Retail Giant Sales Forecasting Assignment

BACKGROUND

Global Mart is an online supergiant store that has worldwide operations. This store takes orders and delivers across the globe and deals with all the major product categories — consumer, corporate and home office.

Here we'll forecast the sales of the products for the next 6 months, so that we have a proper estimate and can plan the inventory and business processes accordingly.

Major Attributes:

Attributes	Description
Order-Date	The date on which the order was placed
Segment	The segment to which the product belongs
Market	The market to which the customer belongs
Sales	Total sales value of the transaction
Profit	Profit made on the transaction

Segmentation Of Data:

Data is divided into 7 markets and 3 segments as shown in the picture.

Market	Segment
Africa	Consumer
APAC (Asia Pacific)	Corporate
Canada	Home Office
EMEA(Middle East)	
EU (European Union)	
LATAM (Latin America)	
US (United States)	

Hence , we will form a total of 7 * 3 segments . That is 21 total segments.

Names Of The 21 Market Segments Are:

Consumer - APAC
Consumer - LATAM
Consumer - US
Consumer - EU
Corporate - APAC
Corporate - EU
Corporate - LATAM
Corporate - US
Consumer - EMEA
Consumer - Africa
Home Office - APAC
Home Office - LATAM
Home Office - US
Home Office - EU
Corporate - EMEA
Corporate - Africa
Home Office - EMEA
Home Office - Africa
Consumer - Canada
Corporate - Canada
Home Office - Canada

Finding the Most Profitable Segment – COV points :

The coefficient of variation (standard deviation/mean) was used to find the most profitable segments.
The segment wise COV values, in increasing order for top 5 are:

	Market segment	Most Consistent
0	Consumer - APAC	0.522725
7	Corporate - APAC	0.530051
4	Consumer - EU	0.595215
5	Consumer - LATAM	0.683770
11	Corporate - EU	0.722076

-The segments with the lowest COV are APAC Consumer and EU Consumer.

Reason why the segment is the most profitable one ?

These have the lowest variation and hence are the most predictable ones.
A low COV implies high mean sales ,which means that these two segments are the most profitable ones.

Below are the COV values for all 21 segments:

	Market segment	Most Consistent
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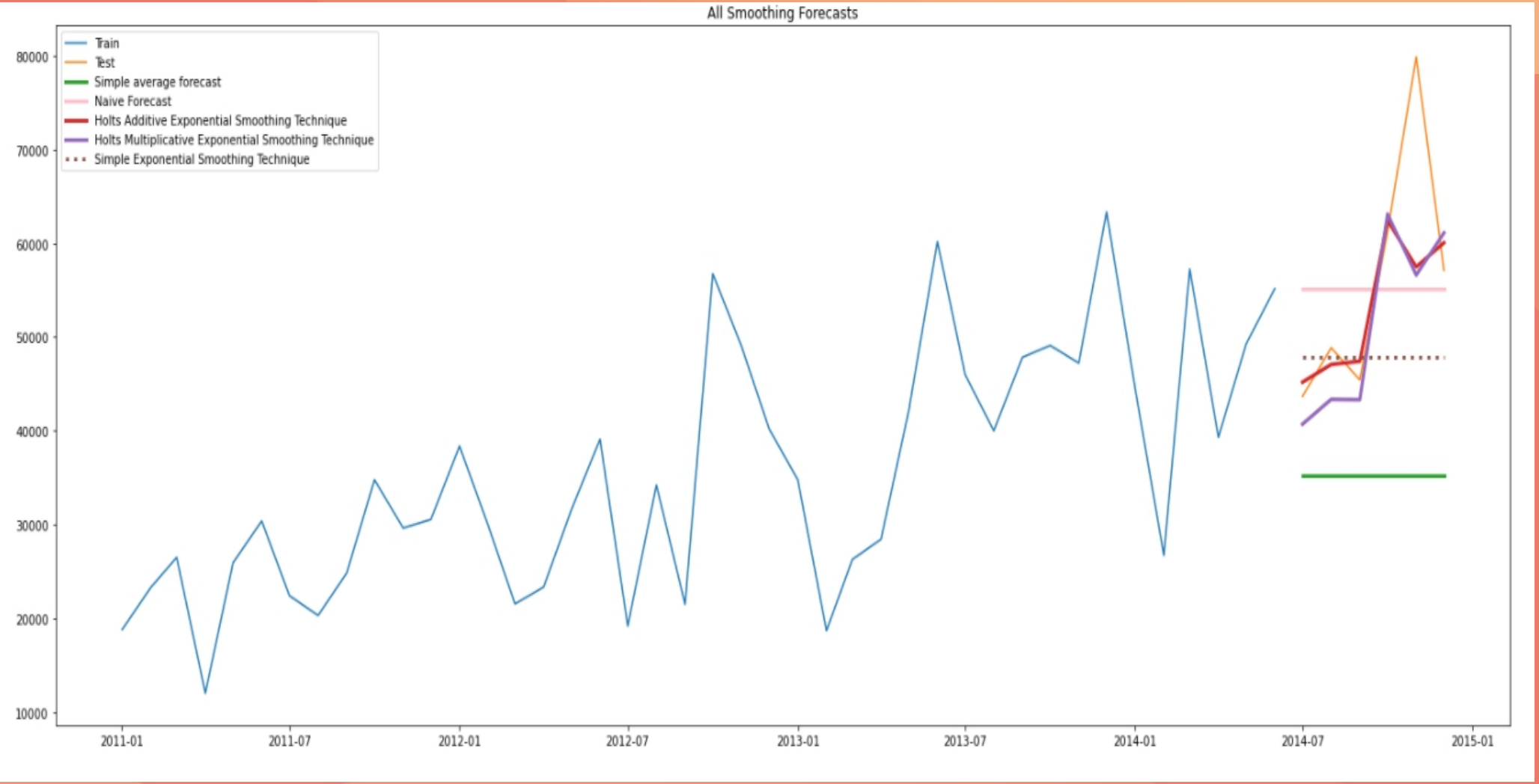
7	Corporate - APAC	0.530051
4	Consumer - EU	0.595215
5	Consumer - LATAM	0.683770
11	Corporate - EU	0.722076
12	Corporate - LATAM	0.882177
18	Home Office - EU	0.938072
14	Home Office - APAC	1.008219
6	Consumer - US	1.010530
13	Corporate - US	1.071829
20	Home Office - US	1.124030
19	Home Office - LATAM	1.169693
2	Consumer - Canada	1.250315
1	Consumer - Africa	1.310351
9	Corporate - Canada	1.786025

15 segments with less COV values , in an increasing trend.

8	Corporate - Africa	1.891744
15	Home Office - Africa	2.012937
16	Home Office - Canada	2.369695
3	Consumer - EMEA	2.652495
10	Corporate - EMEA	6.355024
17	Home Office - EMEA	7.732073

last 6 values (6 segments with the highest COV values)

All Smoothing Forecasts:



Better Technique?

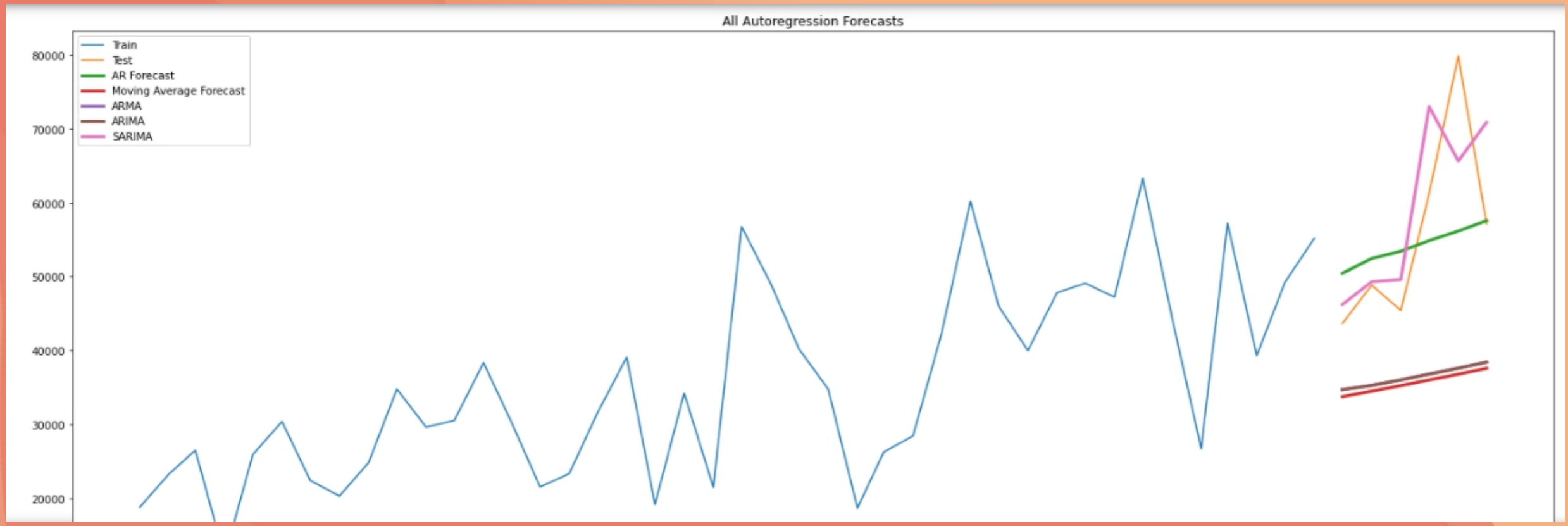
Both Holt winters method display seasonilty and perform better than the other smoothing techniques. But the Holts additive forecast is better than multiplicative forecast. It forecasts the level, trend and seasonlity fairly well compared to others.

MAPE Values of Different Smoothing Techniques:

	Method	RMSE	MAPE
0	Naive method	12355.97	17.47
0	Simple Average method	24146.06	34.34
0	Simple Moving Average Forecast (6 Months)	16294.34	16.80
0	Simple Exponential method	14764.66	15.83
0	Holt Exp method	11402.24	15.63
0	Holt Exponential Additive method	9304.48	7.76
0	Holt Exponential method Multiplicative	10021.79	10.30

It is evident that the MAPE value of Holt's Exponential Additive Method is least which makes it the most suitable method .

Final Forecasts using ARIMA :



SARIMA forecasts are the closest to the test set and its performance is better than other Autoregressive techniques.

MAPE Values using ARIMA Techniques :

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Holt Exponential method Multiplicative	10021.79	10.30
Autoregressive (AR) method	10985.28	13.56
Moving Average (MA) method	23360.02	33.93
Autoregressive moving average (ARMA) method	22654.32	32.40
Autoregressive integrated moving average (ARIMA) method	22654.32	32.40
Seasonal autoregressive integrated moving average (SARIMA) method	9612.36	12.86

SARIMA has the least MAPE Value of 12.86 among all ARIMA Methods.

CONCLUSION:

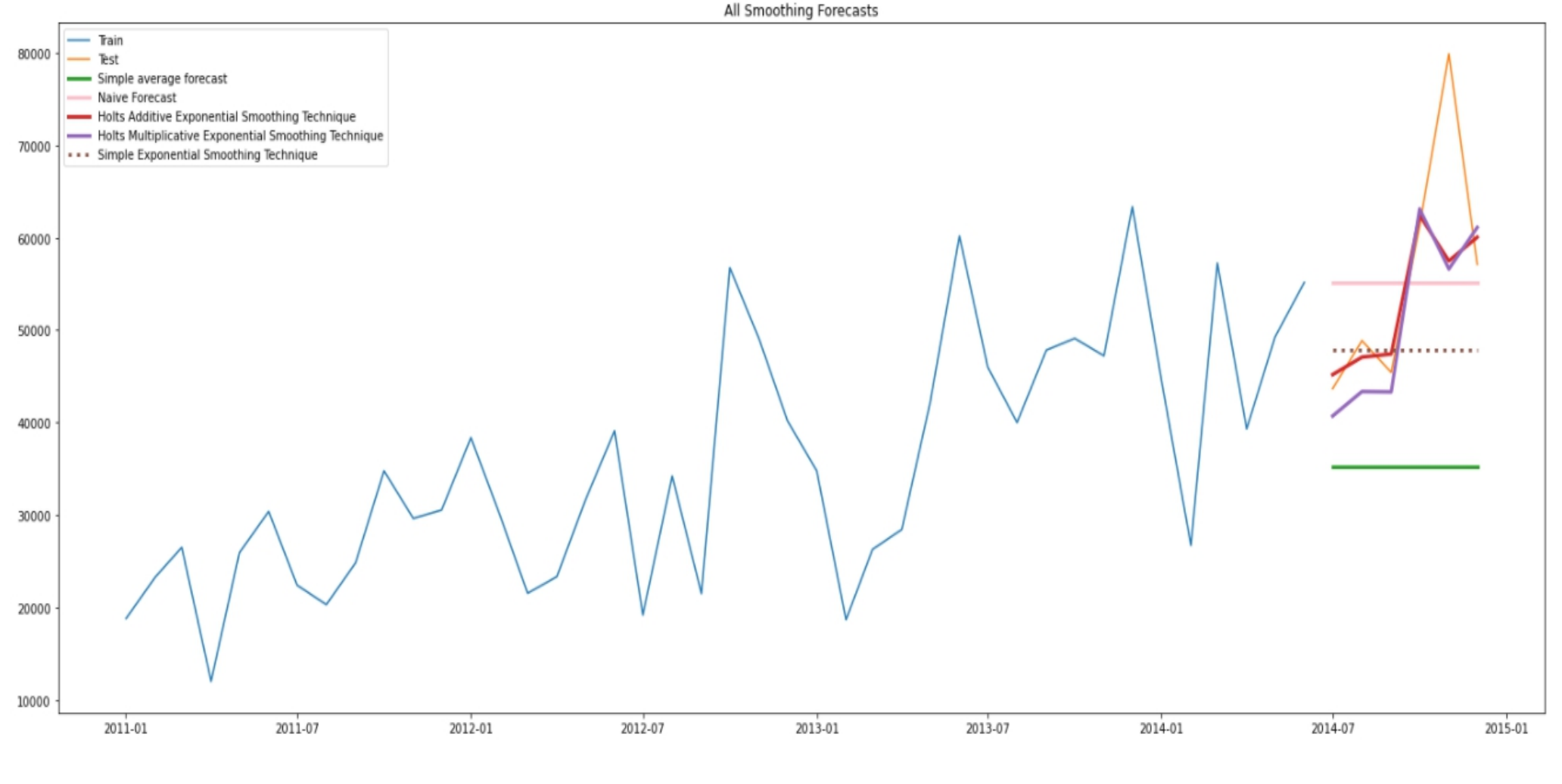
- Sales data series had 48 observations. It displayed trend and seasonality.

- SARIMA performs the best in autoregression methods as it almost accurately predicts trend and seasonality.

- Holt Winters Additive method performs the best in smoothing techniques.

- APAC and EU consumer segments are the most profitable ones. Items corresponding to these segments should be kept more in stock.

- Holts Additive Method has a MAPE of 7.76 , which is the least MAPE value achieved. Therefore this is the best method for sales forecast.



In this graph we can see Holts Additive Smoothing Technique.

T H A N K S