Course and Examination Fact Sheet: Spring Semester 2020

8,152: Derivatives

ECTS credits: 4

Overview examination/s
(binding regulations see below)
Decentral - Written examination (100%, 90 mins.)

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

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

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)


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.

**Examination information**

**Examination sub part/s**

1. Examination sub part (1/1)

**Examination time and form**

Decentral - Written examination (100%, 90 mins.)

**Remark**

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**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 handwritten 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**

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

**Examination languages**

Question language: English

Answer language: English

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**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)


Additional material made available on StudyNet
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 (CW21) are relevant to central examinations.

**Binding nature of the fact sheet:**

- Information about courses and examination time (central/decentral) and examination type starting from the beginning of the bidding on 23 January 2020
- Information about examinations (examination aid regulations, examination content, examination-relevant literature) for decentral examinations after the 4th semester week on 16 March 2020
- Information about examinations (examination aid regulations, examination content, examination-relevant literature) for central examinations as from the starting date for examination registration on 6 April 2020

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