Economics 506
Advanced Economic Statistics

Course Syllabus

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Class Times: M 2:50-4:10 (Scott 215) & M 4:30-5:50 (Murray 015)
[recitation when scheduled W 2:50-4:10 (Scott 215)]

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Swanson: M 1:00-2:50 p.m. (or by appointment)
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Course Content

Econ506 is the first course in the core econometrics sequence. The main purpose of this course is to provide you with a rigorous foundation of statistics and probability, enabling you to successfully complete the rest of the core in econometrics. Focus in the course will be on basic principles, including among other things: probability, random variables, conditional probability, probability densities and distributions, characteristic functions, test statistic formulation and distribution theory, statistical inference, and basic regression. Time permitting, we will also cover basics in Monte Carlo experimentation, bootstrapping, and nonparametric testing. Although a firm theoretical foundation in statistics is viewed as essential to continuing with the core, it is assumed that many of you will ultimately be interested in pursuing applied fields in economics. For this reason, some emphasis will be placed on applied problem solving using the tools learned in the class. In this regard, I will teach basics of computing using the GAUSS computer program. GAUSS will be used for assignments in Econ506, as well as in later core econometrics courses.
Textbooks
[The starred texts are recommended course texts.]


Course Grade

Your course grade will be based on the results from 2 in class examinations, and two (computer and analytical) assignments.

**Requirement 1**: There will be two examinations given for this course. One sometime in late October and one in late November. These tests will count for 70% of the final course grade.

**Requirement 2**: The second requirement is the completion of 2 assignments (15% each). These assignments will have an analytical and/or computational component as well as a computing component.

In general, I aim to give “A”s to overall grades of 80% or more, “B”s to grades over 60%, and “C”s and “D”s to lower grades. Although I reserve the right to adjust grades upwards, I will not use a bell curve to adjust grades downwards.
Course Outline

The course will follow Hogg and Craig, with extra coverage when deemed useful from all of the additional texts listed above. A broad outline of the topics to be covered follows (topics are subject to change as course evolves):

1. **Review - Basic Statistics**
   - (i) Set Theory and Probability
   - (ii) Random Variables and Expectation
   - (iii) Densities, Distributions, Moment Generating Functions, and Characteristic Functions
   
   Readings: Hogg and Craig chpt. 1

2. **Conditioning and Independence**
   - (i) Conditional Probability and Bayes Theorem
   - (ii) Correlation
   - (iii) Stochastic Independence
   
   Readings: Hogg and Craig chpt. 2, 3

3. **Sampling Theory**
   - (i) Important Distributions, Random Samples, Statistics and their Distributions, etc.
   - (ii) Asymptotic Distribution Theory
     - (ii-a) Types of Convergence
     - (ii-b) Weak and Strong Laws of Large Numbers
     - (ii-c) Central Limit Theorems
   
   Readings: Hogg and Craig chpt. 4, 5

4. **Estimation**
   - (i) Maximum Likelihood
   - (ii) Method of Moments
   - (iii) Asymptotic Normality, Information Matrix and Cramer-Rao Inequality
   - (iv) Estimator Properties Including Consistency, Bias, and Efficiency
   - (v) Sufficient Statistics
   - (vi) Numerical Methods
   - (vii) Regression Models
   
   Readings: Hogg and Craig chpt 6, 7, 8

5. **Statistical Inference**
   - (i) Basic Concepts, Neyman-Pearson, Test Consistency and Bias
   - (ii) Models of Conditional Mean and Conditional Variance
   - (iii) Hypothesis Tests and Confidence Intervals (t-tests, F-tests, Z- and \( \chi^2 \) test limiting distributions)
   - (iv) Lagrange Multiplier, Wald, and Likelihood Ratio Tests
   - (v) Monte Carlo Experiments
   - (vi) The Bootstrap
   
   Readings: Hogg and Craig chpt. 6, 9
7. **Nonparametric Tests (time permitting)**
   (i) Empirical Distributions, Quantiles, etc.
   (ii) Sign Test
   (iii) Wilcoxon rank sum test
   (iv) Chi-Squared Tests of Independence
   (v) Empirical Distributions and Kolmogorov-Smirnov Type Tests
   Readings: Hogg and Craig chpt 9

8. **Advanced Topics (time permitting)**
   (i) (Strict) Stationarity, Nonstationarity
   (ii) Properties of Data Used in Economics
   (iii) Multiple Regression
   (iv) Prediction
Assignment Due Dates, Exam, etc.

Assignment 1 Due:

Assignment 2 Due:

Exam 1 Date:

Exam 2 Date: