Course Syllabus

M-MATH-102911, T-MATH 105874

Time Series Analysis

Summer Semester 2020

Lectures (0161100): Tuesday 14:00-15:30, 20.30 SR −1.011, Prof. Dr. Tilmann Gneiting
Exercises (0161110): Monday 8:00-9:30, 20.30 SR −1.011, Johannes Resin

Course Contents and Prerequisites

A time series is a sequence (x_t) of data where the subscript t indicates the time at which the datum x_t was observed. The course provides an introduction to the theory and practice of statistical time series analysis. Topics covered include stationary and non-stationary stochastic processes, autoregressive and moving average (ARMA) models, model selection and estimation, state-space models and the Kalman filter, forecasting and forecast evaluation, and an outline of spectral techniques.

Knowledge of the contents of modules M-MATH-101321 (Introduction to Stochastics) and M-MATH-101322 (Probability Theory) is essential. Furthermore, familiarity with the contents of module M-MATH-103220 (Statistics) is strongly recommended.

Tentative Weekly Schedule

April 21	Introduction
April 28	Stationary processes
May 5	Stationary processes
May 12	Trend and seasonality
May 19	Forecasting
May 26	Forecasting
June 2	ARMA models
June 9	ARMA models
June 16	Identification and estimation for ARMA processes
June 23	Identification and estimation for ARMA processes
July 7	Multivariate time series models
July 14	ARIMA models, state-space representations, and Kalman filter
July 21	Spectral analysis

This schedule is tentative and may change. Anticipated dates for exercise sessions are Monday, April 27, May 18, May 25, June 15, June 22, July 13, and July 20.

Tentative dates for oral exams are Tuesday, July 21, August 4, and October 20.

Literature

Textbooks on time series analysis include Brockwell and Davis (1991, 2016), Chatfield and Xing (2019), and Shumway and Stoffer (2017).

Statistical Software for Time Series

The problem sets will frequently require the use of a suitable statistical programming language. Any code discussed in class meetings will be in the R language. While you are also encouraged to use R, feel free to work with your standard language if it is suitable.

Disclaimer

At the time of writing (March 11, 2020), instruction at universities worldwide is subject to major disruption and transformation. All information is tentative. In particular, class sessions might get rescheduled or canceled.

References

Brockwell, P. J. and Davis, A. (1991). *Time Series, Theory and Methods*, second edition. Springer.

Brockwell, P. J. and Davis, A. (2016). *Introduction to Time Series and Forecasting*, third edition. Springer.

Chatfield, C. and Xing, H. (2019). *The Analysis of Time Series. An Introduction with R*, seventh edition. Chapman & Hall/CRC.

Shumway, R. H. and Stoffer, D. S. (2017). *Time Series Analysis and Its Applications: With R Examples*, fourth edition. Springer.