CAS EC507 A1: Statistics for Economists
Spring 2015

Lectures: Monday and Wednesday, 5:30-7:00pm, CAS 116

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Course Description: EC507 is an intermediate level course in statistics for Masters in Economics program. It provides an introduction to descriptive statistics, probability theory, and statistical inference. The objective of the course is to give students a necessary background in statistics and to prepare students for higher level econometrics and applied economics courses. The first part of the course gives the students introduction into descriptive statistics. The second part provides a foundation in probability theory. The third part covers random variables and their distributions and the fourth part of the course covers statistical inference (parameter estimation, confidence intervals, and hypothesis testing).
The course is the prerequisite for EC508 (Econometrics) class, which covers regression analysis in great depth. Statistical software program Stata will be introduced and used throughout the course.

Prerequisites: Familiarity with algebra and calculus is assumed.

Course Website: The course website is found on Blackboard Learn, and is accessible through http://learn.bu.edu/. If you are enrolled in the course, a link should automatically appear in the My Courses folder. Announcements, problem sets, and solutions will be posted on this website.

Textbooks and Readings:

Main:

- Wackerly D. D., W. Mendenhall, and R. L. Scheaffer, *Mathematical Statistics with Applications*, 7th edition.
  The customized version of this book that includes Chapters 1-11 with the appendices (ISBN is 1285923782) is available at BU's Barnes & Noble bookstore.

Additional references:

- Ramachandran and Tsokos, *Mathematical Statistics with Applications,* Elsevier, 2009.

- Ross, S.M., *Introduction to Probability and Statistics for Engineers and Scientists*. Fourth Edition.
- DeGroot, M. H. and M. J. Schervish, *Probability and Statistics*. Fourth Edition.

Course Requirements and Grading: The course will have a midterm and a final exam, as well as at least six problem sets. The midterm determines 30% of your grade, the final exam 40%, and the problem sets the remaining 30%. 80% of the problem sets with the highest grade will be counted toward the final course grade. Students are encouraged to work on problem sets in groups but each student has to turn in his/her own solution. Identical copies and late problem sets will not be accepted.

Exam Schedule: The midterm is scheduled for Wednesday, March 4, in class, and the final exam is scheduled for Wednesday, May 6, from 5:30 to 7:30 pm (to be confirmed). Under no circumstances will either exam be administered on a different date to accommodate travel plans. Any changes in exam times, locations, or dates will be announced in class and posted on the course website. It is the responsibility of the student to be aware of these changes.

Important Class Dates:
January 21, 2015 – First class
February 16, 2015 – Presidents' Day, no class
February 17, 2015 – Substitute Monday schedule of classes
March 4, 2015 – Midterm, in class, to be confirmed
March 7-15, 2015 – Spring Recess, no classes
April 20, 2015 – Patriots' Day, no class
April 29, 2015 – Last Class
May 6, 2015 – Final Exam, 5:30-7:30pm, to be confirmed

Software: Some of the problem sets for this course will require the use of the statistical program Stata. This program will also be used in your next Econometrics class, EC508.

You can access Stata in the Computer Labs at the 5th floor of the Department of Economics, rooms 525, 514, and 540. If you need help getting access to these rooms, contact Karen Rodi, room 512.

If you decide to purchase Stata, personal licenses can be acquired at reduced prices through Stata's program with Boston University called GradPlan.

Stata comes in five different versions as described at http://stata.com/products/which-stata-is-right-for-me/. The most basic version, Small Stata, is sufficient to solve the problems in EC507. It can analyze datasets with a maximum of 99 variables and 1,200 observations. A six-month license costs $35 and a one-year license costs $49.

However, you may want to purchase the version called Stata/IC (or Intercooled Stata) as it is recommended for use in the next Econometrics class, EC508. Stata/IC allows datasets with as many as 2,047 variables. The number of observations is limited only by the amount of RAM in your computer. A perpetual license for Stata/IC costs $189, a one-year license is $98, and a six-

month license is \$69. More information on the program and purchasing options is available at http://stata.com/order/new/edu/gradplans/.

Academic Conduct: The University Academic Code of Conduct governs behavior in this course regarding plagiarism and cheating on exams, and will be strictly enforced. The code is available at http://www.bu.edu/academics/resources/academic-conduct-code/.

Course Outline:

I.   Descriptive Statistics

    a.   Types of Data
    b.   Describing Data Sets
    c.   Summarizing Data Sets

II.   Basic Concepts in Probability Theory

    a.   Set Theory
    b.   Conditional Probability, Independence, Bayes' Rule

III.   Elements of Statistical Inference

    a.   Random Variables: Univariate Models

        i.   Discrete Random Variables
        ii.   Continuous Random Variables
        iii.   Distribution Functions

    b.   Multiple Random Variables

        i.   Bivariate Distributions
        ii.   Marginal Distributions
        iii.   Conditional Distributions
        iv.   Multivariate Distributions

    c.   Expectations

        i.   Definition and Properties
        ii.   Variance
        iii.   Covariance and Correlation
        iv.   Conditional Expectation and Conditional Variance
        v.   Moments and Moment Generating Functions
        vi.   Inequalities

    d.   Special Distributions

        i.   Discrete Distributions
        ii.   Continuous Distributions

    e.   Distribution of Sampling Statistics

        i.   Random Samples
        ii.   Sampling Statistics: Sample Mean, Sample Variance
        iii.   Law of Large Numbers and Central Limit Theorem

IV. Statistical Inference

    a. Point Estimation

        i. Parameters vs. Estimators
        ii. Properties of Estimators
        iii. Estimation Methods: Method of Moments, Maximum Likelihood

    b. Interval Estimation

        i. Student t Distribution and F Distribution
        ii. Confidence Intervals for the Mean
        iii. Confidence Intervals for the Variance

    c. Hypothesis Testing

        i. Definitions: Null and Alternative hypothesis, Types of Tests, Types of Error, Power Function
        ii. Likelihood Ratio Tests