**477/577 In-class Exercise 5 : Fitting Wine Sales**

(due Fri 4/06/2017)

Name:

Use this file as a template for your report. Submit your code and comments together with (selected) output from R console.

* Your comments must be Arial font, and **BOLD FACED**.
* Your code must be Lucida Console font.

You must submit PRINTOUT of this file.

First, copy and paste below command in R console.

**D0 <- read.csv("http://gozips.uakron.edu/~nmimoto/pages/datasets/wine.csv")**

**Wine <- ts(D0, start=1980)**

Now your “D1” in R contains monthly Australian wine sales in 80’s.

1. Plot D1, ACF and PACF of **Wine** data. Do you see seasonality? Is there an obvious trend to the data? What does ACF and PACF plots suggest about seasonality?

(Your code)

**(Your comment and plots/outputs)**

1. Take seasonal difference of **Wine** with lag 12, and plot the series, along with ACF and PACF of the series. Test for stationarity. State your conclusion about stationarity of seasonally differenced **Wine** data.

(Your code)

**(Your comment and plots/outputs)**

1. Given the ACF and PACF in (2), if ARMA model was fit to seasonally differenced **Wine** data, do you expect to see sAR term and/or sMA term?

**(Your comment and plots/outputs)**

1. Use **auto.arima(Wine, stepwise=FALSE)** to fit sARIMA model to the original (not differenced) Wine data. Did **auto.arima()** suggest seasonal model? Why or why not? Does it make sense to use this model?

(Your code)

**(Your comment and plots/outputs)**

1. Fix whatever necessary in the definition of **Wine**, so that **auto.arima()** considers seasonal model automatically. What is the suggested model now? How does the model look? Perform routine parameter significance check, and residual analysis. Make sure to use **stepwise=FALSE** option. Search for better choice of p,q,P,Q, around the values suggested by **auto.arima()**.

(Your code)

**(Your comment and plots/outputs)**

1. Are you happy with the value of d, and D, suggested in (5)? Why or why not? If unhappy, search for better value of d and/or D.

(Your code)

**(Your comment and plots/outputs)**

1. Now using the seasonally differenced **Wine** data with lag=12. Force fit MA(11), and sMA(1), and check for parameters being too close to unit root. What is the conclusion? What is the reason behind this check?

(Your code)

**(Your comment and plots/outputs)**

1. Regardless of your conclusion in (7), subtract monthly average from the original **Wine** data. After the subtraction, fit linear trend with regression, then fit the residual with sARMA. Perform the routine parameter/residual analysis. Comment on the fit.

(Your code)

**(Your comment and plots/outputs)**

1. Express your final model mathematically, using Yt as your observations. Briefly, state the reason that you chose this model. Here’s special character you may need (copy and paste to use) : ▽, ▽12,ϕ1, θ1, Θ1, Φ1, , Xt, et, σ2. Match all the parameter estimates with their symbols.

**(Your comment)**