PSCI 7108: Time Series and Pooled Time Series

University of Colorado Boulder

Spring 2018

Time: Tuesday, 2:00-4:30
Location: KTCH 1B31
Instructor: Dr. Andrew Q. Philips
Office: KTCH 144
Email: andrew.philips@colorado.edu
Office hours: Thursday, 2:30-4:00, or by appointment

COURSE DESCRIPTION: Time series models—models which take advantage of variation over time in a single unit—and pooled time series (sometimes called cross-sectional time series or time series cross-sectional) models—which utilize variation across both time and spatial units—are very common in political science. While these models offer substantial leverage over important social science problems that use purely cross-sectional data, there are a number of pitfalls that are necessary to avoid during estimation.

In this course we will cover both time series and pooled time series. The first half of the class will be spent on time series. We will discuss the structure of these data, diagnosing certain characteristics, and cover a number of models that can be used to model time series data, such as autoregressive distributed lag, error-correction, and vector autoregressive models. In the second half of the course, we move to pooling time series data across multiple units. Much of the discussion during this part involves how we choose to model temporal and spatial heterogeneity—or, indeed—whether we model it at all.

By the end of this course you should be able to:

- Understand a variety of time series and pooled time series models
- Diagnose and test for characteristics unique to these types of data
- Be comfortable reading articles and books utilizing these data
- Apply what you have learned to your research.

PREREQUISITES: This an graduate level course; students should have a background in advanced regression statistics (i.e., Data I, II and III).

SOFTWARE: We will use a mix of R and Stata in this course. Although both statistical packages can handle time series and pooled time series data, sometimes R excels at a particular tool, and sometimes Stata does. Although familiarity with either program is not necessary, it is a plus. Those unfamiliar with these programs may want to purchase or borrow some of the suggested textbooks that cover working with R and Stata, although there are copious amounts of information available for free online. Please download both R (https://cran.r-project.org/) and RStudio (https://www.rstudio.com/) before the first class session.

GRADES: Course grades will be based on the following. Participation is worth 15% of the final grade. An in-class presentation of the student’s original research paper is worth 10%, as is the colleague critique. About halfway through the semester, a mid-term exam will be given that is worth
20% of the final grade. Last, the original research paper will comprise 45% of the final grade. Note that there are no opportunities for extra credit, nor is there a final exam.

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<tr>
<td>Participation</td>
<td>15%</td>
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<td>In-Class Presentation</td>
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<td>Colleague Critique</td>
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<td>Midterm Exam</td>
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<td>Original Research Paper</td>
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The following scale will be used to turn numerical grades into letter ones. Note that I will round up a letter should your grade fall on the number (but on or above 0.5) between two letters (e.g., 89.5 up to 90 rounds up to an A-).

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**PARTICIPATION:** Participation is an integral component of graduate courses. Students are expected to come to every class having already read the assigned readings for that day, and should be prepared to discuss them. Graduate-level courses only are successful when all participate actively in the discussion.

**MIDTERM EXAM:** About halfway through the semester there will be a mid-term exam. It will be in-class, open book, where you are free to consult your notes, readings, etc.

**ORIGINAL RESEARCH PAPER:** By the end of the class, students should have a solo-authored research article-length working paper that either: a.) a purely methodological paper (less common), or b.) an applied research paper that utilizes at least one of the maximum likelihood models discussed in the course. Since one semester is a short time in which to write such a paper, it is crucial to get some semblance of an research topic early in the semester. I encourage students to meet with me early on to discuss potential topics. Half-way through the semester, there will be a mandatory “check-in” to ensure all students have a feasible research topic. I am open to this paper being submitted for credit in another course, or a substantial re-write from a previous semester, but this needs to be cleared by me (and by the other professor if applicable). Note that the most important part of the research paper for the purposes of this class is the theory, hypotheses, research design, and presentation and interpretation of the results. Students are highly encouraged to write the paper using \LaTeX.

**COLLEAGUE CRITIQUE:** After all research papers are due, I will assign each student to read and critique two of their fellow students' papers. Students should treat this just as they would an invitation to peer review a manuscript. Theory, research design, data, methods, etc..., should be critiqued.
IN-CLASS PRESENTATIONS: Instead of a final exam, students will give in-class presentations on their research papers. These are conference-length (i.e., about 10-15 minutes, depending on the number of students) presentations.

ATTENDANCE AND LATE POLICY: Attendance is a key component of succeeding in graduate school. I provide slides for each class, but we will have a much more comprehensive discussion than what appears on the slide. Attendance is mandatory, with the exception of university-excused absences. If you need to miss a class, you should—if possible—let me know in advance so that we can make arrangements.

Assignments are due on the day listed in the syllabus. Late assignments will not be accepted.

REQUIRED TEXTS: The following text is required for the course. Any additional readings will be made available to you on the first day of class or as needed.


Note that it is expected to read the week’s required readings before coming to class.

RECOMMENDED TEXTS: The following texts are not required, but may be helpful to some. In the schedule below there are additional texts in the “suggested readings”.

- On \LaTeX: 
  - Various links provide on the \LaTeX Project website: https://www.latex-project.org/help/links/.

- On R:

- On Stata:
  - Cameron, Adrian Colin, and Pravin K. Trivedi. 2009. \textit{Microeconometrics using Stata} Volume 5. College Station, TX: Stata Press.

- On time series (general):

- On pooled time series or econometrics in general:
TENTATIVE SCHEDULE:

Tuesday, January 16: NO CLASS

Week 1: Introduction to Time Series Data, Diagnosing Time Series Properties

Required Readings:

- Pickup, Introduction, Ch. 1 and 2

Week 2: ARIMA and Distributed Lag Models

Required Readings:

- Pickup Ch. 3, 4 (§4.1-4.3), and 5 (§5.1-5.4)

Suggested Readings:


Week 3: Unit Roots, Cointegration, and ECMs

Required Readings:

- Pickup Ch. 6

Suggested Readings:

- Pfaff, Bernhard. 2008 Analysis of integrated and cointegrated time series with R. Springer.

Week 4: VAR and VECM Models

Required Readings:

• Whiteley, Paul, Harold Clarke, David Sanders and Marianne Stuart. 2016. “Hunting the Snark: A reply to ‘Re-evaluating the valence models of political choice.’” Political Science Research and Methods: 221-240.

Suggested Readings:

• Brandt, Patrick T., and John T. Williams. 2007. Multiple Time Series Models

Week 5: ARCH/GARCH and DCC

Required Readings:

• Pickup Ch. 4 (§4.4) and 5 (§5.5)

Suggested Readings:


Week 6: Fractional [Co]Integration, and Asymmetric Dynamic Effects

Required Readings:


Suggested Readings:

• Clarke, Harold D., and Matthew Lebo. 2003 “Fractional (co) integration and governing party support in Britain.” British Journal of Political Science 33.02: 283-301.

Week 7: Why Pool? Modeling Out Heterogeneity and Dynamic Issues

Required Readings:

Week 8: Midterm Exam

Week 9: Modeling Heterogeneity: Intercepts and Slopes

Required Readings:

- Bell, Andrew, and Jones, Kelvyn. 2015. “Explaining fixed effects: Random effects modeling of time-series cross-sectional and panel data.” Political Science Research and Methods, 3(1):133-153.

Suggested Readings:


March 27: NO CLASS (Spring Break)

Week 10: Modeling Dynamics, GMM and DPD Estimators

Required Readings:


Suggested Readings:


Week 11: Modeling Dynamic Heterogeneity, Introduction to Modeling Spatial Heterogeneity

Required Readings:


Week 12: Modeling Spatial Heterogeneity

Required Readings:


Suggested Readings:


**Week 13: Modeling Dichotomous Data, Missing Data and Unbalanced Datasets**

Required Readings:


Suggested Readings:


**Week 14: Student Presentations**

Research papers due Friday, April 27, by 11:59pm.

Student critiques due Tuesday, May 1 by Noon.

**STATEMENT ABOUT 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—either online at http://www.colorado.edu/disabilityservices/—or at the Center for Community, N200, 107 UCB.

To best accommodate students who may require alternative services, it is crucial that you contact me early in the semester if you need such accommodations.

**HONOR CODE, COPYRIGHT, AND PLAGARISM STATEMENTS**

“On my honor, as a University of Colorado Boulder student, I have neither given nor received unauthorized assistance”

The CU Honor Code is intended to uphold the intellectual reputation of the university by establishing trust among individuals regarding intellectual honesty. As the website states, “The Honor Code secures an environment where academic integrity can flourish and aims to install the principles of honesty, trust, fairness, respect, and responsibility as essential features of the University of Colorado Boulder campus”. Violations of intellectual honesty include plagiarism, cheating, and the unauthorized use of materials, all of which erode trust among individuals. If you have any questions about this, please see me, the Honor Code website (http://www.colorado.edu/honorcode/), or the Honor Code Office (1B70 Regent Admin Building).
The handouts and lectures used in this course are copyrighted. By “handouts,” I mean all materials generated for this class, which include but are not limited to syllabi, exams, in-class materials, and review sheets. Because these are copyrighted, you do not have the right to copy them or distribute them to others outside class, unless I expressly grant permission. In addition, I do not grant permission to tape class lectures.

SYLLABUS CHANGES

I reserve the right to make changes to the syllabus during the course of the semester as needed and will make the most updated copy available to you and announce said changes during class.

Last updated: January 7, 2018