DS 6373 Midterm Fall 2019 Take Home Portion Ver A

For both questions: Consider the half-hourly electricity demand in England and Wales from Monday, 5 June 2000 to Sunday, 16 July 2000.) Data: electricity.csv on GitHub in Unit 8 folder.

Question 1 (10 points):

Below is the realization, acf, periodogram and spectral density of the data.



Is this data stationary or non-stationarity. Discuss and defend your argument addressing all 3 conditions of stationarity. Provide visual evidence when you address condition 3.

Question 2. (20 points)

Which model do you think is most appropriate/useful for forecasting electricity usage (Model 1, Model 2 or Model 3)? Compare the models based on statistics, properties and characteristics we have learned in class. Answers are graded on completeness, correctness, convincingness and thoroughness.

Do this for two scenarios:

1. Forecasts for the next day of electricity usage.
2. Forecasts for the next week of electricity usage.

Model 1

Model 2

Model 3: Custom Model

Use fore.signalplus.wge() to fit a cos model. A good start is to type “?fore.signalplusnoise.wge” in the console to read the R information on the function. You will need to select the most useful frequency and the function will estimate the amplitude, phase shift and mean level (intercept). In addition, pages 260/261 and 266/267 will be of good help as well. As part of your answer, fully specify the model as in equation (6.61) on page 260. Hint: “(Intercept)” = A0 “xmtx1” = A1 “xmtx2” = A2 using attribute *$b* from the fore.signalplusnoise.wge() function call.

taylorShort = taylor[1:2000]

taylor\_336 = artrans.wge(taylor,phi.tr = c(rep(0,335),1))

aic5.wge(taylor\_336)

taylor\_336\_1 = artrans.wge(taylor\_336,phi.tr = 1)

aic5.wge(taylor\_336\_1)

est\_p3\_q1 = est.arma.wge(taylor\_336,p = 3, q = 1)

est\_p3\_q2 = est.arma.wge(taylor\_336\_1, p = 3, q = 2)

# s = 336, ARMA(3,1)

fore.aruma.wge(taylorShort,s = 336, phi = est\_p3\_q1$phi, theta = est\_p3\_q1$theta, n.ahead = 336, lastn = TRUE)

# s = 336, d = 1, ARMA(3,2)

fore.aruma.wge(taylorShort,s = 336, d = 1, phi = est\_p3\_q2$phi, theta = est\_p3\_q2$theta, n.ahead = 336, lastn = TRUE)

#signalplusnoise cos freq = 1/48

fore.sigplusnoise.wge(taylorShort,freq = 1/336,n.ahead = 336, linear = FALSE, lastn = TRUE)