

Quantitative Statistical Methods II

Outline of the Course

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Quantitative & Statistical Methods II
Barcelona GSE. Winter 2017

Chapter 1. Potential Outcomes and Causality: Treatment Effects

I. Introduction

II. Potential Outcomes, Selection Bias, and Treatment Effects

III. Identification of Treatment Effects under Different Assumptions

IV. Linear Regression and Treatment Effects

A. Conditional independence

B. Omitted variable bias

C. Treatment variables that take more than two values

D. Endogenous controls

Chapter 2: Social Experiments

I. Randomized Control Trials and Natural Experiments

II. Random Assignment and Treatment Effects

III. Standard Errors and Inference

IV. Introduction of Additional Regressors

V. Warnings: Imperfect Compliance and Effects on Intermediate Outcomes

A. Partial or Imperfect Compliance and Intention-to-Treat Analysis

B. Longer Run Interaction of Treatment and Intermediate Outcomes

Chapter 3. Selection on Observables. Matching

I. Selection Based on Observables and (Exact) Matching

II. The Common Support Condition

III. Propensity Score Matching

IV. Estimation methods

V. Matching versus Regression

VI. Inference: Bootstrap Standard Errors

Chapter 4. Instrumental Variables

I. Identification of causal effects in IV settings

A. Homogeneous treatment effects

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- B. Heterogeneous treatment effects
- II. Imperfect Compliance and IV*
- III. Local Average Treatment Effects (LATE)*
- IV. Conditional Estimation with Instrumental Variables*
- V. Continuous Instruments: Marginal Treatment Effects (MTE)*
- VI. Some Remarks about Unobserved Heterogeneity in IV Settings*
- VII. Weak Instruments*

Chapter 5. Regression Discontinuity

- I. The fundamental RD assumption*
- II. Homogeneous Treatment Effects*
- III. Heterogeneous Treatment Effects*
 - A. Sharp design
 - B. Fuzzy design
- IV. Estimation Strategies*
- V. Conditioning on Covariates*

Chapter 6. Panel Data

- I. Introduction*
- II. Static Models*
 - A. The Fixed Effects Model. Within Groups Estimation
 - B. The Random Effects Model. Error Components
 - C. Testing for Correlated Individual Effects
- III. Dynamic Models*
 - A. Autoregressive Models with Individual Effects
 - B. A small digression: quick review of Generalized Method of Moments (GMM)
 - C. Difference GMM Estimation
 - D. System GMM Estimation
 - E. Specification Tests

Chapter 7. Differences-in-differences

- I. Differences in Differences Setup*
- II. Differences in Differences in the Regression Context*
- III. Triple Differences*
- IV. Synthetic Control Methods*

Chapter 8. Quantile Regression and Quantile Treatment Effects

- I. Introduction*
 - A. Motivation

- B. Unconditional quantiles
- C. Nonparametric conditional quantiles
- II. *Quantile Regression*
 - A. Conditional Quantiles (revisited)
 - B. The Quantile Regression Model
 - C. Estimation
 - D. Quantile Regression with Censoring
- III. *Quantile Treatment Effects (QTE)*
 - A. What We Do (and What We Do Not Do)
 - B. The QTE Estimator

References

General References

- Angrist, J. D. and J.-S. Pischke**, 2009, *Mostly Harmless Econometrics, An Empiricists Companion*, Princeton University Press.
- Cameron, C. A. and P. K. Trivedi**, 2005, *Microeconometrics: Methods and Applications*, Cambridge: Cambridge University Press.

Social Experiments

- Bertrand, M. and S. Mullainathan**, 2004, “Are Emily and Greg More Employable than Lakisha and Jamal? A Field Experiment on Labor Market Discrimination,” *American Economic Review*, 94, 991-1013.
- Duflo, E. R. Glennerster and M. Kremer**, 2007, *Using Randomization in Development Economics Research: A Toolkit*, CEPR Discussion Paper No. 6059.
- Ham, J. C. and R. J. LaLonde**, 1996, “The Effect of Sample Selection and Initial Conditions in Duration Models: Evidence from Experimental Data on Training”, *Econometrica*, 64, 175-205.
- Krueger, A. B.**, 1999, “Experimental Estimates of Education Production Functions”, *Quarterly Journal of Economics*, 114, 497-532.
- Miguel, E. and M. Kremer**, 2004, “Worms: Identifying Impacts on Education and Health in the Presence of Treatment Externalities,” *Econometrica*, 72, 159-217.
- Moffitt, R. A.**, 2003, *Means-Tested Transfer Programs in the United States*. Chicago: The University of Chicago Press.
- Snow, J.**, 1855, *On the Mode of Communication of Cholera*, Churchill, London. Reprinted by Hafner, New York, 1965.

Stock, J. H., J. Wright and M. Yogo, 2002, “A Survey of Weak Instruments and Weak Identification in Generalized Method of Moments,” *Journal of Business and Economic Statistics*, 20, 518-529.

Stock, J. H. and M. Yogo, 2005, “Testing for Weak Instruments in Linear IV Regression,” Ch. 5 in D. W. K. Andrews (ed.), *Identification and Inference for Econometric Models*, New York, Cambridge University Press, 109-120.

Selection on Observables (matching)

Dehejia, R. and S. Wahba (1999), “Causal Effects in Nonexperimental Studies: Reevaluating the Evaluation of Training Programs,” *Journal of the American Statistical Association*, 94, 1053-1062.

Dehejia, R. and S. Wahba (2002), “Propensity Score Matching Methods for Non-experimental Causal Studies,” *Review of Economics and Statistics*, 84, 151-161.

Dearden, L., C. Emmerson, C. Frayne, and C. Meghir, 2009, “Conditional Cash Transfer and School Dropout Rates”, *Journal of Human Resources*, 44, 827-857.

Hirano, K. G. W. Imbens, and G. Ridder, 2003, “Efficient Estimation of Average Treatment Effects Using the Estimated Propensity Score”, *Econometrica*, 73, 669-738.

Rosenbaum, P.R. and D.B. Rubin, 1983, “The Central Role of the Propensity Score in Observational Studies for Causal Effects”, *Biometrika*, 70, 41-55.

Instrumental Variables

Angrist, J. D., 1990, “Lifetime Earnings and the Vietnam Era Draft Lottery: Evidence from Social Security Administrative Records,” *American Economic Review*, 80, 313-336.

Angrist, J. D., 1998, “Estimating the Labor Market Impact of Voluntary Military Service using Social Security Data on Military Applicants,” *Econometrica*, 66, 249-288.

Edin, P-A., P. Fredriksson, and O. Aslund, 2003, “Ethnic Enclaves and the Economic Success of Immigrants – Evidence from a Natural Experiment,” *Quarterly Journal of Economics*, 118, 329-357.

Frlich, M., 2003, *Program Evaluation and Treatment Choice*, Berlin-Heidelberg: Springer-Verlag.

Heckman, J. J. and E. Vytlacil, 2005, “Structural Equations, Treatment Effects, and Econometric Policy Evaluation,” *Econometrica* 73, 669-738.

Imbens, G. W. and J. D. Angrist, 1994, “Identification and Estimation of Local Average Treatment Effects”, *Econometrica*, 62, 467-475.

Vytlacil, E., 2002, “Independence, Monotonicity, and Latent Index Models: An Equivalence Result”, *Econometrica*, 70, 331-341.

Willis, R. J. and S. Rosen, 1979, “Education and Self-Selection”, *Journal of Political Economy*, 70, 331-341.

Regression Discontinuity

Angrist, J. D. and V. Lavy, 1999, “Using Maimonides Rule to Estimate the Effect of Class Size on Scholastic Achievement,” *Quarterly Journal of Economics*, 114, 533-775.

Cool, T. and D. T. Campbell, 1979, *Quasi-Experimentation: Design & Analysis Issues of Field Settings*, Chicago: Rand McNally College Publishing Company.

Fredriksson, P., ckert B. and H. Oosterbeek, 2013, “Long-Term Effects of Class Size,” *Quarterly Journal of Economics*, 249-285.

Hoxby, C. M., 2000, “The Effects of Class Size on Student Achievement: New Evidence from Population Variation”, *Quarterly Journal of Economics*, 115, 1239-1285.

Lee, D. S., and T. Lemieux, 2009, “Regression Discontinuity Designs in Economics,” *Journal of Economic Literature*, 48, 281-355.

Ludwig, J. and D. L. Miller, 2007, “Does Head Start Improve Childrens Life Chances? Evidence from a Regression Discontinuity Design,” *Quarterly Journal of Economics*, 122, 159-208.

Panel Data

Aker, J. C., 2010, “Information from Markets Near and Far: Mobile Phones and Agricultural Markets in Niger”, *American Economic Journal: Applied Economics*, 2, 46-59.

Arellano, M., 2003, *Panel Data Econometrics*, Oxford University Press.

Arellano, M. and S. Bond, 1991, “Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations”, *Review of Economic Studies*, 58, 277-297.

Arellano, M. and O. Bover, 1995, “Another Look at the Instrumental-Variable Estimation of Error-Components Models”, *Journal of Econometrics*, 68, 29-51.

Arellano, M., and B. Honoré, 2001, “Panel Data Models: Some Recent Developments,” in J. J. Heckman and E. E. Leamer (Eds.), *Handbook of Econometrics*, Vol, 5, 32293296.

Balestra, P. and M. Nerlove, 1966, "Pooling Cross Section and Time Series Data in the Estimation of a Dynamic Model: The Demand for Natural Gas", *Econometrica*, 34, 585-612.

Chamberlain, G., 1984, "Panel Data", in Z. Griliches and M.D. Intriligator (eds.), *Handbook of Econometrics*, vol. 2, Elsevier Science, Amsterdam.

Fang, H. and A. Gavazza, 2011, "Dynamic Inefficiencies in an Employment-Based Health Insurance System: Theory and Evidence", *American Economic Review*, 101, 2047-3077.

Hausman, J. A., 1978, "Specification Tests in Econometrics", *Econometrica*, 46, 1251-1272.

Differences-in-differences

Abadie, A. and J. Gardeazabal, 2003, "The Economic Costs of Conflict: A Case Study of the Basque Country", *American Economic Review*, 93, 113-132.

Duflo, E., 2001, "Schooling and Labor Market Consequences of School Construction in Indonesia: Evidence from an Unusual Policy Experiment," *American Economic Review*, 91,795-913.

Card, D. E. and A. B. Krueger, 1994, "Minimum Wages and Employment: A Case Study of the Fast-Food Industry in New Jersey and Pennsylvania," *American Economic Review*, 84, 772-793.

Quantile Regression and Quantile Treatment Effects

Abadie, A., 2003, "Semiparametric instrumental variable estimation of treatment response models" *Journal of Econometrics*, 113, 231-263.

Abadie, A., J. D. Angrist, and G. W. Imbens, 2002, "Instrumental Variables Estimates of the Effect of Subsidized Training on the Quantiles of Trainee Earnings", *Econometrica*, 70, 91-117.

Firpo, S., 2007, "Efficient Semiparametric Estimation of Quantile Treatment Effects," *Econometrica*, 75, 259-276.

Imbens, G. W. and D. B. Rubin, 1997, "Estimating Outcome Distributions for Compliers in Instrumental Variables Models", *Review of Economic Studies*, 64, 555-574.

Koenker R., 2005, *Quantile Regression*, Cambridge: Cambridge University Press.

Koenker R. and G. Basset, 1978, "Regression Quantiles", *Econometrica*, 46, 33-50.

Powell, J. L., 1986, "Censored Regression Quantiles" *Journal of Econometrics*, 32, 143-155.