Faculty of Science

MASM18, Mathematical Statistics: Financial Statistics, 7.5 credits

Matematisk statistik: Finansiell statistik, 7,5 högskolepoäng

Second Cycle / Avancerad nivå

Details of approval

The syllabus was approved by Study programmes board, Faculty of Science on 2007-06-14 (N2007148) and was last revised on 2025-12-04 by The Education Board of Faculty of Science. The revised syllabus comes into effect 2025-12-04 and is valid from the autumn semester 2026.

General information

The course is an elective course for second-cycle studies for a Master of Science in Mathematical statistics.

Language of instruction: Swedish and English

Main field of study	*Specialisation*
Mathematics	A1F, Second cycle, has second-cycle course/s as entry requirements
Mathematical Statistics	A1F, Second cycle, has second-cycle course/s as entry requirements

Learning outcomes

The course should be regarded as the statistical part of a course package also including MASM34 Valuation of Derivative Assets. Its purpose is to give the student tools for constructing models for risk valuation and pricing, based on data.

The aim of the course is that students on completion of the course should have acquired the following knowledge and skills:

Knowledge and understanding

On completion of the course, the students are expected to be able to:

- handle variance models such as the GARCH family, stochastic volatility, and models used for high-frequency data,
- use basic tools from stochastic calculus: Itô's formula, Girsanov transformation, martingales, Markov processes, filtering,
- understand when and how filtering methods should be applied,
- statistically validate models from some of the above model families.

Competence and skills

On completion of the course, the students are expected to be able to:

- find suitable stochastic models for financial data,
- work with stochastic calculus for pricing of financial contracts and for transforming models so that data becomes suitable for stochastic modelling,
- validate a chosen model in relative and absolute terms,
- solve all parts of a modelling problem using financial and statistical theory (from this course and from other courses) where the solution includes model specification, inference, and model choice,
- use tools for filtering of latent processes, such as Kalman filters and particle filters,
- present the solution in a written technical report, as well as orally,
- utilize scientific articles within the field and related fields.

Judgement and approach

On completion of the course, the students are expected to be able to:

- reflect over the limitations of the chosen model and method, as well as alternative solutions.

Course content

The course deals with model building and estimation in non-linear dynamic stochastic models for financial systems. The models can have continuous or discrete time and the model building concerns determining the model structure as well as estimating possible parameters. Common model classes are, e.g., GARCH models with discrete time or models based on stochastic differential equations in continuous time. The student will also meet statistical methods, such as Maximum-likelihood and (generalized) moment methods for parameter estimation, kernel estimation techniques, non-linear filters for filtering and prediction, and particle filter methods.

The course also discusses prediction, optimization, and risk evaluation for systems based on such descriptions.

Course design

Teaching consists of lectures, exercises, computer exercises and projects. Participation in computer exercises, projects and thereby integrated teaching is compulsory.

Assessment

Assessment takes the form of laboratory work (3 credits) during the course as well as written and oral presentation of the project (4,5 credits) at the end of the course.

Students who fail the regular exam are offered a re-examination shortly afterwards.

The examiner, in consultation with Disability Support Services, may deviate from the regular form of examination in order to provide a permanently disabled student with a form of examination equivalent to that of a student without a disability.

Grades

Grading scale includes the grades: Fail, Pass, Pass with distinction
For passing grade on the entire course passing grade on the project presentation (written and oral), and participation in compulsory parts are required.

The grading scale for laboratory work is Fail, Pass, whereas project presentation is graded according to the scale Fail, Pass, Pass with Distinction

The final grade is grade on the project.

Entry requirements

For admission to the course knowledge equivalent to the course MASC04, Stationary Stochastic processes, 7.5 credits is required together with English B.

Further information

The course is given by Centre for Mathematical Sciences, Lund University.

The course is read together FMSN60 Financial Statistics 7.5 credits which is a course given by Lund's engineering school LTH.

Knowledge corresponding to MASM17 Time series analysis, 7.5 credits, is recommended, as well as basic knowledge in financial economy.

The examination of the course is scheduled according to LTH:s exam schedule.