Course overview:

This course is an intermediate level statistics and econometrics course. It provides an introduction to descriptive statistics, probability theory, statistical inference and regression analysis. The course aims at providing students with the necessary background in statistics to be able to follow higher level econometrics and applied economics courses. The first part of the course covers basic data analysis, descriptive statistics and probability theory. The second part deals with univariate and multivariate distributions and sampling distributions. The third part covers statistical inference (estimation, confidence intervals, tests of statistical hypotheses) and contains an introduction to linear regression. Familiarity with algebra and calculus is assumed.

All course announcements and documents will be posted on the Blackboard website.

Textbook:


Teaching Assistant:

Shuang Wang is the teaching assistant of the course. She will be in charge of the discussion class F 1:00 pm -2:00 pm. Office hours: B17C, W 10:30 am -11:30 am.
E-mail: shuangw@bu.edu

Assignments, exams and grading:

There will be a number of problem sets and practices. Selected problems will be solved and discussed in class and all solutions posted. Exams will be based on the theory and on problems and exercises similar to those assigned during the course in the problem sets and practices. Course grades will be based on two midterm exams and a cumulative final exam. Each midterm will count for 25% of the final grade and the final exam 50%.

Software

Some of the problem sets will include empirical questions that should be solved using statistical software. For these questions you will be provided with the data and you are required to use Stata. The use of Stata will be introduced in the classes and discussions.
Course outline

1. **Introduction to Statistics**

2. **Descriptive Statistics**, R&T 1
   1. Types of Data
   2. Describing Data Sets
   3. Summarizing Data Sets

3. **Elements of Probability**, R&T A.I, 2.1-2.4
   1. Set Theory
   2. Probability Theory

4. **Elements of Statistical Inference**

   A. **Random Variables: Univariate Model**, R&T 2.5
      1. Definition
      3. Continuous Random Variables: Probability Density Function

   *Midterm 1: Thursday, September 29*

   B. **Multiple Random Variables**, R&T 3.3
      1. Bivariate Distribution
      2. Marginal Distribution
      3. Conditional Distribution
      4. Independence
      5. Multivariate Distribution

   C. **Expectation**, R&T 2.6
      1. Definition
      2. Properties
      3. Variance
      4. Covariance and Correlation
      5. Conditional Expectation and Conditional Variance
      6. Moments and Moment Generating Function
      7. Inequalities
D. **Special Distributions**, R&T 3.2

1. Discrete Distributions
2. Continuous Distributions

E. **Distribution of Sampling Statistics**, R&T 4.1, 4.2, 4.4, 3.5

1. Random Sample
2. Sampling Statistics: Sample Mean, Sample Variance
3. The Law of Large Numbers and The Central Limit Theorem

*Midterm 2: Thursday, November 3*

5. **Statistical Inference**

**A. Point Estimation: Methods, Properties**, R&T 5.1 - 5.5

1. Definitions: parameter vs. estimator
2. Properties of Estimators
3. Estimation Methods: Method of Moments, Maximum Likelihood

**B. Interval Estimation**, R&T 6.1 - 6.5

1. t-Student and F Distributions
2. Confidence Intervals for the Mean
3. Confidence Intervals for the Variance

**C. Hypothesis Testing**, R&T 7.1 - 7.5

1. Definitions: Null and Alternative Hypotheses, Types of Tests, Type of Errors, Power
2. Likelihood Ratio Tests
3. Examples

6. **Linear Regression**, R&T 8.1 - 8.2

1. Introduction: Linear Regression Model
2. Least Squares Estimator
3. Statistical Inference about Regression Parameters

*Final Exam: Tuesday, December 20, 6:00-8:00 pm*