University of St.Gallen

Course and Examination Fact Sheet: Autumn Semester 2019

9,151: Computational Finance

ECTS credits: 4

Overview examination/s

(binding regulations see below)
Decentral - Oral examination (individual) (75%, 15 mins.)
Decentral - Group examination paper (all given the same grades) (25%)

Attached courses

Timetable -- Language -- Lecturer
9,151,1.00 Computational Finance -- Englisch -- Schürle Michael

Course information

Course prerequisites

The course is recommended for MBF-students in their third semester of the program, but is also open for students of other programs with focus on finance and quantitative methods. No specific prior knowledge required.

Course content

The valuation of financial derivatives cannot always be performed by closed-form solutions to the underlying pricing equations. In particular more complex options require the application of advanced numerical methods. This course provides a solid introduction to financial option valuation and the numerical techniques applied by quantitative analysts to price single- and multiasset options without and with early exercise rights, barriers and other exotic features. Calibration methods are also discussed. Examples for the implementation of the individual concepts are presented in MATLAB, a tool which has become standard in the banking industry. A prior background in numerical analysis or MATLAB is not required, but students are expected to become familiar with the language and solve programming exercises in the self-study part. The implementation of a programming exercise is mandatory and part of the examination (group work assignment).

Course structure

- Option valuation preliminaries, principle of risk neutral valuation
- Binomial model and extension to American options
- Black-Scholes PDE
- Greeks and hedging
- Derivation of the implied volatility
- Exotic options
- Random number generation
- Monte Carlo methods and variance reduction
- Simulation of stochastic processes (stochastic differential equations)
- Quasi-Monte Carlo methods
- Finite difference methods

Course literature

- Lecture notes will be provided on Studynet
- D. J. Higham: An Introduction to Financial Option Valuation
- J. Hull: Options, Futures, and Other Derivatives
- R. Seydel: Tools for Computational Finance

University of St.Gallen

Additional course information

--

Examination information

Examination sub part/s

1. Examination sub part (1/2)

Examination time and form

Decentral - Oral examination (individual) (75%, 15 mins.)

Remark

--

Examination-aid rule

Extended Closed Book
The use of aids is limited; any additional aids permitted are exhaustively listed under "Supplementary aids". Basically, the following is applicable:

- At such examinations, all the pocket calculators of the Texas Instruments TI-30 series and mono- or bilingual dictionaries (no subject-specific dictionaries) without hand-written notes are admissible. Any other pocket calculator models and any electronic dictionaries are inadmissible.
- In addition, any type of communication, as well as any electronic devices that can be programmed and are capable of communication such as notebooks, tablets, PDAs, mobile telephones and others, are inadmissible.
- Students are themselves responsible for the procurement of examination aids.

Supplementary aids

no aids admitted

Examination languages

Question language: English
Answer language: English

---

2. Examination sub part (2/2)

Examination time and form

Decentral - Group examination paper (all given the same grades) (25%)

Remark

Solution of programming exercise (mandatory)

Examination-aid rule

Term papers

- Term papers must be written without anyone else's help and in accordance with the known quotation standards, and they must contain a declaration of authorship.
- The documentation of sources (quotations, bibliography) has to be done throughout and consistently in accordance with the APA or MLA standards. The indications of the sources of information taken over verbatim or in paraphrase (quotations) must be integrated into the text in accordance with the precepts of the applicable quotation standard, while informative and bibliographical notes must be added as footnotes (recommendations and standards can be found, for example, in METZGER, C. (2017), Lern- und Arbeitsstrategien (12th ed., Cornelsen Schweiz).
- For any work written at the HSG, the indication of the page numbers both according to the MLA and the APA standard is never optional.
- Where there are no page numbers in sources, precise references must be provided in a different way: titles of chapters or sections, section numbers, acts, scenes, verses, etc.

- For papers in law, the legal standard is recommended (by way of example, cf. FORSTMOSER, P., OGOREK R. et SCHINDLER B. (2018, Juristisches Arbeiten: Eine Anleitung für Studierende (6. Auflage), Zürich: Schulthess, or the recommendations of the Law School).

Supplementary aids
--

Examination languages
Question language: English
Answer language: English

Examination content
Overview (an extensive check list will be provided on StudyNet before the exam):

- Option valuation preliminaries, principle of risk neutral valuation
- Binomial model and extension to American options
- Black-Scholes PDE
- Greeks and hedging
- Derivation of the implied volatility
- Exotic options
- Random number generation
- Monte Carlo methods and variance reduction
- Simulation of stochastic processes (stochastic differential equations)
- Quasi-Monte Carlo methods
- Finite difference methods

The solution of an assignment (programming exercise) may be performed in groups of size 1-4. The solution consists of working Matlab code as well as a brief documentation of the program structure and results.

Examination relevant literature
Lecture notes, self-study exercises and other material assigned during the lectures

Please note

Please note that this fact sheet alone is binding and has priority over any other information such as StudyNet (Canvas), personal databases or faculty members' websites and information provided in their lectures, etc.

Any possible references and links within the fact sheet to information provided by third parties are merely supplementary and informative in nature and are outside the University of St.Gallen's scope of responsibility and guarantee.

Documents and materials that have been submitted no later than the end of term time (CW51) are relevant to central examinations.

Binding nature of the fact sheet:

- Information about courses and examination time (central/decentral) and examination typestarting from the beginning of the bidding on 22 August 2019
- Information about examinations (examination aid regulations, examination content, examination-relevant literature) for decentral examinations after the 4th semester week on 14 October 2019
- Information about examinations (examination aid regulations, examination content, examination-relevant literature) for central examinations as from the starting date for examination registration on 4 November 2019

Please consult the fact sheet again after these deadlines have expired.