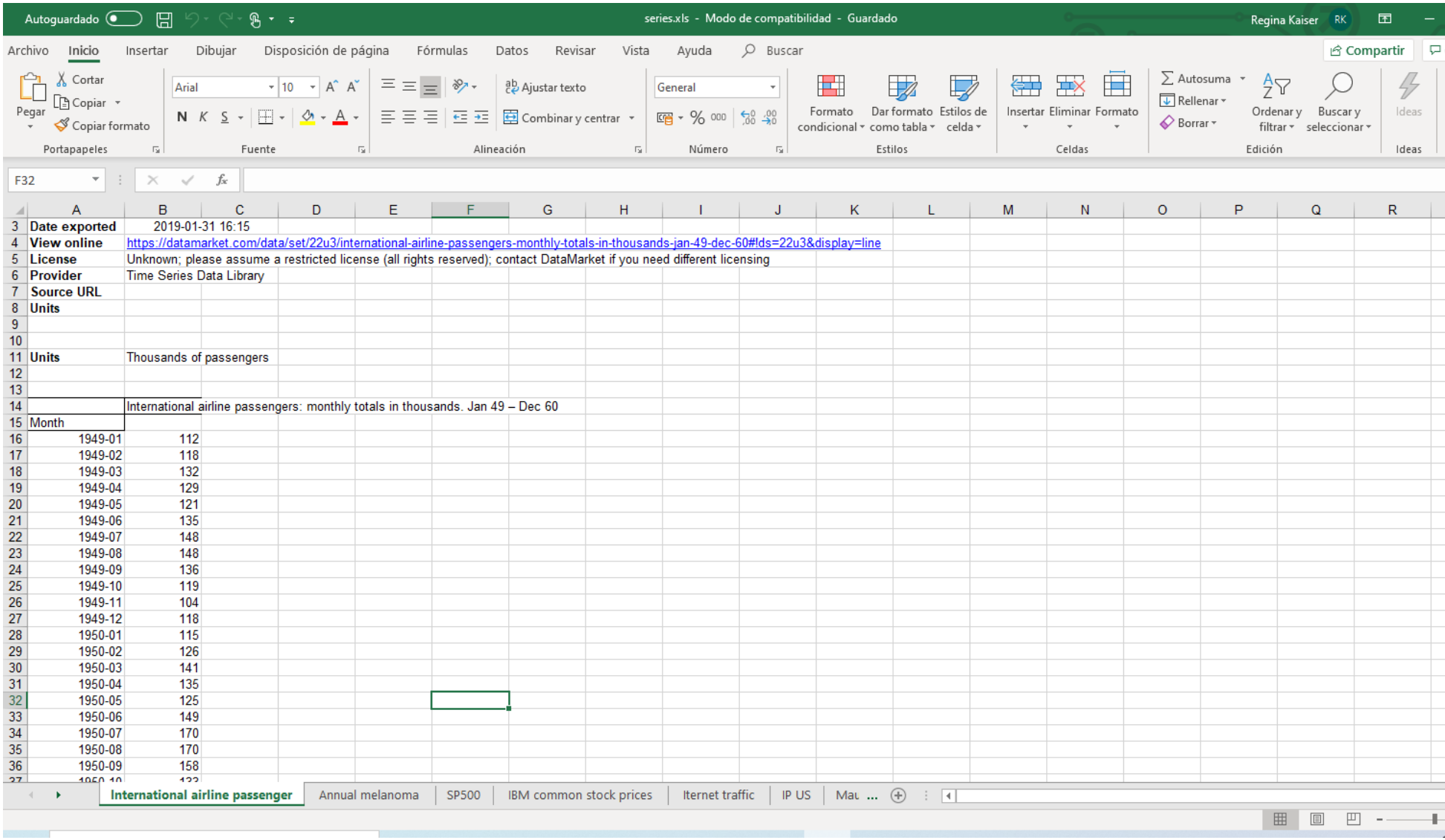
Time Series Analysis: First laboratory

29 de enero de 2020

Laboratory contents.

- Excel file with data.
- Read and plot time series data in R.
- Log transformation and differencing.
- Autocorrelation function and correlogram.
- Simulation of an AR(1) process and its ACF/PACF

Excel file with data.



	A	B
3	**Date exported**	2019-01-31 16:15
4	**View online**	https://datamarket.com/data/set/22u3/international-airline-passengers-monthly-totals-in-thousands-jan-49-dec-60#!ds=22u3&display=line
5	**License**	Unknown; please assume a restricted license (all rights reserved); contact DataMarket if you need different licensing
6	**Provider**	Time Series Data Library
7	**Source URL**	
8	**Units**	
9		
10		
11	**Units**	Thousands of passengers
12		
13		
14		International airline passengers: monthly totals in thousands. Jan 49 – Dec 60
15	Month	
16	1949-01	112
17	1949-02	118
18	1949-03	132
19	1949-04	129
20	1949-05	121
21	1949-06	135
22	1949-07	148
23	1949-08	148
24	1949-09	136
25	1949-10	119
26	1949-11	104
27	1949-12	118
28	1950-01	115
29	1950-02	126
30	1950-03	141
31	1950-04	135
32	1950-05	125
33	1950-06	149
34	1950-07	170
35	1950-08	170
36	1950-09	158

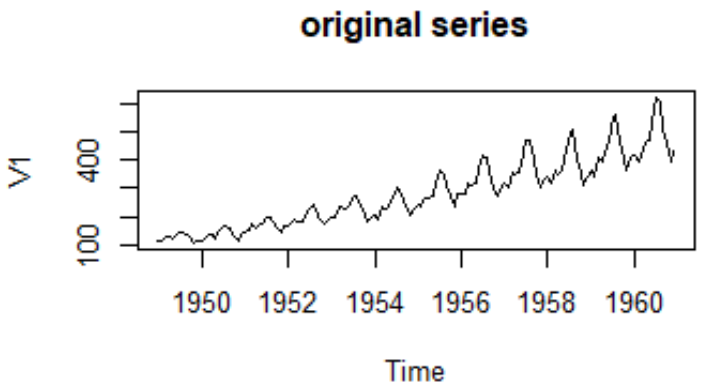
Read and plot time series data in R.

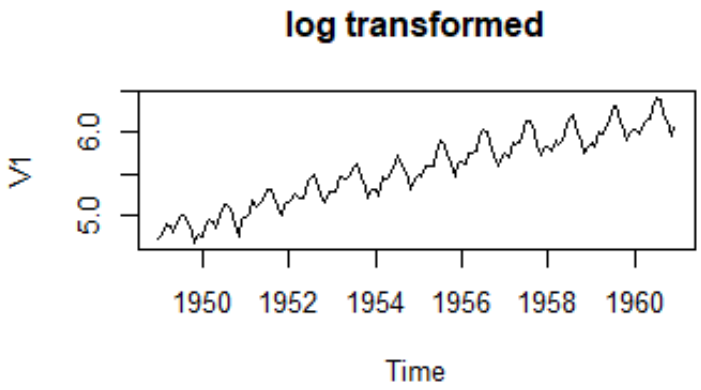
- To read data in R use read.table"with file=clipboard.
- To define the object as a time series use command "ts".
- To plot the time series use command "plot".

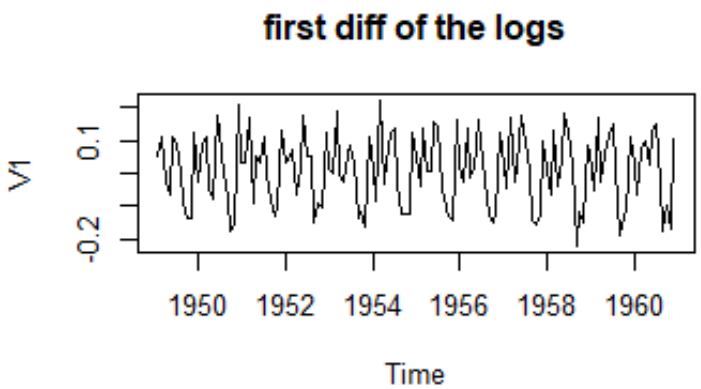
Log transformation and differencing.

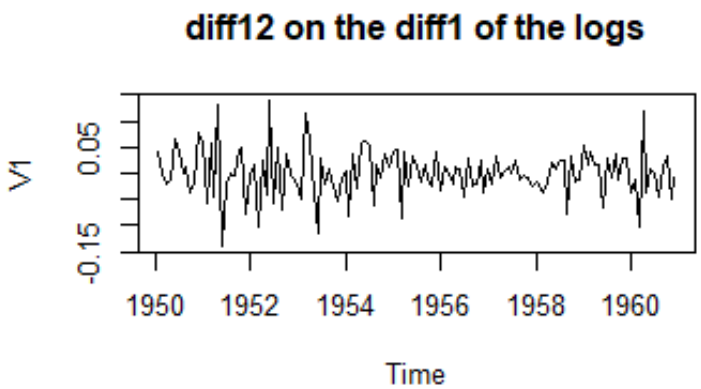
- Command "log" for the logarithmic transformation.
- Command "diff" for differencing.
- Example: take the series ïnternational air passengers", generate the log transformation, generate the first difference of the logs, generate the difference of order 12 on the first difference of the logs and plot the four series.

Example Airline Passengers.







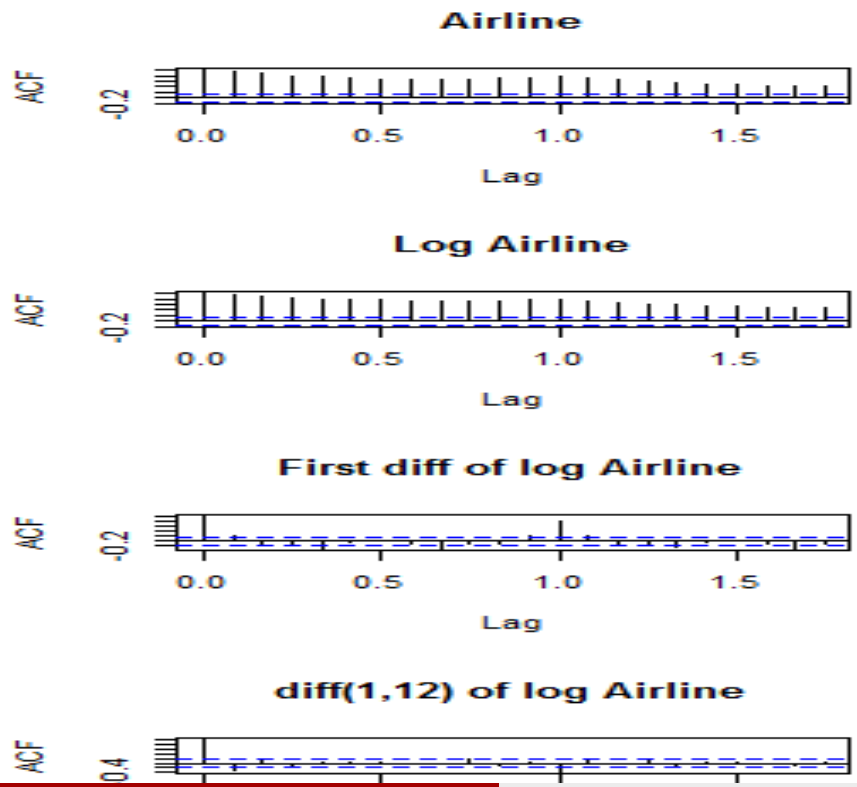


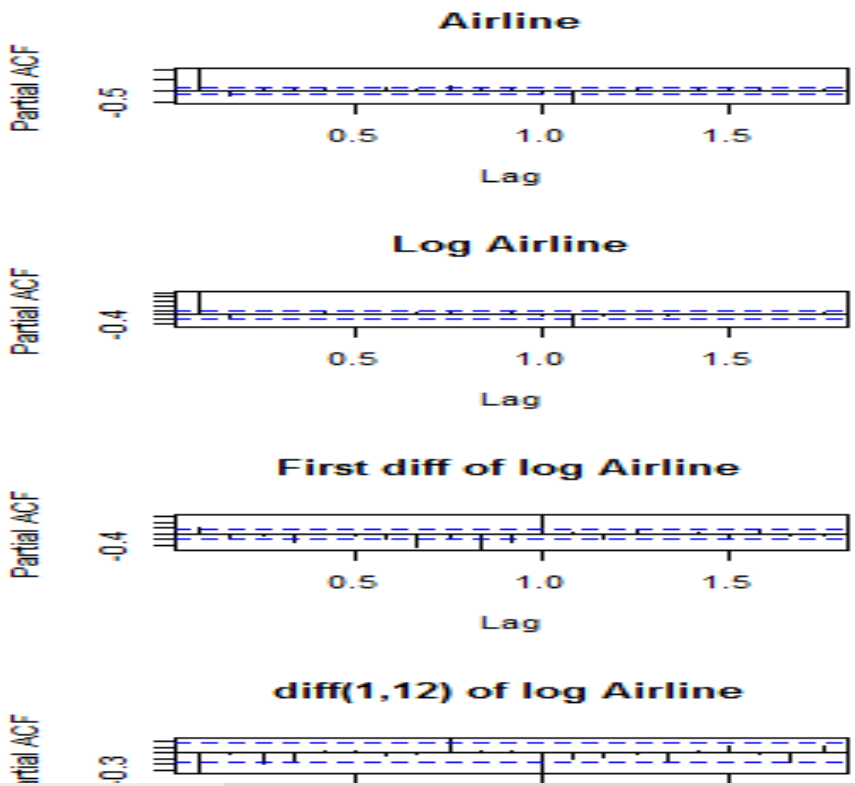
Autocorrelation Function and correlogram.

- Use of command .^{a}cf".
- Use of command "Box.test".
- Use of ommand "pacf".
- Example: Obtain the correlograms, Ljung-Box tests and partial correlograms for the passengers, log passengers, $\bigtriangledown$ log passengers and $\bigtriangledown\bigtriangledown_{12}$ log passengers.

Example Airline Passengers.

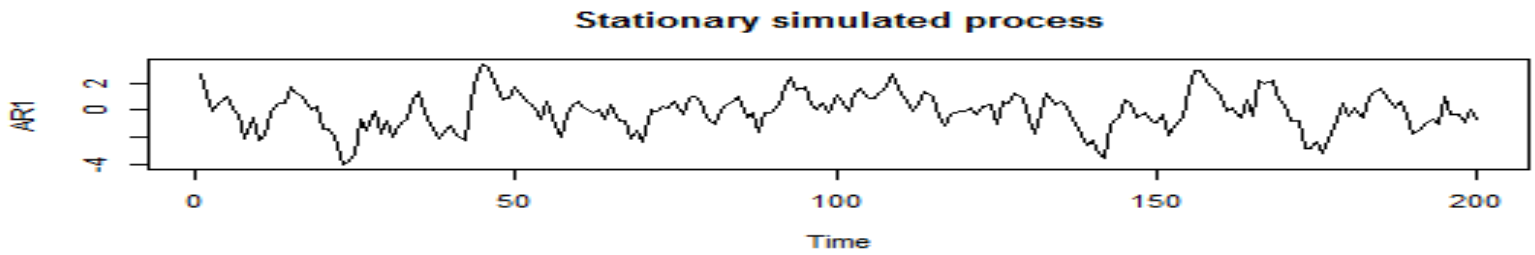
- $Q_{24}(pass) = 1471{,}5$; $Q_{24}(logpass) = 1635{,}9$; $Q_{24}(dlpass) = 282{,}64$; $Q_{24}(ddlpass) = 67{,}25$ Null hypothesis is rejected for all of them.

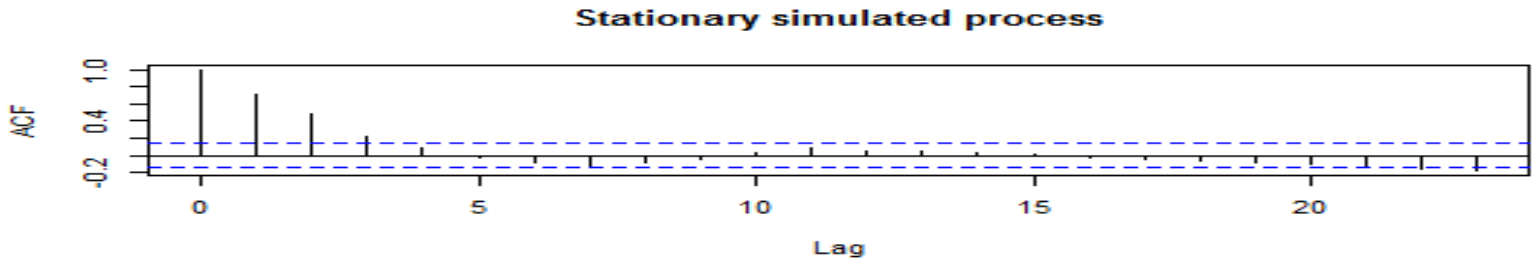


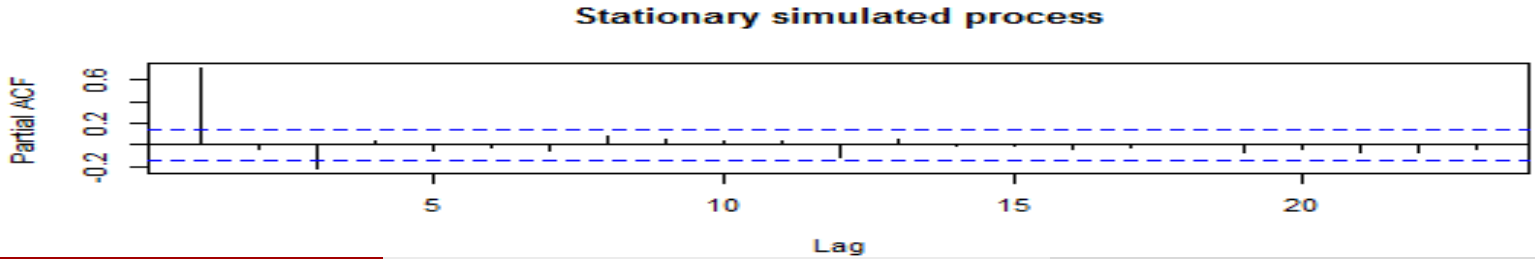


Simulated process.

- Simulate the process $x_t = 0{,}8 \cdot x_{t-1} + a_t$ being $a_t \sim N(0, 1)$ Plot the original series, the correlogram and partial correlogram







Assignment. Deadline Feb, 6th .

- Select one of the series in the series.xls file (or any other source)
- Plot the series and discuss weak stationarity (mean, variance)
- Use the acf, pacf and Ljung-Box test to support the stationarity/non-stationarity.
- Make all the transformations needed to render your series stationary and plot acf and pacf of the transformed series. Can you see any significant dependance in the new series?