Homework 7 and 8 for Materials Covered in Week 9 and 10

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Instructions:

The weekly assignment serves two purposes: (1) Review concepts, techniques, theories, statistical models covered during the week. (2) Extend the materials taught in the asynchronized lectures, assigned readings, and live sessions; some new concepts and/or techniques are introduced in the weekly assignment.

Below are specific instructions:

- **Due: 11/20/2016 (11:59pm PST)**
- You may complete this assignment on your own or in a group of no more than 3 students.
- When working in a group, you are strongly encouraged to complete the assignment on your own before discussing your group mates. Do not use the "division-of-labor" approach to complete the assignment.
- The homework is designed as a quantitative analysis. The instructions and questions are designed to guide you through the analysis of data using regression techniques. As such, you should think of it as a quantitative case study and the result of the study is a report with a set of well-written codes that can be used to reproduce the results in the report.
- Submission:
  - Submit your own assignment via ISVC
  - Submit 2 files:
    1. R-script or R markdown file
    2. A pdf file including the summary, the details of your analysis, and all the R codes used to produce the analysis
  - Each group only needs to submit one set of files
  - Use the following file naming convensation; fail to do so will receive 10% reduction in the grade:
    - **SectionNumber_hw07and08_LastNameFirstInitial.fileExtension**
    - Examples:
      - Section1_hw07and08_YauJ.Rmd
      - Section1_hw07and08_YauJ.pdf
      - Section1_hw07and08_TiwariD_YauJ.Rmd
      - Section1_hw07and08_TiwariD_YauJ.pdf

Objective:

The key objective of this homework is to practice the use of the autoregressive models and other foundational time series models.

Exercises:

1 **Pre-Anlaysis: Examine the series:** Load the given series and examine the series. What frequence is the series (please show it in R, not Excel)? What are the start and end of the series? Are there any missing values?

2 **Using data frame:** What are the pros and cons of using data frame to analyze time series?

3 **Subsetting the series:** Fore the rest of the analysis, include only the data in 2015 and 2016, excluding the last *6* data points in the series.

4 **Graphical Analysis:** Produce the time series plot of the series. Comment on the plot. Does it (or does it not) look like it can be modeled using the autoregressive model?

5 **Dependency Strucutre:** Plot the ACF and PACF graphs. Comment on these graphs. Does it "look like" a stationary series? Define (weak) stationarity. Does it (or does it not) look like it can be modeled using the autoregressive model?

6 **Estimation:** Estimate an AR model using the *ar()* function.

7 **Model "Selection":** Which model is selected based on the AIC? What does AIC measure? What are the pros and cons of using AIC to select model.

8 **Model Diagnostic:** Plot the residuals of the estimated model. Comment on the plot. Does it resemble a white noise series? What do you expect a white noise series to look like?

9 **Inference:** Compute the 95% confidence intervals of the parameter estimates. Explain the results.

10 **Forecasting:** Produce a *6 steps* ahead forecast. Explain your results. How well is your forecast compare relative to the actual values of data (i.e. that last *6* data points that you left out.)