Econ 481-3
Topics in Econometrics
Spring 2020

IMPORTANT: Lectures and office hours will be held in ZOOM until further notice. Check Canvas moving forward to find out when we go back to the classroom. REGISTER NOW!.

Lecture: TTh 1:30-3:20, KGH 3301

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Course Description: This course is the third quarter in the graduate econometrics sequence. It is divided in four parts. Part I presents a comprehensive discussion of the most popular instrumental variables approaches currently used in applied work. Part II presents what I consider to be the fundamental notions behind asymptotic approximations. Part III covers the topic of uniformly valid inference, with an emphasis on inference in moment inequality models. Finally, Part IV presents recent methods for inference in the Regression Discontinuity Design.

Grading: Grading will consist on weekly reports (submitted via Canvas), two problem sets due on **April 23rd** and **May 14th**, and an in-class presentation on one of the topics of Part IV. The problem sets will be available a week and a half before the due date and will consist of theoretical questions and empirical/methodological questions. Weekly reports should avoid displays and formulas and be limited to a maximum of two pages. Finally, for the in-class presentation the students must prepare a slide presentation and write a 6-8 pages long set of lecture notes for each class. This part of the course will involve anonymous peer grading. The weighting scheme for the final grade will be:

Weekly Reports:	20%
Problem sets:	50%
in-Class presentation:	30%

Lecture Notes: I will provide lecture notes every week with related references you are supposed to read. The readings listed below include most of the articles we will discuss in class.

AccessibleNU: Any student requesting accommodations related to a disability or other condition is required to register with AccessibleNU (847-467-5530) and provide professors with an accommodation notification from AccessibleNU, preferably within the first two weeks of class. All information will remain confidential.

Zoom: We will be using Zoom for remote instruction. Each lecture will be recorded and available to watch later on Canvas. If you plan to watch the lecture "live", please be aware of the following guidelines:

- This is a small class and there are no TAs. This means that I will be not be looking at chat often so I recomend that you DO NOT use chat to try to call my attention or ask a question. You may use chat to share or say something relevant to other participants. Recall that chat is being recorded too.
- If you have a clarification question, use the "raise your hand" feature. My expectation is that you will ask questions and I will plan to answer all of them on a first come, first served basis.
- The use of video is encouraged. Assuming our connections are fast enough I would prefer if you use video, at the very least, when you ask questions. Your microphones will be muted by default and I (or you) will un-mute them when you want to ask your question.
- Note-taking may be challenging in a Zoom lecture. To ease with this, I plan to do the following. First, whatever slides I use for the lecture will be available for you to download a few minutes before the lecture starts. Second, I highly recommend you watch the video trying to understand what I say and then watch it a second time to take notes if you cannot keep up. You can also ask me to stop or slow down and I will be happy to do so.
- My regular lectures (in the classroom) usually last exactly 1 hour and 50 minutes. Using Zoom will make the lectures go much faster. I have decided not to teach "more" material as a consequence of this as this is (hopefully) not a permanent change.

Tentative Course Schedule: Econ 481-3 Spring 2020

Lecture	Date	Topics	Evaluation
		Part I: Instrumental Variables 101	
1	Tu, April 7	Selection on Observables (s)	–
2	Th, April 9	Roy Models and LATE (s)	–
3	Tu, April 14	Marginal Treatment Effects (s)	PS1 out
4	Th, April 16	Extrapolation and Some Extensions (s)	–
		Part II: Understanding Asymptotic Approximations	
5	Tu, April 21	Local Asymptotics (b)	–
6	Th, April 23	Extrapolating Local Power (b)	PS1 due
7	Tu, April 28	Contiguity (b)	–
8	Th, April 30	Local Asymptotic Normality (b)	PS2 out
9	Tu, May 5	Convolution Theorems (b)	–
		Part III: Uniformity and Inference with Moment Inequalities	
10	Th, May 7	The Bahadur-Savage Problem (b)	–
11	Tu, May 12	Uniformity of the t-test (b)	–
12	Th, May 14	Uniformity of Subsampling (b)	PS2 due
13	Tu, May 19	Inference in Moment Inequality Models I (s)	–
14	Th, May 21	Inference in Moment Inequality Models II (s)	–
		Part IV*: Regression Discontinuity Design	
15	Tu, May 26	Intro to Regression-Discontinuity Designs	Presentation
16	Th, May 28	Robust Nonparametric Inference for RDD	Presentation
17	Tu, June 2	Approximate Permutation Tests in the RDD	Presentation
18	Th, June 4	Testing Continuity of a Density	Presentation

Readings

[1] Andrews, D. W. K. Inconsistency of the bootstrap when a parameter is on the boundary of the parameter space. *Econometrica 68*, 2 (March 2000), 399–405.

[2] Andrews, D. W. K., and Guggenberger, P. Validity of subsampling and "plug-in asymptotic" inference for parameters defined by moment inequalities. *Econometric Theory 25*, 3 (June 2009), 669–709.

[3] Andrews, D. W. K., and Soares, G. Inference for parameters defined by moment inequalities using generalized moment selection. *Econometrica 78*, 1 (January 2010), 119–158.

[4] Bahadur, R., and Savage, L. J. The nonexistence of certain statistical procedures in nonparametric problems. *Annals of Mathematical Statistics 25* (1956), 1115–1122.

[5] Bester, C. A., Conley, T. G., and Hansen, C. B. Inference with dependent data using cluster covariance estimators. *Journal of Econometrics 165*, 2 (2011), 137–151.

[6] Billingsley, P. *Probability and Measure*. Wiley-Interscience, 1995.

[7] Bugni, F., Canay, I. A., and Shi, X. Inference for subvectors and other functions of partially identified parameters in moment inequality models. *Quantitative Economics 8*, 1 (2017), 1–38.

[8] Bugni, F. A. Bootstrap inference in partially identified models defined by moment inequalities: Coverage of the identified set. *Econometrica 78*, 2 (April 2010), 735–753.

[9] Bugni, F. A., and Canay, I. A. Testing continuity of a density via g-order statistics in the regression discontinuity design. *arXiv preprint arXiv:1803.07951* (2018).

[10] Calonico, S., Cattaneo, M. D., and Titiunik, R. Robust nonparametric confidence intervals for regression-discontinuity designs. *Econometrica 82* (2014).

[11] Cameron, A. C., Gelbach, J. B., and Miller, D. L. Bootstrap-based improvements for inference with clustered errors. *The Review of Economics and Statistics 90*, 3 (2008), 414–427.

[12] Cameron, A. C., and Miller, D. L. A practitioner's guide to cluster-robust inference. *Forthcoming in Journal of Human Resources* (2013).

[13] Canay, I. A. El inference for partially identified models: Large deviations optimality and bootstrap validity. *Journal of Econometrics 156*, 2 (June 2010), 408–425.

[14] Canay, I. A., and Kamat, V. Approximate permutation tests and induced order statistics in the regression discontinuity design. *The Review of Economic Studies 85*, 3 (2018), 1577–1608.

[15] Canay, I. A., Romano, J. P., and Shaikh, A. M. Randomization tests under an approximate symmetry assumption. *Econometrica 85*, 3 (May 2017), 1013–1030.

[16] Canay, I. A., Santos, A., and Shaikh, A. M. On the testability of identification in some nonparametric models with endogeneity. *Econometrica 81*, 6 (2013), 2535 – 2559.

[17] Canay, I. A., Santos, A., and Shaikh, A. M. The wild bootstrap with a "small" number of "large" clusters. working paper, 2018.

[18] Canay, I. A., and Shaikh, A. M. Practical and theoretical advances for inference in partially identified models. In *Advances in Economics and Econometrics: Volume 2: Eleventh World Congress*, B. Honoré, A. Pakes, M. Piazzesi, and L. Samuelson, Eds., vol. 2. Cambridge University Press, 2017, pp. 271–306.

[19] Heckman, J. J., and Vytlacil, E. Structural equations, treatment effects, and econometric policy evaluation 1. *Econometrica 73*, 3 (2005), 669–738.

[20] Hoeffding, W. The large-sample power of tests based on permutations of observations. *The Annals of Mathematical Statistics 23*, 2 (1952), pp. 169–192.

[21] Ibragimov, R., and Müller, U. K. t-statistic based correlation and heterogeneity robust inference. *Journal of Business & Economic Statistics 28*, 4 (2010), 453–468.

[22] Ibragimov, R., and Müller, U. K. Inference with few heterogenous clusters. *Manuscript* (2013).

[23] Imbens, G. W., and Angrist, J. D. Identification and estimation of local average treatment effects. *Econometrica 62*, 2 (1994), 467–475.

[24] Lee, D. S. Randomized experiments from non-random selection in u.s. house elections. *Journal of Econometrics 142*, 2 (2008), 675 – 697.

[25] Lehmann, E., and Romano, J. P. *Testing Statistical Hypotheses*, 3rd ed. Springer, New York, 2005.

[26] McCrary, J. Manipulation of the running variable in the regression discontinuity design: A density test. *Journal of Econometrics 142*, 2 (2008), 698 – 714.

[27] Mogstad, M., Santos, A., and Torgovitsky, A. Using instrumental variables for inference about policy relevant treatment parameters. *Econometrica 86*, 5 (2018), 1589–1619.

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[29] Politis, D. N., Romano, J. P., and Wolf, M. *Subsampling*. Springer, New York, 1999.

[30] Pollard, D. *A User's Guide to Measure Theoretic Probability*. Cambrigde University Press, New York, 2002.

[31] Romano, J. P. On non-parametric testing, the uniform behaviour of the t-test, and related problems. *Scandinavian Journal of Statistics 31* (2004), 567–584.

[32] Romano, J. P., and Shaikh, A. M. Inference for identifiable parameters in partially identified econometric models. *Journal of Statistical Planning and Inference 138*, 9 (September 2008), 2786–2807.

[33] Romano, J. P., and Shaikh, A. M. On the uniform asymptotic validity of subsampling and the bootstrap. *The Annals of Statistics 40*, 6 (2012), 2798–2822.

[34] Romano, J. P., Shaikh, A. M., and Wolf, M. A practical two-step method for testing moment inequalities. *Econometrica 82*, 5 (2014), 1979–2002.

[35] Savin, N. E., and Würtz, A. H. Power of tests in binary response models. *Econometrica 67*, 2 (1999), pp. 413–421.

[36] Serfling, R. J. *Approximation Theorems of Mathematical Statistics*. John Wiley, New York, 1980.

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[38] Vytlacil, E. Independence, monotonicity, and latent index models: An equivalence result. *Econometrica 70*, 1 (2002), 331–341.