# Econ 120C: Econometrics

Professor Yixiao Sun
Department of Economics,
University of California, San Diego
Spring 2022

## 1. Teaching Team

**Instructor:** Professor Yixiao Sun, yisun@ucsd.edu

**Teaching Assistants:**
Spini, Pietro: pspini@ucsd.edu
Zhu, Linyan: liz125@ucsd.edu
De Vries, Tjeerd: tjdevrie@ucsd.edu

**Reader:** Xie, Haitian: hax082@ucsd.edu

## 2. Organization

**Delivery and class time**

- The lecture and discussion sessions will be delivered in-person

- The lecture meeting time: (you can attend either class)

  9:30am – 10:50am, Center 105, TuTh.

  12:30pm – 1:50pm, Center 214, TuTh.

- The discussion meeting time: (you can attend any of the following four sessions)

  3:00pm-3:50pm, RWAC 0121, Wednesday

  4:00pm-4:50pm, RWAC 0121, Wednesday

  5:00pm-5:50pm, RWAC 0121, Wednesday

  6:00pm-6:50pm, RWAC 0121, Wednesday

**Office hours**

We will hold our office hours via Zoom or in-person. Zoom links will be posted on Canvas (under "Zoom LTI PRO")

Yixiao Sun, 10:00am – 11:30am, Wednesdays, on Zoom or in person by appointment.

TAs' office hours will be posted on Canvas)

**Communications**

1. We are available for questions during our office hours and discussion sessions.

2. You can post your questions to the discussion board on Canvas. We will check the discussion board regularly and answer your questions there. **Please use the discussion board rather than emailing me unless you need to discuss a private matter.**

3. When you have to email us regarding a private matter, please include ECON120C in the subject line (this is a good practice for any course), and we will try to respond to your email before any other emails.

4. As your instructors, we do not have any control over enrollment, waiting list, and any other administrative issues. These matters are handled by the department's undergraduate advising office.

## 3. Course Description

This course covers contemporary causal inference methods in observational studies. In a complex system, economic and beyond, causal inference aims at determining the causes and effects of the actions being studied — for example, the effect of increasing the minimum wage on employment, the impact of increasing the education level on earnings, the effect of more (or less) aggressive police responses on reducing domestic violence, and the influence of introducing higher property-right protection on economic growth. The course introduces students to the concepts and methods that are commonly used by economists and other practitioners to identify and estimate the causal effects of an action or policy. The main topics are correlation vs causality, panel data methods, instrumental variable regression, experiments and quasi-experiment, difference-in-differences, and regression discontinuity. The course will enable students to provide insightful and enlightening answers to many interesting questions of causation. It will also equip students with the knowledge to estimate the fundamental relationships in economics such as the demand and supply. The course is particularly recommended for students who plan to pursue a quantitative career in business analytics, policy evaluation, etc.

Throughout, we will focus on both understanding and doing. The understanding part will come from lectures and discussion sessions. The doing part will come from problem solving and extensive statistical software use. This course requires serious commitment. Econometrics is best learned by doing, and you will be asked to do a fair amount of hands-on work.

**Prerequisites**

ECON120C is the sequel to ECON120B. You are expected to have a thorough grasp of the material covered in Econ120B, namely, the linear regression model. In addition, you are expected to be familiar with basic statistics and probability, and to have some working knowledge in calculus.

**Textbook**

The required textbook for this class is **Introduction to Econometrics**, by James Stock and Mark Watson. The book will be available as an eBook through Canvas. Note that the lectures will cover many additional materials not found in the textbook.

The eBook is provided by the UC San Diego Bookstore through Canvas and are free for the first two weeks of classes. After two weeks, your student account will be charged a special reduced price unless you opt out. If you decide to opt out you must complete the process by **April 9th, 2022** and you will be responsible for sourcing the materials elsewhere.

For any questions about billing please contact textbooks@ucsd.edu.

For any questions about using your eBook, please reference RedShelf Solve at **??**

To opt-out:

- Click the RedShelf link in Canvas

- Click View Course Materials

- Scroll down to the gray opt-out button and follow the prompts to opt out.

Again, you have until **April 9th, 2022** to complete this process and you will be responsible for getting access to the materials elsewhere.

**Econometrics Video Handbook**

The course will follow the Econometrics Video Handbook (EVH) fairly closely. The EVH is available through Canvas. For some topics, you may be asked to watch videos in the EVH. I will post on Canvas which video(s) to watch. The EVH is the product of the department's most recent effort in modernizing econometric training at UCSD.

**Main Topics (subject to change)**

Part I. Review of Econ120A/120B.

Part II. Causality and Causal Models; Threat to the validity of OLS for causal inference

Part III. Panel Data Models

Part IV. IV and 2SLS

Part V. Experiments and Quasi-experiments: DID and RDD

**4. Software**

You will have to use the statistical software package Stata to solve some assignment problems. Download and license information is available on Canvas. Please do not distribute the license information outside of UCSD. It is against the law.

### 5. Assessment

**Assignments (15%)**

There will be eight assignments, each of which will carry a weight of 1.875% towards the final class grade. Assignments will be graded on three scales. A score of 50% will be given to an assignment which is clearly incomplete, but has made a start towards answering some of the questions. A score of 75% will be given to an assignment which is largely complete, but does not answer every question in full. A score of 100% will be given to an assignment which is clearly well-done, and answers all of the assigned problems.

The assignments will involve both theoretical and empirical work. If you have any question on the problem sets, please ask me or TA during our office hours. Our office hours are for you.

Answers to assignments are to be submitted via Canvas. You can scan your answer into a pdf using a free app on your smart phone. **DO NOT** email assignments.

Assignments are due at 11:59pm on Fridays. **LATE answers will not be accepted!** The lowest assignment score will be dropped (if you are happy with the first seven scores, you do not need to submit the last assignment). The average of the rest seven scores will be counted toward your final grade. The tradeoff for this benefit is that we will be strict about not accepting late assignments. **Please DO not request an extension for ANY reason. Such a request will be ignored automatically. Requesting for an exception is not fair to other students and imposes extra burdens on the teaching team.**

For each assignment, a solution will be posted on Canvas after its due date. The solution will be posted together with the assignment. **Some assignment problems will appear in the exams.**

**Midterm Exam (35%) and Final Exam (50%)**

There will be one midterm exam and one final exam.

Midterm Exam: 04/29/2022, Friday, 7:00pm–8:20pm, Online exam proctored by Zoom

Final Exam Time: 06/04/2022, Saturday, 7:00pm–9:59pm, Online exam proctored by Zoom

- Both exams will be delivered via Canvas. Please make sure you have a good and stable internet connection.

- Both exams will be closed-book. No calculator is needed or allowed. You can have ONE page (double-sided, no larger than 8.5in by 11in) of note. It must be hand-written; photo reducing and pasting are not permitted. The note policy applies to both the midterm exam and the final exam. No other notes is allowed.

- There will be no make-up exam for the midterm. If you miss the midterm for a verifiable medical reason, I will use your final exam score for the missing midterm. Failure to notify me promptly that you must miss the midterm will

result in a zero grade. I will not excuse any other absences, as the exam time is given well in advance. Please do not request an exception. Such a request will be ignored automatically. Unexcused absences will result in a zero.

- There will be **no alternative exam time for either the midterm exam or the final exam.** Please do not request a different exam time for any personal reason (e.g., ceremony of any type, organization activity of any type) unless it is related to an unexpected health issue. In such a case, a doctor's certificate is required. Please make sure that the doctor's name, phone number and email address are legible.

- **There will be no make-up final exam**. An exception is medical absence, in which case a doctor's certificate is required. Please make sure that the doctor's name, phone number and email address are legible. Please scan and email the doctor's certificate **as soon as possible**. Failure to notify us before or on the exam date will result in a zero grade. **Please do not request any other exception**.

- We will use Zoom to proctor the exams. You are required to show your student ID to your camera at the beginning on the exam. You are required to submit your Zoom meeting ID in advance and record your video with both audio and video on. Please share your computer screen (only one monitor is allowed). Make sure that your desktop, your face, and your hands will appear in the Zoom recording. Submit your Zoom recording by embed the video into a video submitting assignment on Canvas. Failure to submit the Zoom meeting ID for the exam session or provide a proper recording will result in a zero grade for the exam. Please read the exam proctoring protocol on the class page carefully.

### 0.0.1 Grading

All three parts (assignment, midterm and final exams) are needed to pass the class. If there is a zero in any of the three parts, you will get an "F". For example, if you turn in none of the assignments, you will receive an "F" regardless of your exam scores.

Conditional on a non-zero score on each of the three parts, the course grade will be assigned as follows. First, the weighted average of numerical scores will be obtained. Suppose your scores on the assignment are 75, 0, 100, 100, 100, 100, 100 and 75. Your midterm and final exam scores are 82 and 85, respectively. Then, after dropping 0, the lowest assignment score, the weighted average is $(75 \times 2 + 100 \times 5)/7 \times 0.15 + 82 \times 0.35 + 85 \times 0.50 = 85.129$. The weights on the assignments, the midterm, and the final exam cannot be changed. Second, if the class average of the weighted average is below 70 points, points will be added to all scores to bring the mean score to 70 points. Finally, after rounding, letter grades will be assigned using the following scale:

| | | | |
|---|---|---|---|
| >=90 A+ | [75,80) B+ | [60, 65) C+ | [45 50) D |
| [85,90) A | [70,75) B | [55, 60) C | < 45 F |
| [80,85) A- | [65,70) B- | [50, 55) C- | |

Note that the scale is exact, and letter grade assignment is automated. For example, if your score is 84.5, you will get an A; If your score is 84.4, you will get an A-.

A regrading request has to be made within one week after a grade is posted. Regrading is possible only if there is a grading error.

We can help with any questions you may have during the quarter. However, no opportunity for extra credits will be provided after the final exam. Please do not ask if there is anything else you can do to improve your grade after the final exam. You should ask us this question during the quarter. All issues should be sorted out as soon as they arise — do not wait until the end of the quarter.

## 6. Other policies

If you have a documented disability, please email me your documentation as soon as possible so that I can make suitable accommodations for you. If you believe that you have a disability and need some special accommodations, please register with the Office for Students with Disabilities.

Students who violate UCSD's academic integrity policy will earn a failing grade for the course. In addition, the Council of Deans of Student Affairs will impose a disciplinary penalty.