

RETAIL GIANT SALES FORECASTING ASSIGNMENT

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A series of horizontal lines of varying lengths and colors (teal, light blue, and white) extending from the right side of the slide.

Problem Statement

- To build a model to forecast the Sales and Quantity of the products for the next 6 months.
- The Market-Segment on which the forecast need to be made is obtained by calculating Coefficient of Variance.

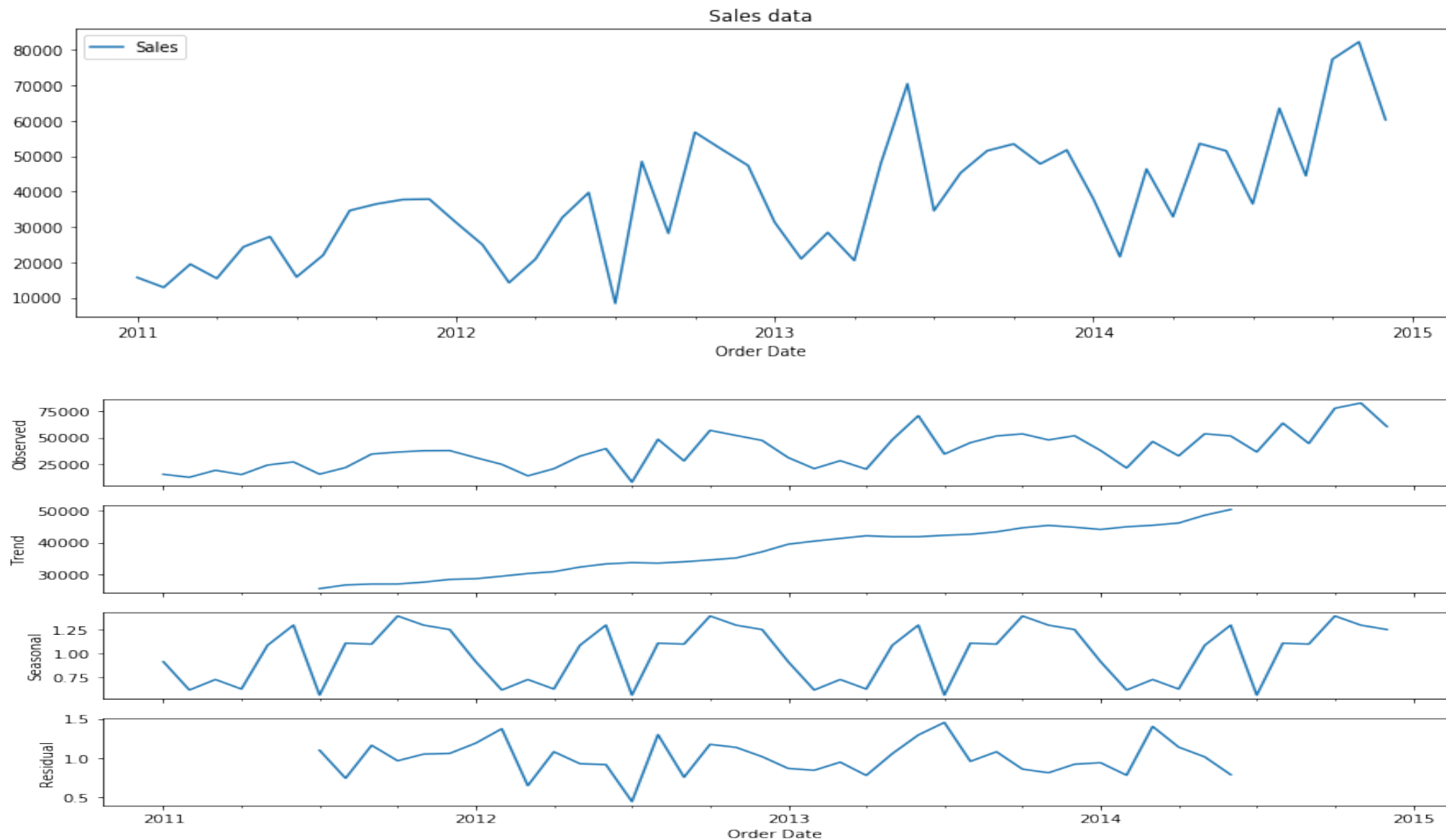
Approach

- The coefficient of variance (CoV) for each market segment on variable Profit is calculated.
- There are 21 market segments and respective CoV are,

Market Segment	
APAC-Consumer	0.603633
APAC-Corporate	0.740799
APAC-Home Office	1.061530
Africa-Consumer	1.446661
Africa-Corporate	1.685008
Africa-Home Office	2.013987
Canada-Consumer	1.497032
Canada-Corporate	1.219189
Canada-Home Office	2.245148
EMEA-Consumer	2.749927
EMEA-Corporate	6.861820
EMEA-Home Office	6.140222
EU-Consumer	0.655334
EU-Corporate	0.697702
EU-Home Office	1.128192
LATAM-Consumer	0.688935
LATAM-Corporate	0.890930
LATAM-Home Office	1.359984
US-Consumer	1.108571
US-Corporate	1.039660
US-Home Office	1.231887

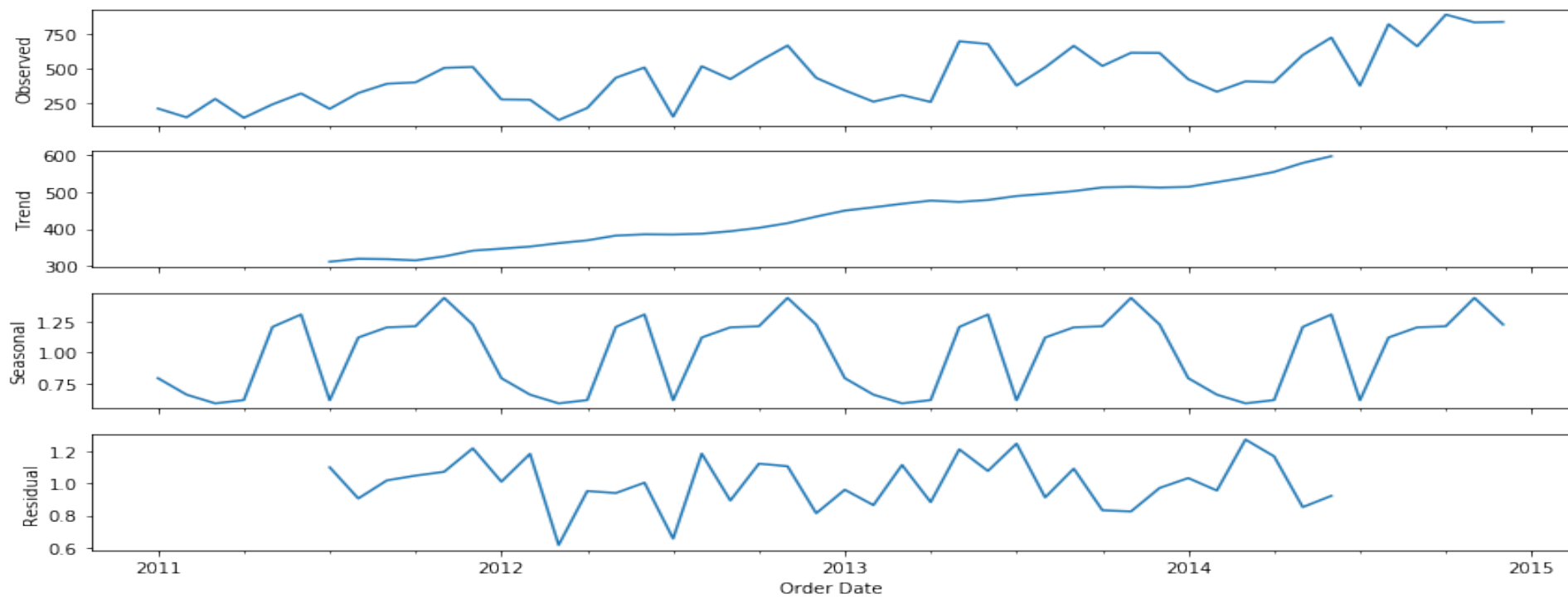
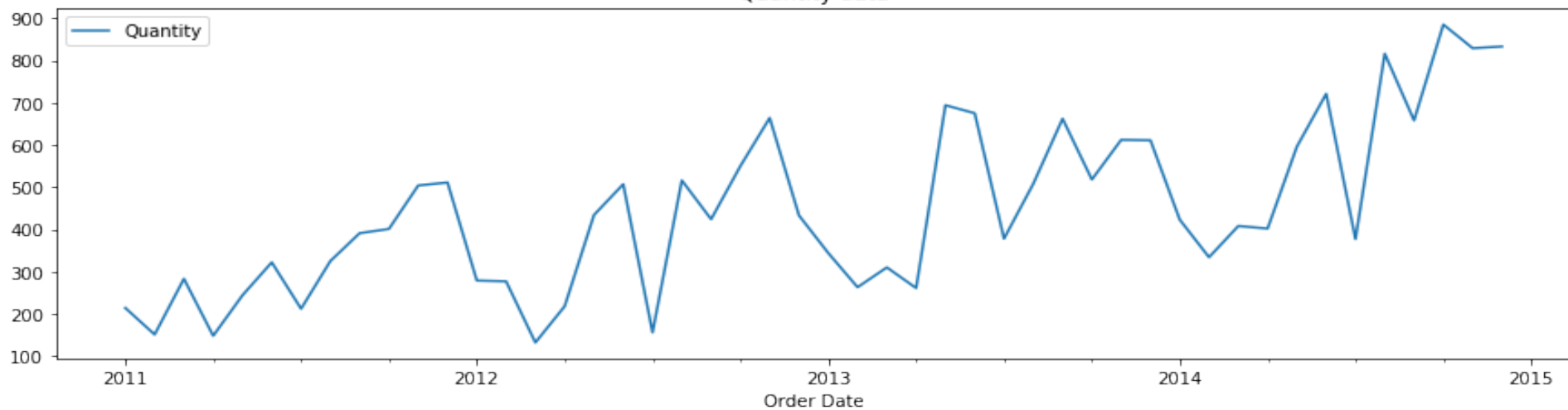
- The CoV is given by ratio of standard deviation to mean.
- Among the 21 market segment, the one most consistently profitable is the one having lowest CoV value.
- Here, market segment with low CoV is considered because low CoV means less fluctuations and less spread.
- The APAC-Consumer market segment has low CoV compared to all.

- From the graphs, we can say that the Sales data of APAC-Consumer has trend and seasonality.



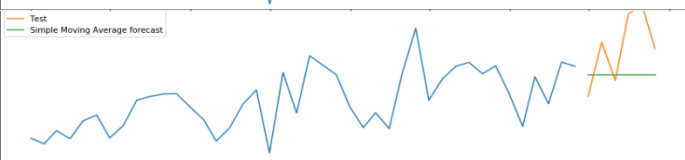






- As the sales data has both trend and seasonality, based on the flow chart we can go with Holt Winter's method or SARIMA method.
- SARIMA is better as the data points are more than 10.
- From the graphs, we say that the Quantity data of APAC-Consumer has trend and seasonality.
- On the similar lines as Sales data, we can go with Holt Winter's method or SARIMA method.
- SARIMA is better as the data points are more than 10.
- Refer the next slide for the graphs of the Quantity data.




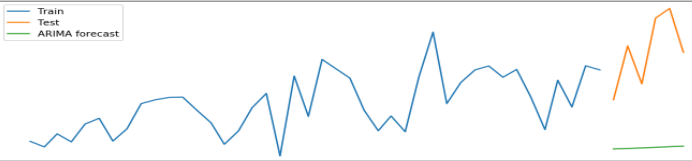

Quantity data



Smoothing Techniques and results for Sales

Method	MAPE	Graph
Naive method	26.86	
Simple Average method	38.18	
Simple Moving Average method	27.40	
Simple exponential smoothing	27.28	
Holt exponential smoothing	24.63	
Holts-Winter Additive smoothing	40.05	
Holts-Winter Multiplicative smoothing	39.39	








ARIMA set of Techniques and results for Sales

Method	MAPE	Graph
Autoregressive AR	27.27	 <p>The graph displays three data series: 'Train' (blue line), 'Test' (orange line), and 'Auto regression forecast' (green line). The 'Train' and 'Test' lines show a fluctuating upward trend. The 'Auto regression forecast' line is a straight green line, indicating a poor fit to the data's pattern.</p>
Moving Average MA	81.64	 <p>The graph displays three data series: 'Train' (blue line), 'Test' (orange line), and 'Moving average forecast' (green line). The 'Train' and 'Test' lines show a fluctuating upward trend. The 'Moving average forecast' line is a nearly horizontal green line, indicating a very poor fit to the data's pattern.</p>
Autoregressive moving average ARMA	77.66	 <p>The graph displays three data series: 'Train' (blue line), 'Test' (orange line), and 'ARMA forecast' (green line). The 'Train' and 'Test' lines show a fluctuating upward trend. The 'ARMA forecast' line is a nearly horizontal green line, indicating a poor fit to the data's pattern.</p>
Autoregressive integrated moving average ARIMA	77.66	 <p>The graph displays three data series: 'Train' (blue line), 'Test' (orange line), and 'ARIMA forecast' (green line). The 'Train' and 'Test' lines show a fluctuating upward trend. The 'ARIMA forecast' line is a nearly horizontal green line, indicating a poor fit to the data's pattern.</p>
Seasonal autoregressive integrated moving average SARIMA	14.89	 <p>The graph displays three data series: 'Train' (blue line), 'Test' (orange line), and 'SARIMA forecast' (green line). The 'Train' and 'Test' lines show a fluctuating upward trend. The 'SARIMA forecast' line is a green line that follows the general upward trend of the data, indicating a significantly better fit compared to the other methods.</p>



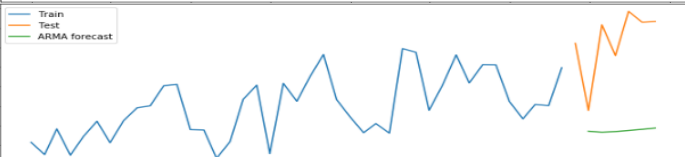


Best Technique for Sales forecast

- The technique which works best for sales forecast is SARIMA as it has less MAPE value compared to others and from graph also we can see that forecast is most accurate with SARIMA.

Smoothing Techniques and results for Quantity

Method	MAPE	Graph
Naive method	26.86	
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ARIMA set of Techniques and results for Quantity

Method	MAPE	Graph
Autoregressive AR	27.27	 <p>This graph displays the performance of the Autoregressive (AR) model. It includes three data series: 'Train' (blue line), 'Test' (orange line), and 'Auto regression forecast' (green line). The x-axis represents time steps, and the y-axis represents the quantity. The forecast line follows the general trend of the training data but shows some deviation from the test data.</p>
Moving Average MA	81.64	 <p>This graph displays the performance of the Moving Average (MA) model. It includes three data series: 'Train' (blue line), 'Test' (orange line), and 'Moving average forecast' (green line). The forecast line is a smoothed version of the training data, failing to capture the underlying pattern and showing a significant deviation from the test data.</p>
Autoregressive moving average ARMA	77.66	 <p>This graph displays the performance of the Autoregressive Moving Average (ARMA) model. It includes three data series: 'Train' (blue line), 'Test' (orange line), and 'ARMA forecast' (green line). The forecast line follows the training data closely but shows a slight deviation from the test data.</p>
Autoregressive integrated moving average ARIMA	77.66	 <p>This graph displays the performance of the Autoregressive Integrated Moving Average (ARIMA) model. It includes three data series: 'Train' (blue line), 'Test' (orange line), and 'ARIMA forecast' (green line). The forecast line follows the training data closely but shows a slight deviation from the test data.</p>
Seasonal autoregressive integrated moving average SARIMA	14.89	 <p>This graph displays the performance of the Seasonal Autoregressive Integrated Moving Average (SARIMA) model. It includes three data series: 'Train' (blue line), 'Test' (orange line), and 'SARIMA forecast' (green line). The forecast line follows the training data closely and shows a better fit to the test data compared to the other models.</p>

Best Technique for Quantity forecast

- The technique which works best for quantity forecast is SARIMA as it has less MAPE value compared to others and from graph also we can see that forecast is most accurate with SARIMA.