# ECON 5243: Econometrics II

University of Oklahoma
Fall, 2018

Prerequisite: ECON 5123
Class Meets: Tu & Th 3:00 pm - 4:15 pm
Class Room: Cate Center 140
Office Hours: Tu & Th 11:30 - 12:30 pm.

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**This syllabus is a contract between you and me. By taking this course you agree to abide by the policies and rules listed within.**

## Course Description:

This course is essentially one for Micro-econometrics but is well suited to anyone in finance, accounting, sociology, political science, or any other disciplines of social science. The main goal of this course is to learn a set of econometrics tools which can be applied in empirical research in different fields of micro-economics. The course will emphasize the importance of research design for the identification of causal effects, as well as the limitations in the applicability of many commonly used techniques. Although we will learn different econometric methods, the formal requirements of the class will consist primarily of problem sets requiring students to analyze real data and replicate results from published papers in the hope that doing applied work will help you to learn the theory behind it.

This course is a sequence of ECON 5123 so students should be familiar with matrix algebra, basic (asymptotic) statistics/econometrics, and basic inference procedures. The course is build up based on all these tools so you won't enjoy yourself or get much out of the course without this prior training. I will very frequently use all these techniques assuming students know the basics and will not spend much time on the details of those statistical procedures. However, if you ever have any doubts, please stop by in the office hours.

## Course Grades:

Your course grade will be based on, (i) five homework assignments, (ii) one midterm exam, (iii) an independent research project (iv) final exam, as well as a possibility for bonus points based on class participation. The weights for these parts are listed below. Homework assignments will be based on both analytical questions and real data analysis by using statistical

Table 1: Weights of Exams, Homeworks and Project

| Index | Weights |
|---|---|
| 5 Problem Sets | 25% |
| Midterm Exam | 25% |
| Research Project/ Replication | 20% |
| Class Presentation | 5% |
| Final Exam | 25% |

softwares. In many instances you will be required to produce publication quality tables and figures showing the major results of these analyses, and you will be required to submit all programs used in generating your results.

The course has been divided in four major parts and each exam will cover two of them. There will be only analytical exam questions in both the exams. I will go over practice questions before both the exams to give you a better idea about the exams. As a graduate student, I expect you to handover your homework assignments in a professional outlet by using either **PDF or Microsoft word document.**

I believe in horizontal equity: all students who receive the same numerical grade will receive the same letter grade (i.e. a 90 will not be an A- for one student and an A for another). I also believe in vertical equity: higher numerical grades will (obviously) correspond to higher letter grades. After grading is complete, identical adjustments may be made to everyones grade if the median score is lower than expected.

At this point in your career the grade you receive in this course should have little impact on the quality of your dissertation thesis. One rule I follow is that no one will receive a grade in the 'A range' without completing all the problem sets, showing up in classes regularly and do well in the independent research project or the replication analysis. This is not surprising because combining homework assignments and research project consists of 50% of your final grade.

## Research Project/ Replication:

You have two options either to submit an independent original research project or replicate all the empirical analysis of a journal article. Note that the journal has to be a well known economics journal and the article has to be one which we will not cover in the class. Journal of Applied Econometrics (JAE) has a replication section. If you would like to submit replication analysis, I will encourage you to look at some of the published to article from that section of

the JAE. Your replication paper should principally involve one of the research designs listed on the course outline below, or some variation, no exceptions to that rule. Remember that if the codes of any article is available in online, you are not suppose to run the codes to produce the replication results, in that case you need to use different softwares.

The most important part of the independent research project is to find a good research question and for that you need a fair amount of knowledge about the literature in which your are interested. This requires a huge time investment so the quality of your question has a high correlation on how much time you are willing to invest. I expect you to submit a 10-12 pages (not more than 3000 words) report where you need to address the following questions:

1. What is the research question?
2. Why is that research question important?
3. What is the contribution of your question in the literature?
4. What is the identification strategy? and why do you choose that?
5. Results and conclusion.

Please note that your research project topic or replication analysis article must be approved by me by **October 18th, 2018** along with proof that you have the data in hand and the **final submission** deadline is **December 6th, 2018**.

## Statistical analysis software

I recommend that students use Stata because Stata has already implemented most of the course materials we will cover in this course. However, it is not required, you can use SAS, Matlab, R, Gauss or any other statistical softwares for your homework and class project. I will be able to read your codes from any of those listed softwares to verify the final output. Stata is most popular in applied research since it is well accepted by the economists around the world and it's also very user friendly. However if you want to implement some new techniques which are not available in Stata, matrix language softwares like R, Matlab and Guass will be a better choice compared to Stata and SAS. It's completely your decision to choose the right statistical softwares for you.

## Textbooks and Other References


- **[CT]:** Cameron, A. Colin and Pravin K. Trivedi (2005) Microeconometrics: Methods and Applications. Cambridge University Press.

- **[AP]:** Angrist, Joshua and Jorn-Stefen Pischke (2009). Mostly Harmless Econometrics
- **[W]:** Wooldrige, Jeffrey M. (2002). Econometric Analysis of Cross-Section and Panel Data
- **[DM]:** Davidson, Russel and James G. Mackinnon (2004). Econometric Theory and Methods
- **[G]:** Greene, William H. (2012). Econometric Analysis
- **[B]:** Baltagi, Badi (2012). Econometric Analysis of Panel Data

The following articles, books, and notes are also very useful references for a wide range of material.

- Heckman, James, Robert LaLonde and Jeffrey Smith. 1999. "The Economics and Econometrics of Active Labor Market Programs." In Orley Ashenfelter and David Card, eds., Handbook of Labor Economics, Volume 3A. Amsterdam: North-Holland, pp. 1865-2097.
- Angrist, Joshua and Alan Krueger. 1999. "Empirical Strategies in Labor Economics." In Orley Ashenfelter and David Card, eds., Handbook of Labour Economics, Volume 3A. Amsterdam: North-Holland, pp. 1277-1366.
- Heckman, James and Navarro-Lozano Salvador. 2004. "Using Matching, Instrumental Variables, and Control Functions to estimate Economic Choice Models" The Review of Economic Studies. Vol. 86(1), 30-57.
- Imbens, Guido and Jeffrey Wooldridge, "What's New in Econometrics?" NBER 2007 Summer Institute Notes: Link
- Murnane, Richard J. and John B. Willett (2011). Methods Matter. Improving Causal Inference in Educational and Social Science Research. Oxford University Press.
- Morgan, Stephen L. and Christopher Winship (2007). Counterfactuals and Causal Inference: Methods and Principles for Social Research. Cambridge University Press.
- Guido Imbens and DOnald Rubin. 2015. Causal Inference For Statistics, Social and Biomedical Sciences. Cambridge University Press.

# Course Readings

# 1 Basic Research Designs

## 1.1 Overview of Causal Reasoning

- Cameron and Trivedi (CT) chapter 2
- Holland, Paul W., "Statistics and Causal Inference," Journal of the American Statistical Association, 1986, 81, 945-960.
- Rubin, Donald B., "Statistics and Causal Inference: Comment: Which Ifs Have Causal Answers?," Journal of the American Statistical Association, 1986, 81, 961-962.
- Freedman, David, "Statistical Models and Shoe Leather," Sociological Methodology, 1991,21, 291-313.
- DiNardo, John E and David S Lee, "Program Evaluation and Research Designs," Handbook of Labor Economics, 2011, 4, 463-536.
- Heckman, James, "The Scientific Model of Causality," Sociological Methodology, August 2005,35 (1), 1-98.
- Fryer, Roland G. and Steven D. Levitt, "The Causes and Consequences of Distinctively Black Names," Quarterly Journal of Economics, August 2004, 119 (3), 767-805.
- Rosenzweig, Mark R. and Kenneth I. Wolpin, "Natural "Natural Experiments" in Economics," Journal of Economic Literature, December 2000, 38, 827-874.

## 1.2 Ordinary Least Squares

- Angrist and Pischke (AP) chapter 3, Greene, William (G) chapter 3 and 4, Cameron and Trivedi (CT) chapter 4.

## 1.3 Heteroskedasticity

- Greene, William (G) chapter 9, Davidson and Mackinnon (DM) chapter 7, Angrist and Pischke (AP) chapter 8
- Carrol J. "Adapting for Heteroskedasticty in Linear Models", Annals of Statistics, 1982, 10:1224-1233

## 1.4 OLS Under Misspecification

- Wooldrige, Jeffrey (W) chapter 4, Davidson and Mackinnon (DM) chapter 3.
- Lien D., and Vuong Q., "Selecting the Best Linear Regression Model: A Classical Approach", Journal of Econometrics, 1987, 35: 3-23
- Amemiya T. "Selection of Regressors", International Economics Review, 1980, 21: 331-345
- Carrol J., "The Lagrange Multiplier Test and Its Applications to Model Specification in Econometrics", Review of Economic Studies, 1980, 47: 239-254

## 1.5 Measurement Error

- Cameron and Trivedi (CT) chapter 26, Wooldrige, Jeffrey (W) chapter 4.
- Bollinger, C., "Measurement Error in Human Capital and the Black-White Wage Gap" Review of Economics and Statistics, 2003, 85:578-585.
- Bollinger, C. and Amitabh Chandra. 2005."Iatrogenic Specification Error: A Cautionary Tale of Cleaning Data" Journal of Labor Economics. Vol 23(2), 235-257. NBER 2003, Technical Working Paper 289.
- Ashenfelter, Orley and Alan Krueger. "Estimates of the Economic Return to Schooling from a New Sample of Twins. American Economic Review 84 (Dec. 1994): 1157-1173

## 1.6 Sample Selection Models

- Cameron and Trivedi (CT) chapter 16, Wooldrige, Jeffrey (W) chapter 17.
- Heckman James. "Sample Selection Bias as a Specification Error" The Econometric Society 1979, 153-161.
- Greene W. "Sample Selection Bias as a Specification Error: Comment" Econometrica, 1981, 49, 795-798.
- Newey Whitney. "Two-step series estimation of sample selection models" The Econometric Society 2009, 12: 217-229.
- Heckman J., Icimura H., Smith A., Todd P. "Characterizing Selection Bias Using Experimental Data" Econometrica 1998, 66: 1017-1098.
- Das M., Newey W., Vella F. "Nonparametric Estimation of Sample Selection Models" Review of Economic Studies 2003, 70: 33-58.
- Alan Kruger and David Schkade. "Sorting in the Labor Market: Do Gregarious Workers Flock to Interactive Jobs?" The Journal of Human Resources 2008, 859-883.

# 2 Selection on Unobservable Designs

## 2.1 Instrumental Variables

- Angrist and Pischke (AP) chapter 4, Cameron and Trivedi (CT) chapter 6, Davidson and Mackinnon (DM) chapter 8, Greene, William (G) chapter 8 and 9, Wooldrige, Jeffrey (W) chapter 5 and 6.
- Angrist, Joshua D., Guido Imbens, and Donald Rubin, "Identification of Causal Effects Using Instrumental Variables," Journal of the American Statistical Association, 1996, 91, 444-455.
- Angrist, Joshua D. and Alan Krueger, "Instrumental Variables and the Search for Identification: From Supply and Demand to Natural Experiments," Journal of Economic Perspectives, 2001, 15, 69-86.
- Angrist, Joshua D., "Lifetime Earnings and the Vietnam Era Draft Lottery: Evidence from Social Security Administrative Records," American Economic Review, June 1990, 80(3), 313-336.
- Card, David. "The Causal Effect of Education on Earnings," in Orley Ashenfelter and David Card, eds., Handbook of Labor Economics, Vol. 3A, North Holland, 1999.
- Heckman James. "Randomization as an instrumental Variable," Review of Economics and Statistics, 1996, 78, 336-341.

## 2.2 Difference-in-difference models

- Angrist and Pischke (AP) chapter 5
- Card, David and Alan B. Krueger, "Minimum wages and employment: A case study of the fast-food industry in New Jersey and Pennsylvania.," American Economic Review, 1994,84, 487-496.
- Bertrand, Marrianne, Esther Duo, and Sendhil Mullainathan, "How Much Should We Trust Differences-in-Differences Estimates," Quarterly Journal of Economics, 2004, 119(1), 249-275.
- Autor, David H, "Outsourcing at Will: The Contribution of Unjust Dismissal Doctrine to the Growth of Employment Outsourcing," Journal of Labor Economics, Jan 2003, 21 (1), 1-42.
- Jacobson, Louis, Robert LaLonde, and Daniel Sullivan, "Earnings Losses of Displaced Workers," The American economic review, Sep 1993, 83 (4), 685-709.

### 2.3 Regression Discontinuity Research Design

- Angrist and Pischke (AP) chapter 6
- Thistlewaite, Donald and Donald Campbell, "Regression-Discontinuity Analysis: An Alternative to the Ex Post Fact Experiment," Journal of Educational Psychology, 1960, 51, 309-317.
- Imbens, Guido W. and Thomas Lemieux, "Regression Discontinuity Designs: A Guide to Practice," Journal of Econometrics, 2008, 142, 615-635.
- Lee, David S. and Thomas Lemieux, "Regression Discontinuity Designs in Economics," Journal of Economic Literature, 2010, 48, 281-355.
- Chay, Kenneth Y., Patrick McEwan, and Miguel Urquiola, "The Central Role of Noise in Evaluating Interventions that Use Test Scores to Rank Schools," American Economic Review, 2005. Sept. 1237-1258.

## 3 Selection on Observables Designs

### 3.1 Generalised Method of Moments

- Cameron and Trivedi (CT) chapter 6, Wooldrige, Jeffrey (W) chapter 8.

### 3.2 Quantile Regression

- Angrist and Pischke (AP) chapter 7
- Buchnisky M., "Recent Advances in Quantile Regression Models: A practical Guideline for Empirical Research" Journal of Human Resources, 1998, 33, 88-126.
- Buchnisky M, "Changes in the U.S Wage Structure 1963-1987: Application of Quantile Regression" Econometrica, 1994, 62, 405-458.
- Koenker, Roger and Kevin F. Hallock, "Quantile Regression," Journal of Economic Perspectives, 2001, 15, 143-156.
- Koenker, Roger and Basset G., "Regression Quantiles" Econometrica, 1978, 46, 33-50.

### 3.3 The Propensity Score and Matching

- Rosenbaum, Paul and Donald Rubin, "The Central Role of the Propensity Score in Observational Studies for Causal Effects," Biometrika, 1983, 70, 41-55.
- Rosenbaum, Paul and Donald Rubin, "Reducing Bias in Observational Studies Using Subclassification on the Propensity Score," Journal of the American Statistical Association, 1984, 79, 516-524.
- Dehejia, Rajeev H. and Sadek Wahba, "Causal Effects in Non-experimental Studies: Revaluating the Evaluation of Training Programs," Journal of the American Statistical Association, December 1999, 94 (448), 1053-1062.
- Almond, Douglas, Kenneth Y. Chay, and David S. Lee, "The Costs of Low Birth Weight," Quarterly Journal of Economics, 2005.

## 4 Advanced Modeling

### 4.1 Discrete Choice Models

- Cameron and Trivedi (CT) chapter 14-15, Wooldrige, Jeffrey (W) chapter 15.
- Maddala G.S., "Limited Dependent and Qualitative Variables in Economics", 1983. Cambridge, UK, Cambridge University Press.
- William Greene and David Henser. "Modeling Ordered Choices" 2010. Cambridge, UK, Cambridge University Press.
- Rainer Winkelman and Stefan Boes. "Analysis of Microdata" 2005. Springer Publisher.

### 4.2 Panel Data

- Baltagi chapter 2-4, Angrist and Pischke (AP) chapter 5, Wooldrige, Jeffrey (W) chapter 10.
- Carrasco, Raquel. 2001. "Binary Choice With Endogenous Regressors in Panel Data: Estimating the Effect of Fertility on Female Labor Participation", Journal of Business and Statistics, 19: 385-394.
- Kyriazidou, E. "Estimation of a panel data sample selection model" Econometrica, 1997, 65 1335-1364

- Lee, M.J. "Panel Data Econometrics for Limited Dependent Variables" 2002. San Diego, Academic Press
- Hsiao, C. "Analysis of Panel Data" 2nd Edition (2003), Cambridge, UK, Cambridge University Press.

## Important Exam Details:

Your exam dates are **October 11th** and **December 13th, 2018**. I do not give makeup examinations, but if you have a reasonable excuse in my judgment for missing a midterm exam, then the final exam will count for 50% of your course grade. Similarly If you do not take the final exam for any reason you must provide me with a written explanation for you absence. If, in my judgment, your final exam absence is justified then your course grade will be adjusted by replacing your midterm exam weight as 50%. Excuses should be discussed before the exam dates and any unexcused absences from an exam will result in a zero on that exam.

Students who may need academic accommodations due to a disability should discuss their needs with me at the beginning of the semester. To obtain authorized accommodations, you should be registered with the Office of Disability Services and have an updated accommodation letter for me. Accommodations and related support services such as exam administration are not provided retroactively and must be requested in advance. For more information about services and policy, please visit the university website.

## Academic Integrity:

The University of Oklahoma Academic Integrity Policy holds students accountable for the integrity of the work they submit. The policy also governs the integrity of work submitted in exams and homework assignments as well as the veracity of signatures on attendance sheets and other verifications of participation in class activities. You must do all of your exams independently. If it is determined that you have violated this standard of academic honesty you can receive an F in the course. For more information please visit the University of Oklahoma website.

## Class Participation:

I strongly encourage you to participate in the class discussion and ask questions whenever something is not clear to you. Your class participation is a good indicator of your involvement in the class. I would assign 2 extra points based on your over all class participation and attendance in the class. This two points will be added after adding up all the weights so it will play an important role for the students who are at the margin of any letter grades.

After each class I will also ask you to write a one-minute paper, where you will answer two questions: (1) What is the most important thing you learned in class today? and (2)

What is the one thing that you wish you understood better from today's class? Your answers are an important source of regular feedback on how I can make the material in ECON 5243 immediately more understandable. Be sure to print your name and student ID number on your one-minute paper.

Table 2: Class Schedule

| Part | Week | Date | Tuesday | Date | Thursday |
|---|---|---|---|---|---|
| Part 1 | | | | | |
| | W1 | Aug 21 | Statistical Inference | Aug 23 | Causal Reasoning |
| | W2 | Aug 28 | Causal Reasoning & OLS | Aug 30 | OLS & Heteroskedasticity |
| | W3 | Sep 04 | OLS Misspecification | Sep 06 | Measurement Error **(PS1 Due)** |
| | W4 | Sep 11 | Sample Selection Models **(Graded PS1 Due)** | Sep 13 | Sample Selection Models |
| Part 2 | | | | | |
| | W5 | Sep 18 | Instrumental Variables | Sep 20 | Instrumental Variables **(PS2 Due)** |
| | W6 | Sep 25 | Instrumental Variables **(Graded PS2 Due)** | Sep 27 | Difference-in-Difference |
| | W7 | Oct 02 | Regression Discontinuity | Oct 04 | Regression Discontinuity **(PS3 Due)** |
| | W8 | Oct 9 | Review of Midterm Exam **(Graded PS3 Due)** | Oct 11 | **Midterm (Part 1&2)** |
| Part 3 | | | | | |
| | W9 | Oct 16 | GMM and SEM | Oct 18 | GMM and SEM |
| | W10 | Oct 23 | Quantile Regressions | Oct 25 | Quantile Regressions |
| | W11 | Oct 30 | Propensity Score Matching | Nov 01 | Propensity Score Matching **(PS4 Due)** |
| | W12 | Nov 06 | Discrete Choice Models **(Graded PS4 Due)** | Nov 08 | Discrete Choice Models |
| Part 4 | | | | | |
| | W13 | Nov 13 | Panel Data | Nov 15 | Panel Data **(PS5 Due)** |
| | W14 | Nov 20 | Panel Data **(Graded PS5 Due)** | Nov 22 | No Class (Thanksgiving Break) |
| | W15 | Nov 27 | Class Presentation | Nov 29 | Class Presentation |
| | W16 | Dec 04 | Class Presentation | Dec 06 | Class Presentation **(Research Paper Due)** |
| Final | Week | Dec 13 | (Extra Office Hours for Final) | Dec 13 | **Final Exam (4:30-6:30 pm) (Cumulative)** |