DEPARTMENT OF POLITICAL AND SOCIAL SCIENCES

1st term seminar, Academic year 2024-2025

Introduction to Quantitative Methods

Instructor: Alexandra Jabbour (alexandra.jabbour@eui.eu)

Tuesdays, 11:00-13:00 & Fridays, 9:00-11:00

Office hours: Tuesday, 3-4 pm, request by email

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Course Description and Objectives

The course aims to provide a solid foundation in the quantitative methods commonly used by social scientists. The focus will mainly be on the reasoning behind hypothesis testing, causality issues (briefly), and linear regression (including estimation, interpretation, diagnostic tools, and interactions). The course will be structured around lectures followed by lab sessions. The lab sessions are designed to help researchers improve their coding skills in either Stata or R. I will also emphasise the importance of reproducibility in social science research by, for instance, providing recommendations on how to set up data files for replication. These skills will assist researchers during the publication process and help them develop good coding habits early in their PhD training.

Course Prerequisites:

This seminar is intended for researchers with little to no knowledge of quantitative methods. Knowledge of R or Stata is not required, as the course will provide the necessary background to perform the analyses.

Learning Outcomes

- Develop an understanding of how to think about quantitative information
- Perform basic analyses, such as difference in means, t-tests, and ordinary least squares regressions
- Evaluate the strength of descriptive analysis in social sciences
- Learn how to effectively present descriptive statistics and regression outputs using tables and visualizations

Requirements: Final Project and Exam

Attendance (80% participation) at seminars is compulsory to validate the course.

Researchers will also need to upload on Brightspace, a two- to three-page document that includes a research question, a short motivation, hypotheses, a description of the data and methodology, a presentation and interpretation of the results, and a discussion of the potential limitations of the analysis by December 1st. Additionally, researchers are required to submit and upload their replication materials (data and annotated code, using R or Stata) on Brightspace by December 1st. Researchers will present their findings in a 5-minute presentation during the final course session (Session 10).

Finally, there will be a final test in multiple-choice form. I will provide more information about the exam as it approaches.

Schedule:

	Lectures	Lab
1	01-10-2024 11:00 – 13:00 **Seminar Room 4, Badia Fiesolana**	04-10-202 9:00 – 11:00 **Seminar Room 4, Badia Fiesolana**
2	08-10-2024 11:00 – 13:00 Seminar Room 2, Badia Fiesolana	11-10-2024 9:00 – 11:00 Seminar Room 2, Badia Fiesolana
3	15-10-2024 11:00 – 13:00 Seminar Room 2, Badia Fiesolana	18-10-2024 9:00 – 11:00 Seminar Room 2, Badia Fiesolana

4	22-10-2024 11:00 – 13:00 Seminar Room 2, Badia Fiesolana	25-10-2024 9:00 – 11:00 Seminar Room 2, Badia Fiesolana
5	29-10-2024 11:00 – 13:00 Seminar Room 2, Badia Fiesolana	**Wednesday 06-11-2024** **14:00 – 16:00** Seminar Room 2, Badia Fiesolana
6	05-11-2024 11:00 – 13:00 Seminar Room 2, Badia Fiesolana	08-11-2024 9:00 – 11:00 **Sala Triaria, Villa Schifanoia**
7	12-11-2024 11:00 – 13:00 Seminar Room 2, Badia Fiesolana	15-11-2024 9:00 – 11:00 Seminar Room 2, Badia Fiesolana
8	19-11-2024 11:00 – 13:00 Seminar Room 2, Badia Fiesolana	22-11-2024 9:00 – 11:00 Seminar Room 2, Badia Fiesolana
9	26-11-2024 11:00 – 13:00 **Sala del Capitolo**, Badia Fiesolana	29-11-2024 9:00 – 11:00 Seminar Room 2, Badia Fiesolana
10	03-12-2024 11:00 – 13:00 Seminar Room 2, Badia Fiesolana	06-12-2024 9:00 – 11:00 Seminar Room 2, Badia Fiesolana

Readings:

Readings are meant to help you digest the course material. When it comes to learning, repetition is key; therefore, you can complete the readings either before or after the course.

Main textbooks

Cunningham. 2021. *Causal inference: The mixtape*. Yale University Press.

Llaudet and Imai. 2022. Data Analysis for Social Science: A Friendly and Practical Introduction. Princeton University Press

Gelman and Hill. 2007. Data Analysis Using Regression and Multilevel/Hierarchical Models. Cambridge University Press

Wooldridge. 2020. Introductory econometrics: a modern approach. 7th edition

Additional bibliography:

Alexander, Rohan. 2023. Telling Stories with Data. CRC Press.

Angrist and Pischke. 2009. *Mostly harmless econometrics: An empiricist's companion*. Princeton University Press

Bailey, Michael A. 2015. *Real Stats: Using Econometrics for Political Science and Public Policy.* Oxford University Press

Heiss, Andrew. Data Visualization with R.

Kosuke Imai. 2017. *Quantitative Social Science: An Introduction*. Princeton University Press

Neat data visualisation using Stata: see Asjad Naqvi GitHub page

Lecture 1. Introduction to the course

General overview, description of assignments, software, and readings

Reading: Syllabus.

Lecture 2. Conceptual foundations

Causation, Correlation, establishing a common language

Reading: Cunningham, Chap. 3

Hernán, M. A. (2018). The C-word: scientific euphemisms do not improve causal inference from observational data. *American journal of public health*, *108*(5), 616-619

Lecture 3. Descriptive statistics and Visualization

Refresher on variable types, distribution, mean, median, variance

Reading: Llaudet and Imai. Chap. 3-3.4

Lecture 4. Probability and Inference I

Hypothesis testing, population, samples

Reading: Gelman and Hill, Chap. 2 (sections 2.1, 2.2, 2.4)

Lecture 5. Probability and Inference II

P-value, the difference between substance and significance, Confidence intervals

Reading: Llaudet and Imai , Chap. 7

Lecture 6. Linear regression

Mechanics of OLS, Assumptions of linear model, Inference with regression

Reading: Gelman and Hill, Chap. 3 (except 3.2 and 3.3)

Cunningham, Chap 2.

Lecture 7. Multiple regression

*Mechanics of multiple linear regression***,** *multiple vs. simple linear regression models*

Reading: Cinelli, C., Forney, A., & Pearl, J. 2024. A crash course in good and bad controls. *Sociological Methods & Research*, *53*(3), 1071-1104.

Lecture 8. Interaction, Mediation, Binary outcome

Reading: Brambor T, Clark WR, Golder M. 2006. Understanding Interaction Models: Improving Empirical Analyses. Political Analysis. 14(1):63-82.

Lecture 9. Finding and solving (some of the) problems

Outliers, model fit, Heteroskedasticity

Reading: Wooldridge, Chap 8.

Lecture 10. Presentation of term paper

5-minute presentation, slides are mandatory