Quantitative Analysis in Political Research

**Purpose:** This introductory course in quantitative analysis provides graduate students in the social sciences with tools necessary for conducting and understanding empirical research. The most important of these tools is statistics, the science of collecting, analyzing, and extracting useful information from data. We will learn how to characterize samples of data, and then use probability to infer much broader conclusions about the world. Along the way we will learn about probability distributions, expectations, the logic of hypothesis testing, and the regression model. Many of the examples we will consider are not obviously “political”, but the principles of inference you learn will be indispensable in your further studies.

**Prerequisites:** This is not a “statistics for poets” course. Students will be expected to understand and perform arithmetic, algebra, basic calculus, and elementary data analysis on a computer. If you need extra help with these please see me or Taylor. The material in this course is cumulative, each week building on the previous one. Consequently, if you fall behind it may be very difficult to catch up. Therefore it is very important that you understand the concepts presented both in the book and in lecture. **Don’t be afraid to ask questions in lecture or in the discussion section!**

**Requirements:** There will be almost weekly problem sets, which will be assigned on a Tuesday, and are due the following Tuesday in class. Please be kind to Taylor by being tidy and timely with your homework. Together the problem sets will account for 20% of the final grade. You may work on these collaboratively (in groups of no more than 3), but be sure you understand the material, or the exams will prove difficult. There will be two mid-term exams, each counting for 20% of the grade, and one final exam (40%). These exams will be closed-book, though you will be permitted to bring in one standard-size (8.5x11in) review sheet. You will also need a hand calculator for homework and exams.

**Software:** Some of the homework will involve use of R, a popular open-source statistics package. To help you learn R we have reserved the microcomputer lab in 1535 Tolman Hall every Friday from 11-12. The idea is to devote the first hour of section 2505 Tolman Hall) to going over the statistical material for the week, and to spend the second hour learning R. You should also install R on your laptops. It is available at [http://cran.r-project.org/](http://cran.r-project.org/).
There are two textbooks for this course, available at the ASUC and/or Ned’s, both near the corner of Bancroft and Telegraph:


Larsen and Marx is somewhat mathematical, so if you feel like you want a less technical take, here are two other popular textbooks (there are dozens of similar ones):


Note: New and better readings often come to my attention. I reserve the right to add or subtract material as needed.

**Tentative Course Schedule** (There is some flexibility here depending on how we progress.)

**Week 1, Jan 20-22: Taking a Chance with Probability**

- Larsen and Marx, §2-1-§2.5.

**Week 2, Jan 27-29: Taking an RV Out for a Spin (Random Variables and Expectation)**

- Larsen and Marx, §3.1, §3.3, §3.4, §3.5 (skip Example and Theorem 3.5.2), §3.6 (only through p. 199); §3.9 through the top of p. 237.

**Week 3, Feb 3-5: Discrete Probability Distributions**

- Larsen and Marx, §3.2 (Binomial only), §4.1, §4.2 through p. 289.

**Week 4, Feb 10-12: Continuous Probability Distributions and the Central Limit Theorem**

- Larsen and Marx, §4.3.
Week 5, Feb 17: Probability Applications
Week 5, Feb 19: Midterm Exam

Week 6, Feb 24-26: Estimation: Confidence and Significance

- Larsen and Marx, §§5.1, 5.3, Examples 5.4.3 and 5.4.4, the bottom part of p. 388, Example 5.4.6, and §§6.1-6.2.

Week 7, Mar 3-5: Estimation: Power and Error

- Larsen and Marx, §6.4 (skip the “Power Curves” section and everything beginning with “Decision Rules for Nonnormal Data”).

Week 8, Mar 10-12: Inferences for Means

- Larsen and Marx, §§7.1-7.2; §7.4 through p. 493; §9.2.

Week 9, Mar 17: Inferences for Tabular Data

- Larsen and Marx, §10.5 (skip the “Testing for Independence: the General Case” and continue with Case Study 10.5.1).

Week 9, Mar 19: Midterm Exam

Week 10, Mar 24-26: Spring Break

Week 11, Mar 31-Apr 2: Bivariate Regression

- Larsen and Marx, §§11.1, 11.2 (through p. 662), §§11.3, 11.4

Week 12, Apr 7-9: Introduction to Multiple Regression

• Wonnacott and Wonnacott, §13-1-§13-5.

**Weeks 13-15, Apr 14-30: Topics in Regression Analysis (Tentative)**

- **Model Specification**

- **Measurement Error**
  - Gujarati, §13.5.

- **Multicollinearity**
  - Gujarati, Chapter 10.

**Week 16, May 5: Extra Office Hours**

**Week 16, May 7: Final Exam**