Syllabus: Economics 120B – Econometrics

Winter 2022

Prof. Eli Berman (he/him), UC San Diego

Details might change as we discover more about COVID and online instruction.
Classes will be entirely online for the first two weeks this quarter, at least.

Description: This course prepares students for practical empirical research in an academic or business setting. It covers four major ideas in econometrics:

- quantifying uncertainty using confidence intervals
- using linear regression to infer causal relationships
- omitted variable bias
- using linear regression for prediction.

The material may be *technically difficult* and the *workload substantial*, particularly if you find math courses challenging or are new to statistical software. Your payoff will be skills and analytical tools useful for research, and on your next job –should it involve data at all.

Times: Tuesdays 5-7:50pm, initially on zoom, aspirationally in MOS 113. (*C00 Jumbo*),
Tuesdays and Thursdays, 12:30 – 2:00pm, initially on zoom , aspirationally in HSS 1315. (*D00*)

You may attend either class, regardless of which you are enrolled in, while classes are online. When/if we return to in-person instruction, you will need to attend the class you are enrolled in. But be sure to attend exams of the class you are enrolled in (see below).

Contact me? elib@ucsd.edu , but you'll get quicker response
Office hours: Mon. 4-5pm, on zoom

Questions? For questions about logistics or content, use the Discussion board "Ask the TA" on Canvas. Email is best for questions of a personal nature.

Sections:	Wednesday	8:00 - 8:50pm	zoom/CENTR 105	- content
	Friday	Noon - 12:50pm	zoom/HSS 1305	- same content as Wed 8pm
	Friday	2:00 - 2:50pm	zoom/PETER 104	- Q&A (unrecorded)
	Friday	4:00 - 4:50pm	zoom/PETER 104	- Q&A (unrecorded)

Sections aim to cover the same information, so attend one per week. If social distancing becomes a constraint we may require attend your assigned section. No section first week of class.

TAs:	Angela Yutong - aygu@ucsd.edu	OH Thurs 5-6pm (zoom) weeks 5-10
	Jin Xi – x5jin@ucsd.edu	OH Wed 11am – noon (zoom) weeks 1-5

TAs are very clever, and well trained in econometrics. I encourage you to take advantage of their help. There are no TA OH the first week of class.

Prerequisite: Econ 120A or ECE 109 or Math 180A or Math 183 or Math 186 or instructor permission.

Class website: canvas.ucsd.edu/courses/32881
The class site will contain this syllabus, lecture notes, homework assignments, occasional class announcements, and discussions.

Discussion Board: The **fastest** way to get an answer online. Choose <Discussions> on Canvas, then <**Ask the TA**>. TAs and I monitor this more frequently than email. You may post anonymously but you can earn participation points by posting with your name.

Text and Online Video:
This course uses *both* a textbook and online instructional videos (EVH). The two are not always substitutes, so check both. Which you find more helpful may depend on your learning style. I will direct you to appropriate resource during class lectures.

Text: Introduction to Econometrics, by Stock and Watson (REQUIRED).
An e-book is available through the Canvas site for 12 weeks access. (You must click the Redshelf link – then "view course materials" to **opt out by January 15**, to avoid being charged.) Email will come from donotreply@redshelf.com, if your spam filter permits.
Paper text may be available elsewhere, new or used, and from library reserve.
Questions? Try textbooks@ucsd.edu or RedShelf Solve.

EVH Videos: The Econometrics Video Handbook (EVH) is a series of videos developed and maintained by UCSD Econ Professors (including Berman and Dahl) in conjunction with IT Services Educational Technology. You can access EVH on the class canvas page, for free.

Software: Some problem sets will require a software package called *Stata*. *Stata* is essential for problem sets, so access the campuswide license. New to command line programming? Worry not: tutoring in Stata and other computer skills will be provided by your superb TAs.

Homework: Homework is an integral part of this course, --the best way to learn econometrics is to do it. Homework will be posted on the course page; it is your responsibility to check for them.

Homework will be graded on a four-point scale.
1 -- clearly incomplete, but has made a start towards answering some of the questions.
2 -- largely complete, but does not answer every question in full.
3 -- clearly well-done, and answers all of the assigned problems.
4 -- complete and at least 80% correct.

Students may work together on problem sets, although solutions must be written up and submitted separately (including any computer output). It is a good idea to attempt the problems on your own before meeting with a group, so that you fully understand (and can help your friends). Any homework you turn in must represent your own work.

Solution keys to homework will be posted. These solutions will be comprehensive so homework is mostly graded for completeness and will not be returned. If you want a copy of your homework, please make a copy before you turn it in.

Your homework is due at the *beginning* of class, one to two weeks after it is assigned. Late problem sets will **not be accepted** for any reason.

You may miss one homework without penalty, as I drop the lowest score before calculating the homework portion of your grade. The tradeoff for this benefit is that I will be strict about *not accepting late homework*.

Online classes:

Synchronous learners: I aspire to recreate the joy and intimacy of a real life classroom, so please find a quiet place where you are comfortable leaving your camera on and your microphone live, so we can enjoy watching each-other learn. You can earn participation points by asking questions, verbally and in chat (or on bulletin board).

Asynchronous learners: Sorry you're missing out. You can earn participation points by submitting questions on discussion board or by email.

Participation Points: (this changed as of week 2)

Students can get one participation point per (80 minute) class (two per week), by asking (during the same week) a great question in class, section, office hours. Students approved as asynchronous may also earn participation points by posting questions on "Ask the TA."

Exams: One midterm exam and a final. We reserve the right to record exams, to preserve academic integrity. I have not yet decided on an examination technology.

Exams will be outside class time.

Midterm: Friday, Februrary 4, 8pm-9:20pm, location TBA.
Final: Saturday, March 19, 11:30am-2:30pm, location TBA.

If you cannot attend an exam, the alternative will be an oral examination. Tell us now if you must request an oral examination, so that we can evaluate the request in advance and schedule the examination if that request is granted.

Grades: This formula will determine your course grade:

Max (30% x Midterm Exam + 40% x Final Exam, 20% x Midterm Exam + 50% Final Exam) + 15% x Homework + 15% Participation.

Note: a weak midterm can be made up for by writing a strong final; the homework and participation contribute by helping you understand the material and practice it.

Grading Policy: If you find a mistake in grading your exam, you may request a regrade: Write out your reasoning and submit it with your exam within 10 days of when the exam was first returned. Include an email address on your written explanation so we can let you know the result. If you request regrading, your entire exam is subject to regrade. This may bring to light unnoticed errors, so *you could end up with a lower score.* Note, unless your answer is fully correct, the assignment of partial credit is a matter of judgment and subject to a grading scheme, so we are unlikely to change your grade –as the scheme treats all class members equally.

Cheating: Cheating is not allowed. If you are caught cheating, helping someone cheat, or plagiarizing on an exam or homework, you will be referred to the appropriate campus office. Communicating with anyone other than us during an exam is cheating. One possible penalty is failing the class; campus imposes even stiffer penalties. Again, we reserve the right to record exams.

Miscellaneous:

Disabilities will be accommodated. For details contact our wonderful student affairs staff in Sequoyah Hall 245, through the advising center vac.ucsd.edu , or econugadvisor@ucsd.edu . For administrative matters regarding *dropping or adding* the course, waitlists and such, please contact the office of student affairs or use the online resources provided by the university at https: //students.ucsd.edu/ . I don't manage the waitlist.

COURSE OUTLINE

1. Introduction: Why Study Econometrics?
Demand for Coffee.
Who needs data anyway? If you had some, what would you do with it?
Econometric models, parameter estimates, prediction and the testing of economic theories.
Getting good data. Experimental vs. nonexperimental data. Cross-sections, Time-Series, Panels.
Resources: *Stock & Watson* - Chapter #1; EVH D1. Introduction to Econometrics

2. Probability and Statistics: A quick review
Probability, random variables, the normal distribution and the central limit theorem, inference, confidence intervals and hypothesis testing. Asymptotics of the sample mean. Using *Stata*.
Resources: S&W- Chapters #2 and #3; EVH - A. Descriptive Statistics, B. Probability, C. Statistics.

3. Simple Regression (one regressor)
Fitting a line through a cloud of points.
Least squares, unbiased estimates, consistent estimates, confidence intervals, hypothesis testing, omitted variable bias, R^2.
Resources: S&W - Chapters #4 and #5.
EVH – E1. Single Variable Linear Prediction Models, F5. Multivariate Linear Causal Model.

4. Multiple Regression: Estimation
The second explanatory variable, interpreting coefficients, omitted variable bias.
Efficiency & heteroskedasticity.
Resources: S&W - Chapter #6. EVH – E2. Multivariate Linear Prediction Models

Midterm -- *Friday, February 4, 8pm-9:50pm, location TBA*

5. Causal Inference and Random Assignment
Random assignment vs. omitted variable bias.
Resources: S&W - Chapter #13.
EVH – F1. Causality and Causal Models, F2. Predictive Analysis and Causal Inference, F3. Simple Linear Causal Model, H1. Understanding Causality. H3. Natural Experiments.

6. Multiple Regression: Inference and Nonlinearity
Confidence intervals (CI) for parameters, hypothesis testing, single (t) vs. multiple (F) tests.
Etiquette in reporting results, modeling nonlinear functions, interaction terms.
Resources: S&W - Chapters #7 and #8. EVH – F4. Multivariate Linear Causal Model.

7. Sources of Bias: measurement error, sample selection, simultaneity and omitted variables
Omitted Variable Bias again, measurement error, fixed effects, sample selection, simultaneity.
Resources: S&W - Chapters #9 and #10. EVH – J1. Panel Data, J2. Fixed Effects, J3. Differences in Differences.

Final Exam – *Saturday, March 19, 11:30am-2:30pm, location TBA.*

Questions? Please feel welcome to contact us through the discussion board (on Canvas), email your TA, or email me at elib@ucsd.edu, or come chat during office hours. We don't bite.