ST3233: Tutorial 1

August 2016

1 Mean and covariance computations

Consider a white noise process $\{W_k\}_{k \geq 0}$ with variance $\mathrm{Var}(W_k) = \sigma_W^2$.

1. Consider the time series $\{Y_{k \geq 1}\}$ defined by

$$Y_k = W_k - \frac{1}{2} W_{k-1}.$$

   Compute the mean $\mathbb{E}[Y_k]$ and covariance function $\mathrm{Cov}(Y_p, Y_q)$

2. Consider the time series $\{Y_{k \geq 1}\}$ defined by $Y_0 = 1$ and

$$Y_k = Y_{k-1} \times W_k.$$

   Compute the mean $\mathbb{E}[Y_k]$ and covariance function $\mathrm{Cov}(Y_p, Y_q)$.

3. Consider the time series $\{Y_{k \geq 1}\}$ defined by $Y_0 = 0$ and

$$Y_k = \frac{1}{2} Y_{k-1} + W_k.$$

   Compute the mean $\mathbb{E}[Y_k]$ and variance function $\mathrm{Var}(Y_k)$.

2 Temperature in Singapore

Consider the dataset contained in `temperature_in_singapore.csv`.

1. Load the dataset and plot it. You may want to use the command `ts(...)`. Use the R help if you are not familiar with this command.

2. Decompose the time series into a trend, seasonal and reminder time series.

3. Plot the seasonal pattern. Does it look alright to you?

4. Use the command `forecast(...)` to make a forecast for the monthly temperature in Singapore in the next few months.