ST3233: Tutorial 3

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1 Triple Exponential Smoothing

Index	1	2	3	4	5	6	7	8
y_k	-1	-1	1	0	0	1	?	?
L_k	0	0	0					
b_k	0	0	1					
s_k	0	0	0					
$Forecast$							?	?

Use the triple exponential smoothing algorithm to make forecast up to time $k = 8$. You will use

$$\alpha = 0.5, \quad \beta = 0.5, \quad \gamma = 0.5, \quad m = 3.$$

2 Simple Exponential Smoothing

Consider a white noise process $\{W_k\}_{k\geq 0}$ with variance σ_W^2. A Simple Exponential Smoothing with parameter $\alpha = 0.2$ and initial forecast $F_0 = 0$ is fitted to this white noise:

$$F_{k+1} = \alpha\, W_k + (1 - \alpha)\, F_k.$$

Compute the variance of F_k and compute $\lim_{k\to\infty} \mathrm{Var}(F_k)$.

3 Simple Exponential Smoothing

Consider a white noise process $\{W_k\}_{k\geq 0}$ with variance $\sigma_W^2 = 1$.

1. Generate a realization of length $T = 200$ of a drifted random walk defined as $y_0 = 0$ and $y_k = y_{k-1} + \delta + W_k$ with $\delta = 1$; plot the generated time series.
2. Fit a Double Exponential Smoothing model to the first $N = 150$ values of the generated time series.
3. Make some forecasts F_k for time $151 \leq k \leq 200$ and compare it to the truth; you will superpose the forecasts and the truth on a same plot.

4 Consumption of Durian in Singapore

Use **Google Trends** (`https://www.google.com.sg/trends`) to download the number of internet queries in Singapore containing the word `durian`. Use this time series data and a triple exponential smoothing approach to predict the consumption of Durian in Singapore during the next few months.

5 Vivocity

You are a consultant advising a retailer based in the **Vivocity** mall in Singapore; he would like to estimate the number of people who will visit Vivocity during the next 12 month. Use data from **Google Trends** to carry out this analysis.