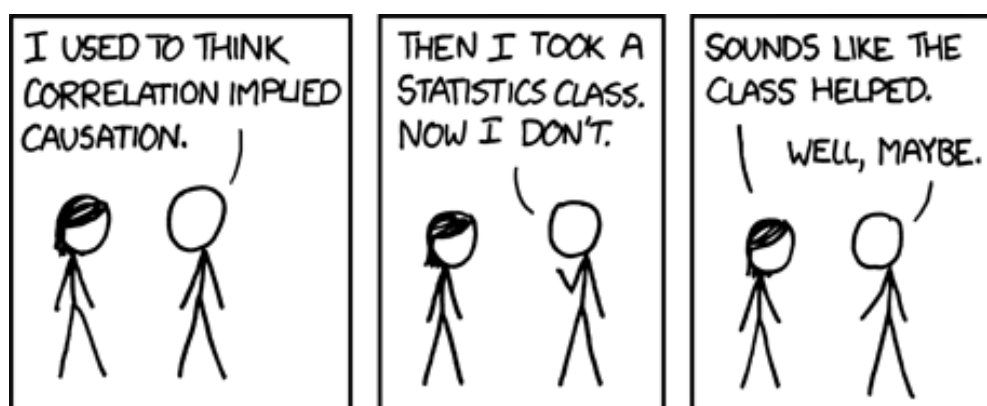




Lectures: MWF 1–2pm

Location: Mulford 159

Section: Various (see page 5 of this document)

Instructor: Aprajit Mahajan (aprajit@berkeley.edu)

Instructor Office Hours: M 2–4pm (219 Giannini)

GSI: Shuo Yu (shuoy@berkeley.edu)

Office Hours: F 3–5pm (Giannini 304)

GSI: Abdou Cisse (cisse@berkeley.edu)

Office Hours: W 3–5 (Giannini 304)

Course Web: <https://bcourses.berkeley.edu/courses/1526855>

Gradescope: <https://www.gradescope.com/courses/561608>

Final: Wed Dec 13, 7–10pm (Group 12), Location TBA

Document Last Updated: September 4, 2023

REQUIRED TEXTBOOK: *Introduction to Econometrics* by James H. Stock and Mark W. Watson (Addison-Wesley, 3^d or 4th Edition).¹ In addition, [Angrist and Pischke \(2008\)](#), [Freedman \(2005\)](#) and [Manski \(2013\)](#) contain complementary material and are particularly useful if you are contemplating research in the social sciences. However, they are not required for the course.

PREREQUISITES: There are no enforced pre-requisites though I expect students to be comfortable with basic linear algebra and calculus and the general logic of mathematical argument as outlined below.

ASSUMED PREPARATION IN MATHEMATICS: I am assuming that all students have knowledge of calculus and linear algebra. In particular, I assume students are familiar with basic multivariate calculus (first and second derivatives and how to obtain them), summation and integration, matrices and matrix operations. More generally, I expect students to be comfortable following mathematical arguments and the structure of mathematical proofs.

I will provide a brief overview of the necessary mathematical tools needed but this will be brief and will assume students are generally comfortable with the nature of mathematical arguments.

ASSUMED PREPARATION IN STATISTICS: I am assuming that all students have knowledge of the topics covered in [Statistics 2](#). Particularly important are: the difference between the population and the sample,

¹You could probably get by with any edition. The problem set question numbers will correspond to the 4th edition

the difference between a parameter and an estimator, basic properties of random variables (including both discrete and continuous random variables), calculating expectations, variances, correlations, conditional expectations and conditional variances, working with the univariate normal distribution and constructing confidence intervals and conducting hypothesis tests.

I will also assume that students are familiar with basic regression analysis. I will begin by reviewing regression analysis but using linear algebra notation. Therefore, the basic concepts (e.g. the OLS estimator) should be familiar even though the mathematical formula may not.

If you have not learned this material before, or if you have forgotten this material, then you will not be able to understand the material covered in this course and you should not take this course.

EXPECTED LEARNING OUTCOMES:

1. Formal understanding of econometric theory, including the ability to construct econometric proofs.
2. Ability to apply regression techniques with a competency sufficient for academic level research.
3. Ability to critically evaluate empirical work in popular, work related and academic settings.

Course Requirements

- 30%: Problem Sets
- 30%: Midterm Exam
- 40%: Final

EXAMS:

All exams will be closed book. However, students will be allowed to carry a letter sized (8.5×11 inch) page “cheat-sheet” with them to the exams (both sides can be used).

1. Midterm Wed Oct 11, in-class
2. Final Wed Dec 13, 7–10pm (Group 12), Location TBA

The exam dates are not flexible. Please notify me in writing by the second week of the term about any known or potential extracurricular conflicts (such as religious observances or UCB related team activities). There will be no exception for job interviews or other non-UCB activities. I will try my best to help you with making accommodations, but cannot promise them in all cases. In the event there is no mutually-workable solution, you may be dropped from the class.²

It is entirely your responsibility to ensure that your graded exam is picked up and to confirm the grade entered on the course website (any issues about midterm grades must be resolved within one week of the graded exam being returned).

PROBLEM SETS:

There will be **6** problem sets during the course. **All problem sets must be uploaded on gradescope by 6 P.M. on the due date.** Late homework will be assigned a grade of 0 **and the lowest grade will be dropped in computing grades.** It is *entirely* your responsibility to ensure that you complete the assignments and remember to submit them on time (all submissions are online). In addition, **it is entirely your responsibility to confirm the problem set grade entered on the course website.**

²See <http://goo.gl/1nAWY8> for more details.

Any issues about problem set grades must be resolved within one week of the grades being released.

There will be no extensions for the problem sets. The only exception to this rule is for death of a family member or illness requiring immediate attention of a physician. There will be no exception for job interviews or other non-UCB activities or for completed work that students forget to turn in.

PROBLEM SET DUE DATES

1. Fri 9/8 : Problem Set 1 Due.
2. Fri 9/22 : Problem Set 2 Due.
3. Fri 10/6 : Problem Set 3 Due.
4. Fri 10/27 : Problem Set 4 Due.
5. Fri 11/17 : Problem Set 5 Due
6. Fri 12/1 : Problem Set 6 Due

All problem sets will be uploaded using [Gradescope](#).³

Statement on Accommodation of Religious Creed

We will follow the guidelines set out by the university that are available [here](#).⁴

Statement on Accommodation for Pregnancy and Parenting

In compliance with Title IX of the Education Amendments of 1972, and with the California Education Code, Section 66281.7, it is the official policy of the University of California at Berkeley to not discriminate against or exclude any person on the basis of pregnancy or related conditions, and to provide reasonable accommodations to students as appropriate. I will make allowances for medically necessary absences for pregnancy and related conditions and make reasonable accommodations for classes, exams, and problem sets. For more information about accommodations for students who are pregnant or parenting, please contact the Office for the Prevention of Harassment and Discrimination.⁵

Accommodations for Students with Disabilities

Please contact me as soon as possible if you need particular accommodations, and we will work out the necessary arrangements. The [Disabled Students' Program \(DSP\)](#)⁶ can provide accommodations for students.

³<https://www.gradescope.com/courses/561608>

⁴<http://guide.berkeley.edu/religious-creed-policy/>

⁵<http://ophd.berkeley.edu/>

⁶<http://dsp.berkeley.edu/>

Statement on Academic Integrity

Any test, paper or report submitted by you and that bears your name is presumed to be your own original work that has not previously been submitted for credit in another course unless you obtain prior written approval to do so from your instructor.

If you are not clear about the expectations for completing an assignment or taking a test or examination, be sure to seek clarification from your instructor or GSI beforehand.

Academic dishonesty and misconduct will be handled according to university regulations with no exceptions. Please see the relevant sections on academic integrity at [UCB Official Notices](#).⁷

Cheating: A good lifetime strategy is always to act in such a way that no one would ever imagine that you would even consider cheating. Anyone caught cheating on a quiz or exam in this course will receive a failing grade in the course and will also be reported to the University Center for Student Conduct. In order to guarantee that you are not suspected of cheating, please keep your eyes on your own materials and do not converse with others during the quizzes and exams.

Plagiarism: To copy text or ideas from another source without appropriate reference is plagiarism and will result in a failing grade for your assignment and usually further disciplinary action. For additional information on plagiarism and how to avoid it, see, for example [here](#).⁸

Academic Integrity and Ethics: Cheating on exams and plagiarism are two common examples of dishonest, unethical behavior. Honesty and integrity are of great importance in all facets of life. They help to build a sense of self-confidence, and are key to building trust within relationships, whether personal or professional. There is no tolerance for dishonesty in the academic world, for it undermines what we are dedicated to doing – furthering knowledge for the benefit of humanity. Your experience as a student at UC Berkeley is hopefully fueled by passion for learning and replete with fulfilling activities. And we also appreciate that being a student can be stressful. There may be times when there is temptation to engage in some kind of cheating in order to improve a grade or otherwise advance your career. This could be as blatant as having someone else sit for you in an exam, or submitting a written assignment that has been copied from another source. And it could be as subtle as glancing at a fellow student's exam when you are unsure of an answer to a question and are looking for some confirmation. One might do any of these things and potentially not get caught. However, if you cheat, no matter how much you may have learned in this class, you have failed to learn perhaps the most important lesson of all.

Out of Class Collaboration

You are allowed to work together in groups for the problem sets, but each student must turn in an individual problem set with their own solutions. Please indicate on the solution the names of the other students, if any, who worked with you on the problem set. It is not a violation of this policy to submit essentially the same answer on a problem set as another student, but is a violation of this policy to submit a close to exact or exact copy.

Regrade Requests

If there was an unambiguous mistake in the grading of your problem set or exam, you may request a regrade but note that your **entire** problem set (or exam) will be regraded. You should be aware that your

⁷<https://teaching.berkeley.edu/statements-course-policies>

⁸<https://guides.lib.berkeley.edu/c.php?g=1108718&p=8084589>

grade may go up or down on the regrade request.

Requests for regrades based on attempts to get more partial credit will be automatically denied. Requests for regrades based on a desire for a better grade and not based upon a mistake in the grading will be automatically denied. Requests for regrades based on interpreting what you wrote or what you meant to say will be automatically denied.

All regrade requests should be in writing, stating exactly what was misgraded, and should be submitted to the GSIs within one week of the date on which the material was returned to you. Any regrade request submitted after one week of when the material was returned to you will be automatically denied.

Course Management

- We will make extensive use of the bcourses [web-site](#)⁹ throughout the quarter. Lecture handouts, problem sets and solutions will all be posted on coursework. In addition, important announcements about office hours, times and locations will also be made on coursework. Please make sure to check the site regularly.
- This year we will use the [Discussions feature of bcourses](#) to answer questions on an ongoing basis. Please post any course-related questions there and we will try to answer them regularly. **I strongly encourage students to post answers to their classmates' questions as well (and active participation in this fashion is a good signal to the instructors)**. Please check the discussion to see if your question has been answered already before contacting us.
- To help us deal efficiently with the potentially large volume of course-related correspondence, please include “EEP118” in the subject heading (e.g. Subject: EEP118 problem set question) when emailing. There is no guarantee that emails that do not contain EEP118 in the subject line will be read.
- The GSIs are here to help you learn and attending sections and office hours with questions is one of the best ways to reinforce the materials that you may be seeing for the first time in class.
- Attendance to one discussion section is mandatory. There are four sections scheduled as follows:

F 9–10AM	30 Wheeler
W 9–10AM	79 Dwinelle
W 10–11AM	101 Wurster
F 11–12PM	204 Wheeler

COMPUTATIONAL EXERCISES:

The course (particularly in the first three problem sets) will require working with data. We recommend the use of Python or Stata. Students are also welcome to use any other statistical package that they wish to use.¹⁰ Python is an open-source general purpose programming language. A useful resource for working with Python for econometrics is [here](#).¹¹ I will make a set of Python scripts available on [Jupyter Hub](#)¹²

⁹<https://bcourses.berkeley.edu/courses/1526855>

¹⁰A useful resource for working with Stata is <http://www.ats.ucla.edu/stat/stata/>. You can also purchase a student version of Stata for your own computer but that is not required for the course.

¹¹<https://tinyl.io/931v>

¹²<https://datahub.berkeley.edu/>

that you will need for the problem sets and will also be helpful in illustrating some of the concepts we learn in class.

COURSE OUTLINE

1. Linear Regression with one Regressor and Asymptotic Distribution Theory using matrix notation.
Required Reading: Stock and Watson, Chapters 4, 5, 17
2. Regression with Multiple Regressors using matrix notation.
Required Reading: Stock and Watson, Chapters 6, 7, 8, 9, 18
3. Instrumental Variables using matrix notation.
Required Reading: Stock and Watson, Chapters 12, 13
4. Panel Data
Required Reading: Stock and Watson, Chapter 10
5. Limited Dependent Variable Models
Required Reading: Stock and Watson, Chapter 11
6. Introduction to Time Series Models
Required Reading: Stock and Watson, Chapter 14
7. Introduction to Sample Selection Models
Required Reading: Class Notes.

Acknowledgement: The strip on p.1 is from xkcd.com

References

- ANGRIST, J., AND J. PISCHKE (2008): *Mostly Harmless Econometrics: An Empiricist's Companion*. Princeton Univ Press.
- FREEDMAN, D. (2005): *Statistical models: Theory and Practice*. Cambridge Univ Press.
- MANSKI, C. F. (2013): *Public Policy In An Uncertain World: Analysis and Decisions*. Harvard University Press.