Time Series Case Study

RETAIL GIANT FORECASTING

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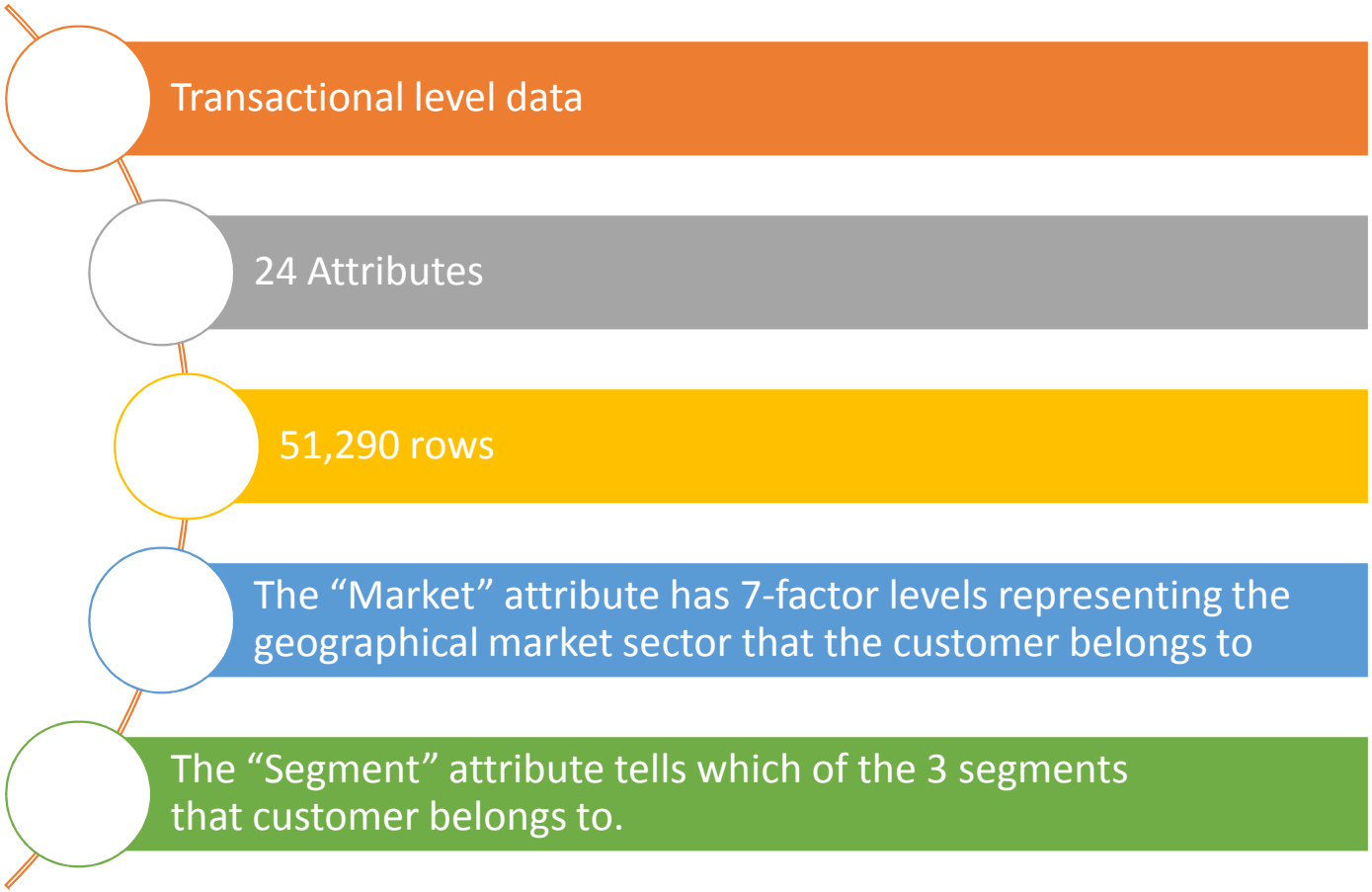
Business Understanding

"Global Mart" is an online store super giant having worldwide operations. It takes orders and delivers across the globe and deals with all the major product categories - consumer, corporate & home office. The store caters to 7 different market segments and in 3 major categories i.e. 21 (7*3) buckets.

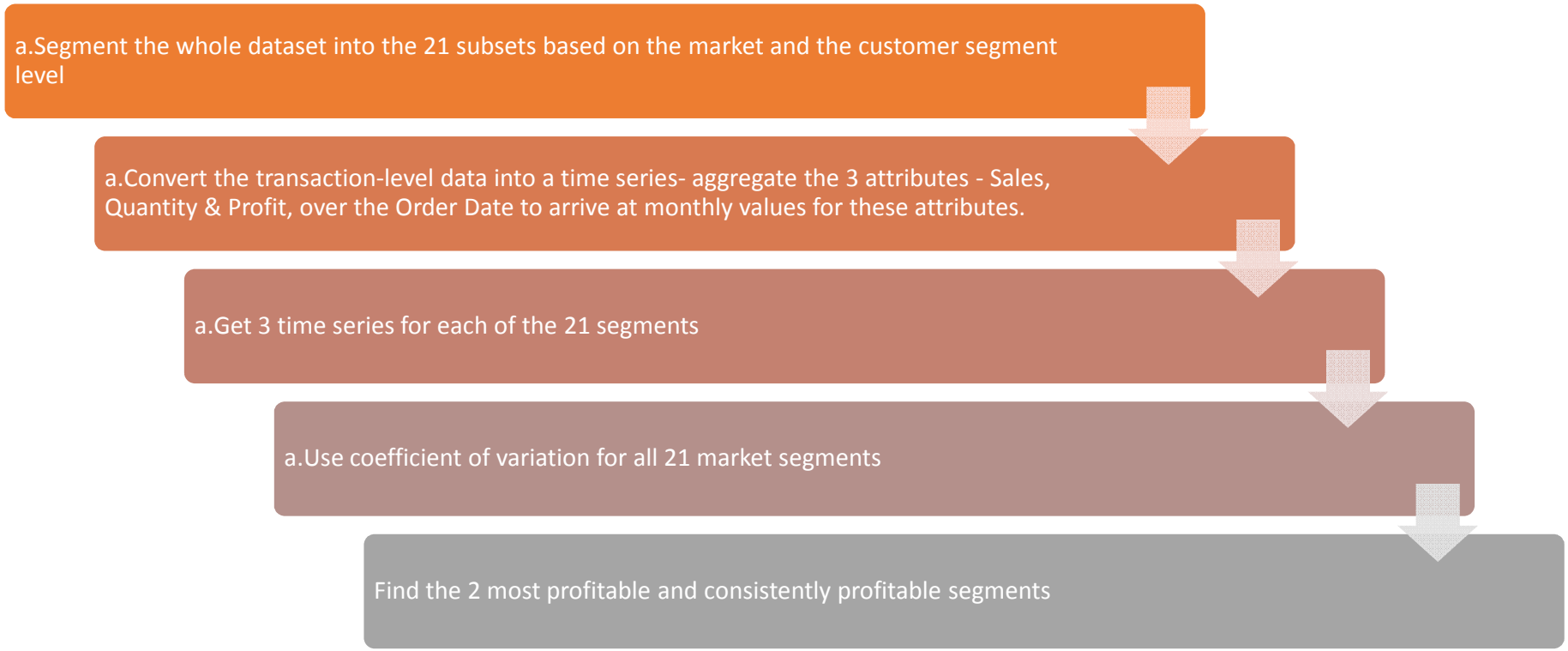
Objective- Forecast the sales and the demand for the next 6 months in order to manage the revenue and inventory accordingly.

Find out 2 most profitable (and consistent) segment from 21 buckets and forecast the sales and demand for these segments.

Data Understanding



Data Preparation



Model Building

- Forecast the sales and quantity for the next 6 months by using classical decomposition and auto ARIMA for forecasting.
- Smoothen the data before you perform classical decomposition.

Model Evaluation

- To test the accuracy of your forecast, we initially separated out the last 6 months values from the dataset, after aggregating the transaction level data into the monthly data. Then checked 6 months forecast using the out-of-sample figures. We use MAPE for this.

Result

Two Market and Segment with the Maximum profit for the given period Jan2011 to Dec 2014

- Consumer APAC: Rs 2,22,818
- Consumer EU: Rs1,88,688

Two Market and Segment with consistent profit for the given period Jan2011 to Dec 2014 can be obtained from the coefficient of variation(sd(profit)/mean(profit)).Lower the value of CV, better the consistency

- Consumer APAC : 0.36
- Consumer EU : 0.41

Total Profit of eachMarkets and Segments

	Category		
Segment	Consum..	Corpora..	Home Office
Africa	47,772	20,687	20,413
APAC	222,818	129,737	83,445
Canada	9,678	5,036	3,103
EMEA	25,533	12,499	5,866
EU	188,688	123,394	60,748
LATAM	120,633	57,875	43,135
US	134,119	91,979	60,299

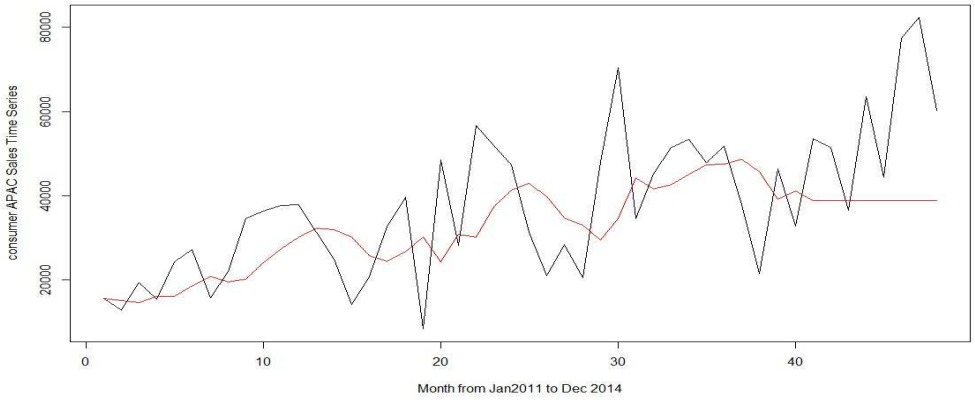
Coefficent of Variation of Market and Segments

	Category		
Segment	Consum..	Corpora..	Home Office
Africa	0.607	1.001	0.853
APAC	0.417	0.436	0.660
Canada	0.679	0.857	1.649
EMEA	1.317	2.588	2.401
EU	0.361	0.441	0.743
LATAM	0.427	0.569	0.699
US	0.659	0.532	0.738

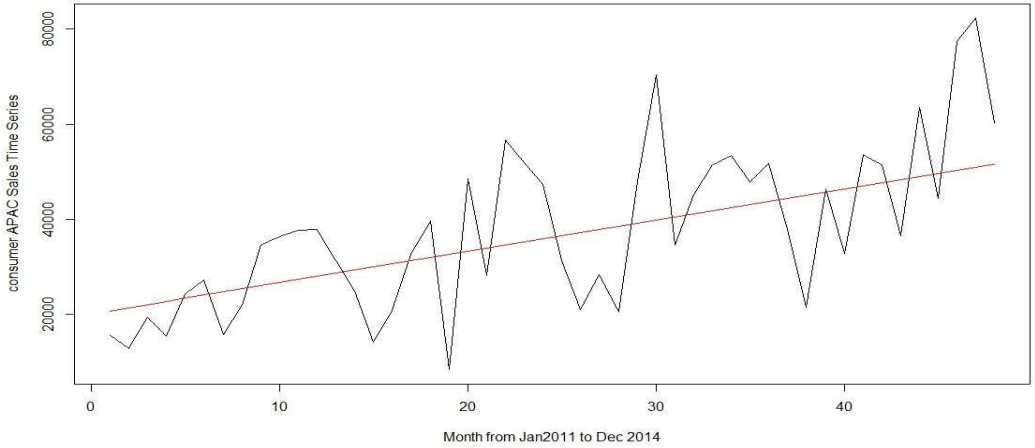
APAC-Sales Forecasting

- We have used two methods to predict sales- Classical Decomposition Method and ARIMA Method, but Classical Method gives better result

ARIMA Method



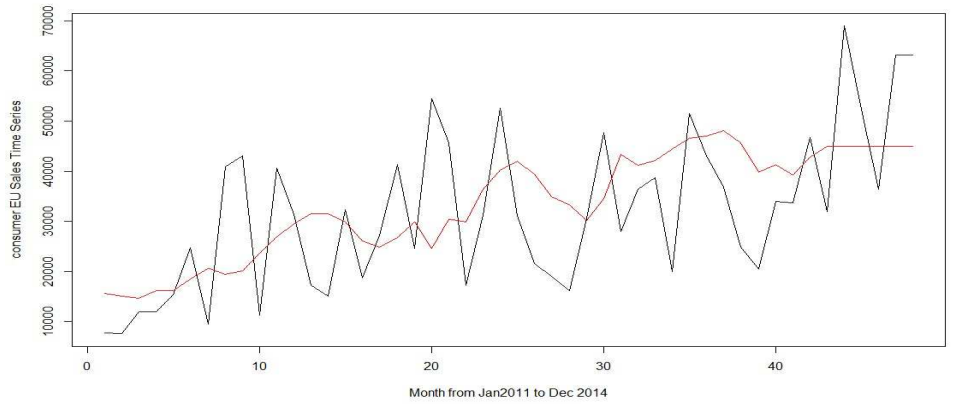
Classical Method



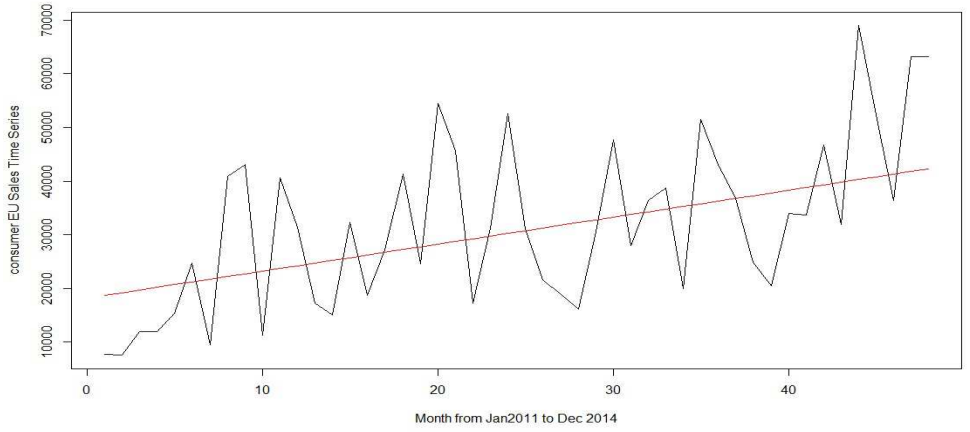
EU-Sales Forecasting

- We have used two methods to predict sales- Classical Decomposition Method and ARIMA Method, but Classical Method gives better result

ARIMA Method



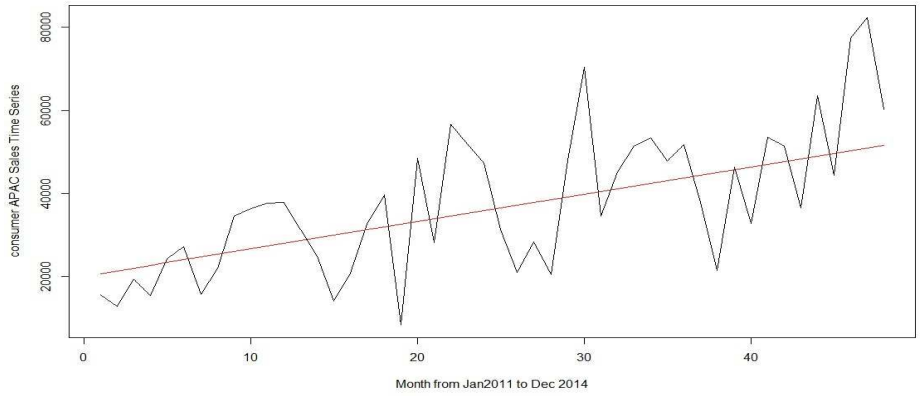
Classical Method



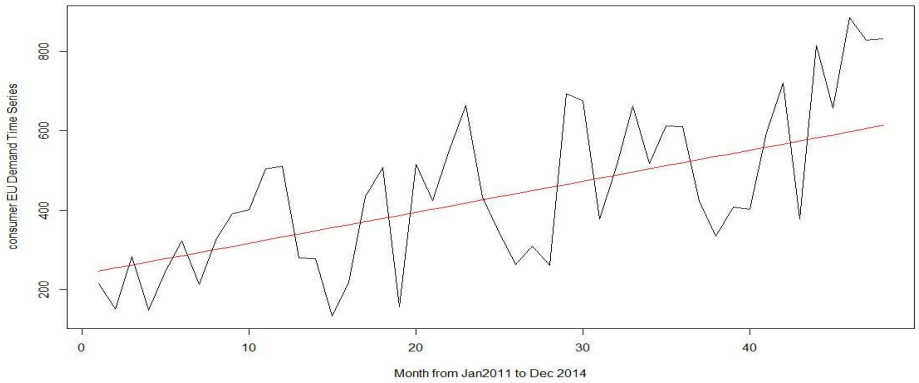
Demand Forecasting

- We have used two methods to predict demand- Classical Decomposition Method and ARIMA Method, but ARIMA method seems to overfit so we have taken results of only Classical Decomposition Method to predict demand in both buckets(APAC Consumer and EU Consumer)

APAC Consumer-Demand Forecasting



EU Consumer-Demand Forecasting



Conclusion

- The two most profitable buckets out of 21 are- EU consumer and APAC consumer segment.
- On analyzing Sales and Demand for Consumer APAC and Consumer EU, it is found that the all four of them have only trend and no seasonality.
- Better Results are obtained for Classical Decomposition Method for predicting sales for both buckets.
- Lower MAPE indicates better model. But For demand, in case of consumer APAC, ARIMA model seems to overfit .So classical decomposition method is better to predict the demand.
- Following table provide MAPE values for sales and demand of APAC Consumer and EU Consumer buckets-

Market and Segment	Method	MAPE value
Consumer Sales APAC	Classical	25.15
Consumer Sales APAC	Arima	27.68
Consumer Demand APAC	Classical	29.52
Consumer Demand APAC	Arima	26.52
Consumer Sales EU	Classical	28.10
Consumer Sales EU	Arima	28.49
Consumer Demand EU	Classical	30.18
Consumer Demand EU	Arima	30.13