FINANCIAL MATHEMATICS WITH COMPUTATIONAL APPLICATIONS (m63108p)

Instructors: G.PAPAGIANNIS

Core Course, 3rd semester, 5 ECTS units

Course level: Graduate (MSc)

Language: Greek

Course Description

This course focuses on the computational part of financial mathematics and is organized in three thematic sections. The first one is about Monte Carlo methods and their applications in pricing financial derivatives under static and dynamic approaches and variance reduction methods for improving accuracy in pricing estimates. In the second part, parametric and nonparametric approaches for the risk quantification and dependence modeling are presented, with special emphasis in the calculation of insurance and financial risk. In the third section modern statistical learning techniques for the study of data from financial and insurance markets are presented.

Prerequisites

Students should have basic knowledge of optimization, probability theory, stochastic processes and finance. For the programming part of the course and the related computational assignments basic knowledge of computational packages (e.g., Octave/MATLAB, R, Python) is required.

Target Learning Outcomes

After successfully completing the course, students will be able to:

- develop and implement computational techniques for treating problems of financial mathematics
- use analytical-statistical methods to the stochastic modeling and interpretation of interesting quantities in financial and insurance markets
- understand and use the basic financial and insurance risk quantification tools
- apply modern methods and techniques of statistical learning for the analysis of market data

Recommended Bibliography

- Asmussen, S., & Glynn, P. W. (2007). *Stochastic simulation: algorithms and analysis* (Vol. 57). Springer Science & Business Media.

- Bishop, C. M. (2006). *Pattern recognition and machine learning*. Springer.
- Cherubini, U., Luciano, E., & Vecchiato, W. (2004). *Copula methods in finance*. John Wiley & Sons.
- Glasserman, P. (2013). *Monte Carlo methods in financial engineering* (Vol. 53). Springer Science & Business Media.
- Hastie, T., Tibshirani, R., & Friedman, J. (2009). *The elements of statistical learning: data mining, inference, and prediction*. Springer Science & Business Media.
- Joe, H. (2014). *Dependence modeling with copulas*. CRC press.
- Korn, R., Korn, E., & Kroisandt, G. (2010). *Monte Carlo methods and models in finance and insurance*. CRC press.
- McNeil, A. J., Frey, R., & Embrechts, P. (2015). *Quantitative risk management: concepts, techniques and tools-revised edition*. Princeton University Press.

Teaching and Learning Activities

One three-hour lecture per week (for 8 weeks), computational assignments to be submitted per course's section.

Assessment and Grading Methods

The final grade is calculated as a weighted average of the grade in computational assignments that are submitted during the course (40%) and the grade of the final examination (60%).