

Applied Econometrics with R

Universidad del CEMA

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time See “Schedule”
webpage TBD

Overview and Objectives

This course will cover some of the most popular empirical methods used in applied economics. The main goal is to make these methods transparent to the students. To accomplish that goal we will (i) present a brief theoretical discussion of each method, (ii) implement them in the context of research questions using the programming language R. Furthermore, we show specific application of these econometric techniques by discussing two recent topics in applied economics in which they have been used. The expectation is that students will develop a deeper intuition of how the methods work by actually working with them. As a result, we hope to encourage students to pursue applied research in Economics.

The course starts with discussing general principles on pursuing credible research and with an introduction to R. Next, we move onto classical and important theoretical topics in Econometrics. As with most content of the class, we will illustrate them using R. Finally, we present three empirical strategies to deal with the problem of “selection on unobservables”: instrumental variables, fixed effect models, and regression discontinuity. We discuss some applications from recent empirical papers.

Knowledge of statistics and introductory econometrics is assumed for this course.

Content

- Introduction
 - Credible Research in Economics
 - An Introduction to R
- Making Regression Make Sense
 - Asymptotics, Inference, and the Causal Interpretation of Regression
 - Regression Anatomy, OVB Formula, Frisch–Waugh–Lovell Theorem
- Selection on Unobservables
 - Instrumental Variables
 - Difference in Differences
 - Fixed Effects Models and Event-Study Designs

- Discussions
 - Urban Economics: Estimation under Non-Random Placement of Infrastructure
 - Labor Economics: The Effects of the Minimum Wage on Employment

Evaluation

Replication The first element for evaluation will come from one replication exercise. Students will be provided with data and instructions, and will need to implement the replications in R. Expected submissions include a PDF file presenting the results and the code used to obtain them. Usage of RMarkdown is encouraged.¹

The replication exercise is due on Sunday, April 25th at midnight.

Research Proposal The second part of the evaluation regards the presentation of a novel research idea. Specifically, students must submit a brief research proposal (no more than 4 pages) describing:

- *Research question.* Why is it important? Motivate your idea.
- *Research design.* How are you going to answer your question? What are strengths and potential weaknesses of your research design? What are threats to identification?
- *Empirical implementation.* What data would you use? What regression(s) would you run?

The research proposal is due on Sunday, May 9th at midnight.

Schedule

The course will consist of nine 2-hour meetings via Zoom. In the first and second meetings we will introduce R, so it is recommended to already have R and RStudio installed in your computer.² I will use R in several meetings, typically to replicate a result or to illustrate some concept.

Proposed dates for the meetings, all in the month of April 2021 at 5pm Buenos Aires time.

1. Week 1: Tuesday 6, Thursday 8, Friday 9.
2. Week 2: Monday 12, Tuesday 13, Thursday 15, Friday 16.
3. Week 3: Monday 19, Tuesday 20.

An overview of the (intended) material to be covered in each meeting is the following:

1. Course overview // Introduction to R
2. Causal Inference // Application: Elías, Lacetera, and Macis (2019).
3. Making Regression Make Sense: Asymptotics, Inference and Causality
4. The tidyverse packages // Regressions with R // RMarkdown
5. Instrumental Variables // Applications: Ananat (2011).

[*Other applications:* Roberts and Schlenker (2013) and David, Dorn, and Hanson (2013)]

¹Here is a guide to the general markdown language. If time permits, we will also discuss Rmarkdown in class.

²Visit r-project.org and rstudio.com

6. Urban Economics Discussion: Estimation of treatment effects under non-random placement of infrastructure. Applications: Fajgelbaum and Redding (2018) and Belmar and Gentile Passaro (2021).

[*Other Papers in this area:* Michaels (2008), Banerjee, Duflo, and Qian (2012), Perez (2017), and Donaldson and Hornbeck (2016).]

7. Differences-in-differences // Application: Duflo (2001) and Di Tella and Schargrotsky (2004).

[*Other applications:* Card and Krueger (1994)]

8. Fixed Effects Models and Event-Study Design // Application: Ajzenman, Cavalcanti, and Da Mata (2020).

[*Other applications:* Gentzkow, Shapiro, and Sinkinson (2011).]

9. Discussion: The effect of the minimum wage on employment. Papers: Card and Krueger (1994), Meer and West (2016), and Cengiz et al. (2019).

[*Other Papers in this area:* Autor, Manning, and Smith (2016) and Clements and Wither (2019).]

Graduate level Econometrics books

- Angrist, Joshua D and Jörn-Steffen Pischke (2008). *Mostly harmless econometrics: An empiricist's companion*. Princeton university press.
- Cunningham, Scott (2018). *Causal Inference: The Mixtape*. Unpublished manuscript.
- Hansen, Bruce E. (2020). *Econometrics*. Unpublished manuscript.

Undergraduate level Econometrics books

- Hanck, Christoph, Martin A Alexander, and Martin Schmelzer (2019). *Introduction to econometrics with R*. Nelson Education. URL: <https://www.econometrics-with-r.org>.
- Wooldridge, Jeffrey M (2016). *Introduction to econometrics: A modern approach*. Nelson Education.

Coding and Data

- Colonescu, Constantin (2016). *Principles of Econometrics with R*. URL: <https://bookdown.org/ccolonescu/RPoE4/>.
- Facure, Matheus (2020). *Econometrics and Causal Inference (python)*. URL: <https://matheusfacure.github.io/econtutorials/>.
- Gentzkow, Matthew and Jesse M Shapiro (2014). *Code and data for the social sciences: A practitioner's guide*. Tech. rep. URL: <https://www.brown.edu/Research/Shapiro/pdfs/CodeAndData.pdf>.
- Wilke, Claus O (2019). *Fundamentals of data visualization: a primer on making informative and compelling figures*. O'Reilly Media. URL: <https://serialmentor.com/dataviz>.

Coding in R

- Bran, Jenny (2020). *Data wrangling, exploration, and analysis with R*. URL: <https://stat545.com/>.
- Montane, Martin (2020). *Ciencia de datos para curiosos*. URL: <https://martinmontane.github.io/CienciaDeDatosBook/>.
- Phillips, Nathaniel D (2018). *YaRrr! The Pirate's Guide to R*. URL: <https://bookdown.org/ndphillips/YaRrr/>.
- Venables, William N, David M Smith, R Development Core Team, et al. (2009). *An introduction to R*. URL: <https://cran.r-project.org/doc/manuals/r-release/R-intro.pdf>.
- Wickham, Hadley (2019). *Advanced R*. CRC press. URL: <https://adv-r.hadley.nz/>.
- Wickham, Hadley and Garrett Golemund (2016). *R for data science: import, tidy, transform, visualize, and model data*. O'Reilly Media, Inc. URL: <https://r4ds.had.co.nz/>.
- Xie, Yihui, Christophe Dervieux, and Emily Riederer (2020). *R Markdown Cookbook*. URL: <https://bookdown.org/yihui/rmarkdown-cookbook/>.

Methods Papers

- Angrist, Joshua D, Guido W Imbens, and Donald B Rubin (1996). “Identification of causal effects using instrumental variables”. In: *Journal of the American statistical Association* 91.434, pp. 444–455.
- Angrist, Joshua D and Jörn-Steffen Pischke (2010). “The credibility revolution in empirical economics: How better research design is taking the con out of econometrics”. In: *Journal of economic perspectives* 24.2, pp. 3–30.
- Athey, Susan and Guido W Imbens (2017). “The state of applied econometrics: Causality and policy evaluation”. In: *Journal of Economic Perspectives* 31.2, pp. 3–32.
- Bertrand, Marianne, Esther Duflo, and Sendhil Mullainathan (2004). “How much should we trust differences-in-differences estimates?” In: *The Quarterly journal of economics* 119.1, pp. 249–275.
- Cameron, A Colin and Douglas L Miller (2015). “A practitioner’s guide to cluster-robust inference”. In: *Journal of human resources* 50.2, pp. 317–372.
- Freedman, David A (1991). “Statistical models and shoe leather”. In: *Sociological methodology*, pp. 291–313.
- Imbens, Guido W (2014). “Instrumental variables: an econometrician’s perspective”. In: *Working Paper NBER*.
- Imbens, Guido W and Thomas Lemieux (2008). “Regression discontinuity designs: A guide to practice”. In: *Journal of econometrics* 142.2, pp. 615–635.
- Leamer, Edward E (1983). “Let’s take the con out of econometrics”. In: *The American Economic Review* 73.1, pp. 31–43.
- Schmidheiny, Kurt and Sebastian Siegloch (2020). “On event studies and distributed-lags in two-way fixed effects models: Identification, equivalence, and generalization”. In: *ZEW-Centre for European Economic Research Discussion Paper* 20-017.

Discussion Papers

- Ajzenman, Nicolas, Tiago Cavalcanti, and Daniel Da Mata (2020). “More than words: Leaders’ speech and risky behavior during a pandemic”. In: *Available at SSRN 3582908*.
- Ananat, Elizabeth Oltmans (2011). “The wrong side (s) of the tracks: The causal effects of racial segregation on urban poverty and inequality”. In: *American Economic Journal: Applied Economics* 3.2, pp. 34–66.
- Ashenfelter, Orley and Alan Krueger (1994). “Estimates of the economic return to schooling from a new sample of twins”. In: *The American economic review*, pp. 1157–1173.
- Autor, David H, Alan Manning, and Christopher L Smith (2016). “The contribution of the minimum wage to US wage inequality over three decades: a reassessment”. In: *American Economic Journal: Applied Economics* 8.1, pp. 58–99.
- Banerjee, Abhijit, Esther Duflo, and Nancy Qian (2012). *On the road: Access to transportation infrastructure and economic growth in China*. Tech. rep. National Bureau of Economic Research.

- Belmar, Jose and Diego Gentile Passaro (2021). “Bimodal Transport Infrastructure and Regional Development: Evidence from Argentina, 1960 - 1991”. In: *CAF Working Paper*.
- Card, David and Alan B Krueger (1994). “Minimum wages and employment: A case study of the fast food industry in New Jersey and Pennsylvania”. In: *American economic review* 84.
- Cengiz, Doruk et al. (2019). “The effect of minimum wages on low-wage jobs”. In: *The Quarterly Journal of Economics* 134.3, pp. 1405–1454.
- Clemens, Michael A, Ethan G Lewis, and Hannah M Postel (2018). “Immigration restrictions as active labor market policy: Evidence from the mexican bracero exclusion”. In: *American Economic Review* 108.6, pp. 1468–87.
- Clements, J and M Wither (2019). “The Minimum Wage and the Great Recession: Evidence of Effects on the Employment and Income Trajectories of Low-Skilled Workers”. In: *Journal of Public Economics* 170, pp. 53–67.
- David, H, David Dorn, and Gordon H Hanson (2013). “The China syndrome: Local labor market effects of import competition in the United States”. In: *American Economic Review* 103.6, pp. 2121–68.
- Di Tella, Rafael and Ernesto Schargrodsky (2004). “Do police reduce crime? Estimates using the allocation of police forces after a terrorist attack”. In: *American Economic Review* 94.1, pp. 115–133.
- Donaldson, Dave and Richard Hornbeck (2016). “Railroads and American economic growth: A “market access” approach”. In: *The Quarterly Journal of Economics* 131.2, pp. 799–858.
- Duflo, Esther (2001). “Schooling and labor market consequences of school construction in Indonesia: Evidence from an unusual policy experiment”. In: *American economic review* 91.4, pp. 795–813.
- Eliás, Julio J., Nicola Lacetera, and Mario Macis (2019). “Paying for Kidneys? A Randomized Survey and Choice Experiment”. In: *American Economic Review* 109.8, pp. 2855–88.
- Fajgelbaum, Pablo D and Stephen J Redding (2018). “Trade, structural transformation and development: Evidence from Argentina 1869-1914”. In: *NBER Working Paper* 20217.
- Gentzkow, Matthew, Jesse M Shapiro, and Michael Sinkinson (2011). “The effect of newspaper entry and exit on electoral politics”. In: *American Economic Review* 101.7, pp. 2980–3018.
- LaLonde, Robert J (1986). “Evaluating the econometric evaluations of training programs with experimental data”. In: *American economic review*, pp. 604–620.
- Meer, Jonathan and Jeremy West (2016). “Effects of the minimum wage on employment dynamics”. In: *Journal of Human Resources* 51.2, pp. 500–522.
- Michaels, Guy (2008). “The effect of trade on the demand for skill: Evidence from the interstate highway system”. In: *The Review of Economics and Statistics* 90.4, pp. 683–701.
- Perez, Santiago (2017). “Railroads and the Rural to Urban Transition: Evidence from 19th-Century Argentina”. In: *Job Market Paper*.
- Roberts, Michael J and Wolfram Schlenker (2013). “Identifying supply and demand elasticities of agricultural commodities: Implications for the US ethanol mandate”. In: *American Economic Review* 103.6, pp. 2265–95.