# Syllabus: Economies 120B – Econometrics

**Winter 2020**

**Prof. Eli Berman, UC San Diego**

**THIS SYLLABUS WILL CHANGE AS THE QUARTER PROGRESSES**

**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.
- And, we cover advanced concepts such as heteroskedasticity and fixed effects.

The material may be technically difficult and the workload substantial, particularly if you find math courses challenging or have never used statistical software. Your payoff will be skills and analytical tools that are useful for research, and in high demand in the marketplace.

**Times:** Tuesdays and Thursdays, 3:30 – 4:50pm, WLH (Warren College) 2112
Tuesdays and Thursdays, 5:00 – 6:30pm, WLH (Warren College) 2112
You may attend either class, regardless of which you are enrolled in, as long as the Fire Marshall's seating safety limit is not exceeded. (Should this become a problem, we will insist that you attend your assigned class.) Seating priority will go to students in their enrolled class.

**Contact me?** elib@ucsd.edu
Office hours: Monday 1-3pm ECON 218

**Sections:**

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| | Wednesday | 10:00 - 10:50 | TM (Marshall College) 102 |
| | Wednesday | 11:00 - 11:50 | TM (Marshall College) 102 |

You may attend any section, regardless of which class you are enrolled in, provided that the Fire Marshall's seating safety limit is complied with. Sections aim to cover the same information, so no need to attend more than one per week. There will be no section the first week of class.

**TA:** Ha Dieu Vu, vha@ucsd.edu
TA office hours (OH) will be in PSET lab (see below).
The TA is very clever, and well trained in econometrics. I encourage you to take advantage of their help. There are no OH the first week of class.

**Reader:** Beata Luczywek

**UIA:** Qijing Ma, qim018@ucsd.edu, will hold OH in PSET lab (below)

**PSET** (Problem Solving and Economics Tutoring lab):

- Econ 300
- Starts week 2
- Hours and schedule here
- (PSET is closed for holiday weekends)

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

**Class website:** canvas.ucsd.edu

The class site will contain this syllabus, lecture notes, homework assignments, occasional class announcements, and discussions. You should check it regularly.

**Text and Online Video:**
This course uses *both* a textbook and online instructional videos. The two are not always substitutes for each other. For some class topics the videos are the better resource, while for others the textbook is better. Which you find more helpful may also 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 (via RedShelf; link on the left side of course page) $22.38 for 12 weeks access. (This is an *opt-out system,* so click Redshelf link to opt out within two weeks to avoid charges.) Paper text is $69.00 new/ $51.75 used to purchase from bookstore.

**EVH Videos:** The Econometrics Video Handbook (EVH) in an exciting new resource, a series of videos developed and maintained by Professors Beare, Berman, Dahl, Elliot, Famulari, Sun, Watson, and Wuthrich, of UC San Diego in conjunction with IT Services Educational Technology at UCSD, funded by an Innovative Learning Technology Initiative grant from the UC Office of the President.
You can access the EVH on the class canvas page. Access is free.

**Software:** Practical learning will require a software package called *Stata*. *Stata* is essential for problem sets, so access the campuswide license, or use in a lab. Tutoring in Stata and other computer skills will be provided by your superb UIA, in the PSET room.

**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 handed in 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 the homework will be posted. These solutions will be comprehensive and the homework is mostly graded for completeness, so homework 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; if you cannot attend class, have a classmate turn it in for you, or turn it in at TA OH *before* class. Emailed homework will not be accepted.

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*.

**Laptops, phones, tablets and other distracting technology:**

*Put them in airplane mode and turn off Wifi when class begins*. Your full attention is required and I can't possibly compete with your social network friends online. So, hide your phones. Feel free to use your laptops and tablets to take notes, but without internet or mobile access. If devices become a distraction I reserve the right to ban them.

**Tests:** We will have one midterm exam and a final. We reserve the right to record video of exams, to preserve academic integrity. **All exams will be out of class.**

Midterm: Monday Februrary 10, 8pm-9:20pm, location TBA.
Final: Saturday, March 21, 3pm-5:59pm, location TBA.

Exams are administered across all 120B sections simultaneously, including those taught by Professor Dahl. They are not necessarily the same exam questions across courses and sections.

There will be no scheduled make-up exams or alternative exam dates. In the tragic case of illness, accident or misfortune precluding you taking the midterm –with documentation from a doctor, the police or a suitable authority, we will meet and decide on some grading solution.

**Grades:** The following formula will determine your course grade:

Max (35% x Midterm Exam + 55% x Final Exam, 20% x Midterm Exam + 70% Final Exam) + 10% x Homework.

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

**Grading Policy:** If you think a mistake was made in grading your exam, you may request a regrade: Write out your reason for a regrade and submit it with your exam within 10 days of when the exam was first returned to the class. 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 may end up with a lower score.* Note that 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 --to treat 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. Having unauthorized notes on your person during the exam constitutes cheating, for example, as does using a smartphone during an exam. One possible penalty is failing this class; campus imposes even stiffer penalties. Again, we reserve the right to monitor exams by video.

**Miscellaneous:**

Disabilities will be accommodated. For details contact our excellent staff: Jennifer Beauchamps and the staff in the office of undergraduate student affairs in Sequoyah Hall 245.
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/ .

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

**COURSE OUTLINE (EVH resources subject to change)**

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.

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 -- Monday, Feb 10, location TBA

5. Causal Inference and Random Assignment
Random assignment vs. omitted variable bias.
*Resources:* S&W - Chapter #13. EVH – F. The Linear Causal Model, H1. Understanding Causality.

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.

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.

Final Exam – Saturday, March 21, location TBA