Linnæus University

Course syllabus

Faculty of Technology

Department of Mathematics

4MA507 Riskanalys, 7,5 högskolepoäng
4MA507 Risk and Portfolio Analysis, 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. Literature list is revised.
The course syllabus is valid from spring semester 2023

Prerequisites
4MA501 Foundations of probability, 7.5 credits, or equivalent.

Objectives
The students shall after the course is completed be able to:

- describe and apply the sound principles and quantative methods for making investment- and risk management decisions - in the presence of hedgeable and non-hedgeable risks - presented in this course
- evaluate the aforementioned methods for a given problem and select the appropriate one
- justify the choice of tools made in a coherent and concise manner
- compute the statistical quantities for profit and loss distributions based on historical observations.
- employ and compose the mathematical techniques for quantitative risk management
- master the mathematical proof techniques for quantitative risk management concepts, risk factors, portfolio optimization, and risk aggregation
- communicate and lead an argument in topics of quantitative risk management, capital allocation, and risk aggregation

- critically assess the mathematical possibilities and limitations of portfolio optimization, quantitative risk management, and risk aggregation, and to relate to the measures given by the Basel treaties

Content

- interest rates
- bonds, cash streams, arbitrage principles
- derivatives, arbitrage principles
- introduction to hedging (quadratic hedging)
- introduction to investment (quadratic portfolio optimization, utility optimization)
- traditional risk measures, e.g. Value at Risk and expected shortfall, spectral risk measures
- market risk, credit risk, operational risk
- statistical estimators of Value at risk and expected shortfall
- introduction to extrem value theory

Type of Instruction
Lectures, seminars, and computer labs.

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

- graded exercises
- statistical laborations
- oral examination

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: 4MA207 Risk and Portfolio Analysis, 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
Henrik Hult, Filip Lindskog, Ola Hammarlind, Carl Johan Rehn: *Risk and Portfolio Analysis: Principles and methods*, Springer, latest edition

Side literature
Mc Neil A., Frey R., Embrechts P.: *Quantitative Risk Management*, Princeton University Press, Latest Edition.