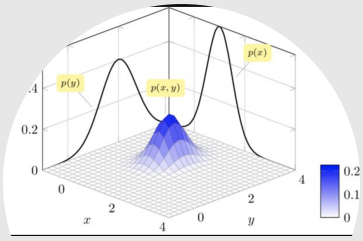


# Sci, Tech, & Int'l Affairs II

## INTA 8001

## Instructor Info

David Muchlinski

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Habersham 147

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## Course Info

Prereq: INTA 6003

Fri

11a-1.45p

Hab 136

## Lab Info

## TA Info

## Overview

This course introduces students to the most common quantitative empirical research design in political science: the linear model. We will put linear regression in context by discussing its mathematical derivation, its assumptions, and its application to observational, experimental, and causal research designs. We will begin with a brief review of probability theory and matrix algebra before introducing the basic two variable regression model. We will then follow with the multivariate model for hypothesis testing, prediction, and estimation of causal effects. This is followed by the most common pitfalls encountered using the linear model and appropriate means to resolve violations of model assumptions.

A prerequisite for this course is INTA 6003 Empirical Research Methods. Students are expected to have familiarity with the R statistical analysis software. Students are expected to learn how to utilize this program on their own with minimal guidance given during lecture. This seminar is mandatory for all Ph.D. students and strongly advised for all Masters students.

Students will be graded on 3 homework assignments, a midterm, and an original research project which must make use of the skills learned in this seminar. As this material can be technical, the primary mode of instruction will be through lecture. However, students are expected to come to each seminar having read through all assigned reading. These book chapters and articles will provide you with applications of the linear model in context and are thus invaluable for learning how such research is conducted and presented in the field.

## Material

### Required Texts

Gujarati, D. N. (2003). Basic Econometrics. Fourth Edition. Boston: McGraw-Hill.

### Other

Any required journal articles and book chapters will be provided on Canvas.

## Grading Scheme

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|---|---|
| 15% | Homework Assignments (5% Each) |
| 35% | Midterm Exam |
| 50% | Research Paper & Presentation |

Grades will follow the standard scale: A = 89.5-100; B = 79.5-89.4; C = 69.5-79.4; D = 60-69.4; F <60. Curing is at the discretion of the professor and will be utilized only to maintain a normal grade distribution. "Rounding" will be implemented provided a student has no outstanding work.

## Learning Objectives

- For MS INTA
  - Students will be able to apply basic statistical skills to include quantitative and qualitative methodologies in academic and professional contexts within the field of international affairs.
  - Students will develop research skills in order to produce a research or policy paper on specific technological and scientific issues in international affairs.
- For INTA Ph.D.
  - Students will be able to apply advanced statistical skills and quantitative and qualitative research methodologies in the study of international security.
  - Students will be able to apply advanced research skills in producing publishable research that contributes to the body of scholarly work in technology and international affairs.

## Research Paper

Students will conduct research and write an original research paper utilizing a regression-based research design on a topic they will choose in consultation with the professor. Students must identify a research question and discuss this question with the professor during office hours or otherwise outside of class by the beginning of Week 5. This paper will follow standard journal article formats (i.e. 8-10k words, well developed hypotheses, clear analysis, literature review, APSA standard formatting). Students will present their paper during the final seminar via PDF or PowerPoint presentation. This seminar paper may utilize data previously collected, and students need to be aware of what they can accomplish within the span of a single semester for this project. Students may utilize previous seminar papers, but must expand upon them in novel ways for this seminar. Students must submit all `R` code in .html format using `R Markdown` when submitting their final paper.

## Homework

Homework assignments are due two weeks from date assigned. All homework is to be completed and submitted in `R Markdown` .html format via Canvas before the seminar begins. No late work will be accepted except unless covered by the policy below. More detailed instructions will be released for each assignment. Work not submitted in .html format (including .pdf, .docx, or .rmd) will not be accepted and students submitting homework in such formats will be penalized one letter grade for improper format submission per day until resubmission.

## Exams

There will be one midterm exam. Students will have two weeks to complete the exam. More detailed instructions will be released when assigned.

## Make-up Policy and Late Work

Make-up assignments and exams will not be permitted unless in case of legitimate medical or other concerns which should be discussed privately with the professor to determine legitimacy. If an extension is granted, work must be submitted by that time. If a student submits late work without notifying the professor of any change in circumstances, such work will not be accepted and receive a score of zero.

## Diversity and Inclusivity Statement

The Institute does not discriminate against individuals on the basis of race, color, religion, sex, national origin, age, disability, sexual orientation, gender identity, or veteran status in the administration of admissions policies, educational policies, employment policies, or any other Institute governed programs and activities. The Institute's equal opportunity and non-discrimination policy applies to every member of the Institute community. The Institute's affirmative action program, Title IX program, and related policies are developed in compliance with applicable law. Pursuant to Title IX, the Institute does not discriminate on the basis of sex in its education programs and activities. As such, the Institute does not tolerate any kind of gender-based discrimination or harassment, which includes sexual violence, sexual harassment, and gender-based harassment. Inquiries concerning the Institute's application of or compliance with Title IX may be directed to the Title IX Coordinator, Burns Newsome, burnsnewsome@gatech.edu, 404-385-5151. Additionally, inquiries concerning the application of applicable federal laws, statutes, and regulations (such as Title VI, Title IX, and Section 504) may be directed to the U.S. Department of Education's Office of Civil Rights at `www2.ed.gov/ocr`.

## Accommodations for Students with Disabilities

Reasonable accommodations will be made for students with verifiable disabilities. In order to take advantage of available accommodations, students must register with the Office of Disability Services at Suite 123, Smithgall Student Services Building, 353 Ferst Drive, 404-894-2563 (Voice); 404-894-1664 (TDD). For more information on Georgia Tech's policy on working with students with disabilities, please see review the Office of Disability Service's web page at `https://policies.ncsu.edu/regulation/reg-02-20-01/`. The Office of Disability Services collaborates with students, faculty, and staff to create a campus environment that is usable, equitable, sustainable and inclusive of all members of the Georgia Tech community. Disability as an aspect of diversity that is integral to society and Georgia Tech. If students encounter academic, physical, technological, or other barriers on campus, the Disability Services team is available to collaboratively find creative solutions and implement reasonable accommodations.

## Academic Integrity

Academic dishonesty in the form of cheating or plagiarism will not be tolerated. In brief, plagiarism is defined, for the purposes of this class, as: copying, borrowing, or appropriating another entity's work and presenting it as your own in a any submitted assignment, deliberately or by accident. Acts of plagiarism will be reported in accordance with the Honor Code. In order to avoid being charged with plagiarism, if you use the words, ideas, phrasing, charts, graphs, or data of another person or from published material, then you must either: 1) use quotation marks around the words and cite the source, or 2) paraphrase or summarize acceptably using your own words and cite the source. The plagiarism policy is not restricted to books, but also applies to video and audio content, websites, blogs, wiki's, AI-generated content like Chat-GPT, and podcasts. Plagiarism includes putting your name on a group project to which you have minimally contributed. For information on Georgia Tech's Academic Honor Code, please visit `http://www.catalog.gatech.edu/policies/honor-code/` or `http://www.catalog.gatech.edu/rules/18/`. Any student suspected of cheating or plagiarizing on a assignment will be reported to the Office of Student Integrity, who will investigate the incident and identify the appropriate penalty for violations. The student will also receive a grade of zero on the assignment at the professor's discretion and be referred to the Department Chair, Associate Chair, or Graduate Committee Chair.

## Class Schedule

### MODULE 1: Probability Theory, Matrix Algebra, and Statistical Inference

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|---|---|---|
| Jan 12 | Into to Probability Theory | de Mesquita, E. B., & Fowler, A. (2021). Thinking Clearly with Data: A Guide to Quantitative Reasoning and Analysis. Princeton University Press. Chs. 1-2 Canvas<br><br>King, G. (1990). On Political Methodology. *Political Analysis*, 2, 1-29.<br><br>Gill, J. (2006). Essential Mathematics for Political and Social Research. New York: Cambridge University Press. Chs. 7 Canvas |
| Jan 19 | Matrix Algebra and Random Variables | Gill, J. (2006). Essential Mathematics for Political and Social Research. New York: Cambridge University Press. Chs. 3-4, Ch.1 review if needed Canvas<br><br>Gill, J. (2006). Essential Mathematics for Political and Social Research. New York: Cambridge University Press. Chs. 8 Canvas<br><br>Homework 1 Assigned |
| Jan 26 | Learning from Random Samples | Gelman, A., Hill, J., & Vehtari, A. (2020). Regression and Other Stories. Cambridge University Press. Ch. 4 Canvas<br><br>de Mesquita, E. B., & Fowler, A. (2021). Thinking clearly with data: A guide to quantitative reasoning and analysis. Princeton University Press. Ch 3, Ch. 11 Canvas |
| Feb 2 | Hypothesis Tests and What is Regression? | Clarke, K. A., & Primo, D. M. (2012). A Model Discipline: Political Science and the Logic of Representations. Oxford University Press. Chs. 1-3 Canvas |
| Feb 9 | Single-Variable OLS Regression | Gujarati, Chs. 1-3<br><br>Homework 2 Assigned |
| Feb 16 | Two-Variable OLS Regression | Gujarati, Chs. 4-6 |
| Feb 23 | Multiple Regression in Matrix Notation | Gujarati, Chs. 7-9 |

### MODULE 2: Relaxing Model Assumptions

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|---|---|---|
| Mar 1 | Gauss-Markov Violations | Gujarati, Chs. 7-8, 11-12<br><br>Achen, C. H. (2005). Let's Put Garbage-Can Regressions and Garbage-Can Probits where they Belong. *Conflict Management and Peace Science*, 22(4), 327-339.<br><br>Beck, N., Katz, J. N., & Tucker, R. (1998). Taking Time Seriously: Time-series-Cross-section Analysis with a Binary Dependent Variable. *American Journal of Political Science*, 42(4), 1260-1288.<br><br>Clarke, K. A. (2005). The Phantom Menace: Omitted Variable Bias in Econometric Research. *Conflict Management and Peace Science*, 22(4), 341-352. |

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| | | Enders, A. M., & Uscinski, J. E. (2021). On Modeling the Social-Psychological Foundations of Support for Donald Trump. *American Politics Research*, Online First.<br><br>ADDITIONAL (OPTIONAL) READING<br><br>Signorino, C. S., & Yilmaz, K. (2003). Strategic Misspecification in Regression Models. *American Journal of Political Science*, 47(3), 551-566.<br><br>Achen, C. H. (2002). Toward a new political methodology: Microfoundations and ART. Annual review of political science, 5(1), 423-450.<br><br>Lee Ray, J. (2003). Explaining Interstate Conflict and War: What Should be Controlled for?. *Conflict Management and Peace Science*, 20(2), 1-31.<br><br>Tu, Y. K., Gunnell, D., & Gilthorpe, M. S. (2008). Simpson's Paradox, Lord's Paradox, and Suppression Effects are the Same Phenomenon–The Reversal Paradox. *Emerging Themes in Epidemiology*, 5(1), 1-9.<br><br>Carter, D. B., & Signorino, C. S. (2010). Back to the Future: Modeling Time Dependence in Binary Data. *Political Analysis*, 18(3), 271-292.<br><br>Midterm Assigned |
| Mar 8 | Panel Data Models | Gujarati Ch. 16<br><br>Clark, T. S., & Linzer, D. A. (2015). Should I use Fixed or Random Effects?. *Political Science Research and Methods*, 3(2), 399-408.<br><br>Bell, A., & Jones, K. (2015). Explaining Fixed Effects: Random Effects Modeling of Time-Series Cross-Sectional and Panel Data. *Political Science Research and Methods*, 3(1), 133-153.<br><br>King, G., & Roberts, M. E. (2015). How Robust Standard Errors Expose Methodological Problems they do not Fix, and What to do About it. *Political Analysis*, 23(2), 159-179.<br><br>Aronow, P. M. (2016). A Note on "How Robust Standard Errors Expose Methodological Problems They Do Not Fix, and What to Do About It". arXiv preprint arXiv:1609.01774.<br><br>Professor Away for Conference. No Class |
| Mar 15 | Additional Concepts | Interaction Effects, Dummy Variables, Polynomial Regression<br><br>Schrodt, P. A. (2014). Seven Deadly Sins of Contemporary Quantitative Political Analysis. *Journal of Peace Research*, 51(2), 287-300. |
| **MODULE 3: Causal Inference** | | |
| Mar 22 | Causal Inference I: Thinking about Causality | Fearon, J. D. (1991). Counterfactuals and Hypothesis Testing in Political Science. *World Politics*, 43(2), 169-195. |

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| | | Ward, M. D., Greenhill, B. D., & Bakke, K. M. (2010). The Perils of Policy by p-Value: Predicting Civil Conflicts. *Journal of Peace Research*, 47(4), 363-375<br><br>Pearl, J. (2009). Causal Inference in Statistics: An Overview. *Statistics Surveys*, 3, 96-146.<br><br>Spring Break |
| Mar 29 | Causal Inference II Instrumental Variables | Dube, O., & Vargas, J. F. (2013). Commodity Price Shocks and Civil Conflict: Evidence from Colombia. *Review of Economic Studies*, 80(4), 1384-1421<br><br>Hangartner, D., Dinas, E., Marbach, M., Matakos, K., & Xefteris, D. (2019). Does Exposure to the Refugee Crisis make Natives more Hostile?. *American Political Science Review*, 113(2), 442-455.<br><br>Homework 3 Assigned |
| April 5 | Causal Inference III: Regression Discontinuity | Excerpts from Cattaneo, M. D., Idrobo, N., & Titiunik, R. (2019). A Practical Introduction to Regression Discontinuity Designs: Foundations. Cambridge University Press. |
| April 12 | Causal Inference IV: Difference in Difference | Dinas, E., Matakos, K., Xefteris, D., & Hangartner, D. (2019). Waking up the Golden Dawn: Does Exposure to the Refugee Crisis Increase Support for Extreme-Right Parties?. *Political Analysis*, 27(2), 244-254. |
| Apr 19 | Causal Inference V: Matching | TBD |
| Week 16 | Research Presentation | 22:00 Slides to Canvas<br><br>Final Paper Due Time TBD |