Department of Economics
Princeton University

Economics 312, Fall 2005

- Lectures: MW 1:30pm-2:50pm (Room: Icahn Lab. 101)
- Precepts: Th: 11-11:50, Fisher B01. Fri: 10-10:50, Fisher B02.
- Professor: Andres Aradillas-Lopez, 312 Fisher Hall (email: aaradill@Princeton.EDU)
- Office Hours: 9:30am-11am, Wednesday
- Preceptor: Julio Cacho-Diaz (email:jcacho@Princeton.EDU)
- Office Hours: TBD
- Course webpage: http://blackboard.princeton.edu

Description/Objectives of the Course:
(As described in Princeton University's Catalog): This course is an introduction to econometrics. Econometrics is a sub-discipline of statistics that provides methods for inferring economic structure from data. This course has two goals. The first goal is to give you means to evaluate an econometric analysis critically and logically. Second, you should be able to analyze a data set methodically and comprehensively using the tools of econometrics.
This course is meant to be an introductory analysis to the problems of observation, estimation and hypothesis testing in economics. It covers the statistical theory for the linear regression model, its most important variants and some extensions to nonlinear models. Theoretical analysis will be accompanied by the study of empirical economic examples.

Prerequisites:
ECO 100 and ECO 101 and ECO 202, or ORF 245, and MAT 200 or MAT 201.

Required text:
Jeffrey M. Wooldridge, Introductory Econometrics. Thomson South-Western; 3rd Edition.

Supplementary (optional) text:
Stock and Watson, Introduction to Econometrics. Pearson Addison Wesley; 1st Edition.

Requirements/Grading:

- Final Exam: 50%
- There will be a three-hour final exam (to be scheduled by the Office of the Registrar).
- Midterm: 25%

  The midterm will take place in-class on **Wednesday October 26th.**

- Problem Set(s): 25%

  There will be a problem set every week. Problem sets will count toward 25% of your final grade.

  Discussing the problem sets with other students is allowed, and perhaps encouraged. However, the answers you submit must reflect your own understanding of the solutions. Direct copying is not permitted and will be treated as cheating. Problem sets will be distributed on Monday and will be due in class the following Monday. **Late problem sets will not be accepted**. However, **we will drop the two lowest scores** in your problem sets when computing the grades.

- Computer Work:

  Solving the problem sets will require computer work. It will be assumed that you possess general computer literacy but no prior knowledge of STATA –the computer program we will use–. You will be given brief introduction to STATA in the first precept.

  Exceptions to the Rules:
  The only way we can accept a late problem set, or reschedule the midterm exam on an individual basis **is with a written request from your College Dean or from Mc Cosh Health Center.** The final exam date is absolutely and completely out of my control.

Course Outline:

1. **Review of Probability and Statistics.**

   Probability: Random variables, measures of central tendency, measures of dispersion. Conditional distributions, conditional expectation, conditional variance. Examples of distributions: Normal Distribution, Chi-Square Distribution, t Distribution, F Distribution, Bernoulli Distribution.

   Statistics: Law of Large Numbers, Central Limit Theorem. Estimators and their properties: Unbiasedness, efficiency, consistency, asymptotic normality. Confidence intervals and Hypothesis Testing.

   (Wooldridge, Appendix B and C.)

2. **Economic Data and the Simple Linear Regression Model.**

   Structure of economic data: Cross-sectional, time series, panel data.

   Simple linear regression model: Derivation and properties of Ordinary Least Squares (OLS) estimates. Expectation and variance of OLS: Conditions for unbiasedness and efficiency of OLS.

   (Wooldridge, Chapters 1 and 2.)

3. **Multiple Regression Model with Cross-Sectional Data.**

   OLS estimation in the multiple regression model: Derivation and interpretation of OLS estimates, fitted values and residuals. Properties of OLS under the Classical Linear Model (CLM) Assumptions.

   Inference in the multiple regression model: Tests of hypotheses and confidence interval construction for the parameters in the multiple regression model.

   Asymptotic properties of OLS estimators: Conditions for consistency, asymptotic normality and asymptotic efficiency of OLS when CLM Assumptions are not satisfied. Inference under these conditions.

   Model construction: Logarithmic and quadratic functional forms. Functional forms with interactions, using dummy explanatory variables. Goodness of fit measures, residual analysis and selection of regressors.

   Heteroskedasticity with cross-sectional data:. Properties of OLS with heteroskedastic errors. Testing for Heteroskedasticity. Correcting for Heteroskedasticity: Weighted Least Squares.

   (Wooldridge, Chapters $3-8$.)

4. **Multiple Regression with Time-Series Data**

   Properties of OLS estimates in the presence of time-series data: CLM assumptions with time-series data and the resulting properties of OLS estimates. Asymptotic properties of OLS with time-series data.

   Serial correlation with time-series data: Properties of OLS when errors are serially correlated. Testing for serial correlation. Correcting for serial correlation. Heteroskedasticity and serial correlation in time-series models: testing and correcting.

   (Wooldridge, Chapters $10-12$.)

5. **Inconsistency of OLS.**

   Properties of OLS with functional form misspecification. Testing for functional form misspecification. Properties of OLS under measurement error.

   Panel Data Methods: Use of panel data to handle endogeneity. Estimation techniques: Differencing. Fixed-effects and Random-effects estimation.

   Instrumental Variables: Instrumental Variables estimation. Two-Stages Least Squares. Testing for Endogeneity. Simultaneous Equations Model.

   (Wooldridge, Chapters $9, 13-16$.)

6. **Nonlinear models**

   Dummy-dependent variables: Probit and Logit models. Sample Selection. Nonlinear Least Squares.

   (Wooldridge, Chapter 17.)