

ST3233: Tutorial 5

October 2016

1 MA(q) or AR(p)

The files `tut5_ts1.dat` and `tut5_ts2.dat` contains two time series of length $T = 10^3$.

1. Load these files and display these time series.
2. Using the ACF/PACF, propose a model (i.e. AR(p) or MA(q)) for each one of these two time series.
3. Read the R documentation for the function `arima(...)` to find out how to fit an AR(p) or an MA(q) model to these time series.

2 SP 500

The file `tut5_SP500.csv` contains a file directly downloaded from google finance <https://finance.yahoo.com>; it contains the historical price of the financial index SP500.

1. Load the file and plot the “Open” price time series. In the remaining of this exercise, we call this time series $\{x_k\}_{k \geq 0}$.
2. Create the log-returns time series y_k defined as $y_k = \log[x_k/x_{k-1}]$. Plot the time series of the log-returns.
3. Display the ACF and PACF of this time series.
4. We would like (naively) to model the time series of the log-returns by an MA(2) process,

$$y_k = W_k + \alpha W_{k-1} + \beta W_{k-2}$$

Use the command `arima(...)` to obtain estimates $\hat{\alpha}$ and $\hat{\beta}$.

5. Simulate a new time series \tilde{y}_k that follows an MA(2) model,

$$y_k = W_k + \hat{\alpha} W_{k-1} + \hat{\beta} W_{k-2}.$$

If the MA(2) model was an appropriate model for $\{y_k\}_{k \geq 0}$, the simulated time series $\{\tilde{y}_k\}_{k \geq 0}$ should roughly look similar to $\{y_k\}_{k \geq 0}$. Is this the case?

6. Try to find some reasons why the MA(2) model is not a good approach.
7. Is non-Gaussianity the only problem?