**ADF test on gas data**

Augmented Dickey-Fuller Test

data: gas.ts1

Dickey-Fuller = -2.7131, Lag order = 7, p-value = 0.2764

alternative hypothesis: stationary

\*p is high null will fly, meaning null hypothesis is accepted . Given TS data is not stationary

**ADF test on difference gas data**

Augmented Dickey-Fuller Test

data: gas.ts1\_df

Dickey-Fuller = -15.782, Lag order = 7, p-value = 0.01

alternative hypothesis: stationary

\*p is low null will go, meaning null hypothesis is rejected i.e. difference gas data is stationary.

**Manual ARIMA**

Call:

arima(x = gas.train, order = c(12, 2, 5))

Coefficients:

ar1 ar2 ar3 ar4 ar5 ar6 ar7 ar8 ar9 ar10 ar11 ar12 ma1

0.1180 -0.2430 -0.1403 0.0609 0.0112 -0.2333 -0.1096 -0.1676 -0.1281 0.0342 0.1476 0.3935 -1.5255

s.e. 0.1963 0.1787 0.1527 0.1279 0.0815 0.0715 0.0988 0.0896 0.0914 0.0944 0.0818 0.0753 0.2105

ma2 ma3 ma4 ma5

0.8179 -0.3776 -0.0729 0.1598

s.e. 0.4130 0.4138 0.3095 0.1481

sigma^2 estimated as 2887776: log likelihood = -2539.34, aic = 5114.69

**Auto ARIMA seasonal is false**

Series: gas.train

ARIMA(0,1,0)

sigma^2 estimated as 5362447: log likelihood=-2630.76

AIC=5263.52 AICc=5263.53 BIC=5267.18

**Auto ARIMA stationary is true**

Series: gas.train

ARIMA(1,0,1)(1,0,0)[12] with non-zero mean

Coefficients:

ar1 ma1 sar1 mean

0.9774 -0.3082 0.6552 29555.391

s.e. 0.0130 0.0717 0.0571 8329.852

sigma^2 estimated as 3728243: log likelihood=-2590.87

AIC=5191.74 AICc=5191.95 BIC=5210.06

**Accuracy ARIMA**

ME RMSE MAE MPE MAPE MASE ACF1 Theil's U

Training set -67.16872 1693.435 1188.702 -0.2274841 4.230144 0.4509184 -0.009622786 NA

Test set 2701.88440 4277.416 3263.057 4.7790893 6.123841 1.2377969 0.242065978 1.082012

**Accuracy Auto ARIMA**

ME RMSE MAE MPE MAPE MASE ACF1 Theil's U

Training set 137.6222 2311.672 1589.338 0.2296755 6.054045 0.6028941 -0.02403815 NA

Test set 4579.3385 7172.962 6022.209 7.7924525 11.111107 2.2844443 0.69795394 1.719389

**Accuracy Auto ARIMA1**

ME RMSE MAE MPE MAPE MASE ACF1 Theil's U

Training set 112.709 1917.410 1327.624 -0.4821548 5.032014 0.5036162 -0.003814232 NA

Test set 4078.119 5969.602 5061.620 7.1819728 9.475915 1.9200577 0.366072021 1.495484