Hand-in Assignment 1

Analysis of Time Series 1MS014

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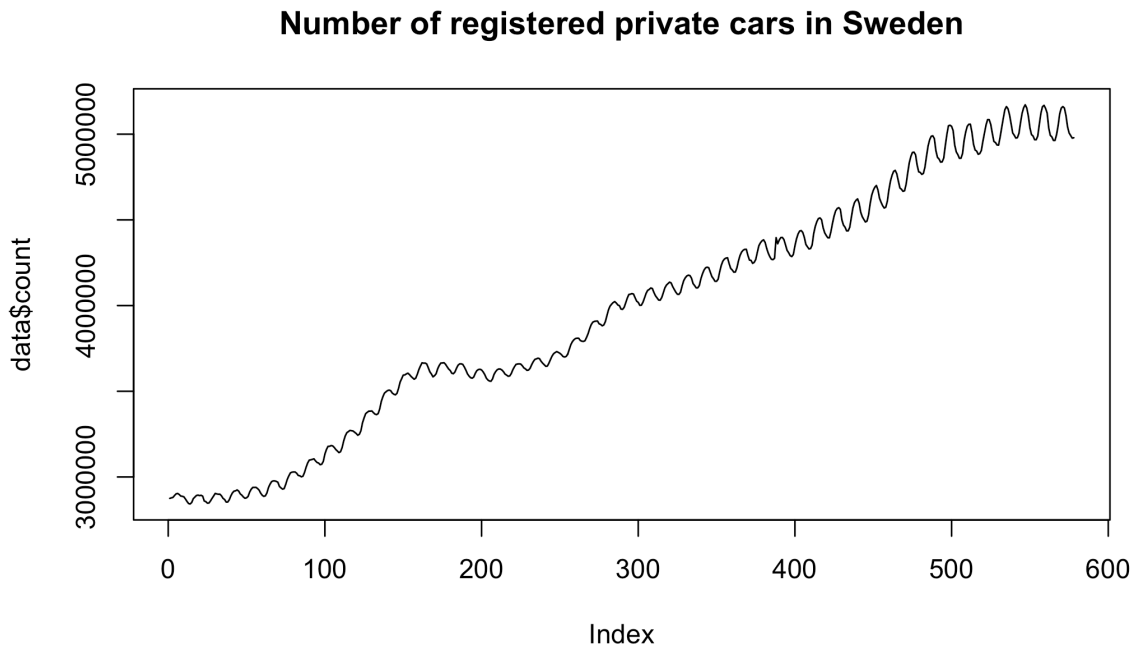
Task 4

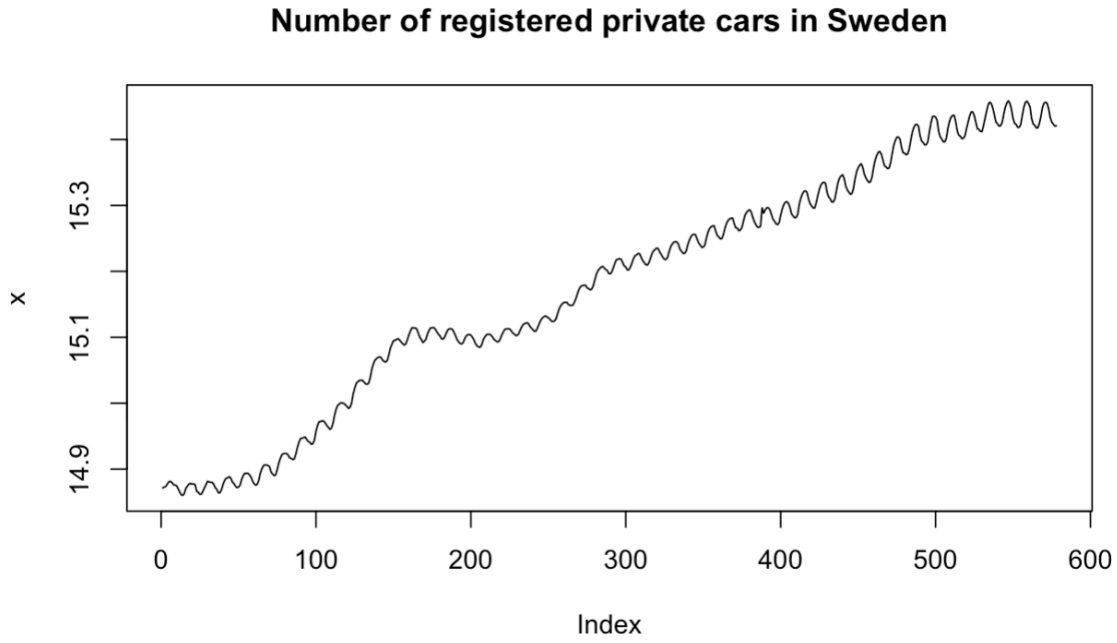
The number of registered private cars in Sweden for the years 1977 until February 2025, monthly data, is given in the second column of the file carsmon.dat at Studium.

Find a suitable ARIMA (or SARIMA) model for these data, or a transformation thereof. Analyze the model residuals carefully, in order to make sure that the model provides a good description of the data. It might be a good idea to try transformations, like the logarithm.

Below is the time-series data plotted for the dataset of registered private cars from 1977-2025:



As the mean of the data with respect to time is changing, along with slight differences in the variance noticeable after around index 350, the data appears to be non-stationary initially. Upon applying a log transformation, to reduce the magnitude of the variance, and to scale down the data, the graph looks like the following:


Number of registered private cars in Sweden
x
14.9
15.1
15.3
0
100
200
300
400
500
600
Index

A Code

```r
data = read.table("~/uni/analysis-time-series/carsmon.dat", header=TRUE)
x = log(data$count) # logarithm operation

plot(data$count, type='l')
title(main = "Number of registered private cars in Sweden")
plot(x, type='l')
title(main = "Number of registered private cars in Sweden (log)")

par(mfrow=c(1,2)) # Making the display of 2 plots

acf(x, lag.max = 50) # ACF
pacf(x, lag.max = 50) # PACF cuts off after lag 1
```

Listing 1: This is a code block.