

AGEC 651: Econometrics II
Department of Agricultural Economics
Purdue University
Spring 2018

Course Details:

Professor: Michael S. Delgado
Class Schedule: MWF 1:30-2:20 Rawls 1071
Office: KRAN 635
Office Hours: Walk-in or by appointment
Email: delgado2@purdue.edu

Course Description:

This course covers basic PhD level econometrics and introduces new methods at the frontier of applied econometrics, emphasizing theoretical foundations and application of techniques. We will develop the linear regression model, the properties of the least squares estimator, hypothesis testing, endogeneity and instrumental variables regression, and generalized linear regression. We will introduce alternative estimation techniques such as maximum likelihood, generalized method of moments, nonlinear regression, and methods for panel data. The final part of the course will cover identification and estimation of causal treatment effects, including both reduced form and structural approaches.

Goals For You:

1. Develop a rigorous understanding of econometrics as a tool for testing economic hypotheses and measuring causal and correlated effects;
2. Develop an understanding of fundamental econometric concepts that you can use as your research career develops;
3. Learn the scope of the frontier in econometric methods, and the relative merits of these methods;
4. Develop a foundation in econometric computation.

Textbook and Materials:

Econometric Analysis, 7th Edition, Greene (required for Parts 1-3)

Imbens, G. W. and Wooldridge, J. M., 2009. "Recent Developments in the Econometrics of Program Evaluation," *Journal of Economic Literature*, 47:1, 5-86 (required for Part 4)

Athey, S. and Imbens, G. W., 2016. "The State of Applied Econometrics – Causality and Policy Evaluation", working paper (recommended for Part 4)

Matching, Regression Discontinuity, Difference-in-Differences, and Beyond, Lee (Recommended for Part 4)

Causal Inference for Statistics, Social, and Biomedical Sciences, Imbens and Rubin, (Recommended for Part 4)

I may assign additional readings as we go depending on class discussions and time.

Software:

All homework assignments and the semester project are to be done using R. No exceptions.

Grading Policy:

The grade for this course will be based on homework assignments, quizzes, a midterm exam, a semester project, and a final exam. The semester project is to be submitted on or before the last day of class. Semester grades will be determined according to the following weights:

Homework: 10%

Quizzes: 15%

Midterm: 25%

Project: 20%

Final Exam: 30%

Homework Assignments:

The homework assignments focus on application of certain models we discuss in class. For these assignments, I have you manually program the data and estimation in R, and submit your R code along with the solution for each assignment. I encourage you to work together on the homework assignments, but every individual needs to submit his/her own assignment. No late homeworks without a university approved absence.

Quizzes:

I periodically give a five minute quiz at the start of class. The quizzes are closed book, and cover a topic recently discussed in class. Missed quizzes cannot be made up; in the case of a university approved absence, the missed quiz will be omitted from the semester grade calculation. There will probably be around five quizzes over the course of the semester, but this can vary depending on how things go.

Exams:

Both the midterm and final exam will be in-class, written examinations. Make-up exams will not be given unless there is a documented university approved absence. In all possible cases, please notify me in advance if you will be needing a make-up.

Project:

Over the semester, I want you to develop a Monte Carlo simulation analysis of a particular econometric estimator. The purpose of this project is for you to get comfortable motivating, deriving, and manually programming an (advanced) econometric technique. We will determine the topic of the project near the beginning of the semester.

The submitted project must include a brief motivation for the estimator, a thorough description/derivation of the econometric model and estimation approach, and a complete Monte Carlo simulation that illustrates the performance of the estimator. I expect the finished project to be around 8-10 pages in length, not including references. I want you to submit your R code along with your project (not part of the page count) and also send me a copy via e-mail that I can run myself. I will grade the project based on the appropriateness of the written motivation, the rigor and clarity of the derivation, the quality of the Monte Carlo analysis, and the overall quality of the writeup.

I strongly encourage you to work throughout the entire semester on the project, and to consult with me frequently as you make progress.

Course Outline:

1. The Basic Linear Regression Model

- Linear Regression
- Least Squares Estimator
- Properties of Least Squares Estimator
- Hypothesis Testing

2. Extensions of the Linear Regression Model

- Functional Form and Structural Change
- Endogeneity and Instrumental Variable Regression
- Generalized Linear Regression

3. Introduction to Alternative Estimation Methods

- Maximum Likelihood Estimation
- Generalized Method of Moments Estimation
- Nonlinear Estimation
- Systems of Equations Estimation
- Spatial Econometric Models

4. Identification and Causal Analysis

- Potential Outcomes and Causal Effects
- The Importance of Sample Selection, Balance, and Overlap
- Estimation when Selection is on Observables
- Estimation when Selection is on Unobservables
- Causal Spatial/Social Spillovers

The topic list is somewhat tentative, and may change depending on the pace of the course. Parts 1-3 generally follow Greene's *Econometric Analysis* pretty closely; I do this so you can more easily work alongside the class with the text. Part 4 will come from Imbens and Wooldridge (2009), Athey and Imbens (2016), the Lee and Imbens and Rubin textbooks, and my own notes.

Communication:

My primary method of communication will be through email to your Purdue email address; please check it regularly.

Campus Emergencies:

In the unusual event of a major campus emergency, course requirements, deadlines and grading percentages are subject to changes that may be necessitated by a revised semester calendar or other circumstances. To get information about changes in this course visit the course home page, contact me by email or call me at my office. To report an emergency, call 911. To obtain updates regarding an ongoing emergency, sign up for Purdue Alert text messages, view www.purdue.edu/ea. There are nearly 300 Emergency Telephones outdoors across campus and in parking garages that connect directly to the PUPD. If you feel threatened or need help, push the button and you will be connected immediately. If we hear a fire alarm during class we will immediately suspend class, evacuate the building, and proceed outdoors. Do not use the elevator. If we are notified during class of a Shelter in Place requirement for a tornado warning, we will suspend class and shelter in the basement. If we are notified during class of a Shelter in Place requirement for a hazardous materials release, or a civil disturbance, including a shooting or other use of weapons, we will suspend class and shelter in the classroom, shutting the door and turning off the lights. Please review the Emergency Preparedness website for additional information: <http://www.purdue.edu/ehps/emergency-preparedness/index.html>.

Academic Dishonesty:

University policy on academic dishonesty is clear: academic dishonesty in any form is strictly prohibited. Anyone found to be cheating or helping someone else cheat will be referred directly to the Dean of Students for disciplinary action. Academic dishonesty includes citing someone else's work as your own, using cheat sheets, or sharing your answers with someone else. If you are unsure whether your planned action constitutes academic dishonesty, seek clarification from the instructor. Details of the Purdue University academic integrity policies can be found here: http://www.purdue.edu/purdue/about/integrity_statement.html. Writing assignments for this course will be checked for originality using the iThenticate software.

Special Needs:

If you have a disability that requires academic adjustments, please make an appointment to meet with me during the first week of classes to discuss your needs. University policy requires all students with disabilities to be registered with the Disability Resource Center in Young Hall (765-494-1247) before classroom accommodations can be provided. Accommodations will be made based on documentation from the Purdue University Disability Resource Center.