

GRAD-C6

Statistics II: Time Series, Panel Data and Limited Dependent Variables (with R)

Simon Munzert

1. General Information

Class Time	Thursdays, 9-12h (3 hours per course!)
Venue	1.61 (Computer Lab)
Instructor	Dr. Simon Munzert
Instructor's office	3.59
Instructor's email	munzert@hertie-school.org
Instructor's phone number	+49 (0)30 259 219 450
Assistant	Alwine Hoppe hoppe@hertie-school.org +49 (0)30 259 219 337 3.60
Office Hours	Mondays, 2-3pm (appointment by email required)
Teaching Assistant	Gabriel Tarriba
TA's email	g.tarriba@phd.hertie-school.org
TA drop-in sessions	Mondays, 10-12
Venue for TA drop-in sessions	1.61 (Computer Lab)

Instructor Information:

Simon Munzert is Lecturer in Political Data Science at the Hertie School of Governance. He received his doctoral degree in Political Science from the University of Konstanz. His research interests include measuring and forecasting public opinion, political representation, and the use of new media in society.

Gabriel Tarriba is a PhD candidate at the Hertie School of Governance. His dissertation focuses on the educational attainment of the children of immigrants in Western Europe.

2. Course Contents and Learning Objectives

Course contents:

This course introduces students to an array of commonly used statistical techniques with a strong emphasis on application. It is intended to provide students with both a theoretical and concrete understanding of statistical techniques. The course begins with a review of OLS regression and covers elementary time-series and panel data, before introducing students to maximum likelihood estimation and some categorical data designs. All classes take place in the computer lab and divide time between theory and application. Students are assigned a problem set at the end of each class covering that day's materials and the beginning of the following class is used to review the answers. Most of these assignments involve the proper analysis of practice datasets using R.

Main learning objectives:

The goals are to (1) acquaint you with some of the most common statistical methods, (2) enable you to implement these with statistical software, and (3) prepare you for our methods electives.

Target group:

Everyone interested in empirical research and evidence-based policymaking.

Prerequisites:

Statistics I

3. Grading and Assignments

Evaluation is conducted via a combination of one replication project (40%), one in-class final exam (40%), and a series of weekly assignments that are graded for effort (20%). The replication project is based on a couple of research papers provided by the instructor; the student can choose one of the papers and replicate the analysis. The replication project itself is brief (maximum 7 pages) but bear in mind that coding takes considerable time. None of the assignments in this class are collaborative. I encourage you to study together and learn to use the software together. Assignments, however, are expected to represent your individual effort.

Composition of Final Grade:

Assignment	Deadline/Date	Final grade
Series of weekly assignments	Tuesdays, 11.59pm	20%
In-class final exam	22.11.2018	40%
Replication project	20.12.2018	40%

Late submission of assignments:

For each day the assignment is turned in late, the grade will be reduced by 10% (e.g. submission two days after the deadline would result in 20% grade deduction).

Attendance: Students are expected to be present and prepared for every class session. Active participation during lectures and seminar discussions is essential. If unavoidable circumstances arise which prevent attendance or preparation, the instructor should be advised by email with as much advance notice as possible. Please note that students cannot miss more than two sessions. For further information please consult the Examination Rules §9.

Academic Integrity: The Hertie School of Governance is committed to the standards of good academic and ethical conduct. Any violation of these standards shall be subject to disciplinary action. Plagiarism, deceitful actions as well as free-riding in group work are not tolerated. See Examination Rules §15.

4. General Readings

Readings come primarily from the Woodridge book below. Readings for a number of topics not covered in Woodridge will be uploaded in Moodle. The library has five copies of the Woodridge book and one reserve copy of Long. Differences between the 4th, 5th, and 6th editions of Wooldridge are minimal, so if you prefer to save money buying a prior edition, that's absolutely fine.

Books (Required):

Jeffrey M. Wooldridge. *Introductory Econometrics: A Modern Approach*. 4th ed. South-Western College Publishers.

James E. Monogan III. *Political Analysis Using R*. Springer.

Optional References:

- Gary King, *Unifying Political Methodology. The Likelihood Theory of Statistical Inference*. University of Michigan Press. (conceptual framework for ML estimation and applications using various models)
- Scott J. Long. *Regression Models for Categorical and Limited Dependent Variables*. Sage. (discussion of standard econometric models and Maximum Likelihood estimation)
- Joshua D. Angrist and Joern-Steffen Pischke. *Mostly Harmless Econometrics*. Princeton UP. (not so harmless companion with focus on methods for quasi-experimental designs)
- Trevor Hastie, Robert Tibshirani, and Jerome Friedman. *The Elements of Statistical Learning. Data Mining, Inference, and Prediction*. 2nd ed. Springer. (data science perspective on problems of classification using machine learning methods)

Articles:

The required and optional journal articles listed on the syllabus are available on the course's Moodle website.

5. Session Overview

Session	Session Date	Session Title
1	06.09.2018	Overview and a Gentle Primer to R
2	13.09.2018	Linear Regression Review and Model Building
3	20.09.2018	Interactions and Practical Problems
4	27.09.2018	Time Series: Finite Distributed Lag Models, Stationarity and Weak Dependence
5	04.10.2018	Panel Data: Pooled Cross-Sections, Difference-in-Differences, First Differences
No class on 11 October 2018!		
6	18.10.2018	Panel Data: Fixed Effects and Random Effects
Mid-term Exam Week: 22-26 October 2018 – no class		
7	01.11.2018	Introduction to Maximum Likelihood
8	08.11.2018	Binary Response Models: Logit and Probit
9	15.11.2018	Ordinal and Count Models: Ordinal Logit, Poisson, Negative Binomial
	22.11.2018	In-class final exam
	20.12.2018	Replication project due at 11.59p.m.

6. Course Sessions and Readings

Session 1: 06.09.2018**Overview and a Gentle Primer to R**

Please bring your laptop (if you have one)!

Session 2: 13.09.2018**Linear Regression Review and Model Building**

Required Readings	Wooldridge Ch. 3, skim Ch. 4, 6.3; Monogan Ch. 6
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Session 3: 20.09.2018**Interactions and Practical Problems**

Required Readings	Wooldridge Ch. 6.2, 7.4, 9 Braumoeller, Bear F. 2004. Hypothesis Testing and Multiplicative Interaction Terms. <i>International Organization</i> 58(4): 807—820. Brambor, Thomas, William Roberts Clark, and Matt Golder. 2006. Understanding Interaction Models: Improving Empirical Analyses. <i>Political Analysis</i> 14(1): 63—82.
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Session 4: 27.09.2018**Time Series: Finite Distributed Lag Models, Stationarity and Weak Dependence**

Required Readings	Wooldridge Ch. 10, 11, 12; Monogan Ch. 9
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Session 5: 04.10.2018**Panel Data: Pooled Cross-Sections, Difference-in-Differences, First Differences**

Required Readings	Wooldridge Ch. 13
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Session 6: 18.10.2018**Panel Data: Fixed Effects and Random Effects**

Required Readings	Wooldridge Ch. 14 Beck, Nathaniel, and Jonathan N. Katz. 1995. What to do (and not to do) with Time-Series Cross-Section Data. <i>American Political Science Review</i> 89(3): 634—647. Clark, Tom S., and Drew A. Linzer. 2015. Should I Use Fixed or Random Effects? <i>Political Science Research and Methods</i> 3(2): 399—408.
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Mid-term Exam Week: 22-26 October 2018 – no class

Session 7: 01.11.2018

Introduction to Maximum Likelihood

Required Readings	King Ch. 2, 4
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Session 8: 08.11.2018

Binary Response Models: Logit and Probit

Required Readings	Wooldridge Ch. 17, Monogan Ch. 7.1
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Session 9: 15.11.2018

Ordinal and Count Models: Ordinal Logit, Poisson, Negative Binomial

Required Readings	Monogan Ch. 7.2, 7.3
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22.11.2018

Final exam

20.12.2018

Replication project: Due at 11.59 p.m.