University of St.Gallen

Course and Examination Fact Sheet: Spring Semester 2015

10,356: Mathematical Methods in Finance

ECTS credits: 4

Overview examination/s
(binding regulations see below)
Decentral - examination paper written at home (individual) (50%)
Decentral - Oral examination (individual) (50%)

Attached courses
Timetable -- Language -- Lecturer
10,356,1.00 Mathematical Methods in Finance -- English -- De Giorgi Enrico

Course information

Course prerequisites
Topics of the MiQEF course "Advanced Mathematics and Statistics – Part Mathematics".

Course content
This course covers topics in dynamic portfolio selection and asset pricing in a continuous-time setting. The final goal is to study mathematical techniques from stochastic calculus and their application in finance.

Course structure

1. Preliminaries

Basics and notation

Martingales

Poisson process and Brownian motion

Levy processes

Semimartingales

Decomposition of processes

2. Stochastic integration

Simple processes

Extensions

Itô formula for semimartingales

Feynman-Kac formula

Stochastic differential equations

Martingale representation theorem

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3. Consumption and portfolio choice

Hamilton-Jacobi-Bellman approach

Martingale approach

Non-standard preferences

4. Asset pricing

Fundamental theorem of asset pricing

Girsanov theorem

Stochastic volatility models

Models with jumps

Course literature

1. De Giorgi, Enrico (2015): Mathematical Methods in Finance, Lecture Notes, HSG.

2. Duffie, D. (2001): *Dynamic Asset Pricing, Princeton University Press*, Princeton.

3. Ingersoll, J.E. (1987): *Theory of Financial Decision Making*, Rowman and Littlefield.

4. Karatzas, I. and Shreve, S.E. (1998): *Methods of Mathematical Finance*, Springer.

5. Merton, R.C. (1992): *Continuous Time Finance*, Blackwell.

6. Protter, P. (2003): *Stochastic Integration and Differential Equations*, Springer, Berlin Heidelberg.

7. Shreve, S.E. (2004): *Stochastic Calculus for Finance II: Continuous Time Models*, Springer, New York.

Specific references to the chapters of the books listed above and additional references to research papers will be given during the course.

Additional course information

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Examination information

Examination sub part/s

1. Examination sub part (1/2)

Examination time and form
Decentral - examination paper written at home (individual) (50%)

Remark
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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. (2013), Lern- und Arbeitsstrategien (11th ed., 3rd printing). Aarau: Sauerländer).
- 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. (2014, Juristisches Arbeiten: Eine Anleitung für Studierende (5. Auflage), Zürich: Schulthess, or the recommendations of the Law School).

Supplementary aids
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Examination languages
Question language: English
Answer language: English

2. Examination sub part (2/2)

Examination time and form
Decentral - Oral examination (individual) (50%)

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 bilingual 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
none.

Examination languages
Question language: English
Answer language: English

Examination content

1. Preliminaries

Basics and notation

Martingales

Poisson process and Brownian motion

Levy processes

Semimartingales

Decomposition of processes

2. Stochastic integration

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Extensions

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3. Consumption and portfolio choice

Hamilton-Jacobi-Bellman approach

Martingale approach

Non-standard preferences

4. Asset pricing

Fundamental theorem of asset pricing

Girsanov theorem

Stochastic volatility models

Models with jumps

Examination relevant literature
De Giorgi, Enrico (2015): Mathematical Methods in Finance, Lecture Notes, HSG.

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 22 January 2015
- Information about decentral examinations (examination-aid rule, examination content, examination relevant literature): after the 4th semester week on 16 March 2015
- Information about central examinations (examination-aid rule, examination content, examination relevant literature): from the start of the enrolment period for the examinations on 6 April 2015

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

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