

Political Science 7962: Seminar in Research Design and Quantitative Techniques

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Office Hours: M,F 9:00-11:40; T TH 9-10:15
or by appointment.

Semester: Fall 2015
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Course Objectives

Political Science 7962 is the introductory course in quantitative methodology for graduate students in political science. The goal of the course is to enable students to evaluate, conduct, and report research using basic quantitative methods. The course introduces students to a set of introductory statistical concepts and techniques, and their practical application to research in political science. Topics covered include measurement, descriptive statistics, statistical inference, and tests of bivariate relationships. The course concludes with an overview of multivariate analysis.

This course is intended to train students to conduct their own research projects. Lectures and readings will present the theory behind some of the tools used in quantitative research. However, like many skills, a facility with statistical methods is acquired through experience and practice. Workbook assignments throughout the semester will allow students to apply concepts from the course materials to practical problems in Political Science. These exercises will also familiarize students with the STATA statistical package. Students from disciplines other than political Science may opt to use the statistical package SPSS or R if those languages are more widely used in their discipline. Students will also write a piece of original quantitative research applying their skills to a topic of their own choosing. These skills will be useful later, most immediately in POLI 7963.

The Nature of the Course

This is a statistics course. But not just a statistics course. And certainly not a math course. It is a course in the application of basic statistics to research problems in social science. As such this course will cover a very wide range of types of material. We will deal with math of course, because an understanding of the internal logic of statistical techniques is important to their correct interpretation, and is a foundation for future statistical training. There will be formulas because the formulas present, in a concise form, the logic underlying statistical methods. We will also cover some intuitions, vocabulary and social conventions surrounding statistical analysis, as well as best practice for quantitative analysis. Statistics do not speak for themselves, and their meaning depends on our interpretation of the statistical results. The art of interpretation is also a major goal of this course. Note that these are very different types of information.

So for example, $\Sigma(x-\bar{X})(y-\bar{Y})$ is the **formula** for the covariation between two variables and provides the logic which drives correlation and OLS regression analysis. This is a straightforward matter of logic and mathematics.

In some types of graphical presentations of data (pie charts, histograms) surface area is equivalent to relative frequency. Understanding this **concept** will make the discussions of probability distributions easier to grasp. And that in turn is the cornerstone of interpreting tests for statistical significance.

The .05 significance level is an arbitrary social **convention** which is, thanks to historical accident, extremely important in the way statistical results are interpreted and published (or not published.) .05 is an internationally shared convention but not a logical necessity.

The syntax or command file is a text file of commands used to manipulate data and generate statistical results in STATA or SPSS. **Best practice** in quantitative research is to always generate and save a command file for later use, and to share with researchers who are trying to replicate your results.

Required Texts

The Chicago Guide to Writing about Numbers Second Edition by Jane Miller. ISBN-13: 978-0226185774 ISBN-10: 022618577X.

Master Math: Probability by Catherine A. Gorini ISBN 1435456564.

Essentials of Statistics for the Behavioral Sciences, 8th Edition Frederick J Gravetter and Larry B. Wallnau Cengage Learning: 1133956572.

A STATA Companion to Political Analysis Third edition by Philip H. Pollock III 978-1-4522-4042-8
or if you are not planning to take POLI 7963 next semester you can also use –

An SPSS Companion to Political Analysis Fourth edition by Philip H. Pollock III. ISBN 1435456564
or if you are up for a challenge–

An R Companion to Political Analysis Fourth edition by Philip H. Pollock III. ISBN-10: 1452287317

Other readings will be placed on moodle. Assigned readings must be completed before the class period for which they are assigned to allow participation in class discussion.

The Chicago Guide to Writing about Numbers is a handbook of useful tips for conveying quantitative information clearly and concisely. These tips are valuable for a wide range of communications ranging from lectures and general audience writing to administrative reports and scholarly articles. We will not cover this material in depth in class, but your mastery of it will be evident in the high quality of your seminar paper.

Master Math: Probability presents probability theory in more depth than most statistics textbooks. Given the importance of probability for statistical inference and for formal theories of strategic interaction, you need more than a superficial understanding of the topic. It will not help you win at the casino, but will help you understand why you lose, and how to lose more slowly.

Essentials of Statistics for the Behavioral Sciences, 8th Edition is the essentials of intro statistics. (The unabridged version is longer but covers material which is less essential.) It is a good treatment of the logic and mathematics behind the methods we will cover this semester, and has good practical examples of each technique. There are

countless introductions to statistics in print and online, but this is one of the best. And sharing a common text keeps the class on the same page literally and figuratively (common notation etc.).

All students must buy one of the *Companion to Political Analysis* workbooks. The editions listed differ mainly by the statistical software package used to do the lab exercises. The use of one of the current editions listed is important so that everyone has the same problems and exercises for their lab and homework assignments. Poli Sci students are required to purchase the STATA edition, and a Poli Sci TA will hold lab sessions to help students using STATA to conduct their lab exercises. STATA is an increasingly popular solution for Political Scientists because it is often quicker to implement new statistical techniques than is SPSS. STATA is also used in later courses in the statistics sequence. Unfortunately, STATA is not available in all of the computer labs at LSU, though it is available in the first floor lab in Stubbs Hall or can be purchased through tigerware. (Theory students who will not take 7963 can safely opt for the SPSS workbook.)

SPSS is being rebranded by IBM as a solution for business applications with a decreased emphasis on the social sciences. R is freeware and popular in some circles in geography, mathematics, and the physical sciences. Mathematically, there should be no difference in the statistical output generated by each program. So it does not matter to me which program you use. Students from other disciplines are welcome to use the STATA workbook as well, and can take advantage of the lab sessions. However, disciplines and faculty differ in their choice of a statistical package, and if your discipline or major professor has a strong preference for SPSS or R, you may want to use that language instead. R is freeware and SPSS is available in most of the computer labs on campus. There is extensive online help for both of these languages, and I can give you some help with SPSS. I regret that I am not at all fluent in R.

Recommended Equipment

A **flash drive** is needed for saving work done in the computer lab. Because most computer labs on campus do not feature STATA, Poli Sci students should purchase a copy of STATA/IC or STATA/SE version 10 or later. (Note that a copy of “Small STATA” will not handle enough observations to handle all the workbook exercises.)

Graded Requirements

Midterm Exam	[weight = 20%]
Final Exam	[weight = 20%]
Lab and Homework Assignments	[total weight = 30%]
Research Project	[weight = 30%]

The Midterm Exam will be a take home exam due Oct 14 at 9:00 AM. As such it is an open book exam- all course materials may be used during the exam. Collaboration with other students is, however, prohibited.

The Final Exam will be an in-class closed book exam Dec 12, 9:00-12:00.

The Lab Assignments will be taken from the workbook.

The Research Project is a piece of original quantitative research. Students often use data related to their current research projects or to a field they find particularly interesting.

Assignment Schedule:

Labs	Paper
Chs 1 and 2 Due Sept 22	Sections I and II due Sept 14
Chs 3 and 4 Due Oct 5	Section III due Sept 28
Ch 5 due Oct 19	Section IV due Oct 25
Chs 6 and 7 due Nov 2	Section V due Nov 15
Ch 8 due Nov 16	Final Paper (all sections) due Dec 7
Ch 9 due Nov 23	
Ch 10 due Nov 30	

Reading Schedule

Complete indicated readings before class

Part I Conceptual Foundations and univariate descriptive statistics

Aug 26: Introduction to the course, Vocabulary and Notation, Software, Datasets etc

J. Miller Ch 1, 2

Pollock "Companion to Political Analysis" Chapter 11

Gravetter Ch 1 (on moodle)

Gill Essential Mathematics sections 1.1 to 1.4 (on moodle)

Nagler 1995 "Coding Style" (on Moodle)

Sept 2: Measurement: Levels, Reliability and Validity

S. Stevens, "On The Theory of Scales of Measurement" Science Volume 103 Issue 2685 (June 7 1946) 677-680. (on moodle)

Johnson and Reynolds "Research Methods in Political Science" ch 4. (on moodle)

J Miller Ch. 4 (pages 53-64), Ch 7

Gravetter Ch 1 section 1.4

Sept 9: Presenting & Summarizing Data: Frequencies and Graphical Techniques; Central Tendency and Dispersion, Skewness and Kurtosis.

Gravetter Ch 2, 3 and 4

J Miller Ch. 4 (remainder) ch 7

Part II Foundations of Inferential Statistics

Sept 16: Introduction to probability/ Comparisons

Gravetter Ch 6 (6.1,6.2)

Gorini chapters 1,2,3

Miller Ch 3 (33-40)

Kahneman 2011 Thinking Fast and Slow "Law of small numbers" (moodle)

Sept 23: Binomial Distribution/ conditional probability

Gorini chapters 4,5,6,7

Gravetter Ch 6 (6.6)

And crosstab reading from Pollock (moodle)

Sept 30: The Normal Distribution and the Central Limit Theorem

Gorini chapters 8,9

Gravetter chs 5 , 6 (6.3,6.4), 7

Oct 7 Hypothesis Testing and Confidence Intervals

Ronald Fisher, The Design of Experiments London: Oliver and Boyd. Chr 2. (moodle)

Miller Ch 3

Gravetter Ch 6 (6.7) and 8

Part III Bivariate techniques

Oct 14 : Bivariate statistics, nominal data

Gravetter Ch 15

Oct 21 : Sample means and the t distribution

Gravetter Ch 9 and 10

Oct 28 Analyzing Variance (ANOVA)

Gravetter Ch 12

Nov 4 Correlation and Bivariate Regression

Gravetter Ch 14

Part IV. multivariate techniques

Nov 11 Multiple Regression, Dummies and Interactions

Lewis Beck Applied Regression: An Introduction Sage Publications (Section 3 on Multiple Regression)
(moodle)

Brambor, Clark, and Golder 2005 "Understanding Interaction Models: Improving Empirical Analyses"
Political Analysis 14: 63-82 (moodle)

Suits 1957 "Use of Dummy Variables in Regression Equations" Journal of the American Statistical
Association 52: 280 548-551 (moodle)

Nov 18 Categorical Dependent Variables : Logit

Pollock 2012 The Essentials of Political Analysis 4th ed CQ Press Ch. 9 (on moodle)

Nov 25 Nonlinear OLS, measurement error, and proportions

Gill Essential Mathematics sections 1.5 to 1.7 (on moodle)

Firebaugh and Gibbs 1985 "Users Guide to Ratio Variables" ASR 50:5 731-722 (moodle)

Dec 2 Wrap up and cautionary notes

Abelson Ch 4 "Styles of Rhetoric" (moodle)

Abelson Ch 5 "On Suspecting Fishiness" (moodle)

Mearshimer and Walt 2013 "Leaving Theory Behind" (on moodle)

Mock and Weisberg 1992. "Political Innumeracy: Encounters with Coincidence, Probability, and Chance"

AJPS 36(4):1023-1046. (moodle)