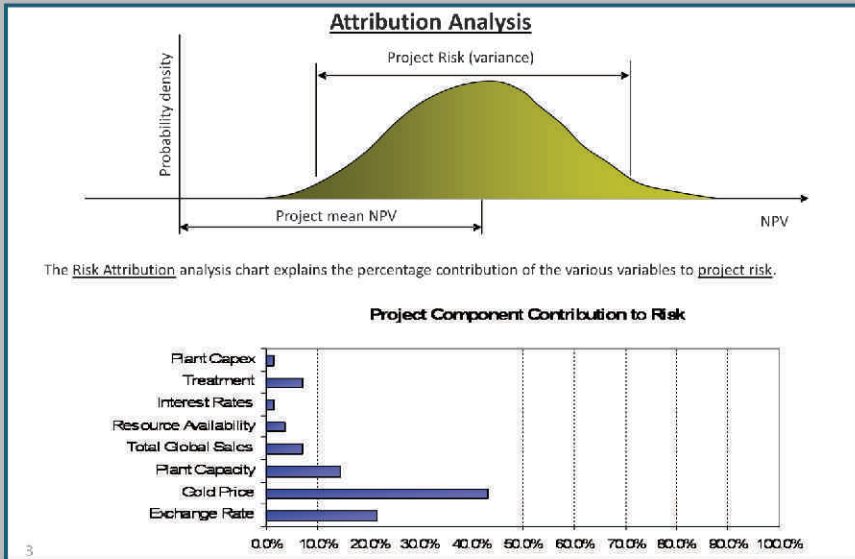
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The following are examples of where Cyest Analytics has applied quantitative risk modelling in practice.

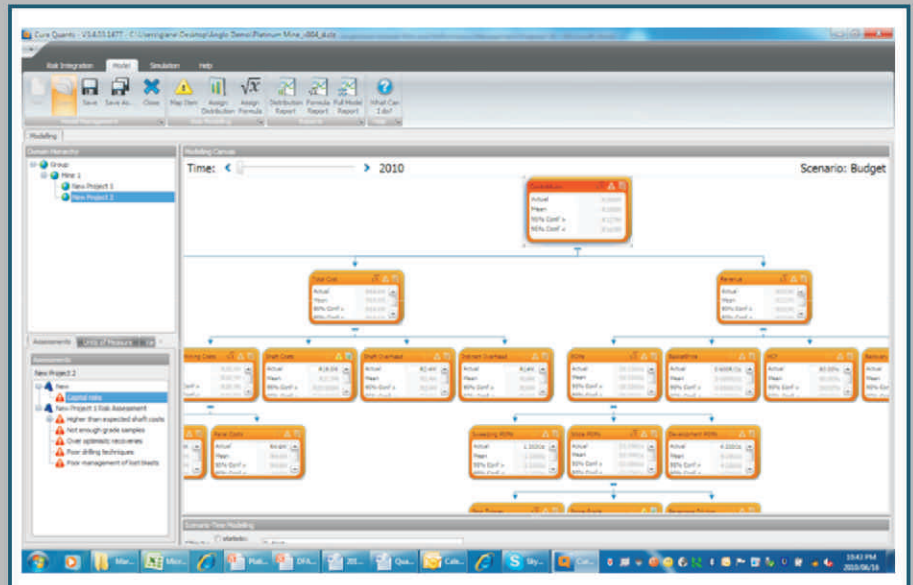
1. Capital Project Valuation to determine the variability of NPV and downside risk (probability of NPV<0), taking all underlying inherent risks into account (concept studies, desktop studies, prefeasibility studies and feasibility studies).
2. Quantification of the underlying risks on current operations outputs (production, revenue, cash flow).
3. Specific modelling to assess impact of Falls of Ground.
4. Variability within a capital estimate and calculating contingency requirements based on the required confidence level of the estimate.

Cyest Analytics has developed a quantitative risk tool that allows a user to build an intuitive stochastic model that visually represents the underlying model logic. This allows for the importing of a risk register from a qualitative risk assessment process so that the incremental impact of each risk can be assessed. Currently this tool has been integrated with CURA Assessor for seamless integration of qualitative and quantitative risk assessment.

Contact Cyest Analytics to discuss your risk assessment needs relating to Quantitative Risk Modelling, facilitation of qualitative risk assessments using proven frameworks or implementing our qualitative risk modelling solution in your business.

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