University of St.Gallen

Course and Examination Fact Sheet: Spring Semester 2022

8,152: Derivatives

ECTS credits: 4

Overview examination/s

(binding regulations see below)
Decentral - Written examination (with defined exam duration) (100%, 90 mins.)
Examination time: term time

Attached courses

Timetable -- Language -- Lecturer
8,152,1.00 Derivatives -- Englisch -- Ammann Manuel , Fengler Matthias Reginald

Course information

Course prerequisites

As prerequisites the courses "Financial Markets" and "Quantitative Methods" are required. No previous derivatives courses are required.

Learning objectives

- Students acquire a thorough understanding of how derivative instruments and models work
- Exercises deliver practical learning and applications of taught material and deepen knowledge of the topics presented

Course content

The primary objective of this course is to provide students with an advanced introduction to derivative instruments, concepts, applications, and models necessary to analyze those instruments. The course is designed for students interested in modern financial instruments, their applications, and quantitative methods.

Course structure and indications of the learning and teaching design

Session 1: Introduction, Hedging, Futures

- Hedging
- Hedge ratio
- Basis risk
- Cross hedging

Session 2: State Preference Theory

- Arbitrage
- Arrow-Debreu securities
- Complete and incomplete markets
- Risk-neutral valuation

Session 3: Binomial Model

- Binomial trees
- Replication
- Risk-neutral valuation
- American and European options

Session 4: Black-Scholes

- Stochastic calculus
- Replication
- Fundamental partial differential equation
- Risk-neutral valuation
- Black-Scholes formula
- Options on indices, currencies, futures
- Implied volatility
- Volatility smile
- Greeks
- Dynamic hedging

Session 5: Exotic Options and Numerical Methods

- Monte Carlo simulation
- Pricing and hedging exotic options

Session 6: Financial Engineering, Structured Products

- Engineering payoff structures
- Structured products
- Pricing

Session 7: Advanced Pricing Models

- Local volatility model
- Stochastic volatility
- Jump diffusions
- Estimation and calibration
- Model risk

Session 8: Implied Densities

- Implied densities
- Parametric and nonparametric estimation techniques
- Use cases of implied densities
- Implied risk aversion
- The pricing kernel puzzle

Session 9: Volatility Derivatives

- Volatility and variance swaps
- VIX index
- VIX options and futures

Session 10: Interest Rate and FOREX Derivatives

- Bond options
- Caps and floors
- Swaptions
- Forex derivatives

Session 11: Credit Derivatives

- Credit risk
- Credit default swaps
- Collateralized debt obligations

Course literature

John C. Hull, *Options, Futures, and Other Derivatives*, 10th Ed., Pearson, 2017 (recommended chapters)

Manuel Ammann, Lecture Notes, *Introduction to Option Pricing*.

Schoutens, Simons, Tistaert: *A perfect calibration! Now What?* Wilmott 2004(2)

Reiswich and Wystup: *A Guide to FX Options Quoting Conventions*, The Journal of Derivatives, Winter 2010, 18(2), pp.58-68

The course material (slides & lecture notes) will be made available on StudyNet.

Additional course information

The independent studies include the lecture notes as mandatory reading. Four problem sets will be made available on StudyNet and discussed in the respective sessions.

- The course is conducted in attendance
- All lectures will be either streamed live or recorded and made available online via Zoom.

SARS-CoV-2 Pandemic

In the case of the President's Board having to implement new directives due to the SARS-CoV-2 pandemic in the spring semester 2022, the course information listed above will be changed as follows:

- The course is conducted online via the platform Studynet;
- The recordings of the course are uploaded on StudyNet;
- The written examination is conducted online via the platform StudyNet;
- The examination modalities and further information are communicated via StudyNet.

Examination information

Examination sub part/s

1. Examination sub part (1/1)

Examination time and form
Decentral - Written examination (with defined exam duration) (100%, 90 mins.)
Examination time: term time

Remark
Via the platform StudyNet

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, mobile telephones and others, are inadmissible.
- Students are themselves responsible for the procurement of examination aids.

Supplementary aids
You may bring a double-sided A4 cheat sheet.

Examination languages
Question language: English
Answer language: English

University of St.Gallen

Examination content

The exam covers all topics discussed in the course.

Examination relevant literature

Manuel Ammann, Lecture Notes, *Introduction to Option Pricing*.

Schoutens, Simons, Tistaert: *A perfect calibration! Now What?* Wilmott 2004(2)

Reiswich and Wystup: *A Guide to FX Options Quoting Conventions*, The Journal of Derivatives, Winter 2010, 18(2), pp.58-68

Additional material made available on StudyNet

Please note

Please note that only this fact sheet and the examination schedule published at the time of bidding are is binding and takes precedence over other information, such as information on StudyNet (Canvas), on lecturers' websites and information in lectures etc.

Any references and links to third-party content within the fact sheet are only of a supplementary, informative nature and lie outside the area of responsibility of the University of St.Gallen.

Documents and materials are only relevant for central examinations if they are available by the end of the lecture period (CW21) at the latest. In the case of centrally organised mid-term examinations, the documents and materials up to CW 12 are relevant for testing.

Binding nature of the fact sheets:

- Course information as well as examination date (organised centrally/decentrally) and form of examination: from bidding start in CW 04 (Thursday, 27 January 2022);
- Examination information (regulations on aids, examination contents, examination literature) for decentralised examinations: in CW 12 (Monday, 21 March 2022);
- Examination information (regulations on aids, examination contents, examination literature) for centrally organised mid-term examinations: in CW 12 (Monday, 21 March 2022);
- Examination information (regulations on aids, examination contents, examination literature) for centrally organised examinations: two weeks before the end of the registration period in CW 15 (Monday, 11 April 2022).