Home Appliances Demand Forecasting Using ARIMA model

Objective

Generate quarterly forecasts for Industry Shipment Demand for Q3 and Q4 of 2015 for each of the 13 product categories

Resources

1. Historical weekly shipment information from 2010
2. Macro-economic data like GDP, interest rates, etc.

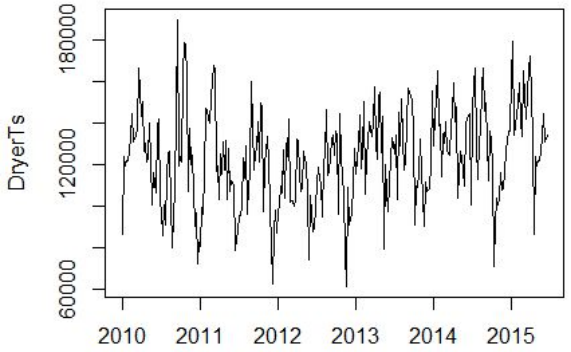
Approaches

Using AR, MA and ARIMA as well as Seasonal ARIMA models for various products based on the trend pictured in using the Historical data.

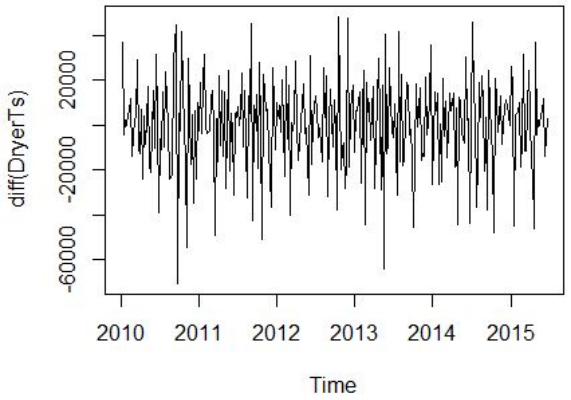
Simpel Time Series Approach

1. Stationarized the series series, verified using Augmented Dickey-Fuller Test
2. Splitting trend, seasonal variation and white noise
3. Fitting and prediction using ARIMA model

(Illustrated using Dryer as example)



The time series plot of given series

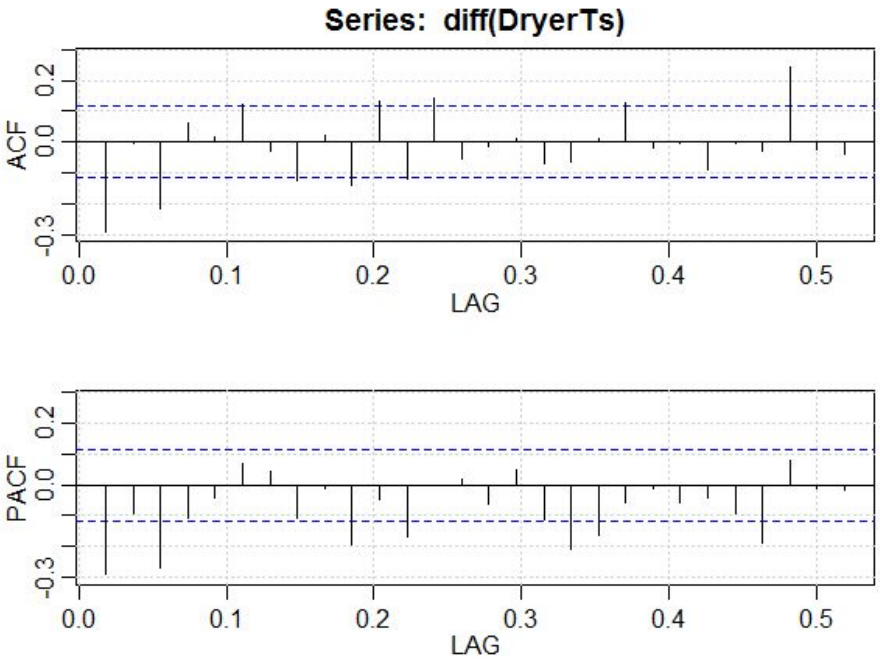


The time series plot stationarized series (used diff function)

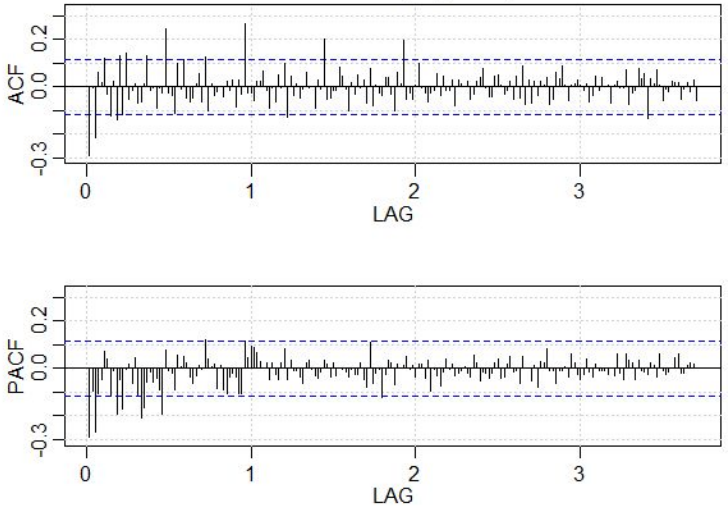
Duckey Fuller Test & ACF/PACF

```
#slicing time (year-week) and units alone
dataDrver <- data[data$PRODUCT ==
"Dryer",c(3,5)]

#converting the dataframe to timeseries
DrverTs <- ts(dataDrver$INDUSTRY_UNITS.
start=c(2010,1), end= c(2015,26), freq=54)

#Augmented Dickey-Fuller Test for given series
adf.test(DryerTs)

#Augmented Dickey-Fuller Test after differencing
adf.test(diff(DrverTs))
#acf graph after differencing
acf(diff(DrverTs))
acf(diff(DryerTs), max.lag=200)

#pacf graph after differencing
pacf(diff(DrverTs))
pacf(diff(DryerTs), max.laf=200)
```

ACF/PACF Graphs



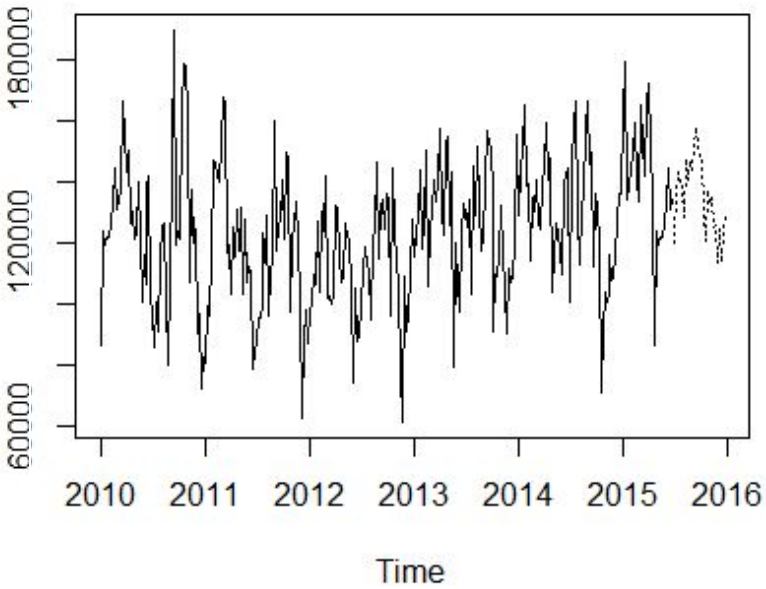
ACF/PACF, ACF and PACF cuts off at 1 corresponding to q and p respectively



ACF/PACF with lag upto 200 to check for seasonal pattern, P,Q,D

Fitting the model and forecasting

```
#fitting ARIMA model
fitDryer <- arima(DryerTs, c(1,1,1),seasonal = list(order = c(0, 1, 1), period = 54))

#predicting for next 2 quarters (27 weeks)
predDryer <- predict(fitDryer, n.ahead=27)

#plotting the graph along with forecated value for Q3 and Q4 2015
ts.plot(DryerTs, predDryer$pred, lty = c(1,3))
```



Predicted value for Q3 and Q4 2015 represented by dotted lines

99.73%*

Accuracy:

Accuracy for taken example, the Dryer

Overall Accuracy was close to 92.093%*

*Overall for the period of 27 weeks

Conclusion

The **Time series model [MAPE = 0.09]** has not taken into account the econometric data which represents the real world scenario and rather did a simple analysis of trend and seasonal effect.

Further the **Time Series model** can be improved to represent the real world by including the econometric data as **Explanatory variables.**

Product	Actual Unit	Predicted	Abs Error
2 Door Bottom Mount	121739	183433.76	0.207215175
Built-in Ovens	200132	386430.6	0.047843249
Cooktops	202712	392963.9	0.011959056
Dishwasher	1958321	3467227	0.063382738
Dryer	1865626	3550004	0.012182684
Free Standing Ranges	1884944	3451780	0.049852426
Freezer	574460	1091764.2	0.060158244
French Door	807973	1313876.1	0.174851508
Front Load	580620	1195009	0.091511666
MHC	1303157	2073968.5	0.132391172
Side by Side	642838	993138.3	0.144872518
Top Load	1865736	3248467	0.056186097
Top Mount	1407774	2364558	0.131949002

Thank you