ME384Q.3 / ORI 390R.3: Time-Series Analysis

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Homework 1

Assigned Monday, January 28th, 2019;
Due Thursday, February 7th, 2019, in class

Problem 1: For the data enclosed in the excel file titled "HW1_Problem1.xls" please do the following:

a) Fit an AR(1) model to the data using methods we learnt in class. Determine the maximum likelihood estimate of the autoregressive coefficient ϕ_1, variance of the white noise in the AR(1) model and the variance of the maximum likelihood estimate of the parameter ϕ_1.
b) Comment on your result? What kind of a process does this look like?

Problem 2: For the retail sale data posted on the class website (originating form before the economic calamity of 2007/2008), please do the following

(a) Fit a line passing through the data (first order polynomial fit). Use regression methods used in class, with time t being indexed from 0 to length(data)-1 (month is the unit of time).
(b) Calculate residuals after you removed the first order fit and then fit an autoregressive model of order 2 – AR(2) to those residuals (again, months are units of time). Please mark the residual sum of squares after you fitted the AR(2) model.
(c) Take the same residuals obtained after fitting a line through the sales data, but now please fit an AR(4) model. Once again mark the residual sum of squares after you fitted the AR(4) model.
(d) Increase the order of the AR(k) model by fitting AR(6), AR(8), AR(10) and so on models. Do this until you fit AR(20). Please plot the residual sums of squares of these models as you increased the order of the AR models. Please comment on what you see.