## Exercise 3 – RegARIMA Models

.\data\retail\Automobile dealers.dat contains data from retail sales at automobile dealerships. Adjust the series with a test for log transformation, a test for trading day and Easter, automatic model selection, and tests for AO, LS, and TC outliers:

**ad <- import.ts("x:\\courses\\2019cr\\data\\retail\\automobile dealers.dat",format="datevalue")**

**m <- seas(ad,outlier.types=”all”,x11=””)**

Use the output file and the udg() function to answer the following questions.

1. What ARIMA model was chosen for this series? Is this a mixed model?

When a seasonal object is created with automdl{}, the AIC test tables for trading day and Easter are not printed in the output file. Hard-code the ARIMA model and run the seas function again.

1. Did X-13A-S find Easter to be significant? If yes, what was this regressor’s t value?
2. Did X-13A-S find a significant trading day regressor? If yes:
   1. Which trading day was chosen, one coefficient or six coefficient?
   2. How different are the AIC values for no TD, TD1, and TD6?
   3. What were the F test statistic and *p*-value for the trading day regressor(s)?
3. Were any outliers found? If so, what were they, and what were their t values?
4. What was the estimate of the seasonal MA parameter?
5. Based on these results, would you consider a regARIMA model of the form (p d q)(0 0 0) + fixed seasonal regressors? Why or why not?

Create a seasonal object for the series with the transformation choice, regression variable choice, and outliers all hard-coded.

**Creating New Spec Files –** *Optional*

.\data\Retail contains data files for retail series.

Select a series and create a seas() function which

* Selected the best transformation using the AIC test,
* Tests for trading day and Easter effects,
* Searches for additive outliers, temporary changes, and level shifts,
* Selects an ARIMA model automatically,
* Creates ACF and PACF plots for all combinations of zero and one first differences and zero and one seasonal differences.

Run your new spec file.

Look at the ACF and PACF plots from the identify spec in the output file. Based on these plots, do you agree with the ARIMA model selected using automdl?