Econ 1123: Introduction to Econometrics

Prof. Pettenuzzo

Fall 2024

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Office Hours: M 10:30-12:00 PM

Web: **www.davidepettenuzzo.com**

Class Hours: M&W 9:00-10:15 AM

Classroom: Science Ctr Hall D

Teaching Fellows:

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Course Description

This course aims at introducing econometric models and empirical techniques that are useful to conduct economic research with data. The course covers linear regression models, discrete choice models, time series models, and panel data models. We will devote significant space to empirical applications, and give the students the opportunity to gain hands-on experience on how to conduct empirical work in econometrics using Stata.

Prerequisites

Statistics 104 or equivalent.

Note: Students seeking a treatment of econometric theory with a higher level of mathematics should take Economics 1126.

Required Materials

1. The required textbook for the course is James H. Stock and Mark W. Watson, Introduction to Econometrics (4th edition), Pearson/Addison Wesley.

2. Two optional books are J.M. Wooldridge, Introductory Econometrics, South-Western College Publishing and J. Angrist and S. Pischke, Mostly Harmless Econometrics. Wooldridge covers the same material with a somewhat more mathematical treatment. Angrist and Pischke provided good intuition for the methods used for causal inference.

3. The online textbook https://www.econometrics-with-r.org is also a great resource, as it focuses on the use of R in econometrics

4. Additional readings will be posted on CANVAS as the course progresses.

Course Objectives

Upon successful completion of the course you will:

1. Understand the basic statistical assumptions underlying regression analysis and the situations in which these assumptions are appropriate;

2. Be able to identify when the basic regression assumptions may be violated and to correct for these violations using appropriate techniques;

3. Be able to critically assess empirical studies in economics and other professional journals;

4. Have proficiency using the Stata programming language in Econometrics;

Evaluation

You will be evaluated on the following:

- Problem sets: 30%

- Midterm: 30%

- Final exam: 40%

Attendance and class participation

Learning in econometrics is cumulative; that is, each topic builds on the previous one. As a result, attendance is extremely important, both during lectures and sections. I expect you to attend every class, to arrive on time, and to leave only after the class ends. You are also expected to read the assigned materials and participate in class discussions on a regular basis.

Problem sets

There will be six problem sets, each one comprising a mix of theoretical and computer-based questions and will serve to reinforce material discussed in class. Solutions will be posted on the course website after you have handed in the problem set. For the computer-based exercises, you are free to choose between R and STATA. STATA is available for download from FAS IT. R can be downloaded from the website: http://cran.r-project.org/. You will also want to install RStudio an interface to R. RStudio can be obtained, free of charge, from www.rstudio.org.

Complete problem sets must be turned in electronically through Canvas by 11:59 PM EST of the due date. Late submissions will not be accepted, however in order to accommodate special circumstances (e.g. illnesses, unforeseen conflicts), I will drop the lowest score among your problem sets from the final grade calculation.

Your submission must include three files: (1) a write up, (2) Code, (3) Output. The write up has to include all answers to questions (including regression output, tables, and graphs needed to answer the various parts of all the questions in the problem set). The grader should be able to reference your write up and see your full response to the question (i.e. treat this write up as a report of your work). The Code needs to include all Stata or R commands you used in the coding portion, and be well commented to easily reference your work. The Output file must be up to date and in either .log, .pdf, or .html format.

Regrade requests must be requested within a week of the date that the assignment in question was returned to students. No requests beyond this due date are considered. Please note that re-grade requests are only for cases where the student believes that there was a grading error made on work that they had already submitted (i.e. we do not accept re-submissions or supplemental submissions). All teaching staff decisions on regrades are final and cannot be further appealed.

I expect the homework assignments to be done individually. However, I encourage you to consult with each other in working the homework assignments, although copying someone else's work is not permitted. Note that if you simply copy your answers from one of your classmates in addition to receiving a zero on the problem set you will be in violation of Harvard rules on academic honesty and may not receive credit for the course.

Midterm

The Midterm date is posted below within the course outline. Note that there will be no make-up midterm. If you think you may have to miss the midterm, you need to contact me before the exam and have a very good reason. If you end up missing it, and you have a very good reason for it, then more weight will be put on the other components of your grade. Note that in the absence of a valid reason, your grade on the midterm will be zero, and furthermore will count towards your final grade. The midterm will be based on material covered up to the point at which the exam is held.

Final exam

The final exam will be cumulative, but with a stronger emphasis on the material covered after the midterm. Please note that absence from final exam will excused only for a serious illness or family emergency which will need to be appropriately documented.

Weekly Schedule

The schedule is tentative and subject to change. The midterm exam will test on the material that was taught up until 1 lecture prior to the exam. The material covered in the second half of the semester builds on the concepts learned during the first half of the semester though, so it is important to continue reviewing those concepts throughout the semester. The relevant chapters from the Stock and Watson texbook that will be covered are listed at the beginning of each week.

Week 01, 09/02 - 09/06:   Course introduction (S&W Chapter 1)

- Wed 09/04 – Lecture 1: Introduction to the course

Week 02, 09/09 - 09/13:   Review of statistics (S&W Chapter 2)

- Mon 09/09 – Lecture 2: Review of statistics I

- Wed 09/11 – Lecture 3: Review of statistics II

- *Section 1 (Introduction to STATA and R for Econometrics)*

Week 03, 09/16 - 09/20:   Review of probability (S&W Chapter 3)

- Mon 09/16 – Lecture 4: Review of probability I - **[PS 1]**

- Wed 09/18 – Lecture 5: Review of probability II

- *Section 2*

Week 04, 09/23 - 09/27:   Linear regression model with one regressor (S&W Chapters 4 and 5)

- Mon 09/23 – Lecture 6: Linear regression model with one regressor

- Wed 09/25 – Lecture 7: Inference in linear regression with one regressor

- *Section 3 -* **[PS 1 due]**

Week 05, 09/30 - 10/04:   Linear regression with multiple regressors (S&W Chapter 6)

- Mon 09/30 – Lecture 8: Linear regression model with multiple regressors - **[PS 2]**

- Wed 10/02 – Lecture 9: Linear regression model with multiple regressors (continued)

- *Section 4*

Week 06, 10/07 - 10/11:   More inference (S&W Chapter 7) & Nonlinear regression models (S&W Chapter 8, sections 8.1–8.2)

- Mon 10/07 – Lecture 10: Inference in linear regression with multiple regressors

- Mon 10/07 – Lecture 11: Nonlinear regression functions

- *Section 5 -* **[PS 2 due]**   **[PS 3]**

Week 07, 10/14 - 10/18: Nonlinear regression functions & Critiques to OLS (S&W Chapter 8, sections 8.3–8.4 and Chapter 9)

- Wed 10/16 – Lecture 12: Assessing studies based on multiple regression

- *Section 6 -* **[PS 3 due]**

Week 08, 10/21 - 10/25: Panel data methods (S&W Chapter 10)

- **Mon 10/21 – Midterm (during regular class hours)**

- Wed 10/23 – Lecture 13: Regression with panel data variables I - **[PS 4]**

- *No sections this week*

Week 09, 10/28 - 11/01: Instrumental variables (S&W Chapter 12)

- Mon 10/28 – Lecture 14: Regression with panel data variables II

- Wed 10/30 – Lecture 15: Instrumental variables regression I

- *Section 7 -* **[PS 4 due]**

Week 10, 11/04 - 11/08: Binary dependent variables (S&W Chapter 11)

- Mon 11/04 – Lecture 16: Instrumental variables regression II - **[PS 5]**

- Wed 11/06 – Lecture 17: Regression with binary dependent variables

- *Section 8*

Week 11, 11/11 - 11/15:   Big data (S&W Chapter 14)

- Mon 11/11 – Lecture 18: Prediction with many regressors and big data I

- Wed 11/13 – Lecture 19: Prediction with many regressors and big data II

- *Section 9 -* **[PS 5 due]**

Week 12, 11/18 - 11/22: Time series, part 1 (S&W Chapter 15, sections 15.1–15.4)

- Mon 11/18 – Lecture 20: Introduction to time series I

- Wed 11/20 – Lecture 21: Introduction to time series II - **[PS 6]**

Week 13, 11/25 - 11/29: Time series, part 2 (S&W Chapter 15, sections 15.5–15.9)

- Mon 11/25 – Lecture 22: Additional topics in time series regression I

- *Section 10*

Week 14, 12/02 - 12/06:   Time series, part 2 (S&W Chapter 15, sections 15.5–15.9)

- <u>Mon 12/02 – Lecture 23</u>: Additional topics in time series regression II

- <u>Wed 12/04 –</u>

- *Section 11 -* **[PS 6 due]**