Stochastic Methods for Quantitative Finance

Description. This course is an introduction to stochastic calculus at the undergraduate level with applications to financial models. The emphasis is on computational and practical techniques. Topics include: Brownian motion; Itô's formula; stochastic differential equations; partial differential equations; Girsanov's theorem; optimal stopping; simulation and finite difference numerical methods; applications in finance; implementation in MATLAB.

Prerequisites. Probability at the level of ORF 309.

Lecture notes. Lecture notes will be made available during the course.

Sample reading list.
• *Introduction to Stochastic Processes, second ed.*, by G. F. Lawler, Chapman & Hall, 2006.
• *Financial Calculus: An Introduction to Derivative Pricing*, by M. Baxter and A. Rennie, Cambridge University Press, 1996.
• *Option Theory With Stochastic Analysis*, by F. E. Benth, Springer (Universitext), 2004.
• *A Course in Financial Calculus*, by A. Etheridge, Cambridge University Press, 2002.
• *Elementary Stochastic Calculus*, by T. Mikosch, World Scientific, 1999.
• *From Elementary Probability to Stochastic Differential Equations With MAPLE*, by S. Cyganowski, P. E. Kloeden and J. Ombach, Springer (Universitext), 2002.

Grading. A homework set will be due every two weeks. There will also be a midterm and a take-home final. The final grade breakdown is: homework 40%; midterm 20%; final 40%.

Homework. The homeworks will contain some computer exercises; an introduction to MATLAB will be given at the beginning of the course, so no prior experience is needed.

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