**OUTCOME of R-Code**

**ENGLISH BAZAR**

**ARIMA (1,2,1)**

arima(x = data, order = c(1, 2, 1))

Coefficients:

ar1 ma1

0.2989 -1.0000

s.e. 0.0695 0.0159

sigma^2 estimated as 7378: log likelihood = -1118.01, aic = 2242.02

Training set error measures:

ME RMSE MAE MPE MAPE MASE ACF1

Training set 0.8947909 85.44464 50.26382 0.04755682 2.262531 0.9574909 -0.02220585

**SARIMA (1,0,0)**

arima(x = data, seasonal = list(order = c(1, 0, 0), period = 12))

Coefficients:

sar1 intercept

0.7853 2320.1977

s.e. 0.0440 122.3535

sigma^2 estimated as 190395: log likelihood = -1445.25, aic = 2896.5

Training set error measures:

ME RMSE MAE MPE MAPE MASE ACF1

Training set 67.5661 436.3425 358.4957 -0.5356872 15.57283 6.829094 0.9541027

**Pattern Sequence Forecast (PSF)**

psf\_RMSE

[1] 826.8709

psf\_MAE

[1] 670.1965

psf\_MPE

[1] -45931

psf\_ME

[1] -459.31

psf\_MAPE

[1] 0.3624653

mase(data,psf\_forecast)

[1] 12.76678

**Holt’s Trend Method (HT)**

holt(y = data)

Smoothing parameters:

alpha = 0.9999

beta = 0.1759

Initial states:

l = 1428.1661

b = -4.6018

sigma: 90.017

AIC AICc BIC

2743.396 2743.719 2759.684

Error measures:

ME RMSE MAE MPE MAPE MASE ACF1

Training set 1.995383 89.07443 55.36054 0.1223329 2.42735 0.1603394 0.1557807

**Holt-Winters’ Seasonal Additive Method (AHW)**

hw(y = data, seasonal = "additive")

Smoothing parameters:

alpha = 0.9998

beta = 0.134

gamma = 1e-04

Initial states:

l = 1435.1467

b = 8.3497

s = -0.5188 4.7742 13.2066 -1.4228 -24.1174 15.4444

-15.0985 5.5377 18.128 -3.1071 -12.7708 -0.0555

sigma: 90.627

AIC AICc BIC

2757.326 2760.843 2812.703

Error measures:

ME RMSE MAE MPE MAPE MASE ACF1

Training set 1.768876 86.76874 56.67454 0.1021812 2.496635 0.1641451 0.2311738

**Holt-Winters’ Seasonal Multiplicative Method (MHW)**

hw(y = data, seasonal = "multiplicative")

Smoothing parameters:

alpha = 0.7209

beta = 0.057

gamma = 0.2777

Initial states:

l = 1434.4675

b = 5.16

s = 0.9251 0.9256 1.0625 0.9893 0.9466 1.0435

0.9752 1.0044 1.0545 1.0484 1.0537 0.9711

sigma: 0.0467

AIC AICc BIC

2821.664 2825.181 2877.041

Error measures:

ME RMSE MAE MPE MAPE MASE ACF1

Training set 1.597857 109.6218 76.35573 0.08880705 3.329756 0.2211473 0.432836

**Error-Trend-Seasonality (ETS)**

ets(y = data)

Smoothing parameters:

alpha = 0.9999

beta = 0.1511

phi = 0.8

Initial states:

l = 1428.1119

b = -4.977

sigma: 0.0365

AIC AICc BIC

2715.572 2716.026 2735.117

Training set error measures:

ME RMSE MAE MPE MAPE MASE ACF1

Training set 6.586341 86.63894 51.63143 0.2647334 2.297908 0.1495389 0.1537945

**Prophet Forecasting Model (PFM)**

prophet\_RMSE

[1] 552.068

prophet\_MAE

[1] 404.6035

prophet\_MPE

[1] -21641.83

prophet\_ME

[1] -216.4183

prophet\_MAPE

[1] 0.2248331

mase(prophet\_data1$y,prophet\_forecast$yhat)

[1] 10.11598

**GAZOLE**

**ARIMA (1,2,1)**

arima(x = data, order = c(1, 2, 1))

Coefficients:

ar1 ma1

0.0055 -1.0000

s.e. 0.0726 0.0171

sigma^2 estimated as 33835: log likelihood = -1263, aic = 2532

Training set error measures:

ME RMSE MAE MPE MAPE MASE ACF1

Training set -1.621638 182.9824 87.20673 -0.2647531 3.547619 0.9957106 -0.003374435

**PSF**

psf\_RMSE

[1] 636.5855

psf\_MAE

[1] 546.5735

psf\_MPE

[1] -33972.79

psf\_ME

[1] -339.7279

psf\_MAPE

[1] 0.2419801

mase(data,psf\_forecast)

[1] 6.240677

**Holt’s Trend Method (HT)**

holt(y = data)

Smoothing parameters:

alpha = 0.9999

beta = 1e-04

Initial states:

l = 2099.0262

b = 4.7198

sigma: 185.0209

AIC AICc BIC

3020.057 3020.379 3036.344

Error measures:

ME RMSE MAE MPE MAPE MASE ACF1

Training set -5.039797 183.0835 87.24365 -0.4543553 3.551987 0.2742436 0.0006204204

**Holt-Winters’ Additive Method (AHW)**

hw(y = data, seasonal = "additive")

Smoothing parameters:

alpha = 0.9999

beta = 1e-04

gamma = 1e-04

Initial states:

l = 2154.7195

b = -10.0463

s = 2.9025 26.3091 39.6063 -54.294 -27.1742 15.4325

51.6249 71.6672 9.578 -9.226 -40.2292 -86.1971

sigma: 185.3839

AIC AICc BIC

3032.146 3035.663 3087.523

Error measures:

ME RMSE MAE MPE MAPE MASE ACF1

Training set 9.287795 177.4915 101.3609 0.1534309 4.100918 0.3186201 -0.001415065

**Holt-Winters’ Multiplicative Method (MHW)**

hw(y = data, seasonal = "multiplicative")

Smoothing parameters:

alpha = 0.6551

beta = 1e-04

gamma = 1e-04

Initial states:

l = 2155.8411

b = -9.7202

s = 1.0213 0.9944 0.9997 0.9782 0.994 1.0436

1.0314 1.0315 0.9802 0.9831 0.9797 0.9628

sigma: 0.0734

AIC AICc BIC

3021.376 3024.893 3076.753

Error measures:

ME RMSE MAE MPE MAPE MASE ACF1

Training set 12.36135 185.241 117.801 0.1891042 4.73072 0.3702983 0.3048373

**Exponential Smoothing (ETS)**

ets(y = data)

Smoothing parameters:

alpha = 0.9803

Initial states:

l = 2080.2008

sigma: 0.0662

AIC AICc BIC

2970.350 2970.478 2980.123

Training set error measures:

ME RMSE MAE MPE MAPE MASE ACF1

Training set -0.241553 183.0701 87.7635 -0.260532 3.565606 0.2758777 0.01971509

**Prophet Forecasting Model (PSM)**

prophet\_RMSE

[1] 431.6353

prophet\_MAE

[1] 337.3109

prophet\_MPE

[1] -17415.38

prophet\_ME

[1] -174.1538

prophet\_MAPE

[1] 0.149505

mase(prophet\_data1$y,prophet\_forecast$yhat)

[1] 5.486347

**SAMSI**

**ARIMA (1,2,1)**

arima(x = data, order = c(1, 2, 1))

Coefficients:

ar1 ma1

-0.0809 -1.0000

s.e. 0.0723 0.0227

sigma^2 estimated as 6704: log likelihood = -1109.3, aic = 2224.6

Training set error measures:

ME RMSE MAE MPE MAPE MASE ACF1

Training set -5.092815 81.45113 55.24431 -0.2856579 2.424121 0.9957781 -0.01364352

**PSF**

psf\_RMSE

[1] 779.3997

psf\_MAE

[1] 576.695

psf\_MPE

[1] -53056.72

psf\_ME

[1] -530.5672

psf\_MAPE

[1] 0.3339366

mase(data,psf\_forecast)

[1] 10.39492

**Holt’s Trend Method (HT)**

holt(y = data)

Smoothing parameters:

alpha = 0.8976

beta = 1e-04

Initial states:

l = 1215.3842

b = 9.5516

sigma: 82.4006

AIC AICc BIC

2709.449 2709.771 2725.736

Error measures:

ME RMSE MAE MPE MAPE MASE ACF1

Training set -0.02278429 81.53778 55.87964 -0.0320029 2.474998 0.2389117 0.007669467

**Holt-Winters’ Additive Method (AHW)**

hw(y = data, seasonal = "additive")

Smoothing parameters:

alpha = 0.8871

beta = 0.0095

gamma = 1e-04

Initial states:

l = 1255.3556

b = 22.0103

s = -22.8047 -11.0226 17.7345 30.6623 35.5874 3.0558

-13.4801 21.2776 14.0418 -19.3996 -9.8013 -45.8511

sigma: 82.838

AIC AICc BIC

2722.818 2726.335 2778.195

Error measures:

ME RMSE MAE MPE MAPE MASE ACF1

Training set -6.886331 79.31139 55.08611 -0.3894995 2.489096 0.235519 -0.002348409

**Holt-Winters’ Multiplicative Method (MHW)**

hw(y = data, seasonal = "multiplicative")

Smoothing parameters:

alpha = 0.7926

beta = 0.008

gamma = 0.132

Initial states:

l = 1248.9

b = 16.945

s = 0.9487 0.975 1.0006 1.028 1.0331 1.0039

0.9911 1.0261 1.0545 0.976 0.9944 0.9686

sigma: 0.0412

AIC AICc BIC

2773.103 2776.620 2828.481

Error measures:

ME RMSE MAE MPE MAPE MASE ACF1

Training set -5.265822 85.33675 62.64244 -0.2996888 2.834542 0.2678258 0.05812259

**Exponential Smoothing (ETS)**

ets(y = data)

Smoothing parameters:

alpha = 0.9205

Initial states:

l = 1161.4448

sigma: 82.5496

AIC AICc BIC

2708.174 2708.302 2717.946

Training set error measures:

ME RMSE MAE MPE MAPE MASE ACF1

Training set 10.68136 82.11852 55.86909 0.4682782 2.465423 0.2388666 -0.01270884

**Prophet Forecasting Model (PSM)**

prophet\_RMSE

[1] 703.7465

prophet\_MAE

[1] 435.2969

prophet\_MPE

[1] -32867.06

prophet\_ME

[1] -328.6706

prophet\_MAPE

[1] 0.2607733

mase(prophet\_data1$y,prophet\_forecast$yhat)

[1] 10.29817