

**Princeton University
Woodrow Wilson School
Graduate Program**

Fall Term – 2005 (Preliminary)

WWS 507c
Quantitative Analysis: Advanced

Professor Alan Krueger
419 Robertson Hall
Ext. 8-4046

This course will introduce students to statistical methods and their applications in social science and public policy. The course is divided into four sections. The introductory section briefly covers descriptive statistics, including statistical summary measures and graphical display of data. The second section focuses on probability theory as the basis of statistical techniques. The third section covers sampling theory, estimation, and inference. The final section covers linear regression analysis and logit models. Throughout the course, examples from many fields will be discussed to demonstrate the wide applicability of quantitative analysis and to introduce statistical methods.

Students are expected to be familiar with algebra and multivariate calculus, including at least derivatives and integrals. Students who do not meet this requirement should take WWS 507b.

Grades are based on: 6 problem sets (4% each, with the option of dropping one, so the total is 20% of the final grade); 3 projects (6% each, so the total is 18% of the final grade); a mid-term exam (27%), and a three-hour final exam (35%). All exams will allow students to bring in **one** page of notes and will require the use of a calculator that handles square roots, logarithms, and exponential functions, as well basic algebraic functions.

Because the only way to learn statistics is by practicing it, the problem sets and projects are a critical part of the class. A total of 6 problem sets will be handed out. Students can choose not to hand in one of the problem sets. The problem sets consist of a wide array of questions, ranging from formal "drills" to practical applications. Students are encouraged to collaborate on problem solutions and to discuss alternative solution strategies. However, each student is required to hand in his or her own solutions. Precepts will meet once a week. Problem sets will typically be due in precept. Late problems sets will *not* be accepted. Precepts will review problem set solutions as well as answer other questions.

The projects are meant to give students hands-on experience conducting statistical analyses. You may work together on the statistical analysis for the projects. You may **NOT** work together on the project write-ups. Each of you must turn in your own write-up of the project. An integral part of the course is that students are expected to help conduct a survey of New Jersey voters concerning the upcoming Gubernatorial election. This project will require 2 hours of interviewing in the WWS Survey Center facility and a short (maximum 2 pages) memo describing your experiences with the survey. Data collected from this survey will be used in the class.

No textbook satisfactorily covers probability and statistics for this course. As a result, probability and sampling theory will be taught mainly from notes. The main textbook for the course is Stock, James H. and Mark W. Watson, *Introduction to Econometrics*, 1st Edition, (Addison-Wesley). We will use this text primarily in the second half of the semester. Lecture notes can be downloaded from Blackboard. Students are also encouraged to supplement the technical material in the first half of the course by consulting one of the following textbooks: Dennis Wackerly, William Mendenhall, and Richard Scheaffer, *Mathematical Statistics with Applications*, (6th Edition is most current), Duxbury; R.V. Hogg, and A.T. Craig, *Introduction to Mathematical Statistics* (5th Edition is the most current) Pearson; R.J. Larsen, *Introduction to Mathematical Statistics and Its Applications*, Pearson; I. Miller, and M. Miller, *John E. Freund's Mathematical Statistics* (6th Edition), Prentice Hall. These books will be placed on reserve in Wallace. They vary in level of difficult, but all cover about the same material, so you should find one that is most appropriate for you.

Data, problems sets, and other course information will be provided on Blackboard. The administrative assistant for this course is Kety McCoach (room 223 Robertson), who can be reached by phone at 8-4826 or email kmccoach@princeton.edu. All problem sets should be handed in to Kety or in precept. The teaching assistant for the course will be announced in September.

Course Outline

Topics	Readings
Review: Summarizing Data, Descriptive Statistics	SW: Chapter 1
Probability, Conditional Probability, Probability Rules	Notes + Statistics Texts
Random Variables, Probability Distributions, Expectations	Notes + Statistics Texts SW(elementary coverage): Sections 2.1-2.4, Appendix 15.1
Sampling Theory and Design	Notes + Statistics Texts
The Sample Mean, the Law of Large Numbers and the Central Limit Theorem	Notes + Statistics Texts SW(elementary coverage): Sections 2.5-2.6, 3.1, Appendix 15.2
Estimators, Confidence Intervals, Hypothesis Tests	Notes + Statistics Texts SW(elementary coverage): Chapter 3.2-3.5
Program Evaluation with Randomized Controlled Experiments	SW: Chapter 11.1-11.2, pages 385-386
Bivariate Regression	SW: Section 3.6, Chapter 4, Chapter 15
Multiple Regression	SW: Chapter 5
Nonlinearities and Choice of Functional Form	SW: Chapter 6
Regression with a Binary Dependent Variable	SW: Section 9.1
Assessing Studies based on Multiple Regression	SW: Chapter 7