

Time Series Analysis - Week 3

Introduction

In these tasks, you will examine data with trends and seasons, trying to determine suitable model structures for them. Before the session, you are expected to:

- View the online videos for week 3, answering all questions posed in the videos.
- Read chapter 4 in the course textbook.
- Download the needed matlab functions and data files from the course webpage.

Task 1

Use Matlab to generate $N = 1000$ samples of the SARIMA process with the $A(z)$ and $C(z)$ polynomials

$$\begin{aligned}A(z) &= 1 - 0.5z^{-1} + 0.7z^{-2} \\ C(z) &= 1 - 0.7z^{-12}\end{aligned}$$

and with a seasonal periodicity of $s = 12$, i.e., such that $A(z)\nabla_s y_t = C(z)e_t$. Section 3.4 in the first computer exercise explains how you can use Matlab to do this. Plot y_t as well as the ACF and the PACF of the process; can you see the seasonality of the process? Try forming a new process such that $w_t = \nabla_s y_t$ and examine the ACF and the PACF of w_t . Note that you need to remove the initial s samples after you filtered the process. Can you determine suitable model orders from the ACF and the PACF? You can try increasing the data length to see if this helps. Try changing the season to $s = 1$ to see how this affects the data and the ACF and PACF.

Task 2

Load the data set containing temperature measurements from Svedala using the command `load svedala`. Can you determine the seasonality of the data? What seems to be a reasonable model for the data? This task is the initial part of Section 3.5 in the first computer exercise.