Econ 481-3
Topics in Econometrics
Spring 2021

Lecture: TTh 1:30-3:20, in Zoom

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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 20th** and **May 11th**, 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 as described below. 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 or slides every week with related references you are supposed to read. The readings listed below include most of the articles we will discuss in class.

in-class Presentation: Students should split into **4 groups** and choose one of the topics of Part IV by **April 27th**. The following is expected:

- **Day of presentation**: A slide presentation available to students the morning before class.

- **Day of presentation**: A set of lecture notes that is about 6-8 pages long in a similar format than the one used for the class lecture notes.

- **Grading the day after**: Grading will evaluate the clarify of the slides, the clarity of the lecture note, and the quality of the exposition during the presentation. This part of the course will involve anonymous peer grading, so each student will have to fill out the grading form after each presentation and send it to the instructor.

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:

- The use of video is encouraged. Assuming our connections speeds are fast enough I would prefer if you have your video on during the lecture. If you chose to have your video off and you wish to ask a question, please **turn on your video** when you do so.

- Microphones should be **muted** during lecture. You should of course turn on your microphone when you want to ask a question.

- This is a small class and there are no TAs. This means that I will be not be looking at chat often so I recommend that you DO NOT use chat to try to call my attention or ask a question.

- Note-taking may be challenging in a Zoom lecture. To ease with this, I plan to do the following.

  - The slides I use for the lecture will be available for you to download the morning of the lecture day. You should check Canvas before the start of each class.
  - During lecture I will make annotations on the slides and you should feel free to do the same.
  - After each class I will upload the slides that contain the annotations I made during lectures so if you decided not to take notes while I teach, you will have the completed version of the slides at the end of the lecture.
  - If you need to review the material, you will have the recorded lecture available on Canvas.

Tentative Course Schedule: Econ 481-3 Spring 2021

Lecture	Date	Topics	Evaluation
		Part I:	
		Instrumental Variables 101	
1	Th, April 1	Selection on Observables	–
2	Tu, April 6	Roy Models and LATE	–
3	Th, April 8	Marginal Treatment Effects (MTEs)	PS1 out
4	Tu, April 13	Extrapolation and Some Extensions	–
5	Th, April 15	Outcome Tests via MTEs	–
		Part II:	
		Understanding Asymptotic Approximations	
6	Tu, April 20	Local Asymptotics (b)	–
7	Th, April 22	Contiguity (b)	PS1 due
8	Tu, April 27	Local Asymptotic Normality (b)	Pick Topic
9	Th, April 29	Convolution Theorems (b)	PS2 out
		Part III:	
		Uniformly Valid Inference with Moment Inequalities	
10	Tu, May 4	The Bahadur-Savage Problem (b)	–
11	Th, May 6	Uniformity of the t-test (b)	–
12	Tu, May 11	Uniformity of Subsampling (b)	PS2 due
13	Th, May 13	Inference in Moment Inequality Models I (s)	–
14	Tu, May 18	Inference in Moment Inequality Models II (s)	–
		Part IV[*]:	
		Regression Discontinuity Design	
15	Th, May 20	Intro to Regression-Discontinuity Designs [21, 30]	Presentation
16	Tu, May 25	Robust Nonparametric Inference for RDD [4, 11]	Presentation
17	Th, May 27	Approximate Permutation Tests in the RDD [15, 41]	Presentation
18	Tu, June 1	Testing Continuity of a Density [10, 29]	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] ARMSTRONG, T. B., AND KOLESÁR, M. Simple and honest confidence intervals in nonparametric regression. *Quantitative Economics 11*, 1 (2020), 1–39.

[5] BAHADUR, R., AND SAVAGE, L. J. The nonexistence of certain statistical procedures in nonparametric problems. *Annals of Mathematical Statistics 25* (1956), 1115–1122.

[6] 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.

[7] BILLINGSLEY, P. *Probability and Measure.* Wiley-Interscience, 1995.

[8] 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.

[9] 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.

[10] BUGNI, F. A., AND CANAY, I. A. Testing continuity of a density via g-order statistics in the regression discontinuity design. *Journal of Econometrics 221*, 1 (2021), 138–159.

[11] CALONICO, S., CATTANEO, M. D., AND TITIUNIK, R. Robust nonparametric confidence intervals for regression-discontinuity designs. *Econometrica 82* (2014).

[12] 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.

[13] CAMERON, A. C., AND MILLER, D. L. A practitioner's guide to cluster-robust inference. *Forthcoming in Journal of Human Resources* (2013).

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

[15] 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.

[16] CANAY, I. A., MOGSTAD, M., AND MOUNTJOY, J. On the use of outcome tests for detecting bias in decision making. Tech. rep., National Bureau of Economic Research, 2020.

[17] CANAY, I. A., ROMANO, J. P., AND SHAIKH, A. M. Randomization tests under an approximate symmetry assumption. *Econometrica 85*, 3 (May 2017), 1013–1030.

[18] 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.

[19] CANAY, I. A., SANTOS, A., AND SHAIKH, A. M. The wild bootstrap with a "small" number of "large" clusters. working paper, 2018.

[20] 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.

[21] CATTANEO, M. D., TITIUNIK, R., VAZQUEZ-BARE, G., ET AL. The regression discontinuity design. *Handbook of Research Methods in Political Science and International Relations, eds. L. Curini and RJ Franzese, Sage Publications* (2019).

[22] HECKMAN, J. J., AND VYTLACIL, E. Structural equations, treatment effects, and econometric policy evaluation 1. *Econometrica 73*, 3 (2005), 669–738.

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

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

[25] IBRAGIMOV, R., AND MÜLLER, U. K. Inference with few heterogenous clusters. *Manuscript* (2013).

[26] IMBENS, G. W., AND ANGRIST, J. D. Identification and estimation of local average treatment effects. *Econometrica 62*, 2 (1994), 467–475.

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

[28] LEHMANN, E., AND ROMANO, J. P. *Testing Statistical Hypotheses*, 3rd ed. Springer, New York, 2005.

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

[30] Melly, B., and Lalive, R. Estimation, inference, and interpretation in the regression discontinuity design. Tech. rep., working paper, 2020.

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

[32] Nelson, F., and Savin, N. The danger of extrapolating asymptotic local power. *Econometrica 58*, 4 (1990), 977–981.

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

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

[35] 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.

[36] 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.

[37] 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.

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

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

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

[41] Shen, S., and Zhang, X. Distributional tests for regression discontinuity: Theory and empirical examples. *Review of Economics and Statistics* (2016). forthcoming.

[42] van der Vaart, A. W. *Asymptotic Statistics*. Cambridge University Press, Cambridge, 1998.

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