



## Course and Examination Fact Sheet: Autumn Semester 2021

### 7,305: Statistics

ECTS credits: 4

### Overview examination/s

(binding regulations see below)

Central - Oral examination (individual) (100%)

Examination time: inter-term break

### Attached courses

Timetable -- Language -- Lecturer

[7,305,1.00 Statistics](#) -- Englisch -- [Audrino Francesco](#)

### Course information

#### Course prerequisites

Bachelor level knowledge of Mathematics, Statistics, and Econometrics similar to the one gained in the Bachelor in Economics at the HSG (for example, having followed the course "3.222 Data Analytics I: Statistics").

#### Learning objectives

Students will learn how to deal with stochastic environments and will be able to work properly under conditions where uncertainty plays a major role. Moreover, students will identify and estimate key quantities (parameters) that drive the distributions of the relevant random variables under investigation.

#### Course content

Introductory course in Probability and Statistics for Master students.

The course will emphasize topics needed in the further study of economics, finance, and econometrics and will provide the needed quantitative preparation for the understanding and analysis of the different economic and financial applications taught in the later terms.

### Course structure and indications of the learning and teaching design

#### 1. Main probability distributions employed in statistical modeling: the discrete case

- Discrete probability functions and distribution functions
- Special discrete distributions
- Relations among certain discrete distributions
- Expectation and other moments
- Multivariate discrete distributions
- Moment generating function

#### 2. Main probability distributions employed in statistical modeling: the continuous case

- Probability density function and cumulative distribution function
- Special continuous distributions
- Expectation and other moments
- Multivariate continuous distributions
- Moment generating function
- Distribution of functions of continuous random variables



- Estimation of distribution functions and probability density functions: the empiric distribution function

### 3. Point estimation

- The point estimation problem
- The method of least squares
- Maximum likelihood estimation
- The method of moments

### 4. Confidence sets and tests of hypothesis

- Excursus: The Central Limit Theorem
- Confidence interval
- Confidence set and its construction
- Test of hypothesis

### 5. The likelihood-ratio test and alternative "large-sample" equivalents of it

- Testing normal means and normal variances
- The likelihood-ratio test
- The chi-squared test

The course will alternate between in-class frontal lectures (Mondays and Tuesdays) and online lectures (Wednesdays, via Zoom). During the different classes there will also be an alternation between the explanation of theoretical concepts and the individual and/or in group solution of exercises such to create a dynamic environment and facilitate discussion among teacher and students. Some exercises and practical illustrations/applications will be solved with the use of a PC (R-software).

## Course literature

### Mandatory literature:

- F. Audrino, Lecture Notes, provided via Canvas at the beginning of the term.

### Recommended literature:

- E.J. Dudewicz and S.N. Mishra, *Modern mathematical statistics*, Wiley, New York, 1988

### Additional reference:

J. Shao, *Mathematical Statistics*, Springer Texts in Statistics, 2003.

## Additional course information

In the case that this course is disrupted and/or discontinued due to the coronavirus pandemic, all classes will continue online via Zoom and will be recorded in the cloud.

The lecturer informs via Canvas (and email) on the changed implementation modalities of the course.

No changes to the examinations are necessary.

## Examination information

### Examination sub part/s



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

### Examination time and form

Central - Oral examination (individual) (100%)

Examination time: inter-term break

### 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, 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

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## Examination content

- 1. Main probability distributions employed in statistical modeling: the discrete case**
  - Discrete probability functions and distribution functions
  - Special discrete distributions
  - Relations among certain discrete distributions
  - Expectation and other moments
  - Multivariate discrete distributions
  - Moment generating function
- 2. Main probability distributions employed in statistical modeling: the continuous case**
  - Probability density function and cumulative distribution function
  - Special continuous distributions
  - Expectation and other moments
  - Multivariate continuous distributions
  - Moment generating function
  - Distribution of functions of continuous random variables
  - Estimation of distribution functions and probability density functions: the empiric distribution function
- 3. Point estimation**
  - The point estimation problem
  - The method of least squares
  - Maximum likelihood estimation
  - The method of moments
- 4. Confidence sets and tests of hypothesis**
  - Excursus: The Central Limit Theorem
  - Confidence interval
  - Confidence set and its construction
  - Test of hypothesis
- 5. The likelihood-ratio test and alternative "large-sample" equivalents of it**
  - Testing normal means and normal variances
  - The likelihood-ratio test



- The chi-squared test

## Examination relevant literature

Lecture Notes (available on Canvas at the beginning of the teaching term).

### 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 (CW51) at the latest. In the case of centrally organised mid-term examinations, the documents and materials up to CW 42 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 34 (Thursday, 26 August 2021);
- Examination information (regulations on aids, examination contents, examination literature) for decentralised examinations: in CW 42 (Monday, 18 October 2021);
- Examination information (regulations on aids, examination contents, examination literature) for centrally organised mid-term examinations: in CW 42 (Monday, 18 October 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 45 (Monday, 8 November 2021).