From Questions to Models to Decisions: dialogue to support effective use of simulation modelling

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Abstract

There are many challenges facing those who interpret the output of simulation models to better support decision makers. Not least among these is the difficulty presented when the complicated simulation model sits at the beginning of the chain, being part of a forecast system that was neither designed to address this particular decision maker's question nor adapted to provide relevant information given the imperfections of this particular model (or set of models). The situation closely parallels the statistician's traditional nightmare user: "Here is my data, what does it tell me" when the data were collected without an appropriate experimental design.

It is argued that more effective Decision Support can be achieved by a process of dialogue, starting with the question actually asked by the decision maker and taking a more nuanced view of the role of the available evidence in the decision process. In climate impact assessment, a 90% probability of a randomly-chosen model run simulating long-term drought in southern Africa does not correspond to a 90% chance of long-term drought actually occurring in southern Africa: if you assume that it does, you may be making decisions that are riskier than you thought. In financial modelling, a "ten-sigma" event such as that experienced when the Swiss Franc was unpegged from the Euro does not correspond to an actual frequency of one in 10^24: if you assume that it does, you may be making decisions that are riskier than you thought. Many other examples no doubt spring to the mind of the audience. We will discuss some desiderata for the effective design and use of simulation modelling to inform decisions, including appropriate use of expert judgement to move forward from the limitations of probabilistic descriptions of model-land outcomes and into the real world (from Questions to Models to Decisions).

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