**Forecasting Methods (FIN 335) – Final Project Spring 2018**

For this project you are asked to find two time series you can use to demonstrate the different methods for modeling and forecasting with time series we will have examined in this course. The FRED website should be a good source of the time series for this project, however you are certainly free to use others. One of the time series must be seasonal (monthly or quarterly) and one must be either seasonally adjusted or not seasonal to begin with (e.g. annual or daily data). Both time series should be long enough (T > 100 would be good) so that you can apply most, if not all, of the methods we have examined and can form training/test sets as needed.

You must clear your choice of the two time series with me first (the sooner the better) and I am happy to assist with the data importation process during my office hours if you are having any troubles. Just send me a link to the two time series you are considering, or send me each of the time series in Excel (.xls,.xlsx, or .csv format). You may also consider multiple time series where one of these series is viewed as the response series and the other series are viewed as predictor series , but you are not required to. I still plan to cover methods for doing this later in the semester.

The following should be parts of your analyses for this final project:

1. Preliminary graphs and analysis of the time series. This means plotting the time series in multiple forms: time series plot (autoplot), gglagplot, ggseasonplot, ggsubseriesplot, and the sample ACF where appropriate. You must discuss your findings using appropriate terminology and proper grammar. (15 pts. – 10 points for seasonal, 5 points non-seasonal).
2. For both series using the most appropriate basic forecasting method: naïve, mean, seasonal naïve, or naïve with drift for the two time series make a forecast using a reasonable value for . Include both a plot and table of this forecast. Be sure to justify your choice of method for each time series. (10 pts. – 5 pts. for each time series).
3. For the seasonal time series only, develop an OLS regression model that adequately models your time series and justify your choice of model by considering the following: (20 pts. total)

* AIC,AICc, and/or BIC
* Forecast accuracy using a training/test set approach.

Finally make a 2-year forecast using your model including both a plot and table of the results.

Be sure to include all relevant output and discuss your results.

1. For the seasonal time series only, use STL decomposition methods to do the following: (20 pts.)

* Decompose the time series and produce a plot of the seasonal, trend, and remainder components.
* Compute and plot the seasonally adjusted version of the time series.
* Make 2-year forecasts using the time series decomposition method (stlf). Include a plot and table of these forecasts.
* How does the accuracy of your forecasts using decomposition compare to your OLS model? To do this you will need to use the same training/test sets you used in part (c).

1. Use appropriate exponential smoothing methods, consider both classic (like SES or any of Holt’s methods) and the ETS approach, for both series to make forecasts for the next several time periods. Carefully and thoroughly justify the choice of the final exponential smoothing approach you chose for both series. If we call the number future forecast periods *h* you should consider a few values of *h,* e.g. *h = 12, 24, 36* for monthly data. Be sure to include all relevant output and plots. This must be done for both time series. (30 pts. – 15 pts for each series)
2. Use Box-Jenkins models (i.e. ARIMA) to model the time series and make future forecasts using the same future time periods as you used in part (e). Include plots and tables of these forecasts for both series. Carefully and thoroughly justify your choice of ARIMA model using appropriate methods. You might need to fit a few models to arrive at what you think is best for your time series, be sure to compare & contrast models you considered.   
   (30 pts. – 15 pts. for each series.)
3. Develop a Powerpoint presentation of the important highlights of your analysis of both time series. Do a complete discussion of the results of the non-seasonal time series followed by a complete discussion of the seasonal time series. Be sure to give sufficient background information for both time series including proper references.

Imagine you are doing this presentation to a potential employer at a job interview, i.e. do your very best! Sloppy presentation = poor grade = no job = (“Hello, can I take your order please?” or “Would you like fries with that?”). You will be presenting your work to the class at the scheduled final exam time.