

ECON 6140---Probability and Statistics: Econometrics I, Fall 2009

Instructor:	Rehim Kılıç (rehim.kilic@econ.gatech.edu)
Office hours:	MW 11:50 am-12:45pm, Old CE Building 220
Lectures:	MW 6:35-7:55pm, Old CE Building 110
TAs:	Manny Glover (glover.michaele@gmail.com)
TA office hours:	TBA

The **most important rule** for this course is first to read the syllabus and then attend the class and in cases of nonattendance learn what is going on in the class from your friends. The second rule is to check t-square on a regular basis. All the information needed for the course is in this syllabus and changes/additions will be announced during class and/or in *t-square*! It should be emphasized that this syllabus can be changed or modified as required by the instructor.

The **objective** of the course is to give a fairly intuitive introduction to statistical and econometric methods with particular emphasis on regression analysis. After completing the course a student should be able to (1) have the background in probability theory that are essential for statistical analysis; (2) understand random variables and their distributions and relate them to statistical inference; (3) learn the basic foundations of sampling theory and hypothesis testing in various settings; (4) understand the assumptions underlying regression analysis and form a judgment about whether they hold in a given problem; (5) conduct empirical research using economic data and run meaningful regressions on the computer.

Textbooks (required): *Introductory Econometrics: A Modern Approach*, 4th edition, by Jeffrey Wooldridge (Southwest-Cengage Publishers);
Statistics and Econometrics: Methods and Applications, 1st edition, by O. P. Ashenfelter, B. Levine, and D. J. Zimmerman (Wiley).

It is essential that in addition to the lectures students keep up with the corresponding book chapters. (It is impossible to cover all details in the lecture.) Most of the sample datasets and homework problems will also be taken from the textbooks.

Software: Real world examples and actual data analysis are an essential part of the course. We will use the statistical package STATA in this course. It is easy to learn. Class examples will be illustrated using STATA, and students will be expected to use STATA for the empirical exercises on their problem sets. There are two options for accessing STATA: (i) use the computers in the Old CE Building Computer lab; or (ii) purchase your own one-year license (\$95) for STATA/IC 10 (not Small STATA) through <http://www.stata.com/order/new/edu/gradplans/gp-direct.html>.

Grading: Problem sets (approx 6 to 8)---20%; two midterms---25% each; final---30%. The final course grade will be curved.

Problem sets are due in class; late problem sets will NOT be graded. You will be allowed to drop the lowest score on your problem sets. There will be NO makeup exams; if you miss an exam for a valid medical reason (and you bring a doctor's note), then I'll just weigh the final and/or the next midterm more heavily.

Tentative exam dates: September 23 and November 2, December 10 at 6 pm.

Attendance Policy: Regular class attendance is expected and occasionally I will take attendance (at least ten throughout the semester). This class requires continuous participation in terms of answering questions, asking questions, discussing results and topics. Excessive absences may cause you to perform poorly in the exams. If you are not in half of the attendances, you will lose one letter grade no matter how well your problem sets or exam scores are! I reserve the right to make changes in this syllabus if I feel that it is for the benefit of the class!

Policy on Academic Integrity and other issues: All students are expected to comply with the Georgia Tech Honor Code. Any evidence of cheating or other violations of the Georgia Tech Honor Code will be submitted directly to the Dean of Students. Cheating includes, but is not limited to: using a calculator, books or any form of notes on exams; copying directly from any source, including friends, classmates, tutors, or a solutions manual; allowing another person to copy your work; signing person's name or having another person sign your name on an attendance sheet; taking a test in someone else's name, or having someone else take a test in your name; or asking for a re-grade of a paper that has been altered from its original form.

Students with disabilities that have been certified by the Office for Disabilities Services will be appropriately accommodated, and should inform the instructor as soon as possible of their needs.

Course outline (topics near end to be covered as time permits; “W”=Wooldridge),
“A”=Ashenfelter et al.”

1. Introduction (W 1, A 1.1-1.3)
 - a. What is econometrics?
 - b. Types of economic data
 - c. Causality vs. correlation
2. Probability Theory (A 2)
 - a. Random Experiment
 - b. Probability
 - c. Conditional Probability
 - d. Bayes' Theorem
 - e. Independence
3. Random Variables and Their Probability Distributions (A 3, W App B.1)
 - a. Random Variables: Discrete and Continuous
 - b. Probability Distributions of Discrete and Continuous Random Variables
 - c. Empirical Frequency Distributions
 - d. Some Popular Discrete and Continuous Distributions
4. Moments of Random Variables (A 4, W App B.3)
 - a. Features of Probability Distributions: Mathematical Expectation
 - b. Central Tendency and Distribution
 - c. Tail Behavior
5. Multivariate Distributions (A 5, W App B.2, B.4)

- a. Discrete and Continuous Multivariate Distributions
 - b. Conditional Distributions
 - c. Independence
 - d. Moments of Multivariate Distributions
6. Sampling Theory and Distributions (A 6, W App B.5, App C.1)
 - a. Populations, Parameters and Sampling
 - b. Sample Statistics
 - c. Sampling Distributions
 7. Estimation Theory I: Point Estimation (A 7, W App C.2- App C.4)
 - a. Finite Sample Properties
 - b. Asymptotic Properties
 - c. Estimation Methods
 - i. Method of Moments
 - ii. Method of Maximum Likelihood
 - iii. Method of Least Squares
 8. Interval Estimation and Statistical Inference (A 8, W App C.5)
 - a. Interval Estimation of population mean, difference between two population means, population proportion, population variance
 - b. Hypothesis Testing
 9. The simple regression model (W 2)
 - a. Model and assumptions
 - b. Ordinary least squares (OLS) estimator
 - c. Goodness-of-fit and R-squared
 - d. Logarithmic transformations
 - e. Properties of OLS
 10. The multiple regression model (W 3)
 - a. How do the simple regression results extend?
 - b. Omitted variables bias
 - c. Multicollinearity
 - d. Gauss-Markov theorem: efficiency of OLS
- Further topics as time permits:*
11. Statistical inference (“finite sample”) for OLS (W 4)
 - a. Confidence intervals
 - b. Single parameter tests: “t test”
 - c. Two-sided versus one-sided test
 - d. p-values
 - e. Multiple restriction tests: “F test”
 12. Asymptotic (“large sample”) theory for OLS (W 5)
 - a. Consistency
 - b. Asymptotic Distribution of OLS