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

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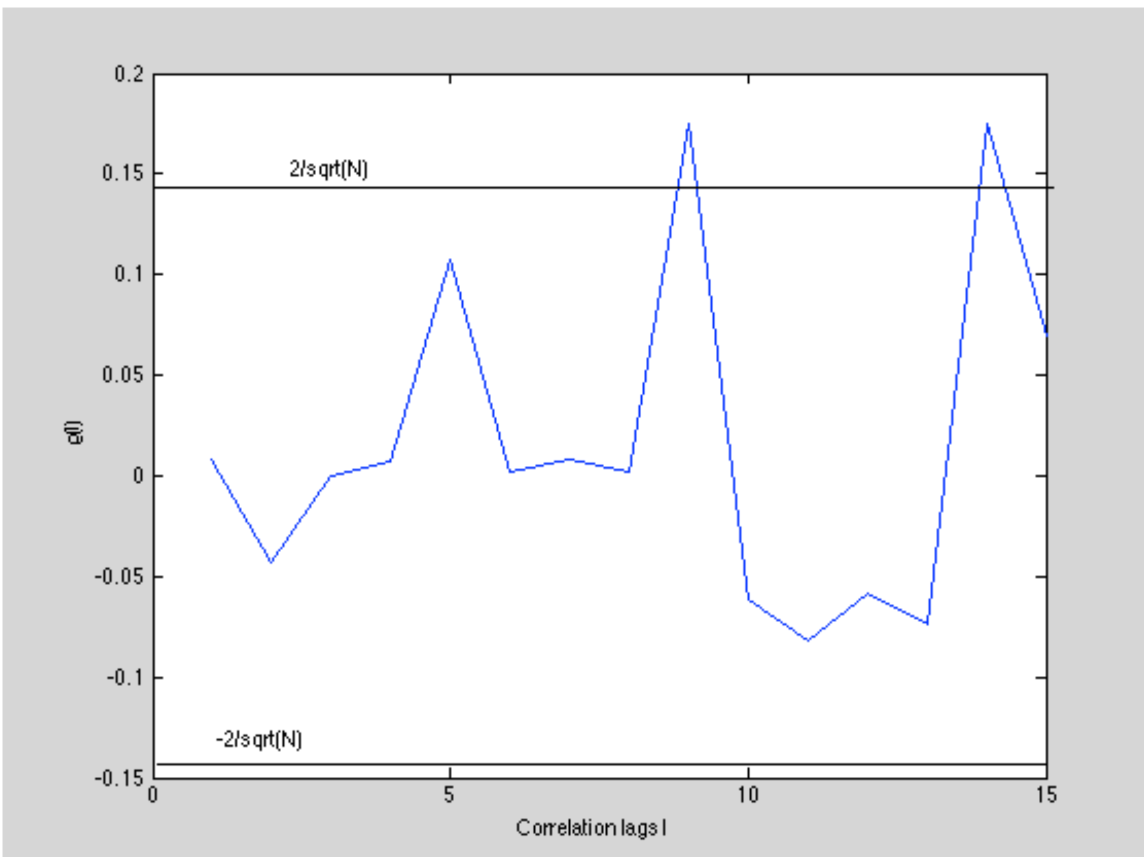
Homework 3 – Solutions

Wholesales Problem:

F-Criterion returns model ARMA(14,13). Please see the code enclosed for finding of an ARMA model using F-testing and feel free to use it in your projects

AIC Criterion returned model ARMA(19,18). Please see the code enclosed for finding of an ARMA model using AIC criterion. Please feel free to use that code for your projects.

Obviously, F-testing and AIC did not return the same model and one can explain that by the fact that the two approaches use different theoretical basis to pursue model structures. Ultimately, one needs to check the residuals of the modeling and select the model that gives uncorrelated residuals. Figure below shows correlations for the residuals obtained from the ARMA(14,13) model and it is obvious that they are uncorrelated. Hence, we can continue to use the ARMA(14,13) model.



Problem 4.8

Model ARMA(2,1): $N = 200$; $F_{0.95}(4,\infty) = 2.37$; $A_1 = 202.3$, $S = 4$, $r = 7$

The smallest sum of squares of ARMA(4,3) is given by

$F = \frac{A_1 - A_0}{S} + \frac{A_0}{N-r}$, or $2.37 = \frac{202.3 - A_0}{4} + \frac{A_0}{200-7}$, hence $A_0 = 192.828$.

Problem 4.10

$N = 120$; AR(1): $\hat{\phi}_1 = 0.9$; ARMA(2,1): $\hat{\phi}_1 = 1.32$, $\hat{\phi}_2 = -0.378$; $\hat{\theta}_1 = 0.41$

ARMA(2,1) model: $X_t - 1.32X_{t-1} + 0.378X_{t-2} = a_t - 0.41a_{t-1}$

Now $\lambda_1\lambda_2 = -0.378$, $\lambda_1 + \lambda_2 = 1.32$

Therefore $\lambda_1 = 0.9$, $\lambda_2 = 0.42$ are the roots.

i.e. $(1 - 0.9B)(1 - 0.42B)X_t = (1 - 0.41B)a_t$

The roots 0.42 and 0.41 nearly get cancelled. Therefore, the AR(1) is adequate and ARMA (2,1) does not give significant improvement.