Tutorial 3

1. ARCH(q) model.

(a) Why would an ARCH model be preferred to an ARMA model for modeling a financial time series?
(b) Is it reasonable to assume normal distribution of innovation sequence?
(c) What are the possible limitations of an ARCH model?
(d) Plot the daily log-returns of DAX. What can be inferred from the plot? Fit the data on daily log returns to ARCH(q) model.

2. Univariate GARCH(p,q) model.

(a) Recall the GARCH model. How can the parameters be interpreted?
(b) Fit the data on daily log returns to GARCH(p,q) model. Compare the results with those from the exercise 1 part (d).
(c) Assume an autoregressive structure (of order 1) of conditional mean in the mean equation. Re-estimate the model and comment on the results.
(d) Assume that daily log-returns of DAX are represented by GARCH(1,1) model. Is the normal distribution of innovation term appropriate to use? If not, what could be possible alternatives? Justify your answers.
(e) Explain the difference between symmetric and asymmetric GARCH models (AGARCH, GJR-GARCH, NIC, EGARCH).
(f) Estimate GJR-GARCH model, EGARCH for daily log-returns of DAX. Compare the results.
(g) What effect does GARCH-M capture? Fit the daily log-returns of DAX to the model.

3. Multivariate GARCH model.

(a) In which case would a multivariate GARCH model be used?
(b) What are the drawbacks of multivariate GARCH models?
(c) Calculate and plot rolling average correlations based on approximately 1 year (m = 250) observations of NASDAQ and S&P 500.
   
   Hint: For rolling window correlations use the equation defined by
   \[ @movcor(y(m), x(m), 2 \times m + 1) \], where \(@movcor – EViews function for calculation of m-period backwards moving correlation, y, x – time series of interest, m – the size of the window. \]