Homework 1

Due: Thursday 1/31/19 by 12:00pm

Clearly, 1. and 2. do not have right or wrong answers - you will be given full credit for each as long as your responses indicate that you made an honest effort.

Course and Project Preparation

1. List up to three topics you hope we'll cover, from the most to least interesting to you. I will try to incorporate the most popular topics into the last few weeks of the course as time permits.
2. In a few sentences sentences, describe the kind of data you are interested in analyzing using the tools you gain in this course. The goal of this exercise is to get you started thinking about the kind of data you might use for your course project.

Regression Review and Basic Time Series Concepts

3. This problem will require that you work with the `chicken` data from the `astsa` package.

   (a) In class, we regressed the the monthly price per pound of chicken on an intercept and the times the chicken prices were measured, $\boldsymbol{t} = (2001 + 7/12, \ldots, 2015 + 11/12)$. Plot the residuals from this regression as a function of the month.

   (b) Using `lm`, regress monthly price per pound of chicken on an intercept, $\boldsymbol{t}$, and indicators for the month the price was recorded.

   (c) The `lm` function used in part (b) returns an estimate of σ_w. Is this the unbiased estimate s_w^2, or the maximum likelihood estimate $\hat{\sigma}_w^2$?

   (d) Describe and interpret the results of an F-test of the model used in (a) versus the regression model used in (b).

   (e) Compute AIC values for the the model used in (a) and the model used in (b). Based on AIC, which model provides a better fit? Do AIC and the F-test agree?

   (f) Plot the residuals from model (b) as a function of time.

   (g) Referring back to (f), do you see evidence of correlated residuals across time?

   (h) Plot the sample autocorrelation function of the residuals from model (b) for $h \leq 24$ without using the `acf` function or any other third party function that automatically computes the ACF. Include a dashed horizontal line at 0. Revisit (g) - do you see evidence of correlated residuals across time?