Series 1

1. In this exercise we are dealing with daily rainfall data `rainDay.txt`. The data consists of the date (01.01.2000 until 31.12.2008) and the rainfall on that day in mm.

```
> dd <- read.table("http://stat.ethz.ch/Teaching/Datasets/WBL/rainDay.txt", header=T)
```

a) Read in the data `rainDay.txt` and tell R that the column `DATE` is a date.
R-Hint: `as.Date(..., format=...)`

b) Define your data (without the `DATE`-column) correctly as a time series of class `ts`.

c) Use the R-Functions `weekdays()`, `months()` and `quarters()` to create these factors. Combine them together with the rainfall data and the date into one dataframe.
R-Hint: `data.frame`

2. Here are some examples of time series. Decide on the frequency (how many measurements per year) and `deltat` (the time difference between measurements in the unit of years).

a) Sunshine duration per month in Basel from 1990 to 2000.

b) Number of newborn babies in the city of Zurich per year from 2000 to 2011.

c) Number of reservations in a restaurant for every night during 4 weeks.

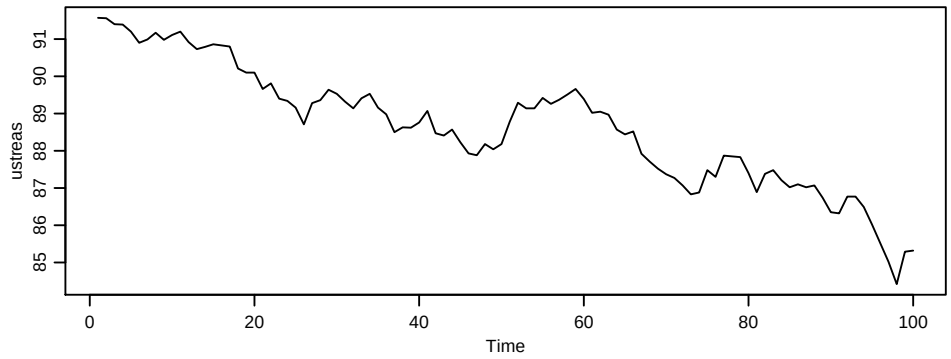
d) Water runoff of a river. The data has been collected every day for four years.

e) Number of reservations in a restaurant for every night during 4 years.

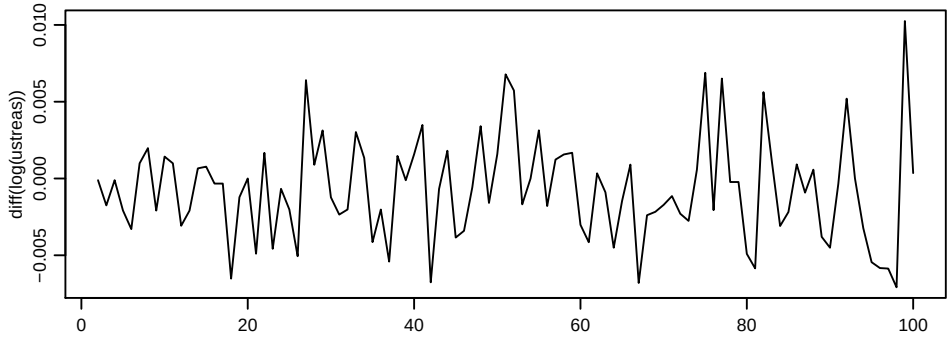
3. Have a look at the set of time series on the next two pages. For every series, shortly answer the following questions (motivate your answers):

- Is the time series stationary?
- Is there a trend?
- Can you find some seasonal effect? If yes, what is the period?

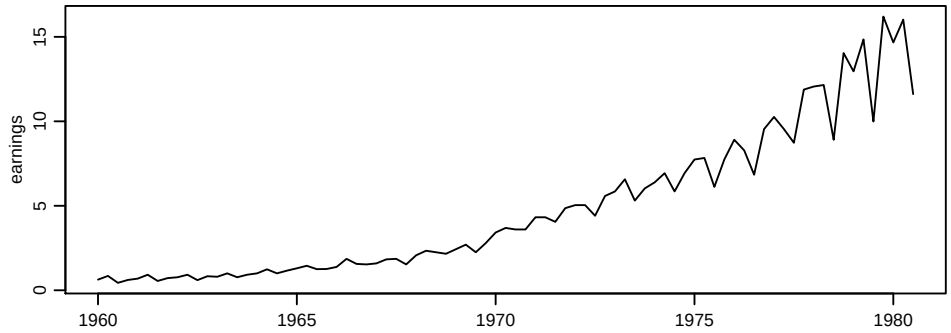
a) US treasury bill contracts from the Chicago market for 100 consecutive trading days in 1981.



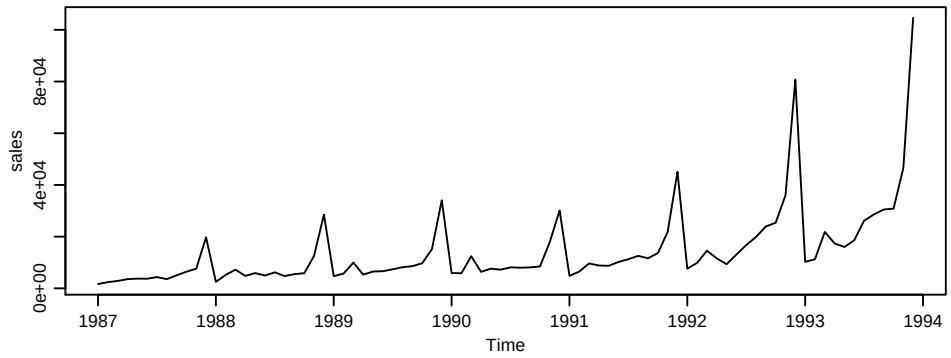
b) The underlying time series is the same as in Part a), the US treasury bill contracts from the Chicago market. Here, the data is plotted after taking differences to lag 1 of the logarithm of the time series.



c) Quarterly earnings per share of Johnson & Johnson, an American manufacturer of pharmaceuticals and medical devices:

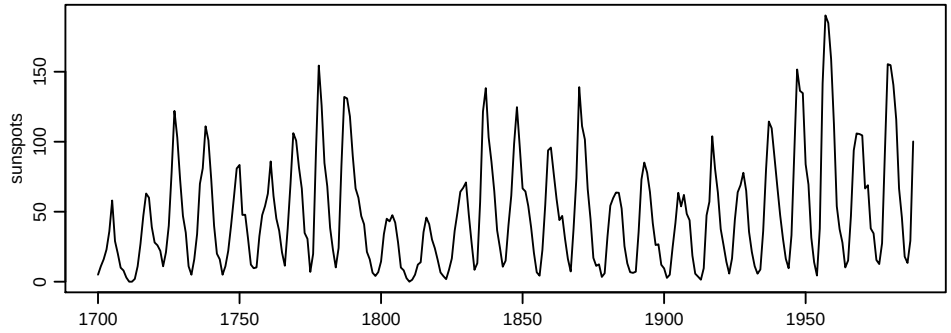


d) Monthly sales for a souvenir shop at a beach resort town in Queensland, Australia, for January 1987-December 1993 (original data from Wheelwright and Hyndman, 1998).

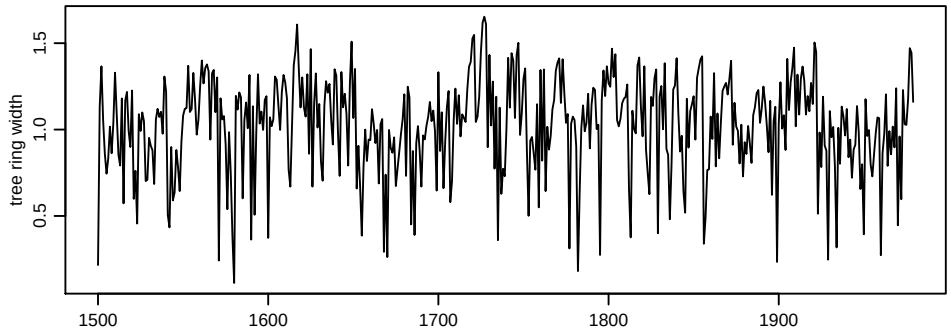


e) Again the "souvenir" time series of Part d), plotted after taking differences to lag 1 of the logarithm of the time series.

f) Yearly numbers of sunspots:



g) Widths of tree rings in the years from 1500 to 1979:



Exercise hour: Monday, February 20.