



Course and Examination Fact Sheet: Spring Semester 2019

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.

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.

The **separate MBF-course "Financial Modeling Workshop: Derivatives"**, also offered in the spring semester, is tailored to the structure of this course. In the workshop students implement the models introduced in the Derivatives course using Excel and VBA. This helps students to gain a deeper understanding of the topic and its applications. No programming knowledge in VBA is required for "Financial Modeling Workshop: Derivatives".

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

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



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

Hagan, Kumar, Lesniewski, Woodward: *Managing Smile Risk*. Wilmott 2002(1), Sections 1-2.2

Jackwerth: *Option-Implied Risk-Neutral Distributions and Risk Aversion* 2004, The Research Foundation of AIMR

Wystup: *FX Options and Structured Products*, Wiley, 2017, Chapters 1-1.6

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. Additionally, four problem sets will be made available on StudyNet and discussed in the respective sessions. In the first lecture, recommended chapters in Hull for reading will be given.

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 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

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

Examination languages

Question language: English

Answer language: English

Examination content

The exam covers all topics discussed in the course.

Examination relevant literature

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

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

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



Hagan, Kumar, Lesniewski, Woodward: *Managing Smile Risk*. Wilmott 2002(1), Sections 1-2.2

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Wystup: *FX Options and Structured Products*, Wiley, 2017, Chapters 1-1.6

Please note

We would like to point out to you that this fact sheet has absolute priority over other information such as StudyNet, faculty members' personal databases, information provided in lectures, etc. When will the fact sheets become binding?

- Information about courses and examination time (central/decentral and grading form): from the start of the bidding process on 24 January 2019
- Information about decentral examinations (examination-aid rule, examination content, examination relevant literature): after the 4th semester week on 18 March 2019
- Information about central examinations (examination-aid rule, examination content, examination relevant literature): from the start of the enrolment period for the examinations on 08 April 2019

Please look at the fact sheet once more after these deadlines have expired.