PLSC503: Theory and Practice of Quantitative Methods (Spring 2020)

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Class time/location: Monday and Wednesday, 2:30-3:45, RKZ 05. Office hours and section hours TBD.

Course Overview and Prerequisites

This course provides an intensive introduction to the methods used in political science for quantitative empirical inquiry. Topics include: missing data, causal inference, selection on observables, instrumental variables, regression discontinuity designs, panel (TSCS/longitudinal) data.

PLSC 500 (Foundations of Statistical Inference) is a prerequisite, with mathematical training at the level of the math camp and PL529 (Mathematics for Political Science) expected.

Primary Readings

The required textbooks for this course are:

MHE: Angrist JD, Pischke JS. 2008. *Mostly Harmless Econometrics: An Empiricist's Companion*. Princeton University Press.[1]

A&M: Aronow, PM and Miller, BT 2019. *Foundations of Agnostic Statistics*. Cambridge University Press.

All other readings will be made available on Canvas. It is mandatory that students attempt to engage with all assigned readings before class.

Assignments, Exams and Grading

Problem Sets. Five problem sets will typically be assigned on Wednesdays (dates TBD). They will be due the following week on Wednesday at 2:30-3:45pm. Although students can work in groups, we strongly encourage students to attempt the problem sets individually first. Submitted problem sets must indicate

[1] Other books/articles that will be helpful supplements when MHE is confusing or vague:

Angrist, Joshua D., and Jörn-Steffen Pischke (2014). *Mastering 'metrics: The path from cause to effect*. Princeton University Press, 2014. This is an undergraduate version of MHE that might be helpful to consult if you are struggling with intutions in MHE.

Angrist, Joshua and Alan Krueger (1999). Empirical Strategies in Labor Economics. In Ashenfelter, Orley and David Card, eds., *Handbook of Labor Economics*, Vol. 3c. Amsterdam: North-Holland. 1277–1366. Section 2 is essentially an older, article-length version of MHE, but is sometimes clearer than MHE about the same topics.

Morgan, Stephen L., and Christopher Winship (2015). *Counterfactuals and causal inference*. Cambridge University Press. An alternative take on causal inference covering many of the same topics as MHE, with emphasis on graph-based causal inference.

the names of all students who collaborated. Solution sets, where applicable, will be posted within one week of the problem set due date. Accordingly, problem sets *cannot be accepted late*, and will be awarded zero credit.

Exams. There will be a midterm and a final exam, tentatively scheduled for 2/19 and 4/22 respectively. Both exams are in-class only, however students will have the opportunity to submit corrections to their in-class components one week after the exam, and partial credit will be awarded as appropriate.

Final project Each student will complete a final project, consisting of a research paper (approximately 15-25pp) and associated class presentation during the last week of class (approximately 15 minutes + Q&A). The project may either be a (i) replication of quantitative empirical work or (ii) original project. Students should be in consultation with the instructor and TFs throughout, and must submit a one page project draft proposal no later than the midterm.

The final grade will be based on problem sets (20%), the midterm (20%), the final exam (30%), and final project (30%).

Statistical Software

We will be using the R programming language, available at `http://cran.r-project.org/`.

Plagiarism and Academic Integrity

As the Yale Graduate School notes: "Academic integrity is a core institutional value at Yale. It means, among other things, truth in presentation, diligence and precision in citing works and ideas we have used, and acknowledging our collaborations with others. In view of our commitment to maintaining the highest standards of academic integrity, the Graduate School Code of Conduct specifically prohibits the following forms of behavior: cheating on examinations, problem sets and all other forms of assessment; falsification and/or fabrication of data; plagiarism, that is, the failure in a dissertation, essay or other written exercise to acknowledge ideas, research, or language taken from others; and multiple submission of the same work without obtaining explicit written permission from both instructors before the material is submitted. Students found guilty of violations of academic integrity are subject to one or more of the following penalties: written reprimand, probation, suspension (noted on a student's transcript) or dismissal (noted on a student's transcript)."

Topics

Starred readings are mandatory, but everything listed is strongly recommended for your understanding.

Introduction

*MHE, Ch. 1.

*Freedman, D. A. (1991). Statistical models and shoe leather. Sociological Methodology. 21: 291–358.

Review of regression and statistics

*A&M, Ch. 2, 3, 4.1-4.3.4, 5.1-5.2.1.

*MHE, Ch. 3.1.

*Hansen, B. (2019). *Econometrics*. Ch. 2.1-2.3, 2.5-2.19, 2.25, 2.28, 3.1-3.4. Manuscript. Available at: `https://www.ssc.wisc.edu/~bhansen/econometrics/`. Note: there will be some mathematics (esp. linear algebra in 2.18) that you may not understand – this is expected, and you should consult the other readings to fill in gaps.

Foundations of missing data and causal inference

*A&M Ch. 6-7.

*MHE Ch. 2, 3.2-3.3

*Hansen Ch. 2.30.

Imbens, GW. (2004) Nonparametric Estimation of Average Treatment Effects Under Exogeneity: A Review. Review of Economics and Statistics 86(1):4-29.

Holland, P. W. (1986). Statistics and causal inference. Journal of the American Statistical Association, 81(396): 945–960.

Instrumental variables

*MHE Ch. 4.1.1-4.1.2, 4.4, 4.5, 4.6.1

*Angrist, J., G. Imbens, and D. Rubin, (1996), "Identification of Causal Effects Using Instrumental Variables," Journal of the American Statistical Association, Vol. 91: 444–472.

Panel data

* MHE Ch. 5.

* Blackwell, M. (2013). A framework for dynamic causal inference in political science. American Journal of Political Science, 57(2), 504-520.

Regression discontinuity designs

*MHE Ch. 6

*Imbens, G., and T. Lemieux, (2008), "Regression Discontinuity Designs: A Guide to Practice," Journal of Econometrics, Vol. 142(2): 615–635.

*Cattaneo, MD, N Idrobo, R Titiunik. (2019) A Practical Introduction to Regression Discontinuity Designs: Foundations. Cambridge University Press. Available at: `https://arxiv.org/abs/1911.09511`

Design-based inference for surveys and experiments (if time permits)

*Sarndal, C. E., Swensson, B. and Wretman, J. 1992. *Model Assisted Survey Sampling*. New York: Springer. Chs 1-3.3.

*Imbens, G. W., and Rubin, D. B. (2015). *Causal inference in statistics, social, and biomedical sciences*. Cambridge University Press. Chs. 3-6.