

Course Description

Maura Mezzetti

Department of Economics and Finance
Università Tor Vergata

Instructor Maura Mezzetti

e-mail maura.mezzetti@uniroma2.it

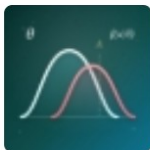
Website <https://sites.google.com/site/mezzettimaura/>

Office Hours Via teams on request or Room P2-S53: Tuesday
11:00-13.30 and 16:00-17:30 I will always be available

Teaching Assistant Tiziano Iannaccio
ttiziano.iannaccio@uniroma1.it

Course Website <http://www.economia.uniroma2.it/>

MEZZETTI-8012375-STATISTICS 2026-2027



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The course is designed to provide an in-depth knowledge of the main aspects of statistical inference (point estimation and hypothesis testing), both from a conceptual and a technical point of view. Optimality principles are discussed for the main procedures, based on the properties of estimators and on the likelihood principle. The implications of such concepts are analyzed both within the finite sample case and in the asymptotic setting. Principles and techniques discussed in the course are fundamental to the development and analysis of statistical models in econometrics.

The course is an introduction to the fundamental principles and tools of statistical inference, i.e. how to draw conclusions from data subject to random variation. Topics include: random sampling; principles of data reduction; point estimation; hypothesis testing; confidence intervals.

In Particular:

- Brief review of probability
- Random samples and asymptotic methods
 - Sampling and sums of random variables
 - Laws of large numbers and central limit theorem
- Principles of Data Reduction: Sufficiency
- The Likelihood Principle: the Likelihood Function.

- Point Estimation
 - Methods of Finding Estimators: Methods of Moments, Maximum Likelihood Estimators.
 - Finite Sample Properties: Unbiasedness and Efficiency.
 - Asymptotic Properties: Asymptotic Unbiasedness, Consistency and Efficiency.
 - Fisher Information and the Cramer-Rao theorem.
- Hypothesis Testing
 - Methods of Finding Tests: Neyman Pearson lemma
 - Large sample tests: Likelihood Ratio Tests, Score Test, Wald Test
 - Methods of Evaluating Tests: the Power Function, Most Powerful Tests.
 - The p-value.
- Special topics (if time permits)
 - Robustness
 - Notes on Bayesian Inference
 - Non Parametric Inference: Kolmogorov-Smirnov Test

Course Materials: Text Book

Required: G. Casella, R.L. Berger. Statistical inference. Cengage Learning, 2021.

Suggested:

- K. Knight. Mathematical statistics. Chapman Hall/CRC (2000).
- N. Mukhopadhyay. Probability and Statistical Inference, Dekker-CRC Press (2000).

Introductory readings:

- T. H. Wonnacott and R. J. Wonnacott. Statistics: Discovering Its Power. John Wiley Sons; International Ed edition (1982).
- A. Mood, F. Graybill and D. Boes. Introduction to the theory of statistics, McGraw-Hill (1974).

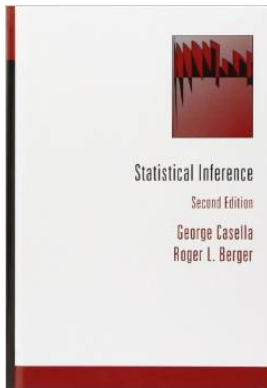
- <http://www.economia.uniroma2.it/> STATISTICS Mezzetti
- You can find
 - Lecture slides
 - Exercises suggested
 - Past Exams
 - Tutorials slides

Strongly suggested: JOIN TEAMS

- SLIDES are always posted in advance
- Section: HOMEWORKS: Every week exercises will be posted: STRONGLY encouraged to SOLVE in advance (No grading)

Strongly Suggested to use the book to prepare the exam, website materials consist only of notes, that cannot replace the book!

Casella_Berger_Statistical_Inference.pdf



- Some exercises will be solved using Matlab (the use during class is encouraged)

Detailed Program

September

Monday	14-Sep	9-11	Course Introduction and Brief review of probability
Tuesday	15-Sep	9-11	Property of Random Sample
Wednesday	16-Sep	9-11	Property of Random Sample
Monday	21-Sep	9-11	Exercise Matlab: Random Sample
Tuesday	22-Sep	9-11	Introduction to Inference and Sufficiency
Tuesday	22-Sep	11-13	Tutorials
Wednesday	23-Sep	9-11	Inference and Point Estimation
Monday	28-Sep	9-11	Methods of Evaluating Estimators
Tuesday	29-Sep	9-11	MOM Maximum Likelihood Estimators

October

Wednesday	30-Sep	9-11	Maximum Likelihood Estimators
Monday	05-Oct	9-11	Fisher Information and Cram�er-Rao Bound
Tuesday	06-Oct	9-11	Comparison among estimators and optimality results
Wednesday	07-Oct	9-11	Exercises on point estimation
Thursday	08-Oct	9-11	Tutorials
Monday	12-Oct	9-11	Confidence Intervals
Tuesday	13-Oct	9-11	Hypothesis Testing: Methods of Finding Tests
Wednesday	14-Oct	9-11	Neyman-Pearson Lemma
Thursday	15-Oct	9-11	Tutorials
Monday	19-Oct	9-11	Large-Sample Inference
Tuesday	20-Oct	9-11	Review of all the theory
Wednesday	21-Oct	9-11	Simulation of Exam
Thursday	22-Oct	9-11	Tutorials

- **Final Exam** will be written, will consist on exercises and open-ended questions on theory, covering all the program. Score will be up to 30. *Only in the winter Session:* maximum 2 points can be added solving one homework assignment and by taking one or more surprise multiple choice tests during the class.
- **In case of Covid Emergency** Exam will be online and an oral exam is required
- **Assignments**
 - ① Due October 14th

There are no different assessment method/exam program between attending and non attending students, but attendance is strongly recommended.

In MaterialeDidattico/PastExams you can find some examples of past exam, NOTICE: the more recent the test, the higher the probability that the difficulty level matches that of future tests.

- In order to take an exam, students **MUST** register on-line via the web-site <http://delphi.uniroma2.it>. Students who are not registered for the scheduled exam are not admitted to the exam.
- Grades cannot be "frozen" by postponing registration to a future exam date: **BELATED REGISTRATION OF GRADES IS NOT ALLOWED!**
- In the case of failure the failing grade will not be recorded and the DELPHI system will display *ritirato* - (withdrawn)
- Requests to negotiate or change a grade will not be considered.

Zero tolerance policy in relation to cheating in examinations.

- Any act of academic dishonesty will result in a failing grade. This failing grade may be registered in the student's record, implying that it will affect the grade point average . Some examples of academic dishonesty include (but are not limited to!!!):
 - 1 use of mobile phones, tablets, smartwatches, or earphones/earbuds during the exam;
 - 2 use of textbooks, classnotes or any other unauthorized materials during the exam;
 - 3 collaboration and communication with other students during the exam;
 - 4 looking at other student's papers during the exam;
 - 5 taking the exam for someone else or having someone take the exam for you;
 - 6 obtaining exam questions in advance through illicit means, etc...
- Please note that claiming *ignorance* of these rules will not be accepted as an excuse.

The Importance of Office Hours



Advice for Students:

- **Don't Get Lost** Ask questions in class. If something isn't clear to you, it probably isn't clear to others either. Most questions arise when the instructor has not made a connection clear or has accidentally omitted an important point. **Your question may give the instructor a chance to explain more clearly.**
- If you have difficulty with problems, ask for help from the instructor or a TA. By then it may be too late.
- **Office Hours** They are there for your benefit. Take advantage of them!