

Applied Quantitative Methods for the Social Sciences II

Master in Social Sciences
Carlos III-Juan March Institute

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Office hours: Thu 15h-17h (email before)

Time and place:

Thursdays, 10h–13h

Room 18.1.A04

Key dates

Proposal presentations	April 9 (*)
In-class exam	April 30 (**)
Final essay submission	May 20
Final essay (extraordinary)	June 12

(*) A second date may be added

(**) Short exam, only first half of class

1 Description

This is a graduate-level course on quantitative methods applied to Social Sciences. It builds on the contents of the previous course, AQMSS-I. In this course we will apply the statistical tools learned in the previous course and use them to analyze a variety of datasets, focusing on different questions. Our focus will be on how to apply quantitative methods in practice: learning what methods should be used in each case, what strategies we can use to answer each question, how to interpret and visualize model results, and how to evaluate them.

We will also focus intensively on the use of the statistical program R, both for model estimation and data cleaning and transformation. The goal of this course is to prepare students to go from research question to answer, which involves thinking about research design, collecting or finding data, cleaning and preparing it, estimating models, and presenting and interpreting results.

The course will consist of a mixture of brief lectures and practical computer lab sessions. In the lecture we will cover basic concepts and ideas, and we will discuss assigned readings. These readings will be published papers which we will ‘reverse engineer’ and think about how to extend or improve them. In the lab sessions, we will go through replication material of published papers and solve problem sets.

2 Requirements and grading

The grade will consist mainly of three components: 1) problem sets, 2) a final project, and 3) an exam. The different activities and how they contribute to the final grade are as follows:

- **Problem sets (20%):** We will start problem sets in class, but students have to finish them at home and submit them by a given short deadline. Evaluation will be based on successful submission of problems sets on time.
- **Proposal presentation and peer review (10% + 10%):** Halfway through the course, you will present your idea for the final essay in class. Each student will be paired with another student, and will discuss his idea and provide feedback. More details will be discussed in class.
- **Final essay (30%):** The final essay consists of a small research note (max 3,000 words) incorporating an original data analysis using R. You are free to choose any topic and/or data source (it can overlap with your other substantive courses). More details will be discussed in class.
- **Exam (30%):** Final exam focusing on both theoretical and practical issues.

3 AI policy

In this course, students should not use artificial intelligence tools to carry out the work or exercises proposed by the faculty. In the event that the use of AI by the student gives rise to academic fraud by falsifying the results of an exam or work required to accredit academic performance, the Regulation of the UC3M of partial development of the Law 3/2022, of February 24th, of University Coexistence, will be applied.

4 Readings

I will provide a more specific list of readings and textbooks, but we will rely on several textbooks and materials. I detail below which chapters correspond to each session. Some of these are freely available online and many provide code and data resources. In addition, I list below other books that either focus more on the use of R or on causal inference.

- Urdinez and Cruz, *R for Political Data Science: A Practical Guide* (CRC, 2020).
- Imai, *Quantitative Social Science: An Introduction* (Princeton UP, 2017).
- Gelman, Hill, and Vehtari, *Regression and Other Stories* (Cambridge UP, 2021).
- Bueno de Mesquina and Fowler, *Thinking Clearly with Data: A Guide to Quantitative Reasoning and Analysis* (Princeton UP, 2021).
- Diez, Cetinkaya-Rundel, and Barr, *OpenIntro Statistics* (OpenIntro, 4th ed, 2019).
- Ismay, Kim, and Valdivia, *Statistical Inference via Data Science: A ModernDive into R and the Tidyverse* (Online/CRC, 2025).

Textbooks more focused on the use of R are:

- Wickman, Cetinkaya-Rundel, and Gloremund, [R for Data Science](#) (Online/O'Reilly, 2nd ed, 2023).
- Arel-Bundock, Greifer, and Heiss, [Model to Meaning: How to Interpret Statistical Models Using `marginalEffects` for R and Python](#) (online, 2025).
- Rodrigues, [Building reproducible analytical pipelines with R](#) (online, 2023).

For topics more related to causal analyses (which you will explore more in depth in a later course during the second year of the MA), two reference textbooks are:

- Nick Huntington-Klein, [The Effect: An Introduction to Research Design and Causality](#) (Chapman and Hall/CRC, 2021).
- Scott Cunningham, [Causal Inference: The Mixtape](#) (Yale University Press, 2021).

5 Course outline

This schedule is subject to changes depending on our progress during the semester. A detailed outline for each session can be found in the course website (franvillamil.github.io/advanced_quant/).

Session 1	February 5	Introduction
Session 2	February 12	Applied regression (I)
Session 3	February 19	Applied regression (II)
Session 4	February 26	Model interpretation and diagnostics
Session 5	March 5	Best practices in computing
Session 6	March 12	Panel data (I)
Session 7	March 19	Panel data (II)
Session 8	March 26	Spatial data (I)
Session 9	April 9	Project presentations
Session 10	April 16	Spatial data (II)
Session 11	April 23	Other outcomes (nominal, ordinal, count, duration)
Session 12	April 30	Exam + Review / Advanced topics