

# Bush 631: Quantitative Methods

Dr. Rotem Dvir

Fall 2021

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Office Hours: Tuesday&Thursday 9:30-11:00 a.m.

Office: Allen 2116 (2nd floor)

Web: [Course Website](#)

Class Hours: Tuesday 04:35-07:20 p.m.

Class Room: *Allen 1006*

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## Course Description

This is a graduate course in quantitative social science research methods. We will learn about various methods to design a research and use quantitative data to tackle a variety of questions in politics as a whole, and international affairs in particular. For example, What is the best way to predict election outcomes? What factors drive the onset of wars? What is the likelihood of a successful sanctions regime? Which type of leaders are more prone to concede in an international dispute? and how public opinion may shape the decision to begin negotiations? Beyond academia, companies and non-profits have invested heavily in data science techniques to learn about their users, platforms, markets, and programs. Data scientists at these institutions are essentially applied social scientists and employ many of the same techniques you will learn in this course.

This course will cover the tools and techniques of quality research design and the introductory statistical skills that are designed to give you an understanding of the appropriate uses (and mis-uses) of these tools and techniques. The goal is to give you the ability to understand, explain, and perform social science research, with a special focus on data analysis and causal reasoning. You will be able to read and understand the methodology of most academic articles in the social sciences. In addition, you will have a foot in the door of the data science world. This course will also help you to become proficient in the use of statistical software to manage and analyze data. The skills of collecting and analyzing data in a sophisticated manner has become crucial for the modern job market across industries. Finally, you will obtain data literacy that will help you be a critical consumer of evidence for the rest of your life.

## Course Objectives

1. Identify, understand and assess research designs, and their fit to the study of research questions in social sciences.
2. Develop analytic skills to assess research designs that help understand events and processes in international affairs.
3. Discuss methods of data collection (designing surveys and survey questions, determining sampling and sample size, etc.)

4. Develop data analysis skills including data management, basic descriptive statistics, and the ability to explore data (bivariate and multivariate models), as well as visualizing important findings.
5. Understand the process of generating hypotheses and testing them using basic inferential statistics.
6. Read and critique scholarly articles presenting statistical information. Identify problems in applying quantitative data in the public realm.

## Required Readings

**Book:** Kosuke Imai. (2017). *Quantitative Social Science: An Introduction*.

The book is available in the Texas A&M bookstore. You will need a copy of the book, otherwise it will be nearly impossible to pass the class. The book is comparatively affordable. Small number of copies of the book are available at the TAMU Evans and PSEL libraries.

Reading assignments for each week of class are listed in the *Course Schedule* section of this syllabus. Reading assignments should be completed prior to the relevant meeting. Additional reading material is available through Internet links. Please note that some materials can only be accessed on computers connected to the University's network.

**Course Material Copyright:** The handouts used in this course are copyrighted. By "Handouts," I mean all materials generated for this class, which includes but are not limited to syllabi, slides, and tasks. Because these items are copyrighted, you do not have the right to copy handouts (or place them online), unless I expressly grant permission, which I have not. You do not have the right to electronically record (audio and/or video) any part of this class without the express, written consent of the instructor. You also do not have the right to post recordings of any portion of the class online or to distribute by other means.

## Attendance and Participation

Class attendance will count for *five (5) percent* of your final grade. I expect you to actively participate in class discussions, ask questions, listen to your fellow students, and be attentive. Learning research methods is much easier when done in concert with others.

You are allowed to have one **free unexcused absence** from class. After one unexcused absence, I will deduct one point from the 5 possible attendance points for each unexcused absence. Excused absences are not deducted from your grade. I will decide what counts as excused on a case-by-case basis, but in general absences will only be excused for good reasons. You must contact me **before** missing class. If you have more than six (6) unexcused absences, you will receive an F in the course.

If you do have any problems that do not allow you to perform well in class, please email me ASAP. I am willing to work with you, but this is only possible if you come talk to me early enough.

## Grading Policies

Your grade for this course consists of the following:

- (1) **Attendance (5%):** as detailed in the section above.
- (2) **Home (Swirl) assignments (10%):** These are short assignments to be completed **before** the

relevant class. These assignments are directly based on the textbook and are designed to check whether you understood the materials covered in the textbook. You will receive a pass for the respective exercise as long as you attempt all questions. As proof, you will save a screenshot of the log at the end and submit it to me before the start of the class in which it is due.

**(3) Research Design task I - Experimenting with Experiments (10%):** In this task, you are asked to prepare a template for an experiment based on our class discussion. More details will be provided in class. Assignment due **September 27, 2021**.

**(4) Research Design task II - using R (15%):** In this task, you will use your knowledge of R software to analyze data provided by me. More details will be provided in class. Assignment due **October 12, 2021**.

**(5) Research Design task III - Unpacking research designs in the literature (15%):** In this task, you will read three (3) articles and submit a summary of the research design of each paper based on a list of questions. More details will be provided in class. Assignment due **November 16, 2021**.

**(6) Final project (35%):** In groups of **maximum 3 students**, you will prepare a policy brief that is related to the topic of international affairs and focuses on a relevant research design. The document will analyze an issue in international affairs and rely on data analysis for empirical evidence. More details will be provided in class. Assignment due **December 10, 2021**.

Each student/group must approve their topic for the term paper by the date detailed in the course schedule section.

**(7) Final project presentation (10%):** You will prepare a professional presentation of your policy brief document (more details will be provided during the semester). Presentations will be taking place in class on **December 7, 2021**.

### *Grading Scale*

Letter grades will be assigned as follows: all grades will be final and will not be changed unless the instructor has made a miscalculation.

A:  $\geq 89.5$

B:  $\geq 79.5 - < 89.5$

C:  $\geq 69.5 - < 79.5$

D:  $\geq 59.5 - < 69.5$

F:  $< 59.5$

### *Tasks, final project: Document your work*

To get full credit on homework tasks, you must **show the work** you did to get an answer in addition to giving the correct answer. Primarily, all code in R must be documented so as to be understandable to an outside individual (and can be replicated).

For some of the tasks (I will inform you which ones), you may work together in groups. Yet, the write-up of your homework/task must be done individually. In other words, each person must submit answers (showing work) in her or his own words. Failure to adhere to this policy may result in honors code violations. Please ask me if you have any questions about what constitutes individual work.

*Make-up Policy*

Students will be allowed (in most cases, see Student Rule 7) to make-up tasks, provided that they **email me within 24 hours of their absence**. In addition, they must show original evidence of a university-excused absence or a letter from their dean explaining their absence (Please note that I do not accept Xeroxed copies of medical excuses from students). For instructions on how to obtain a letter from your dean regarding your excused absence, refer to Student Rule 7.2: “The associate dean for undergraduate programs, or the dean’s designee, of the student’s college may provide a letter for the student to take to the instructor stating that the dean has verified the student’s absence as excused” [Student Rule 7](#).

*Students with Disabilities*

The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact Disability Services, currently located in the Disability Services building at the Student Services at White Creek complex on west campus or call 979-845-1637. For additional information visit <http://disability.tamu.edu>.

*Academic Dishonesty/Plagiarism statement*

As commonly defined, plagiarism consists of passing off as one’s own the ideas, words, writings, etc., which belong to another. In accordance with the definition, you are committing plagiarism if you copy the work of another person and turn it in as your own, even if you should have the permission of the person. Plagiarism is one of the worst academic sins, for the plagiarist destroys the trust among colleagues without which research cannot be safely communicated. If you have any questions regarding plagiarism or any other form of academic misconduct, please consult the Aggie Honor System Office website <http://www.tamu.edu/aggiehonor> or the latest version of the Texas A&M University Student Rules, under the section “Scholastic Dishonesty.” <http://rules.tamu.edu>. Always remember:

"An Aggie does not lie, cheat or steal, or tolerate those who do."

*Diversity, equity and inclusion statement*

The Department of International Affairs is committed to fostering a diverse, equitable, and inclusive learning environment for all students, staff, and faculty. We welcome individuals of all ages, backgrounds, citizenships, disabilities, ethnicities, family statuses, genders, gender identities, geographical locations, languages, military experiences, political views, races, religions, sexual orientations, socioeconomic statuses, and/or work experiences [see, http://diversity.tamu.edu/](http://diversity.tamu.edu/). We recognize a special responsibility to undertake particular efforts to include the participation and voices of those from historically underrepresented groups. In all of this, diversity alone is not the only goal; we also strive to hear, listen to, and incorporate new voices in our teaching, research,

and service. We hold that embracing and supporting new perspectives, individuals, and ideas invigorates academic excellence and pushes our entire community forward. The Department of International Affairs and the Bush School expect everyone to demonstrate respect for different experiences, beliefs and values expressed by other members of our community and to engage in reasoned discussions. As a department of international affairs, within a university dedicated to the public good, a commitment to diversity, equity, and inclusion is critical for preparing and ensuring the success of the next generation of leaders.

#### *Title IX Statement on Limits to Confidentiality*

Texas A&M University is committed to fostering a learning environment that is safe and productive for all. University policies and federal and state laws provide guidance for achieving such an environment. Although class materials are generally considered confidential pursuant to student record policies and laws, University employees - including instructors - cannot maintain confidentiality when it conflicts with their responsibility to report certain issues that jeopardize the health and safety of our community. As the instructor, I must report (per Texas A&M System Regulation 08.01.01) the following information to other University offices if you share it with me, even if you do not want the disclosed information to be shared: Allegations of sexual assault, sexual discrimination, or sexual harassment when they involve TAMU students, faculty, or staff, or third parties visiting campus.

These reports may trigger contact from a campus official who will want to talk with you about the incident that you have shared. In many cases, it will be your decision whether or not you wish to speak with that individual. If you would like to talk about these events in a more confidential setting, you are encouraged to make an appointment with the Student Counseling Service <https://scs.tamu.edu/>. Students and faculty can report non-emergency behavior that causes them to be concerned at <http://tellsomebody.tamu.edu>.

#### *COVID-19 Statement*

To help protect Aggieland and stop the spread of COVID-19, Texas A&M University urges students to be vaccinated and to wear masks in classrooms and all other academic facilities on campus, including labs. Doing so exemplifies the Aggie Core Values of respect, leadership, integrity, and selfless service by putting community concerns above individual preferences. COVID-19 vaccines and masking — regardless of vaccination status — have been shown to be safe and effective at reducing spread to others, infection, hospitalization, and death.

#### *Less official pandemic stuff*

Texas A&M University does not have a mask or vaccination mandate, but as the previous statement mention, it is highly recommended.

I will be wearing a mask in class (and I am fully vaccinated). I have two young kids at home, both are unable to receive the COVID-19 vaccine because they are too young. I'm guessing many of you have friends and loved ones in similar situations.

Following [CDC guidelines](#), I strongly recommend/urge/encourage you to wear a mask in class on Tuesdays regardless of your vaccination status. I will place a box of disposable masks by the door if you would like one.

Again, Texas A&M University **does not require either vaccines or masks**, and if you aren't vaccinated or don't wear a mask, there are no penalties.

### *Communication*

The best place to ask questions is in the classroom. If your question is not related to class material or relevant to other students, we can discuss it after class. Outside the classroom, there are two ways to get in touch:

1. Office Hours: I encourage you to visit my office hours to discuss any difficulties with the course. I recommend watching [this Video \(link\)](#) - it is both fun and offers some pointers on office hours. I am available to meet outside of office hours, but you must contact me in advance so we can schedule a time that works for both of us.
2. Email: you can **always** email me with any concern you have (class-related or not). You can expect me to reply to emails within 24 hours during the work week. I will not reply to emails on the weekend, except for urgent matters. If the situation requires it, we can set-up a Zoom meeting and discuss the matter instead of via email. As with all business related correspondence, please include an appropriate salutation, identify yourself, and write in complete sentences.

### *Course Schedule and Readings*

Changes to Syllabus: I reserve the right to update/modify/clarify the syllabus with advance notification (QSS below refers to textbook).

#### **Week 1**

Tuesday, August 31, 2021: **Introduction**

- *Required Reading*: QSS, Chapter 1 (pp. 1-31).
- *What's the plan?*:
  - Course procedures, Canvas, Course website, office hours.
  - Introduction to R: download R and RStudio to your machine (instructions will be sent before class).

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#### **Week 2**

Tuesday, September 7, 2021: **Causality vol. I**

- *Required Reading*: QSS, Chapter 2 (pp. 32-54, sections 2.1-2.4).
- *Recommended Reading*: Mattes, Michaela and Jessica Weeks (2019). "Hawks, Doves, and Peace: An Experimental Approach" *American Journal of Political Science*, 63 (1), pp. 53-66. ([Article Link](#))
- *What's the plan?*:
  - The concept of causality in social science research, causal effects and counterfactuals.

- Randomized experiments (RCTs).
  - R work: looking at our data, cross-tabs, relational operators, sub-setting data, factor variables.
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### Week 3

Tuesday, September 14, 2021: **Causality vol. II**

- *Required Reading*: QSS, Chapter 2 (pp. 54-74, sections 2.5-2.8).
  - *Recommended Reading*: Fuhrmann, M., and Michael Horowitz. (2015). "When leaders matter: Rebel experience and nuclear proliferation." *The Journal of Politics*, 77(1), 72-87. ([Article Link](#))
  - *What's the plan?:*
    - Expanding the discussion on the concept of causality in social science.
    - Observational studies.
    - R work: diff-in-means estimator, descriptive stats tools (mean, median, range, quantiles, standard deviation).
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### Week 4

Tuesday, September 21, 2021: **Measurement vol. I**

- *Required Reading*: QSS, Chapter 3 (pp. 75-96, sections 3.1-3.4).
  - *Recommended Reading*: Sagan, S. and Benjamin Valentino. (2018). "Not just a war theory: American public opinion on ethics in combat." *International Studies Quarterly*, 62(3), 548-561. ([Article Link](#)).
  - *Recommended Reading*: Dvir, R., Geva, N. and Arnold Vedlitz. (2021). "Unpacking Public Perceptions of Terrorism: Does Type of Attack Matter?" *Studies in Conflict and Terrorism*, Online. ([Article Link](#)).
  - *What's the plan?:*
    - Measuring theoretical concepts - why? how? and some of the main challenges.
    - Tools for measurement: Surveys and sampling procedures.
    - R work: prop.table function, missing data (NAs), visuals (barplot, histogram, boxplot).
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### Week 5

Tuesday, September 28, 2021: **Measurement vol. II**

- *Required Reading*: QSS, Chapter 3 (pp. 96-122, sections 3.5-3.8).
- *Recommended Reading*: Huff, C., and Joshua Kertzer. (2018). "How the public defines terrorism." *American Journal of Political Science*, 62(1), 55-71. ([Article Link](#)).
- *What's the plan?:*
  - How to measure complex concepts.
  - Bivariate relationships, correlation, clustering.

- R work: visuals (scatterplot, time trends, QQ plot), z-score, correlation, matrix, list, k-means algorithm.
  - **Submit Research Design task I before class!!**
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## Week 6

Tuesday, October 5, 2021: **Prediction vol. I**

- *Required Reading*: QSS, Chapter 4 (pp. 123-139, section 4.1).
  - *Recommended Reading*: GAO Report. (2021). “Defense Budget: Opportunities Exist to Improve DOD’s Management of Defense Spending.” *US government accountability office website*. ([Article Link](#)).
  - *What’s the plan?:*
    - Using data to make predictions (elections, defense spending).
    - Prediction based on average value.
    - R work: loops, conditional statements, dates, unique values, errors, time series plot.
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## Week 7

Tuesday, October 12, 2021: **Prediction vol. II**

- *Required Reading*: QSS, Chapter 4 (pp. 139-161, section 4.2).
  - *Recommended Reading*: Lin-Greenberg, E. (2019). “Backing up, not backing down: Mitigating audience costs through policy substitution.” *Journal of Peace Research*, 56(4), 559-574. ([Article Link](#)).
  - *What’s the plan?:*
    - Predicting with data (elections, international conflict and presidential approval).
    - Prediction based on linear regression models, model fit.
    - R work: predict, residuals, coef, merging datasets.
    - **Submit Research Design task II before class!!**
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## Week 8

Tuesday, October 19, 2021: **Prediction vol. III**

- *Required Reading*: QSS, Chapter 4 (pp. 161-188, sections 4.3-4.4).
- *Recommended Reading*: Schwartz, J. and Christopher Blair. (2020). “Do Women Make More Credible Threats? Gender Stereotypes, Audience Costs, and Crisis Bargaining.” *International Organization*, 74(4), 872-895. ([Article Link](#)).
- *Recommended Reading*: Fuhrmann, M. (2020). “When Do Leaders Free-Ride? Business Experience and Contributions to Collective Defense.” *American Journal of Political Science*, 64(2), 416-431. ([Article Link](#)).



- *What's the plan?:*
    - Predicting with data (presidential approval, past experience and alliance contribution).
    - Prediction based on linear regression models - linearity, degrees of freedom, heterogeneous treatment effects.
    - R work: linear model function, levels for factor variable, interaction models.
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## Week 9

Tuesday, October 26, 2021: **Probability vol. I**

- *Required Reading:* QSS, Chapter 6 (pp. 242-277, sections 6.1-6.2).
  - *Recommended Reading:* Edry, J., Johnson, J. and Ashley Leeds. (2021). "Threats at Home and Abroad: Interstate War, Civil War, and Alliance Formation." *International Organization*, 75(3), 837-957. ([Article Link](#)).
  - *What's the plan?:*
    - Probability and modeling randomness, conditional probability, Bayes's rule.
    - Components of probability theory - sample space, events, permutations, combinations.
    - R work: `prop.table()` for probabilities, sum of columns and rows.
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## Week 10

Tuesday, November 2, 2021: **Probability vol. II**

- *Required Reading:* QSS, Chapter 6 (pp. 277-313, sections 6.3-6.5).
  - *Recommended Reading:* Horowitz, M., McDermott, R., and Alan Stam. (2005). "Leader age, regime type, and violent international relations." *Journal of Conflict Resolution*, 49(5), 661-685. ([Article Link](#)).
  - *What's the plan?:*
    - Random variables and probability distributions, large sample theorems.
    - Probability mass function, cumulative density function, expectation, variance.
    - R work: density and probability functions, variance, simulations.
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## Week 11

Tuesday, November 9, 2021: **Estimation and Uncertainty vol. I**

- *Required Reading:* QSS, Chapter 7 (pp. 314-342, section 7.1).
- *Recommended Reading:* Robinson, Kali. (2021). "What is the the Iran Nuclear Deal?" *Council of Foreign Relations website*. ([Article Link](#)).
- *Recommended Reading:* Smeltz, D., Farmanesh, A., and Brendon Helm. (2021). "Iranians and Americans Support A Mutual Return to JCPOA". *The Chicago Council on Global Affairs Report*. ([Article Link](#)).

- *What's the plan?:*
    - Important concepts in estimation: unbiasedness, consistency, margin of error.
    - Population and sample treatment effects, confidence intervals.
    - R work: simulations, loops, qnorm().
    - **Last day to approve final project topic!!**
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## Week 12

Tuesday, November 16, 2021: **Estimation and Uncertainty vol. II**

- *Required Reading:* QSS, Chapter 7 (pp. 342-369, section 7.2).
  - *Recommended Reading:* Scotto, T. J., & Reifler, J. (2017). "Getting tough with the dragon? The comparative correlates of foreign policy attitudes toward China in the United States and UK." *International Relations of the Asia-Pacific*, 17(2), 265-299. ([Article Link](#)).
  - *What's the plan?:*
    - Hypothesis testing, type I and type II errors, power analysis.
    - Null hypothesis, p-value, one-sample test, two-sample tests.
    - R work: simulations, fisher.test(), pnorm(), t.test().
    - **Submit Research Design task III before class!!**
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## Week 13

Tuesday, November 23, 2021: **Estimation and Uncertainty vol. III**

- *Required Reading:* QSS, Chapter 7 (pp. 370-390, section 7.3).
  - *Recommended Reading:* Miller, S. (2014). "Reading a Regression Table: A Guide for Students", *Steven Miller blog*. ([Link to Blog](#)).
  - *What's the plan?:*
    - Uncertainty in linear regression models, inferences about coefficients.
    - Homoskedastic error, law of total variance.
    - R work: lm(), predict(), confint().
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## Week 14

Tuesday, November 30, 2021: **Review & Summary**

- *Recommended Reading:* Avey, P. C., Desch, M. C., Parajon, E., Peterson, S., Powers, R., & Tierney, M. J. (2021). "Does Social Science Inform Foreign Policy? Evidence from a Survey of US National Security, Trade, and Development Officials." *International Studies Quarterly*. ([Article Link](#)).
- Probability and data in the real world: *Prediction by the numbers* ([Link](#))
- Probability and chance: *Tails you win* ([Link](#))

- *What's the plan?:*
    - Documentary: uncertainty, data and probability in real life.
    - Social science and International affairs research in the 'real-world': does it affect policy-making?
    - Review on all topics, time for Q & A.
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**Tuesday, December 07, 2021** - final project presentations.

**Friday, December 10, 2021** - submit final project by midnight (to Canvas).

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### **"Did I read the syllabus?" Task**

If you read all the way to this point, that's great! Please email me (by **Monday August 30th**) a gif or a picture of your favorite NFL/NBA/MLB/NHL/Soccer star or team (I promise I will use it as data for class!!).