

# Risk Analytics

As human society becomes more complex and interconnected, it is more vulnerable to rare but catastrophic events, such as the coronavirus pandemic, the extremes of climate that regularly affect all regions of the world or the continuing turbulence in the financial markets. For risk managers at major companies, banks and public bodies, an accurate quantitative assessment of the risks linked to such events plays an increasingly crucial role in decision making processes. Risk assessment involves using past observations to forecast the future as well as possible, often extrapolating beyond existing data, and assessing the uncertainties surrounding these forecasts. A critical awareness of the statistical/stochastic ideas behind such calculations is essential in understanding both their limitations and their sensitivity to failure of the underlying assumptions, and, thus, in appreciating when and why such extrapolation may be particularly dangerous.

## Objectives

Upon completion of that course the students will be able to

- Apply techniques from a general methodological toolkit for measuring risk in most fields of risk management
- Use risk management tools available in the statistical language R
- Analyse and estimate risk measures and their uncertainty assessment through concrete datasets from fields of operations, insurance, finance and environment.

## Course

This course on methodologies for risk assessing includes the following topics:

- Why risk analytics matters?
- Time series analysis
- Extreme value theory (EVT)
- Monitoring and reporting risk

## Prerequisites

Basic statistics and knowledge of statistical software R.

## References

- McNeil, A. J., Rüdiger, F. and Embrechts, P., 2015, *Quantitative Risk Management: Concepts, Techniques and Tools - Revised Edition*, Princeton Series in Finance.
- Stuart Coles, 2001, *An Introduction to Statistical Modeling of Extreme Values*, Springer Verlag.
- Embrechts, P., Hofert, M. & Chavez-Demoulin, V., 2024, *Risk Revealed (Cautious Tales, Understanding and Communication)*. Cambridge University Press.

## Exam

Without exam.

**Evaluation:** At the end of the project, students will have to provide a detailed written report and give a presentation.

$$\text{Final grade} = 0.5 * \text{Report grade} + 0.5 * \text{Presentation grade}$$

## Retake

Without exam

**Evaluation:** A complement to the report will be asked. The final report is 100% of the grade.