ECON 103: Introduction to Econometrics

SYLLABUS, SUMMER 2015 (SESSION C)

UCLA

Instructor: Matthew Miller (mattnmiller@g.ucla.edu)
Lecture: MW 1:00 - 3:05 pm, Haines 39
Lab: W 4:00 - 4:50 pm, Haines 39
Office Hours: Bunche 7380, Monday 3 - 5 pm (or by appointment)
Teaching Assistants: Fanghua Li (li.fanghua.econ@gmail.com), Ruoyao Shi (shiruoyao@ucla.edu), Yuan Tian (ytian14@ucla.edu)

1 Course Description

Econometrics is one of the most powerful tools available to applied economists. It is widely incorporated into nearly every sub-field of economics, including labor, health and development, finance, education, industrial organization, urban, macroeconomics, and trade. It is also a major tool for others types of professionals tasked with quantitative analysis. Consulting and financial firms, along with think tanks, tech companies, and a host of other public and private institutions, face problems that can be approached by applying economic modeling to data sets that are constantly increasing in size and complexity. Economics 103 is the first course of the major to introduce you to econometrics and its range of applications. Econometrics lies at the intersection of the economic intuition and modeling learned in core courses like Econ 11, 101, and 102 and the statistical concepts of Econ 41. It is a tool for addressing economic problems with quantitative rigor. Throughout the class we will balance theoretical concepts with applications, meaning once we learn a technique you will be required to take that concept and apply it to actual data related to widely debated economics issues and policy problems. We will start by focusing on one of the primary tools in basic econometrics, the linear regression model. We will discuss its desirable properties, the assumptions needed to achieve those properties, how to conduct hypothesis testing, and, importantly, its limitations. These topics will take up the first few weeks of the course. In the last two to three weeks, we will cover a selection of topics that build and improve on the basic linear regression framework, including time series and panel data methods, instrumental variables, difference-in-difference estimation, and regression discontinuity. Emphasis on these topics will be less theoretical and geared more towards application.

Concurrent to the theoretical discussion in lecture, you are required to attend weekly lab sections held by the TAs. Due to space constraints, you must attend the lab you are enrolled in. In lab, the goal is to apply the techniques from lecture to important economic problems using data. This course, relative to other versions of 103, takes this data analysis component much more seriously. We will focus on two empirical applications for the duration of the term. These applications will be from the literature, and will be worked through carefully to help demonstrate the concepts, as well as to improve your ability to work with statistical software and data. For this course I suggest you use Stata, the most commonly used program by applied (micro)economists. Other packages, such as R and SAS can be used, but labs will be taught using Stata. Finally, there is one lab lecture each week. During this time myself and guest speakers
will present specifics related to research on a range of interesting topics not normally presented, including reviewing programs, data sources, and problem encountered, in addition to original analyses that are more commonly presented.

This course is intended for students who have taken both a course in micro or macroeconomic theory (Econ 11 or something higher), along with a course in statistics. For economics majors, this is Econ 41, but other statistics courses in the Math or Statistics departments may suffice. The economic intuition and level of mathematics used in these pre-requisite courses will be very useful preparation for Econ 103.

2 Textbook and Readings

Lecture material will draw from the following textbooks (note the abbreviations in [·]):

- Wooldridge, Jeffrey. *Introductory Econometrics: A Modern Approach* [W]
- Kennedy, Peter. *A Guide to Econometrics* [K]

You should plan on buying/having easy access to either Hill et al or Wooldridge, and read whichever one you choose closely (the department suggests Hill et al; I prefer and draw most lecture material from Wooldridge. The edition does not matter). The Kennedy book is a more interesting read and good for intuition, and it also contains various references to higher level material for those who are interested (it will not substitute for the other textbooks, however, and should be used as a supplement).

2.1 Readings for Lab and Problem Sets

The following guide is a useful resource for learning how to code and work with data. It is short and freely available online and I will assign readings from it early on as you start your data work on problem sets.


Your grade will depend, in part, on your code and how well you adopt good practices, so pay attention to their suggestions (see Grading section below).

For problem sets, you will work through exercises adapted from the following (popular) paper:


This paper is well cited and contains many applications of the types of econometric techniques you will learn throughout the quarter. In addition, it uses data that are publicly available. The goal of the problem sets will be for you to start by downloading the underlying data in its original form, and then work to build it into a format that can be analyzed in a statistical software package. The ultimate goal is for you to replicate some of the main findings in this papers, and to construct some interesting analyses of your own.
3 Grading

The course grade will consist of three components: problem sets, exams, and participation. There will be two problem sets. Each will be based on replicating selected results from a popular, published paper in the applied literature. There will also be a portion where you are to develop your own question derived from the paper and put forward an insightful, related analysis. You will have three weeks to complete each assignment.

In addition, there will be two exams. The first will be short (only an hour) and held during the lab lecture in Week 3 (August 19th). The second exam will be longer (two hours) and take place during the last lecture (September 9th). Exams will be cumulative.

Lastly, there will be a participation grade. If you attend lectures and labs, ask questions in office hours, and demonstrate that you are engaged in the course, you should receive full participation points.

The grading breakdown is:

- Problem Sets: 45%
- First Exam: 20%; Second Exam: 30%
- Participation: 5%

The grade distribution will approximately follow:

- A+/A/A- (25%)
- B+/B/B- (35%)
- C+/C/C- (25%)
- D/F (15%)

4 Other Information

- POLICY ON MISSED EXAMS: If a student has a valid medical excuse and can provide written documentation of such an excuse, or if the student has received prior permission (at least one week in advance of the exam) to miss an exam from the instructor, then additional weight will be placed on the final exam. Prior permission to miss an exam is only granted for serious and compelling reasons. A student who misses an exam without a valid medical excuse or without receiving prior permission will receive a zero.

- DISABLED STUDENTS and the OFFICE of STUDENT DISABILITIES (OSD): Any student with a pre-existing illness or condition who requests special arrangements must (a) qualify under OSD rules for such special arrangements and (b) must take the exam with OSD. Any such arrangements with OSD must be made the first week of classes. The instructor must be informed of any such arrangement in the first week of classes. For additional information and the qualification conditions of the Office of Student Disabilities (OSD), please visit their website at [http://www.osd.ucla.edu/](http://www.osd.ucla.edu/). All other students must take the exam at the scheduled time under the same time constraints. It is the responsibility of all students who request special arrangements with OSD to be familiar with all of their rules as well as the rules of this class.

- ACADEMIC DISHONESTY: Any cases of cheating will be reported to the Office of the Dean of Students. For more details on this and other important matters, please refer to the Office of the Dean of Students website at [http://www.studentgroups.ucla.edu/dos/](http://www.studentgroups.ucla.edu/dos/).
5 Course Outline

Each lecture I will post a set of notes around 10 - 15 pages long. You should read these first, either before or after each lecture. This will give you the foundation. You should then read W or HCL readings meticulously to fill in any gaps. Again, K is a great source for big picture and intuition.

• Week 0 [you should do these before our first lecture]
  - Get Stata set up\(^1\)
    - Work through some of these modules: [http://www.ats.ucla.edu/stat/stata/modules/default.htm](http://www.ats.ucla.edu/stat/stata/modules/default.htm). Do as many as you can - the more comfortable you are with Stata before the course starts the better. Having to fumble with Stata basics while also trying to absorb the material (which can be challenging) may be a struggle.
    - If you are out of practice with the Econ 41 (statistics) material (e.g. expected values, variance, probability distributions), you should brush up before we start.

• Week 1
  - Lecture 1 - Introduction to Econometrics and Data Analysis: Read W, Ch. 1 or HCL Ch. 1. Helpful to read K Ch. 1, W Appendices C.1-3, D.1-2.
  - Lecture 2 - Linear Regression Model: Read W, Ch. 2 or HCL, Ch. 2. Helpful to read K Ch. 2 and 3.
  - Lab 1 - Introduction to Stata and Example of Empirical Work, Should You Study, or Party?: Read GS Ch. 1 and 5.

• Week 2
  - Lecture 3 - Multiple Linear Regression and Issues with OLS: Read W, Ch. 3, 6.1 - 6.3 or HCL Ch. 4, 5.1 - 5.3, 5.6 - 5.8. Helpful to read K, Ch. 6, 7, and 9.
  - Lecture 4 - Inference and Asymptotics: Read W, Ch. 4, 6.4 and 5 or HCL Ch. 3, Ch. 5.4 - 5.5, Ch. 6.1 - 6.2. Helpful to read K, Ch. 4.
  - Lab 2 - Presentation (Speaker TBA). Read GS Ch. 2 and 6.

• Week 3
  - Lecture 5 - Incorporating Qualitative Information: Read W, Ch. 7 or HCL, Ch. 7. Helpful to read K, Ch. 14 and 15.
  - Lecture 6 - Model Specification and Selection (Application of Machine Learning): Read W, Ch. 9 or HCL, Ch. 6.3 - 6.6. Helpful to read K, Ch. 5.
  - Lab 3 - Exam 1 (50 minutes)

• Week 4
  - Lecture 7 - Basics of Time Series: Read W, Ch. 10 or HCL, Ch. 9. Helpful to read K, Ch. 18 (a bit more advanced).

\(^1\)It’s imperative you do this ASAP. There are a few sources on campus for Stata. All Social Science Computing (SSC) lab computers run Stata (these are where your lab sections are held), and you can access these labs at certain times throughout the week outside of section. The CLICC laptops available at YRL run Stata as well. There is also a remote server hosted by SSC called Afterhours ([https://computing.sscnet.ucla.edu/labs/remote-access/afterhours/](https://computing.sscnet.ucla.edu/labs/remote-access/afterhours/)). Buy a thumb drive so that you can transfer data and programs across computers easily (or set up a Dropbox account!).
– Lecture 8 - Basics of Panel Data Estimation: Read W, Ch. 13 or HCL, Ch. 15. Helpful to read K, Ch. 17.
– Lab 4 - Presentation (TBA)

• Week 5
  – Lecture 9 - Instrumental Variables: Read W, Ch. 15 or HCL, Ch. 10. Helpful to read K, Ch. 9.
  – Lecture 10 - Simultaneous Equations: Read W, Ch. 16 or HCL, Ch. 11. Helpful to read K, Ch. 10.
  – Lab 5 - Presentation (TBA)

• Week 6
  – Lecture 11 - Regression Discontinuity Design: Lecture notes are sufficient.
  – Lecture 12 - Exam 2 (2 hours)
  – Lab 6 - Presentation (TBA)