Nonlinear Econometric Analysis (ECO 722)
Hunter College
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Office Hours
Tuesday 11:00am – 12:00am
Thursday 11:00am – 12:00pm
Thursday 2:00pm – 4:00pm
and by appointment

Course description

This is a Masters level course in econometrics and the second in a two-course sequence. The aim of this course is to learn how to conduct statistical analyses of data using nonlinear econometric models to understand the nature of such economic relationships. The emphasis in this course will be on applying nonlinear econometric models to real-world problems. However, this requires a solid understanding of the theory behind estimation techniques and inference procedures which require rudiments of probability theory and statistics, and the ability to prove few basic properties of estimators. The goal is to learn enough theory and get enough practice with empirical models to be able to read journal articles and to be able to conduct empirical research. Therefore, you will also be learn how to use Stata to estimate numerous nonlinear models and use the output to interpret results.

Learning outcomes

At the completion of this course you will be able to

- demonstrate understanding of two estimation frameworks: least squares and maximum likelihood;
- formulate and estimate appropriate nonlinear econometric models for various types of outcomes, e.g. binary, multinomial, count;
- use Stata to estimate such models;
- interpret results and critically evaluate competing models in the context of empirical analysis;
- read and understand journal articles that make use of the concepts and methods that are introduced in the course;
- complete a research project including formulating a research question, applying appropriate methods to answer the question, and preparing a paper summarizing the results.

Texts

There is no assigned textbook for this class. We will cover material from the following text sources as appropriate for each topic. These books are either available through the Hunter College libraries or will be made available for your use.

- Jeffrey, M. W. (2009). *Introductory Econometrics: A modern approach.* Cengage Learning.
- Greene, W. H. (2012). *Econometric Analysis.* Prentice Hall.
- Baum, C. F. (2006). *An introduction to Modern Econometrics using Stata.* Stata press.
- Cameron, A. C. and Trivedi, P. K. (200) *Microeconometrics using Stata.* Stata press.
- Deb, P., Norton, E. C. and Manning, W. G. (forthcoming). *Econometrics of Healthcare Expenditures and Use.* Stata press.
- McCullagh, P. and Nelder, J. A. (1989). *Generalized Linear Models.* CRC press.
- McLachlan, G. and Peel, D. (2004). *Finite Mixture Models.* John Wiley & Sons.

Prerequisites

You need to have taken one undergraduate semester of Econometrics and have a firm grasp of basic differential calculus (first semester undergraduate calculus) and matrix algebra (either via a semester of matrix algebra or an upper-level course in mathematics for economists). In addition, you need to have taken a course in linear econometric analysis (ECO 721 at Hunter College) and received a grade of B or better.

Assignments, exams, study strategy and grading

Extensive use of computers and econometric software is integral to learning econometrics. Because the course emphasizes applications, there is no substitute for spending significant amounts of time exploring the statistical software and completing the homework assignments.

There will be periodic homework (I anticipate 5-6 assignments) which will involve significant statistical computing. Late assignments will not be accepted. Assignments must be presented neatly. I will drop the lowest homework score before aggregating to calculate your course grade. Homework will account for 30% of your grade.

There will be one midterm exam towards the end of the semester. It will account for 30% of your grade.

Perhaps the most important goal of this course is to complete the research for and write a short empirical paper using at least one econometric technique beyond OLS regression and modeled on published work in the economics literature. You will be required to submit a preliminary proposal with a sketch of the topic, appropriate references and data sources approximately 6 weeks into the semester. Conditional on my approval of the project topic, I will require a second proposal that will describe the main hypotheses and details of the econometric methods. The paper will be due at the end of the semester. Each proposal will be counted as a homework assignment and will be graded as such. The paper will account for 40% of your grade.

Academic integrity

I am acutely aware that plagiarism – of text, data, statistical programs – has progressively become technically easier and thus more tempting. I do not tolerate it and will assign a summary F if I suspect it. I am also aware that there are growing numbers of individuals and organizations that offer "expert advice" and/or complete papers. These are unacceptable as well.

Hunter College regards acts of academic dishonesty (e.g., plagiarism, cheating on examinations, obtaining unfair advantage, and falsification of records and official documents) as serious offenses against the values of intellectual honesty. The College is committed to enforcing the CUNY Policy of Academic Integrity and will pursue cases of academic dishonesty according to the Hunter College Academic Integrity Procedures.

ADA Policy

In compliance with the American Disability Act of 1990 (ADA) and with Section 504 of the Rehabilitation Act of 1973, Hunter College is committed to ensuring educational parity and accommodations for all students with documented disabilities and/or medical conditions. It is recommended that all students with documented disabilities consult the Office of AccessABILITY, located in Room East 1214B , to secure necessary academic accommodations. For further information and assistance, please call (212) 772-4857 or (212) 650-3230.

Course Topics

1. Review of Linear Econometrics

a. Wooldridge, Appendices A–E
b. Baum – Chapters 2-8 and Appendices
c. Wooldridge, Chapter 3, Appendix E: Estimation and Interpretation
d. Wooldridge, Chapters 3–7: Inference
e. Wooldridge, Chapters 8 and 9: Specification Issues

2. Maximum Likelihood Estimation

a. Wooldridge – Chapter 17
b. Greene – Chapter 14 (14.1, 14.2, 14.9.1)

3. Binary Outcomes: Linear Probability, Probit and Logit

a. Wooldridge – Chapter 17
b. Greene – Chapter 17 (17.2, 17.3)
c. Baum – Chapter 10
d. Cameron and Trivedi – Chapter 14

4. Multinomial Outcomes: Ordered and Unordered

a. Greene – Chapter 18 (18.2, 18.3)
b. Cameron and Trivedi – Chapter 15

5. Count Outcomes: Poisson, Negative Binomial, and extensions

a. Greene – Chapter 18 (18.4)
b. Cameron and Trivedi – Chapter 17
c. Deb, Norton and Manning

6. Generalized Linear Models

a. McCullagh and Nelder
b. Deb, Norton and Manning

7. Models for Heterogeneous Effects

a. McLachlan and Peel
b. Deb, Norton and Manning