

Assignment 2

4181 - Applied Time Series

To be Submitted on Blackboard by Tuesday, February 23rd (2:20 PM)

Your homework submission should contain your R code, outputs from the R code (as long as it's not too lengthy) and plots. Please clearly answer each question; your answers should contain more than just R code.

- 1- Install the `zoo` package and the `rdatamarket` package.
- 2- Go to <https://datamarket.com/data/list/?q=interval:month%20provider:tsdl> , this website contains more than 200 time series with monthly observations. Choose one dataset.
- 3- Load the chosen dataset into R using the `dmseries` function. You will need to copy the link of your dataset and then input that to the function as such:

```
1 <- dmseries("https://datamarket.com/data/set/22y3/james-river-at-buchanan-va-1911-1960")
```
- 4- Plot the time series. Calculate and plot the acf of this time series. What does the acf plot suggest? Is there autocorrelation? Is it positive or negative? What are implications of positive (or negative) autocorrelation? Is there seasonality?
- 5- Fit a Holt Winters (HW) model to your time series with the `HoltWinters()` function. Plot the fit.
- 6- Calculate the one-step ahead forecasting error of your model from step 5. Calculate both the mean squared error (MSE) and the mean absolute deviation (MAD).
- 7- Fit an another HW model using multiplicative seasonality (your first fit was using additive seasonality since that is the default). Compare the MSE and the MAD of these two models.
- 8- Obtain the alpha, beta and gamma values of the Holt Winters model in step 5. Try changing these values, and record the MSE and MAD of each such parameter combination. Try this with at least 5 different parameter combinations. Provide a table with the parameters and the performances of all 5 models.
- 9- Based on your previous answers, if you had to pick one HW model for your dataset, what parameters would you use for α , β and γ ? What type of a seasonality component is more appropriate?

To be Discussed in Class on Tuesday, February 23rd

- 1- Install the `forecast` package.
- 2- Obtain the 2 step ahead forecast accuracy of your method.
- 3- Adapt your code from step 1 to calculate the forecasting accuracy of any n-step forecast.
- 4- Change your code and perform prediction using STL (via the `stl()` function) instead of Holt Winters. Calculate the one-step ahead, and 12-step ahead forecast accuracies of this model, and compare these numbers to that of HW.
- 5- Change your code and perform prediction using Neural Networks (via the `nnetar()` function). Calculate the one-step ahead, and 12-step ahead forecast accuracies of this model, and compare these numbers to that of HW and STL models.