Assignment 3

3 Possible Points

This assignment's due date is Tuesday, June 20th by 8:00 PM. The grading policy for late assignments can be found in the syllabus. You are strongly encouraged to work in groups of up to 4 students, but each of you must submit his/her own version of the assignment. Please put the names of your group members in a comment in the program.

Write a single text file that contains all of your work for this assignment. Name it ps3_[yourlastname].txt - for example, mine would be ps3_hoff.txt The text file should submit all of the commands necessary to answer the questions. Please put the answers to the **bold questions** in a comment line in your text file, even if you think the answer is readily apparent.

This assignment is designed to introduce you to the basic naive, averaging and exponential smoothing forecasting techniques. For exponential smoothing methods, use the `HoltWinters()` function in R. Note that this is monthly data starting in January of 1980.

Useful R Functions

- `ts.plot()`: allows overlay of time series with different number of time periods.
- `gpars()`: an option in `ts.plot()` that allows you to make your graphs look nice.
- `length()`: finds the number of elements in a vector.
- `abs()`: returns the absolute value of a vector.
- `predict()`: makes predictions for certain classes of objects.
- `n.ahead=` : tells R how many periods you'd like to forecast ahead.
- `lag()`: lags a time series object a specified number of lags. NOTE: you'll probably want to use negative values here.
- `HoltWinters()`: performs a Holt-Winters exponential smoothing procedure. To use this correctly with seasonal, you'll need to specify the frequency of the seasonality. Use visual inspection to help you figure out this frequency.
- `cbind()`: brings two or more vectors together.
- `data.frame()`: creates a data.frame object which produces similar results to `cbind()`.
- `shift()`: useful for creating lag and lead variables in a data.frame object. This function can be found on Springboard as it not a default R function.

Getting the Data

- Download and import the data titled ps3.csv from the course website.

Inspecting the Data

- Create a plot of the variable "fortw" (fortified wine sales).
- Create a plot of the ACF function for the same variable.
- **What kind of attributes does the data have? What forecasting techniques would be the best to use?**

Forecasting the Data

- Create a naive and exponential smoothing forecast for the variable "fortw". Make sure to take into account the attributes that you saw from the above plots. Make sure to produce plots with the actual data and forecasts overlaid (one graph per forecasting technique).
- **Using the Mean Absolute Percentage Error (MAPE) measure of error, which of the forecasting technique performs best? Do you agree with the results from the MAPE measure?**
- Create a forecast for 1 period ahead (i.e. outside of the sample).
- **Compare the 1 period ahead forecasts for the 2 different basic forecasting techniques.** Hint: the `predict()` function will be helpful for the exponential smoothing method.

Different Data

- Import the ps3b.csv data set from the course website into R.
- **Repeat entirety of the above analysis but with the variable x.**