**Tutorial Activity 10**

**Week 11**

In this tutorial, the objectives are as follows:

* To compute the variance of the foreca
* st error.
* To model the volatiluity using asymmetric models in R.
* To generate and analyze the news impact curves.
* To employ the likelihood ratio tests for restrictions in non-linear models.

1. Suppose that the simple return of a monthly stock index follows the MA(2) model.

, .

Assume that and . Compute the 1-step-ahead forecasts of the return at the forecast origin . Also compute the lag-1 and lag-2 autocorrelations of the return series. What is the standard deviation of the associated forecast error?

Forecast error is defined as where *h* (*h*=1,2,...) is the forecast horizon and is the information set available up to and including time .

**Student Activity**

Compute the 2-step-ahead forecast of the return at the forecast origin . What is the standard deviation of the associated forecast error?

1. Consider the daily stock index of S&P 500 (^GSPC) from January 3, 2011 to October 08, 2018. You may download the prices using **quantmod** package. The prices will also be available in the file **sp500.csv** in the working dyrectory through **write.csv command**. Compute the log return series. Multiply the log returns by 100 to obtain the percentage returns. Let be the percentage log returns. Install **rugarch,** **sos,** **portes,** **quantmod,** and **fBasics** packages into your computer. The R commands are given in **Tut.10.R** scripts file.
2. Consider series. Provide the descriptive statistics and conduct the normality and serial dependence tests.
3. Fit ARMA(1,0)-GARCH(1,1) and ARMA(1,0)-EGARCH(1,1) models assuming normal distribution to the series.
4. Obtain the normal QQ-plot of the standardized residuals, and write down the fitted model. Is the model adequate? Why?
5. Examine the GARCH plots using **plot(sgarch.fit, which=11)**.
6. Create and analyze the news impact curves for ARMA(1,1)-GARCH(1,1) and ARMA(1,1)-EGARCH(1,1) models with Gaussian distribution.

**Student Activity**

Compare the news impact curves generated by the following commands:

1. **plot(sgarch.fit, which=12)**

and,

1. **ni=newsimpact(z = NULL, sgarch.fit) ## chane the ugarchfit object**

**plot(ni$zx, ni$zy, ylab=ni$yexpr, xlab=ni$xexpr, type="l",**

**main = "News Impact Curve for GARCH(1,1)")**

1. Let where is the sample mean of . Fit a AR(1)-TGARCH(1,1) model with a constant term in the volatility equation to the series. Write down the fitted model. Is the leverage effect statistically significant? Why?
2. Suppose that a researcher wanted to test the null hypothesis that and in the standard AR(1)-GARCH(1,1) model for S&P 500 log returns. Explain how this might be achieved within the maximum likelihood framework.