

# Department of Economics, USC, Fall 2023

## Econ 513, Practice of Econometrics

### 1 Instructor and TA

Instructor:

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Office hours: by appointment (send email)

TA

TBA

### 2 Course Description

This course is an introduction to econometrics which I define as the measurement of economic relations, i.e. relations between economic variables. Such relations are useful to assess the effect of a single variable holding other variables constant, the type of effect that economic theory informs us about. They can also be used to obtain the causal effect of a policy. Economic relations are also useful in prediction. We show how the tools of statistics that are designed to analyze outcomes of random experiments can be used to make inferences on relations that are not stochastic. We consider linear relations first and develop the estimation and inference methods for such relations. An issue that comes up frequently in empirical economic (and general social science) research is that variables that affect an outcome are not chosen at random. We discuss various approaches to dealing with the resulting endogeneity/selection bias. Finally we also consider nonlinear relations, in particular the relation between a discrete outcome and determining variables.

The lectures 1-5 are a review of the multiple linear regression model using matrix notation. Lectures 6 and 7 introduce asymptotic and bootstrap inference in that model. Lectures 8-15 are on special topics. In lectures 8-13 we consider econometric methods that allow us to distinguish correlation and causation. The final two lectures consider discrete outcome models that are closer to economic theory. For these models we also need to discuss nonlinear estimation.

Throughout results are illustrated with empirical examples. The same data are used in the assignments.

The goal of this class is to prepare you for empirical research in economics. You should be able to apply the techniques discussed in these lectures and also be able to use methods suggested in the literature as discussed in advanced texts as the Wooldridge book.

### 3 Course Organization

There are weekly lectures on Tuesday and Thursday 8-10am in THH 208. There is no class on October 12 (Fall recess) and on Thursday November 25 (Thanksgiving). Besides the lectures there will be assignments that involve data analysis. We support STATA that is available on the USC network, but you can also use R or Python or something else, but we are not able to support these languages. The data can be downloaded from the course site. The TA will organize a few sessions to introduce you to STATA. The TA will also address math and stats deficiencies in special TA sessions. Please attend these.

### 4 Lectures

- Lecture 1: Empirical economic relations
- Lecture 2: Some properties of the OLS solution
- Lecture 3: The Classical Linear Regression Model I
- Lecture 4: The Classical Linear Regression Model II
- Lecture 5: Inference in the CLR model
- Lecture 6: Inference in the multiple linear regression model: Asymptotics
- Lecture 7: Inference in the multiple linear regression model: Bootstrap
- Lecture 8: Instrumental variables
- Lecture 9: Panel data: random effects
- Lecture 10: Panel data: Fixed effects
- Lecture 11: Differences-in-differences
- Lecture 12: Nonparametric regression and regression discontinuity I
- Lecture 13: Nonparametric regression and regression discontinuity II
- Lecture 14: Discrete choice I
- Lecture 15: Discrete choice II

### 5 Lecture Notes and Prerequisites

Lecture notes are available on the course blackboard site and will be updated during the course. The lecture notes are self-contained. Basic probability material and matrix algebra is reviewed in the

appendices A-D of Wooldridge, 'Introductory Econometrics: A Modern Approach', Thomson-South Western. We recommend that you become familiar (or renew the acquaintance) with that material. We assume that you know basic matrix operations as multiplication, inversion etc. We also assume that you have some knowledge of statistics and that you know what an estimator, a confidence interval and a test is. In the first weeks of the course the TA will organize a few sessions in which the required prior knowledge is reviewed.

## 6 Textbook and References

I recommend that you have at least one advanced econometrics text as a reference book. The main choices are:

Econometric Analysis of Cross Section and Panel Data, Jeffrey M. Wooldridge, MIT Press.

Econometric Analysis, W. H. Greene, Prentice Hall.

Mostly Harmless Econometrics, J. D. Angrist and J-S. Pischke, Princeton University Press

The first two books are more formal and the third is more informal. The first two are recommended if you want to be able to learn new techniques from the literature, while the third provides more intuition. In my experience the third book is the most useful for the majority of students (and also by far the cheapest). None of the books cover all material in the course. All three books will be useful as a reference when you engage in your own empirical projects.

## 7 Exams and Grading

Midterm: TBA.

Final: Tuesday, December 12, 4:30-6:30 p.m.

Homework assignments: The assignments will involve empirical work where we will use STATA that is available on the USC network. An introduction to STATA will be provided. You must hand in all homeworks to pass this course. For the assignments you will work in a group with one colleague and you submit the group effort as a pdf to the TA by the due date.

Grading: Grades will be based on problem sets (20%), the midterm (40%), and the final examination (40%).

## 8 Statements

### STUDENTS WITH DISABILITIES

Any student requesting academic accommodations based on a disability is required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP. Please be sure the letter is delivered to me (or to TA) as early in the semester as possible. DSP is located in STU 301 and is open 8:30 a.m.–5:00 p.m., Monday through Friday. Website for DSP and contact information: (213) 740-0776 (Phone), (213) 740-6948 (TDD only), (213) 740-8216 (FAX) [ability@usc.edu](mailto:ability@usc.edu).

### ACADEMIC INTEGRITY

USC seeks to maintain an optimal learning environment. General principles of academic honesty include the concept of respect for the intellectual property of others, the expectation that individual work will be submitted unless otherwise allowed by an instructor, and the obligations both to protect one's own academic work from misuse by others as well as to avoid using another's work as one's own. All students are expected to understand and abide by these principles. SCampus, the Student Guidebook, contains the University Student Conduct Code (see University Governance, Section 11.00), while the recommended sanctions are located in Appendix A.

### EMERGENCY PREPAREDNESS/COURSE CONTINUITY IN A CRISIS

In case of a declared emergency if travel to campus is not feasible, USC executive leadership will announce an electronic way for instructors to teach students in their residence halls or homes using a combination of Blackboard, teleconferencing, and other technologies. See the university's site on Campus Safety and Emergency Preparedness.