

Home Assignment 1

Submission deadline: **10 May 2022** (before 23:59 CEST). Individual solutions to be submitted as an .R code file with comments to wischnewsy@uni-trier.de. Use the following label: <YourLastName>.R.

1. (10 points) **Modeling the 3-Month Money Market Interest Rates**

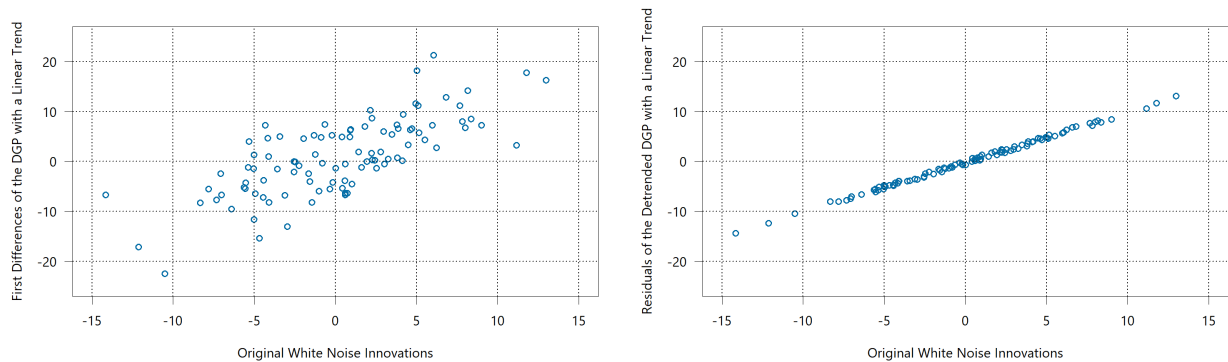
1. Read the `data1.xlsx` dataset into your working environment. Create three time series corresponding to the interest rates in the Euro Area, Denmark, and Sweden.
2. Familiarize yourself with the variables by plotting them separately and jointly in one graph.
3. Summarize, test the variables for normality, and compute the histograms. Which type of skewness is present?
4. Which pair of the three variables is the closest to each other? Show your conclusions.
5. Now focus on the period starting from the year 2013. What has changed with respect to 3. and 4.?
6. Convert the monthly data into quarterly. Calculate the average annual change based on the resulting time series.
7. Use the original monthly time series for Sweden for the rest of the analysis. Check this variable for the existence of a trend. Take the necessary actions.
8. Determine the appropriate lag length for an ARIMA(p,d,q) model. Estimate it and interpret the results.
9. Perform a test for residual autocorrelation. Justify the number of lags of your choice and interpret the results.
10. Forecast the interest rate for the period of March 2021–March 2022. Measure the accuracy formally and graphically. Comment on the results.

Useful functions: `graphics::hist()`, `stats::aggregate()`, `urca::ur.df()`, `ggplot2::autoplot()`

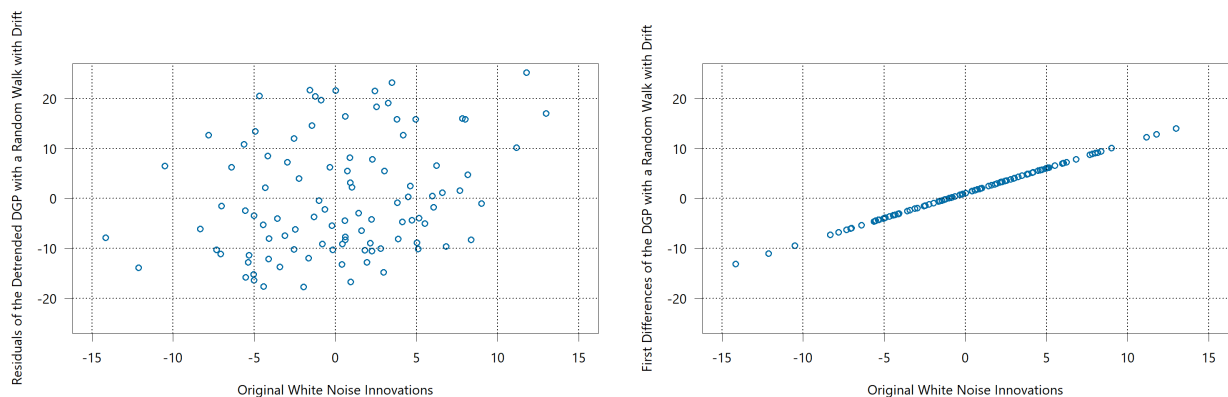
2. (2 points) **Bonus: Replication of Results**

Create a time series with a (i) deterministic trend and with a (ii) stochastic trend. Then, perform the necessary steps to replicate the following graphs using the same normally distributed white noise process.

(a)



(b)



Useful functions: `stats::rnorm()`, `base::diff()`, `stats::lm()`