Department of Economics
University of Southern California

Introduction to Econometrics

Professor Vittorio Bassi

Fall 2018
Economics 318

Lectures: Monday/Wednesday 2:00-3:50pm – KAP 144

Discussion Section: Tuesday 6-6:50pm – GSF 109; Friday 1:00 -1:50pm – KAP 140

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Course Overview

This course follows Introduction to Statistics for Economics (Econ 317). It is intended to provide students with an understanding of and experience with the key methods economists use to quantify the relationships among variables. A major goal is to prepare students to carry out high quality statistical analysis themselves.

The main focus will be on multivariate regression and causal inference. Topics will include functional form, heteroskedasticity, serial correlation, omitted variables and simultaneity bias, instrumental variables, and forecasting. If time permits, I will also cover implementation of some basic machine learning techniques at the end of the course. We will consider a number of types of data, including cross-sectional data, time series data, and panel data. Practical as well as theoretical issues will be discussed in how to distinguish correlations from causal effects.

Students will become proficient in the use of STATA, a leading computer program for statistical analysis in the social sciences. We will go through the steps of obtaining and coding data for use in an analysis. Review sessions and problem sets will provide experience in the use of econometric techniques to analyze data.

Readings:

Required Text

Jeffrey M. Wooldridge, Introductory Econometrics: A Modern Approach, South-Western College Publishing, 6th edition. The international edition or the 5th editions are fine, since there is little difference between the 5th and 6th editions. You can also search online for digital versions of the textbook: these may be available for a lower cost.

Supplementary Texts

If we are able to cover the material as on the calendar, I will give an introduction to machine learning techniques during the last 1.5 weeks of the course. An excellent introductory text is An Introduction to Statistical Learning by James, Witten, Hastie and Tibshirani. The material in the textbook is at more advanced level than in this course, so I will not go into the level of detail in the book. You do not need

a copy, it is only a reference – all test and problem set material will be based on class lectures. Statisticians are more generous than economists, so you can get a free copy on Professor James' website at http://www-bcf.usc.edu/~gareth/ISL/ISLR%20First%20Printing.pdf.

STATA

The computer program STATA will be used extensively in the course. The program has good help facilities and guides available for free on the internet. UCLA maintains an excellent web site devoted to STATA. TA sections will be used to go over key STATA commands. If you have a question, you can likely google it and find an answer. Popular sites for answering questions about Stata include Statalist and StackOverflow.

You do not absolutely need to buy STATA since it is readily available on public computers around campus, but it may be helpful to have on a personal computer. The current version is Version 15, but Versions 11, 12, 13 and 14 are equally fine. You can purchase STATA by following the instructions at https://itservices.usc.edu/stats/stata/, You should choose either STATA IC, SE, or MP.   STATA IC is fine for the course and most research projects, and the least expensive option ($45 for a 6 month license).

Requirements

1. Problem sets (20%):

2. Quizzes (20%)

3. Midterm exam (25%)

4. Final exam (35%).

Problem Sets: Problem sets will include both analytical problems and empirical problems that involve computing. Your lowest problem set grade will be dropped, so you can miss one with no questions asked. However, it is strongly recommended that you attempt all of the problem sets. **I do not accept late problem sets.** You are permitted to work in groups on the problem sets, but you must do all your own computing and write up your own answers. You must indicate the name of group members on your assignment.

Quizzes: These will be posted each week to blackboard and contain 10 questions, each worth 10 points. They are designed to ensure that you are keeping up with the material even during weeks that you do not have problem sets. Quizzes are open-book, meaning that you can use your textbook and class notes when taking them. However, you cannot consult with other students. Quizzes for a particular week must be taken before the Monday class of the following week. The lowest 2 quiz grades will be dropped.

Note on STATA: Logs must be attached to problem sets. STATA code must follow good programming practice and be well-commented.

TA Sessions:
Attendance at the weekly TA sessions is **highly recommended**. During the TA sessions, the TAs will instruct you in how to use Stata, which is necessary for completing the problem sets. You will also be tested on your knowledge of Stata during the exams. The TAs will also go over important concepts from class and problem set solutions.

Schedule of Readings and Lecture Topics

Class attendance and participation is mandatory. It is highly recommended that you do the reading for a particular class **before** coming to class so that you are prepared and can ask questions if you were confused.

The first two weeks will review and go slightly more in-depth on material that you covered in Econ 317. You should read each of these appendices prior to coming to class since I will not have time to go through all of the material. This material is the basis of all of the rest of the class, so it is absolutely vital that you have a firm understanding.

I will be coordinating the course material and lectures with Professor Weaver (who teaches ECON 318 on Tues/Thurs from 4-5:50pm) so that we cover the same material. If for some reason, you are unable to attend a particular lecture, you can go to his lectures, but you may not do this any more than 2 times in the semester. Our lectures may differ slightly, so it is your responsibility to also check with your classmates to ensure that you know what we have covered in the class.

	Topics	Readings	Problem Set
Week 1 August 20	Course introduction and math review	Ch 1 Appendix A, especially A.1 on properties of sums.	
August 22	Random variables and their probability distribution, Joint, marginal and conditional distributions Expected value, variance and standard deviation of random variables and their properties	Appendix B1-B5, especially B.3 and B.4.	
Week 2 August 27	Normal and related distributions	Appendix C	
August 29	Random sampling, Estimators and estimates	Appendix C (continued)	
Week 3 September 3	**Labor Day – No Class**		
September 5	Basics of Simple Regression Analysis Bivariate Linear Regression Model OLS estimation of Bivariate Linear Model	Ch 2.1-2.5	PS #1 due
Week 4 September 10	Basics of Multiple Regression Analysis Multivariate Linear Regression Model OLS estimation of Multivariate Linear Model	Ch 3.1-3.2	
September 12	Statistical Properties of OLS	Ch 3.3, 3.4, 3.5	
Week 5 September 17	Basic Statistical Inference, confidence intervals, hypothesis testing	Ch 4.1-4.3	PS #2 due
September 19	Hypotheses about combinations of parameters Testing Multiple Hypotheses	Ch 4.4-4.5	
Week 6 September 24	Consistency of OLS Asymptotic Normality and Large Sample Inference Asymptotic Efficiency	Ch 5.1 Ch 5.2 (skip section 5-2a) Ch 5.3	PS #3 due
September 26	Developing and Using Regression Models	Ch 6 (skip 6-4c and 6-4d)	
Week 7 October 1	**Midterm Exam – this will cover material through chapter 4**		
October 3	Using multivariate regression to decompose group differences *Note that October 5th is the last day to drop the course without a mark of "W" on your transcript*	Ch7.1-7.3	
Week 8	Linear Probability Model; Logit; Probit	Ch 7.4-7.7	

October 8		Ch 17.1-a, 17.1-d (skip b and c)	
October 10	Heteroskedasticity-Robust Inference Testing for Heteroskedasticity Weighted Least Squares [time permitting]	Ch 8	PS #4 due
Week 9 October 15	The Challenge of Omitted Variable Bias Experiments/Randomized Controlled Trials	*Lecture notes and additional handouts*	
October 17	Experiments/Randomized Controlled Trials (continued)	*Lecture notes and additional handouts*	
Week 10 October 22	Difference Estimators	Ch 13.1-13.4	PS #5 due
October 24	Difference-in-Differences Estimators	Ch 13.5	
Week 11 October 29	Fixed Effects Models	14.1	
October 31	Random Effects Models	Remainder of Ch 14	
Week 12 November 5	Instrumental Variables	Ch 15.1-15.3	PS #6 due
November 7	Two Stage Least Squares and Testing for Endogeneity *Note that November 9th is the last day to drop the course with a mark of "W" on the transcript*	Ch 15.4-15.5	
Week 13 November 12	Time Series Data	Ch 10.1-10.2	
November 14	Functional Form, Dummy Variables and Index Numbers Trends and Seasonality	Ch 10.4-10.5	
Week 14 November 19	Introduction to Machine Learning –		PS #7 due
Week 15 November 26	Overview of LASSO **No class meeting, I will instead post a video of the lecture for you to watch**	ISLR 6.1 and 6.2	
November 28	Overview of tree-based estimators	ISLR 8.1	

Additional Resources
Below I list some resources that you may find useful for this course or future courses. None of the material is required, but all should be available at the library. I have listed some additional econometrics books, but the Wooldridge text is the best.

Econometrics
1. Mastering Metrics and Mostly Harmless Econometrics by Angrist and Pischke. These are short textbooks with an emphasis on the applications of the tools we develop in this course. Mostly Harmless Econometrics is more advanced.
2. Introduction to Econometrics by Stock and Watson. This textbook is at a slightly lower level to Introductory Econometrics by Wooldridge.

STATA
3. Microeconometrics Using Stata: Revised Edition by Cameron and Trivedi. An in-depth overview of econometrics with STATA.
4. Statistics with STATA by Hamilton. A good guide to Stata.
5. STATA guides at UCLA and Princeton. Both include tutorials, detailed help files, and web

videos.

Applied Economics

6. Freakonomics and Superfreakonomics discuss a number of applied economics papers. If you read some of the papers that the books are based on, you will see that they use the econometrics you learn in this course.
7. Some excellent podcasts about applied economics is NPR's Planet Money and The Indicator, as well as the BBC's More or Less.
8. The site websites http://microeconomicinsights.org/   and http://voxeu.org/ provide short summaries of economics articles on a variety of topics. Most of the articles are empirical, and many use techniques covered in the course.

Policy on Missed Exams

Students must take the exams at the scheduled times. The only valid grounds for a make-up exam is a valid medical excuse with documentation, or extenuating circumstances for which prior arrangements have been made with the instructor. No credit will be given for unexcused, missed exams. Student will receive an F for the course if the final exam is missed for an unexcused absence. If you have a valid reason for missing the final exam, and can document it, you will be awarded an incomplete.

Under the USC ARR Grade Handbook, students are never permitted to omit taking the final exam or take it early. The only possible grounds for taking the final exam at a different time from the rest of the class are: (1) two final examinations that are scheduled for the same time; or (2) more than two final examinations on the same day. If this situation applies to you, you must contact both me and the other involved professors no later than two weeks prior to the examination dates.

Statement on 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 - https://policy.usc.edu/student/scampus/.

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. Academic misconduct will not be tolerated, and any violations will be reported to the University for adjudication. Portions of your exams will be photocopied before being returned to you to ensure that no alterations are made to test booklets after return in an attempt to receive a higher grade.

Statement for 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.

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.

Support Systems:

Student Counseling Services (SCS) – (213) 740-7711 – 24/7 on call
Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention. engemannshc.usc.edu/counseling

National Suicide Prevention Lifeline – 1 (800) 273-8255
Provides free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week. www.suicidepreventionlifeline.org

Relationship and Sexual Violence Prevention Services (RSVP) – (213) 740-4900 – 24/7 on call
Free and confidential therapy services, workshops, and training for situations related to gender-based harm. engemannshc.usc.edu/rsvp

Sexual Assault Resource Center
For more information about how to get help or help a survivor, rights, reporting options, and additional resources, visit the website: sarc.usc.edu

Office of Equity and Diversity (OED)/Title IX Compliance – (213) 740-5086
Works with faculty, staff, visitors, applicants, and students around issues of protected class. equity.usc.edu

Bias Assessment Response and Support
Incidents of bias, hate crimes and microaggressions need to be reported allowing for appropriate investigation and response. studentaffairs.usc.edu/bias-assessment-response-support

The Office of Disability Services and Programs
Provides certification for students with disabilities and helps arrange relevant accommodations. dsp.usc.edu

USC Support and Advocacy (USCSA) – (213) 821-4710
Assists students and families in resolving complex issues adversely affecting their success as a student EX: personal, financial, and academic. studentaffairs.usc.edu/ssa

Diversity at USC
Information on events, programs and training, the Diversity Task Force (including representatives for each school), chronology, participation, and various resources for students. diversity.usc.edu

USC Emergency Information
Provides safety and other updates, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible. emergency.usc.edu

USC Department of Public Safety – UPC: (213) 740-4321 – HSC: (323) 442-1000 – 24-hour emergency or to report a crime.
Provides overall safety to USC community. dps.usc.edu