COURSE DESCRIPTION: Quantitative analysis is an important component of nearly all political science research. This course is designed to introduce you to the fundamental tools used for data analysis. We will review and build on what you have learned in Data I. Most of this course focuses on understanding the approach of ordinary least squares (OLS). We will start by reviewing some topics you may already know, then move onto OLS estimation. Then we will cover violations of OLS assumptions, as well as various approaches to addressing such violations.

While it is crucial for political scientists to master OLS, in reality most research involves using alternative modeling techniques, many of which were developed for use in situations where OLS is inappropriate. Therefore, in the second half of the course, we cover a variety of alternative extensions and issues such as dichotomous dependent variables, endogeneity, as well as spatial and temporal dependence. In addition, we will spend a lot of time discussing how to present and interpret regression results, as well as substantive and statistical significance.

By the end of this course you should be able to:

- Understand what is going on “under the hood” of OLS, and interpret regression results
- Diagnose and address violations of the regression assumptions
- Have a variety of models to add to your “toolkit”
- Apply what you have learned to your research.

PREREQUISITES: This is a graduate level course; students should have a background in introductory regression (i.e., Data I). We will be working in matrix algebra notation throughout much of the course, although prior experience with this is not necessary.

SOFTWARE: We will use R for most of this course. Although familiarity with R is not necessary, it is a plus. Those unfamiliar with this program may want to purchase or borrow the suggested textbooks that cover working with R, although there are copious amounts of information available for free online. Please download both R (https://cran.r-project.org/) and RStudio (https://www.rstudio.com/) before the first class session. We will probably also use some Stata, although it is not necessary to purchase it for this course. Although there will not be a substantial amount of writing, students are encouraged to write up any assignments using \LaTeX.

GRADES: Course grades will be based on the following. Participation and homework assignments make up 40% of the final grade. About halfway through the semester, a mid-term exam will be given
that is worth 30% of the final grade. At the end of the semester, there will be a take-home final exam worth 30% of the final grade. There are no opportunities for extra credit.

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<th>Participation and Homework</th>
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<tr>
<td>Midterm Exam</td>
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<td>Final Exam</td>
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The following scale will be used to turn numerical grades into letter ones. Note that I will round up a letter should your grade fall on the number (but on or above 0.5) between two letters (e.g., 89.5 up to 90 rounds up to an A-).

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**PARTICIPATION:** Participation is an integral component of graduate courses. Students are expected to come to every class having already read the assigned readings for that day, and should be prepared to discuss them. Graduate-level courses only are successful when all students participate actively in the discussion.

**HOMEWORK:** Throughout the semester, there will be various homework assignments. Some of these will be group assignments, others on your own. Most will involve some form of data analysis and interpretation/presentation of regression results. We will discuss more specifics on homework in class.

**MIDTERM EXAM:** About halfway through the semester there will be a midterm exam. This will be closed book.

**FINAL EXAM:** At the end of the semester, there will be a comprehensive final exam. The final exam will be take-home and open book. You may consult textbooks, articles, and your notes for this exam, but not others (this will be considered a form of cheating).

**TEACHING ASSISTANT:** The teaching assistant this semester will be TBA.

**ATTENDANCE AND LATE POLICY:** Attendance is a key component of succeeding in graduate school. I provide slides for each class, but we will have a much more comprehensive discussion than what appears on the slide. Attendance is mandatory. If you have to miss a class, you should let me know in advance so that we can make arrangements.

Assignments are due on the day listed in the syllabus. Late assignments will not be accepted.

**REQUIRED TEXTS:** The following text is required for the course. Any additional readings will be
made available to you on the first day of class or as needed. This text is advanced, but will be a helpful reference after the semester is over.


Note that it is expected to read the week’s required readings before coming to class.

**RECOMMENDED TEXTS:** The following texts are not required, but may be helpful to some. In the schedule below there are additional texts in the “suggested readings”.


**TENTATIVE SCHEDULE:** Note that this schedule is subject to change. We will spend as long as we need to on a topic, and many of the topics in the second half of the course may not take a full course day to cover.

**Week 1: Course Introduction, Regression Assumptions, Introduction to Matrix Algebra and R**

**Required Readings:**

- Greene, Appendix A

**Suggested Readings:**


**Week 2: No Class (MLK Day)**

**Week 3: No Class**

**Required Readings:**

- Greene, Ch. 1
Week 4: Under the Hood: OLS

Required Readings:
- Greene, Ch. 2

Week 5: Under the Hood: OLS (continued)

Required Readings:
- Greene, Ch. 3

Week 6: OLS in Practice

Required Readings:
- Greene, Ch. 4

Week 7: OLS in Practice (Continued)

Required Readings:
- Greene Ch. 5 and 6

Suggested Readings:

Week 8: Generalized Least Squares

Required Readings:
- Greene Ch. 9

Suggested Readings:

Week 9: MID-TERM EXAM

Week 10: Binary Dependent Variables

Required Readings:
Week 11: No Class (Spring Break)

POST MID-TERM: Weeks 12-16

The second half of the course will consist of a variety of topics that build on the first half of the course. Depending on time, we will cover everything below (and maybe some extra topics). There will not be extensive coverage of each topic; in fact most topics could comprise an entire semester-long course. Instead, it is to help familiarize you with the various methodological tools that are out there for you to use, depending on your research question.

Time Series:

Required Readings:

- Greene Ch. 20 and 21 (skim both)

Spatial Statistics:

Required Readings:


Endogeneity:

Required Readings:

- Greene Ch. 8

Causality and Causal Inference:

Required Readings:


Pooled Time Series, Clustering, and HLM:

Required Readings:

- Greene Ch. 11
• Beck, Nathaniel, and Jonathan N. Katz. 1995. “What to do (and not to do) with time-series cross-section data.” 
  *American Political Science Review*: 634-647.


Suggested Readings:


**Maximum Likelihood Estimation:**

Required Readings:


**Resampling, Quantities of Interest, and Presenting Results:**

Required Readings:


Suggested Readings:

• Tomz, Michael, Jason Wittenberg, and Gary King. 2001. “Clariﬁy: Software for interpreting and presenting statistical results.”


**Final Exam: TBA (take-home)**

**SYLLABUS CHANGES**

I reserve the right to make changes to the syllabus during the course of the semester as needed and will make the most updated copy available to you and announce said changes during class.

**Last updated:** January 7, 2019

**UNIVERSITY-MANDATED STATEMENTS**

**Accommodation for disabilities**

If you qualify for accommodations because of a disability, please submit your accommodation letter from Disability Services to your faculty member in a timely manner so that your needs can be addressed. Disability Services determines accommodations based on documented disabilities in the academic environment. Information on requesting accommodations is located on the Disability Services website. Contact Disability Services at 303-492-8671 or dsinfo@colorado.edu for further assistance. If you have a temporary medical condition or injury, see Temporary Medical Conditions under the Students tab on the Disability Services website.
Classroom behavior

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 race, color, national origin, sex, pregnancy, age, disability, creed, religion, sexual orientation, gender identity, gender expression, veteran status, political affiliation or political philosophy. 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 of Conduct.

Honor code

All students enrolled in a University of Colorado Boulder course are responsible for knowing and adhering to the Honor Code. Violations of the policy may include: plagiarism, cheating, fabrication, lying, bribery, threat, unauthorized access to academic materials, clicker fraud, submitting the same or similar work in more than one course without permission from all course instructors involved, and aiding academic dishonesty. All incidents of academic misconduct will be reported to the Honor Code (honor@colorado.edu; 303-492-5550). Students who are found responsible for violating the academic integrity policy will be subject to nonacademic sanctions from the Honor Code as well as academic sanctions from the faculty member. Additional information regarding the Honor Code academic integrity policy can be found at the Honor Code Office website.

Sexual misconduct, discrimination, harassment and/or related retaliation

The University of Colorado Boulder (CU Boulder) is committed to fostering a positive and welcoming learning, working, and living environment. CU Boulder will not tolerate acts of sexual misconduct (including sexual assault, exploitation, harassment, dating or domestic violence, and stalking), discrimination, and harassment by members of our community. Individuals who believe they have been subject to misconduct or retaliatory actions for reporting a concern should contact the Office of Institutional Equity and Compliance (OIEC) at 303-492-2127 or cureport@colorado.edu. Information about the OIEC, university policies, anonymous reporting, and the campus resources can be found on the OIEC website. Please know that faculty and instructors have a responsibility to inform OIEC when made aware of incidents of sexual misconduct, discrimination, harassment and/or related retaliation, to ensure that individuals impacted receive information about options for reporting and support resources.

Religious holidays

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, I will try to accommodate your requests, but you must contact me early in the semester. See the campus policy regarding religious observances for full details.