

University of Mannheim  
Chair of Political Science II  
Prof. Dr. Thomas König  
Moritz Marbach  
Spring 2014

February 13, 2014

# Applied Linear Regression Analysis

## Syllabus

Fridays, 10.15-11.45am, B 318 (in A5, 6),  
Module "Methods in International Relations I"

Office :        A 350 (in A5, 6)  
Office Hour:   Tuesday, 1-2pm (walk-in) or by appointment  
Phone:         +49 (0) 621-181-2071  
E-Mail:        mmarbach@mail.uni-mannheim.de  
Web:           www.moritz-marbach.com

## 1 Course Description

This course is about the linear regression model and its application in political science. The course is centered around Fox (1997) and covers mainly part II and III (Chapter 5 to 13). We will focus on the following topics: How do we estimate the parameters in a linear regression model and how to make inferences about them (in small and large samples)? What is their interpretation? Under what conditions can the linear regression model be used to analyze data? How can we detect if important assumptions are violated (non-constant error variance, non-linearity, influential data, omitted variables, measurement error); what to do in such cases? The course's overall goal is to give students a good understanding of linear regression (which includes its mathematical foundations) in order to enable them to apply it thoughtfully to analyze data. The acquired knowledge will also serve students well when using other regression models, such as discrete choice models. Each session will be a mix of lecture, demonstrations, and hands-on problem solving by students.

## 2 Prerequisite

This course assumes that students have taken the data analysis class and are familiar with the notion of hypothesis testing. The applied examples from the course require that students are familiar with STATA; see Kohler/Kreuter (2009), Chapter 3, 5 and 10 if you need a refresher. The University of Mannheim provides STATA home licenses for students free of charge.

### 3 Requirements

Read the **assigned literature** carefully and engage in the discussions during the sessions. All materials are provided through ILIAS (ilias.uni-mannheim.de).

Each week's session comes with a **problem set** which has to be handed in before the next class. Problem sets are to be submitted as printed copies in English. Problem sets placed in mailboxes, or sent via email will not be accepted at any time unless arranged with me. Use the Word file template provided on ILIAS to prepare your solution sheets. You can work in groups of two if you like. Groups submit one printed copy only.

Problem sets will be graded and returned to students the following week during class. Students that do well in a problem set, get two points. If they are doing okay only one; if there are major flaws, zero points. I also reserve the right to give extra credit if students handle parts of the problem set exceptional well (max. 1 point per problem set). Since there are 12 problem sets over the entire semester, the maximum total points students can get for the problem sets is 24 (+12).

In order to encourage in-class **participation** and sound preparations, I will adjust each final grade by +/-4 points depending on the student's performance.

The final grade is assigned as follows:

| Grade | $\geq$ % | $\geq$ pts. |
|-------|----------|-------------|
| 1.0   | 95.5     | 23          |
| 1.3   | 90.9     | 22          |
| 1.7   | 84.8     | 20          |
| 2.0   | 80.3     | 19          |
| 2.3   | 75.8     | 18          |
| 2.7   | 69.7     | 17          |
| 3.0   | 65.2     | 16          |
| 3.3   | 60.6     | 15          |
| 3.7   | 54.5     | 13          |
| 4.0   | 50       | 12          |

Note, that you will not get 5 ECTS credits if you fail the course (fewer than 12 points). If you fail the course, you have to retake the entire course (or an equivalent course suitable for your study program) in the next semester.

### 4 Other Matters

**Absences:** You are expected to attend every class. An absence can only be excused, provided that you talk to the instructor as soon as possible and present acceptable written evidence if required (e.g. medical attestation).

**Cheating:** The University's minimum penalty for plagiarism is a failure in the course. Cheating or plagiarism can lead to expulsion (Exmatrikulation) from the University.

**Suggestions:** Suggestions for improvement are welcome at any time! Any concern about the course should be brought first to my attention - either directly or via a spokesman/spokeswoman.

## 5 Schedule

| No. | Date   | Topic                                    | Readings     |
|-----|--------|--|--------------|
| 1   | Feb 14 | Introduction                             |              |
| 2   | Feb 21 | Working with STATA                       | KK C2+10; N  |
| 3   | Feb 28 | Point Estimation                         | AF C5        |
| 4   | Mar 7  | Significance Tests                       | AF C6        |
| 5   | Mar 14 | - Project: Replicating Hyde (2007) I -   | H line 1-386 |
| 6   | Mar 22 | What is a regression?                    | F C2; B C2   |
| 7   | Mar 28 | Fitting a straight line: OLS             | F C6; B C3   |
| 8   | Apr 4  | Statistical inference for OLS            | F C6; B C4   |
| 9   | Apr 11 | - Project: Replicating Hyde (2007) II -  | H            |
|     | Apr 18 | <i>Holidays</i>                          |              |
|     | Apr 25 | <i>Holidays</i>                          |              |
| 10  | May 2  | Regression diagnostics                   | F C11+12     |
| 11  | May 9  | Omitted variables, measurement error     | F C6.3-4     |
| 12  | May 16 | The problem of causal inference          | B C5         |
| 13  | May 23 | - Project: Replicating Hyde (2007) III - | H            |
| 14  | May 30 | Final discussion                         | B C11; FR    |

## 6 Course Readings

- AF: Agresti, A. & Finlay, B. (2009). *Statistical Methods for the Social Sciences*. Upper Saddle River: Pearson, 4th edition.
- B: Berk, R. A. (2004). *Regression Analysis. A Constructive Critique*. Thousand Oaks: Sage.
- F: Fox, J. (1997). *Applied Regression Analysis, Linear Models, and Related Methods*. Thousand Oaks: Sage.
- FR: Freedman, D. A. (1991). Statistical models and shoe leather. *Sociological Methodology*, 21, 291–313.
- H: Edited version of "The Observer Effect in International Politics" by Susan D. Hyde (2007).
- KK: Kohler, U. & Kreuter, F. (2009). *Data Analysis Using Stata*. College Station: STATA Press, 2nd edition.
- N: Nagler, J. (1995). Coding style and good computing practices. *The Political Methodologist*, 6(2), 2–8.

## 7 Further Readings

There are many excellent textbooks on (frequentist statistics), I list some of my favorites here. Talk to me if you need specific recommendations:

- Angrist, J. D. & Pischke, J.-S. (2009). *Mostly Harmless Econometrics. An Empiricist's Companion*. Princeton: Princeton University Press.
- DeGroot, M. H. & Schervish, M. J. (2011). *Probability and Statistics*. London: Pearson, 4th edition.
- Gelman, A. & Hill, J. (2006). *Data Analysis using Regression and Multilevel/Hierarchical Models*. Cambridge: Cambridge University Press.
- Hayashi, F. (2000). *Econometrics*. Princeton: Princeton University Press.
- Kennedy, P. (2008). *A Guide to Econometrics*. Malden: Blackwell.
- King, G. (1998). *Unifying Political Methodology. The Likelihood Theory of Statistical Inference*. Ann Arbor: The University of Michigan Press.
- Moore, W. H. & Siegel, D. A. (2013). *A Mathematics Course for Political and Social Research*. Princeton: Princeton University Press.
- Agresti, A. & Finlay, B. (2009). *Statistical Methods for the Social Sciences*. Upper Saddle River: Pearson, 4th edition.
- Wooldridge, J. M. (2001). *Econometric Analysis of Cross Section and Panel Data*. MIT Press.
- Wooldridge, J. M. (2009). *Introduction to Econometrics. A Modern Approach*. South Western, Cengage Learning, 4th edition.

I should mention Greene, W. H. (2011). *Econometric Analysis*. Upper Saddle River: Prentice Hall, 7th edition as well.