ECON 370: Advanced Econometrics
Professor Hamilton, Fall 2023

Instructor Info

> Office: Robins School of Business 250
> Email: thamilt2@richmond.edu
> Office Hours: Tue. 10:30 – 11:30
>   Thu. 10:30 – 11:30

Blackboard

> Blackboard will be used extensively to post course documents and course announcements.
>
> https://blackboard.richmond.edu/

Textbook

> There is no textbook for this course. Assigned readings will come from a variety of online sources. All readings will be available in the *Blackboard* → *Course Documents* → *Readings* folder, either as links or pdf files.

Laptop and Spiderweb Server

> You will be required to use the program R to complete assignments. We will interface with R through the University's Spiderweb Server. Instructions on how to access this server can be found in the *Spiderweb Server Access* section below.
>
> You will also need a laptop to use during designated classes. Please let me know if you do not have a laptop that you can bring to class.

Course Objectives

> The objective of this course is to expand your econometric toolbox to include more advanced techniques in econometrics. You should be familiar with the classical linear regression model and comfortable with the fundamentals of estimating and interpreting multiple linear regression. In this course, we will extend the basic regression model to include panel data, qualitative/categorical dependent variables, simultaneous equations models, and techniques for identifying causal relationships.
>
> A good econometrician combines strong technical skills with the art of building a model based on theory and intuition. This course will involve a modest degree of mathematical rigor to build the necessary theoretical foundation. In addition, hands-on exercises will require students to master the application and interpretation of econometric techniques. The use of R allows for practical experience with econometric estimation that will complement other material.

Course Expectations

Be prepared to work hard and learn something new.

Students are expected to take an active part in this course, including being prepared to discuss outside work and readings in class and take part in class exercises. This requires keeping up with assigned reading, homework, and practice problems. To be successful in this course you should expect to devote no less than 10 to 14 hours each week, including lectures, studying, and preparing assignments.

This course will focus on theory and application. Both are important. You must be ready to think about abstract concepts, pay attention to nuanced technical details, and apply what you learn in an original way. We will also spend time learning basic coding (in R) to implement econometric techniques. I expect that you have some experience with writing code. If not, that's ok.

Grading

Grades for this course will be determined through a combination of homework, a dataset project, class participation, and exams. Homework will be assigned consistently throughout the semester. R Assignments are additional homework assignments for which you will submit your code. The dataset project requires you to construct your own dataset and conduct an econometric analysis in R. Components of the course grade are weighted as follows:

12%	Homework
12%	R Assignments
5%	Quizzes
5%	Class Participation
44%	Equally divided between two Midterm Exams
22%	R Final Exam

Homework

Homework will be assigned regularly throughout the semester. Assignments will be posted on Blackboard. All homework should be completed individually. Homework should be submitted as a hard copy. It should be neat, legible, and presentable. Final numerical answers should be obvious and all discussion should be in complete sentences.

R Assignments

The R Assignments will involve analysis in R over the course of the semester. These assignments consist of writing R code to perform econometric analysis. You will work on this throughout the semester so that your work follows the content of the course. See the *Submitting R Assignments* Section below for details.

Quizzes

There will be a short quiz at the beginning of class *every* Monday.

Honor Policy

Students are expected to abide by the University of Richmond's Honor Code:

https://studentdevelopment.richmond.edu/student-handbook/honor/pdfs/statutes.pdf

AI Policy

It is prohibited to use any Artificial Intelligence programs/software/applications to complete work for this class. If you are using any online resources, you should never find yourself typing anywhere other than in a Google.com search bar.

Content Prerequisites

An introductory econometrics course is a prerequisite for Advanced Econometrics. The following topics highlight the important concepts and techniques that you should be familiar with coming into the course:

- Statistical Inference
    - o Sample data vs. population
    - o Sampling distributions of statistics
    - o Hypothesis testing on a single parameter
    - o Confidence interval for a single parameter
    - o The Normal distribution; student's t-distributions; F-distribution

- Linear Regression Basics
    - o Analytical and contextual interpretation
    - o Inference on coefficients; use of standard errors
    - o Goodness-of-fit analysis
    - o Non-linear functional forms

Submitting R Assignments

Objectives:
- Reinforce econometric theories and concepts through data applications
- Develop coding and data analysis skills

Format:
You will submit a R script that contains work for each assignment. The file should be submitted through the University's *Spiderweb* server.

1. The R script should have filename: *Lastname_FirstInitial_RX.R* (properly capitalized), where *X* indicates the assignment number; e.g. my first assignment will be submitted as *Hamilton_T_R1.R*

2. Each assignment should run without error and produce the required variables/output.

3. The script should not print or load anything that is not explicitly asked for in the assignment.

4. The file *Lastname_FirstInitial_RX.R* should be saved in the *Student_Submissions_370* folder by the due date.

Spiderweb Server Access

The Spiderweb Server hosts R Studio so that you can use the software through your web browser. The server is only accessible through the UR campus network. If you are off campus, you must use the university's VPN. The following steps will guide you through setting up and working with the R Studio interface.

You will follow these two steps every time you want to use R Studio.

1. https://spiderweb.richmond.edu:8787/
2. Sign in with your UR netID and password

Course Outline:

Topic
Introduction
Review
<u>Panel Data Models</u>
Basic Panel Data Models
Fixed and Random Effects Models
Difference-in-difference Models
<u>Qualitative Response Models</u>
Logit and Probit Models
Multinomial Models
Poisson Model
<u>Advanced Functional Form</u>
Regression Splines
Nonparametric Regression
<u>Causal Identification</u>
Instrumental Variables
Regression Discontinuity Design
Synthetic Controls

Tentative exam dates are listed below. Any changes will be announced at least 2 classes ahead of time. Only serious reasons will be considered for a makeup examination and I will only consider allowing a makeup for planned University activities if I am notified in advance. I will not accept any homework after the due date without prior approval. Exams and homework that are missed without approval will result in a score of zero.

Exam Dates:

      Midterm I: Wednesday, October 11
      Midterm II: Monday, November 13

Final Exam: University Final Exam Block

      Tuesday, December 12, 9:00am-12:00pm