PROG8430 – Data Analysis, Modeling and Algorithms

Assignment 3

Time Series Analysis

DUE BEFORE 10PM NOVEMBER 15, 2020

1. Submission Guidelines

All assignments must be submitted via the econestoga course website before the due date in to the assignment folder.

SUBMISSIONS

In the Assignment 3 Folder submit:

1. Your R Code
2. Your report in Word, following the template previously given.
   PLEASE DO NOT SUBMIT ZIPPED FILES

All variables in your code must abide by the naming convention [variable_name]_[intials]. For example, a variable I create for State would be State_DM.

You may only use the 'R' packages discussed and demonstrated in class:

1. pastecs
2. tseries
3. smooth
4. TTR

THIS IS AN INDIVIDUAL ASSIGNMENT. UNAUTHORIZED COLLABORATION IS AN ACADEMIC OFFENSE. Please see the Conestoga College Academic Integrity Policy for details.

IF YOU USE THE EXAMPLE CODE PRESENTED IN CLASS, THE COMMENTS SHOULD BE MODIFIED TO REFLECT YOUR WORK. FAILURE TO DO SO WILL RESULT IN LOST MARKS.

2. Grading

This assignment will be marked out of 25 and is worth 5% of your total grade in the course. Late assignments will receive a mark of 0.

3. Data

Each student will be using two datasets:

Welland20F.csv

Waterloo20F.csv

4. Background

Welland20F.csv contains average temperature by month for the city of Welland. The dates covered are January 1985 to December 1994.

Waterloo20F.csv contained total precipitation for Waterloo for the years 1970 to 1995.

Both datasets have been retrieved from Environment Canada from data generated by local weather stations.

You will be using basic time series analysis to describe and forecast temperature (or precipitation) for these two areas.

Your work should follow the format of the sample report used previously.

5. Assignment Tasks

Nbr	Description	Marks
SECTION 1: Welland Rain		
1	Data Transformation 1. Read in the Welland data and transform it into an appropriate time series datatype.	1
2	Descriptive Data Analysis 1. Summarize the precipitation information (mean, std dev, etc.) 2. Plot the time series data and make note of anything significant you observe. 3. Decompose the times series data in to the constituent components. Comment on each (any trends you observe, etc.) 4. Determine if the time series is stationary. 5. Deseasonalize the information and plot the result. 6. Add any comments about what you observe: seasonality of precipitation, trends, etc.	1 1 1 1 2 2
SECTION 2: Waterloo Precipitation		
1	Data Transformation 1. Read in the Waterloo data and transform it into an appropriate time series datatype.	1
2	Descriptive Data Analysis 1. Summarize the information (mean, std dev, etc.) 2. Plot the time series data and make note of anything significant you observe.	1 1 2

	3. Smooth the precipitation chart using a moving average. Try 3 different values for the moving average and choose the one you think best shows the trend (if any). 4. Determine if the time series is stationary. 5. Create an autocorrelation chart (using acf) and comment on which lags are significant. Do previous values seem to influence current values?	1 2
3	1. Create a simple moving average forecast of precipitation in Waterloo for five years beyond the data provided. Graph your results along with a 75% prediction interval. 2. Create an exponentially smoothed forecast of precipitation in Waterloo for five years beyond the data provided. Graph your results along with a 75% prediction interval. 3. Compare the two forecasts you created in steps 1 and 2 above. Which forecast seems superior? Why?	2 2 2
7	Professionalism and Clarity of Presentation 1. Your submission will be evaluated on the basis of professionalism and clarity of presentation.	2