

Long Memory in Time Series PhD Course

Course Description

Motivation

Time series analysis looks to capture the intrinsic information contained in the data by the use of statistical models. The typical model used in time series is the autoregressive moving average, *ARMA*, given by

$$x_t = \alpha_0 + \alpha_1 x_{t-1} + \cdots + \alpha_p x_{t-p} + \varepsilon_t + \theta_1 \varepsilon_{t-1} + \cdots + \theta_q \varepsilon_{t-q},$$

where $\{\varepsilon_t\}$ is a random disturbance.

Long Memory deals with the notion that certain series have autocorrelation functions, a measure of the impact of past observations, that decay slower than what any *ARMA* model can account for. The autocorrelation function for a long memory process shows hyperbolic decay instead of the typical geometric decay for *ARMA* models. This translates into perturbations having significant effects even after much time has passed. Its presence has repercussions for inference and prediction.

Long memory has been detected in several time series, including inflation, volatility measures, electricity prices, and temperature. As an example, Figure 1 presents the monthly temperature deviations series of the Northern Hemisphere and its autocorrelation function. The series presents long memory in the sense that its autocorrelation function is still significant after 100 periods. Any disturbance in temperature takes a long time to disappear, which is relevant for studies like the ones associated with Climate Change.

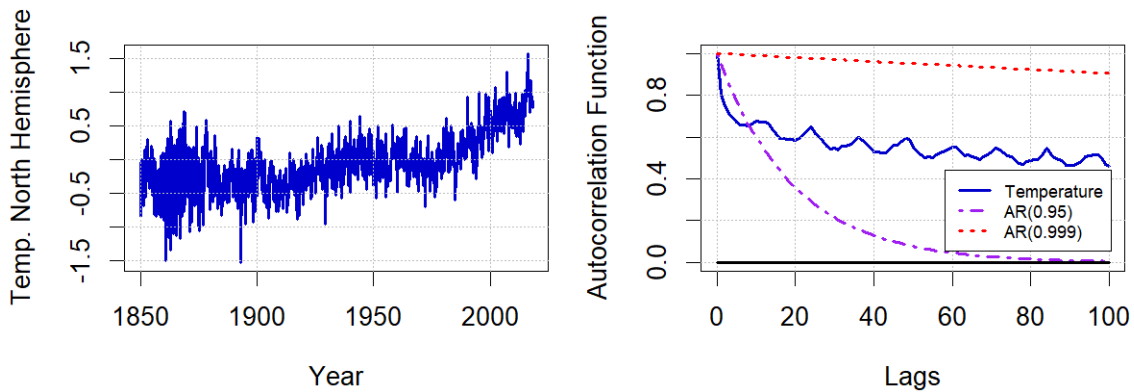


Figure 1: Temperature for Northern Hemisphere and its autocorrelation function.

The course will provide an introduction to long memory in time series, including estimation, testing, and applications. The course will provide participants with the necessary knowledge to understand and analyse long memory in time series.

Outline

This course will provide an introduction to long memory in time series. The course will cover the following topics:

- Introduction to long memory and motivation
- Estimation of long memory models
- Forecasting with long memory models
- Applications of long memory models

Instructor

Prof. Dr. Uwe Hassler from Goethe University Frankfurt.

Reading Material

- Hassler, U. (2018). Time series analysis with long memory in view (1st edition). John Wiley & Sons.
- Beran, J., Feng, Y., Ghosh, S., & Kulik, R. (2013). Long-Memory Processes: Probabilistic Properties and Statistical Methods. Springer Berlin Heidelberg. <https://doi.org/10.1007/978-3-642-35512-7>
- Baillie, R. T. (1996). Long memory processes and fractional integration in econometrics. Journal of Econometrics, 73(1), 5–59. [https://doi.org/10.1016/0304-4076\(95\)01732-1](https://doi.org/10.1016/0304-4076(95)01732-1)

Evaluation

The participants are evaluated by solving suggested exercises which provide and prove an understanding of the presented theory. To pass the course, at least 70% of the exercises should be satisfactory evaluated.

Prerequisites

Basic knowledge of time series and statistics.

Logistics

Dates

The course will be held on November 26th-27th, 2024.

Venue

The course will be held at the Department of Mathematical Sciences, Aalborg University, Aalborg, Denmark.

The Department of Mathematical Sciences is located at Thomas Manns Vej 23, 9220 Aalborg East, Denmark.

 Map

Fee

The course is free of charge for the students from AAU, AU, KU, CBS and SDU.

Lunch, coffee breaks, and course dinner are included, provided by the Danish Graduate Programme in Economics (DGPE).

Costs associated with transportation and accommodation should be covered by the participants' home institutions.

ECTS Credits

Upon completing all course activities, participants will be awarded 3 ECTS credits and a course certificate.

Connection to AWE VI Long Memory Symposium in Aarhus University

Participants in the course are encouraged to attend the AWE VI Long Memory Symposium in Aarhus University on November 28th-29th, 2024.

The symposium will feature presentations on long memory in time series and related topics. Participation in the symposium is free of charge, but registration is required.

More information about the symposium will be available soon.

Registration

Registration form will be available soon.

Organizer

For any questions regarding the course, please contact J. Eduardo Vera-Valdés, eduardo@math.aau.dk.

We look forward to welcoming you to Denmark in November!