Modelling a System Which We Don't Understand

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Optimal modelling conventionally focusses on managing **noise in the data.** When we model a system whose basic processes are incompletely understood, we must also focus on **faulty understanding of the process.** These two types of uncertainty — data and process uncertainty — are antagonistic: increasing the control of either uncertainty results in reduced control of the other. In other words:

A mathematical model which is constructed or up-dated to provide high fidelity to measurements will be extremely sensitive to imperfections in the knowledge underlying the model.

We discuss two examples: (1) An heuristic example of the up-dating of a mathematical model from measurements. (2) A simple model of the U.S. macroeconomy, and its use for inflation management. The examples illustrate the irrevocable trade-off between high performance and high immunity to uncertainty.

Throughout the talk we will emphasize the conceptual tools from

Information-gap decision theory

which serve the modeller in deciding what to optimize and how to do it.

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