

# Quantitative Methods II: Decision Making Under Uncertainty

IRCO 454

Winter 2008  
Gardner Room  
Section 1: M-W 5:00-6:20 pm  
Section 2: M-W 6:30-7:50 pm  
Office hours: M-W 2-4 pm

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## **The Course**

This course introduces students to the use of regression analysis and its application to public policy, political science, and economic research. Course topics place an emphasis on the types of data encountered in policy research and the challenges that researchers face in analyzing these kinds of data. The level of mathematical presentation is moderate, and the primary goal is the understanding of conceptual problems and applications rather than an emphasis on derivations. Nevertheless, students will be expected to understand and follow the basic derivation and properties of the regression estimator in both scalar and matrix notation. The course is structured around the assumptions of the regression estimator, the implications of those assumptions for analyzing data, and the methods used to address the violations of assumptions of the regression model. The goal of the course is to provide students with the statistical tools necessary to address research questions that are of interest to them.

On Monday, students will receive a theory based lecture on the mathematical properties of the linear regression technique and problems with its application. Lectures will be based on the readings and students will be expected to have completed the readings prior to class. Wednesdays will take the form of a practical hands-on lab, where students will receive thorough instruction on how to program and interpret regression models in STATA. Laptops are not allowed in class on Mondays, but are required on Wednesdays.

## **Texts**

The following texts are required.

- Wooldridge, Jeffrey M. 2006. *Introductory Econometrics: A Modern Approach*, Volume 4E.

## **Optional Texts**

- Baum, Christopher. 2008. *An Introduction to Modern Econometrics Using Stata.* Stata Press. <http://www.stata.com/bookstore/statabooks.html>
- Xiao Chen, Philip B. Ender, Michael Mitchell & Christine Wells. 2006. *Stata Web Books: Regression with Stata.* <http://www.ats.ucla.edu/stat/stata/webbooks/reg/default.htm>
- Zorn, Christopher. *Stata for Dummies*

- <http://www.buec.udel.edu/yatawarr/Stata4Dummies.pdf>
- Acock, Alan. 2005. *A Gentle Introduction to Stata*.  
<http://www.stata.com/bookstore/statabooks.html>

## Grading

### 50% - 4 Problem Sets

These will be handed out after class on January 15, January 29<sup>th</sup>, February 12<sup>th</sup>, and February 26<sup>th</sup>.

Homework will be submitted in two parts:

- 1.) An annotated .do file of all the operations used to answer the homework questions. This .do file must be e-mailed to the *QM2 Homework* folder at least one-hour before class on the Wednesday following homework distribution. Both the e-mail and .do file should be titled "LastName\_HWt#". 20% of the homework grade will be based on whether students' .do files run correctly.
- 2.) A *Word* document that includes both the Stata code from the .do file and the answers to the homework questions. A hard copy of this document must be submitted prior to the beginning of class on the Wednesday following homework distribution.

Late problem sets will not be graded.

### 50% - Final Take-Home Exam

The exam will be e-mailed to students on Thursday, March 11<sup>th</sup> at 8 am. It will be due in digital form by 5pm on Thursday, March 18<sup>th</sup>.

- Will test cumulative knowledge
- Will involve writing your own do-file
- Grade will be determined based on your answers to the questions and whether do files can be run without error.

## Course Outline

**Week 1 (January 5, 7):** Read Wooldridge Appendices A and B, Chapter 1

- Discussion of course design
- Brief refresher on important topics learned in QM1
- Introduction of the simple linear regression model.
- Introduction to STATA 9.

**Week 2 (January 12, 14):** Read Wooldridge Chapter 2

- Derivation and basic properties of Ordinary Least Squares
- The mathematics underlying regression analysis
- Variance of error terms and OLS coefficients.

**Week 3 (January 19\*, 21):** Read Wooldridge Chapter 2, Chapter 3 (3.1 and 3.2)

- Properties of the OLS estimator
- Introduction of the general linear model
- The meaning and use of control variables

**Week 4 (January 26, 28):** Wooldridge Chapter 3 (3.4-3.5). Malesky Matrix Algebra Notes (to be e-mailed)

- Multiple Regression Analysis
- The meaning and usage of control variables.
- The expected value of OLS estimators
- The variance of OLS estimators

**Week 5 (February 2, 4):** Read Wooldridge Chapter 4; Review Appendix B.

- Statistical inference
- Goodness of fit
- t-tests and F-tests in OLS
- The use and misuse of R-squared

*Optional reading:* Kennedy, Peter E. 2002. "Sinning in the Basement: What are the Rules? The Ten Commandments of Applied Econometrics." *Journal of Economic Surveys*. 16:4, 569-589; Kennedy, Peter E. 2002. "Oh No! I Got the Wrong Sign! What Should I Do?" *Simon Fraser University, Department of Economics, Discussion Papers*.

**Week 6 (February 9, 11):** Read Wooldridge Chapter 6 and Chapter 7

- Measurement errors and implications
- Applied use of quadratic, logs
- Prediction
- Qualitative information in the regression model
- Dummy variables and interaction effects

**Week 7 (February 16\*, 18)** Read Wooldridge Chapter 9

- Model evaluation

- Forecasting
- Measurement error

**Week 8 (February 23, 25):** Baum 84-87; Baum 216

- Multicollinearity and Omitted Variable Bias
- The inclusion of irrelevant variables

**Week 9 (March 2, 4):** Read Wooldridge Chapter 8.

- Heteroskedasticity
- Diagnostics of the problems

**Week 10 (March 9, 11):** Wooldridge 322-325. Baum 185-188.

- Endogeneity
- A brief look into the future (logit, probit, time series, panel design).