

**Syllabus**  
**Economics 318: Introduction to Econometrics**  
Department of Economics, University of Southern California  
Spring Semester 2023, GFS 118

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Office Hours: Thursday 11 am– 12 pm and by appointment

**Teaching Assistant:**

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**Course Objectives:**

This course provides an introduction to methods and statistical techniques used to test economic theory and analyze economic data. Econometric techniques are increasingly used in business, government and academic settings to analyze markets, create forecasts based on past data, study the effect of economic policies, and test economic theories. A good understanding of econometrics is increasingly valued by employers in many fields.

Like no other course in my undergraduate experience, my time spent learning econometrics taught me a great lesson: tough courses can be challenging and rewarding at the same time. Learning Econometrics changed the way I look at the world. My objective this semester is to do the same with you, change the way you look at the world and become competent handling data and understanding the importance of statistical analysis when applied to different types of data. I tend to use recent data and examples from finance and the macro economy and we will try and apply the tools we learn in Econ 318 to answer questions like:

- Is there a gender pay gap in some sectors in the US Economy?
  - Can we predict the price of Bitcoin or Tesla 3 months ahead?
  - What is the return to education? Does it make economic sense to go to graduate school?
- Etc.

The main tool of econometrics is regression analysis, which is concerned with uncovering and estimating relationships between different variables. In this course we will introduce regression analysis, emphasizing the intuition behind the procedures and how to apply them to real world data. The course will both help students understand how to use data to test hypotheses and serve as an introduction to the ideas and techniques of forecasting and prediction towards the end of the course. I will also give you an introduction to machine learning algorithms we use for big data analysis, time permitting.

Upon successful completion of the course you will:

- Understand the statistical assumptions underlying regression analysis and when they are appropriate

- Be able to identify when some of the basic regression assumptions may be violated and to correct for that with appropriate techniques
- Have experience with the “art” of modeling data
- Be able to understand, interpret, and evaluate data analysis performed by others
- Be familiar with Stata/R/Python, popular econometric software/programming languages increasingly used in corporate, government, and academic jobs

**Textbook:**

Damoder Gujarati: Basic Econometrics

The textbook is to serve as a reference for you; you will not have any assignments that will require the textbook. As a result, you should feel free to buy earlier versions of the textbook or, if you feel it would be more useful, another introductory econometrics textbook. Others I recommend are Stock and Watson Introduction to Econometrics and Wooldridge Introductory Econometrics.

Students will receive a number of homework assignments, handouts, and some other course materials through the course web page. Students will also receive e-mail messages about the course.

For availability of Stata at USC, visit: <http://www.usc.edu/its/stats//stata/atusc.html>

Various information on Stata is available online (e.g., <http://www.ats.ucla.edu/stat/stata/>) or <http://data.princeton.edu/stata/>), both of which offer free Stata tutorials.

I will also upload youtube videos for R and files/ebooks to get you acquainted with Python. There will be a number of lab sessions during the semester with the TA wherein you will gain hands-on experience with R/Python. Prior knowledge of R or Python is not required in this class.

**Prerequisites:**

All students should have taken an introductory statistics course (ECON 317). I will also use elementary calculus. It is assumed that you are familiar with calculus and have had at least one course on probability and statistics concepts. No knowledge of matrix algebra is required. The course will begin with a review of some core statistical material. You should already be familiar with the key ideas that are presented. The material will be discussed in the context of the linear regression model. The second part of the course will apply these statistical tools in a fuller examination of the linear regression model as it is used in economics and the social sciences.

**Examinations, Homework and Grading:**

**Problem Sets/Computer Exercises: 20%**

Problem sets are due at the beginning of class on the specified date and preferably typewritten. They should be turned in on time as late problem sets will NOT be accepted and there will be no credit for late homework. You may discuss your homework assignments with other students in the course and form study groups. However, you must do the computer assignments yourself and write up your own answers to all questions.

### **Midterm I and Midterm II: 30%**

Midterm exams are non-cumulative and consist of problems and short answer questions. Each midterm exam accounts for approximately 15% of the course grade. Although the midterm exams are non-cumulative, most chapters build on previous ones. Hence, to do well on the exams, students should carefully review the previous chapters.

The two midterm exams are usually during 7th and 11th week of instruction. The exact dates of the midterm exams will be announced in class at least 10 days in advance.

### **Final Group project 25% and Group Presentation 25%:**

The final project and presentation is aimed at helping you gain skills that will aid you in your future career and practice applying the skills learned in this class. To that end it is important to practice the research process: identifying a problem, gathering and analyzing data, and communicating your results.

Students will write a short original research paper using data. Students will be graded on the paper, one paper will be submitted per team. The goal of the paper is for you to apply the tools you have developed in this class to address an economic question involving data. You likely have a topic from your professional or personal life that lends itself to data analysis, and I encourage you to choose a topic that is familiar and of interest to you. Papers should be well-written and be no longer than 10 pages excluding references. The instructor will be happy to advise you on your research question.

Due to the size of the class, you will be working/presenting in groups of 2/3 people. I will email you your group selection by end of week 3. You should plan to meet (virtually or in person) with your team and come up with a research proposal. You should get approval for your topic from the instructor by end of week 7.

There will be lab sessions with the TA during the semester. You will be applying the tools learnt in the course to data using software in these sessions. I prefer students to use Python or R as these are fairly simple programming languages to learn and use with economic data. I will email you the dates of these sessions in the first 2 weeks.

While grading details are given above, the true keys to success in this class are listed below in order of importance:

1. Attend and participate in class. Econometrics is a difficult subject with a language that is often difficult to comprehend at first. Attempting to learn via only reading the textbook is not recommended. Moreover, in this class, each lecture builds upon the last. Also, I want to emphasize that learning is not a spectator sport. You are paying a lot to attend USC, so be active with your learning. Ask questions.
2. Don't neglect problem sets. Econometrics can only be learned through struggle. Make doing problems sets a priority. While I encourage you to work with others on these problems sets, don't free ride! Often the best learning comes from teaching others or trying to convince others that your solution is correct.

3. Consult the textbook. While I will try to stick to the textbook in my lectures, I have my own way of discussing some topics. However, not everyone learns in the same way, so what may be confusing to you in class may be clearer in the textbook presentation.
4. **Don't give up**. Econometrics may seem simple at first, but it can become very complex in a hurry. However, do not fret, the beauty of Econometrics is its elegance. After awhile, the big picture will come together and you will see how these tools can help analyze and quantify very difficult problems. But it takes effort to get there. If you find yourself getting lost, seek help from me or the Teaching Assistant! Often the simplest comments make all the difference. Besides, I like getting to know my students.

## **Statement on Academic Conduct and Support Systems:**

### **Academic Conduct:**

Plagiarism – presenting someone else’s ideas as your own, either verbatim or recast in your own words– is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in SCampus in Part B, Section 11, “Behavior Violating University standards” [policy.usc.edu/scampus-part-b](http://policy.usc.edu/scampus-part-b). Other forms of academic dishonesty are equally unacceptable. See additional information in SCampus and university policies on scientific misconduct, [policy.usc.edu/scientific-misconduct](http://policy.usc.edu/scientific-misconduct).

### **Support Systems:**

*Counseling and Mental Health* - (213) 740-9355 – 24/7 on call [studenthealth.usc.edu/counseling](http://studenthealth.usc.edu/counseling)  
Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention.

*National Suicide Prevention Lifeline* - 1 (800) 273-8255 – 24/7 on call [suicidepreventionlifeline.org](http://suicidepreventionlifeline.org)

Free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week.

*Relationship and Sexual Violence Prevention Services (RSVP)* - (213) 740-9355(WELL), press “0” after hours – 24/7 on call [studenthealth.usc.edu/sexual-assault](http://studenthealth.usc.edu/sexual-assault) Free and confidential therapy services, workshops, and training for situations related to gender-based harm.

*Office of Equity and Diversity (OED)* - (213) 740-5086 | Title IX – (213) 821-8298 [equity.usc.edu](http://equity.usc.edu), [titleix.usc.edu](http://titleix.usc.edu)

Information about how to get help or help someone affected by harassment or discrimination, rights of protected classes, reporting options, and additional resources for students, faculty, staff, visitors, and applicants.

*Reporting Incidents of Bias or Harassment* - (213) 740-5086 or (213) 821-8298 [uscadvocate.symplicity.com/care\\_report](http://uscadvocate.symplicity.com/care_report)

Avenue to report incidents of bias, hate crimes, and microaggressions to the Office of Equity and Diversity | Title IX for appropriate investigation, supportive measures, and response.

*The Office of Disability Services and Programs* - (213) 740-0776 dsp.usc.edu

Support and accommodations for students with disabilities. Services include assistance in providing readers/notetakers/interpreters, special accommodations for test taking needs, assistance with architectural barriers, assistive technology, and support for individual needs.

*USC Campus Support and Intervention* - (213) 821-4710 campussupport.usc.edu

Assists students and families in resolving complex personal, financial, and academic issues adversely affecting their success as a student.

*Diversity at USC* - (213) 740-2101 diversity.usc.edu

Information on events, programs and training, the Provost's Diversity and Inclusion Council, Diversity Liaisons for each academic school, chronology, participation, and various resources for students.

*USC Emergency* - UPC: (213) 740-4321, HSC: (323) 442-1000 – 24/7 on call dps.usc.edu, emergency.usc.edu

Emergency assistance and avenue to report a crime. Latest updates regarding safety, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible.

*USC Department of Public Safety* - UPC: (213) 740-6000, HSC: (323) 442-120 – 24/7 on call dps.usc.edu

Non-emergency assistance or information.

*Office of the Ombuds* - (213) 821-9556 (UPC) / (323-442-0382 (HSC) ombuds.usc.edu

A safe and confidential place to share your USC-related issues with a University Ombuds who will work with you to explore options or paths to manage your concern.

Students are expected to comply with all aspects of USC's COVID-19 policy. Failure to do so may result in removal from the class and referral to Student Judicial Affairs and Community Standards.

### **Academic Accommodations:**

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 as early as possible in the semester. DSP is located in STU 301, and is open 8.30am-5.00pm, Monday through Friday. The phone number for DSP is (213)-740-0776.

## **Academic Integrity Policy:**

We are committed to upholding the University's Academic Integrity code as detailed in the SCampus Guide. It is the policy of the Economics Department to report all violations of the code. Any serious violation or pattern of violations of the Academic Integrity Code will result in the student's expulsion from the major or minor, or from the undergraduate program.

## **Policy on Missed Exams:**

Students must take the exams as scheduled. The only valid reason for missing an exam is serious illness (as verified in writing by a medical doctor).

There will be no make-up exams unless a student has a valid medical excuse and can provide documentation for such an excuse, or if a student cannot take the exam because of extenuating circumstances, and prior arrangements are made with the instructor if possible. The student will receive zero credit for unexcused missed exams.

Student will receive an F for the course if final exam is missed for unexcused absence regardless of student's performance during the semester. If a student has a valid reason for missing the final exam, and can document it, he/she will be awarded an incomplete "Re-grades" will only be undertaken if there is evidence of a grading error. **However, the whole exam will be re-graded, so your exam grade could go down.**

Both the professor and the TA use the website for posting handouts, lecture notes, problem sets, etc., so monitor the website frequently.

## **Course Outline (Tentative)**

1. What is econometrics?
2. Review of Statistics
3. Linear Regression Model (Univariate)
4. Hypothesis Testing
5. Multiple Regression
6. Functional Form
7. Dummy Variables
8. Multicollinearity
9. Heteroskedasticity
10. Autocorrelation
11. Model Selection
12. Endogeneity
13. Introduction to Timeseries data and forecasting