PSCI 2075: Quantitative Research Methods

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1 Course Description

Our digital world requires we make sense of and evaluate arguments based on quantitative data. This class is designed to provide the student with the basics of data analysis which serves two purposes. The first is instrumental: the skills associated with data analysis are in high demand–whether in government or in the private sector setting. The second purpose is more civic minded: democracy depends on debate that must be grounded in empirical reality. Consider the following call to arms by Thomas Piketty: " ...social scientists...must not flee in horror the minute a number rears its head, or content themselves with saying that every statistic is a social construct, which of course is true but insufficient" (Piketty 2014:575). He goes on to say that "Refusing to deal with numbers rarely serves the interests of the least well-off" (Piketty 2014:575).

From a pedagogical perspective, this class is based on the philosophy that the best way to learn data analysis is by doing it. The bulk of the class is based on three homework assignments that will not only introduce the student to important tools, the assignments will provide the student with a toolbox that can be used in all subsequent classes at CU and beyond. Finally, to effectively examine data, students will be introduced to the statistical software called "R". The software is free and is commonly used in the University as well as in private organizations such as Google.

2 Course Requirements

In addition to three substantial homework assignments, there will be regular assignments that will be completed in class. The homework assignments will vary in weight and will be designed to introduce the student to important data analytic techniques through examining real world political data. The in-class assignments (worth 20% of the final grade) will be designed to practice the skills necessary to succeed on the homework assignments. Instead of sitting through lectures, I've designed the class to create an active learning environment. Show up to class ready participate, practice, and play! The distribution of the final grade will be calculated as follows:

- Assignment I: 10%

- Assignment II: 20%

- Assignment III: 20%

- Final: 20%

- Participation in Lecture: 10% Students will receive 1 pt credit if they respond to 75% of the clicker questions that are posed in class that day. We'll add up the possible points for the semester and if the student has 85% of the points, they receive full credit.

- In-class assignments: 20% There will be short group assignments that will be performed in class as part of the active learning environment.

Understanding the demands and rigors of college life, students will be allowed three days total of being tardy on assignments. Typical uses of these days are: illness (non-hospitalized), stuck at airport, girlfriend/boyfriend sad, file got erased, computer broken, etc.,. The three days can be used for one assignment or can be divided among all assignments. For each 24 hours a paper is late (past the three days), a third of a letter grade will be subtracted from the assignment. If there is a dispute regarding the grade on an assignment or exam, the student is required to meet face-to-face with their teaching assistant. If, after that meeting, the student wishes to have the graded material re-graded by the professor, I will re-grade the material with the understanding that the grade can go up, remain unchanged, or go down.

3 Required Materials

Listed below is the book available on-line as well as screencasts.

- David S. Brown (2014). *Data Analysis for the Social Sciences*, Bananastand Press, Boulder, CO (Available on class D2L site).

- David S. Brown (2015). *Screencasts for PSCI 2075*, Bananastand Studios, Boulder, CO (Available on class D2L site).

4 Schedule

- August 28th and 30th *An introduction to the class and to R*: this week is pretty self-explanatory, I will outline what we'll be doing in class over the semester as well as get squared away with some rudiments to the statistical package R.

    1. *Data Analysis for the Social Sciences*: Preface and Chapter 1
    2. *Screen Cast*: "Getting Started with R" and "Using RStudio"

- September 6th *Introduction to descriptive statistics*: What are descriptive statistics, what are the most useful tools, and how can they be used and abused?

  1. *Data Analysis for the Social Sciences*: Chapter 3
  2. *Screen Cast*: "Univariate Descriptions" and "Bivariate Descriptions"

- September 11th and 13th *Transforming variables*: variables or measures rarely come in the best form given our purposes. During this week we will concentrate on transforming variables so that we can more readily identify important empirical patterns.

  1. *Data Analysis for the Social Sciences*: Chapter 4
  2. *Screen Cast*: "Tranforming Categorical Data" and "Log Transformation"

- September 18th and 20th *Identifying relationships with descriptive statistics*: With very simple descriptive statistics (scatterplots, histograms, lineplots, and boxplots, we can uncover the relationship between different variables of interest.

  1. *Data Analysis for the Social Sciences*: Chapter 5
  2. *Screen Cast*: "Bivariate Descriptions"

- September 25th and 27th *Controlled comparisons*: Controlling for variables is the bread and butter of all scientific inquiry. This week we will explore how 'controlling' for certain variables produces interesting insights into how the world works.

  1. *Data Analysis for the Social Sciences*: Chapter 6
  2. *Screen Cast*: "Making Controlled Comparisons"

- October 2nd and 4th *Linear Regression*: First, we'll learn how to perform a bivariate linear regression in order to understand what's going on 'underneath the hood'. We'll also learn about goodness of fit measures which provide a guide to how accurate our predictions will be.

  1. *Data Analysis for the Social Sciences*: Chapter 7
  2. *Screen Cast*: "Bivariate Regression" and "Interpreting Regression Coefficients"

- October 9th and 11th *Multiple Regression*: Multiple regression allows us to control for variables that might have an *additive* or an *interactive* influence on the dependent variable.

  1. *Data Analysis for the Social Sciences*: Chapter 8
  2. *Screen Cast*: "Multiple Regression"

- October 16th and 18th *Dummy variables and interactions*: Dummy variables are a useful way to check for additive or interactive processes in a multiple regression framework. Dummy variables and interactions must be handled with care: In my experience, dummy variables can make otherwise smart people look like dummies.

    1. *Data Analysis for the Social Sciences*: Chapter 9
    2. *Screen Cast*: "Dummy Variables" and "Dummies and Interactions"

- October 23rd and 25th *Making inferences*: In the last few weeks we learned how t-statistics helped us identify *statistically significant* relationships. What does that mean? A key concept you'll learn this week is the Central Limit theorem, a key to all statistical analysis.

    1. *Data Analysis for the Social Sciences*: Chapter 10

- October 24th and 26th *Means testing*: Are there important differences between groups? For example, do women tend to be more conservative or liberal than men? Do people with kids tend to be more supportive of legalized marijuana? We're going to conduct a survey of the class that coincides with the electoral season.

    1. *Data Analysis for the Social Sciences*: Chapter 10

- October 30 and November 1 *Data Construction*: Getting data into the computer so that it can be analyzed is an art and a very valuable skill. This week will be devoted to merging data and constructing data sets that can be analyzed for the third project.

    1. *Screen Cast*: "Diagnostics (Residual Plot)"

- November 6th and 8th *Regression Diagnostics*: Concentrating solely on t-statistics can lead us astray. There are many ways to manufacture the results one prefers. How can we test whether our findings represent what's going on in the world versus what's going on in our computer?

    1. *Data Analysis for the Social Sciences*: Chapter 11
    2. *Screen Cast*: "Diagnostics (Influence)"

- November 13th and 15th *Logistic regression*: We use logistic regression when our dependent variable is categorical variable. This technique comes in useful when we want to know whether something will happen or not. For example, will people vote? Will a republican win? Will an individual decide to protest? These are all questions that require logistic regression.

    1. *Data Analysis for the Social Sciences*: Chapter 11

2. *Screen Cast*: "Logistic Regression"

- November 20th and 22nd *Logistic Regression and Predicted Probabilities*: Logistic regression does lend itself to very straightforward interpretations except that we have to do a little work first to make that possible. This week we'll review logistic regression and focus on how to interpret the results.

    1. *Data Analysis for the Social Sciences*: Chapter 12

- December 4th and 6th *Logistic Regression: review*: More practice with logistic regression.

    1. *Data Analysis for the Social Sciences*: Chapter 12

- December 11th and 13th, We've covered a lot of material this semester. This week will be devoted to doing exercises in class that will help prepare for the final.

5   Important Dates

- Assignment I: Due September 29th, Midnight

- Assignment II: Due October 27th, Midnight

- Assignment III: Due December 7th, Midnight

- Final December 17th, 1:30-4:00pm

6   University of Colorado Policies

- If you qualify for accommodations because of a disability, please submit to your professor a letter from Disability Services in a timely manner (for exam accommodations provide your letter at least one week prior to the exam) so that your needs can be addressed. Disability Services determines accommodations based on documented disabilities. Contact Disability Services at 303-492-8671 or by e-mail at dsinfo@colorado.edu. If you have a temporary medical condition or injury, see Temporary Injuries guidelines under the Quick Links at the Disability Services website and discuss your needs with your professor.

- Campus policy regarding religious observances requires that faculty make every effort to deal reasonably and fairly with all students who, because of religious obligations, have conflicts with scheduled exams, assignments or required attendance. In this class, just let the instructor know if there any conflicts in advance of the date in question.

- Students and faculty each have responsibility for maintaining an appropriate learning environment. Those who fail to adhere to such behavioral standards may be subject to discipline. Professional courtesy and sensitivity are especially important with respect to individuals and topics dealing with differences of race, color, culture, religion, creed, politics, veteran's status, sexual orientation, gender, gender identity and gender expression, age, disability, and nationalities. Class rosters are provided to the instructor with the student's legal name. I will gladly honor your request to address you by an alternate name or gender pronoun. Please advise me of this preference early in the semester so that I may make appropriate changes to my records. For more information, see the policies on classroom behavior and the student code.

- The University of Colorado Boulder (CU-Boulder) is committed to maintaining a positive learning, working, and living environment. CU-Boulder will not tolerate acts of discrimination or harassment based upon Protected Classes or related retaliation against or by any employee or student. For purposes of this CU-Boulder policy, "Protected Classes" refers to race, color, national origin, sex, pregnancy, age, disability, creed, religion, sexual orientation, gender identity, gender expression, veteran status, political affiliation or political philosophy. Individuals who believe they have been discriminated against should contact the Office of Institutional Equity and Compliance (OIEC) at 303-492-2127 or the Office of Student Conduct and Conflict Resolution (OSC) at 303-492-5550. Information about the OIEC, the above referenced policies, and the campus resources available to assist individuals regarding discrimination or harassment can be found at the OIEC website. The full policy on discrimination and harassment contains additional information.

- All students of the University of Colorado at Boulder are responsible for knowing and adhering to the academic integrity policy of this institution. Violations of this policy may include: cheating, plagiarism, aid of academic dishonesty, fabrication, lying, bribery, and threatening behavior. All incidents of academic misconduct shall be reported to the Honor Code Council (honor@colorado.edu; 303-735-2273). Students who are found to be in violation of the academic integrity policy will be subject to both academic sanctions from the faculty member and non-academic sanctions (including but not limited to university probation, suspension, or expulsion). Additional information regarding the Honor Code policy can be found online and at the Honor Code Office.

Bibliography

Piketty, Thomas. 2014. *Capital in the Twenty-First Century*. Harvard University Press.