

Syllabus for Research Methods in Economics and Business¹

Spring 2022

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Place:	2413, No. 2 Public Teaching Building	Office hours:	By appointment
Repository:	https://gitee.com/zhiyuanryanchen/econ-research-methods		

Description

This course is intended to train students in frontier research methods for good empirical and quantitative studies in areas related to economics and business. This course covers a variety of research tools and approaches that are widely used in economics, business, finance, and management.

It emphasizes a collaboration of various quantitative skills in conducting empirical research, as well as a tight connection between the theory and empirical facts. The course begins by introducing causal inference methods. Then it introduces programming skills using Stata based on simulated datasets. It will cover data visualization,

¹This syllabus is evolving; make sure that you have the most recent version.

summary statistics, simulation, and estimation. Some recent developments in machine learning and text analysis will be introduced with examples implemented in Python. Then it discusses the establishment of economic theories behind the observed empirical facts, including both verbal-based and math-based models. The course concludes by introducing basic computational methods in estimating and simulating structural economic models to perform the counterfactual analysis.

Prerequisites

This course will assume a knowledge of graduate-level microeconomics, macroeconomics, and econometrics. Some experience in working with Stata, Matlab, Python, Jupyterlab, and Git is preferred, but not a must for this course.

Requirements and Grading

1. ***Class participation:*** Though this is a lecture course, class discussion and interaction are a crucial part of our synthesis of the material and learning. It is therefore vital that you come to every class, prepared and ready to contribute.
2. ***Problem sets:*** You may be required to do some problem sets. Some problem sets will be discussed in class and students are required to present their solutions.
3. ***Research project:*** You are also required to complete a research project that is designed to walk you through the process of conducting independent economic re-

search. A suggestive list of potential research projects will be announced in class. You may need to come to discuss with me if you choose a project not on the list. The research project requires you to replicate and/or extend an existing paper. Based on the results you find, you are required to develop your own research question, propose hypotheses or design theoretical frameworks, and design econometric models or build theoretical models to answer your research question. The project is to be written in the form of a journal article, with motivation, model and/or hypotheses, data, results, and a conclusion. Students may work in groups; the maximum number of members in each group should not exceed three. Two deadlines for the research project:

- TBD (last class in the fall semester): A complete proposal is due in the class. You will present your projects in class and receive comments, and may need to revise your proposal based on the comments.
- TBD (Some time after the summer vacation): Final draft of the research project is due

4. *Grading:* Your grade for the course will be determined as follows:

- **Class participation:** 30%
- **Problem sets:** 20%
- **Research project:** 50% = 20% (presentation) + 30% (final draft)

The Tentative Class Schedule

* means important!

1. Class 1 (4/21)– Causal inference, linear regressions, panel data models, Diff-in-Diff

References

- J.D. Angrist and J.S. Pischke, *Mostly Harmless Econometrics: An Empiricist's Companion*, Princeton University Press, 2009. [Chapters 1~5]
- Douglas Almond, Kenneth Y. Chay, David S. Lee, *The Costs of Low Birth Weight*, *The Quarterly Journal of Economics*, Volume 120, Issue 3, August 2005, Pages 1031–1083

Readings

- Jeff Woodridge 2007 NBER Lecture “[Difference in Differences Estimation](#)”
- Abadie, A., and M. D. Cattaneo. (2018): “*Econometric Methods for Program Evaluation*,” *Annual Review of Economics*, 10, 465–503.
- Brodeur, Abel, Nikolai Cook, and Anthony Heyes (2020): “*Methods Matter: p-Hacking and Publication Bias in Causal Analysis in Economics*.” *American Economic Review*, 110 (11): 3634-60.
- Christine Cai, 2020, *Literature on Recent Advances in Applied Micro Methods*. [[PDF](#)]

- John J. Donohue, III, Steven D. Levitt, *The Impact of Legalized Abortion on Crime*, The Quarterly Journal of Economics, Volume 116, Issue 2, May 2001, Pages 379–420

2. Class 2 (5/5) More on Diff-in-Diffs :

References:

- *Marianne Bertrand, Esther Duflo, Sendhil Mullainathan, *How Much Should We Trust Differences-In-Differences Estimates?*, The Quarterly Journal of Economics, Volume 119, Issue 1, February 2004, Pages 249–275
- *Cameron, A. Colin, and Douglas L. Miller. "A Practitioner's Guide to Cluster-Robust Inference." *Journal of Human Resources*, vol. 50, no. 2, 2015, pp. 317–372.
- Abadie, A., A. Diamond, and A. J. Hainmueller. (2010): "Synthetic control methods for comparative case studies: Estimating the effect of California's Tobacco control program," *Journal of the American Statistical Association*, 105, 493–505.
- Abadie, Alberto. "Semiparametric difference-in-differences estimators." *The Review of Economic Studies* 72.1 (2005): 1-19.
- Arkhangelsky, Dmitry, et al. *Synthetic difference in differences*. No. w25532. National Bureau of Economic Research, 2019.
- Athey, S., and Imbens, G. W. (2022). *Design-based analysis in difference-in-differences settings with staggered adoption*. *Journal of Econometrics*, 226(1), 62-79.

- Callaway, Brantly, and Pedro HC Sant'Anna. "*Difference-in-differences with multiple time periods.*" *Journal of Econometrics* 225.2 (2021): 200-230.
- De Chaisemartin, Clement, and Xavier d'Haultfoeuille. "*Two-way fixed effects estimators with heterogeneous treatment effects.*" *American Economic Review* 110.9 (2020): 2964-96.
- Goodman-Bacon, Andrew. "*Difference-in-differences with variation in treatment timing.*" *Journal of Econometrics* 225.2 (2021): 254-277.
- Heckman, James J., Hidehiko Ichimura, and Petra E. Todd. "*Matching as an econometric evaluation estimator: Evidence from evaluating a job training programme.*" *The review of economic studies* 64.4 (1997): 605-654.
- Sun, Liyang, and Sarah Abraham. "*Estimating dynamic treatment effects in event studies with heterogeneous treatment effects.*" *Journal of Econometrics* 225.2 (2021): 175-199.

Readings:

- Wang, Shaoda, and David Y. Yang. *Policy Experimentation in China: the Political Economy of Policy Learning*. NBER No. w29402, 2021.

3. **Class 3 (5/12)**– Understanding Simulation and Bootstrap: Introduction to STATA and Jupyterlab

References:

- *A. Colin Cameron and Pravin K. Trivedi, *Microeconometrics Using Stata*, Second Edition, 2010, Chapters 3, 4.
- *Cameron, A. C., J. B. Gelbach, and D. L. Miller. (2008): “*Bootstrap-Based Improvements for Inference with Clustered Errors*,” *The Review of Economics and Statistics*, 90, 414–27.
- Edward R. Tufte, *The Visual Display of Quantitative Information*, Second, Edition, 2007.
- *A. Colin Cameron and Pravin K. Trivedi, *Microeconometrics Using Stata*, Second Edition, 2010, Chapters 1, 2
- *Stata Corporation,
 - *Stata User’s Guide*, Release 15/Release 16, Stata basics (particularly sections 3 and 10)
 - Collection of Stata Graphs: <https://www.stata.com/support/faqs/graphics/gph/stata-graphs/>
- *Webpages: [QuantEcon DataScience](#), [Introduction](#), [Data Visualization](#) (and references therein)
- *Stata_kernel in Jupyterlab: https://kylebarron.dev/stata_kernel/

4. Class 4 (5/19) – Machine Learning and Text Analysis in Economic Research

References

- *Gentzkow, M., B. Kelly, and M. Taddy. (2019): “*Text as Data*,” *Journal of Economic Literature*, 57, 535–74. [[PDF](#)]

- *Athey, S., and G. W. Imbens. (2019): “Machine Learning Methods That Economists Should Know About,” Annual Review of Economics, 11, 685–725. [[PDF](#)]
- *Cameron, A. Colin, 2019, *Machine Learning Methods in Economics*, [slides](#)

Readings

I. Machine Learning in Economics

- *Hoberg, G., and G. Phillips. (2016), *Text-based network industries and endogenous product differentiation*, Journal of Political Economy, 124, 1423–65.
- *Susan Athey (2018), *The Impact of Machine Learning on Economics*. [[PDF](#)]
- Sendhil Mullainathan and J. Spies, 2017, *Machine Learning: An Applied Econometric Approach*, Journal of Economic Perspectives, 87-106.
- Gareth James, Daniela Witten, Trevor Hastie and Robert Tibsharani (2013), *An Introduction to Statistical Learning: with Applications in R*, Springer. [[Python Code](#)]
- [Scikit-learn: Machine Learning in Python](#), Pedregosa et al., JMLR 12, pp. 2825-2830, 2011

II. Text-analysis

- *Scott R. Baker, Nicholas Bloom, Steven J. Davis, *Measuring Economic Policy Uncertainty*, The Quarterly Journal of Economics, Volume 131, Is-

sue 4, November 2016, Pages 1593–1636, <https://doi.org/10.1093/qje/qjw024>

- *Kelly, B. T., D. Papanikolaou, A. Seru, and M. Taddy. (2020): “*Measuring Technological Innovation over the Long Run*,” NBER working paper w25266.
- Raffo, J., and S. Lhuillery. (2009): “*How to play the ‘Names Game’: Patent retrieval comparing different heuristics*,” *Research Policy*, 38, 1617–27.

5. **Class 5 (5/26)**–Seeking the theory behind the empirical facts

References:

- *Melitz, M. J. (2003): “*The impact of trade on intra-industry reallocations and aggregate industry productivity*,” *Econometrica*, 71, 1695–1725.
- *Eaton, J., S. Kortum, and F. Kramarz. (2011): “*An Anatomy of International Trade: Evidence From French Firms*,” *Econometrica*, 79, 1453–98.
- *Chen, Z., Z. Liu, J. C. Suárez Serrato, and D. Y. Xu. (2018): “*Notching R&D Investment with Corporate Income Tax Cuts in China*,” NBER Working Paper No. w24749

Readings:

- Chaney, T. (2008): “*Distorted gravity: The intensive and extensive margins of international trade*,” *American Economic Review*, 98, 1707–21.

6. **Class 6,7 (5/27, 6/2)** – Model computation and simulation: Gravity equation and BLP

References:

- *Mario J. Miranda and Paul L. Fackler, *Applied Computational Economics and Finance*, MIT Press, 2002.
- *Kenneth L. Judd, *Numerical Methods in Economics*, MIT Press, 1998.
- *Anderson, B. J. E., and E. V. A. N. Wincoop. (2003): “Gravity with Gravitas : A Solution to the Border Puzzle,” *American Economic Review*, 93, 170–92.
- *Berry, S., J. Levinsohn, and A. Pakes. (1995): “Automobile Price in Market Equilibrium,” *Econometrica*, 63, 841–90.
- *Nevo, A. (2000): “A Practitioner’s Guide to Estimation of Random-Coefficients Logit Models of Demand,” *Journal of Economics & Management Strategy*, 9, 513–48.
- Vincent, D. W. (2015): “The Berry-Levinsohn-Pakes estimator of the random-coefficients logit demand model,” *Stata Journal*, 15, 854–80.

Readings:

- Jérôme Adda and Russell Cooper, *Dynamic Economics: Quantitative Methods and Applications*, MIT Press, 2003.
- *Berry, S., 1994, “Estimating Discrete-Choice Models of Product Differentiation,” *RAND Journal of Economics*, 25, 242–262.
- Bruce Hansen, *Econometrics*, Chapter 13. [[PDF](#)]

7. Class 8 (1/4)– Student Presentations