

Applied Time Series Analysis – FS 2011

People:

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Course Schedule:

All lectures and exercises will be held at HG E1.2, on Mondays from 10.15-11.55.

Week	Date	L/E	Topics
01	21.02.2011	L/L	Introduction to time series analysis
02	28.02.2011	L/E	Stationarity, decomposition of time series
03	07.03.2011	L/L	Autocorrelation, Correlogram
04	14.03.2011	L/E	Autoregressive Modeling 1
05	21.03.2011	L/L	Autoregressive Modeling 2
06	28.03.2011	L/E	Time series forecasting
07	04.04.2011	L/L	ARMA-Modeling 1
08	11.04.2011	L/E	ARMA-Modeling 2
09	18.04.2011	L/L	Time series regression
10	02.05.2011	L/E	Multivariate time series
11	09.05.2011	L/E	State space models
12	16.05.2011	L/L	Spectral Analysis 1
13	23.05.2011	L/E	Spectral Analysis 2
14	30.05.2011	L/L	Advanced Topics

Exercise Schedule:

The exercises will be held roughly every second week in the lecture room HG E1.2. There is only one group, for which an assistant will provide some background and useful hints on how to approach the problems.

Solving the problems needs to be done autonomously and requires the use of the statistical software package R. The exercise schedule is as follows:

Series	Date	Topic	Hand-In	Solutions
01	28.02.2011	Time series in R	07.03.2011	14.03.2011
02	14.03.2011	Autocorrelation	21.03.2011	28.03.2011
03	28.03.2011	AR(p)-modeling	04.04.2011	11.04.2011
04	11.04.2011	ARMA(p,q)-modeling	18.04.2011	02.05.2011
05	02.05.2011	Multivariate time series	09.05.2011	16.05.2011
06	09.05.2011	State space modeling	16.05.2011	23.05.2011
07	23.05.2011	Spectral analysis	26.05.2011	30.05.2011

The solved exercises can be handed in in the lectures where an assistant will pick them up. Sending them via e-mail or placing them in the corresponding tray in HG J68 until 11.55am of the due date is another option. Please write down your findings and comments. You can support this with a few plots, but please avoid handing in any R-code or an excessive amount of plots.

Software:

The 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/>). Some basic previous knowledge of R is required; the exercises will solely focus on time series specific aspects of R.

If you lack this previous knowledge, do not worry. You can quickly and easily gain it by going over one of the many tutorials which are available. I recommend chapters 1-5 of

<http://www.cyclismo.org/tutorial/R/>,

or, going through the entire content of

<http://math.illinoisstate.edu/dhkim/rstuff/rtutor.html>.

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>

We assume that you either have a personal computer or a notebook where you can install R and do the exercises on. Moreover, on the workstations at ETH, R is already installed. If you don't have an account and feel to need one for solving the exercises, please speak to the assistant.

Written Material

A scriptum for this course will be provided; it is available for download from the course webpage which can be found at

<http://stat.ethz.ch/education/semesters/ss2011/atsa>.

There, you can also find the slides that are presented during the lectures (usually only on Monday morning), the exercise sheets and the sample solutions.

Attendance Certificate:

There are no conditions for obtaining the attendance certificate.

Exam

There will be an oral exam during the regular session that lasts 30 minutes. It will focus on the practical aspects of time series analysis, i.e. it will test whether you know the basic theory of time series analysis and can make use of it for solving time series analysis problems. Some more details will be communicated in the very last lecture of the course.

Literature:

There are many books that are dedicated to time series analysis. Here are a few recommendations, in order of preference:

- 1) **Introductory Time Series with R**, Paul S.P. Cowpertwait and Andrew V. Metcalfe, Springer, 1st Edition (2009). ISBN-10: 0387886974, 256 pages, ca. 40\$.
- 2) **The Analysis of Time Series: an Introduction**, Chris Chatfield, Chapman and Hall / CRC, 6th Edition (2003). ISBN-10: 1584883170. 352 pages, ca. 58\$.
- 3) **Introduction to Time Series and Forecasting**, Peter J. Brockwell and Richard A. Davis, Springer, 2nd Edition (2002). ISBN-10: 0387953515. 456 pages, ca. 90\$.
- 4) **Time Series: Theory and Methods**, Peter J Brockwell and Richard A. Davis, Springer, 2nd Printing Edition (2009). ISBN-10: 1441903194, 688 pages, ca. 82\$.