**Tutorial 5**

**Week 6**

1. R revision - writing the data or output to a file in a working dyrectory.
2. You have estimated the following ARIMA(1,0,1) model for daily crude oil returns. Crude oil prices are given in **crude.txt** file.

(1)

You have data for time to , i.e. you know that , and

1.9346. Estimated parameters of model (1) are: , , .

Remark:

A non-seasonal ARIMA model can be written as

or equivalently as

where and is the mean of

Therefore, Eq. 1 can be writtes as

where

1. Obtain forecasts for the series for times , , , , and using the estimated ARIMA(1,0,1) model.
2. If the actual values for the series turned out to be -1.41651001, -1.33641163, -0.04016871, -0.24135169, 0.00000000 for , , , , and calculate the (out-of-sample) mean error, root mean squared error, and mean absolute error.
3. Calculate the return forecast using the simple moving average and compare it with the forecasts generated by ARIMA(1,0,1) model.

A simple moving average model is given by:

|  |  |
| --- | --- |
|  | (2) |

Take in this exercise.

Note that since we are not considering the rolling window in this exercise is considered to be constant for the entire forecast horizon (i.e., h=5).

1. Explain what stylised shapes would be expected for the autocorrelation and partial autocorrelation functions for the following stochastic processes:
2. white noise
3. an AR(2)
4. an MA(1)
5. an ARMA (2,1).
6. Consider the following ARMA process.
7. Determine whether the MA part of the process is invertible.
8. What procedure might be used to estimate the parameters of an ARIMA model? Explain, briefly, how such a procedure operates, and why OLS is not appropriate.