

Take-home exam of *SPECIAL RESEARCH* *TOPICS IN BUSINESS AND COMMERCE*

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Due: 2024/07/17 at the usual classroom

The dataset *stockmarket.dat* contains stock market data for seven cities for the period January 6, 1986 to December 31, 1997. It is available at

<https://www.fbc.keio.ac.jp/~potiron/stockmarket.dat>

You can read the dataset in R as usual. We will focus on two locations: Japan and Frankfurt. Please DO report R codes after your responses to the questions, i.e., at the end of the take-home exam.

1. Make 2 different plots (one for each location: Frankfurt, Japan) and comment. Do you think that the two time series are correlated?
2. Decompose the two time series using the function in R with a frequency of 261, which is the number of days from each year in our dataset. The decomposition should include three different components, i.e., the trend, seasonal component and the random component. Make two different plots (one for each location) of the decomposition and comment. In particular, do you think it is useful to make such decomposition?
3. Report the correlation between the two time series using the function in R and comment.
4. Can you plot a correlogram, i.e., autocorrelated function (ACF), for the two time series ? Comment the plots that you obtained.

5. Can you plot a correlogram and cross-correlogram for the two time series (such as Figure 3.2 in the book)?
6. Can you plot Holt-Winters exponential smoothing without trend and without seasonal component for the two time series?
7. Can you plot Holt-Winters exponential smoothing with trend and with seasonal component for the two time series?
8. Comment on the plots of the two previous questions. In particular, do you think it is adequate to use exponential smoothing with trend and with seasonal component? Do you see visible improvements on the plots when using them?