PROBABILITY AND APPLICATIONS USING COMPUTATIONAL TECHNIQUES (m63101p)

Instructor: A.YANNACOPOULOS

Core Course, 1st semester, 5 ECTS units
Course level: Graduate (MSc)
Language: Greek

Course Description

Fundamental concepts in probability, with emphasis in multivariate distributions, simulation techniques, stochastic processes. Analytic and numerical techniques. Emphasis in applications in risk management. In particular, we study

- the concepts of probability, random variables, moments and conditional expectation (as a random variable with emphasis in its properties as estimator) are introduced.
- characteristic functions
- fundamental univariate distributions and their simulation
- fundamental multivariate distribution (elliptic distributions) and their simulation
- dependence measures and copulas
- fundamental stochastic processes (Poisson, compound Poisson etc) and their simulation

All concepts and numerical methods are illustrated within the framework of models or examples from actuarial and financial risk management.

Prerequisites

Undergraduate probability.

Target Learning Outcomes

In-depth understanding of the fundamental concepts of probability theory and stochastic processes which are necessary in risk management (motivated by appropriate risk management examples). Good working knowledge of analytic methods and techniques in probability. Good working knowledge of computational techniques. Scientific and statistical computing basics. The students will acquire skills in analysis, processing and modeling using probabilistic and stochastic techniques related to actuarial science, insurance, and finance. They will require skills in programming and the use of modern computing languages and environments (e.g., the Python Ecosystem) focusing on the creation of computational tools for simulation, understanding and modeling risk, based upon techniques from probability theory and stochastic processes as developed in the course. Finally, we aim that the students develop skills for independent study and understanding the current scientific literature and computational techniques in the field, through carefully designed and guided assignments.

Recommended Bibliography

- M. J. Hasset and D. G. Stewart, Probability for risk management, ACTEX Publications 2013
- J. Mc Neil, R. Frey and P. Embrechts, Quantitative risk management, Concepts techniques and tools, Princeton, 2015
- A. N. Yannacopoulos, Probability & Computational Applications, handouts notes

Teaching and Learning Activities

In class (in vivo) teaching and e-learning, computing tutorials, and hands on learning.

Assessment and Grading Methods

Compulsory continuous assessment and oral exams/presentation of these.