Stochastic Processes Applied to Financial Models

Programme course

6 credits

Stokastiska processer för finansmarknadsmodeller

TAMS29

Valid from: 2017 Spring semester

Determined by
Board of Studies for Electrical Engineering, Physics and Mathematics

Date determined
2017-01-25

Main field of study
Mathematics, Applied Mathematics

Course level
Second cycle

Advancement level
A1X

Course offered for
- Industrial Engineering and Management - International, M Sc in Engineering
- Industrial Engineering and Management, M Sc in Engineering
- Applied Physics and Electrical Engineering, M Sc in Engineering
- Mathematics, Master's programme
- Applied Physics and Electrical Engineering - International, M Sc in Engineering

Entry requirements
Note: Admission requirements for non-programme students usually also include admission requirements for the programme and threshold requirements for progression within the programme, or corresponding.

Prerequisites
Linear Algebra, Analysis. Introduction to Probability Theory. A second course in mathematical analysis is useful.

Intended learning outcomes

The course gives an introduction to the theory of stochastic processes and the Black-Scholes model. After a completed course the student is expected to be able to:

- handle advanced items and theorems within the theory of stochastic processes, such as the Kolmogorov extension theorem, ergodicity of time discrete Markov chains, the Kolmogorov differential equations for time continuous Markov chains, Wiener process, Ornstein-Uhlenbeck process, stochastic Itô-integral, Itô-formula, Martingales in discrete and continuous time Doleans measure and stopping
- construct solutions to stochastic differential equations
- understand the two different approaches to the Black-Scholes formula, on the one hand by means of the geometric Brownian motion and related partial differential equations, on the other hand by means of the fundamental theorem of pricing
- calculate the fair price of certain financial assets

Course content

Martingales, Markov processes, stochastic integrals, stochastic differential equations, Brownian motion, Itô's formula, Girsanov's theorem,

diffusion processes, random walk, Ising model,

Black-Scholes formula, risk-neutal valuation, volatility,

geometric Brownian motion and statistical analysis of stock prices,

Teaching and working methods

Lectures and tutorials.

Examination

TEN1	Written Examination	6 credits	U, 3, 4, 5

Grades

Four-grade scale, LiU, U, 3, 4, 5

Department

Matematiska institutionen

Director of Studies or equivalent

Ingegerd Skoglund

Examiner

Jörg-Uwe Löbus

Course website and other links

http://courses.mai.liu.se/GU/TAMS29

Education components

Preliminary scheduled hours: 48 h
Recommended self-study hours: 112 h

Common rules

Regulations (apply to LiU in its entirety)

The university is a government agency whose operations are regulated by legislation and ordinances, which include the Higher Education Act and the Higher Education Ordinance. In addition to legislation and ordinances, operations are subject to several policy documents. The Linköping University rule book collects currently valid decisions of a regulatory nature taken by the university board, the vice-chancellor and faculty/department boards.

LiU's rule book for education at first-cycle and second-cycle levels is available at http://styrdokument.liu.se/Regelsamling/Innehall/Utbildning_pa_grund-_och_avancerad_niva.