

STAT 443: Time Series and Forecasting

Lab 8: Forecasting - Part I

- The lab must be completed in R Markdown. Display all the R code used to perform your analysis.
- Create a pdf or html file and use it as your lab submission.
- Please ensure that the file you submit is in good order (e.g., not corrupted and contains the work you intend to submit). No late (re-)submissions will be accepted.

During this lab you will apply the Holt–Winters forecasting method in R. The time series in this case study is to be split into a *training set* (on which the model is fitted), and a *test set* (on which predictions from the model can be assessed).

Download the data file `souvenir.txt`. It contains monthly sales (in A\$) for a souvenir shop at a beach resort town in Queensland, Australia, for January 1987–December 1993. Import the data into R as a time series object.

1. Plot the time series and its acf and comment on what you see. If you deduce there is a seasonal effect, is it additive or multiplicative?
2. Extract the time series of sales figures between January 1987 to December 1992 (you can use the `window` command for this, or otherwise). Fit a prediction model based on the data from January 1987 to December 1992 using the R function `HoltWinters()`. Set the options according to what you decided above. Provide the parameter values for your smoothing model. Plot the fitted model.
3. Now use the prediction model from above to predict monthly sales from January 1993 to December 1993 via the `predict` function. Plot the predicted values along with 95% prediction intervals. Provide the forecast values for the first three months of 1993.
4. Do the observed values for the first three months of 1993 fall inside their corresponding 95% prediction intervals?
5. If you were to perform a transformation on the time series, what would you consider and why?