Unit 8: Implementing Quantitative Risk Models.

Title: Quantitative Risk Modelling

Part A

Read Goerlandt et al (2017), Hugo et al (2018) and Çelikbilek & Tüysüz (2020) and answer the following questions:

1. How do Goerlandt et al (2017) suggest that the validity of QRA approaches can be validated? What did they posit was the most effective approach?

Conceptual validity is understood here as the condition where an operationalisation of a concept measures what it intends to measure. This understanding is in line with validity e.g., in social sciences

Pragmatic validity is the condition where a method meets its intended requirements in terms of the results obtained, as understood e.g., by Rae et al. (2014) in questioning the efficacy of QRA

They discuss four approaches to QRA with four validity criteria:

1 Traditional statistical analysis, large amount of relevant data available

2 Traditional statistical analysis in other cases

3 Probability of frequency and Bayesian approaches estimating non-observable parameters

4 Bayesian approaches predicting observables

where it is concluded that under none of the approaches, QRA in general fulfils the scientific validity requirements

the approaches for pragmatic validity risk analysis:

1. Complete Benchmark exercise: comparison with a complete parallel analysis of the same system or activity

2. Partial benchmark exercise: comparison with a parallel analysis on some parts of the same system or activity

3. Reality check: comparison with operating experience of corresponding systems

4. Independent peer review: examination of the output of the risk analysis by a (range of) technical expert(s)

5. Quality assurance: examination of the process behind the analysis.

Each of these approaches were found to bring valuable insights into the validity of a particular QRA. However, more research is needed for instance with respect to the effectiveness of the proposed methods for the different identified uses of QRA, and which processes, techniques and social structures support their successful application.

2. Which techniques did Hugo et al (2018) should be applied to project management? What were their recommendations to increase the use of QR analysis in Projects?

Hugo et all refer to one standard that is widely known is the Guide to the Project Management Body of Knowledge (PMBOK) which serves as a standard for implementing project management. It provides a framework that

combines project processes with specific knowledge areas. A widely known approach to quantitative analysis is through Monte Carlo simulation.

Hugo et all indicated the benefit in tool. With a view to improving the use of risk management tools, and specifically the use of quantitative risk management tools, the following recommendations are made,

- Focus on the factors that were identified as significant in affecting tool use

- Improve individuals' risk management competence via training and exposure

- Align the parent organisation's approach to risk management with projects and strive to improve the organisation's maturity levels in project and risk management processes.

- Make available the required resources, both human and software, to carry out risk management, both for qualitative and quantitative risk management.

3. The last paper reviews various Multi-criteria decision methods (MCDMs) and considered the relative accuracy and validity of the techniques. Which did they find was the most accurate of the methods compared? What were the failings of the general TOPSIS approach?

Methods such as AHP, VIKOR, MOORA and TOPSIS were evaluated. The data was collected in different methods such as random data, Horizontally random data and Vertically random data however from the paper there was no single technique was identified as outstanding. Although from the results it seems that AHP and MOORA were far more accurate.

The author states that for Random data AHP and MOOR have almost 3 times higher success than that of TOPSIS. AHP, IKOR and MOOORA are more than 80 % better than TOPSIS. AHP is 18 times better, VIKOR is 10 times better and MOORA is 9 times better than the success percentages of TOPSIS.

For Horizontally data TOPSIS had the worst results.

The failing from TOPSIS seems to be rank reversal, ranking index and correlation criteria.