PADP 8130: Linear Models (Spring 2015)

Hye-Sung Kim
Office: Baldwin Hall 203D
Office Hours: Thursdays 1:00-4:00 pm
Email: hkim82@uga.edu

Course Information
Classroom: Baldwin Hall 206
Class Time: T 1:35 – 4:45 PM

Course Description

This course is an introduction to the theory and application of linear modeling to social science problems. The focus of this class will be to provide you with the theoretical and practical skills necessary to conduct your own empirical research. Topics will include ordinary least squares, hypothesis testing, dealing with violations of the underlying assumptions of multiple regression, instrumental variables estimation, simultaneous equations, time-series econometrics, panel data techniques, causal inference and data reduction techniques.

By the end of the course, students should be able to:

- Identify the most appropriate methodological techniques for analysis given a research question and available data, as well as identify, understand the implications, and offer resolution to various problems encountered during quantitative analysis.
- Conduct data analyses using the methodologies covered in the course. In particular, students should be able to diagnose and test empirical models, and apply the techniques for correcting models that violate statistical assumptions.
- Manage data and conduct analyses using Stata.

Required Text

Microeconometrics Using Stata, A. Colin Cameron and Pravin K. Trivedi, Revised Edition, STATA Press, Edition:2nd,

and one of the following:

- *Applied Regression Analysis and Generalized Linear Models*, John Fox, SAGE Publications (Edition: 2nd)
- *A Guide to Econometrics*, 6th Edition, Peter Kennedy, Wiley-Blackwell
- *Econometric Analysis* (7th Edition), William H. Greene, Pearson

You will need access to Stata. There are 2 ways to obtain it:

1. Purchase it. You can purchase Stata at a discounted price through their "Grad Plan": http://www.stata.com/order/new/edu/gradplans/. Recommended: Stata/IC or Stata/SE 13.

2. Use it at the computer lab in Baldwin Hall.

Grading

Class attendance is not required, but is strongly recommended.

Exams (30%)

There will be a take-home exam worth 30 % of your course grade handed out on **April 21**. It will be due on **April 27 by 11:59pm**. It will be cumulative and open-book. Unless you receive prior authorization from the instructor in writing, late exams will be penalized two full letter grades for each day-or fraction thereof-that they are late.

Weekly Quizzes (30 %)

There will be a short quiz at the beginning of each class. The quiz will cover the material from the previous week. Missing class on the day of a quiz will result in a score of zero on that quiz. Your lowest grade will be dropped.

Original Research Paper (35 %)

This paper will count for 35 % of the course grade. Conduct empirical research on the question of your choice using a dataset of your choice. Note that you must use linear models in your analysis. A research proposal that includes the dataset, the research question and details about the key variables of interest is due on February 3. The research paper is due on April 21. This paper will include a brief introduction to the research question, a literature review, a description of the data and measures, including descriptive statistics, an explanation of the empirical methodology, results, and the discussion/interpretation of the results. The style of the paper should be similar to that of published journal articles. If you are unsure of what this entails, consult recent issues of journals like the *Journal of Public Administration Research and Theory* and the *Journal of Policy Analysis and Management*. Unless you receive prior authorization from the instructor in writing, late papers will be penalized two full letter grades for each day---or fraction thereof-that they are late.

Presentation (5 %)

This presentation will count for 5 % of the course grade. On April 21, all students will present their original research papers to the class. Each student will be allotted 12-15 minutes for presenting and each presentation will be followed by 3-5 minutes' worth of questions from the class. Each student will present the following about their assigned paper: the research question, the data used, the empirical methodology, and the findings. The presentation will include an interpretation of the findings and how these results answer the original research question. If your paper is not turned in by the beginning of the day of presentations, you will not be able to present and you will receive a zero for the presentation. No exceptions.

Academic Integrity

All students are responsible for maintaining the highest standards of honesty and integrity in every phase of their academic careers. The penalties for academic dishonesty are severe and ignorance is not an acceptable defense.

Course Topics

Note: The course syllabus is a general plan for the course; deviations announced to the class by the instructor may be necessary. We may not cover all of these topics. Conversely, time permitting, other topics might be covered in this course.

January 5 (Monday)	Introduction: Math/Stat review; Simple linear regression • OLS estimator as random variables • Six assumptions of the classical linear regression model • The Gauss Markov Theorem • The R-squared goodness of fit measure
January 13	Multiple regression • OLS regression in Matrix form • OLS and goodness of fit in the K-Variable model • The classical assumptions revisited • Functional transformations of dependent and independent variables • Functional form test • Dichotomous (dummy) independent variables
January 20	Interval estimation and hypothesis testing • Common families of statistical distribution • OLS under the normality assumption • Confidence intervals/interval estimation • Testing hypotheses about a single parameter: the t-test and statistical significance • Difference between statistical significance and economic (substantive) significance • Testing hypotheses involving several parameters: the F-test
January 27	Model specification • Omitted variable bias • Omitted variable bias tests • Including irrelevant variables • Comparing nested and non-nested models • Differential effects across groups
February 3	Models for dummy dependent variables • **Research proposal due** • OLS when the dependent variable is dichotomous • Introduction to maximum likelihood as an approach to creating estimators

	• Probit and logit regression models and interpreting coefficients in probit and logit models • Interval estimation and hypothesis testing in probit and logit models
February 10	Other data Problems • Multicolinearity • Measurement errors
February 17	Nonspherical Errors • Heterocedasticity • Diagnosis and remedy of heteroscedasticity • Autocorrelation • Diagnosis and remedy of autocorrelation
February 24	Instrumental Variables
March 3	Simultaneous Equations
March 10	**No Class - Spring Break**
March 17	Time-series econometrics
March 24	Panel data econometrics

March 31	Causal inferences and econometrics of impact evaluation
	• Introduction to impact evaluation techniques:
	  • Randomized experiments
	  • Differences-in-Differences

April 7	Causal inferences and econometrics of impact evaluation
	• Introduction to impact evaluation techniques:
	  • Regression Discontinuity Design (RDD)
	  • Matching and Propensity Score

April 14	Factor Analysis and Other Data Reduction Method
April 21	Paper Presentations • *Research paper due* • Final exam handed out