

Econometric Methods

Lectures: M/W, 9:30am – 10:25am, HGL 113
Computer Lab: F, 3:45pm – 4:40pm, PB 115
Instructor: Prof. Yoonseok Lee (426 Eggers Hall, ylee41@maxwell.syr.edu)
Office Hours: M., 10:25am–11:25am

TA: Shulin Shen (sshen06@syr.edu)
(Office Hours: Th 4:00-5:00pm @ 124 Eggers Hall)

Course Description

This course focuses on basic techniques for estimating linear regression models as well as interpreting the estimates from such models. The course is intended for the undergraduate students pursuing BS in economics and the first-year students in the economics MA program. The course covers the theory of classical least squares estimation, maximum likelihood estimation, generalized least squares estimation, and instrumental variables estimation. Firm background on the undergraduate-level statistics as well as calculus is required. Upon completion of this course, students can carry out their own economic data analysis. (*Prerequisites:* ECN 521 or equivalent; ECN 301 or 311; and college-level calculus)

In order to give students hands-on experience of economic data analysis, computer-based exercises are integrated as an essential part of the course. If you are already familiar with a statistical software package (such as MINITAB, SPSS, Stata, EViews, SAS, R, GAUSS, MATLAB, etc.), you are welcome to use it. For the students who have never used any statistical package, the recommended software for this course is STATA. Note that TA will only support STATA.

The TA will hold weekly office hours and computer lab/TA sessions. The weekly TA sessions (*every Friday*) are essential for this course, especially to learn basic skills to solve take-home exams, so do attend them diligently. During each session, the TA will solve exercise questions about materials covered in the class; the TA will also teach how to use STATA and go over data-analysis exercises.

The class web page is available at <http://blackboard.syr.edu>. Announcements, exams, TA session materials and additional course materials are to be posted there, so make sure to visit the site frequently. Hard copies of these materials will *not* be distributed.

Textbooks & Software

The textbook for the course is:

Stock, J.H., and M.W. Watson (2014). *Introduction to Econometrics*, 3rd ed. (updated), Pearson.

Suggested software for this course is STATA. It is available in the university public computer labs as well as Maxwell PC lab; but student may purchase his/her own license for more practice (STATA 14 is the most recent version).

Another reference that is useful, though not required, is:

Wooldridge, J.M. (2013). *Introductory Econometrics: A Modern Approach*, 5th ed., Cengage Learning.

Organization and Evaluation

Grade is based on class attendance and two take-home exams. The grading breakdown is as follows:

Class and Lab Attendance 20%; Take-home Exams 80%.

Class/Lab attendance is to be checked on random dates. Note that lab attendance also counts any assignments/quizzes from the TA. The take-home exams are scheduled as

- 1st Take-Home: due Wed., Oct. 14 (*the exam is to be posted on Mon., Oct. 12*)
- 2nd Take-Home: due Wed., Dec. 9 (*the exam is to be posted on Mon., Dec. 7*)

The exams should be prepared *in hard-copy* (no e-mail submissions are accepted) and be returned at the beginning of the class on each due date. (Each exam will show its due date and time on its first page.) No late submissions will be accepted. Each take-home exam is to be posted on the class Blackboard web site two days before each due date. Each exam includes data analysis questions, so make sure to master STATA before the first exam. Students can use any course materials for these take-home exams, but cannot work with other students.¹ No makeup exams nor early exams will be given for any reason, so please plan your travels smartly. *Students are required to take all the take-home exams to pass this course.*

Course Outline

I. Introduction (Ch 1, 2 & 3)

1. What is Econometrics
2. Quick Review of Probability & Statistics

¹A word of advice: When you write the solution, provide the major steps of your calculation. It is a good training for organizing and explaining your idea. You will not be able to get the full credit if you simply write down the final answers without providing details.

3. Basics of Linear/Matrix Algebra

II. Linear Regression with One Regressor (Ch 4 & 5)

1. Linear Regression Models & Least Squares Assumptions
2. Algebra of (Ordinary) Least Squares (OLS)
3. Properties of the OLS Estimators and Gauss-Markov Theorem
4. Inference on the OLS Estimators
5. Maximum Likelihood (ML) Estimator

III. Linear Regression with Multiple Regressors (Ch 6 & 7)

1. Geometry of Least Squares
2. Decomposition of Squaring, Reparametrization & Multicollinearity
3. Partitioned Regression & Variable Omission vs. Redundant Variables
4. Inference on the Multiple Regression

IV. Violating LS Assumptions I: Non-i.i.d. Error (Ch 5.4, 14.2, 17.5 & 18.6)

1. Heteroskedasticity and Weighted LS (WLS)
2. Autocorrelation
3. Generalized Least Squares (GLS) Estimation
4. Properties of GLS Estimators

V. Violating LS Assumptions II: Endogeneity (Ch 12)

1. Conditional Expectation, Endogeneity & Instrumental Variables (IV)
2. Two-Stage Least Squares (2SLS)
3. Properties of the 2SLS Estimators

Academic Integrity Syracuse University's Academic Integrity Policy holds students accountable for the integrity of the work they submit. Students should be familiar with the policy and know that it is their responsibility to learn about course-specific expectations, as well as about university policy. The university policy governs appropriate citation and use of sources, the integrity of work submitted in exams and assignments, and the veracity of signatures on attendance sheets and other verification of participation in class activities. The policy also prohibits students from submitting the same written work in more than one class without receiving written authorization in advance from both instructors. The presumptive penalty for a first offense by an undergraduate student is course failure, accompanied by a transcript notation indicating that the failure resulted from a violation of Academic Integrity Policy. The standard sanction for a first offense by a graduate student is suspension or expulsion. For more information and the complete policy, see <http://academicintegrity.syr.edu>.

Accommodations for Students with Disabilities If you believe that you need accommodations for a disability, please contact the Office of Disability Services (ODS), located in Room 309 of 804 University Avenue, or call (315) 443-4498 for an appointment to discuss your needs and the process for requesting accommodations. ODS is responsible for coordinating disability-related accommodations and will issue students with documented Disabilities Accommodation Authorization Letters, as appropriate. Since accommodations may require early planning and generally are not provided retroactively, please contact ODS as soon as possible. For more information, see <http://disabilityservices.syr.edu/faculty-staff/contact-us/>.