Time Series Forecasting

Retail Giant Sales Forecasting
October 2020

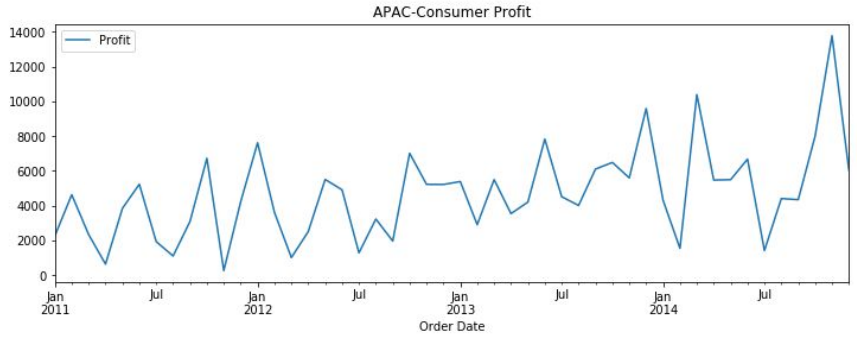
Introduction

- 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 & home office.
- The aim of this project is to **forecast** the **sales** of the products for the next 6 months, so that the company has a proper estimate and can plan their inventory and business processes accordingly.

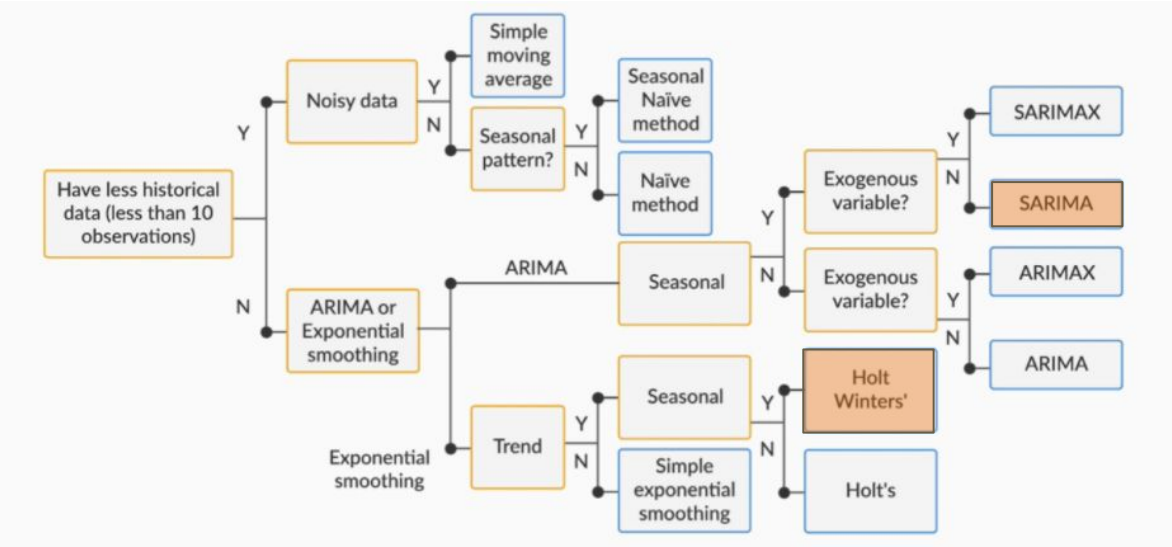
Coefficient of Variance (Cov)

Market_Segment	mean	std	cov
APAC-Consumer	4400.894243	2328.343041	0.529061
APAC-Corporate	2574.919807	1381.381825	0.536476
EU-Consumer	3699.977143	2228.977594	0.602430
LATAM-Consumer	2295.555697	1588.659231	0.692059
EU-Corporate	2216.299429	1619.735425	0.730829
LATAM-Corporate	1122.633016	1002.365692	0.892870
EU-Home Office	1224.456536	1162.551208	0.949443
APAC-Home Office	1511.088314	1541.976104	1.020441
US-Consumer	2686.740912	2747.942085	1.022779
US-Corporate	1754.199083	1902.991919	1.084821
US-Home Office	1132.065762	1287.900959	1.137656
LATAM-Home Office	818.398941	968.879479	1.183872
Africa-Consumer	957.707000	1270.143926	1.326234
Canada-Consumer	204.465000	280.185549	1.370335
Africa-Corporate	412.617571	790.028612	1.914675
Africa-Home Office	377.221071	768.526445	2.037337
Canada-Corporate	73.650714	152.326873	2.068233
EMEA-Consumer	423.960286	1138.184151	2.684648
Canada-Home Office	69.075366	224.457042	3.249451
EMEA-Corporate	182.642643	1174.768016	6.432058
EMEA-Home Office	82.225857	651.412770	7.922238

- We can find the most consistently profitable market-segment by using a measure called "Coefficient of Variation (CoV)".
- The coefficient of variation or CoV is nothing but the ratio of the standard deviation to mean
- We see that "APAC-Consumer" has the lowest Coefficient of Variance which means that **"APAC-Consumer"** is the most **consistently profitable** market-segment

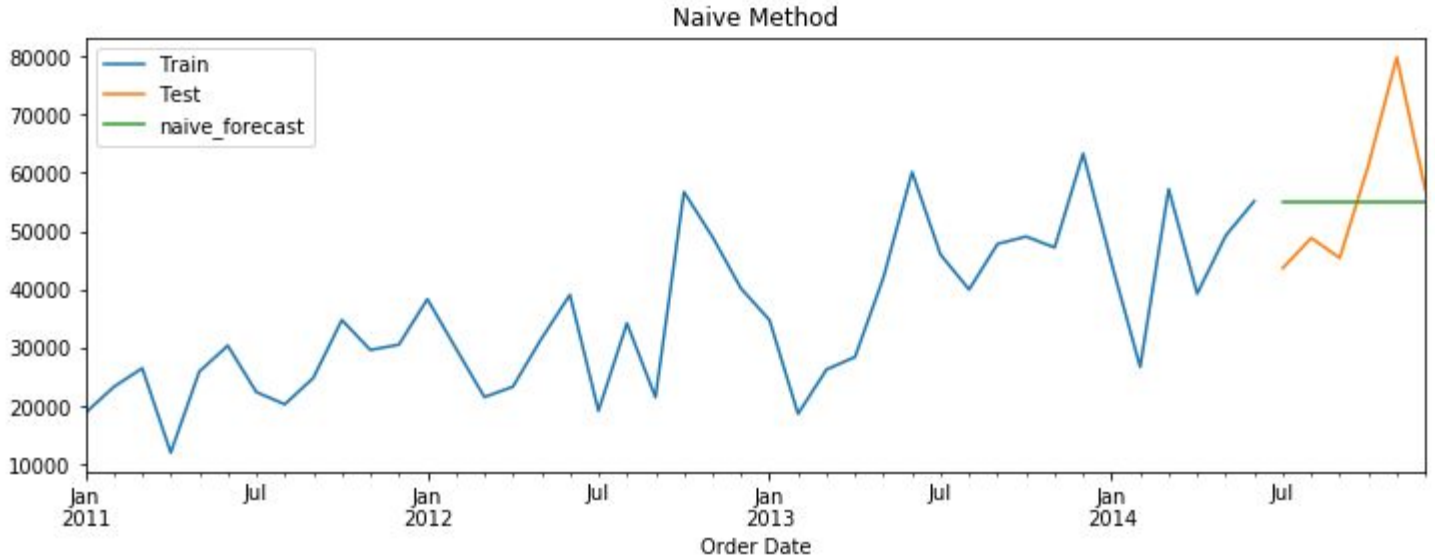


Flow Chart



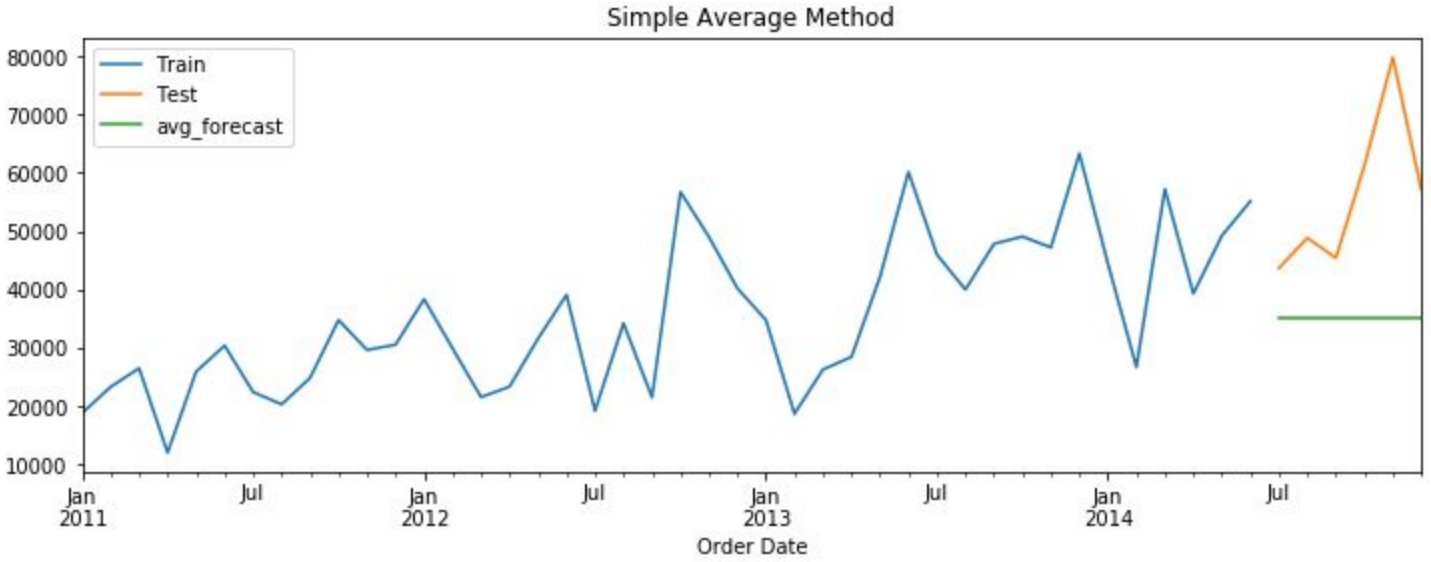
As per the flow chart, **Holt Winter's** Method in the smoothing technique and **SARIMA** in the ARIMA set of methods might work best.

Naive Method



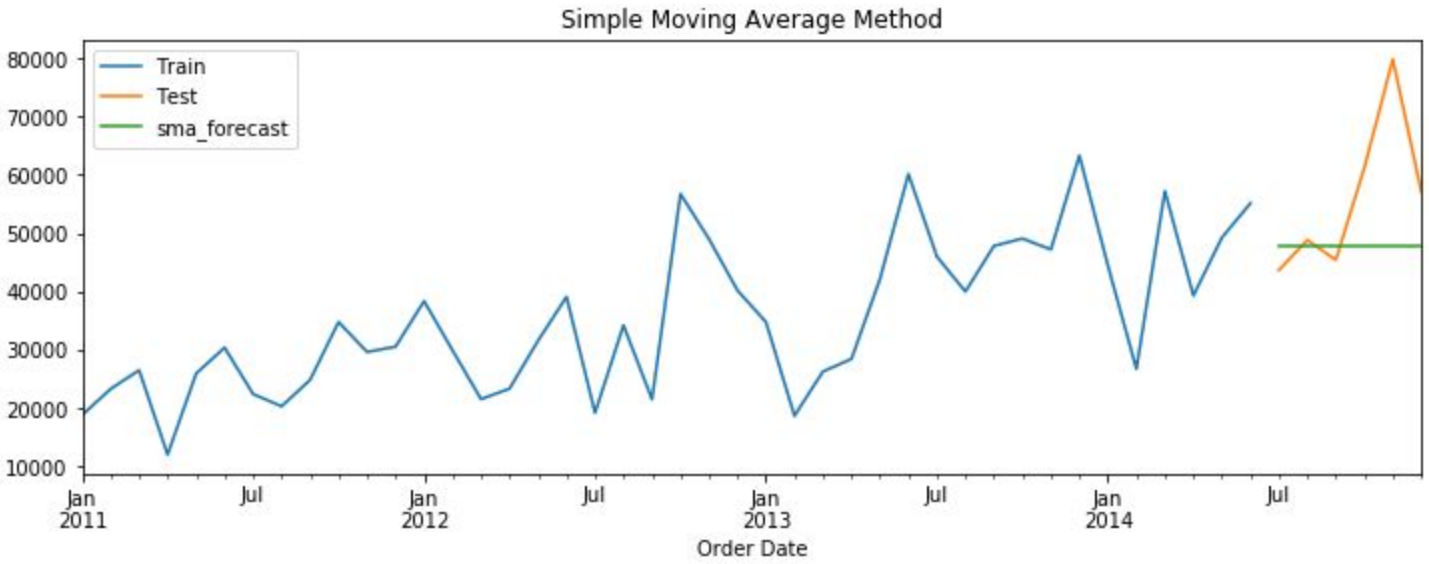
The Naive Method performs moderately well on the test set.
The MAPE value for this method is 17.47%.

Simple Average Method



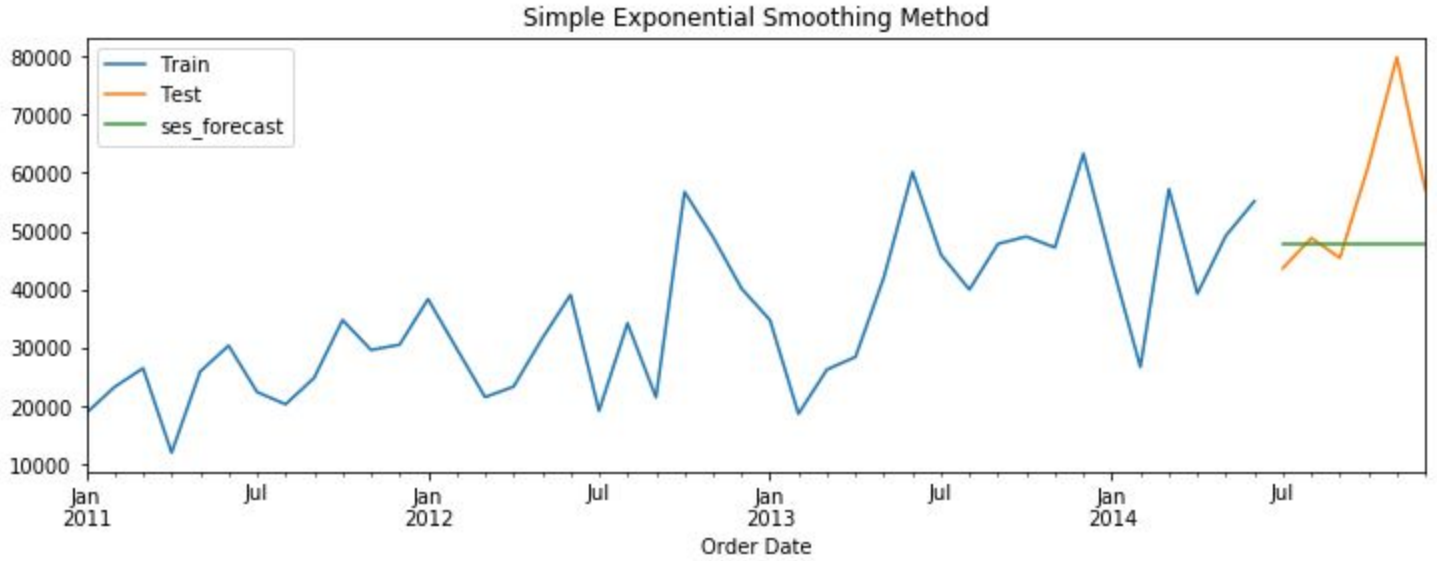
The Simple Average Method performs poorly on the test set.
The MAPE value for this method is 34.34%.

Simple Moving Average Method



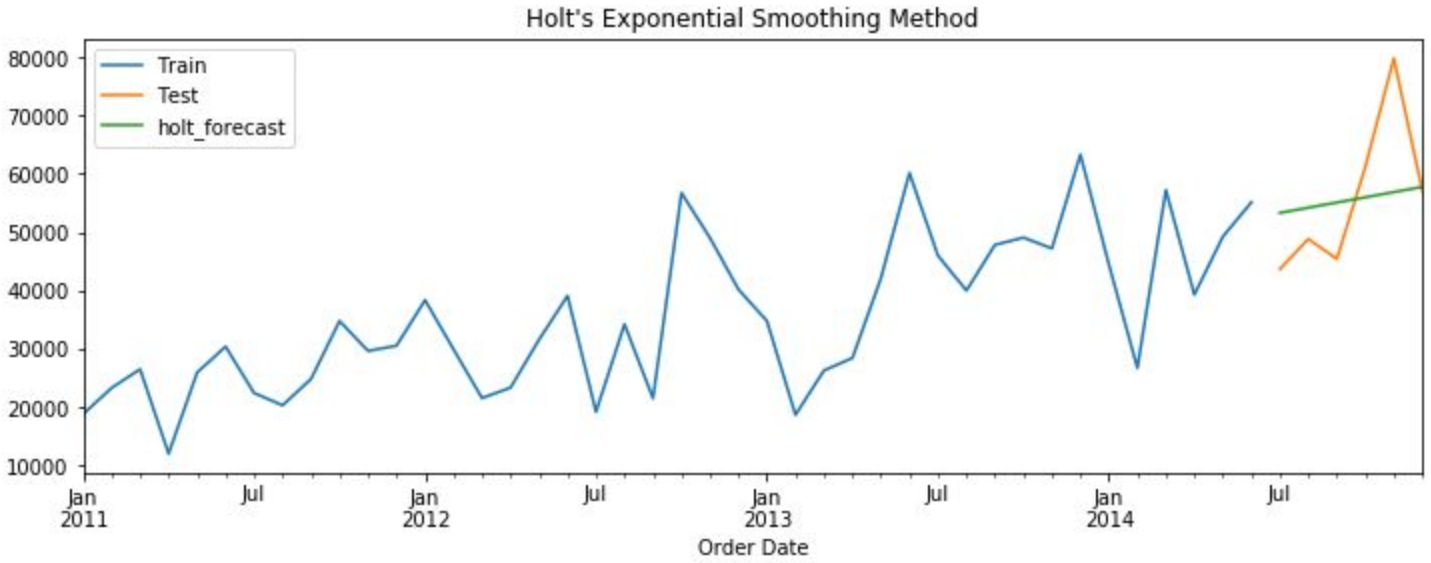
The Simple Average Method performs moderately well on the test set.
The MAPE value for this method is 15.82%.

Simple Exponential Smoothing Method



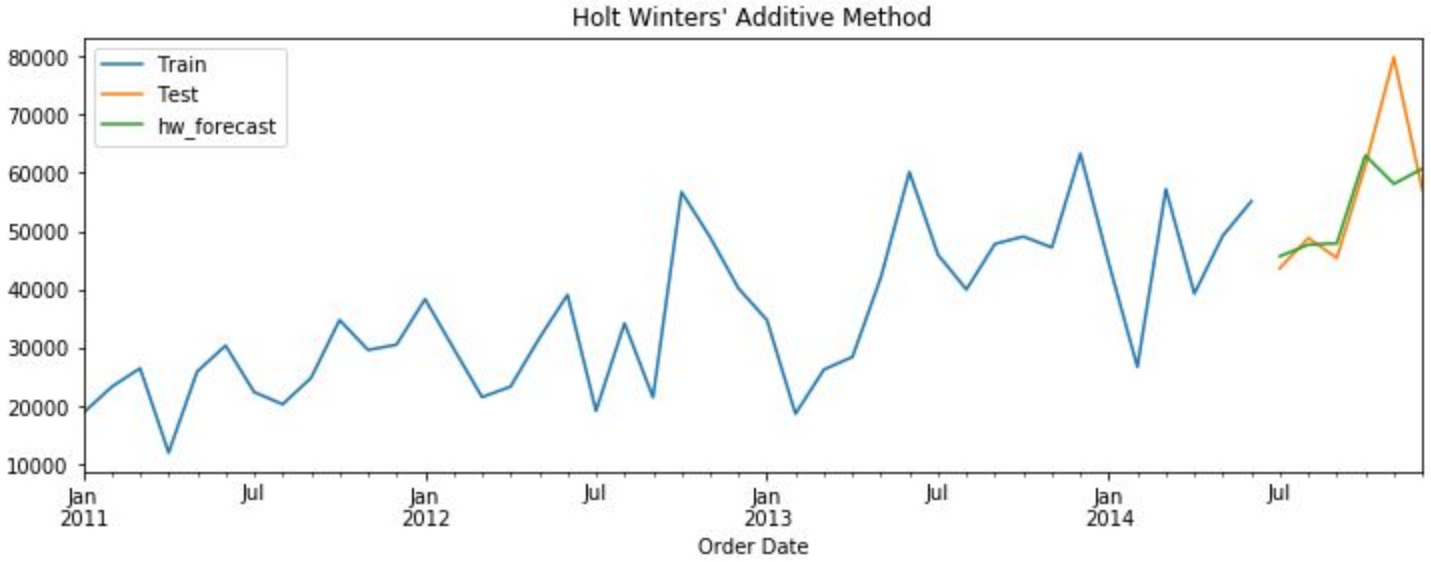
The Simple Exponential Smoothing Method performs moderately well on the test set. The MAPE value for this method is 15.83%.

Holt's Exponential Smoothing Method



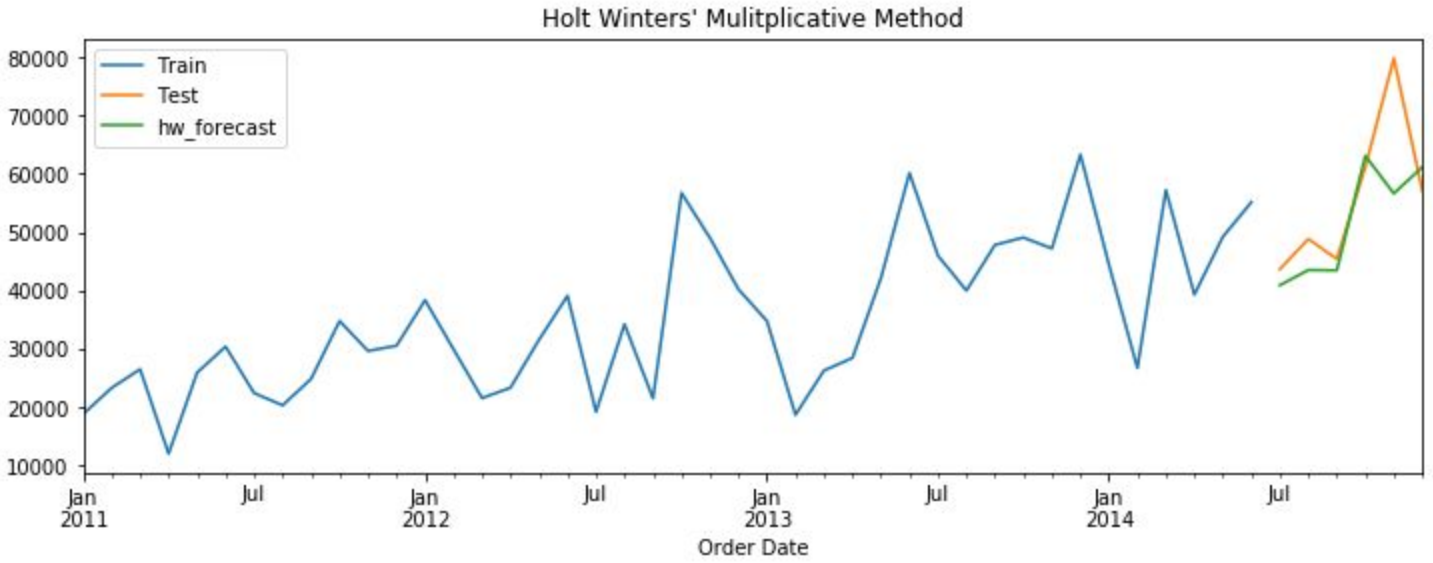
The Holt's Exponential Smoothing Method performs moderately well on the test set. The MAPE value for this method is 15.48%.

Holt Winter's Additive Method



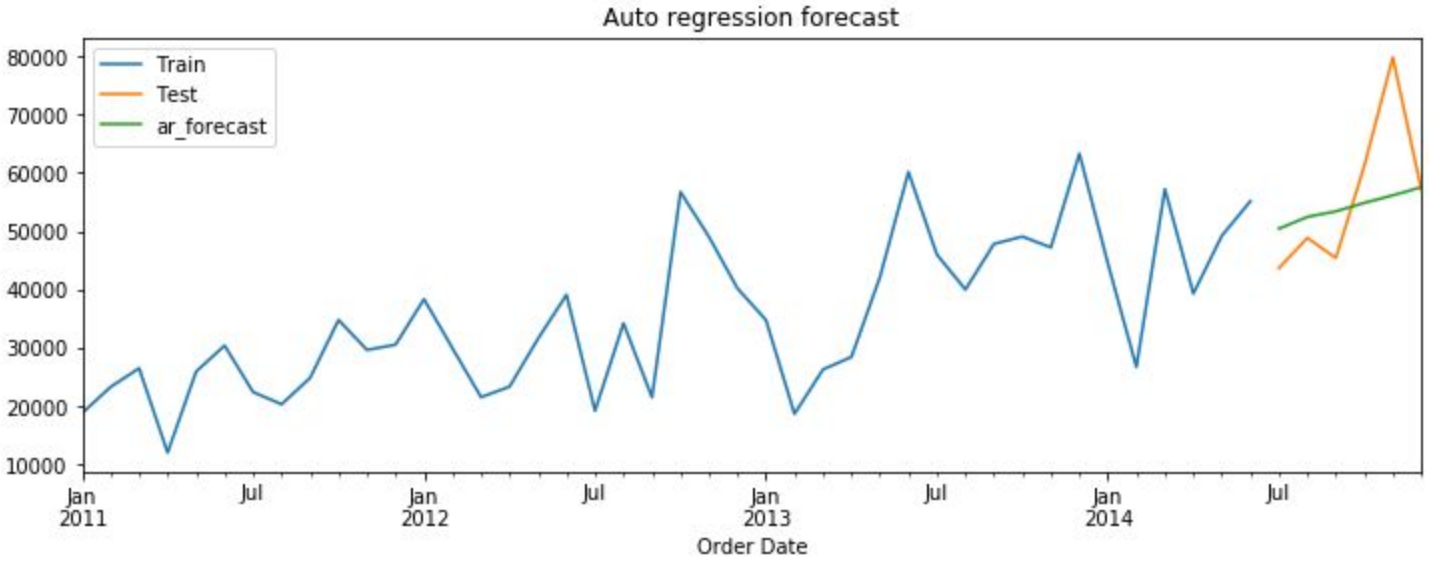
The Holt Winter's Additive Method performs very well on the test set.
The MAPE value for this method is 8.16%.

Holt Winter's Multiplicative Method



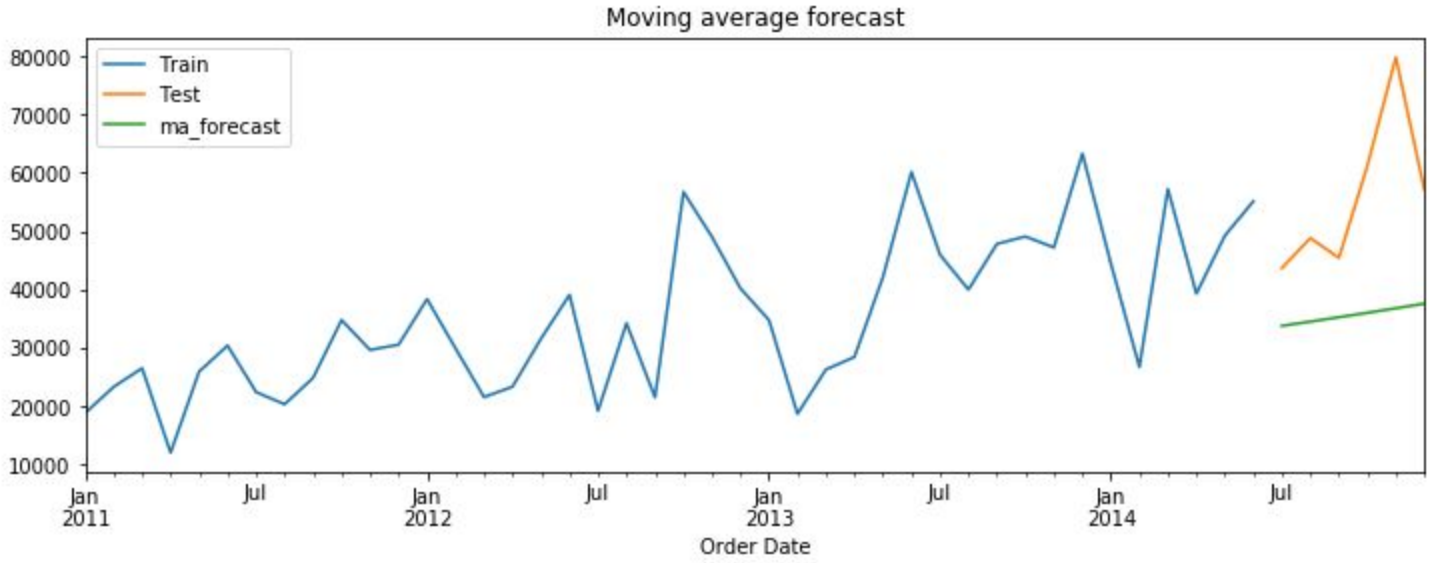
The Holt Winter's Multiplicative Method performs very well on the test set. The MAPE value for this method is 10.12%.

Auto Regression (AR) Method



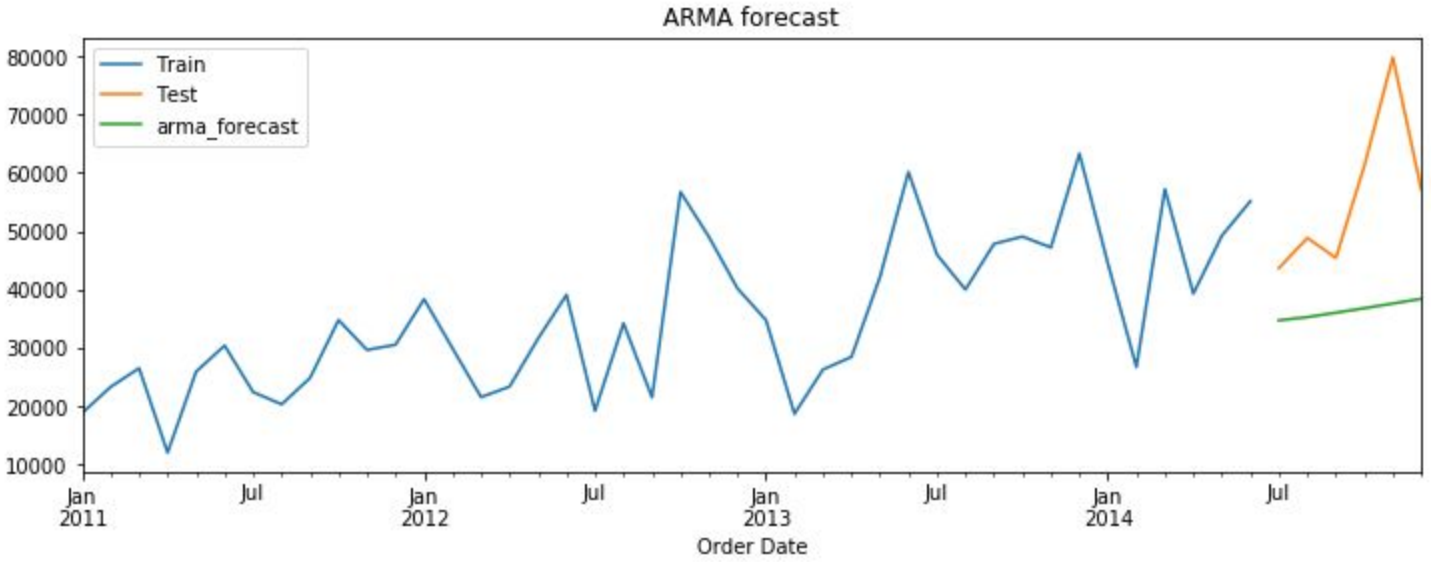
The Auto Regression Method performs moderately well on the test set.
The MAPE value for this method is 13.56%.

Moving Average (MA) Method



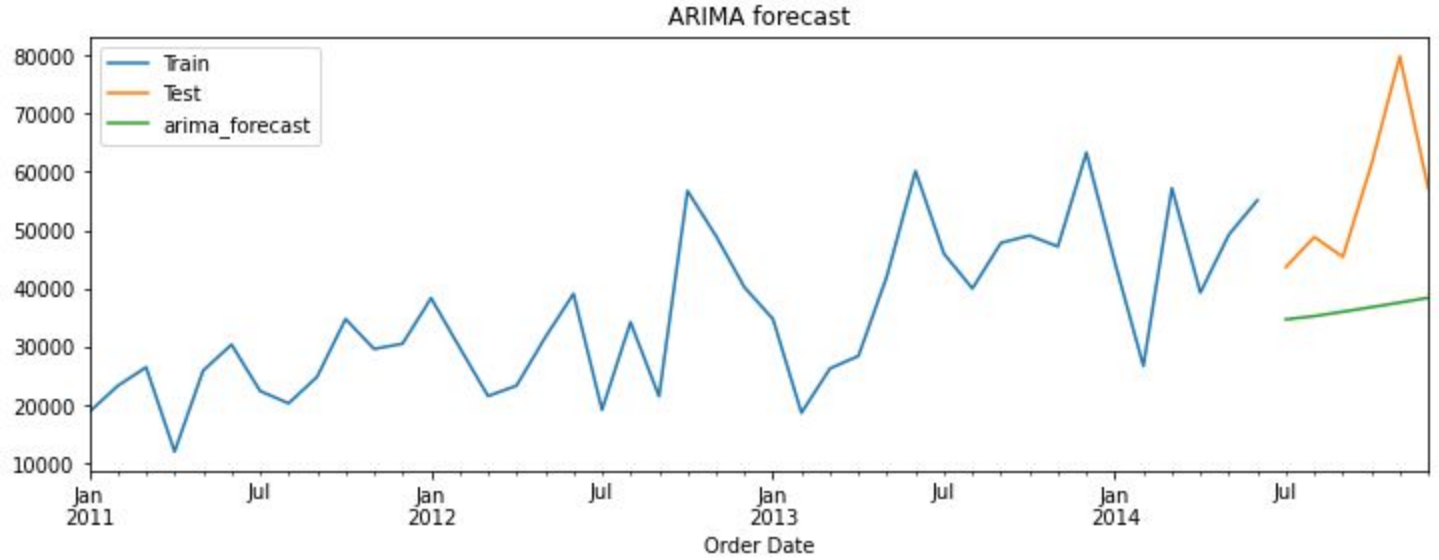
The Moving Average Method performs poorly on the test set.
The MAPE value for this method is 33.93%.

Auto Regressive Moving Average (ARMA) Method



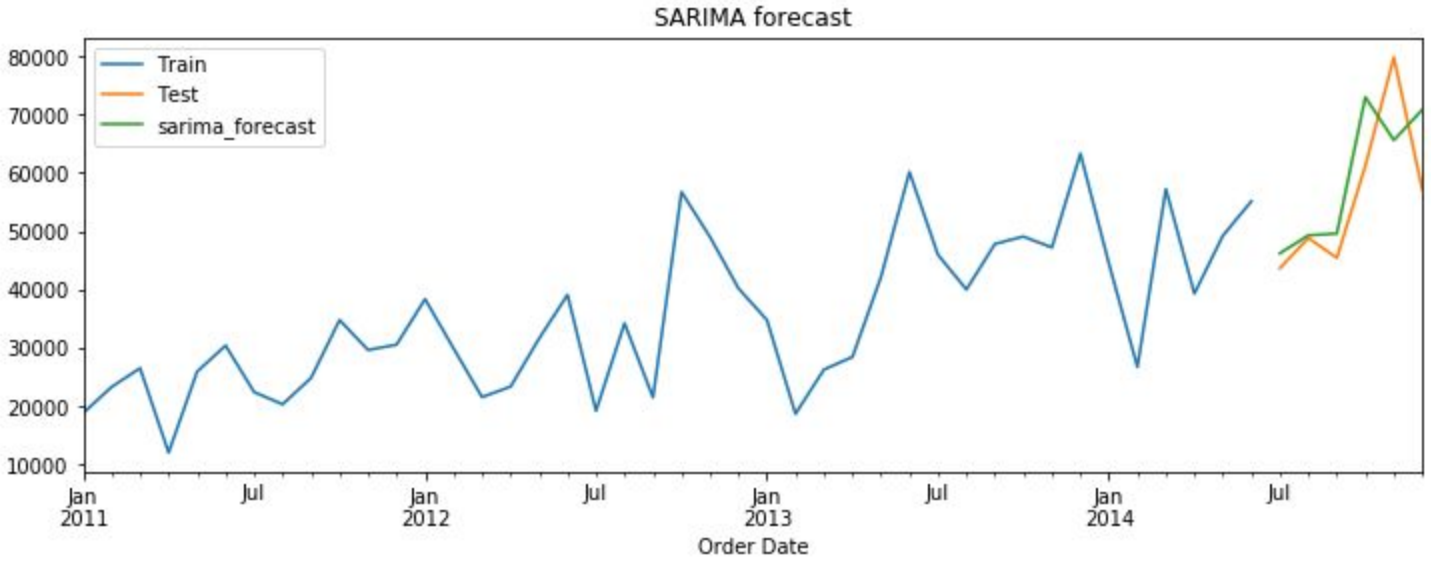
The Auto Regressive Moving Average Method performs poorly on the test set. The MAPE value for this method is 32.40%.

Auto Regressive Integrated Moving Average(ARIMA)



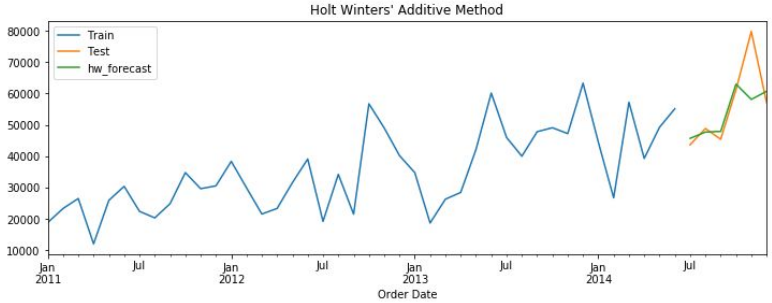
The Auto Regressive Integrated Moving Average Method performs poorly on the test set. The MAPE value for this method is 32.40%.

Seasonal Auto Regressive Integrated Moving Average (SARIMA)

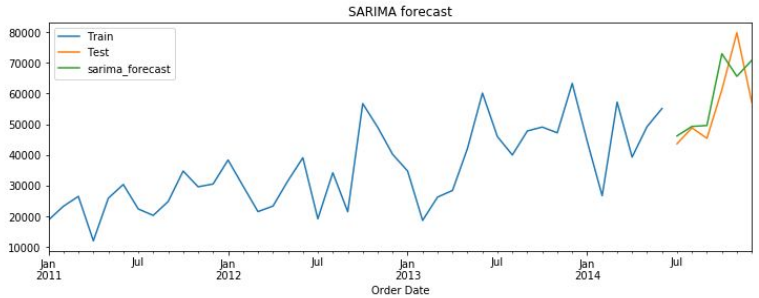


The Seasonal Auto Regressive Integrated Moving Average Method performs moderately well on the test set.
The MAPE value for this method is 12.85%.

Conclusion



- The best forecasting method in the smoothing set of techniques is **Holt Winter's Additive Method** with the least MAPE value of 8.16%.
- Holt Winter's Additive Method forecast is able to predict the sales closer to the actual values.



- The best forecasting method in the ARIMA set of techniques is Seasonal Autoregressive Integrated Moving Average (**SARIMA**) with MAPE value of 12.85%.