

STATISTICAL METHODS IN ECONOMETRICS

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CEMFI, Fall 2023

Course topics

1. Introduction

Probability and Statistics - Describing data.

2. Random variables and probability distributions

Probability space - Discrete and continuous random variables - The normal distribution - Functions of a random variable - Expectations and moments.

3. Multivariate random variables or vectors

Discrete and continuous random vectors - Joint, marginal and conditional distributions - Independence - Functions of random vectors - The multivariate normal distribution - Covariance, correlation, conditional expectations and moments - The best linear predictor.

4. Sampling

Random samples, statistics and sampling distributions - Sample mean and sample variance - Sampling from a normal population: chi-squared, t and F distributions. Random sampling from multivariate populations.

5. Asymptotic theory

Convergence of sequences of random variables - Laws of large numbers and Central limit theorems - Asymptotics of some sample statistics - The bootstrap: introduction.

6. Estimation

The analogy principle - Criteria for a good estimator - Estimation in parametric models - Maximum likelihood estimation and its properties - Bayesian estimation.

7. Tests of hypothesis and confidence intervals

Definitions - The likelihood ratio test and the Neyman-Pearson theory - Frequentist and Bayesian confidence intervals.

8. Regression

Simple and multivariate regression - Properties of least squares - The classical regression model - Classical normal regression.

References

- B. W. Lindgren, "Statistical Theory", McMillan, 4th edition, 1998.
- A. Goldberger, "A Course in Econometrics", Harvard University Press, 1991.
- T. Amemiya: "Introduction to Statistics and Econometrics", Harvard University Press, 1994.
- P. Aronow and B. Miller: "Foundations of Agnostic Statistics"; Cambridge University Press, 2019
- B. Hansen, "Econometrics", University of Wisconsin, 2000-2020.

Schedule

The course lasts for 10 weeks. Every week we meet for two 90-minute lectures on wednesday and a 90-minute problem session on friday. As an exception, the first week we will have have three lectures. Approximately, Topics 1, 2, 4, 5, 7 and 8 will take us one week each. Topics 3 and 6 will take almost two weeks each.

Grading

The grade is based mostly on the final exam (80 %). However, every week you will be asked to work on an assignment in preparation for the problem session, and to turn it in before the session. This is mandatory. The TA will keep track of assignments and will grade some of them randomly. Homework grades and class participation will have weights of 15 % and 5 % respectively.