CHALMERS | UNIVERSITY OF GOTHENBURG

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Financial Time Series TMS087/MSA410 – LP4 2014/15

Project 2

1. Assume that $(r_t, t = 1, \dots, n)$ is a log-return series that has been centered at zero so that

$$\mathbb{E}(r_t^2) = \sigma_t^2,$$

where σ_t^2 is the volatility. Assume that we can express the log-returns by

$$r_t^2 = \sigma_t^2 + \varepsilon_t,$$

where $(\varepsilon_t, t = 1, \dots, n)$ is assumed to be IID noise with variance σ^2.

Using 500 financial return observations of your choice, fit a Nadaraya–Watson volatility estimator with a Gaussian and an Epanechnikov kernel. Present plots of the estimated volatility and the returns. Describe how you chose the bandwidth for the Nadaraya–Watson estimator. (12p)

2. Download 500 simple returns of your choice and compute the corresponding log-returns. Build a GARCH model using first Gaussian and then Student-t distributed innovations by fitting the corresponding ARMA models. Which noise does fit your data better and why? Use your preferred model to do 1- and 2-step-ahead forecasting by forecasting of the corresponding ARMA model and by parametric bootstrap. Evaluate your forecasts and decide which method performs better. (12p)

3. Download 500 simple returns of your choice and compute the corresponding log-returns. Divide your observations in two subsamples and use one subsample to fit a bilinear model to the data. Use parametric bootstrap to compute 1- to 5-step-ahead forecasts. How did you choose the number of computed realizations M and why? Furthermore evaluate your forecasts using the mean squared error and the distributional measure. Do both measures indicate the same performance of your estimator? Feel free to change the number of observations if you feel that this would improve your estimates and forecasts. (12p)

Deadline: Wednesday, May 27, 2015, 10PM

Please turn!

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 18 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".