

# Homework 1

Time series analysis, 2015/2016

Submission:

- By e-mail to [beata.ulohy@gmail.com](mailto:beata.ulohy@gmail.com) with subject **time series 2016 - HW 1 - name**.
- Submit: pdf file which includes all the explanation, graphs, results, etc., R-code used to produce these results and data for problem 2 in txt file.
- Deadline: Tuesday 8th March 2016

## Problem 1: Testing white noise

Load the R library `quantmod`, use it to get the data for the selected stock (your choice) and compute the logarithmic returns

$$return_t = \frac{price_t - price_{t-1}}{price_{t-1}}$$

For example for Amazon (AMZN) stock:

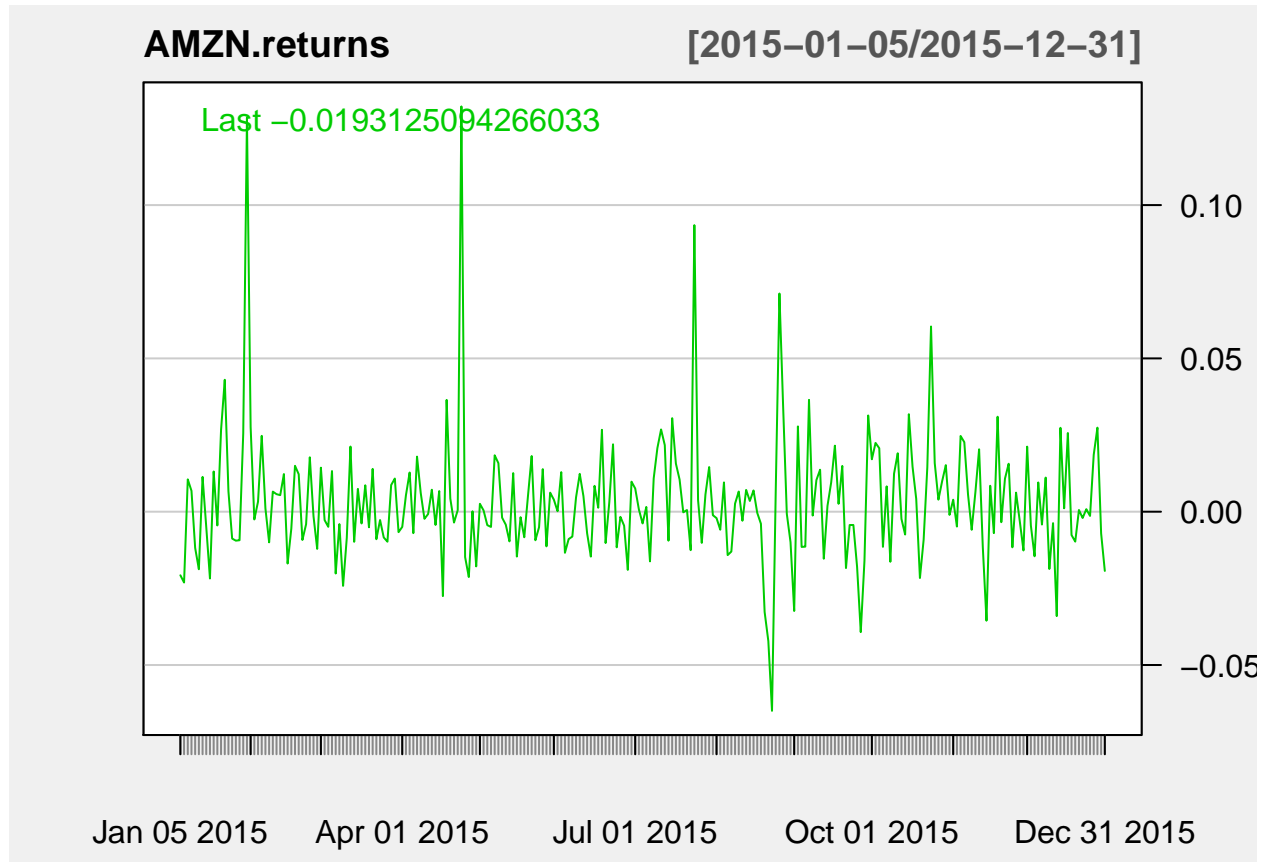
```
library(quantmod)
getSymbols("AMZN", from="2015-01-01", to="2015-12-31", auto.assign=TRUE)
```

```
## [1] "AMZN"
```

```
head(AMZN) # downloaded data
```

```
##          AMZN.Open AMZN.High AMZN.Low AMZN.Close AMZN.Volume
## 2015-01-02    312.58    314.75    306.96    308.52    2783200
## 2015-01-05    307.01    308.38    300.85    302.19    2774200
## 2015-01-06    302.24    303.00    292.38    295.29    3519000
## 2015-01-07    297.50    301.28    295.33    298.42    2640300
## 2015-01-08    300.32    303.14    296.11    300.46    3088400
## 2015-01-09    301.48    302.87    296.68    296.93    2589500
##          AMZN.Adjusted
## 2015-01-02          308.52
## 2015-01-05          302.19
## 2015-01-06          295.29
## 2015-01-07          298.42
## 2015-01-08          300.46
## 2015-01-09          296.93
```

```
# returns which we are interested in
AMZN.returns <- diff(log(AMZN$AMZN.Adjusted))
chartSeries(AMZN.returns, theme="white")
```



Use the sample ACF with corresponding confidence intervals and Ljung-Box test to answer the question, whether returns look like a white noise or not.

In each case (ACF, Ljung-Box) clearly specify the null hypothesis which you test, what test statistics do you use, how the test works (i.e., when you reject the null hypothesis) and what conclusion you arrive to. What is your overall conclusion about returns of the selected stock being a white noise?

## Problem 2: Bass model

Apply the Bass model to selected suitable data.

Describe the data and their source, give the estimated parameters of the model and graphically compare the actual values with the fitted values. Comment on the results.