Quantitative Methods of Political Analysis (v4.2: 6 Apr 2015)

This course offers an introduction to the methods political scientists use to construct, to estimate, and to evaluate systematically empirical representations of theoretical propositions about politics. The course emphasizes the formulation of positive political theories; the derivation of hypotheses from, and the specification of empirical models of, those theories; and the use of data to test those hypotheses and estimate those empirical models. No background in statistics is required. We use and discuss statistical concepts and reasoning, but the course instruction will include any mathematics and statistics needed from the ground up. Problem sets (5 total, approx. biweekly, 10% each), class participation (15%), and a take-home final (35%) comprise the course’s graded exercises. Some class sessions may involve discussion of those exercises, which students should bring, completed, to class. Lecture notes and other course materials will be provided before class sessions as well; students should have read those and bring them to class as well. Everyone is expected to come prepared for, and to participate in, all class sessions.

The course has one required text:

All other class materials will be available through the course CTools site, although we draw sizable selections from the following texts (so you might consider them recommended, not required):

Some assignments will require work in a spreadsheet, like Excel or Numbers or Google Sheets, or in a statistical software package, like Stata or R. I will demonstrate primarily in Excel and Stata. You can access all these software and more via UM’s Virtual Sites at http://virtualsites.umich.edu. (And some are free, like R and Google’s apps.)

Course Schedule

Week 1: Wednesday 1/7 — Welcome & Course Description, including a first look at some empirical analyses of some of the best-developed positive-theoretical propositions in political science. (We’ll see them again later.)


I. Positive Social-Science Theory and Strategies of Empirical Social-Science Research

Our introduction begins by clarifying what positive, as opposed to normative, social-scientific theory, e.g., political-science theory, looks like and is, and how it works. We then discuss, also in introductory fashion, how positive social-science theory may be systematically and objectively evaluated empirically. The latter discussion includes highlighting the distinction between experimental and observational studies, examines the weaknesses of observational studies (some of experimental studies), and asks what strategies one can best apply when experimentation is not feasible and what can one learn from non-experimental studies. (For the most part, political science, as a social science, is a non-experimental science.)

Week 2: Monday 1/12–Wednesday 1/14 — Introduction to Positive Social-Science Theory & its Systematic, Objective Empirical Evaluation

1. Continue with “Background Reading” and the 6 examples of empirical research in political science.

MLK Day: Monday 1/19 — Classes do not meet.

Week 3: Wednesday 1/21 — (Cont.) Positive Social-Science Theory & its Systematic, Objective Empirical Evaluation


Assignment 1: Distributed Wednesday 1/21; Due Friday 1/30

II. Design: Experimental & Observational Studies and Operationalization & Measurement: Variables

A critical part of any empirical analysis is the choice and construction of specific measures, or variables, that accurately represent the theoretical or propositional concepts. In this section, we want to discuss the various criteria that must be satisfied in order to claim one has “good” measures for the central concepts.

Week 4: Monday 1/26–Wednesday 1/28 — Designs of Empirical Political-Science Research


Week 5a: Monday 2/2 SNOWPOCALYPSE!


III. Summarizing and Describing Data

Many empirical studies begin with, and the simplest analyses rely mostly or exclusively, on displaying and comparing descriptive statistics for individual variables. Some of these comparisons are graphical, and others tabulate or present sample statistics such as mean and variance.

Week 6a: Monday 2/9 — Univariate Summary & Descriptive Statistics: Histograms, Means, Variances, etc.

2. FPP, Chs. 3-4.

Assignment 2: Distributed Monday 2/9; Due Tuesday 2/17 (by 7:00pm)
Week 6b: Wednesday 2/11 — Bivariate Summaries & Statistics: Scatterplots, Crosstabs, Covariance, Correlations, etc.

Analyses involving pairs of variables are often done by plotting the values associated with each variable for given data points. The information in these scatterplots can then be summarized in the correlation coefficient.

1. FPP, Chs. 8-9.
3. S&W, Ch. 2 pp.34-35 and Ch. 3 pp. 92-96.

IV. More Probability & Statistical-Inference; Bivariate Analysis

This section re-grounds us formally in the probability & statistics theory underlying statistical inference, in general, including in social science, and begins their application in various forms of bivariate analysis.

Week 7a: Monday 2/16 — Probability, Statistics, and Statistical Inference

1. K&W, Ch. 6, pp. 129-44.

Week 7b: Wednesday 2/18 — Bivariate Analyses


Assignment 3: Distributed Wednesday 2/18; Due Thursday 3/12 at 9:00am

V. Examples of Political Analyses

This section examines a few examples of empirical evaluation of some of the most highly successful, best empirically supported, positive theories in political science. Class discussion will focus on the paper’s main positive-theoretical propositions, the specific hypotheses derived from those theories, the operationalization & measurement of the key conceptual variables involved in those theories, the design & specification of the empirical analyses conducted, and the appropriateness of the conclusions, given the data and methodology. Although we will not yet have covered all of the particular statistical methods used to analyze the data, we will work to establish at least an intuitive understanding of what the empirical results establish and the substantive interpretations and conclusions pulled from the analysis.

Week 8a: Mon. 2/23— Example Empirical Analyses of some Classic Positive-Theoretical Propositions in political science; these cover some of the most thoroughly developed and best empirically supported theories in political science.


VI. The Linear-Regression Model

The most frequently used means for modeling relationships between variables (outcomes & explanators) is the linear-regression model, and its extensions to the generalized linear model (GLM) in which a linear-additive argument enters a nonlinear function, extending the applicability of regression analyses to qualitative and limited dependent-variables. Regression analyses figured prominently in the examples discussed in Sec. IV, and this section develops their logic,
application, and interpretation more fully.

— Linear-Regression Model: Bivariate


2. H&J, Ch. 2, pp. 24-43.
3. H&J, Sect. 3.3 (MC experiment: distribution of b), 3.4-3.6 (inference & interpretation), pp. 60-72.

VII. Regression Analyses

Extensions and Issues in Application of the Linear-Regression Model, and Introduction to the Binary-Outcome Case of the Generalized Linear model.

Week 12: Monday 3/30–Wednesday 4/1 — Further Issues & Considerations in Applied Linear-Regression

2. H&J, Ch. 4, pp. 75-108.

Assignment 4: Distributed Monday 3/30; Due Wednesday 4/8


2. K&W, Sects. 11.3-4, pp. 256-68.

Assignment 5: Distributed Friday 4/10; Due Monday 4/20


Week 15b: Skipped in Winter 2015 — Close Review of the Example Empirical Analyses of some Classic Positive-Theoretical Propositions in political science; these cover some of the most thoroughly developed and best empirically supported theories in political science. Now we are equipped to follow and understand them fully.


Thursday, April 30 at 3:30pm: Final Exam Due