Assignment - 8

BSAN 450 (Spring 2023)

**This assignment is due on April 18, 2023 at 9:00 PM Central. The total points possible are 100 and there are three (3) problems, each carrying equal points. You can form groups to attempt these problems. Each group will submit one copy of the assignment on Canvas, either in word or pdf, and the assignment should clearly include the names of the group members**.

1.This problem is the monthly values of manufacturer’s stocks of evaporated and sweetened condensed milk (case goods), Jan 1971 – Dec 1980. The data is in a file named evapmilk.csv and the name of the variable is Stock.

1. Read this time series into R Studio. Plot the time series and the sample ACF of the time series. Is this time series stationary? Justify your answer.
2. Plot the first difference of the time series and the sample ACF of the first difference. Is the first difference stationary? Justify your answer.
3. Plot the 12th difference of the time series, the sample ACF of the 12th difference and the sample PACF of the 12th difference. Is the twelfth difference stationary? Justify your answer.
4. Plot the 1st and 12th difference of the time series and the sample ACF and sample PACF of the 1st and 12th difference. Is the 1st and 12th difference stationary? Justify your answer. Based on the plots you have done, postulate a model for this time series.
5. Estimate the model (1*−φ*1*B*)(1*−B*12)*Yt* = (1*−θ*12*B*12)*t* and check the residuals. Are there any problems with this model?
6. Estimate the model (1 *−B*)(1 *−B*12)*Yt* = (1 *−θ*12*B*12)*t* and check the residuals. Are there any problems with this model?
7. Compare the model that was fit in part e with the model that was fit in part f. Which model fits the data better? Justify your answer.
8. Compute and plot the forecasts for the next 24 months for each of the two models you estimated earlier. What is the difference between the forecasts from the two different models?

2. This problem involves modelling monthly US Government receipts for a 12 year period. The data is in a file named GovRec.csv and the variable name for this data is Receipts.

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1. Read the data into R Studio and plot a time series plot of the data. Is this plot stationary? Why or why not?
2. Since the variability of this time series is increasing as the level increases, we should consider a non-linear transformation of the data. What transformation would you suggest?
3. Compute the log of the Receipts variable and plot a time series of the log data. Also plot the acf of the log data. Does transformation to the log Receipts make the variation of the time series more consistent?
4. Plot a time series plot and the sample ACF of the 1st difference of the log data. Is the first difference of the log data stationary? Justify your answer.
5. Plot a time series plot, the sample ACF, and the sample PACF of the 12th difference of the log data. Is the 12th difference of the log data stationary? Justify your answer.
6. Plot a time series plot, the sample ACF, and the sample PACF of the 1st and 12th difference of the log data. Is the 1st and 12th difference of the log data stationary? Justify your answer.
7. Suppose you were convinced that only a 12th difference was required to make the log Receipts stationary. Determine a model that has this difference, estimate this model, and perform the diagnostic checks for this model. Note that since you are only taking a 12th difference and the time series plot of the 12th difference may not have a mean of 0, you need to allow for the possibility that the 12th difference has a mean different from zero. The commands to estimate this model are similar to what was done in the lecture.
8. Suppose you were convinced that both a 1st and 12th difference were required to make the log Receipts stationary. Determine a model that has these two differences, estimate this model, and perform the diagnostic checks for this model.
9. Compare the 2 models you estimated in parts g) and h) by comparing the estimated values of *σe*2. Which model seems to fit the data better?

3. The file CSrev.csv contains the monthly time series of receipts for the city of College Station, Texas. The name of the time series is Revenues. Determine an appropriate time series model for this data.

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