



## Course and Examination Fact Sheet: Spring Semester 2021

### 8,152: Derivatives

ECTS credits: 4

### Overview examination/s

(binding regulations see below)

Decentral - Written examination (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

#### 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.

All lectures will be either streamed live or recorded and made available online via Zoom.

- The course is conducted online via the platform Studynet;
- The recordings of the course are available for 30 days;
- The written examination is conducted online via the platform StudyNet;
- The examination modalities and further information are communicated via StudyNet.

### 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 2021, the course information listed above will be changed as follows:

- There will be no change.

The examination information listed below would be changed as follows:

- There will be no change.

## Examination information

### Examination sub part/s

#### 1. Examination sub part (1/1)

##### Examination time and form

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

Examination time: term time

##### Remark

Via the platform StudyNet

##### Examination-aid rule

Examinations with electronic aids - on campus or online

For examinations with electronic aids, students may be asked to install a predefined software on their own computer. The procurement and financing of the necessary technical aids, hardware and software as well as ensuring their functionality is the responsibility of the students, unless they are explicitly provided by the University.

If the examination is conducted with the candidates' own laptop or computer, the private device must meet the following requirements:

- Operating system: Windows or macOS
- Software: Microsoft Excel (minimum: Office 2016 or Microsoft Office 365) and current internet browser;
- All necessary updates for the controlled functioning of the operating system and the required software must be installed;



- HSG login: The HSG account must be functional and the access data must be known;
- Network and power: The device must be WLAN capable and have a stable internet connection. For examinations written outside the University premises, a stable internet connection with a sufficiently high transmission rate as well as the availability of a power supply must be ensured at the user's own responsibility;
- Battery life: Operation must be guaranteed during the entire examination period. The device must have a battery life of at least 90 minutes. It is recommended to carry a working power supply;
- Video and audio capability: For examinations which are not held on University premises, the equipment must have a functioning webcam and a functioning, correctly adjusted microphone.

Participants are responsible for ensuring that their equipment is working properly and allows the partaking in the examination. Any deficiencies in the personal infrastructure are the responsibility of the students. Any deficiencies due to the students' own technology or a lack of an uninterrupted internet connection will not be recognized as procedural errors in the execution of the examination.

The examination is to be taken exclusively by the candidate and only with the help of the permitted aids. The use of additional software, in particular of another internet browser or communication software, is strictly forbidden during the entire examination. Any use of software other than the specified software requires the express prior written permission of the examination administration.

When using a LockDown browser, all applications (internet browser, Office, file explorer, etc.) are blocked and the documents on the computer are therefore not accessible. Any other aids and documents permitted in this leaflet must therefore be printed and/or physically available.

In the case of examinations with electronic aids on the premises of the University, the following shall apply in particular

- After the corresponding request of the examination administration, all connections of the device with networks or other devices (mobile network, WLAN, Bluetooth, etc.) must be disconnected.

For online examinations that do not take place on the University campus, the following applies in particular:

- The identity of the examinee will be verified via webcam before the examination begins. Photographs can be taken. The HSGcard or identity card must be kept ready for this purpose.
- Any unannounced unauthorized removal from the recording area of the webcam may be punished as a culpable violation of the examination conditions.
- Oral examinations may be recorded. The recording may be used for evaluation purposes and documents the examination in the event of appeal and/or disciplinary proceedings. The recordings shall be deleted after the appeal period or any proceedings have expired.
- The use of a headset is only permitted during an oral examination.

## Supplementary aids

Open Book

## 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)



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 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, 28 January 2021);
- Examination information (regulations on aids, examination contents, examination literature) for decentralised examinations: in CW 12 (Monday, 22 March 2021);
- Examination information (regulations on aids, examination contents, examination literature) for centrally organised mid-term examinations: in CW 12 (Monday, 22 March 2021);
- Examination information (regulations on aids, examination contents, examination literature) for centrally organised examinations: two weeks before the end of the registration period in CW 14 (Thursday, 8 April 2021).