# LINEAR STATISTICAL MODELS & ASSOCIATED TECHNIQUES (PADP 8130)

**Course Instructor:**

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**Course Information:**

**Time: Monday: 4:10pm-7:00pm**
**Where: 302 Baldwin Hall & Online**
**Office Hours: Monday: 1:30pm-3:30pm & by Appointment**

## COURSE DESCRIPTION

This course provides an introduction to linear regression analysis and associated statistical techniques for Ph.D. students in the Department of Public Administration and Policy. Specifically, this course provides an intensive introduction to elementary linear regression analysis (OLS estimation), followed by nonparametric regression alternatives to overcome the limitations of linear regression analysis, and concludes with an introduction to modern statistical methods commonly employed to address issues of causal identification with observational data. The aim is to enhance each student's quantitative data analysis toolkit with the methods covered in this course as they develop original research projects during their time in the Ph.D. program, and beyond.

The prerequisites for this course are PADP 8120: *Data Analysis and Statistical Inference* (**Each student is expected to have a working knowledge of this material upon entering this course**). Although the course focuses on data applications using Stata statistical software, it will be preceded by the theoretical basis of the statistical models and methods covered in this course. To make learning the material easier, students should have read and feel comfortable with the assigned readings ahead of its coverage in a given class session. When applicable, students should read any assigned journal article materials that contain applications of any statistical methods covered in the course, with special attention to the statistical methodology and its application to the substantive problem at hand.

The course will involve performing applied data analysis using **Stata (either version 16 or 17 will suffice)** statistical software during the semester. I strongly encourage students to purchase a copy of Stata for their own purposes (i.e., computer). Stata can also be used via the UGA virtual lab (http://vlab.uga.edu). Although I will often point students to the necessary Stata program commands to execute problem set assignments & their own research projects, students are ultimately responsible for becoming proficient in using Stata by learning it on their own outside of class. Stata is very easy to use from a programming-syntax orientation and has a terrific set of online tutorials, help menus, manuals, and user-created (***.ado***) program files that

should be able to assist you in most instances. However, I will be glad to assist students with computer–related questions outside of class sessions. These times can include office hours, a scheduled appointment, or by sending an e–mail message. Please feel free to contact me in such instances.

The following course text materials are required for each student taking this course:

## Required Textbooks

Jeffrey M. Wooldridge. 2019. *Introductory Econometrics: A Modern Approach*. Seventh Edition. Boston, MA: Cengage Learning.

Christopher F. Baum. 2006. *An Introduction to Modern Econometrics Using Stata*. College Station, TX: Stata Press.

Michael N. Mitchell. 2021. *Interpreting and Visualizing Regression Models Using Stata*. College Station, TX: Stata Press.

Scott Ashworth, Christopher R. Berry, and Ethan Bueno De Mesquita. 2021 *Theory and Credibility: Integrating Theoretical and Empirical Social Science*. Princeton, NJ: Princeton University Press (Paperback Version).

*Additional supplementary readings are offered for topics covered in this course. These items can be obtained through electronic links provided by the instructor at the end of the course syllabus.*

# COURSE OBJECTIVES

1. *Understand the concepts underlying linear and related statistical models covered in this course and be able to competently execute these techniques, including diagnostic tests, substantive interpretation of relationships and effects, and sensitivity analyses. This includes both written and oral presentation of these models and the statistical results produced by them.*

2. *Advancing a promising original scholarly research project that is well-thought out, theoretically informed, and empirically crafted in an appropriate manner.*

3. *Provide effective, constructive feedback on a classmate's research that will facilitate the development of the next stage of their research project.*

The attainment of these course objectives will primarily occur through assigned readings, class session lectures, problem sets, research projects, and consultation with the instructor.

# CLASS STRUCTURE

- **SESSION A: 4:10pm – 5:25pm (75 minutes): Approximate – May Vary**
- **BREAK: 5:25pm–5:40pm (15 minutes): Approximate – May Vary**
- **SESSION B: 5:40pm – 6:55pm (75 minutes): Approximate – May Vary**

# CLASSROOM RESPECT & ATTENDANCE POLICIES

It is essential to maintain a healthy learning environment so that everyone can feel free to participate. All members of the class are expected to behave in both a respectful and civil manner towards one another. To ensure that we get through the material of the course, I encourage students to ask questions, but as instructor I reserve the right to meet up with students outside of class sessions who are in need of additional assistance beyond what the instructor can supply during the time allotted for class. **My regularly scheduled office hours will be held on Monday afternoons from 1:30pm–3:30pm & by Scheduled Appointment**. When seeking my assistance during office hours, please either stop by my office or send me a Zoom meeting room link and Outlook invitation for a specific time to meet. If I decline the invitation, I will propose an alternative time in the event I have already scheduled a meeting with one of your classmates or someone in my other course this semester. I encourage each of you to reach out to me during scheduled office hours on a regular basis to discuss the course content that we are covering, as well as the development of your original scholarly research projects for this course.

Students seeking to miss a class for health, professional, or emergency reasons are required to obtain an excused absence by notifying the instructor sufficiently in advance and supplying verifiable documentation of the class absence in a timely manner. The instructor reserves the right to approve or deny excused absences based on the circumstances of each request. Students will be penalized by 3.33% (i.e., 0.033) of their final course total weighted points for each unexcused absence.

## STUDENTS WITH DISABILITIES

If you have a disability for which you are or may be requesting an accommodation, you are encouraged to contact both your instructor and the Disability Resource Center, Clark Howell Hall at UGA Athens campus (https://drc.uga.edu/) within the first two weeks of the term so that accommodations can be investigated on your behalf. Disability Resource Center will verify your disability and determine reasonable accommodations for this course.

## ACADEMIC HONESTY

Cheating, plagiarism, and unauthorized assistance will not be tolerated. Students suspected of violating the University of Georgia's *Academic Honesty Policy:* https://honesty.uga.edu/Academic-Honesty-Policy/) will be required to participate in the outlined procedural process as initiated by the instructor. A minimum sanction of a zero score (F grade) for any given assignment, and possibly an F course grade, will be imposed.

## MENTAL HEALTH AND WELLNESS REOUSRCES

If you or someone you know needs assistance, you are encouraged to contact Student Care and Outreach in the Division of Student Affairs at 706-542-7774 or visit https://sco.uga.edu/. They will help you navigate any difficult circumstances you may be facing by connecting you with the appropriate resources or services. UGA has several resources for a student seeking mental health services (https://www.uhs.uga.edu/bewelluga/bewelluga) or crisis support (https://www.uhs.uga.edu/info/emergencies). If you need help managing stress anxiety, relationships, etc., please visit BeWellUGA (https://www.uhs.uga.edu/bewelluga/bewelluga) for a list of FREE workshops, classes, mentoring, and health coaching led by licensed clinicians and health educators in the University Health Center. Additional resources can be accessed through the UGA App. In addition, more resources are offered to student seeking assistance

- Counseling and Psychiatric Services (CAPS) is your go-to, on-campus resource for emotional, social and behavioral-health support: https://caps.uga.edu/

- TAO Online Support (https://caps.uga.edu/tao/), 24/7 support at 706-542-2273. For crisis support: https://healthcenter.uga.edu/emergencies/.

- The University Health Center also offers FREE workshops, classes, mentoring and health coaching led by licensed clinicians or health educators: https://healthcenter.uga.edu/bewelluga/.

## PREFERRED NAME AND PRONOUNS

Professional courtesy and sensitivity are especially important with respect to individuals and topics dealing with differences of race, culture, religion, politics, sexual orientation, gender, gender variance, and nationalities. Class rosters are provided to the instructor with the student's legal name. I am eager to address you by your preferred name and/or gender pronoun. Please advise me of this preference early in the semester so that I may make appropriate changes to my records. As in the case of learning both first names and surnames for an entire class, I request your patience, as well as to kindly remind me if I accidently make a mistake in the use of preferred names and/or or gender pronouns when I am addressing you.

**PROHIBITION ON BOTH VIDEO AND AUDIO RECORDING OF LECTURES**

In the absence of written authorization from the UGA Disability Resource Center (https://drc.uga.edu/), students may not make a visual or audio recording of any aspect of this course. Students who have a recording accommodation agree in writing that they:

- Will use the records only for personal academic use during the specific course.
- Understand that faculty members have copyright interest in their class lectures and that they agree not to infringe on this right in any way.
- Understand that the faculty member and students in the class have privacy rights and agree not to violate those rights by using recordings for any reason other than their own personal study.
- Will not release, digitally upload, broadcast, transcribe, or otherwise share all or any part of the recordings. They also agree that they will not profit financially and will not allow others to benefit personally or financially from lecture recordings or other course materials.
- Will erase/delete all recordings at the end of the semester.
- Understand that violation of these terms may subject them to discipline under the Student Code of Conduct or subject them to liability under copyright laws.

**CORONAVIRUS INFORMATION FOR STUDENTS UGA**

UGA adheres to guidance from the University System of Georgia and the recommendations from Georgia Department of Public Health (DPH) related to quarantine and isolation. Since this may be updated periodically, we encourage you to review the latest guidance here: https://dph.georgia.gov/dph-covid-19-guidance. The following information is based on guidance last updated on December 29, 2021.

When both on campus and inside campus buildings, please strictly adhere to university's safety protocols regarding COVID-19 from the President's Office directive in order to keep campus and classrooms as Covid-safe as possible:

**Face coverings:** Following guidance from the University System of Georgia, face coverings are recommended for all individuals while inside campus facilities.

**How can I obtain the COVID-19 vaccine?** University Health Center is scheduling appointments for students through the UHC Patient Portal (https://patientportal.uhs.uga.edu/login_dualauthentication.aspx). Learn more here – https://www.uhs.uga.edu/healthtopics/covid-vaccine.

The Georgia Department of Health, pharmacy chains and local providers also offer the COVID19 vaccine at no cost to you. To find a COVID-19 vaccination location near you, please go to: https://georgia.gov/covid-vaccine.

In addition, the University System of Georgia has made COVID-19 vaccines available at 15 campuses statewide and you can locate one here: https://www.usg.edu/vaccination

**What do I do if I have COVID-19 symptoms?** Students showing COVID-19 symptoms should self-isolate and get tested. You can schedule an appointment with the University Health Center by calling 706-542-1162 (Monday-Friday, 8 a.m.-5p.m.). Please DO NOT walk-in. For emergencies and after, see https://www.uhs.uga.edu/info/emergencies.

**What do I do if I test positive for COVID-19?** (***Isolation guidance***) If you test positive for COVID-19 at any time, either through a PCR test, an Antigen test, or a home test kit, you are required to report it through the DawgCheck Test Reporting Survey. Follow the instructions provided to you when you report your positive test result in DawgCheck.

**As of December 29, 2021**, when an individual receive a positive COVID-19 test: Everyone, regardless of vaccination status, should:

- Stay home for 5 days.
- If you have no symptoms or your symptoms are resolving after 5 days, you can leave your house and return to class.
- Continue to wear a mask around others for 5 additional days.

**What do I do if I have been exposed to COVID-19? (*Quarantine guidance*)** If you have been exposed (within 6 feet for a cumulative total of 15 minutes or more over a 24- hour period – unmasked**) to someone with COVID-19 or to someone with a positive COVID19 test and you are:

- Boosted, or have become fully vaccinated within the last 6 months (Moderna or Pfizer vaccine) or within the last 2 months (J&J vaccine)
    - o You do not need to quarantine at home and may come to class.
    - o You should wear a mask around others for 10 days.

o If possible, get tested on day 5. If you develop symptoms, get tested and isolate at home until test results are received, then proceed in accordance with the test results.

• Unvaccinated, or became fully vaccinated more than 6 months ago (Moderna or Pfizer vaccine) or more than 2 months ago (J&J vaccine) and have not received a booster:

o You must quarantine at home for 5 days. After that you may return to class but continue to wear a mask around others for 5 additional days.

o If possible, get tested on day 5.

o If you develop symptoms, get tested and isolate at home until test results are received, then proceed in accordance with the test results.

** "Masked-to-masked" encounters are not currently considered an exposure; this type of interaction would not warrant quarantine. You should report the need to quarantine on DawgCheck (https://dawgcheck.uga.edu/), and communicate directly with your faculty to coordinate your coursework while in quarantine. If you need additional help, reach out to Student Care and Outreach (sco@uga.edu) for assistance.

## REQUIRED ASSIGNMENTS

**(1) Three Problem Sets: Stata Applications: 40% (UNIT 1: 20%; UNIT 2: 10%; UNIT 3: 10%)**

Students will be graded on problem sets covering material from each of the three units of the course (*Principles of Linear Regression [1 assignment]*; *Nonparametric Methods [1 Assignment]; & Modern Identification Strategies [1 assignment]*). These problem sets will entail Stata software applications (graphical and/or statistical) and written analyses of statistical findings and results from the various techniques, models, and tests covered during class sessions. These problem set assignments are due at the time assigned by the instructor [this information will appear on each assignment problem set] – without obtaining formal consent from the instructor, late work will be penalized by 50% for each regular day that it is late. The first problem set covering **UNIT 1** will constitute 20% of the final course grade, while the remaining two assignments covering **UNITS 2** and **3** will each count 10% towards the final course grade. Submitted problems sets must consist of a written analysis of the work, plus Stata program output ***.smcl*** files (and Stata program ***.do*** files) embedded within the corresponding output file. **Although student interaction is encouraged on these problem set assignments, each student is required to perform their own work when completing assignments.**

**(2) An Original Scholarly Research Paper: 40% (15% Draft Version; 25% Final Version)**

Each student will be required to develop a suitable original scholarly empirical-oriented research paper of 30-40 pages in length (double-spaced, 12 point font) using quantitative data during the semester, subject to the instructor's approval. All formatting requirements should conform to current *American Journal of Political Science* guidelines (American Political Science Association's *Style Manual for Political Science* (revised August, 2006)). ***Students are fully responsible for choosing their own research projects and the resulting product that is the outcome of this process. Students are required to discuss their topic(s) with the instructor to assess suitability for this course, and is also subject to instructor approval.*** Students need not be limited to statistical material covered by the time of this deadline (nor the course syllabus) – as long as it is broadly related to the content covered by this course. This is an important element of the course since it encourages the practice of developing and executing their own research projects, with the possibility that it can be further developed into an eventual scholarly publication at some later date.

- **Approval of Written Research Proposal**: **Must be Approved by the Instructor (and not merely submitted) by no later than Friday January 28, 2022 at 4:00pm**. *Failure to obtain instructor approval by this deadline results in 10% of one's final course grade being set equal to zero (0%).* Students are strongly encouraged to get their paper projects approved prior to this date. Student research papers can overlap with research papers being written for other seminars, as long as they are substantively distinct from one another (e.g., pose a different question, use different data to answer the question, employ different methods). This determination will be made by the instructor on a case-by-case basis after consulting with both the student and other affected instructor(s). The written research proposal should be 3-4 single-spaced pages and outline the research question that the paper seeks to answer, its significance/importance, theory and resulting hypotheses used to explain/answer the research question, and empirical strategy (i.e., research design, measurement & statistical models/procedures)

- **Research Paper Completed Draft Version (15%): Due by no later than Friday April 15, 2022 at 12:00pm noon**. Electronic file copy submitted to the instructor (either MS-WORD [preferred option] or LaTex-generated PDF file). *Failure to obtain instructor approval by this deadline results in a 50% penalty per day of one's final course grade derived from this assignment (i.e., 0 points for 2 days late).*

- **Research Paper Final Version (25%): Due by no later than Thursday April 28, 2022 at 5:00pm (submit an electronic file format copy to both the instructor and your assigned classmate discussant).** Copy submitted to the instructor. *Failure to obtain instructor approval by this deadline results in a 50% penalty per day of one's final course grade derived from this assignment (i.e., 0 points for being 2 days late).*

**(3) Presentation of Final Version of Research Paper & Discussant on a Classmate's Research Paper: 20% (10% Per Each Assignment)**

The final portion of each student's course grade will be determined by a presentation of their own research, as well as their ability to provide constructive feedback to a classmate's research paper. The instructor will be responsible for matching paper authors and discussants. **The paper presentations and discussant remarks will be shared in our final class session on Monday May 2, 2022**. We will try to simulate a professional scholarly panel (e.g., PMRC, APSA) where a paper will be presented by its author (12-15 minute time limit range), followed by the discussant offering their constructive type-written feedback patterned after a quality manuscript review at an academic journal that is intended to improve the author's research project moving forward (5-7 minutes), and concluding with an audience discussion (5-10 minutes). This format will be replicated by the number of students taking this course who have completed a research paper.

- **Presentation of Final Research Paper (10%): Due by no later than Monday May 2, 2022 at beginning of the class session (submit a copy to both your assigned classmate presenter and the instructor).** Copy submitted to the instructor. *Failure to obtain instructor approval by this deadline results in a 50% penalty per day of one's final course grade derived from this assignment (i.e., 0 points for being 2 days late).*

- **Discussant of a Classmate's Final Research Paper (10%): Due by no later than Monday May 2, 2022 at the beginning of class session (submit a copy to both your assigned classmate discussant and the instructor).** Copy submitted to the instructor. *Failure to obtain instructor approval by this deadline results in a 50% penalty per day of one's final course grade derived from this assignment (i.e., 0 points for being 2 days late).*

# GRADING SCALE

I will grade individual assignments on the following letter/point system, and each item will be weighted by the stated proportions for each assignment noted above:

| Letter Grade | Points | Letter Grade | Points |
|---|---|---|---|
| **A+** | **4.25** | **B– –/C+** | **2.625** |
| **A+/A** | **4.125** | **B–/C+** | **2.50** |
| **A** | **4.00** | **B–/C++** | **2.375** |
| **A/A–** | **3.875** | **C+** | **2.25** |
| **A–** | **3.75** | **C+/C** | **2.125** |
| **A– –/B+** | **3.625** | **C** | **2.00** |
| **A–/B+** | **3.50** | **C/C–** | **1.875** |
| **B++** | **3.375** | **C–** | **1.75** |
| **B+** | **3.25** | **C– –/D+** | **1.625** |
| **B+/B** | **3.125** | **C–/D+** | **1.50** |
| **B** | **3.00** | **C–/D++** | **1.375** |
| **B/B–** | **2.875** | **D+** | **1.25** |
| **B–** | **2.75** | **D+/D** | **1.125** |
| | | **D** | **1.00** |
| | | | |
| | | **F** | **0.00** |

The "in-between" grades on individual assignments is to the benefit of students to minimize rounding effects. Because the final grade distribution is based on a series of assignments (as opposed to a single item), the final course grade distribution based on your weighted course average from all assignments is given below as follows (***with no rounding up***):

| Letter Grade | Points | Letter Grade | Points |
|---|---|---|---|
| **A+** | **4.00 – 4.25** | **C** | **2.25 – 2.49** |
| **A** | **3.75 – 3.99** | **C–** | **2.00 – 2.24** |
| **A–** | **3.50 – 3.74** | **D+** | **1.75 – 1.99** |
| **B+** | **3.25 – 3.49** | **D** | **1.50 – 1.74** |
| **B** | **3.00 – 3.24** | **D–** | **1.25 – 1.49** |
| **B–** | **2.75 – 2.99** | **F** | **0.00 – 1.24** |
| **C+** | **2.50 – 2.74** | | |

# COURSE OUTLINE & TIMETABLE

**NOTE**: *The tempo may vary throughout the semester.*

| Session | Date | Course Topics/Subject Material | Required Readings |
|---|---|---|---|
| | | **UNIT 1: PRINCIPLES OF LINEAR REGRESSION** | |
| 1 | 1/10/2022 | **GENERAL LINEAR REGRESSION, I: (Assumptions & Solutions/Estimates)** | *Wooldridge (Chapters 1-2)*<br>*Baum (Chapters 1-3)*<br>*Mitchell (Chaps 1-2, Append A)* |
| | **1/17/2022** | **MLK, JR. HOLIDAY OBSERVANCE (NO CLASS)** | |
| | | | |
| 2 | 1/24/2022 | **GENERAL LINEAR REGRESSION, II: (Interpretation and Functional Form)** | *Wooldridge (Chapters 3-5, 7)*<br>*Baum (Chapter 4, 7.1-7.2)*<br>*Mitchell (Chs 3,5, 8-9, App.B&C)* |
| 3 | 1/31/2022 | **GENERAL LINEAR REGRESSION, III: (Diagnostics, I)** | *Wooldridge (Chapter 6)*<br>*Baum (Chapter 5)* |
| 4 | 2/7/2022 | **GENERAL LINEAR REGRESSION, IV: (Diagnostics, II & Heteroskedastic Regression)** | *Wooldridge (Chapters 8-9, 12)*<br>*Baum (Chapter 6)* |
| | | **UNIT 2: RELAXING LINEARITY: NONPARAMETRIC METHODS** | |
| 5 & 6 | 2/14/2022 & 2/21/2022 | **NONPARAMETRIC METHODS: (Odd Cases, Functional Form, Local Linear Regression, Quantile Regression, & Kernel Regularized Least Squares)**<br>***[PROBLEM SET # 1 DUE ON 2/21/2022: WEEKS 1 – 4]*** | *Wooldridge (Chapters 13-14)*<br>*Baum (Chapter 9.1 & 9.4)*<br>*Assigned Readings* |
| 7 | 2/28/2022 | ***RESEARCH PAPER WORKSHOP # 1*** | |
| | **3/17/2022** | **UGA SPRING BREAK HOLIDAY (NO CLASS)** | |
| | | **UNIT 3: MODERN IDENTIFICATION STRATEGIES** | *Ashworth, et al. (Read Sequentially During Course Unit)* |
| 8 & 9 | 3/14/2022 & 3/21/2022 | **CAUSAL INFERENCE, I: Panel Designs (Pooling, Random Effects, Fixed Effects, Hybrid Between-Fixed Effects, & Diagnostics)** | *Wooldridge (Chapters 13-14)*<br>*Baum (Chapter 9.1 & 9.4)* |
| 10 | 3/28/2022 | **CAUSAL INFERENCE, II: Potential Outcomes Framework & Treatment Effects Models**<br>***[PROBLEM SET # 2 DUE ON 3/15/2022: WEEKS 5 –9]*** | *Wooldridge (Chapter 2.7)*<br>*Baum (Chapter 8)*<br>*Assigned Readings* |
| 11 | 3/29/2022 | **CAUSAL INFERENCE, III: "*Treatment*" Interventions (Differences-in-Differences)** | *Wooldridge (Chapter 13.2 –13.5)*<br>*Assigned Readings* |
| 12 | 4/4/2022 | **CAUSAL INFERENCE, IV: "*Threshold*" Interventions (Regression Discontinuity Designs (RDDs))** | *Assigned Readings* |
| 13 | 4/11/2022 | ***RESEARCH PAPER WORKSHOP # 2***<br>**[DRAFT RESEARCH PAPER DUE ON 4/15/2022]** | |
| 14 | 4/18/2022 | ***RESEARCH PAPER WORKSHOP # 3***<br>***[PROBLEM SET # 3 DUE ON 4/22/2022: WEEKS 10 – 12]*** | |
| 15 | 4/25/2022 | ***'SLACK' INSTRUCTIONAL WEEK IF NEEDED [OTHERWISE, ONE-ON-ONE MEETINGS IN PREPARATION FOR FINAL RESEARCH PAPER DRAFT & RESEARCH SYMPOSIUM***<br>**[FINAL *RESEARCH PAPER DUE: 4/28/2022 @ 5:00pm*]** | |
| 16 | 5/02/2022 | **RESEARCH SYMPOSIUM [LAST DAY OF SEMESTER CLASS)**<br>***[DISCUSSANT COMMENTS & RESEARCH PRESENTATIONS DUE ON 5/02/2022]*** | |

# ASSIGNED READINGS (Not Covered in Assigned Textbooks)

## UNIT 2

- *Local Linear Regression:*
  - *https://blog.stata.com/2017/06/27/nonparametric-regression-like-parametric-regression-but-not/*
  - *http://cameron.econ.ucdavis.edu/nhh2017/norway04_nonparametric.pdf*

- *Quantile Regression:*
  - *https://pubs.aeaweb.org/doi/pdfplus/10.1257/jep.15.4.143*
  - *http://fmwww.bc.edu/EC-C/S2013/823/EC823.S2013.nn04.slides.pdf*
  - *Budgeting Policy Application: Breunig & Koski (2020, Policy Studies Journal):* https://onlinelibrary.wiley.com/doi/abs/10.1111/psj.12247

- *Kernel Regularized Least Squares:*
  - *https://web.stanford.edu/~jhain/Paper/PA2014a.pdf*
  - *https://www.jstatsoft.org/article/view/v079i03*
  - *https://web.stanford.edu/~jhain/Paper/JSS2015_RR.pdf*

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## UNIT 3

- *Differences-in-Differences Designs:*
  - *The Most Basic Set-Up: http://www.princeton.edu/~otorres/DID101.pdf*
  - *A more sophisticated example that relaxes the parallel trend assumption using unit-specific trends and matching on observables between treatment and non-treatment groups:*
    *https://www.cambridge.org/core/services/aop-cambridge-core/content/view/1A366C3B5FBD35A4CDAEC8EC453FA353/S1537592716000050a.pdf/deterring_wage_theft_altlabor_state_politics_and_the_policy_determinants_of_minimum_wage_compliance.pdf*

  - *Abadie's (2005) Semiparametric Differences-in-Differences Estimation when Parallel Trends Assumption is Violated and Propensity Score Balancing on Observed Covariates: https://academic.oup.com/restud/article-abstract/72/1/1/1581053?redirectedFrom=fulltext. Application in Administrative Reforms Differential Effects on Organizational Designs: Evaluation of Budgetary Performance by Krause and Jin (2020: Governance): https://onlinelibrary.wiley.com/doi/abs/10.1111/gove.12435.*

- *Synthetic Control Designs (Supplementary Resource to the Material **NOT** Covered in Class):*
  - *http://students.olin.wustl.edu/~sovichd/ECF/Synthetic_Control.pdf*
  - *https://www.tandfonline.com/doi/full/10.1080/10967494.2015.1121178?scroll=top&needAccess=true*
  - *https://www.urban.org/sites/default/files/publication/89246/the_synthetic_control_method_as_a_tool_0.pdf*

- *Regression Discontinuity Designs:*
  - *http://faculty.chicagobooth.edu/max.farrell/research/Calonico-Cattaneo-Farrell-Titiunik2017_Stata.pdf*
  - *https://www.mdrc.org/sites/default/files/regression_discontinuity_full.pdf*
  - *https://www.stata.com/meeting/chicago16/slides/chicago16_cerulli.pdf (TED)*
  - *https://scholar.princeton.edu/sites/default/files/jmummolo/files/sqf_jop.pdf*
  - *https://cattaneo.princeton.edu/papers/Cattaneo-Jansson-Ma_2018_Stata.pdf*
  - *https://www.tandfonline.com/doi/abs/10.1080/01621459.2019.1635480*