

Advanced Econometrics
RED–Rome Economics Doctorate
Fall 2025

Syllabus

Instructor

Professor Franco Peracchi (peracchi@uniroma2.it)
Website: <http://www.eief.it/eief/index.php/people/faculty-az?id=174>.
Office hours: Wednesday 3:00–4:15 pm, or by appointment.

Lectures

Monday, Tuesday and Wednesday, 9:00–11:00 am, for three weeks, from November 3 to November 19, 2025.

Goal

The goal of this course is to introduce students to advanced methods in microeconometrics with a focus on semiparametric and nonlinear methods. The course encompasses a variety of methods, derived from both the frequentist and the Bayesian approach, including: classical linear models; asymptotic approximations vs. resampling methods; IV, GMM and 2SLS; methods for panel data; methods for discrete outcomes; quantile and distribution regression; Tobit and selection models.

Software

This course relies on Stata (<https://www.stata.com>), a commercial statistical package with excellent data management and graphics capabilities that runs on MacOS, Unix and Windows and can be integrated with Python. The most recent version of the package is Stata 19.5.

Grades

Homework 33%, Final exam 67%.

Homework

Spending a significant amount of time each week on the assigned homework is essential to learning the material covered. Homework must be handed in class, on the dates indicated below. There is no credit for late homework. Working in group (up to 3 people) is strongly encouraged but each student needs to hand in her/his own solution.

Homework due dates:

- Problem set 1: November 10.
- Problem set 2: November 17.
- Problem set 3: November 24.

Final exam

Following the exam/grading guidelines of RED–Rome Economics Doctorate, the final exam is a classroom exam, scheduled for TBD.

Grading is in decimals with a maximum grade of 31. The minimum grade for a Pass is 18.

The exam covers all the material discussed in the course. The questions will resemble those assigned in the homework.

Course outline

- [Lecture 1](#) (November 3). Three modeling approaches: The frequentist approach; the Bayesian approach; the Fisherian approach and the maximum likelihood (ML) method.
- [Lecture 2](#) (November 4). Classical linear models: Least squares, ML and Bayesian procedures.
- [Lecture 3](#) (November 5). Asymptotic approximations vs. resampling methods: Consistency and asymptotic normality of OLS and ML; the jackknife; the bootstrap; subsampling.
- [Lecture 4](#) (November 10). IV, GMM and 2SLS: The IV and GMM methods; sampling properties of IV estimators; hypothesis testing; 2SLS; too many instruments and weak instruments.
- [Lecture 5](#) (November 11). Panel data: SURE models; fixed- and random-effects models; relaxing exogeneity; dynamic panel data models; difference-in-differences (DiD); synthetic controls; synthetic DiD.
- [Lecture 6](#) (November 12). Nonparametric regression: Kernel regression; nearest neighbor method and local polynomial fitting; partially linear models; nonparametric IV estimation.
- [Lecture 7](#) (November 17). Models for discrete outcomes: Bivariate outcome models; multinomial models; count-data models; generalized linear models.
- [Lecture 8](#) (November 18). Quantile and distribution regression: Linear quantile regression; quantile treatment effects; unconditional quantile regression; distribution regression.
- [Lecture 9](#) (November 19). Tobit and selection models: Type I Tobit model; Heckman sample selection model; other Tobit models; two-part models.

References

The recommended references are:

- Hansen B.E. (2022) *Econometrics*. Princeton University Press: Princeton (NJ).
- Wooldridge J.M. (2010) *Econometric Analysis of Cross–Section and Panel Data* (2nd ed.), MIT Press: Cambridge (MA).

Additional references include:

- Amemiya T. (1985). *Advanced Econometrics*, Harvard University Press: Cambridge (MA).

- Angrist J.D., and Pischke J.-S. (2009). *Mostly Harmless Econometrics: An Empiricists's Companion*, Princeton University Press: Princeton (NJ).
- Cameron A. C., and Trivedi P. K. (2010). *Microeconometrics Using Stata* (Revised Edition), Stata Press: College Station, TX.
- Davison A. C., and Hinkley V. V. (1997). *Bootstrap Methods and their Applications*. Cambridge University Press: Cambridge (UK).
- Deaton A. (1997). *The Analysis of Household Surveys: A Microeconomic Approach to Development Policy*. Johns Hopkins University Press: Baltimore (MD). Available at <http://documents.worldbank.org/curated/en/593871468777303124/pdf/multi-page.pdf>.
- Efron B., and Hastie T. (2016). *Computer Age Statistical Inference. Algorithms, Evidence, and Data Science*. Cambridge University Press: New York. Available at <https://hastie.su.domains/CASI>.
- Hastie T., Tibshirani R., and Friedman J. (2016). *The Elements of Statistical Learning: Data Mining, Inference, and Prediction* (Second Edition). Springer: New York [ESL]. Available at <https://hastie.su.domains/ElemStatLearn/>.
- Lancaster T. (2004). *An Introduction to Modern Bayesian Econometrics*. Blackwell: Malden (MA).
- Stock J.H., and Watson M.W. (2020) *Introduction to Econometrics* (4th ed.), Pearson: Hoboken (NJ).

Suggestions for further reading will be provided in class.