

PhD Course: Advanced Statistics

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1 Preamble

This course is **limited to 10 participants**. Therefore please make sure that your time allows you to follow this course till the end. A dropping out is not fair to your colleagues who have to wait for an available space until the next semester.

2 Course Contents and Objective

The course provides

1. a profound data analysis using descriptive statistic,
2. a 'repetition' of important statistical concepts as for example p -value, significance level, power analysis, hypothesis, ...,
3. the statistical correct application of the Classical Multiple Linear Regression Model and an outlook on extensions of regression models (advanced methods),
4. an introduction to further advanced statistical methods (Analysis of Variance, Cluster Analysis, Discriminant Analysis or Factor Analysis).

Having an idea of the methods you may use in your research helps you to design your study statistically in the best way. Therefore, the methods are also discussed in order to show you how the knowledge of the approach can help to assess experimental designs appropriately.

The goal of the course is manifold:

- Statistical concepts and methods are discussed and you get an idea which kind of problems are solvable with statistics.
- Checking the assumptions underlying the statistical approaches is important in order to obtain valid results or to adapt your model. Therefore, the

examination of the model prerequisites represents a relevant task in our course.

- A focus is put on the correct interpretation of the results obtained by the applied methods.
- You should recognize the constraints of statistics and the importance of theoretical substance.

Note: On the homepage of our course (OLAT course) you will find all updates, news and downloadable materials e.g., slides or assignments.

Note: As few as possible formulae will be used. However, it is necessary to teach formulae so that you understand the basic concepts and are able to work autonomously in your future research.

3 Course Schedule

The course takes place during the winter semester 2012/13 at the SoWi, University of Innsbruck¹ and is blocked on four Fridays. The exact time and location is in the following table:

Day	Date	Time	Room
Friday	2012/10/05	8:30-12:00, 13:00-15:30	SR 7 (SoWi)
Friday	2012/10/19	8:30-12:00, 13:00-15:30	SR 7 (SoWi)
Friday	2012/11/09	8:30-12:00, 13:00-15:30	SR 7 (SoWi)
Friday	2012/11/23	8:30-12:00, 13:00-15:30	SR 7 (SoWi)

In the morning the lecture takes place (including the discussion of the assignments) and in the afternoon the methods will be applied to data sets and the results discussed in detail. As software package we will use SPSS.

¹SR 7, 2nd floor, East, University of Innsbruck (SoWi), Universitaetsstr. 15, A-6020 Innsbruck

4 Workload and Grading

- After the first three course days you will get an assignment with problems to solve and to upload them in the OLAT course three days before the next lecture. For these exercises **45%** can be achieved. A small assignment worth **5%** is given after the last course day and has to be uploaded before the exam takes place.
- The final exam will be worth **50%** of the grade. The exam will last 90 minutes. In order to get a positive grading half of the points of the final exam must be achieved.

The final exam takes place on **Friday, December 7, 2012, 9:00 - 11:00 AM**, SR 7 (SoWi).

- Grading is as follows:

Result	Grade
< 55%	fail
55% until < 65%	4
65% until < 75%	3
75% until < 85%	2
≥ 85%	1

5 Literature

- Hair J.F., Anderson R.E., Tatham R.L., Black W.C. (1998). Multivariate Data Analysis. Prentice Hall, London. pp 730.
- Legendre P., Legendre L. (1998). Numerical Ecology. Elsevier, Amsterdam pp 853.
- Tutz G., Fahrmeir L. (2001). Multivariate Statistical Modelling Based on Generalized Linear Models. Springer Series in Statistics, Berlin pp 548.
- Krebs C.J. (1989). Ecological Methodology. Harper & Row, New York. pp 654.
- Magnusson W.E., Mourão G. (2004). Statistics without math. Sinauer, Sunderland. pp 136.
- Quinn, G.P. and Keough, M. J. (2010). Experimental Design and Data Analysis for Biologists. Cambridge University Press. Cambridge.