# Econometrics A

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January-February 2019

## 1. DESCRIPTION

This course is an introduction to empirical research. In particular, this course will focus on finding causal relationships from observational data. It will include econometric theory, readings, presentations, STATA practice, and problem solving. We will start by observing that most empirical questions can be framed as "what is the (causal) impact of X on Y?". This central question of econometrics, the question of causality, is our approach to the standard tools of linear least squares, instrumental variable estimation, and panel data analysis.

## 2. COURSE OUTLINE

(1) Introduction: The identification problem, randomized experiments as the golden benchmark. Quick review of probability and statistics (please review Greene, Appendices A, B, C and D). Conditional expectations. Asymptotic theory.
(2) Linear Regression: Ordinary Least Squares, Best Linear Unbiased Estimator, asymptotic properties; Inference: confidence intervals, heteroskedasticity and clustering; Tests: F-tests; The Frisch-Waugh-Lovell theorem.
(3) Identification Issues in Linear Regressions. Omitted variable bias, Measurement error bias, Functional form misspecification.
(4) Inference Issues in Linear Regressions Heteroscedasticity, Clustering, Autocorrelation.
(5) Instrumental variable estimation: IV estimator, exclusion restriction, consistency of the IV estimator, bias of the IV estimator, Hausman test. Weak Instruments.
(6) Panel data estimation: Random effects, fixed effects, within estimator and between estimator.

## 3. PREREQUISITES

I assume that students master some basic notions of probability, statistics and linear algebra. More specifically:

- probability and statistics (random variables, distributions, mean, standard deviation, expectations, conditional expectations, Bayes' rule and asymptotic theory –convergence of random variables, law of large numbers and central limit theorem–. See Appendices B, C and D, Greene.

- Basic notions of matrix algebra (sum, multiplication, inversion, submatrices, and vector spaces). See Appendix A, Greene.
- Basic notions of real analysis: integrals and derivatives.

## 4. Textbooks

Main textbooks:

- Wooldridge, *Econometrics of Cross Section and Panel Data*, MIT PRESS
- A. Colin Cameron, Pravin K. Trivedi (2009) Microeconometrics Using Stata, Stata Press. Good manual to learn how to apply STATA in econometrics applications.

Other useful books:

- Greene (2012). Econometrics, Prentice Hall.
- J. Angrist and S. Pischke (2009). Mostly Harmless Econometrics: An Empiricist's Companion, Princeton University Press.
- Stock and Watson, "Introduction to Econometrics".

## 5. Grading

- Final examination (50%)
- Problemsets (40%)
- Presentations (10%)

## 6. Presentations

Students will prepare a 15 minute presentation on a paper they will be assigned.[1] Presentations will take place at the end of the class on assigned dates. You can work in pairs.

The presentation should:

(1) Identify the research question and motivate the importance of this question
(2) Show the empirical strategy that is being used for the analysis
(3) Show the actual estimating equation and talk through each part of it
(4) Also, state what the assumptions are for this empirical strategy to be valid
(5) Briefly describe the data, focusing on the most novel aspects
(6) Present the main findings associated with the estimating equation that you show
(7) Present 1 or 2 additional results that the author uses to address potential challenges to the empirical strategy
(8) Provide a critical assessment and suggestions for improvement

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[1]You can also suggest an empirical article in your area(s) of interest. If this is the case, please email the paper to me and we'll discuss whether it is a suitable one.

(a) On the empirical strategy, examples would be: Are there other endogeneity concerns that the author did not address? Do the variables measure what the authors claim they measure? Is the sample really unbiased? Would we be worried about external validity? Etc...

(b) On whether the evidence as a while supports the conclusion: Did the author present sufficient evidence on the channel through which the effect is posited to operate? Are there other tests that could have been undertaken?

Given limited time, the presentation should NOT include a literature review, unless the paper builds on another paper and in which case it may be critical to discuss the other paper as a part of the motivation.

## 7. POLICIES

**Late Assignments.** You will be penalized 1/3 of a grade (e.g. from an A- to a B+) per day late. This policy will be maintained independent of the reason why the assignment is handed in late.

**Missing exams.** Students missing an exam will receive a grade of zero. If a true emergency situation arises, contact me prior to the scheduled test time. If I determine that the excuse is justified (e.g., in serious matters such as illness), we will schedule a make-up. Travel plans (e.g., a plane ticket purchased for departure before the day of the exam) are not an acceptable excuse.

**Academic dishonesty.** The work you do in this course must be your own work. Academic dishonesty is not only against the rules, it is cowardly, unfair to your classmates, and a waste of your tuition money. It will simply not be tolerated in this class. The University's penalties for academic dishonesty are severe, and can include receipt of a failing grade in the course for which plagiarized work was submitted; probation, suspension, or expulsion.

## 8. OFFICE HOURS

By appointment. Please email me at: laura.mayoral@iae.csic.es.

## 9. TEACHING ASSISTANT

Each week you will have a practical session taught by Arzi Adbi. Please direct to him all your questions regarding STATA. Office hours: Please email him (arzi.adbi@insead.edu) to arrange an appointment.