Unit 7: An Introduction to the Concepts of Quantitative Risk Modelling

We reviewed selection methods t of quantitative risk modelling which includes Monte Carlo simulations, Bayes theorem-based methods and multi-criteria decision analysis techniques such as TOPSIS, AHP and ANP.

what is quantitative risk modelling (QRM): denotes any mathematical tool that aims to produce systematic risk assessments for purpose of Risk Management e.g, are Monte Carlo Simulation, Bayes Theorem and Multi-Criteria Decision Analysis (Open Risk manual)

Monte Carlo Simulation involves mathematicians, Statisticians, Nuclear Scientist, and computer Scientist. Monte Carlo Simulation is based on the law of large number (LLN)[Karen,2021].

Principles of the Monte Carlo Simulation (Lecture-cast unit 7)

- Probability distribution should be based on empirical evidence.
- Quality of data: The generated number is traceable.
- Graphs: It is a pictorial representation of data

Anti-patterns of Monte Carlo Simulation

- Tools give no control over the coverage area.
- Sampling method has big impact on business.
- Non-Standard Distribution
- , Dimensional simulation does not work well because it is computationally intensive.

Bayes Theorem is a statistical theory of conditional probabilities, it is based on prior knowledge of condition that might relates to an event.

Principles of the Bayes Theorem

- Hypothesis and prior selection which affects the output.
- Subjective probabilities which depend on estimate that change depending on the hypothesis.

Anti-Patterns of the Bayes Theorem:

- Ambiguity: all sources of uncertainty cannot be quantified.
- Ignorance: the decision makers have an opinion on every question answered.

Multi-Criteria Decision Analysis: is one of the main decision-making method that consider more than criterion in the decision-making process (Taherdoost .H) . MCDM has tools and methods that can be applied in different fields from finance to engineering design.

Principles of Multi-Criteria Decision.

- Selecting the type of decision that is required ranking and choice,
- Choosing the best possible techniques that will be driven by availability of tools.

Tools selections are important because it drives compatibility with data source and flexibility of data presentation.

Anti-pattern of multi-criteria Decision.

- Incorrect Selection can result to extensive work in preparing data.
- Rank Reversal: This relates to change in ranking alternatives when criterion is added or dropped.
- Accuracy: some techniques are more accurate than others for the same data sets.

Conclusion: The choice of quantitative risk assessment techniques pick depends on the organizational objective and availability of data and cost budget.

Reference:

- Open Risk Manuel. Quantitative Risk Model. Available from : https://www.openriskmanual.org/wiki/Quantitative_Risk_Model#:[accessed [Accessed 21 September 2023].
- Taherdoost .H.(2023)MDPI.Multi-Criteria Decision Making (MCDM) Methods and Concepts. Available from: https://www.mdpi.com/2673-8392/3/1/6# [Accessed 21 September 2023].
- University Essex Lecture Cast unit 7. An Introduction to the Concepts of Quantitative Risk Modelling**,** Available from https://www.my-course.co.uk/mod/scorm/player.php?a=11785&currentorg=articulate_rise&scoid=23628&sesskey=i9vRshJkGO&display=popup&mode=normal[Accessed 20 September 2023]