

September 15, 2008

WWS 507B: Quantitative Analysis

Woodrow Wilson School
Princeton University
Fall 2008

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All course materials will be posted on the class Web page at blackboard.princeton.edu.

1 Class times and office hours

Lectures: 9 to 10:30 a.m. Tuesdays and Thursdays in Robertson 016. There will be no class Sept. 30 and Oct. 9 because of Rosh Hashanah and Yom Kippur. There will be makeup classes from 9 to 10:30 a.m. Sept. 29 and Oct. 6 in Robertson 002.

Precepts: 7 to 8:30 p.m. Tuesdays and Thursdays in Robertson 016. The two meetings cover the same material; attend whichever one you prefer. There is no precept Sept. 11.

Sam's office hours: 2 to 4 p.m. Thursdays or by appointment. My office is 363 Wallace. My regular Thursday office hours will usually be across the hall in 366 Wallace.

Analia's office hours: 2 to 4 p.m. Mondays, location TBA, or by appointment.

Carlos' office hours: 4 to 6 p.m. Mondays, location TBA, or by appointment.

2 Course description

This course is an introduction to empirical methods commonly used in analyzing public policy. We will discuss how social scientists – especially economists – combine statistical tools and economic theory to answer questions about the world.

Example: Does sending nonviolent criminals to prison (instead of, say, putting them on probation) create a stigma that will reduce their chances of finding legitimate work when they are released? Can we answer this question by taking a national survey of former inmates and people who have never been to prison, and comparing their unemployment rates?

Objectives: By the end of the course, you should be able to perform basic empirical analyses and critically evaluate and explain basic empirical work done by other people.

Prerequisites: This course requires no background in statistics and only basic familiarity with calculus concepts. Students who are proficient in calculus may prefer WWS 507C. Please see me or Professor Taryn Dinkelman, the instructor for WWS 507C, if you have questions about which course is appropriate for you.

3 Grading and policies

Final exam: 35%. Date and time TBA. Closed book, but you may bring one page of notes in your own handwriting.

Midterm: 20%. Take-home: You may complete the exam during any continuous four-hour period between Oct. 23 and Nov. 4; due at the beginning of class Nov. 4. Closed book, closed notes.

Projects: 30%. Project 1: distributed Oct. 23, due at the beginning of class Nov. 18. Project 2: distributed Dec. 2, due at 5 p.m. Jan. 13. You may work with classmates on the statistical analysis but must write up your own reports. The quality of your analysis and the quality of your writing have equal weight in determining the project grade.

Problem sets: 15%. About eight, due in the course folder in the basement of Fisher Hall at 5 p.m. most Fridays. You may work with classmates but must write up your own answers.

I will not accept late work except in cases of medical or family emergency. If you require accommodations for a disability, please see me as soon as possible.

4 Readings

The following recommended textbooks are on reserve at Stokes Library:

- Moore, David S., George P. McCabe and Bruce A. Craig, 2008, *Introduction to the Practice of Statistics*, sixth edition, W.H. Freeman.
- Stock, James H., and Mark W. Watson, 2007, *Introduction to Econometrics*, second edition, Addison-Wesley.

You should buy one textbook, but there is no need to buy both, so examine the books on reserve and choose whichever you find more helpful. Moore et al. is likely to be more useful for students who have minimal background in statistics, while Stock and Watson is likely to be more useful for students who have already taken some statistics or plan to take additional quantitative courses after this one. Previous editions of the books, which may be available used at low cost, are also acceptable, though the chapter numbers may not correspond to those listed on the course outline below.

The following books are also on reserve:

- Ashenfelter, Orley, Phillip B. Levine and David J. Zimmerman, 2003, *Statistics and Econometrics: Methods and Applications*, John Wiley & Sons.
- Huff, Darrell, 1954, *How to Lie with Statistics*, W.W. Norton.

Ashenfelter et al. is a textbook that some students have found helpful in the past. Huff is a brief, entertaining and non-mathematical overview of some of the important topics in the course; it's worth reading early in the semester.

Exams will cover material in the various books only if we also cover it in class or on an assignment. I will assign additional readings from time to time.

5 Course outline

Chapter numbers refer to Moore et al. (MMC), Stock and Watson (SW), and Ashenfelter et al. (ALZ).

1. Motivation and descriptive statistics.
 - a. Introduction. MMC preface; SW 1.1; ALZ 1.1.
 - b. Describing one variable: density, central tendency and dispersion. MMC 1; ALZ A.3.
 - c. Describing relationships between two variables: correlation and simple regression. MMC 2.1-2.3; ALZ A.8.
 - d. Causality and experiments. MMC 2.6; SW 1.2.
2. Probability and random variables.
 - a. Probability theory. MMC 4.1, 4.2, 4.5; ALZ 2, A.2.
 - b. Random variables. Distributions. MMC 4.3; SW 2.1, 2.3, 2.4; ALZ 3, 5.1-5.4, A.2, A.4.
 - c. Expectations, variances, covariances and conditional expectations. MMC 4.4; SW 2.2, 2.3; ALZ 4, 5.5-5.8.
3. Random sampling and sampling distributions.
 - a. Data collection. MMC 3.1-3.2; SW 1.3, 2.5; ALZ 1.3, 6.1-6.4.
 - b. Estimation theory. Estimation of means and variances. SW 3.1; ALZ 6.5, 7.
 - c. Distribution of the sample mean. Law of large numbers. Central limit theorem. MMC 3.3, 4.4, 5.2; SW 2.5, 2.6, 3.1; ALZ 6.6-6.10, A.5, A.7.
4. Statistical inference.
 - a. Hypothesis testing. MMC 6.2-6.4, 7.1; SW 3.2; ALZ 8.3, A.6.
 - b. Confidence intervals. MMC 6.1, 7.1; ALZ 8.2; SW 3.3.
 - c. Comparing two populations. MMC 7.2, 8.1-8.2; SW 3.4-3.5; ALZ 8.2.

d. Bayesian inference. MMC 4.5; ALZ 2.6.

5. Linear regression in detail.

a. Mechanics of simple regression. MMC 10.1; SW 4.1-4.3, 5.3; ALZ 9, 10.6.

b. Assumptions of the classical linear regression model. Unbiasedness. MMC 10.1; SW 4.4, 4.5; ALZ 10.1-10.5.

c. Inference. MMC 11.1; SW 5.1, 5.2, 5.4; ALZ 10.4, 10.5, 14.2.

d. Omitted variable bias. SW 6.1; ALZ 13.1-13.3.

e. Mechanics of multiple regression. MMC 11.1; SW 6.2-6.4, 6.7; ALZ 11.1-11.5.

f. Logs, quadratics, categorical and dummy variables, interactions. SW 8; ALZ 12.1, 12.2, 13.4.

g. Interpreting and assessing regression results. SW 9.

h. Binary dependent variables. SW 11; ALZ 16.