

# Econ 120C: Econometrics

Professor Yixiao Sun  
Department of Economics,  
University of California, San Diego  
Spring 2024

## 1. Teaching Team

**Instructor:** Professor Yixiao Sun, [yisun@ucsd.edu](mailto:yisun@ucsd.edu)

**Teaching Assistants:**

Information on teaching assistants can be found on [canvas.ucsd.edu](https://canvas.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)  
9:30a-10:50a, Center 109, TuTh (smaller class)  
2:00p- 3:20p, Center 113, TuTh (larger class)
- The discussion meeting time: (you can attend either session)  
7:00 pm–7:50 pm, Center 214, Tuesday  
7:00 pm–7:50 pm, Center 214, Thursday
- If technology allows, lectures and discussion sessions will be pod-casted. The EdTech (<https://edtech.ucsd.edu/>) controls when each podcast will be posted on Canvas (under “Media Gallery”). So please do not ask the teaching team for any podcast (we do not have control).

### Office hours

We will hold our office hours in person or remotely

Yixiao Sun, 2:00pm – 3:30 pm, Mondays, in SDSC 189E and on Zoom.

TAs’ office hours will be posted on Canvas.

## Communications

1. You **are encouraged** to post your questions to Piazza, which is linked to Canvas. We will check Piazza regularly and answer your questions there. **Please use Piazza rather than emailing us as much as possible. You can post a private message that only you and the teaching team can view and reply to. Most of the questions should not be set private, but you can post a question anonymously.**
2. We are also available for questions during our office hours.
3. Email us only if **you need to discuss a private matter**. 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 and any other administrative issues. These matters are handled by the department's undergraduate advising office or the university's Office of the Registrar.

## 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-experiments, 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 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 continuation of ECON120B, building upon the foundational concepts of the linear regression model. To ensure a successful understanding of the course material, it is essential that you are familiar with the topics covered in ECON120B. While MATH 181B can serve as a substitute for Econ 120B to meet the prerequisite requirement, it is recommended that you have taken Econ120B recently. In addition to the prerequisite knowledge, a solid background in basic statistics and probability is expected. Working knowledge of calculus will also prove beneficial but not required. As ECON120C involves practical applications of statistical analysis, it will be helpful that you have some experience with Stata, as this software will be utilized throughout the course. We will cover the basics of Stata if you need a refresher.

## **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.

The eBook is provided by the UC San Diego Bookstore through Canvas and is 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 before a deadline, and you will be responsible for sourcing the materials elsewhere.

Note that the lectures will cover many additional materials not found in the textbook. Relying solely on the book will not suffice for this course. The book will not be used for assignments.

## **Econometrics Video Handbook**

The course will closely follow the Econometrics Video Handbook (EVH), 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 represents the department's latest 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

In this course, you will be required to utilize the statistical software package Stata for solving certain assignment problems. Access to download and license information for Stata is available on Canvas. However, please remember that the license information should not be shared or distributed outside of UCSD.

Strict adherence to this policy is of the utmost importance since sharing the Stata license information could have severe legal consequences and potentially put our privilege to use the software at risk. The acquisition of a site license for Stata required substantial effort and communications among the Economics Department, the university administration/EdTech support, and the Stata company.

## 5. Attendance

I strongly encourage you to attend all lectures. I will take attendance for some of the lectures via Canvas. Each attendance will add 1/3 points to your weighted score; see below.

Your letter grade will not be affected in any way by the attendance credits that your classmates will get. There is no penalty for not attending lectures, but there is a reward for doing so!

Please do not request an attendance credit for any reason you miss a lecture. It takes too much of my time to handle these requests, and it will not be fair to other students. Attendance check is supposed to be automated without my further intervention. Here are some of the reasons that I will not consider:

- I was late for the class
- I left the class earlier
- I was sick on that day
- I had a schedule conflict

## 6. Assessment

### Assignments (10%)

There will be eight assignments, each of which will carry a weight of 1.25% towards the final class grade. For each assignment, a random question will be graded based on correctness, and the rest will be graded based on completeness. Completeness grading will use three scales. A score of 50% will be given to a question that is clearly incomplete but has made a start towards answering some part of the question. A score of 75% will be given to a question that is largely complete but does not answer every part in full. A score of 100% will be given to a question that is clearly well done and answers all parts of the question.

Most of the assignments will involve both theoretical and empirical work. If you have any questions on the problem sets, please ask us during our office hours. Our office hours are for you. You are also encouraged to post your questions on Piazza.

Answers to assignments are to be submitted via Canvas. You can scan your answers into a PDF using a free app on your smartphone. **DO NOT** email any assignments, as they will be ignored.

Assignments are due at 11:59 pm on Fridays. The lowest assignment score, such as zero for a missing assignment, 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 remaining 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 places 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. **Each of the midterm and final exams will contain at least one question from the assignments, possibly with some minor modifications.**

### **Midterm Exam (35%) and Final Exam (55%)**

There will be one midterm exam and one **cumulative** final exam.

Midterm Exam: 05/03/2024, Friday, 6:00 pm–7:50 pm, **in-person exam, classroom information will show up on Schedule of Classes**

Final Exam Time: 06/08/2024, Saturday, 3:00 pm–5:59 pm, **in-person exam, classroom information will show up on Schedule of Classes**

- Both exams will be closed-book. No calculator is needed or allowed. You are not supposed to get assistance from others or post your questions on the Internet during an exam. You are not allowed to use any search engine or online translator. You can have ONE page (double-sided, no larger than 8.5in by 11in) of note. It must be hand-written (on paper or using a digital device); photo reducing and pasting are not permitted. The one-page policy applies to both the midterm exam and the final exam.
- There will be no make-up exam. 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., a ceremony of any type, organization activity of any type, family reunion, ...) 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. We may contact the doctor to confirm the health issue.

- **There will be no make-up final exam.** An exception is a 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.**
- Anything we cover in class is subject to being tested. Conversely, if we did not cover a topic in class, it would not be tested. If it is not important enough to mention in class, it is not important enough to test.

## 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

$$(75 \times 2 + 100 \times 5) / 7 \times 0.10 + 82 \times 0.35 + 85 \times 0.55 = 84.736,$$

which is rounded up to 85. The weights on the assignments, the midterm, and the final exam cannot be changed.

Second, if the class median of the weighted average is below 70 points, points will be added to all scores to bring the median score up to 70 points. If the class median of the weighted average is above 75 points, points will be subtracted from all scores to bring the median score down to 75 points.

**The possible adjustment is based solely on the weighted score and takes place before adding any extra credits. There will be no direct adjustment made for either the midterm or the final exam; in other words, there is no curve for either exam. However, depending on the class performance, there may be an adjustment to the weighted score.**

Finally, after adding extra credits (e.g. attendance credits), if any, and rounding, letter grades will be assigned using the following scale:

$\geq 95$ A+	[80,85) B+	[65, 70) C+	[45, 50) D
[90,95) A	[75,80) B	[60, 65) C	< 45 F
[85,90) A-	[70,75) B-	[50,60) C-	

Note that the scale is exact. For example, if your score is 89.4, which will be rounded up to 90, you will get an A; if your score is 88.90, which will be rounded up

to 89, you will get an A-. Please do not email me for a grade change because you are only 0.1 away from the next grade.

Note: **we will follow the above grading criteria as much as possible, but the instructor may have to make a change upon a request from the department, the university, or for other unforeseeable reasons.**

When considering a re-grading request for either the midterm or final exam, please note that only obvious grading errors will be eligible for review. No adjustments will be made for partial credits. If you decide to request a re-grading, please be aware that the entire exam may be subject to reassessment. This means that the regrading process will involve a comprehensive review of the entire exam, not just specific portions. We take the process of regrading seriously and strive to ensure fairness and accuracy in evaluating students' performance. Therefore, it is crucial to submit a regrading request only when there is a clear and evident grading error to maintain the integrity of the evaluation process.

We can help with any questions you may have during the quarter. However, there will be no opportunities for extra credits once the final exam has concluded. Instead, we encourage you to proactively address any concerns or questions you may have before the final exam. Our goal is to support your academic success, and early communication and proactive efforts can greatly contribute to achieving that success.

## 7. Discussion Sessions

A common complaint is that the class lacks problem-solving sessions. Please note that each discussion session serves as a valuable problem-solving opportunity. During these sessions, the Teaching Assistant (TA) will engage you in various problem-solving exercises, including tackling variations of upcoming assignments before their due dates. Additionally, the TA may work through problems from past exams and other practice materials they have prepared.

Although the discussion sessions won't introduce new course material, they play a crucial role in teaching you how to apply and utilize what you learned from lectures to solve problems. **It is essential to attend discussion sessions for this class.**

## 8. 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.

I am a first-generation faculty. I will be more than happy to share my first-gen experiences and journey during office hours. I want to foster an inclusive classroom environment. I encourage you to interrupt me with questions during each lecture.