PP 481: Introduction to Statistical Methods in Political Science

Claremont Graduate University

Spring 2024
Seminar: Monday, 1:00-3:50PM (PST)
Course Location: Yuhaaviatam Center 109 &
Zoom Room [https://cgu.zoom.us/j/83456529314]

Instructor: Carlos Algara, Ph.D.
Office: 227 McManus Hall
Office Hours: Please email me to schedule.
Course Structure: 2 hours concurrent (online/in-person) with 1 hour synchronous lab component
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Course Objectives: Introduction to Applied Statistics in Political Science

This course is designed to be the second part of the Politics & Government's methods sequence in political methodology. We build on the analytical and applied foundations of PP 480 (The Nature of Inquiry), taking the latter's emphasis on research design in the social sciences as our point of departure. This course also builds on the applied programming taught in SPE 489 (Computational Tools for Social Science), as we will be using the R computing environment for all applied work (i.e., problem sets, final project analysis) in this course.

The main focus of this course will be (re-)introducing students to the foundations of research design and how to apply statistical concepts towards evaluation of the specific relationships articulated by these research designs. In other words, this course focuses on how to specify—and statistically evaluate—research designs investigating relationship between independent variable x and dependent outcome variable y. Towards that end, the specific objectives of this course include:

- ⋆ (1) Understanding the foundational choices of research designs, such as the trade-offs between observational and experimental approaches, as well as gaining a deep understanding of the fundamental problem of causal inference.
- ⋆ (2) Gaining an appreciation of the challenges in measuring concepts of interest (variables) posed by our research questions and how to graphically articulate the statistical properties of our measurements of interest.
- ⋆ (3) Providing a broad overview of probability theory and statistical inference, towards an emphasis on conceptualizing and estimating uncertainty in the testing of our hypotheses.

- ⋆ (4) Applying statistical inference to bivariate hypothesis testing using tabular analysis, difference of means, and simple correlation analysis with emphasis on "choosing the right test."
- ⋆ (5) Lastly, we will gain a foundational introduction to bivariate and multivariate regression and how we can apply this workhorse of social science hypothesis towards evaluating our research designs. We will pay close attention towards how to present our regression models in both tabular and graphical form.

Taken together, this course introduces participants to a variety of introductory statistical methods that can be used to engage in hypothesis testing in their own research programs. Participants will learn to specify a research design towards assessing a theory of interest; how to measure and statistically describe key concepts posited by the design; how to correctly choose which introductory statistical test to apply to your research; and how to interpret and present the results of this class for an academic audience. Note that this class is an introduction to statistical analysis in the social science and, as such, should serve as a foundational class that allows you to continue your methods training throughout your academic career. Indeed, this class will introduce some concepts that will be covered in the final methods sequence course (PP 482) which provides for a more comprehensive treatment on regression analysis.

Welcome to the course!

Course Expectations

This course is designed for masters and Ph.D.-level students towards the end of giving you the skills necessary to be *applied political scientists*. ***This course assumes no familiarity with programming.*** However, in this course, we will work with relatively clean datasets and I encourage you to take SPE 489 Computational Tools for Social Science for a more comprehensive treatment of data management principles. Studying political methodology is a labor-intensive activity that is constant *throughout* one's academic career. Students will be expected to complete the assigned readings in advance each week and actively participate in class sessions. Students will also be expected to devote significant time to learning how to implement the statistical techniques covered in this course in the R computing environment, with a particular focus on the `ggplot2` graphical package and `modelsummary` table exportation package. We will use R for the lecture material and applications in this course.

Course Logistics & Requirements

This section of the syllabus serves as a guide for course expectations (both for me and for you) and logistical information such as grade breakdown and course texts.

Course Texts, Materials, & Announcements: All course materials, such as lecture slidsets and problem set prompts, will be made available on the Course Canvas Page. We will be using

selected readings following books in this course, note that I mark whether you have e-book access through the Claremont Colleges Library:

- ⋆ Agresti, Alan. 2018. *Statistical Methods for Social Sciences*. Fifth Edition. Boston, MA: Pearson Publishing.
- ⋆ Angrist, Joshua D. & Jörn-Steffen Pischke. 2009. *Mostly Harmless Econometrics*. Princeton, NJ: Princeton University Press.
- ⋆ Imai, Kosuke. 2018. *Quantitative Social Science: An Introduction*. New York, NY: Cambridge University Press.
- ⋆ Ismay, Chester & Albert Y. Kim. 2020. *Statistical Inference via Data Science: A ModernDrive into R and the Tidyverse*. Boca Raton, FL: CRC Press.
- ⋆ Kellstedt, Paul M. & Guy D. Whitten. 2018. *The Fundamentals of Political Science Research*. Third Edition. New York, NY: Cambridge University Press.
- ⋆ King, Gary, Robert O. Keohane, & Sidney Verba. 1994. *Designing Social Inquiry: Scientific Inference in Qualitative Research*. New York, NY: Cambridge University Press.
- ⋆ Llaudet, Elena & Kosuke Imai. 2022. *Data Analysis for Social Science: A Friendly and Practical Introduction*. Princeton, NJ: Princeton University Press.

Course Lab Hour: While there is no explicit lab component to this course, some days the remaining hour (from 2:45 pm to about 3:50pm) will serve as a course lab to assist students through the coding essentials and provide for more detail of in-class exercises and graded problem sets where appropriate and as time permits. Moreover, students may work on their own projects and ask the instructor coding questions specifically as it relates to their projects. This hour is to assist students with applied computing and no agenda will be supplied by the instructor. *Note that we will discuss programming and conduct coding within the lecture material.*

Grade Breakdown & Schedule:

- ⋆ 5% Class Discussion Participation
- ⋆ 45% Homework Problem Sets
- ⋆ 50% Final Project

Class Discussion Participation (10%): To make the seminar a useful experience, you **must** come to class prepared to discuss the readings and engage with other course material. This means you should already be familiar with each of the readings and be ready to raise (and answer) interesting questions about their arguments, findings, methodological strategies, etc., during class discussion.

Homework Problem Sets (40%): Each student will complete **seven** homework assignments based on specific readings and/or datasets I will distribute. These assignments are to be completed in the R computing environment (unless otherwise instructed). These assignments will be due

in class one week after they are distributed. You are allowed (and ***encouraged***) to discuss the assignments with other students and work collaboratively. However, the final written work for the assignments (e.g., criticisms, interpretations) must be your own. Please complete the write-up of all of the assignments independently and note that ***no late problem sets will be accepted without prior arrangements***. All problem sets are to be completed in R Markdown and turned in as a compiled HTML document.[1] Problem sets will be simply graded on the following scale:

- ✓+: Student put in the effort and got most of the answers correct
- ✓: Student finished the problem set but did not put the effort towards being thorough in responses
- ✓−: Student turned in an incomplete or did not turn in a problem set.

Final Project (50%): Each student will conduct a systematic analysis of data that addresses a substantively interesting question in political science and implements the following elements covered in the course:

1. Specified research design aimed at testing hypotheses derived from a theoretical argument, complete with a discussion of measurement of variables of interest (i.e., not control variables)
2. Justification, presentation, and interpretation of a bivariate hypothesis test between your key independent variable of interest and outcome variable
3. Presentation and interpretation of a multivariate hypothesis test between your key independent variable of interest and outcome variable "controlling" for omitted variables that might be correlated with the outcome dependent variable

Note that this requires choosing a suitable outcome variable that is not a discrete nominal (unordered) outcome variables, such as a variable measuring vote-choice coded (1) other, (2) Donald Trump, (3) Joe Biden. Students can choose to collect original data for their final project, although this is not a requirement (and not recommended, if such data collection leaves you too little time to prepare a high-quality research paper). Each student will:

1. Prepare a research paper in "short article" format that is ***no more than 4,000 words***. The research paper should include: (1) very brief motivation of the research question, (2) very brief theoretical argument and hypotheses to be investigated, (3) a detailed description and justification of the method being used, (4) and a full presentation of the model results (i.e., interpretation of model specification, post-estimation of relevant effects of interests, model fit) used for assessment of hypotheses. For examples of this "short article" format, consult any article published in *Research & Politics*.
2. Provide an initial 1-2 page double-spaced research proposal describing the research question & *dataset* to be analyzed with identification of relevant variables will be due on March 4th.

[1] We will go through the structure of R Markdown in the first week of class. This format allows you to submit your code, output, and analysis in the same compiled document.

3. Provide an initial 1-2 page double-spaced research proposal describing the research design and investigation of variability in the variables of interest, in both tabular *and* graphical form, will be due on March 18th.

4. *Give presentations during the last seminar meeting to present their research projects on May 6th (Week 15).* These mandatory presentations are not graded and are an opportunity to get feedback from the class. Presentations should be approximately 7-9 minutes in length and will be accompanied by electronic slides, much like presentations at major academic conferences such as APSA and MPSA. If you are looking to present independent conference research in the spring, I strongly encourage you to take advantage of this opportunity.

5. Please turn in the final version of your research paper by the end of the day on May 10th.[2] Note that no late final paper submissions will be accepted unless prior arrangements are made with the instructor. Of course, if some extraneous circumstance arises that requires more time to complete this assignment, please make arrangements with the instructor as soon as you can for accommodations and note that documentation may be required in these rare cases.

Note that students must have their proposals *approved* prior to beginning their final research projects and will receive comprehensive feedback on their proposal with amble time left in the semester. ***Final research projects will be due on May 10th at 12:00 midnight.***

Claremont Graduate University Course Grading Scheme

Letter Grade Grade	Grade Point	Grade Description	Learning Outcome
A	4.0	*Complete mastery of course material and additional insight beyond course material*	*Insightful*
B	3.0	*Complete mastery of course material*	*Proficient*
C	2.0	*Gaps in mastery of course material; not at level expected by the program*	*Developing*
U	0	*Unsatisfactory*	*Ineffective*

Note that grades may contain pluses or minus designations as appropriate.

Course Policies

Course Attendance: Students are expected to attend all classes. Students who are unable to attend class must seek permission for an excused absence from the course director or teaching assistant. Unapproved absences or late attendance for three or more classes may result in a lower grade or an "incomplete" for the course. If a student has to miss a class, he or she should arrange to get notes from a fellow student and is strongly encouraged to meet with the teaching assistant

[2] *The final is that finished research projects should be suitable for presentation at an annual political science conference.*

to obtain the missed material. Missed assignments will not be available for re-taking unless *prior arrangements are made with the course instructor.*

Course Late Work & Incomplete Policy: Late assignments will not be accepted except in the event of a medical or family/personal emergency and with coordination with the instructor. Any request for an incomplete must be approved prior to the last day of class or accompanied by a doctor's note or evidence of a family emergency. Per CGU policy, no incompletes will be given after the conclusion of the semester and without completion of over half the course work assigned and with instructor approval.

CGU Academic Policies

Class Policies: The CGU institutional policies apply to each class offered at CGU. Students are encouraged to review the student handbook for their program as well as policy documentation in the Bulletin and on the Registrar's webpages: http://bulletin.cgu.edu/ and http://www.cgu.edu/registrar. The protocols defined by the CGU's Student Conduct Code must be upheld in all classes. For more information, please visit for CGU's Basic Code of Conduct (Links to an external site.).

Credit Hour: Credit hour refers to the units or credits earned by a student for the successful completion of a course at CGU. These are the units recorded on transcripts and the units that are counted toward degree requirements. For CGU courses, a single unit or credit is determined by 10.5 hours of instructional activity per semester. Instructional activity includes direct instructor contact in a physical or virtual classroom as well as asynchronous instructional content for online or hybrid courses. See the full policy here.

Academic Integrity: The work you do in this class must be your own. Information on CGU's Policy and Procedures for Violations of Standards of Academic Integrity can be found here. In addition, the Claremont Colleges Library has a number of resources on academic honesty and integrity, including the following online tutorial: here.

CGU Accommodations

Accommodations for Students with Different Abilities: CGU is committed to creating courses that are inclusive and accessible. If you would like to request academic accommodations due to temporary or permanent disability, contact the CGU Dean of Students and Coordinator for Student Disability Services at DisabilityServices@cgu.edu or (909) 607-9448. Reasonable accommodations are considered after you have conferred with the Office of Disability Services (ODS) and presented the required documentation of your disability to the ODS. Planning is essential, so please communicate to the ODS as soon as possible.

Religious Accommodations: Students who expect to miss classes or assignments as a con-

sequence of their religious observance shall be provided with a reasonable alternative opportunity to complete such academic responsibilities.

Mental Health and Well Being: Graduate school is a context where mental health struggles can arise or be exacerbated. If you ever find yourself struggling, please ask for help. If you wish to seek out campus resources, here is some basic information: services.claremont.edu/mcaps/. Monsour Counseling and Psychological Services (MCAPS) is committed to promoting psychological wellness for all students at The Claremont Colleges. Professional and well-trained psychologists, psychiatrists, and post-doctoral and intern therapists offer support for a range of psychological issues in a confidential and safe environment.

Phone (909) 621-8202
After hours emergency (909) 607-2000
Tranquada Student Services Center, 1st floor
757 College Way
Claremont, CA 91711

Title IX: Title IX. One of my responsibilities as an instructor is to help create a safe learning environment. I am a mandatory reporter. Thus, if I learn of any potential violation of CGU's gender-based misconduct policy (e.g., rape, sexual assault, dating violence, domestic violence, or stalking) by any means, I am required to notify the CGU Title IX Coordinator at Deanof.Students@cgu.edu or (909) 607-9448. Students can request confidentiality from the institution, which I will communicate to the Title IX Coordinator. If students want to speak with someone confidentially, the following resources are available on and off campus: EmPOWER Center (909) 607-2689, Monsour Counseling and Psychological Services (909) 621-8202, and The Chaplains of The Claremont Colleges (909) 621-8685. Speaking with a confidential resource does not preclude students from making a formal report to the Title IX Coordinator if and when they are ready. Confidential resources can walk students through all of their reporting options. They can also provide students with information and assistance in accessing academic, medical, and other support services they may need.

Your Physical Health: . I am also committed to ensuring the health and safety of the CGU community. Information on CGU's COVID Semester protocol can be found here: https://info.cgu.edu/emergency/ and I suspect it will be updated, as needed, as we progress.

Campus security: Campus security can be reached 24 hours/day at (909) 607-2000. Please download the CGU Safety Resource Card to your phone's contacts.

Tech Issues: The Office of Information Technology has a helpdesk to support you with CGU wireless access and email issues. They also have good documentation you can use to learn to connect and use online resources. Website: https://mycampus.cgu.edu/web/it.

Center for Writing and Rhetoric (CWR): CGU has a graduate studies-focused Center for Writing and Rhetoric that works with you no matter where you are in the writing process. The CWR is not just for remediation of your writing, but for all writers to provide partnership and

consultation to improve your academic work at all levels. The CWR can work with you in planning, outlining, drafting, and final review of documents and presentations for class work, conferences, and publications. Website: https://mycampus.cgu.edu/web/writing-rhetoric.

Library: The Claremont Colleges Library has a wealth of resources, including subject specialist librarians, to support your academic work. Use the library for class work and research to access and use data-bases for articles, books, and data sets, to understand how to conduct effective searches and evaluate sources, use digital tools, and much more. The library offers workshops and 1-1 consultations with students as well. Website: https://library.claremont.edu/.

Course Road-Map

1. Week 1 (1/22/2024): Introduction to the Course Syllabus, Canvas, and Installing R, R Studio, & LaTeXDistribution

    ⋆ Please see Canvas for materials regarding how to install R & R Studio.

    ⋆ For additional information regarding the installation of R, RStudio, and a slimmed down version of *LaTeX* that can used to compile Markdown documents from R, see the guide from Professor Andrew Heiss (Georgia State University): here.

    ⋆ For additional information regarding the *full* installation of LaTeX, see: here.

    ⋆ For a *brief* introduction to Markdown syntax and R Markdown, see the guide from Professor Andrew Heiss (Georgia State University): here & here.

    ⋆ For a *comprehensive* introduction of Markdown syntax and R Markdown, see: here.

1. Foundational Concepts: Research Design & Causality

2. Week 2 (1/29/2024): What do we mean by the "scientific" study of politics? The importance of causal theoretical models & variation in political science

    ⋆ Kellstedt & Whitten's *The Fundamentals of Political Science Research*. Cambridge University Press. 2018. **Chapters 1 (The Scientific Study of Politics) & 2 (The Art of Theory Building)**

    ⋆ King, Keohane, & Verba's *Designing Social Inquiry: Scientific Inference in Qualitative Research*. Cambridge University Press. 1994. **Chapters 1 (The *Science* in Social Science), 2 (Descriptive Inference) & 3 (Causality & Causal Inference)**

    ⋆ ***Highly* Recommended on General Advice, but not required:** Ismay & Kim's *Statistical Inference via Data Science: A ModernDrive into R and the Tidyverse*. Chapman & Hall/CRC. 2018. **Chapter 11 (Tell Your Story with Data)**

    ⋆ ***Recommended on General Advice, but not required:*** King, Keohane, & Verba's *Designing Social Inquiry: Scientific Inference in Qualitative Research*. Cambridge University Press. 1994. **Chapter 5 (Understanding What to Avoid)**

Research Design & Published Article Dissection Problem Set 1 Due February 5th

3. Week 3 & 4 (2/5/2024 & 2/12/2024): Research Design & The Fundamental Problem of Causal Inference in the Social Sciences (An Introduction)

    ⋆ Angrist & Pischke's *Mostly Harmless Econometrics: An Empiricist's Companion*. Princeton University Press. 2009. **Chapters 1 (Questions about *Questions*) & 2 (The Experimental Ideal)**

- ⋆ Kellstedt & Whitten's *The Fundamentals of Political Science Research*. Cambridge University Press. 2018. **Chapters 3 (Evaluating Causal Relationships) & 4 (Research Design).**
- ⋆ ***Recommended, but not required:*** Imai's *Quantitative Social Science: An Introduction*. Princeton University Press. 2022. **Chapter 2 (Causality)**
- ⋆ ***Recommended, but not required:*** Llaudat & Imai's *Data Analysis for Social Science: A Friendly and Practical Introduction*. Princeton University Press. 2022. **Chapter 2 (Estimating Causal Effects with Randomized Experiments)**

Causal Inference Problem Set 2 Due February 19th

2. Measurement & Describing Variability

4. Week 5 (2/19/2024): Measuring Concepts of Interest Within the Research Design–Clarity, Reliability, Bias, & Validity
   - ⋆ Kellstedt & Whitten's *The Fundamentals of Political Science Research*. Cambridge University Press. 2018. **Chapters 5 (Measuring Concepts of Interest) & 6 (Getting to Know Your Data)**
   - ⋆ Imai's *Quantitative Social Science: An Introduction*. Princeton University Press. 2018. **Chapter 3 (Measurement)**
   - ⋆ Agresti's *Statistical Methods for Social Sciences*. Pearson Publishing. 2018. **Chapter 2 (Sampling & Measurement)**
   - ⋆ ***Recommended, but not required:*** Ismay & Kim's *Statistical Inference via Data Science: A ModernDrive into R and the Tidyverse*. Chapman & Hall/CRC. 2018. **Appendix A (Statistical Background)**
5. Week 6 (2/26/2024): Measurement Description–Statistical Description of Univariate Distributions in Graphical & Tabular Form
   - ⋆ Agresti's *Statistical Methods for Social Sciences*. Pearson Publishing. 2018. **Chapter 3 (Descriptive Statistics)**
   - ⋆ Ismay & Kim's *Statistical Inference via Data Science: A ModernDrive into R and the Tidyverse*. Chapman & Hall/CRC. 2018. **Chapter 2 (Data Visualization)**

Research Question & Dataset Selection Problem Set 3 Due March 4th

3. Probability Theory, Statistical Inference & Uncertainty

6. Week 7 (3/4/2024): Pre-Spring Break Catch-Up & In-Class Student Dataset Exploration

⋆ CGU Spring Break from March 11th-15th ⋆

Research Proposal Problem Set 4 Due March 18th

7. Week 8 & 9 (3/18/2024 & 3/25/2024): Probability Theory & Statistical Inference–The Fundamental Logic of Statistical Estimation and Population Parameters

    - ⋆ Kellstedt & Whitten's *The Fundamentals of Political Science Research*. Cambridge University Press. 2018. **Chapters 7 (Probability & Statistical Inference)**
    - ⋆ Llaudet & Imai's *Data Analysis for Social Science: A Friendly and Practical Introduction*. Princeton University Press. 2022. **Chapter 6 (Probability)**
    - ⋆ Agresti's *Statistical Methods for Social Sciences*. Pearson Publishing. 2018. **Chapters 4 (Probability Distributions)**
    - ⋆ ***Recommended, but not required:*** Imai's *Quantitative Social Science: An Introduction*. Princeton University Press. 2018. **Chapter 6 (Probability)**
    - ⋆ ***Recommended, but not required:*** Imai's *Quantitative Social Science: An Introduction*. Princeton University Press. 2018. **Chapter 6 (Probability)**

8. Week 10 (4/1/2024): Importance of Statistical Uncertainty in Estimation–The Importance of Correct Estimation & Interpretation of "ρ" values, Confidence Intervals, and Standard Errors

    - ⋆ Kellstedt & Whitten's *The Fundamentals of Political Science Research*. Cambridge University Press. 2018. ***Only:*** **Chapter 8. Section 3 (All Roads Lead to ρ)**
    - ⋆ Imai's *Quantitative Social Science: An Introduction*. Princeton University Press. 2018. ***Only:*** **Chapter 7. Section 1 (Estimation)**
    - ⋆ Agresti's *Statistical Methods for Social Sciences*. Pearson Publishing. 2018. **Chapters 5 (Statistical Inference: Estimation) & 6 (Statistical Inference: Significance Tests)**
    - ⋆ ***Recommended, but not required:*** Llaudet & Imai's *Data Analysis for Social Science: A Friendly and Practical Introduction*. Princeton University Press. 2022. **Chapter 7 Quantifying Uncertainty)**

Statistical Theory Problem Set 5 Due April 8th

4. Statistical Inference & Hypothesis Testing: Bivariate Tests & Introduction to Ordinary Least Squares (OLS) Linear Regression

9. Week 11 (4/8/2024): Bivariate Hypothesis Testing I–Tabular Analysis & Difference of Means

    ⋆ Kellstedt & Whitten's *The Fundamentals of Political Science Research*. Cambridge University Press. 2018. **Chapter 8 (Bivariate Hypothesis Testing)**

    ⋆ Imai's *Quantitative Social Science: An Introduction*. Princeton University Press. 2018. ***Only:*** **Chapter 7. Section 2 (Hypothesis Testing)**

    ⋆ Agresti's *Statistical Methods for Social Sciences*. Pearson Publishing. 2018. ***Only:*** **Chapters 7 (Comparison of Two Groups) & 8 (Analyzing Association Between Categorical Variables)**

    ⋆ ****Highly* Recommended, but not required:*** Ismay & Kim's *Statistical Inference via Data Science: A ModernDrive into R and the Tidyverse*. Chapman & Hall/CRC. 2018. **Chapter 9 (Hypothesis Testing)**

    ⋆ ****Highly* Recommended, but not required:*** Llaudet & Imai's *Data Analysis for Social Science: A Friendly and Practical Introduction*. Princeton University Press. 2022. **Chapter 3 (Inferring Population Characteristics via Survey Research)**

10. Week 12 (4/15/2024): Bivariate Hypothesis Testing II–Correlation Coefficients & "Fitting the Line" in Bivariate OLS Regression

    ⋆ Kellstedt & Whitten's *The Fundamentals of Political Science Research*. Cambridge University Press. 2018. **Chapter 9 (Two-Variable Regression Models)**

    ⋆ Imai's *Quantitative Social Science: An Introduction*. Princeton University Press. 2018. ***Only:*** **Chapter 3. Section 6 (Summarizing Bivariate Relationships), Chapter 4. Section 2 (Linear Regression) & Chapter 4. Section 3. (Regression & Causation)**

    ⋆ Agresti's *Statistical Methods for Social Sciences*. Pearson Publishing. 2018. ***Only:*** **Chapter 9 (Linear Regression and Correlation)**

    ⋆ ****Highly* Recommended, but not required:*** Ismay & Kim's *Statistical Inference via Data Science: A ModernDrive into R and the Tidyverse*. Chapman & Hall/CRC. 2018. **Chapter 9 (Hypothesis Testing)**

    ⋆ ****Highly* Recommended, but not required:*** Llaudet & Imai's *Data Analysis for Social Science: A Friendly and Practical Introduction*. Princeton University Press. 2022. **Chapter 3 (Inferring Population Characteristics via Survey Research)**

Bivariate Hypothesis Testing Problem Set 6 Due April 22nd

11. Week 13 (4/22/2024): Multivariate Regression–"The Basics" of Estimating, Interpreting, & Presenting Multivariate Regression

    ⋆ Kellstedt & Whitten's *The Fundamentals of Political Science Research*. Cambridge University Press. 2018. **Chapter 10 (Multiple Regression: the Basics)**

    ⋆ Agresti's *Statistical Methods for Social Sciences*. Pearson Publishing. 2018. ***Only:*** **Chapter 10 (Introduction to Multivariate Relationships) & Chapter 11 (Multiple Regression & Correlation)**

    ⋆ Angrist & Pischke's *Mostly Harmless Econometrics: An Empiricist's Companion*. Princeton University Press. 2009. **Chapter 3 (Making Regression Make Sense)**

    ⋆ ****Highly* Recommended, but not required:*** Ismay & Kim's *Statistical Inference via Data Science: A ModernDrive into R and the Tidyverse*. Chapman & Hall/CRC. 2018. **Chapter 10 (Inference for Regression)**

12. Week 14 (4/29/2024): Estimating Relationships of Interest from Applied Multivariate Regression–Post-Estimating Marginal Effects & Linear Predictions for Additive and Interactive Hypotheses

    • Kellstedt & Whitten's *The Fundamentals of Political Science Research*. Cambridge University Press. 2018. **Chapter 11 (Multiple Regression Model Specification)**

    • Arel-Bundock, Vincent. 2023. marginaleffects: Predictions, Comparisons, Slopes, Marginal Means, and Hypothesis Tests. R package version 0.17.0 https://marginaleffects.com[3] (**Explore the Following Tutorials: Predictions, Comparisons, & Slopes**)

    • Llaudet & Imai's *Data Analysis for Social Science: A Friendly and Practical Introduction*. Princeton University Press. 2022. **Chapters 4 (Predicting Outcomes Using Linear Regression) & 5 (Estimating Causal Effects with Observational Data)**

    • ****Highly* Recommended, but not required:*** Imai's *Quantitative Social Science: An Introduction*. Princeton University Press. 2018. ***Only:*** **Chapter 4. Section 2 (Linear Regression), Chapter 4. Section 3 (Regression & Causation) & Chapter 7. Section 3 (Linear Regression Model with Uncertainty)**

    • ****Highly* Recommended, but not required:*** Hainmueller, Jens, Mummolo, Jonathan, & Xu, Yiqing. 2018. "How Much Should We Trust Estimates from Multiplicative Interaction Models? Simple Tools to Improve Empirical Practice." *Political Analysis*, 1–30.

[3] Note that this is an interactive, comprehensive, R package tutorial that allows for the post-estimation of quantities of interest (i.e., marginal effects, linear predictions, interactive relationships) that will make interpretation of all models discussed in this course (and more!) intuitive. We will rely on this package for post-estimation and interpretation this point moving forward in the course.

Multivariate Regression Analysis Problem Set 7 Due May 6th

13. Week 15 (5/6/2024): **No new course module readings**–Catch-Up Day or Student Final Project Presentation

⋆ **10-15 Minute PP 481 Research Project Presentations on May 6th** ⋆

Final Research Project Due May 10th

⋆ **CGU Finals Week from May 6th-11th** ⋆

This syllabus was last updated on: January 23, 2024