

*Practical Project Risk Management*¹

Cost Risk Analysis: A brief guide²

Purposes

1. Produce a realistic risk-based forecast for the cost of project ownership.
2. Assess appropriate financial provisions for cost risk.
3. Forecast the effect on cost risk of changes to project scope or contractual agreements.

Typical cost risk model structure

Cost risk effects combinations can be complex. See the *Multiplicative Risk Effects* guidance sheet (October 2022). It is also often necessary to differentiate between costs that are driven by schedule performance and other costs that are not. Since there is no simple repeatable way of structuring cost risk models, an appropriate structure should be developed for each project. However, a structure similar to that illustrated below may be appropriate in many cases.

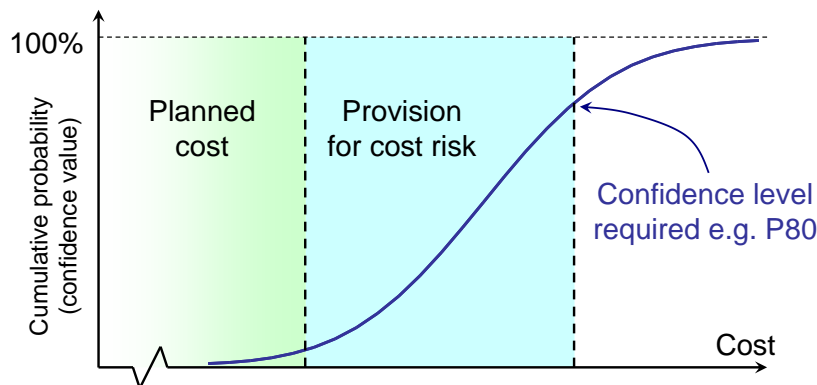
Cost model line item type	Inputs	Outputs
1. Fixed Costs	Fixed values (e.g. fixed prices)	Single values
2. Cost line items with variable cost	Probability distributions	Risk-based forecasts
3. Cost line items driven by schedule	Probability distributions	Risk-based forecasts
4. Risk Events	Probability & impact estimates	Risk-based forecasts
5. Other risk factors	Probability distributions for risks affecting selected elements above e.g. exchange rates risk	
	Summed cost (item types 1-4):	Risk-based forecast

¹ This series of articles is by Martin Hopkinson, author of the books “*The Project Risk Maturity Model*” and “*Net Present Value and Risk Modelling for Projects*” and contributing author for Association for Project Management (APM) guides such as *Directing Change* and *Sponsoring Change*. These articles are based on a set of short risk management guides previously available on his company website, now retired. See Martin’s author profile at the end of this article.

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The simplest approach is to calculate single value outputs for each line item deterministically. A better approach is to use a structure such as that illustrated to prepare a model for Monte Carlo Simulation. This would be necessary if compound risks or other risk factors are included.

Illustration of a Monte Carlo Cost Model Output



The provision for cost risk may be referred to using terms such as risk fund, risk reserve, or risk contingency. This should be differentiated from any contingency provisioned for the effects of unidentified risk (or unknown unknowns), which cannot be estimated by this approach to analysis.

A Cost Risk Model Quality Checklist

1. Have the purposes of the model been identified and agreed?
2. Does the model include all project phases relevant to its agreed purposes?
3. Has the model been built in a way that simulates the effects of all significant sources of risk, whilst also avoiding their duplication?
4. Has the commercial ownership of risk been handled correctly, such that the model includes only the risks that the organization(s) concerned would have to bear?
5. Does the selection of cost line items align with the project cost breakdown structure (CBS), such that, together, they represent all relevant planned costs?
6. Are the key overarching assumptions identified when developing the model and are they disclosed alongside the modelling results?
7. Are there sufficiently few line items in the model to allow the time that is required to develop risk estimates of good quality?
8. Does the model include appropriate levels of correlation between line items?
9. Has a risk estimating approach been used that develops realistic and unbiased estimates?

A model broken down to the lowest levels of the CBS would often fail a number of points in this checklist. Cost risk models are thus typically structured around a relatively high CBS level.

Common Faults

1. Assuming, by default, that a cost risk model should be structured by summing a list of risks.
2. Failure to make realistic estimates for cost line item variability risk (or uncertainty) e.g. by using automatically generated estimates such as planned value +/- 10%.
3. Failure to include realistic levels of correlation between line items – a fault that leads to an unrealistically narrow range in the forecast output and increases with the model's size.

4. Using the outputs of a cost risk model to estimate contingency for unknown unknowns.
5. Failure to identify, record and disclose key overarching assumptions.



About the Author

Martin Hopkinson

United Kingdom



Martin Hopkinson, recently retired as the Director of Risk Management Capability Limited in the UK, and has 30 years' experience as a project manager and project risk management consultant. His experience has been gained across a wide variety of industries and engineering disciplines and includes multibillion-pound projects and programmes. He was the lead author on Tools and Techniques for the Association for Project Management's (APM) guide to risk management (*The PRAM Guide*) and led the group that produced the APM guide *Prioritising Project Risks*.

Martin's first book, *The Project Risk Maturity Model*, concerns the risk management process. His contributions to Association for Project Management (APM) guides such as *Directing Change* and *Sponsoring Change* reflect his belief in the importance of project governance and business case development.

In his second book *Net Present Value and Risk Modelling for Projects* he brought these subjects together by showing how NPV and risk modelling techniques can be used to optimise projects and support project approval decisions. ([To learn more about the book, click here.](#))