Applied Time Series Analysis – SS 2016

People:

Lecturer: **Dr. Marcel Dettling** (marcel.dettling@stat.math.ethz.ch)

Assistants: **Sonja Gassner (WBL)** (sonja.gassner@stat.math.ethz.ch)
Ruben Dezeure (Other) (ruben.dezeure@stat.math.ethz.ch)

Organization:

This course on Applied Time Series Analysis has a heterogeneous audience. It will be visited by students of the "Weiterbildungs-Lehrgang in Angewandter Statistik" (WBL, i.e. "Advanced Studies in Applied Statistics"), from the Master of Science in Statistics, as well as from several bachelor, masters and doctoral programs of other faculties. Rules and organization will differ somewhat between the WBL and other students, see below.

Lectures:

Lectures for all students will be held on Mondays from 10.15-11.55 at ETH Zentrum, room HG E1.2. Theory and examples will be shown on power point slides and the blackboard. Also, a script is available. The tentative schedule is as follows:

Week	Date	L/L	Topics
01	22.02.2016	L/L	Introduction; Stationarity; Visualization
02	29.02.2016	L/L	Transformation; Decomposition
03	07.03.2016	L/L	Autocorrelation; Partial Autocorrelation
04	14.03.2016	L/L	White Noise, Autoregressive Models
05	21.03.2016	L/L	Autoregressive and Moving Average Models
--	28.03.2016	-/-	*Easter Break*
06	04.04.2015	L/L	Autoregressive and Moving Average Models
07	11.04.2016	L/L	Time Series Regression
08	18.04.2016	L/L	ARIMA and SARIMA Models
09	25.04.2016	L/L	Forecasting 1
10	02.05.2016	L/L	Forecasting 2
11	09.05.2016	L/L	Multivariate Time Series Analysis
12	16.05.2016	-/-	*Whitmonday*
13	23.05.2016	L/L	Spectral Analysis
14	30.05.2016	L/L	Miscellaneous, Outlook

Exercises:

Exercises for the WBL students are held weekly on Monday 08.15-10.00 at HG E19 and HG D11 in the usual WBL exercise mode. They start on Monday, February 29, 2016. For all other students, there are only bi-weekly exercises, which take place on Monday 15.15-17.00 in HG E1.2. All exercises will be guided tutorials: you are expected to solve the problems using the statistical software package R, an assistant will be there to give instructions and support. You need to bring your own laptop with R installed on it. If you wish, you can hand in your solution to obtain a feedback on it. Please send code and/or comments by e-mail with "[ATSA]" in the subject line to the assistant Ruben Dezeure until at last a week after the exercise. Feedback will be given until about another week later also via e-mail.

In case the exercise hours from 15.15-17.00 on Mondays collide with other courses in your curriculum, please check back with the assistant Ruben Dezeure (ruben.dezeure@stat.math.ethz.ch). In case of sufficient demand, alternative slots for the exercises may be offered.

Series	Date	Topic	Hand-In	Hand-Back
01	22.02.2016	Time series in R, Decomposition	29.02.2016	07.03.2016
02	07.03.2016	Autocorrelation, AR-Modelling	14.03.2016	21.03.2016
03	21.03.2016	ARMA-Models and Applications	04.04.2016	11.04.2016
04	11.04.2016	Time Series Regression, ARIMA	11.04.2016	18.04.2016
05	02.05.2016	Forecasting with Time Series	09.05.2016	16.05.2016
06	23.05.2016	Multivariate / Spectral Analysis	30.05.2016	06.06.2016

Software:

Theory and exercises will be based on the statistical software package R. This is a freely available open source suite which works on all platforms, see (http://stat.ethz.ch/CRAN/). Basic previous knowledge of R is required or has to be acquired individually; the exercises will solely focus on time series specific aspects of R. If you lack this previous knowledge, you can quickly and easily gain it by going over one of the many tutorials. Recommended are:

http://www.cyclismo.org/tutorial/R/ (chapters 1-5),

http://math.illinoisstate.edu/dhkim/rstuff/rtutor.html (entire content).

The classic resource for the basics on R is the manual “An Introduction to R”, which is quite a bit longer and more technical, but a very worthwhile read:

http://cran.r-project.org/doc/manuals/R-intro.html

Written Material

A script for this course will be provided. The current version is available for download from the course webpage which can be found at.

http://stat.ethz.ch/education/semesters/ss2016/atsa.

From the very same webpage, the slides as well as exercise sheets and master solutions are also available for download. Additional material and exercises for the WBL students are provided at the usual WBL homepage at:

https://www.math.ethz.ch/sfs/education/advanced-studies/information-wbl-15-17.html.

Attendance to Lectures and Exercises:

For the WBL students, attendance of the exercise classes is mandatory as usual. For all other students, there are no requirements regarding attendance. However, according to previous experience, it will be hard to pass the exam based on reading the script only. Especially solving the exercises is absolutely key to success.

Exam

For the WBL students, there will be a midterm (CAS & DAS) and an end-of-semester exam (DAS). Details can be found on the WBL homepage. For all other students, there will be 30-minute oral exams during the regular ETH exam sessions, focusing on the practical aspects of time series analysis, i.e. testing whether you know the basic theory of time series analysis and can make use of it for solving time series analysis problems. It covers all topics which were discussed and/or applied during either the lectures or the exams. Upon passing the exam, the course will be awarded 5 ECTS credit points.