EC 707 Advanced Statistics for Economists
Boston University
Department of Economics
Fall 2019
http://learn.bu.edu

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Office hours: W 4-5:30pm; F 2-3:30pm
Lecture: MW 2:30-3:45pm; CAS 116

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Office hours: Tu 9:30-11am
Discussion: Tu 3:30-4:45pm; SHA 110

Course Objectives

This course is divided in two parts. The first part is an intermediate level statistics course that provides an introduction to mathematical statistics necessary for the subsequent study of econometrics and economic theory. The second part is an introductory econometrics course that focuses on estimation and inference theory for regression models with independent and dependent data. Univariate and multivariate models are covered, and matrix algebra is used extensively. A brief review of the most important results in matrix algebra is provided at the beginning of the course.

Prerequisites

No prior preparation in probability and statistics is required, but familiarity with algebra and calculus is assumed. There are no formal prerequisites.

Recommended Texts

I will post lecture notes summarizing the most relevant material for the course in the blackboard learn web site before each class. I will assume that you have read the notes in advance to the lectures. You should use the lectures to understand the material and ask clarifying questions. The notes are based on following references:

Amemiya, T. (1994), *Introduction to Statistics and Econometrics*, Harvard University Press.

Cameron, C. and P. Trivedi (2005), *Microeconometrics. Methods and Applications*," Cambridge University Press.

Casella, G., and R. Berger (2002), *Statistical Inference*, Duxbury Press, Second Edition.

Goldberger, A. (1991), *A Course in Econometrics*, Harvard University Press.

Greene, W. (2003), *Econometric Analysis*, Prentice Hall, Fifth Edition.

Hayashi, F. (2000), *Econometrics*, Princeton University Press.

Stock, J., and M. Watson (2015), *Introduction to Econometrics*, Pearson Education, Third Edition.

Wooldridge, J. (2010), *Econometric Analysis of Cross-Section and Panel Data*, MIT Press, Second Edition.

Additional References

Kuersteiner, G. (2005), "Lecture Notes on Matrix Algebra," mimeo, Boston University, (K05). These notes will be distributed by the TA in the discussion section.

Requirements and Grading

There will be weekly assignments, one midterm and one final. The course grade will be determined by the midterm (30%) and the final (45%), with the weekly problem sets making up the rest. The midterm and final exams are closed book. No collaboration or outside help is allowed in either of the exams. There will be no makeup exams.

Problem Sets

Problem sets will contain analytical and computational questions. For the computational questions, you can use Matlab or Octave (freeware version of Matlab). BU has a wide-site licensing program that offers free access to Matlab for students at `http://www.bu.edu/tech/services/cccs/desktop/distribution/mathsci/matlab/`. An introduction to Matlab/Octave will be provided in the first TA section. Problem sets due dates will be announced in class. You are encouraged to work in groups on homework but each student has to turn in his/her own copy. Identical assignments will not be accepted. No late homework will be accepted. Homework that is handed in late will receive a zero grade. Exceptions: illness confirmed by a medical certificate from a physician.

The problem sets will be discussed in the TA sections. Students will be randomly chosen to solve the questions and explain the solutions to the rest of the class in the blackboard. To avoid that the selected students just copy their problem set solutions, they will only be allowed to use the problem set questions in the blackboard. If the student does not know how to solve some part of the problem, he or she can ask for help to the TA and the rest of the class.

The problem sets grade will be determined by both the grades of the problem sets and the participation in the TA sections.

Lectures and Discussion Sections

It is expected that students attend all lectures and the weekly TA section. Please check the web site of the course in Blackboard for class announcements: `http://learn.bu.edu`. The use of cell phones is strictly forbidden during the lectures and TA sections. Please turn off your cell phone before the class starts.

Office hours

Students are encouraged to take advantage of the instructor's office hours to clarify material covered in class and other matters related to the course. If you are unable to meet during regular office hours you should set up an appointment by email.

The TA will also hold weekly office hours to answer questions relative to the problem sets and the grading of the assignments. If you are unable to meet during regular office hours you should set up an appointment by email.

Exam Schedule

The mid-term exam will be held in class on Wednesday October 23 during regular class time. The final exam will be held in the final exam week on Monday December 16 from 3pm to 5pm in the lecture class room.

Course Outline

The course covers the following topics. Recommended reading in the textbooks by Amemiya (A), Casella and Berger (CB), Cameron and Trivedi (CT), Goldberger (G), Greene (Gr), Hayashi (H), Stock and Watson (SW) and Wooldridge (W) are listed below for each topic.

Chapter 1: Preliminaries (A 1–5; CB 1.1–1.6, 2.1–2.3, 4.1, 4.2, 4.5, 4.6; G 1–7)

1. Probability
2. Univariate distributions
3. Multivariate distributions
4. Moments

Chapter 2: Sampling (CB 5.1–5.3; G 8)

1. Random samples and sample statistics
2. Sampling from a normal population
3. The multivariate case

Chapter 3: Asymptotic Theory (A 6; CB 5.5, 10; G 9, 10)

1. Sequences of random variables
2. Asymptotics of the sample mean
3. Asymptotics of some sample statistics

Chapter 4: Estimation (A 7; CB 7; G 11, 12)

1. Criteria for an estimator
2. Estimation in parametric models
3. Properties of maximum likelihood

Chapter 5: Tests of Hypotheses and Confidence Intervals (A 8, 9; CB 8, 9; G 20–22)

1. Definitions
2. The Neyman Pearson theory
3. Confidence intervals

Chapter 6: Linear Regression (A 10–12; CT 4, 24; G 13–19; Gr 4, 5; H 1, 2; SW 4–7, 9, 17, 18; W 3,4,6,7)

1. The sample slope
2. The classical regression model
3. Asymptotic properties of OLS
4. Robust variance estimation
5. GLS estimation
6. Additional issues

Chapter 7: Maximum likelihood and asymptotic tests (CT 5, 7, 11; Gr 17; H 7, 8; W 12, 13)

1. Asymptotic properties of maximum likelihood
2. Asymptotic tests
3. The bootstrap

Chapter 8: Stochastic processes (Gr 12, 20; H 2, 6; SW 14, 15)

1. Stationarity and ergodicity
2. Asymptotic theory with dependent observations
3. AR and MA models
4. Nonstationary processes

Chapter 9: Regression with dependent data (Gr 19, 20; H 6; SW 16)

1. Regression models for time series
2. Robust inference
3. Testing for autocorrelation
4. Cointegration and Granger causality