Risk Analytics - INSTITUT HENRI POINCARE
March 2022

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. 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.

This course of *9 hours* on methodologies for risk assessing includes the following topics:

- **Lecture 1 (8 March 22,** *1.5 hours***):**
  Introduction (why risk assessment matters?)
  Extreme value theory I: block maxima approach
  Extreme value theory II: peaks-over-threshold method

- **Practical 1 (8 March 22,** *1.5 hours* **):**
  Get used to the basic of the R environment (needed?)
  Fit EVT models to data

- **Lecture 2 (10 March 22,** *1.5 hours* **)**
  Risk measures (return level; VaR; ES)
  Uncertainty assessment (Bootstrap, backtesting)

- **Practical 2 (10 March 22,** *1.5 hours* **):**
  Risk measure estimation and backtesting (iid/stationary case)

- **Practical 3 + Lecture 3 (16 March 22,** *1.5 hours* **):**
  Risk measure estimation and backtesting in GARCH context.
  Bivariate extremes: Introduction to the bivariate GEV distribution, parametric models (e.g., logistic, bilogistic, Dirichlet), the bivariate threshold excess model.

- **Lecture 4 (16 March 22,** *1.5 hours* **):**
  Further topics: the multivariate and spatial frameworks (if time left).