



LUND
UNIVERSITY

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 and was last revised on 2007-06-14. The revised syllabus applies from 2007-07-01, autumn semester 2007.

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 studies

Mathematical Statistics

Mathematics

Depth of study relative to the degree requirements

A1F, Second cycle, has second-cycle course/s as entry requirements

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Learning outcomes

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:

- 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,

- use tools for filtering of latent processes, such as Kalman filters and particle filters,
- 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,
- understand when and how filtering methods should be applied,
- 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,
- present the solution in a written technical report, as well as orally,
- utilize scientific articles within the field and related fields.

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 course participants 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

The examination is done by written and oral presentation of the the project.

Subcourses that are part of this course can be found in an appendix at the end of this document.

Grades

Marking scale: 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 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. The course MASM17 Time series analysis, 7.5 credits, is recommended, as well as basic knowledge in financial economy.

Subcourses in MASM18, Mathematical Statistics: Financial Statistics

Applies from H15

- 0703 Project, 4,5 hp
Grading scale: Fail, Pass, Pass with distinction
- 0704 Laboratory Work part 1, 1,5 hp
Grading scale: Fail, Pass
- 0705 Laboratory Work part 2, 1,5 hp
Grading scale: Fail, Pass

Applies from V08

- 0701 Exam, 7,5 hp
Grading scale: Fail, Pass, Pass with distinction
- 0702 Computer Exercises, 0,0 hp
Grading scale: Fail, Pass