CHALMERS | UNIVERSITY OF GOTHENBURG

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Financial Time Series TMS087/MSA410 – LP4 2014/15

Project 1

1. Download a stock price series of your choice of no less than 501 (consecutive) observations.

a) Create a log-return series sample of 100 observations and plot the sample path. (1p)

b) Compute the sample mean $\bar{X}_{100}$ and test it at 5% significance level if different from zero. (1p)

c) Compute the sample skewness

$$\bar{S}_n := \frac{1}{(n-1)\bar{\sigma}_n^3} \sum_{i=1}^{n} (X_i - \bar{X})^3,$$

where

$$\bar{\sigma}_n^2 := (n-1)^{-1} \sum_{i=1}^{n} (X_i - \bar{X})^2$$

denotes the sample variance, and test it at 5% significance level if less than zero. (1p)

d) Compute the sample kurtosis

$$\bar{K}_n := \frac{1}{(n-1)\bar{\sigma}_n^4} \sum_{i=1}^{n} (X_i - \bar{X})^4$$

and test it at 5% significance level if greater than 3. (1p)

e) Which test functions did you choose above and which values did they take? (3p)

f) Create a QQ-plot and/or PP-plot for the 100 observations and use it with the test results to decide if it is okay to assume that your log-returns follow a normal distribution. You can use that $\bar{S}_n$ and $\bar{K}_n - 3$ are asymptotically normal with mean zero and variances 6/n and 24/n, respectively for normal data. (2p)

2. Use the stock price series from Task 1 and create 500 log-returns.

Please turn!

a) Compute the sample ACF and PACF and plot graphs. (1p)

b) Implement two tests to test for autocorrelation at different lags and report your results. (3p)

c) Do the log-returns seem to follow an AR model? Give reasons for your answer. (1p)

d) Do the log-returns seem to follow an MA model? Give reasons for your answer. (1p)

3. Use the stock price series from Task 1 or a different one, where you believe that seasonality is of importance, and create 500 log-returns. The goal of this task is to remove trend and seasonality.

a) Implement two tests to estimate and/or eliminate seasonality out of the data. Plot the original and the time series without seasonality. How did you choose and estimate the period d? Did the implemented methods lead to the same result? (2p)

b) Use your new obtained time series without seasonal component to estimate the trend in your data. Plot the new time series without trend and seasonality. How does it look like? (2p)

c) Test your remaining time series without trend and seasonality for stationarity. What do you obtain? Try to explain why you succeeded or did not succeed to eliminate trend and seasonality out of your data. (3p)

Deadline: Friday, May 8, 2015, 8AM
Webpage:
`http://www.math.chalmers.se/Stat/Grundutb/CTH/tms087/1415/`
Requirement: To pass the course, both projects as well as the final exam have to be passed. To pass this project, you need 11 points.
Formalities: You are allowed to work in groups up to two. Nevertheless, everybody should hand in his project individually to make sure that it arrives on time. Send your project report as pdf document to both annika.lang 'at' chalmers.se as well as annika.lang.chalmers 'at' analys.urkund.se. Your report should include all plots, explanations, and answers to the questions as well as your implemented code in an appendix. The code in your preferred language should include comments to be readable. Emails received after the deadline will be considered "failed".