POS 7745 - ADVANCED QUANTITATIVE METHODS

Section: 0001

College of Sciences

School of Politics, Security, and Intl Affairs

Course Information

Term: Fall 2025
Class Meeting Days: W
Class Meeting Time: 01:00PM - 03:50PM
Class Meeting Location: HPH O310
Modality: P
Credit Hours: 3.00

Instructor Information

Name: Jacopo Baggio
Title: Associate Professor
Office Location: HPH 302
Office Hours
Tuesday and Wednesday 11 AM - 12.30 PM
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Course Description

POS 7745 COS-POLS 3(3,0)Advanced Quantitative Methods in Political Research: PR: Admission to Political Science Ph.D. or C.I. Survey of advanced quantitative methods used in political science research, including problems in regression analysis and nonlinear models. Even Spring.

This course is designed to introduce students to advanced topics in the use of statistical methods as well as other methods and tools used to analyze issues in political science research. More specifically, in this course students will learn how to use appropriate statistical software (STATA) in order to perform quantitative data analysis (linear and logistic regression, time-series data analysis, panel data analysis). The course will also introduce students to other potentially useful software to perform data analysis and they will be introduced to methods beyond statistical analysis that are used in political science research such as content analysis, qualitative comparative analysis, agent based modelling and networks.

By the end of the course students will be familiar with the tools used in current quantitative research in political science and know how to use statistical software to apply this methodology to the analysis of political phenomena.

Student Learning Outcomes

After successfully completing this course you will be able to:

1) To understand how to conduct and implement your own research and choosing the appropriate analysis technique based on your general problem statement (research question) as well as data availability/needs.

2) Implement the correct analysis using appropriate software (STATA)

3) Present your findings both orally (through presentation) and written (through writing a research report).

Required Course Materials and Resources

Introductory Econometrics
Authors: Jeffrey M. Wooldridge
Publisher: South Western Educational Publishing

Edition: does not really matter as long as you can cross reference the chapters with the content of class.

Recommended Course Materials

Title: Basic Econometrics
Authors: Damodar N. Gujarati
Publisher: McGraw-Hill Companies

Title: Statistics with Stata
ISBN: 9780495828785
Authors: Lawrence C. Hamilton

Title: Essential Mathematics for Political and Social Research
ISBN: 9780521834261
Authors: Jeff Gill
Publisher: Cambridge University Press

Course Assessment and Grading Procedure

Discussion Assessment: Discussion (15 points)

During the course you will be required to discuss the weekly topic (i.e. analysis method). Discussion takes the following form:

- Two students will discuss a topic (analysis method) assigned,
- One student will be responsible for taking notes of the presentation and discussion and submit the notes of the discussion on Webcourses@UCF

Discussions should:

Critically assess the topic assigned. You can use a power point or not. You are encouraged to search for critiques/validation of the topic assigned (i.e. when to do hypothesis testing, when not, what are the limitations? what are the strengths of the specific analysis method?)

If you have doubts or do not know how to proceed you can organize a meeting with me and I will provide guidelines for critiquing the paper assigned.

Technical Assessment: take-home assignments (25 points)

Each week all students will be expected to complete the assignments given. Assignments vary. For example, take-home assignments will generally relate to analyzing data in STATA. The analysis will reflect the weekly topic.

Final Project

Project Presentation (10 points) – open to faculty and other students.

- The project presentations can be done individually or in groups. Presentation cannot be longer than 15 minutes (and they will be timed, going over time will result in a penalization in points).
- If in groups, all the names of all the group members have to be reported by each individual.
- Each individual will have to present part of the project to receive a grade.
- If an individual part of a group does not actually present, s/he will receive 0 points for this assignment.
- A group can be of no more than 4

Final Project Paper (30 points)

The final project is due the lastweek of class

- The final project can be discussed with me at any time during the course. If you have your own topic, we will work on that, if not, you can choose any topic covered during the course or you will be assigned one.
- The final project has to showcase your technical skills. It has to involve an in-depth analysis of a topic of your choice centered upon a specific analysis method that you have learned during the semester.
- The final project is an individual project.

- Your final project mustconsist of a thoughtful analysis on a topic of your choice:
  - You can choose to analyze and critique an existing paper that uses statistics or other type of analysis and replicate/criticize their results
  - You can choose to analyze your own preferred dataset
- The final research project paper should contain a brief literature review on the topic you are working on, description of the analysis and why you are the methods you choose), results, limitations, discussion and conclusion.
- You need to cite at least 10 peer review articles that deal with the topic of your choice.
- APA style is required as well as proper citation.

The essay must be at least 2000 words, not to exceed 3500 words.

Note here is a non-exhaustive list of potential databases from which you could gather data for your final project:

- A collection of databases, at the country level, from 1946 to today (note that not all countries/years are available for all variables): Goteborg Quality of Governance Institute: https://qog.pol.gu.se/data
- Library Website: http://guides.ucf.edu/SecurityStudies, 'Databases' tab
- ICPSR Inter-University Consortium for Political and Social Research. Find & Analyze Data. http://www.icpsr.umich.edu/icpsrweb/ICPSR/
- Stockholm International Peace Research Institute (sipri). http://www.sipri.org/ Databases.
- Correlates of War. Available Datasets. http://www.correlatesofwar.org/
- Paul Hensel's International Relations Data Site. Paul R. Hensel. University of North Texas. http://www.paulhensel.org/data.html
- Council of European Social Science Data Archive. Accessing Data. http://www.cessda.org
- Comparative Study of Electoral Systems. Other Comparative Projects. http://www.cses.org/about.htm

Grading Scale

Letter Grade	Points
A	93-100
A-	88-92
B	80-88
C	70-79
D	60-69
F	Less than 60

Policies for Course Grade

Assignments will be submitted via Webcourses@UCF.

Make-up Exams and Assignments

Per university policy, you are allowed to submit make-up work (or an equivalent, alternate assignment) for authorized university-sponsored activities, religious observances, or legal obligations (such as jury duty). If this participation conflicts with your course assignments, I will offer a reasonable opportunity for you to complete missed assignments and/or exams. The make-up assignment and grading scale will be equivalent to the missed assignment and its grading scale. In the case of an authorized university activity, it is your responsibility to show me a signed copy of the Program Verification Form for which you will be absent, prior to the class in which the absence occurs. In any of these cases, please contact me ahead of time to notify me of upcoming needs.

Artificial Intelligence (AI) Use Policy

- **Use of Generative Artificial Intelligence (GenAI) is prohibited**. Use of GenAI tools via website, app, or any other access, is not permitted in this class. All components of assignments in this course must be independently and originally

completed by the student. Representing work created by GenAI as your own will be treated as plagiarism.

Disability Access & Accommodations

The University of Central Florida is committed to providing equal access to all students with disabilities (ADHD, learning disabilities, Autism, chronic medical conditions, physical disabilities, etc.). To receive consideration for reasonable disability-related course accommodations, disabled students must contact Student Accessibility Services (SAS) and complete the steps required for SAS to review accommodation requests. More information can be found on the UCF Student Accessibility Services website under the Start Here tab or by contacting SAS directly (Ferrell Commons 185; sas@ucf.edu; Phone - 407-823-2371).

Approved accommodations are shared with course instructors via the SAS Course Accessibility Letter. Implementing certain accommodations may require discussion about specific considerations of the course design, course learning objectives, and the individual academic and course challenges experienced by the student. While students with disabilities or chronic health needs are also encouraged to discuss any course concerns with professors in addition to contacting SAS, professors are not required to facilitate disability-related adjustments to the course unless the professor has received a Course Accessibility Letter from SAS that outlines approved accommodations.

Academic Integrity

Students should familiarize themselves with UCF's Code of Conduct at Student Conduct and Integrity Office. According to Section 1, "Academic Misconduct," students are prohibited from engaging in:

a. Academic misconduct is defined as any submitted work or behavior that obstructs the instructor of record's ability to accurately assess the student's understanding or completion of the course materials or degree requirements (e.g., assignment, quiz, and/or exam). Examples of academic misconduct include but are not limited to: plagiarism, unauthorized assistance to complete an academic exercise; unauthorized communication with others during an examination, course assignment, or project; falsifying or misrepresenting academic work; providing misleading information to create a personal advantage to complete course/degree requirements; or multiple submission(s) of academic work without permission of the instructor of record.

b. Any student who knowingly helps another violate academic behavior standards is also in violation of the standards.
c. Commercial Use of Academic Material. Selling of course material to another person and/or uploading course material to a third-party vendor without authorization or without the express written permission of the University and the instructor of record. Course materials include but are not limited to class notes, the instructor of record's slide deck, tests, quizzes, labs, instruction sheets, homework, study guides, and handouts.
d. Soliciting assistance with academic coursework and/or degree requirements. The solicitation of assistance with an assignment, lab, quiz, test, paper, etc., without authorization of the instructor of record or designee is prohibited. This includes but is not limited to asking for answers to a quiz, trading answers, or offering to pay another to complete an assignment. It is considered Academic Misconduct to solicit assistance with academic coursework and/or degree requirements, even if the solicitation did not yield actual assistance (for example, if there was no response to the solicitation).

Responses to Academic Dishonesty, Plagiarism, or Cheating

Students should also familiarize themselves with the procedures for academic misconduct in UCF's student handbook, *The Golden Rule*. UCF faculty members have a responsibility for students' education and the value of a UCF degree, and so seek to prevent unethical behavior and respond to academic misconduct when necessary. Penalties for violating rules, policies, and instructions within this course can range from a zero on the exercise to an "F" letter grade in the course. In addition, an Academic Misconduct report could be filed with the Office of Student Conduct and Academic Integrity, which could lead to disciplinary warning, disciplinary probation, or deferred suspension or separation from the University through suspension, dismissal, or expulsion with the addition of a "Z" designation on one's transcript.

Being found in violation of academic conduct standards could result in a student having to disclose such behavior on a graduate school application, being removed from a leadership position within a student organization, the recipient of scholarships, participation in University activities such as study abroad, internships, etc.

Let's avoid all of this by demonstrating values of honesty, trust, and integrity. No grade is worth compromising your integrity and moving your moral compass. Stay true to doing the right thing: take the zero, not a shortcut.

Title IX

Title IX prohibits sex discrimination, including sexual misconduct, sexual violence, sexual harassment, and retaliation. If you or someone you know has been harassed or assaulted, you can find resources

available to support the victim, including confidential resources and information concerning reporting options at Let's Be Clear and UCF Cares.

For more information on access and community engagement, Title IX, accessibility, or UCF's complaint processes contact:

- Title IX – ONAC – Office of Nondiscrimination & Accommodations Compliance & askanadvocate@ucf.edu
- Disability Accommodation – Student Accessibility Services – Student Accessibility Services & sas@ucf.edu
- Access and Community Engagement (including the Ginsberg Center for Inclusion and Community Engagement, Military and Veteran Student Success, and HSI Initiatives)
- UCF Compliance and Ethics Office – Compliance, Ethics, and Risk Office & complianceandethics@ucf.edu
- The Ombuds Office is a safe place to discuss concerns.

Reporting an Incident or Issue

If you believe you have experienced discrimination by any faculty or staff member, contact the Office of Nondiscrimination & Accommodations Compliance via the ONAC website or at 407-823-1336. You can also choose to report using the UCF Integrity Line either anonymously or as yourself at 1-855-877-6049 or by using the online form. UCF cares about you and takes every report seriously. For more information see the Reporting an Incident or Issue Webpage.

Deployed Active-Duty Military Students

Students who are deployed active duty military and/or National Guard personnel and require accommodation should contact their instructors as soon as possible after the semester begins and/or after they receive notification of deployment to make related arrangements.

Campus Safety

At UCF Public Safety and Police, safety is the top priority. Emergencies on campus are rare, but if one should arise, it's important to be familiar with some basic safety and security concepts.

- In an emergency, always dial 911.

- Every UCF classroom has an **Emergency Procedure Guide** posted on a wall near the door, which will show you how to respond to a variety of situations. This guide can also be found online here.
- In the event of an active threat, remember **AVOID, DENY, DEFEND**. Choose the best course of action and act immediately. Watch the video here to learn more.
    - **AVOID**. Pay attention to your surroundings and have an exit plan. Get as much distance and as many barriers between you and the threat as quickly as possible.
    - **DENY.** When avoiding is difficult or impossible, deny the threat access to you and your space. Lockdown by creating barriers, turning the lights off and remaining quiet and out of sight. Make sure your cell phone is silenced, but do not turn it off.
    - **DEFEND.** When you are unable to put distance between yourself and the threat, be prepared to protect yourself. Commit to your actions, be aggressive and do not fight fairly. Do whatever it takes to survive.
- For emergencies on campus, UCF will utilize the UCF Alert system. All UCF students, faculty and staff are automatically enrolled to receive these email and text alerts, however, it's a good idea to frequently ensure your contact information is up to date.

Financial Aid Accountability

All instructors/faculty are required to document students' academic activity at the beginning of each course. In order to document that you began this course, please complete this activity by the end of the first week of classes or as soon as possible after adding the course. Failure to do so may result in a delay in the disbursement of your financial aid.

Class Schedule

Week	Topic	Readings	Assignments and Due dates

Week	Topic	Readings	Assignments and Due dates
Week 1 Aug 20	• Introduction • Review of Elements of Research Design	• Henrickson, L., & McKelvey, B. (2002). Foundations of “new” social science: Institutional legitimacy from philosophy, complexity science, postmodernism, and agent-based modeling. PNAS, 99(Suppl 3), 7288-7295. • Lakatos, I. (1974). Falsification and the methodology of scientific research programmes. In I. Lakatos & A. Musgrave (Eds.), Criticism and the growth of knowledge (pp. 170-195). Cambridge, UK: Cambridge University Press. • Alvesson, M., & Sandberg, J. (2011). Generating research questions through problematization. *Academy of management review*, *36*(2), 247-271.	
Week 2 Aug 27	• An overview of different methods and suggestions on how to choose the appropriate ones.	• Lecture will be based on Baggio J.A., Baggio R., Modelling and Simulations in Tourism and Hospitality: Chapter 1,2 and Chapter 4	

Week	Topic	Readings	Assignments and Due dates
Week 3 Sept 3	• Review of the Linear Model • and more on research design	• Biddle, Stephen and Stephen Long. 2004. “Democracy and Military Effectiveness: A Deeper Look.” The Journal of Conflict Resolution 48 (4):525-546. • Wooldridge chapters 1 - 2 • Optional: Gujarati, chapters 1-3	• Discussing Research Design and the linear model (5 points) • Discussion will be held in class
Week 4 Sept 10	• Qualitative Comparative Anlaysis	• Ragin, C.C. 2006. Set relations in social research: Evaluating their consistency and coverage. Political Analysis 14(3), 291-310. • Baggio, J. A., Barnett, A. J., Perez-Ibara, I., Brady, U., Ratajczyk, E., Rollins, N., ... & Anderies, J. M. (2016). Explaining success and failure in the commons: the configural nature of Ostrom’s institutional design principles. *International Journal of the Commons*, *10*(2), 417-439. (QCA application and introduction of reliability metrics - read the supplementary material as well!)	• Discussing QCA and Content Analysis (5 points) • Discussion will be held in class

Week	Topic	Readings	Assignments and Due dates
Week 5 Sep 17	• Uncertainty, • Inference, • and Hypothesis Testing	• Wooldridge chapter 4 • Optional: Gujarati, chapters 5 • Gary King and Eleanor Neff Powell. 2008. "How Not to Lie Without Statistics, http://gking.harvard.edu/files/abs/nolie-abs.shtml • Smaldino PE, McElreath R. 2016 The natural selection of bad science. Royal Society Open Science 3:160384	• Take home assignment 1 (5 points) ◦ Due Sep 17 Before class • Discussing Hypothesis testing (5 points) • Discussion will be held in class

Week	Topic	Readings	Assignments and Due dates
Week 6 Sep 24	• Multivariate Regression	• Wooldridge chapters 3, 5 and 6 • Optional: Gujarati, chapter 7 & 8 • Christopher H. Achen. 1977. “Measuring Representation: Perils of the Correlation Coefficient.” *American Journal of Political Science* 21: 805-815.	• Take home assignment 2 (5 points) ◦ Due Sept 24 Before class • Discussing Multivariate Regression (5 points) • Discussion will be held in class

Week	Topic	Readings	Assignments and Due dates
Week 7 Oct 1st	• Dummy Variables and • Multiplicative Interaction Terms • And Qualitative response models	• Wooldridge chapter 7 • Optional: Gujarati, chapter 9 • Optional: Gujarati, chapter 15 • Robert J. Friedrich. 1982. In Defense of Multiplicative Terms in Multiple Regression Equations. *American Journal of Political Science*. 26(4): 797-833 • Timothy Hellwig and David Samuels. 2007. Voting in Open Economies: The Electoral Consequences of Globalization. *Comparative Political Studies*. 40(3): 283-306. • Brambor et al. 2005. "Understanding Interaction Models: Improving Empirical Analyses." *Political Analysis* 13: 1-20. • Baggio et al. (2019). The importance of cognitive diversity for sustaining the commons. *Nature communications*, *10*(1), 1-11	• Take home assignment 3 (5 points) ◦ Due Oct 1 Before class • Discussing interaction terms and dummy variables will be done by submitting slides and points of discussion to all course mates as well as the instructor
Week 8 Oct 8	• Multicollinearity, heteroskedasticity and autocorrelation, • Model specification and general diagnostic	• Wooldridge chapters 8 and 9 (and review chapters 2 and 3) • Optional: Gujarati, chapters 10, 11, 12 & 13 • Chatterjee, Sangit and Frederick Wiseman. 1983. "Use of Regression Diagnostics in Political Science Research." *American Journal of Political Science* 27: 601-613.	• Take home assignment 4 (5 points) ◦ Due Oct 8 Before class • Discussing Regression Diagnostic (5 points) • Discussion will be held in class

Week	Topic	Readings	Assignments and Due dates
Week 9 Oct 15	• Time Series Analysis and Longitudinal models .	• Wooldridge chapters 10, 12 and 13 • Optional: Gujarati, chapter 26 and 21	• Take Home Assignment 5 (5 points) ◦ Due Oct 15th Before class • Discussing Time Series and Panel Data (5 points) • Discussion will be held in class
Mid Term (Statistics Exam) Oct 22	• In class (usual class time) Mid-Term Exam that will be done on canvas, but in-person		

Week	Topic	Readings	Assignments and Due dates
Week 11 Nov 29th	• Networks	• Borgatti S., Mehra, A., Brass, D.J., Labianca, G. (2009). Network Analysis in the Social Sciences, Science 323, 892-895. • Watts, D. J. (2004). The "New" Science of Networks. Annual Review of Sociology, 30, 243-270. • Lubell, M., Scholz, J., Berardo, R., & Robins, G. (2012). Testing policy theory with statistical models of networks. Policy Studies Journal, 40(3), 351-374. • Berardo, R., & Scholz, J. T. (2010). Self-organizing policy networks: risk, partner selection, and cooperation in estuaries. American Journal of Political Science, 54(3), 632-649. • Porter, M.A. et al. 2007. Community Structure in the United States House of Representatives. Physica A. 386(1): 414-438. • Cranmer, S. J., Desmarais, B. A., Kirkland J.H., (2012). Toward a Network Theory of Alliance Formation. International Interactions 38:295-324.	• Discussing Networks (5 points) • Discussion will be held in class

Week	Topic	Readings	Assignments and Due dates
Week 12 Nov 5th	• Agent Based Models	• Smaldino (2016). All models are stupid, We need more of them. Computational Models in Social Psychology, edited by R. R. Vallacher, A. Nowak, & S. J. Read. Forthcoming in 2016 from Psychology Press. • Baggio, J.A. (2017). Complex Adaptive Systems, Simulations and Agent-Based Modelling. In R. Baggio & J. Klobas (Eds.), Quantitative research methods in tourism: a handbook, 2nd Edition (pp. 363-396). Bristol: Channelview • Abdollahian, M., Yang, Z., Coan, T., & Yesilada, B. (2013). Human development dynamics: an agent based simulation of macro social systems and individual heterogeneous evolutionary games. Systems Modeling, 1(1), 1–14.	• Discussing Agent Based Modeling (5 points) - • Discussion will be held in class
Week 13 Nov 12	Bonus Lecture	• Machine learning and neural networks: use of random forests, boosted gradient regressions and different types of neural networks	
Nov 19th	• CLASS PRESENTATION		

Week	Topic	Readings	Assignments and Due dates
Week 15 Nov 26	• Thanksgiving week, if UCF allows no class, if not either presentations if not done or lecture on topic of your choice.		
Week 16	Research project due (Dec, 5th) Final Exam will be on Dec. 3rd between 12 and 5pm)	Final research project is also due on the 5th of December. The final exam will be done at home (not in person) you can open it at any time time after 12 and it is due at 5pm. You will have 3 hours to complete it from when you open the exam.	