Linnæus University

Course syllabus

Faculty of Technology

Department of Mathematics

4MA505 Finansiell modellering med stokastiska processer, 7,5 högskolepoäng
4MA505 Financial modelling with stochastic processes, 7.5 credits

Main field of study
Mathematics

Subject Group
Mathematics

Level of classification
Second Level

Progression
A1F

Date of Ratification
Approved 2014-10-03
Revised 2022-10-24 by Faculty of Technology.
The course syllabus is valid from spring semester 2023

Prerequisites
4MA503 Stochastic Analysis or the equivalent.

Objectives
After completing the course students should be able to

1. independently and with adequate techniques solve problems , perform calculations and bring the reasoning in the part of _nansiell modeling with stochastic processes covered by the course and in writing communicate these solutions, calculations and reasoning ; in particular

- characterization of Lévy processes and describe their properties
- apply stochastic calculus for Lévy processes
- account for modeling and option pricing in an environment with the jump processes
- argue for the degree to which the Black-Scholes model , lévyprocessmodeller and models with stochastic volatility are valid as stock price models

2. independently immerse themselves in any area within financialmodeling and presentation area in a nuanced way, in their own words

3. in a systematic , critical and constructive review anotherstudent work and point to shortcomings as well as the merits

4. carry out computer calculations and simulations for some of the models as covered in the course.

Content
The course comprises the following parts:

- Lévy processes: definitions, properties and simulation
- modelling of financial time series with Lévy processes
- stochastic calculus for jump processes
- measure transformation for Lévy-processes
- pricing and hedging in incomplete markets
- risk neutral modelling with exponential Lévy processes
- integro differential equations
- numerical methods for financial models
- short introduction to stochastic volatility models.

Type of Instruction
Lectures, computer-based assignment, oral presentation, written report and opposition of a deepening work.

Examination
The course is assessed with the grades A, B, C, D, E, Fx or F.

The grade A constitutes the highest grade on the scale and the remaining grades follow in descending order where the grade E is the lowest grade on the scale that will result in a pass. The grade F means that the student's performance is assessed as fail (i.e. received the grade F).

Assessment of how well the student fulfills the objectives is achieved through:

- written exam, 5 credits (A-F)
- computer based home assignment, 1 credit (U/G)
- oral presentation and written report of a project, 1 credit (A-F)
- opposition of another student's project, 0.5 credits (U/G)

To pass the course, the student must achieve achieve at least the grade E on the written exam and on the project, and the grade G on the home assignment and the opposition. The grade of the course as a whole will be a weighted avarage of the grades on the written exam and the project.

Repeat examination is offered in accordance with Local regulations for courses and examination at the first and second-cycle level at Linnaeus University.

If the university has decided that a student is entitled to special pedagogical support due to a disability, the examiner has the right to give a customised exam or to have the student conduct the exam in an alternative way.

Course Evaluation
During the implementation of the course or in close conjunction with the course, a course evaluation is to be carried out. Results and analysis of the course evaluation are

to be promptly presented as feedback to the students who have completed the course. Students who participate during the next course instance receive feedback at the start of the course. The course evaluation is to be carried out anonymously.

Credit Overlap
The course cannot be included in a degree along with the following course/courses of which the content fully, or partly, corresponds to the content of this course: 4MA205 Financial modelling with stochastic processes, 7.5 credits

Other
Grade criteria for the A–F scale are communicated to the student through a special document. The student is to be informed about the grade criteria for the course by the start of the course at the latest.

Required Reading and Additional Study Material
Required reading
Cont, Rama & Tankov, Peter. *Financial modelling with jump processes*, Second edition, Chapman & Hall/CRC Press, latest edition. 558 pages.

Recommended supplementary reading
Schoutens, W. *Levy Processes in Finance. Pricing financial derivatives*, Wiley, 2003.