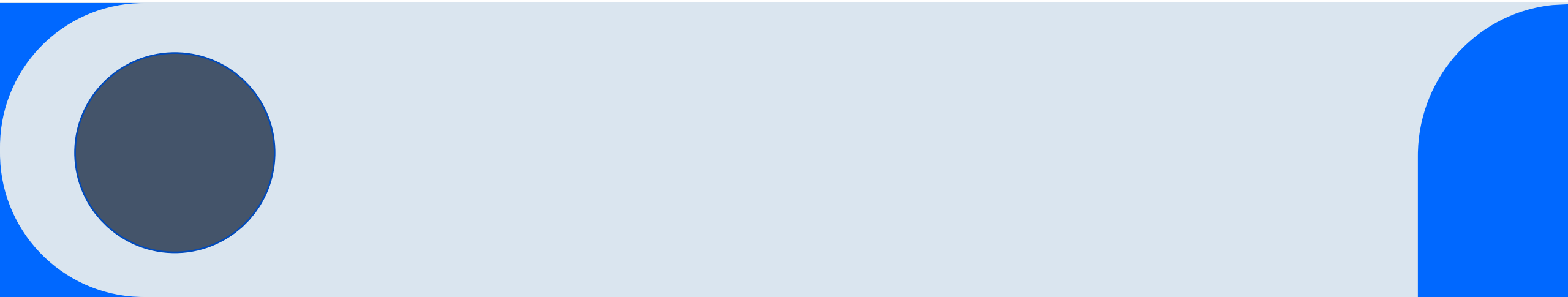


Retail Giant Sales Forecasting



Agenda

1. Problem Statement.
2. What are the 21 market Segments? & Their comparison to find the best segment.
3. Optimal Forecasting Technic.
4. Comparison of all Forecasting Technics.(Smoothing/ARIMA)
5. Conclusions & Recommendations

Problem Statement:

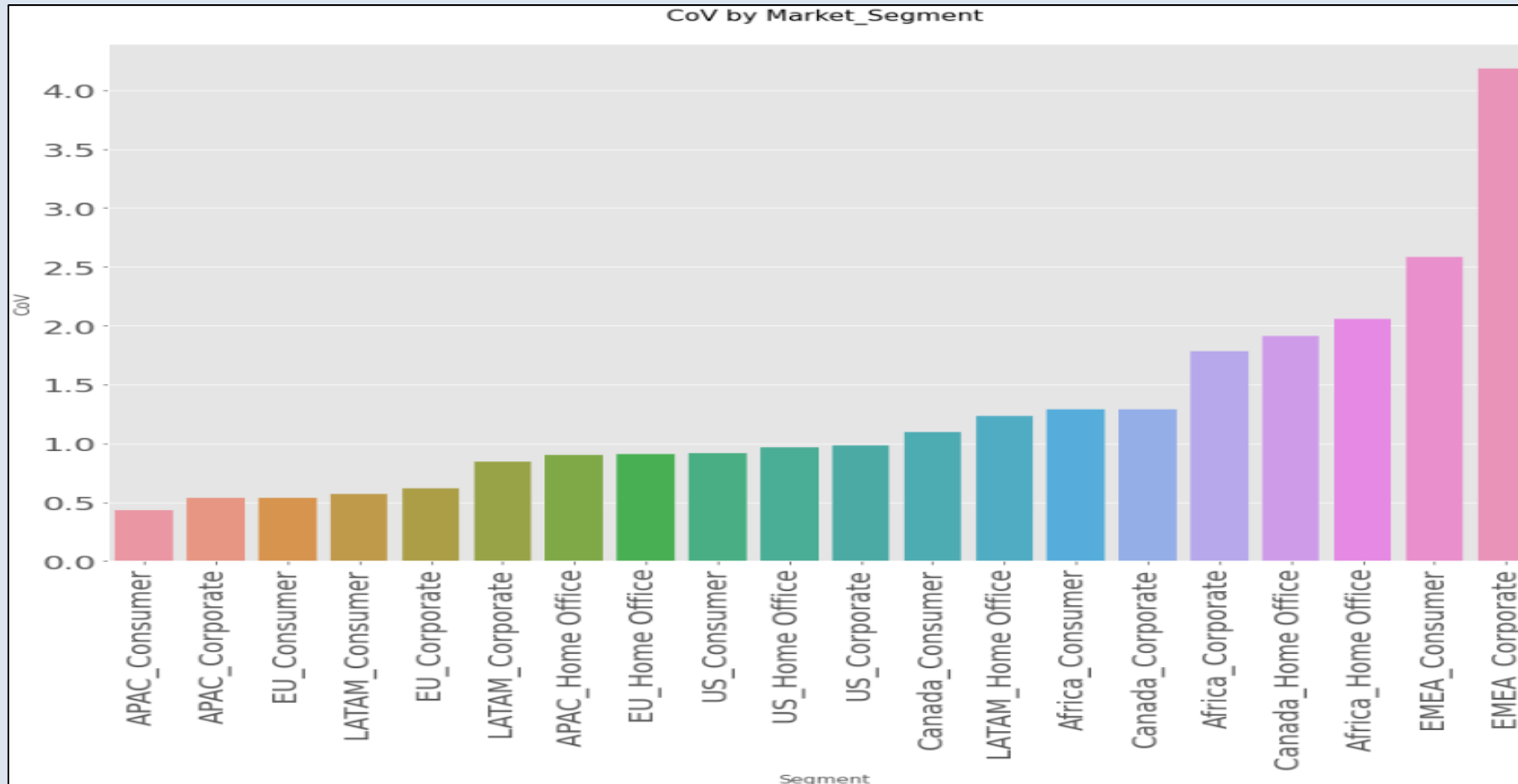
Global Mart is an online supergiant store that has worldwide operations. This store takes orders and delivers across the globe and deals with all the major product categories — consumer, corporate and home office. As a sales manager for this store, you have to forecast the sales of the products for the next 6 months, so that you have a proper estimate and can plan your inventory and business processes accordingly.

Business Objective:

1. Find best market segment amongst 21 segments in terms of profitability
2. Determine which forecasting technic best fits the time-series data for higher accurate forecasts/predictions.

What are the 21 market Segments? & Their comparison to find the best segment.

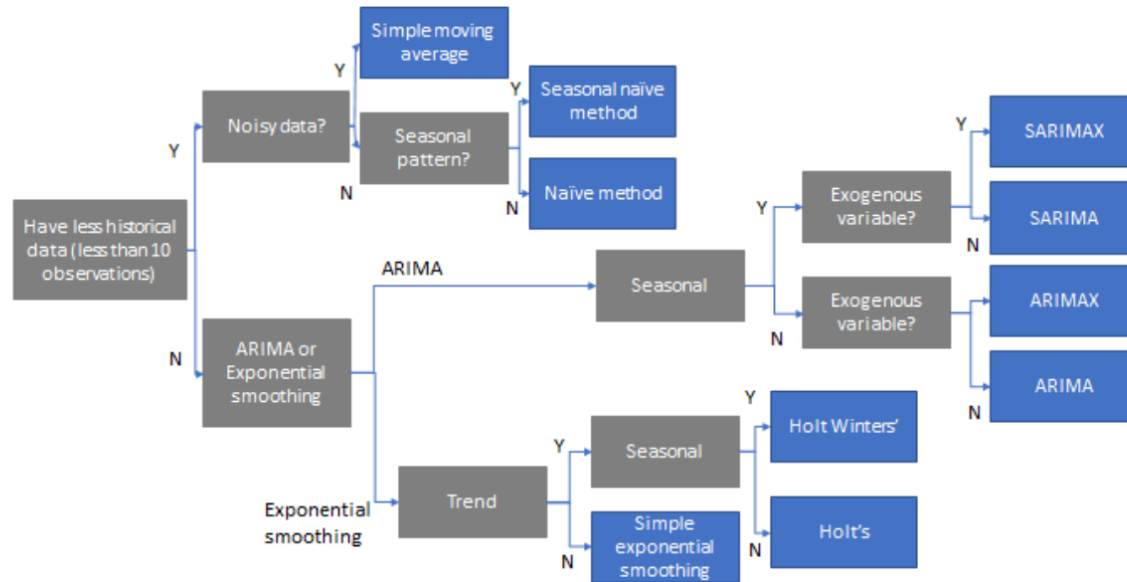
1. From the given set of 21 segments, **APAC_Consumer** has Highest sales & profit
2. To determine best segment we have used concept of Coefficient of Variation. The coefficient of variation (CV) is the ratio of the standard deviation to the mean.



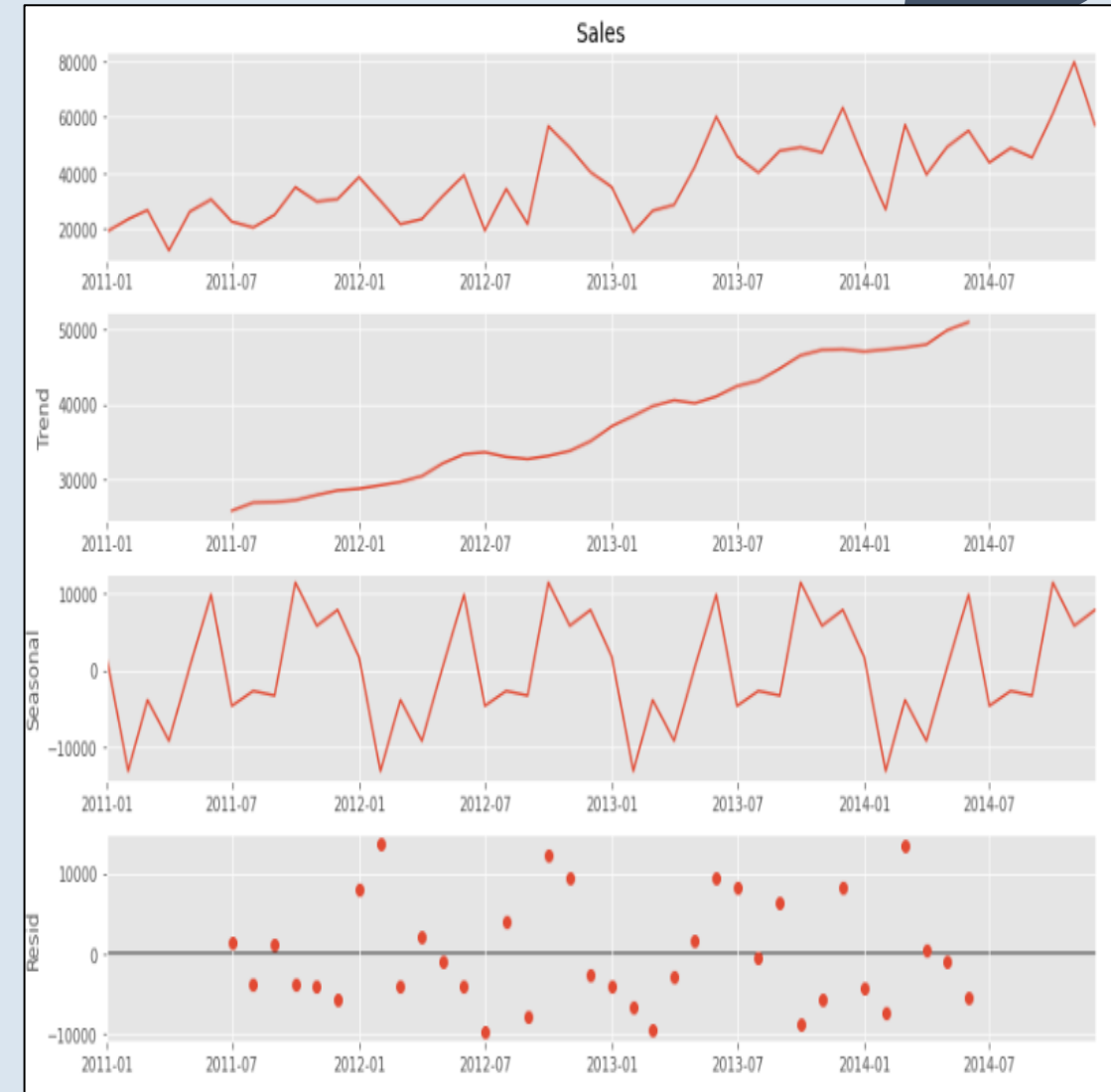
3. The reason to use CoV here is that it helps us in determining the variation or dispersion in profits of each segment, this way we can identify which segment is more volatile and which one is much stable and better the chances of predicting sales, higher the CoV higher instability. Based on above we could infer that **'APAC_Consumer'** is having much better CoV score with least variability

Optimal Forecasting Technic:

Choosing the Right Time Series Method



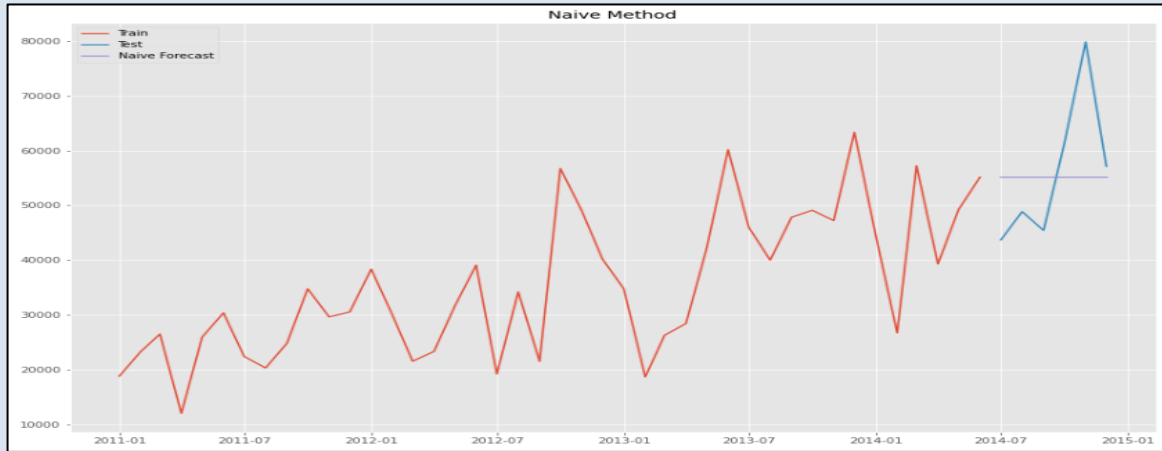
Decomposition Plots



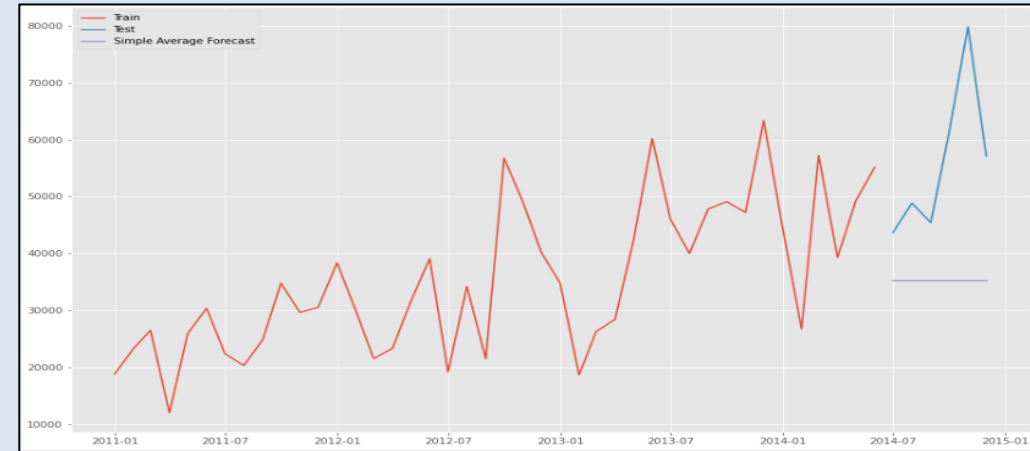
From the above decomposition plots & flow chart guide we can infer that there is a uptrend existing , there is also certain level of seasonality existing, Thus indicating that Holt winter's method and ARIMA/SARIMA methods might yield better results comparatively

Comparison of all Forecasting Technics:(Smoothing/ARIMA)

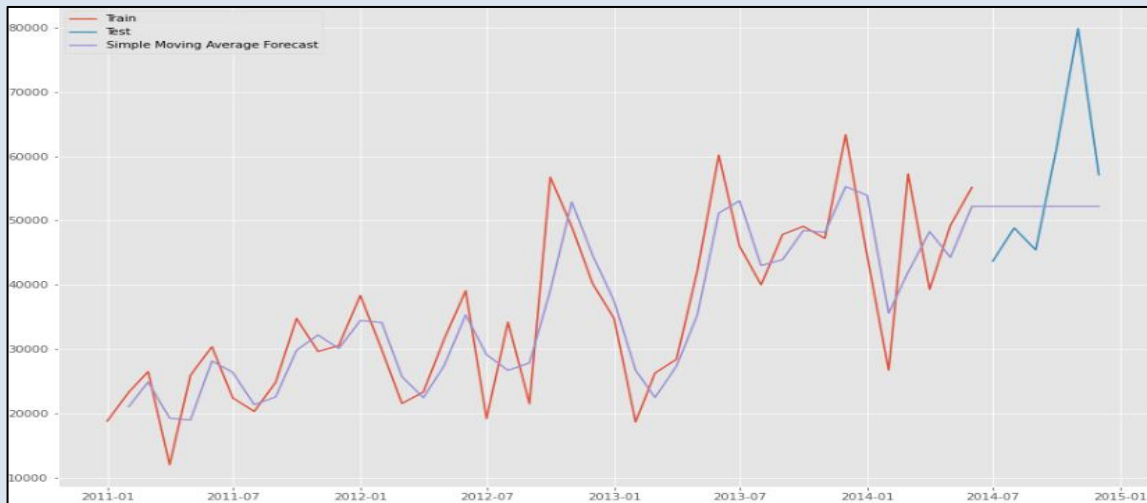
Naive Method



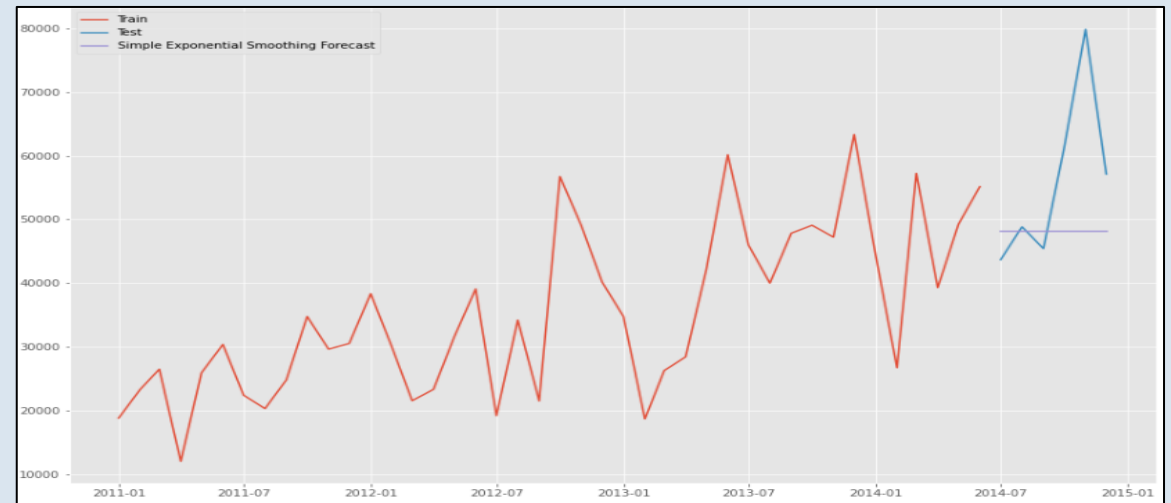
Simple Average Method



Simple Moving Average Method

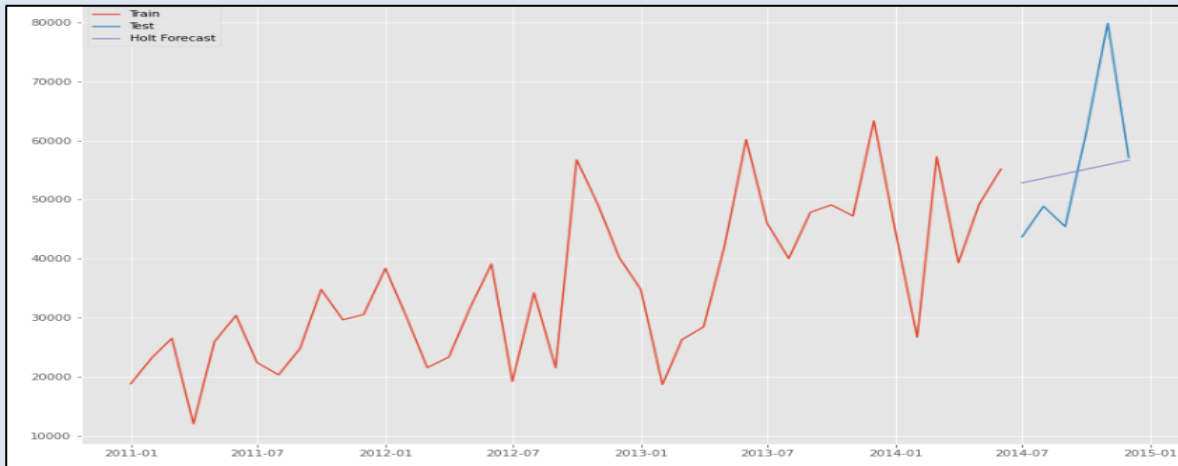


Simple Exponential Smoothing

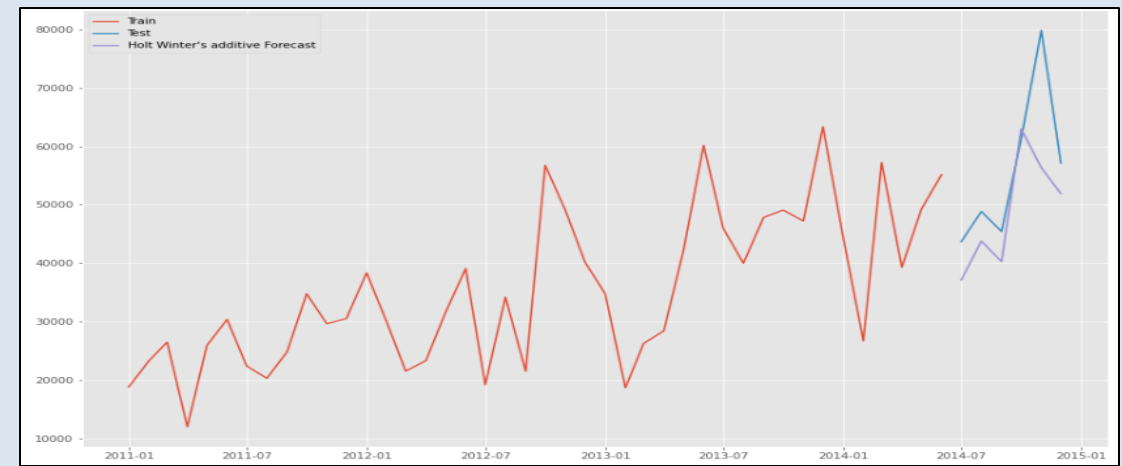


Comparison of all Forecasting Techniques:(Smoothing/ARIMA)

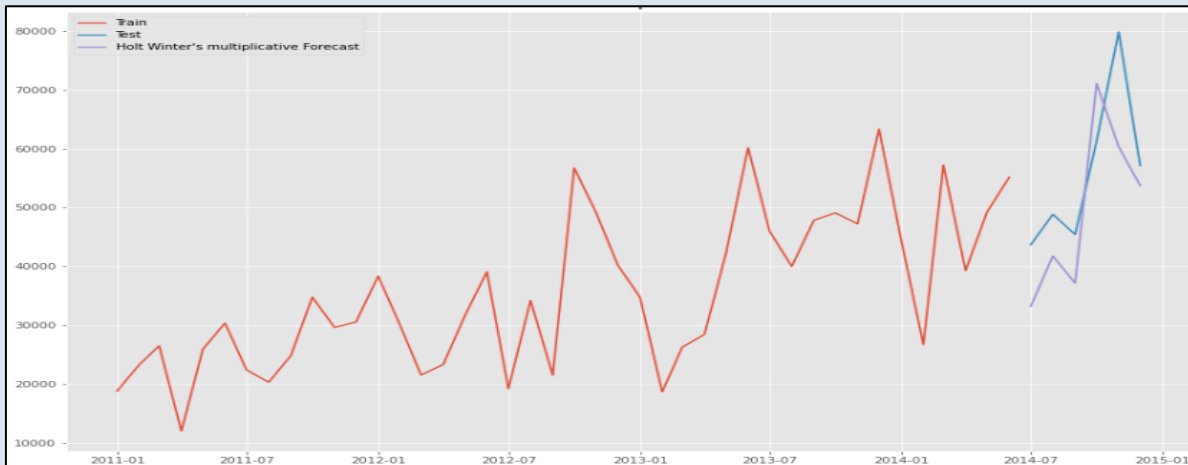
Holt's Method with Trend



Holt Winter's Additive Method



Holt Winter's Multiplicative Method

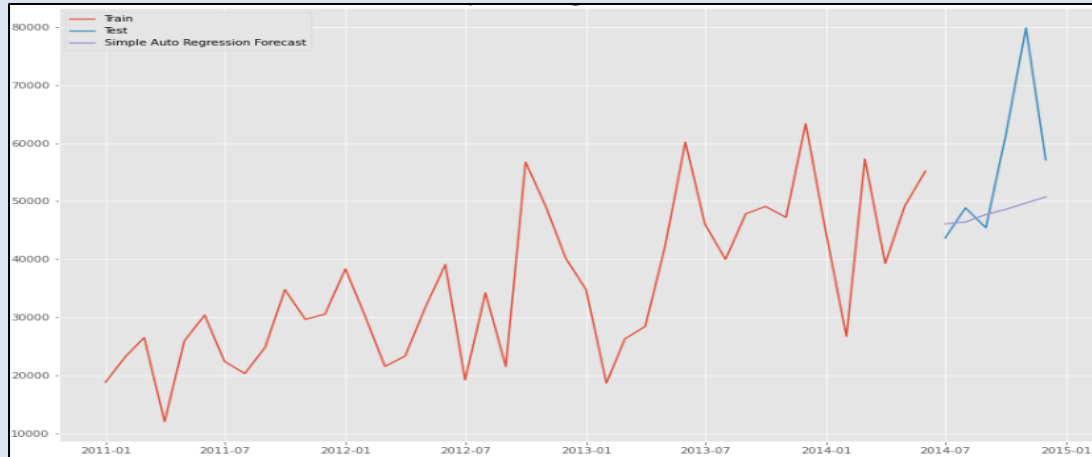


RMSE & MAPE Values for all Smoothing Methods/Technics

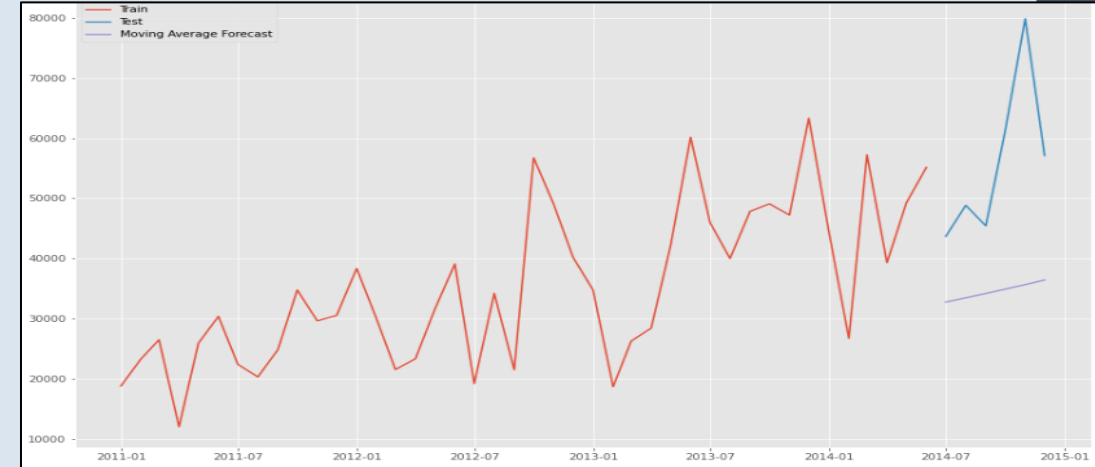
	Method	RMSE	MAPE
0	Naive Forecast Method	12355.97	17.47
0	Simple Average Method	24146.06	34.34
0	Simple Moving Average Method	12903.21	16.54
0	Simple Exponential Smoothing Method	14627.34	15.74
0	Holt's Exponential Smoothing Method	11523.07	15.17
0	Holt Winter's Additive Method	10624.26	13.02
0	Holt Winter's Multiplicative Method	10931.27	17.17

Comparison of all Forecasting Techniques:(Smoothing/ARIMA)

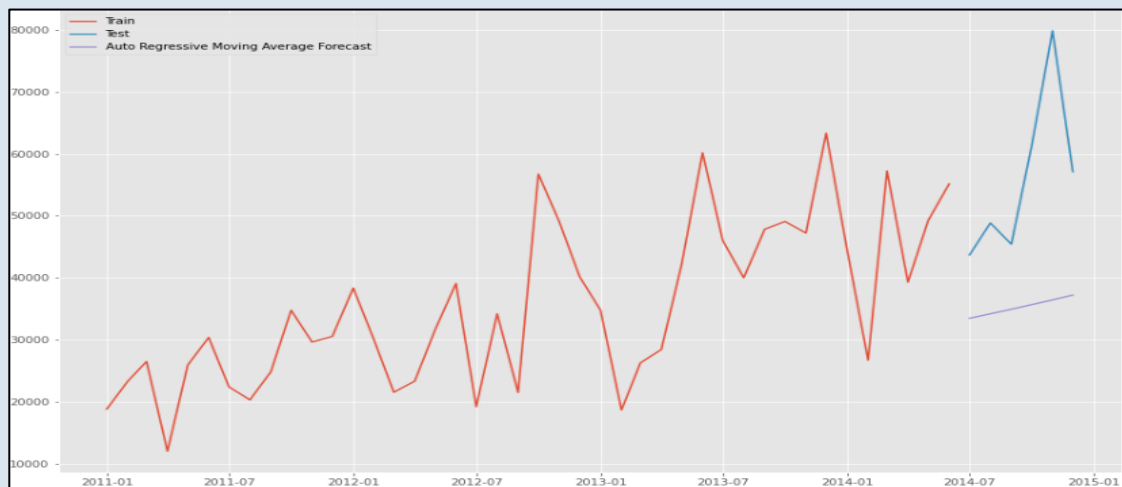
Simple AR Model



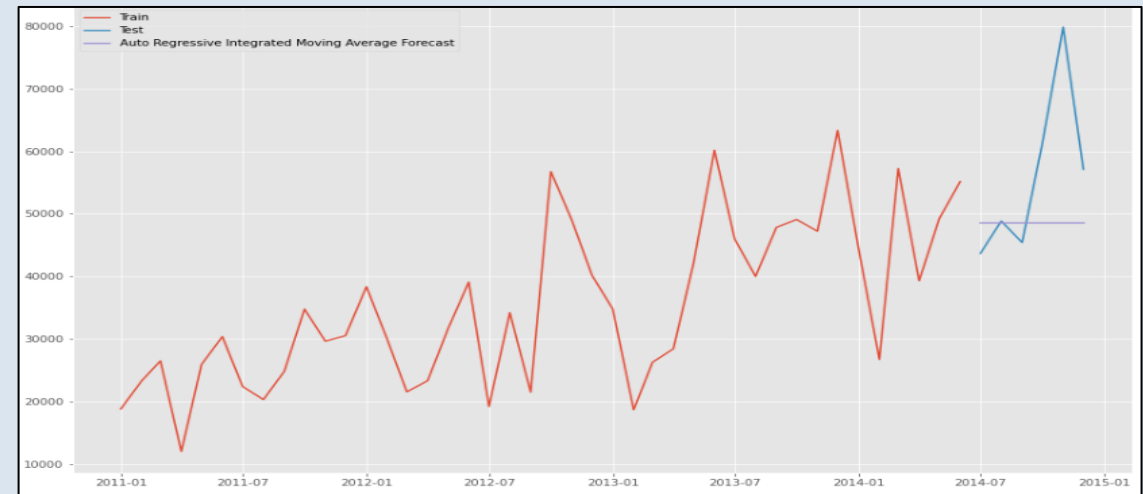
Moving Average Model



ARMA Model

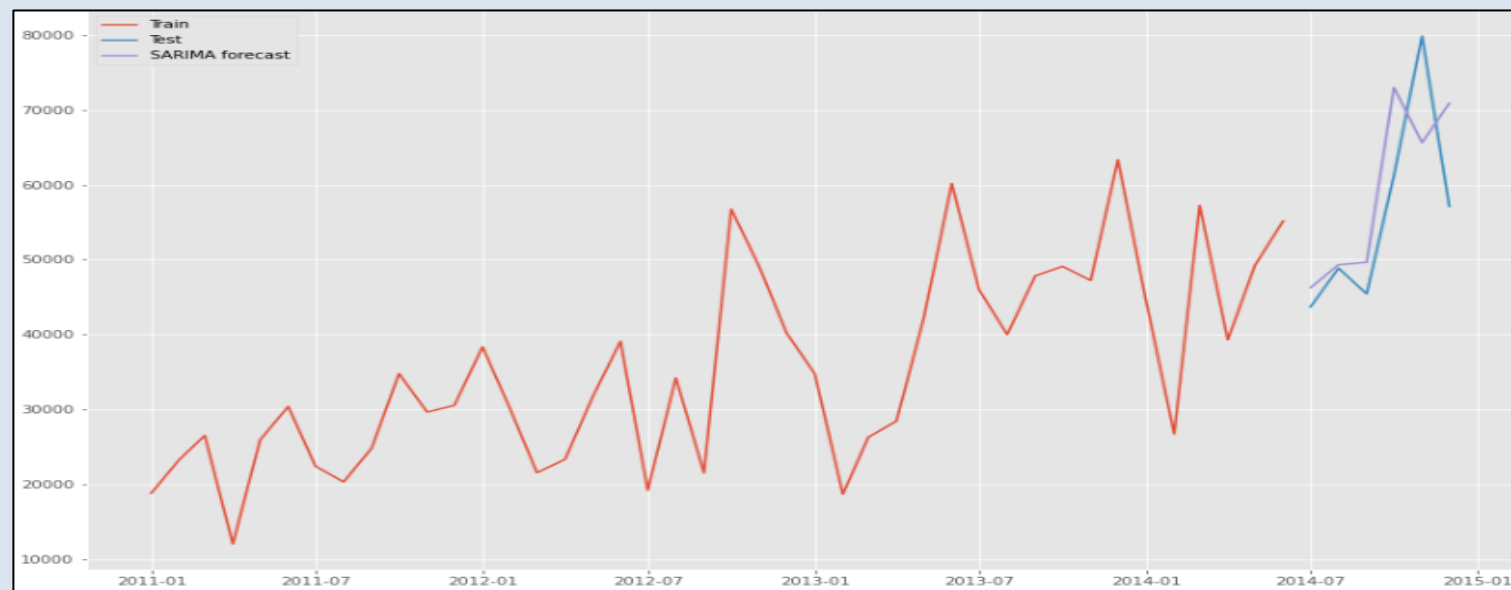


ARIMA Model



Comparison of all Forecasting Techniques:(Smoothing/ARIMA)

SARIMA Model

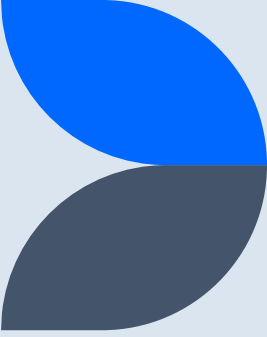


From the above plots/models & their respective RMSE & MAPE values we can determine that ARIMA/SARIMA methods & Holt Winter's Methods(additive/multiplicative) are most accurate in terms of predicting right forecast for time-series data.

RMSE & MAPE Values for all Methods/Technics

	Method	RMSE	MAPE
0	Naive Forecast Method	12355.97	17.47
0	Simple Average Method	24146.06	34.34
0	Simple Moving Average Method	12903.21	16.54
0	Simple Exponential Smoothing Method	14627.34	15.74
0	Holt's Exponential Smoothing Method	11523.07	15.17
0	Holt Winter's Additive Method	10624.26	13.02
0	Holt Winter's Multiplicative Method	10931.27	17.17
0	(AR) Simple Auto Regression Method	13698.16	14.18
0	(MA) Moving Average Method	24323.53	35.93
0	(ARMA) Auto Regressive Moving Average Method	23656.88	34.54
0	ARIMA Method	14431.27	15.60
0	SARIMA Method	9617.49	12.88

Conclusions & Recommendations :



1. The Most Profitable segment is '**APAC_Consumer**' i.e. APAC region with Consumer segment, as it's CoV(Coefficient of Variance) is lowest with highest stability, The Profits & Sales are also the highest for APAC_Consumer segment making it a cherry on top.
2. When checked decomposition plots we can infer that there is a uptrend existing , there is also certain level of seasonality existing.
3. **Non Regressive Models:** From all the above methods stated in results table, right from NAIVE method up to Advanced Smoothing methods like Holt & Holt winter's method we can infer that Holt Winter's method(additive) is said to perform much better in terms of forecasting sales with accuracy of approximately **87%**, although additive method is predicting more accurately the multiplicative method is able to capture the seasonal peaks much accurately.
4. **Regressive Models:** From all the above methods stated in results table, right from Simple AR method to ARIMA & SARIMA method we can infer that ARIMA & SARIMA methods were able to predict much better in terms of accuracy, as ARIMA's accuracy stands at **84.4%**, SARIMA is much better at **87.12%**.
5. Finally, Given the fact based on our decomposition analysis we know that the data consists Trend & Seasonality , considering this as a evidence we can confidently state that **Holt Winter's Method & SARIMA method** are best forecasting pathways for our sales data prediction.

Thank You

