This assignment is concerned with VaR. Assume that the probability of interest is 1% and the financial position is long with $1 millions for each of the two stocks involved. Two data sets are used. The first data set consists of the daily simple returns of the Qualcomm stock from January 1998 to December 2007 for 2514 observations. The second data set contains the daily simple returns of the McDonald’s stock for the same period. The data are in files d-qcom9807.txt and d-mcd9807.txt. Each file has two columns, namely date and sample return. Transform the simple returns into log returns, in percentages.

1. Consider the Qualcomm stock.
   - Calculate the VaR of your position for the next trading day using the RiskMetrics method at the time point $T = 2514$. (You may estimate the IGARCH(1,1) model without constant to obtain the parameter values needed in the calculation.)
   - Build a GARCH(1,1) model for the log return series with Gaussian innovations. What is the VaR based on the fitted model?
   - Build a GARCH(1,1) model with $t$-innovations for the log return series. What is the VaR based on the fitted model?

2. Again, consider the daily log returns of Qualcomm stock. Using blocks of size 21, fit a generalized extreme value distribution to the negative return series. Write down the estimates and their standard errors. Compute the 1% VaR of your financial position based on the fitted parameters. What is the 1% VaR of your financial position for the next 10 trading days?

3. Again, consider the negative log returns of the Qualcomm stock. Fit a generalized Pareto distribution to the return series with threshold 4.0%. Based on the fitted model, what is the 1% VaR of your position? What is the associated expected shortfall? Repeat the analysis using threshold 5.0%. Are the results sensitive to the choice of thresholds?

4. Consider now the log returns of McDonald’s stock. Calculate the VaR using RiskMetrics method. Also, what is the VaR for the combined position of Qualcomm and McDonald’s stocks?
5. Again, consider the daily log returns of McDonald’s stock. Using blocks of size 63, fit a generalized extreme value distribution to the negative returns. Write down the estimates and their standard errors. Compute the 1% VaR of your financial position based on the fitted parameters. Repeat the calculation if block sizes of 21 are used. Are the results sensitive to the choice of block sizes?