IR514: Introduction to Research Design and Statistical Methods

Mondays: 5- 7:50pm
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Office: VKC 232C
Office Hours: MW, 2-3pm and by appointment

The purpose of this course is two-fold. First, we will focus on research design for social science. It is intended to provide an introduction to the principles of research design and social scientific research. We focus on issues that are common in all strands of research and highlight factors that condition the choice of alternative research methods.

Second, the course will introduce students to regression analysis and its application to political science research. The first part of the regression section of the course focuses on the derivation, estimation, and application of linear regression. The second part of the course covers violations of the assumptions of the linear regression model and methods that are used when these assumptions are violated.

The course will cover both the derivation and properties of estimators, as well as practical applications through data analysis using STATA, a statistical software package. The goal of the course is to provide students with an introduction to the tools that are necessary to conduct quantitative research in political science.

Required Books


I will also hand out a CD that has the additional course readings on it.

Assignments

Homework and Participation-50%
We will have a variety of homework assignments. Assignments will consist of short papers on research design, problem sets related to regression, and working with data sets in STATA. Homework will be assigned in class and will be due at the beginning of class the following week. Late homework will not be accepted. If you do not turn in an assignment on time, you will receive a zero on that homework.

Final Paper-50%
Students are required to submit a final paper on the last day of class. In the paper, students should use the statistical skills learned in class to analyze data related to a topic of interest. They should be double-spaced and no longer than 20 pages (including tables, graphs, references, and appendices). The paper is due on December 12th. I will discuss more details about the paper as the semester progresses. Essentially you will briefly outline a theory you want to examine empirically, then you are to present your research design and your statistical analysis. I do not want you to focus on theory development or explication in this paper. You only need to have enough theory to explain the hypotheses or prediction that you will test.

Access to STATA
Most of the homework assignments require access to STATA. Students can access STATA through the computer lab. You can also purchase STATA from the STATA Corporation.

**Schedule of Topics**

**August 25th: Design, Validity, Disconfirmation**
Lecture Readings:
1. Trochim and Donnelly, Chapter 7.

Discussion Readings:

**September 1st: No Class, Labor Day**

**September 8th: Measurement and Sampling**
Lecture Readings
1. Trochim and Donnelly, Chapters 2, 3.

Discussion Readings:

Assignment #1 due on September 15th. Analyze the data provided on rule of law and assess its validity (IRIS data and description).

**September 15th: Experimental Design**
Lecture Readings:
1. Trochim and Donnelly, Chapter 9
Discussion Readings:

September 22nd Designing Quasi Experiments
Lecture Readings:
1. Trochim and Donnelly, Chapter 9 and 10.
2. Cook and Campbell. Chapters 3, 5.

September 22nd Discussion Readings:

Homework #2 due on September 29th. Take an existing theory of politics. Derive a testable hypothesis from it. Design a quasi-experiment to test this hypothesis.

September 29th: Designing Validity
Readings:
1. Trochim and Donnelly, Chapters 11, 12.1.

Section 2 of Course
Part I: Derivation, Estimation, and Application of Linear Regression

October 6th - The Regression Approach to Political Science
Gujarati, Intro and Ch. 1
October 13th- Simple Linear Regression  
Gujarati, Chapter 2 and 3  
*Homework 3*

October 20th - Variance of B and Hypothesis Testing  
Gujarati, Chapters 4 and 5, Review 3.3 and 3.4

October 27th-General Linear Regression in Scalar and Matrix Notation  
Gujarati, Chapters 7-8

November 3rd-Assumptions of Linear Regression  
Gujarati, Review Sections 3.2, 3.4, Appendix 3A, Chapter 4, 7.1  
*Homework 4*

November 10th- Model Performance, R-Squared and Forecasting  
Gujarati, Review Sections 3.5, 5.8-5.12, 7.5-7.8, 8.5-8.6, and 8.9  

November 17th -Dummy Variables, Interaction Terms, and Functional Form  
Gujarati, Chapter 9  
Kam and Franzese Jr., Pages 1-7, 13-39, and 43-60

November 24th: Multicollinearity  
Gujarati, Chapter 10  
*Homework 5*

December 1st –Heteroskedasticity, Autocorrelation and Outliers  
Gujarati, Chapter 11 & 12  

December 8th-Logit and Probit  
Gujarati, Chapter 15  

December 8th: Regression Design: Put together research design and regression analysis

December 12th Papers Due
Supplementary materials available on the Internet:
An excellent introduction to statistics and research design is Statistics at Square One --
http://bmj.com/collections/statsbk/index.shtml, see especially Chapter 5 --
http://bmj.com/collections/statsbk/5.shtml

Good websites on statistics, econometrics, including free downloadable software for data entry, data
analysis, research design, hypothesis testing, document preparation and presentation include:
http://davidmlane.com/hyperstat/index.html
http://members.aol.com/johnp71/javasta2.html#Freebies
http://lib.stat.cmu.edu/
http://www.american.edu/econ/notes/soft.htm

Online readings on the scientific method:
http://www.lse.ac.uk/collections/lakatos/
http://galileoandeinstein.physics.virginia.edu/lectures/lecturelist.html
http://teacher.nsrll.rochester.edu/phy_labs/AppendixE/AppendixE.html
http://plato.stanford.edu/entries/popper/
http://www.brint.com/papers/science.htm
http://www.emory.edu/EDUCATION/mfp/Kuhnsnap.html
http://wwwcdf.pd.infn.it/~loreti/science.html

Useful online articles on qualitative research:
http://bmj.com/cgi/reprint/325/7357/210.pdf
http://bmj.com/cgi/reprint/320/7226/50.pdf
http://bmj.com/cgi/reprint/322/7294/1115.pdf
http://bmj.com/cgi/reprint/324/7344/1003.pdf