TMS086/MSA410: Financial Time Series – Hand in 1

Formal instructions: You work in groups of two persons or less. You may use any (and as many) statistics package(s) you like as long you get the job done. A word-file or pdf (created with serious software) containing detailed and well motivated solutions should be sent to mattib.chalmers'at'analys.urkund.se AND to mattib'at'chalmers.se no later than 12am May 14th. Reports not sent to 'urkund' are considered NOT handed in. Reports handed in after the deadline cannot give a grade higher than 3 or G, i.e. pass. The results from this hand in will be weighted to account for one third of your total grade, however you have to get at least 12 points from this hand in to pass the course. If you do not accumulate 12 points I will let you know and return your hand in with suggestions for improvements. Maximum points per task are given below.

1. Download a stock price series of your choice of no less than 501 (consecutive) observations. Create a log-return series sample of 100 observations and compute (and test at 5% significance level for):
   (a) Sample mean (population mean different from zero). (1p)
   (b) Sample skewness (population skewness less than zero). (1p)
   (c) Sample kurtosis (population kurtosis greater than 3). (1p)
2. Which test functions did you use above and which values did they take? (3p)
3. Create a QQ-plot and/or PP-plot (which should be enclosed in the report) for the 100 observations used above and the results from the tests above to decide if it is ok to assume that log-returns follow a normal distribution. (2p)
4. Using 500 log-returns (from the prices above or some other prices), create graphs (which should be enclosed in the report) of the ACF and the PACF.
   (a) Do the graphs indicate that log-returns follow an AR model? (1p. Just yes or no will give no points)
   (b) Do the graphs indicate that log-returns follow an MA model? (1p. Just yes or no will give no points)
5. Using 500 log-returns (from the prices above or some other prices) to
   (a) Create 95% (historical) VaR using a 21-day variance window, GARCH(1,1) and GJR assuming standard normal white noise.
   (b) Create a graph (to be enclosed in the report) with log-returns and the three VaR series. (3p)
   (c) Are the VaR models really 95%, i.e. can you reject the null hypothesis of 5% violations? (2p. Hypotheses, Test function specification, computation of test function value and p-value are required to get all 2 points)

(d) Use the Diebold-Mariano test, at 5% significance level and with absolute or squared loss, to decide if the is significant performance difference between GARCH and GJR using squared returns as a proxy. (2p)

6. In a real life risk management situation you could use the above result to decide on which of the three models to use (assuming that you only have these three to choose from) but how would you then implement the chosen model? How long windows of learning data would you use? How often would you re-estimate the parameters of the model? Can you improve performance of the chosen model by using a standardized t-distribution instead of the standard normal for the white noise? Derive empirical results presented in graphs and/or tables that support your findings. Is there a better proxy to use in the DM test than the one used above? (5p)