Seminar in Research Design and Quantitative Techniques
Political Science 7962

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Office Hours: I will hold office hours on Tuesdays and Thursdays from 1 p.m. to 2 p.m., as well as by appointment. I practice an “open door” policy. If my door is open, feel free to stop by. I strongly encourage you to get in touch with me if you are struggling with any concept, if you’re not clear what the requirements are, if you’re having personal problems that could impact attendance and performance, or if you feel like you need additional help. This class does not require a strong math background and should be accessible to anyone with knowledge of advanced algebra (and a desire to learn). Students that want more detailed information about the topics discussed in this class should see me during office hours and we can discuss more advanced readings and/or discuss research projects. In addition to office visits, I frequently check email.

Goals
The purpose of this course is to introduce students to a range of basic statistical and data analytic techniques necessary to understand and conduct quantitative social science research. The development of such methodological skills has become increasingly important for social scientists. Social scientists are often asked to conduct quantitative research on their own, or at the very least, to be able to interpret, understand, and utilize research that employs quantitative methods. As such, you should not view this course as a “necessary evil” or an obscure requirement to fulfill your M.A. or Ph.D requirements. Instead, it should be viewed as an introduction to the requisite skills for practicing social scientists.

The topics in this course should not be considered exhaustive, and a thorough statistical background requires more than will be covered in this class. This course provides the cornerstone of probability theory as well as traditional (frequentist) methodology—i.e., the assumptions necessary to draw inferences about a population. The first portion of the class will focus on descriptive statistics—namely, how can we best describe a large dataset with only a few parameters. The second half of the course will examine how we can extrapolate, or infer, from the data. More specifically, we will establish the foundations for inferential statistics. Finally, we will conclude with a brief section on probability theory and non-parametric techniques.

Several topics will be discussed in this course. First we will discuss techniques common in univariate analysis—central tendencies, distributions, and measures of variation or dispersion. We will then move to a more theoretical discussion of the philosophy of science—namely, hypothesis testing and operationalizing social constructs. Of primary
interest in this section will be the estimation of population parameters (characteristics) based on information collected from random samples drawn from populations. Various techniques will be presented to compare samples, such as z-tests, t-tests, the chi-squared statistic, and the F-test. In this section we will explore the logic of experimentation.

Then we will transition into bivariate and multivariate statistical techniques. We will explore how to quantify relationships (correlations) between two (or more) variables. Because social science often focuses upon the relationship between variables, special emphasis will be placed on establishing the direction and magnitude in populations and population samples. At the end of the course we will examine the basis of probability theory—specifically sets, combinatorial methods, and Bayes’ theorem. Probability theory is essential to more advanced statistical models. We will also explore several non-parametric statistical methods. Please note that I reserve the right to make modifications to this syllabus, as well as administer in class exams and extra readings/homework assignments. All assignments, projects, and tests should be done independently, unless noted otherwise.

Two major points need to be emphasized about this course. First, one of the best ways to learn about statistical techniques is to practice them as much as possible. Statistics isn’t “natural” to everyone (perhaps not anyone), but with practice you will become well versed in the topics explored in this class. Only by going through the process of computing the answers to statistical problems, will you develop the statistical skills necessary to understand and conduct empirical research. A second point is that this class should afford students the ability to effectively evaluate research, perhaps even lead students to identify and discard myths pertaining to statistics (e.g., “You can use numbers to prove anything” or “You can lie with statistics”). Honest, ethical social scientists use statistics as an objective way to explore our social world. Social scientists well-versed in statistical methods can easily differentiate good statistical arguments from bad ones. If nothing else, my hope is to provide you with the tools necessary to make this distinction.

Course Textbooks and Software


I strongly encourage you to purchase or borrow a version of Stata (Version 9 or 10). This can be purchased at a discounted rate through PAWS. Students can purchase a year license, Stata (intercooled), or the more expensive Stata special edition. LSU students get a drastically reduced price. While initially expensive, stata is the growing as the most widely used and flexible statistical package in the social and basic sciences. Also, subsequent statistics classes in this department may require (or encourage) you to purchase stata. Feel free to bring laptops to class if you’d like to work stata examples
together. I will periodically provide do-files and log files. Since we will be working through many applied examples, feel free to email me suggestions about datasets you’d like to analyze. My training is primarily in political science and psychology—so many of my examples will be from these two disciplines. Yet this need not be the case.

**Optional Readings**


Timothy M. Hagle (1995). *Basic Math for Social Scientists: Concepts* (Series in Quantitative Applications for Social Scientists) This is part of the Sage monograph series.

William D. Berry and Stanley Feldman (1985). *Multiple Regression in Practice* (Series in Quantitative Applications for Social Scientists) This is part of the Sage monograph series.


**Assessment**

Each student will be evaluated based on the following:

- Midterm Exam (100 points)
- Final Exam (100 points)
- Problem Sets and Assignments 5 x 20 points (100 points)
- Final Report (100 points)

Total (400 points)

**Grading**

- 90%+ = A
- 80-89.9999 = B
- 70-79.9999 = C
- 60-69.9999 = D
- <60 = F

**Calculator**

Many problems we will work out during the semester require the use of a calculator. Be sure the calculator includes a square root and exponent function. Each student should bring a calculator to class.

**Daily Schedule**

*Please read all assignments before the listed meeting times. Please note that the course schedule is subject to change. You are responsible for all announced changes.*
Week 1 (August 25): Introduction to the Course
-Introduction to statistics and definition of key concepts
Knoke et al., Chapter 1 (pp. 3-28)

Week 2 (September 1): NO CLASS
Knoke et al., Chapter 2 (pp. 29-41)

Week 3 (September 8): Univariate Statistics and an Introduction to Stata
Knoke et al., Chapter 2 (pp. 41-66)
Baum (pp. 1-34)

Week 4 (September 15): Distributions and Sample Estimation of Population Parameters
Knoke et al., Chapter 3
Baum (pp. 55-67)
Problem Set 1 (Chapter 2 and 3): Under “General Problems” answer #2, 6, and 10 on pp. 65-66 and #1, 5, 7, and 10 on pp. 106-107 (Due September 22).

Week 7 (September 22): ANOVA
Knoke et al. Chapter 4 (pp. 111-138)

Week 5 (September 29): Bivariate Relationships
Knoke et al., Chapter 6 (pp. 169-203)
Problem Set 2 (Chapter 4 and 6): Under “General Problems” answer #1, 4, and 9 on pp. 136-137 and #1 and 3 on p. 201 (Due October 6).

Week 6 (October 6): Bivariate Relationships in Stata
Baum (pp. 70-94).
Stata Examples
Review for Midterm

Week 7 (October 13): Midterm Exam
You may bring written notes on a single side of an 8.5 x 11 inch piece of paper. You will have the entire class to complete the exam.

Week 8 (October 20): Multivariate Relationships
Knoke et al., Chapter 7
Assignment: Generate a research question, hypothesis, and propose a way to test of this hypothesis. Find a dataset to explore this hypothesis. Explain what variables you’ll examine, and what methods you’ll use. Please see me for suggestions (Due November 3).

Week 9 (October 27): Multivariate Regression
Knoke et al., Chapter 8 (pp. 235-253)

Week 10 (November 3): Multivariate Regression
Knoke et al., Chapter 8 (pp. 253-263)
Baum (pp. 161-171)

**Week 12 (November 10): Multivariate Regression**
Knoke et al., Chapter 8 (pp. 263-285)
Problem Set 3: Stata Problem Set.

**Week 13 (November 17): Introduction to Probability Theory**
Readings TBA

**Week 14 (November 24): Probability Theory, Continued**
Problem Set #4: This will be distributed in class.

**Week 15 (December 1): Non-Parametric Methods**
Readings TBA

**December 5: Final Paper Due: Research paper. Guidelines**
(1) Write a brief literature review that includes at least four cites. (2) State the research question and hypothesis, (3) describe how the hypothesis was tested, and (4) test that hypothesis using the methods detailed in this course. (4) describe your results and write a conclusion. (5) Be sure to include a reference section, figures, and relevant tables. The paper should be about 8-10 pages, double-spaced. 1 inch margins, 12 point (times new roman) font. You should pursue an original research topic and conduct the analysis using an existing dataset.

**FINAL EXAM: TUESDAY DECEMBER 9 7:30-9:30 PM (10%).**