Course Outline

COURSE TITLE	Time Series Data Analysis and Lab
NAME OF LECTURER	Stephan Schlueter

COURSE DESCRIPTION

Time series appear nowadays in many businesses and fields of applications. A classic example is finance, where we have time series of historic stock prices. Those are analyzed for forecasting purposes or to estimate the financial implications of a crisis, fore example. Dutch authorities have long been recording water levels to estimate the risks of breaking dikes. Industry nowadays also relies heavily on knowledge of how to analyze data. Power utilities need to forecast photovoltaic production, modern factories with more and more robots (Industry 4.0) generate huge amounts of data that need to be analyzed in order to optimize production.

However: How to do that? What are proper data science methods to handle missing or skewed values? How to identify and quantify seasonal effects (like e.g. in temperature)? How to simulate future price developments? What's an easy method to forecast oil prices, temperature, or stock prices?

objective of this lecture is to enable students to answer those questions. Thereby the focus is on practical application, that's why the lecture includes a hands-on introduction to R, a free software for statistical analysis. Theory offers a wide range of methods for data analysis. The lecture presents a few of them, but also includes hands-on methods from practice, which allow a rough but quick analysis of a data sample.

RECOMMENDED READINGS

Before the course starts (optional):

- Statistics with R: A Beginner's Guide Robert Stinerock
- The Cartoon Introduction to Statistics Alan Dabney
- Introduction to Statistics and Data Analysis: With Exercises, Solutions and Applications in R Christian Heumann, Michael Schomaker

During and after the course:

- Applied Time Series Analysis: A Practical Guide to Modeling and Forecasting Terence Mills
- Introduction to Time Series and Forecasting Peter Brockwell, Richard Davis
- Applied Time Series Analysis with R (Wayne Woodward, Henry Gray, Yllan Elliot)

TEACHING METHODS

Lecture, problem solving using case studies, computer-ba sed interactive training, student-group report, and student-group presentation

ASSESSMENT METHODS

Student-group final report + short presentation

CLASS TOPICS *(each class is 3 hrs)*

Data cleaning, graphic time series analysis, analytic time series analysis, forecasting, time series analysis with R

SPECIAL COMMENTS