Jeff Grogger
Harris School

Winter 2023
University of Chicago

PP 421: Applied Econometrics

Class: Tuesday/Thursday, 9:30-10:50am, Keller 0010

Instructor: Jeffrey Grogger
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Teaching Assistants:

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Office hours: TBD

Web site: All materials for the class will be posted to its site on Canvas.

Course content: This class covers linear regression from basic Gauss-Markov theory to the LATE theorem. Think of it as a theoretical course for applied researchers.

Prerequisites: Matrix algebra and mathematical statistics.

Reference: The text for the class is William Greene, *Econometric Analysis*, 7th edition. If you choose to use a different edition, the responsibility for cross-walking the reading assignments lies with you.

Grading: There will be four problem sets and a final exam. Problem sets will include paper-and-pencil problems and empirical exercises. Only the three problem sets with the highest scores will be used in calculating the student's grade.

Students may complete the empirical portion of the problem sets using either R or Stata. Please submit both your raw code file (.R .Rmd or .do) along with a writeup of your answers to each problem (.pdf). Please include tables, figures, and other relevant output from your code inside your writeup. You may not write your answers to each problem as comments inside your code (unless you are using Rmarkdown in an appropriate manner).

Problem sets: Students may work together on problem sets but each student must write up his/her answer set individually. Problem sets will count for 2/3 of the course grade.

Problem sets will be turned in via Canvas. The due date and time for each problem set will appear on the heading of the problem set. *No late problem sets will be accepted*. Answer keys will be posted to the website shortly after the problem sets are due.

Exams. The final exam will count for 1/3 of the course grade. It will be a take-home exam, distributed on March 2, 2023, the last day of class. It will be due 24 to 48 hours later, with details forthcoming later in the quarter. ***There will be no make-up exams***.

Communication with TAs. Please use the Canvas discussion board to communicate with the TAs. They will respond in a reasonable amount of time, but immediate turnaround is not a reasonable expectation.

Academic Integrity. To reiterate, you may consult with others while you work on the problem sets, but you must follow these procedures:

- Your problem set must be solely your authorship (written up by yourself, in your own words, including your own code for the empirical part.)
- Your code must have a comment at the top listing the students/TA's/consultants with whom you consulted.
- Any part of your code that was substantially altered because of your discussion with other students/TA's/consultants should cite others' contributions with names and descriptions in a comment at the place where it is applicable.
- Any code based on code that you found online must be documented as such. This includes single lines of code and code that you found but then modified to fit your purpose. Documentation must include the URL and the date and time of access.

Students who violate these procedures, or otherwise violate academic honesty policies, will receive a zero for the problem set or exam in question. This problem set will **NOT** be dropped for the purpose of calculating your grade.

All University of Chicago students are expected to uphold the highest standards of academic integrity and honesty. Among other things, this means that students shall not represent another's work as their own, use disallowed materials during exams, or otherwise gain unfair academic advantage. All students suspected of academic dishonesty will be reported to the Harris Dean of Students for investigation and adjudication. The disciplinary process can result in sanctions up to and including suspension or expulsion from the University, in addition to the grade penalty mentioned above. The Harris policy and procedures related to academic integrity can be found at https://harris.uchicago.edu/gateways/current-students/policies. The University of Chicago Policy on Academic Honesty & Plagiarism can be found at https://studentmanual.uchicago.edu/academic-policies/academic-honesty-plagiarism/

Topics and Readings

1. Multivariate Linear Regression

    a. Lecture Notes Topic 1
    b. Estimation: Mechanics, Greene Ch. 3
    c. Estimation: Statistical properties, Greene Ch. 4
    d. Prediction, Greene Ch. 5.6

2. Finite-sample inference
    a. Lecture Notes Topics 2-3
    b. Greene Ch. 5.1-5.5

3. Large-sample inference,
    a. Lecture Notes Topics 2-3
    b. Greene Chs. 5.6

4. Heteroskedasticity and Generalized Least Squares

    a. Lecture Notes Topic 4
    b. Heteroskedasticity, Greene Ch. 9.4-9.6
    c. Non-Spherical Disturbances and OLS, Greene Ch. 9.2
    d. Generalized Least Squares, Greene Ch. 9.3

5. Specification Issues

    a. Lecture Notes Topic 5
    b. Dummy Variables, Greene Ch. 6.2
    c. Non-linearity, Greene Ch. 6.3
    d. Structural Breaks, Greene Ch. 6.4
    e. Omitted Variable Bias, Greene Ch. 4.3.2
    f. Collinearity, Greene Ch. 4.7.1

6. Models for Panel Data

    a. Lecture Notes Topic 6
    b. Models, Greene Ch. 11.1-11.2
    c. Estimators, Greene Ch. 11.3-11.6, 11.1
    d. Moulton (1990)
    e. Bertrand, et al. (2004)
    f. Solon et al (2013)
    g. Abadie, et al. (2017)
    h. Goodman-Bacon (2021)
    i. Borusyak, et al (2021)

7. Instrumental Variables

    a. Lecture Notes Topic 7
    b. Greene Ch. 8
    c. Hausman (1978)
    d. Bound, et al. (1995)
    e. Pouliot (2019)
    f. Angrist, Imbens, and Rubin (1996)
    g. Mikusheva (n.d.)

8. Additional Topics, (time permitting)
    a. Bootstrap Inference
    b. Penalized Regression