In-class Exercise 3 : Regressing Sales on Index

(due Fri 3/20/2015)

Name:

Use this file as a template for your assignment. Submit your code and comments together with (selected) output from R console. Your comments must be **BOLD FACED**.

First, load Monthly sales and index data from class web site using below R code.

D <- read.table("http://gozips.uakron.edu/~nmimoto/pages/datasets/LS2.txt", header=T)

X <- ts(D$A, start=c(2000,1), freq=12) #- sales data

B <- ts(D$B, start=c(2000,1), freq=12) #- index series

ts.plot(X,B, col=c("black","red"))

ts.plot(X,B\*.05, col=c("black","red"))

1. Plot the original sales data X. Describe the data briefly. (e.g. Monthly or annual data? Seasonality? Trend? Stationarity?)
2. We will use first 11 years (Jan, 2000 to Dec 2010) as in-sample, and 12 th year (Jan 2011 to Dec 2011) as out-sample. We disregard the 2012 data. Cut series X, and B accordingly. Name them X1, B1 for in-sample data, and X2, B2 for out-sample data.
3. Use auto.arima() and regress X1 on B1, and fit ARIMA. Perform the routine model fit diagnosis. (use xreg=B1).
4. Duplicate the model using Arima() function. Output of this must be (almost) identical to output from auto.arima() above.
5. Forecast for year 2011 using forecast() function. (use xreg=B2). Plot all series, X1,forecast, X2, and properly scaled B on the same plot. Make another version of the plot, which is zoomed in on the Jan 2010 – Dec 2012. Calculate prediction MSE for 2011.
6. Plot (▽\_12) Xt and its acf and pacf, do you see that sARIMA with D=1 could potentially fit to this model? If so, can you guess good value for P and Q?
7. Fit seasonal ARIMA (p,d,q)(P,D=1,Q)[12] using auto.arima() with D=1 forced, without any regressor. Perform routine model diagnosis.
8. Using model obtained in (6), forecast for 2011. Plot (X1, forecast, and X2). Calculate prediction MSE.
9. Which model do you like better? (3) or (6)? Why?
10. Write down the models obtained in (3) and in (6) using equations. (You can handwrite). Use Xt for original Sales data, and Bt for index series.