

## Qualitative judgement modelling and discretisations

In many technical areas the use of risk matrices is promoted for risk analysis and management. These include aviation safety (ICAO), climate change (SREX), auditing (COSO) and cybersecurity (NATO and various governments). This approach, which uses qualitative ordinal probabilities and qualitative ordinal impacts, facilitates the application of risk analysis. However, such simplifications entail modelling mistakes cogently argued in Cox (2008). These include ambiguous inputs and outputs, poor resolution, misinterpretation and potentially suboptimal risk treatments. In spite of these, such methods are defended, specially in situations in which little time is available.

Some questions that could be addressed concern providing fundamental ideas around such concept of risk matrix to mitigate its weaknesses or promote its strengths. Here are some of them:

- Cox introduces some concept of coherent risk matrices. We could perform an analysis of what of the matrices proposed by various organisations are actually coherent.
- In the 90's, the topic of ordinal data modelling based on latent variables became well developed. We could apply such approach for both entries of the risk matrix and explore their combined usage.
- Suppose we really want to perform a risk matrix analysis. How do we combine multiple experts along the probability and impact dimensions?
- How do we discretise a full blown risk analysis to adapt to the risk matrix methodology, e.g. for communication purposes?

This inevitably brings a connection with discretisation methods which somehow provide a dual view of the problem. There are still attempts at introducing discretisation methods, many times focusing on arbitrary concepts like having the best three point approximation (to a distribution). A very powerful alternative approach is based on the so-called reduced order models.

Should you be interested in pursuing these or related questions please contact

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