Quantitative Empirical Methods of Political Science (v3.0: 15 March 2016)

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 all the mathematics and statistics needed, from the ground up. Problem sets (10 total, approx. weekly, 5% each), class & section participation (15%), & a take-home final (35%) comprise the course’s graded exercises. Lecture notes and other course materials will be provided before class sessions; students should have read those and bring them to class. Everyone is expected to come prepared for, and to participate in, all class & section sessions.

The course has one required text:

All other class materials will be available through the course CANVAS 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. We will demonstrate primarily in Excel and Stata. You can access all these software & more via UM’s Virtual Sites (http://virtualsites.umich.edu), and some are free, like R & Google’s apps. You can work in groups on assignments if and as you wish, but each student should produce their own final answers for their own, individual submissions. Please be aware that, although working together can help you break through initially on some of the more challenging items, relying too much on your peers over the semester can leave your understanding of the material lacking and accumulate to a large problem for the final. Please do form and work in groups if this is helpful for you, but also be sure you understand fully the material in each assignment by yourself, individually, before proceeding.
University, College, Department, and Course Statements

Accommodations for Students with Disabilities
If you think you need an accommodation for a disability, please let me know at your earliest convenience. Some aspects of this course, the assignments, the in-class activities, and the way the course is usually taught may be modified to facilitate your participation and progress. As soon as you make me aware of your needs, we can work with the Services for Students with Disabilities (SSD) office to help us determine appropriate academic accommodations. SSD (734-763-3000; http://ssd.umich.edu) typically recommends accommodations through a Verified Individualized Services and Accommodations (VISA) form. Any information you provide is private and confidential and will be treated as such.

Religious and Academic Conflicts
Although the University of Michigan, as an institution, does not observe religious holidays, its policy is that every reasonable effort should be made to help students avoid negative academic consequences when their religious obligations conflict with academic requirements. Absence from classes or examinations for religious reasons does not relieve students from responsibility for any part of the course work required during the period of absence. Students who expect to miss classes, examinations, or other assignments as a consequence of their religious observance shall be provided with a reasonable alternative opportunity to complete such academic responsibilities. It is the obligation of students to provide faculty with reasonable notice of the dates of religious holidays on which they will be absent. Such notice must be given by the drop/add deadline of the given term. Students who are absent on days of examinations or class assignments shall be offered an opportunity to make up the work, without penalty, unless it can be demonstrated that a make-up opportunity would interfere unreasonably with delivery of the course. Should disagreement arise over any aspect of this policy, the parties involved should contact the Director of Undergraduate Studies. Final appeals will be resolved by the Provost.

Students Representing the University of Michigan
There may be instances when students must miss class due to their commitment to officially represent the University. These students may be involved in the performing arts, scientific or artistic endeavors, or intercollegiate athletics. Absence from classes while representing the University does not relieve students from responsibility for any part of the course missed during the period of absence. Students should provide reasonable notice for dates of anticipated absences and submit an individualized class excuse form.

Student Mental Health and Wellbeing
The University of Michigan is committed to advancing the mental health and wellbeing of its students. If you or someone you know is feeling overwhelmed, depressed, and/or in need of support, services are available. For help, contact Counseling and Psychological Services (CAPS) at (734) 764-8312 and https://caps.umich.edu during and after hours, on weekends and holidays, or through its counselors physically located in schools on both North and Central Campus. You may also consult University Health Service (UHS) at (734) 764-8320 and www.uhs.umich.edu/mentalhealthsvcs, or for alcohol or drug concerns, www.uhs.umich.edu/aodresources. For a listing of other mental health resources available on and off campus, visit: http://umich.edu/~mhealth.
Course Schedule

Week 1: Wednesday 1/6 — 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 1/11–Wednesday 1/13 — Introduction to Positive Social-Science Theory & its Systematic, Objective Empirical Evaluation

1. Continue with “Background Reading” and the 5 examples of empirical research in political science.

Assignment 1: Distributed Wednesday 1/13

MLK Day: Monday 1/18 — Classes do not meet.

Week 3: Wednesday 1/20 — (Cont.) Positive Social-Science Theory & its Systematic, Objective Empirical Evaluation


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 1/25–Wednesday 1/27 — Designs of Empirical Political-Science Research


Assignment 1: Due Wednesday 1/27
Assignment 2: Distributed Wednesday 1/27
Week 5a: Monday 2/1 — Concepts, Operationalization, & Measurement: Variables, Distributions.


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 5b: Wednesday 2/3 — Univariate Summary & Descriptive Statistics: Histograms, Means, Variances, etc.

2. FPP, Chs. 3-4.

Assignment 3: Distributed Wednesday 2/3
Assignment 2: Due Friday 2/5

Week 6: Mon 2/8–Weds 2/10 — 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.

Assignment 4: Distributed Wednesday 2/10
Assignment 3: Due Friday 2/12

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 2/15 — Probability, Statistics, and Statistical Inference

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

Week 7b: Wednesday 2/17 — Bivariate Analyses

V. 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.

Weeks 8: Monday 2/22–Wednesday 2/24 – Linear-Regression Model: Bivariate


Assignment 4: Due Friday 2/26

Week 9: Winter Break! Have a great vacation!! – Monday 2/29–Wednesday 3/4


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.

Assignment 5: Distributed Monday 3/7
Assignment 6: Distributed Wednesday 3/16
Assignment 5: Due Friday 3/18

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.


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

Assignment 7: Distributed Wednesday 3/23
Assignment 6: Due Friday 3/25


Assignment 8: Distributed Wednesday 3/30
Assignment 7: Due Friday 4/1


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

Assignment 9: Distributed Wednesday 4/6
Assignment 8: Due Friday 4/8


Assignment 10: Distributed Wednesday 4/13
Assignment 9: Due Friday 4/15

Week 16a: Monday 4/18 — Models for Binary Outcomes: Estimation & Interpretation (continued) AND/OR, as time allows:

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.


Assignment 10: Due Tuesday 4/19

Thursday, April 28 at 3:30pm: Final Exam Due