LUND UNIVERSITY

Faculty of Science

MASM23, Mathematical Statistics: Statistical Modelling of Multivariate Extreme Values, 7.5 credits
Matematisk statistik: Statistisk modellering av multivariata extremvärden

Second Cycle / Avancerad nivå

Details of approval
The syllabus was approved by Study programmes board, Faculty of Science on 2011-04-27 to be valid from 2011-04-27.

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

Language of instruction: English and Swedish

Main field of studies Depth of study relative to the degree requirements

Mathematical Statistics 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:

- describe how to define extreme values for multivariate samples,
- describe different characterisations of multivariate extreme value distributions and the

relationship between them,

- explain how to generalize the "peaks over threshold"-model to higher dimensions and which asymptotic distributions arise,
- explain which statistical methods can be used for the analysis of extreme values.

Skills and abilities

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

- handle multivariate data for analysis of extreme values,
- fit extreme value distribution using different methods,
- validate the valilidy of the extreme value model and make suitable modifications of the model,
- use the resulting model for prediction,
- use a statistical computer program for analysis of data,
- present the analysis and conclusions of a practical problem in a written report.

Judgement and approach

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

- always check the prerequisites before stating an extreme value model,
- evaluate the plausibility of a performed study,
- reflect over the limitations of the chosen model and estimation method, as well as alternative solutions.

Course design

Weak convergence for normalized extreme values of stochastic vectors, different characterisations of multivariate extreme value distributions, "peaks over threshold"-model in the multivariate case, different definitions of multivariate generalized Pareto distributions, statistical inference for multivariate extreme values, parametric and semi-parametric methods for multivariate extreme values, use of copula in modelling extreme values, point process characterisation of extreme values, prediction of extreme values, examples of applications of the theory, e.g., estimation of operational risk, climate changes and wind insurances.

Course implementation

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

Assessment

The examination is done by a written exam. Students who
fail the regular exam are offered a re-examination shortly afterwards.

Subcourses

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

Grades

For passing grade on the entire course passed home assignments written exam and participation in compulsory parts are required. The final grade is the grade on the written exam.

Marking scale: Fail, Pass, Pass with distinction.

Entry requirements

For admission to the course knowledge equivalent to the course MASM15, Mathematical Statistics: Statistical Modelling of Extreme Values, 7.5 credits is required together with English B.