Global Mart - CASE STUDY SUBMISSION
–
Sales Forecasting

Group Details

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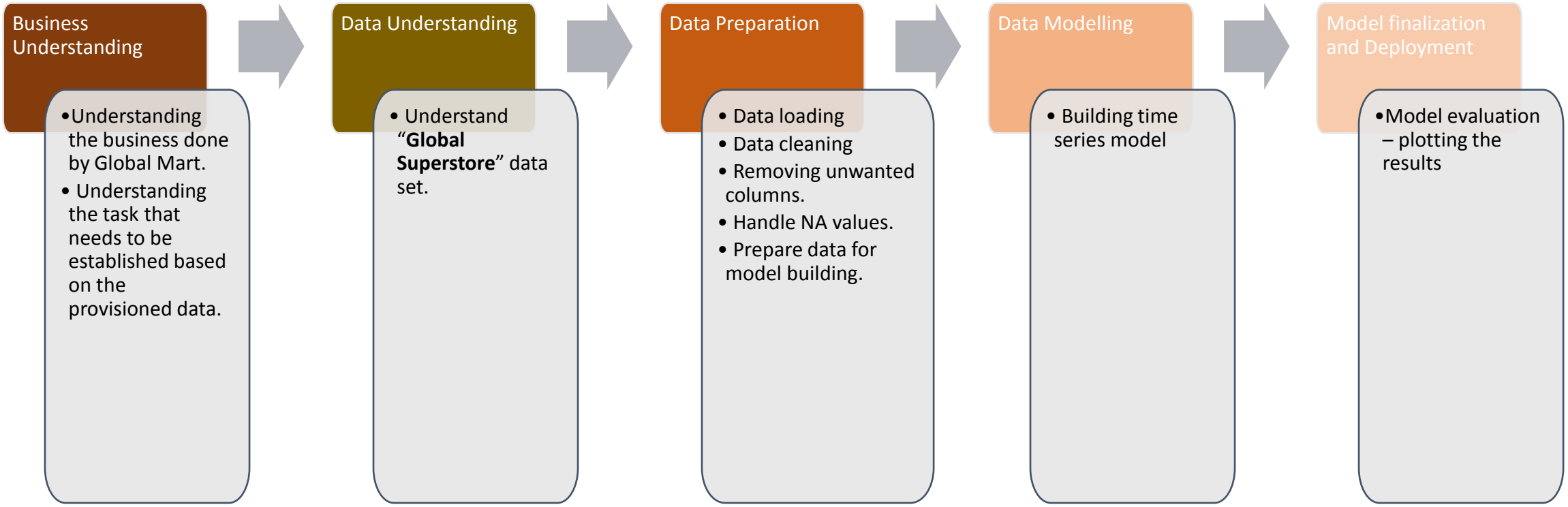
Abstract

“Global Mart” is a large online superstore with worldwide business operations.

As an sales/operational manager, the entrusted task is to finalise the sales plan for the next 6 months by forecasting the demand. This forecasting of sales/demand is expected to help the organisation in managing the revenue and inventory accordingly.

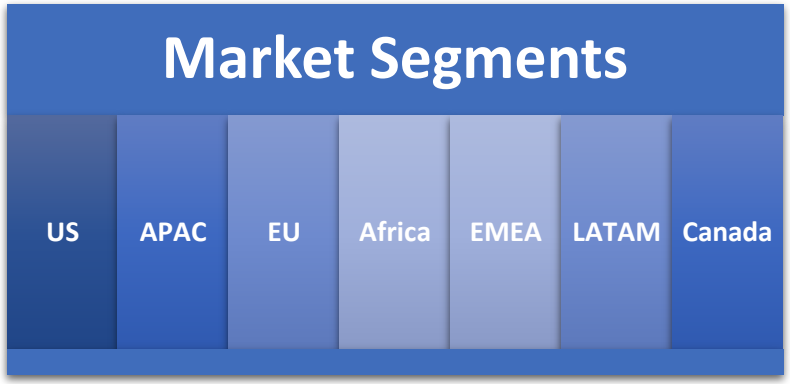
Problem Solving Methodology- CRISP DM



Business Understanding

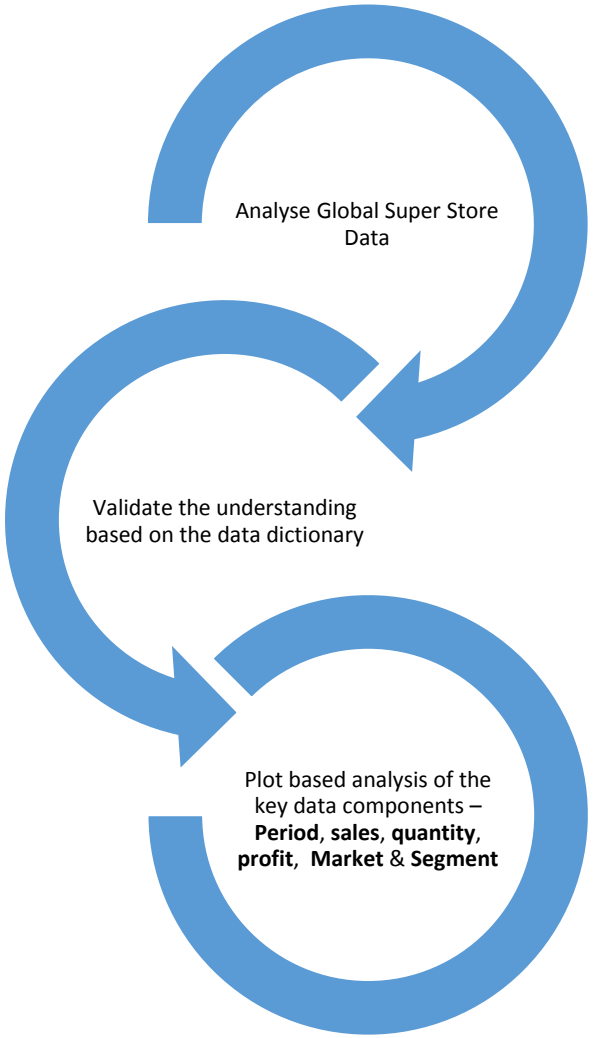
"Global Mart" is a large online superstore with worldwide business operations.

Business foot print:



The expected behaviour of the sales is that not all the segments and markets perform equally and are of same significance. Hence, from a forecasting perspective, the top 2 segments are given priority.

Data Understanding

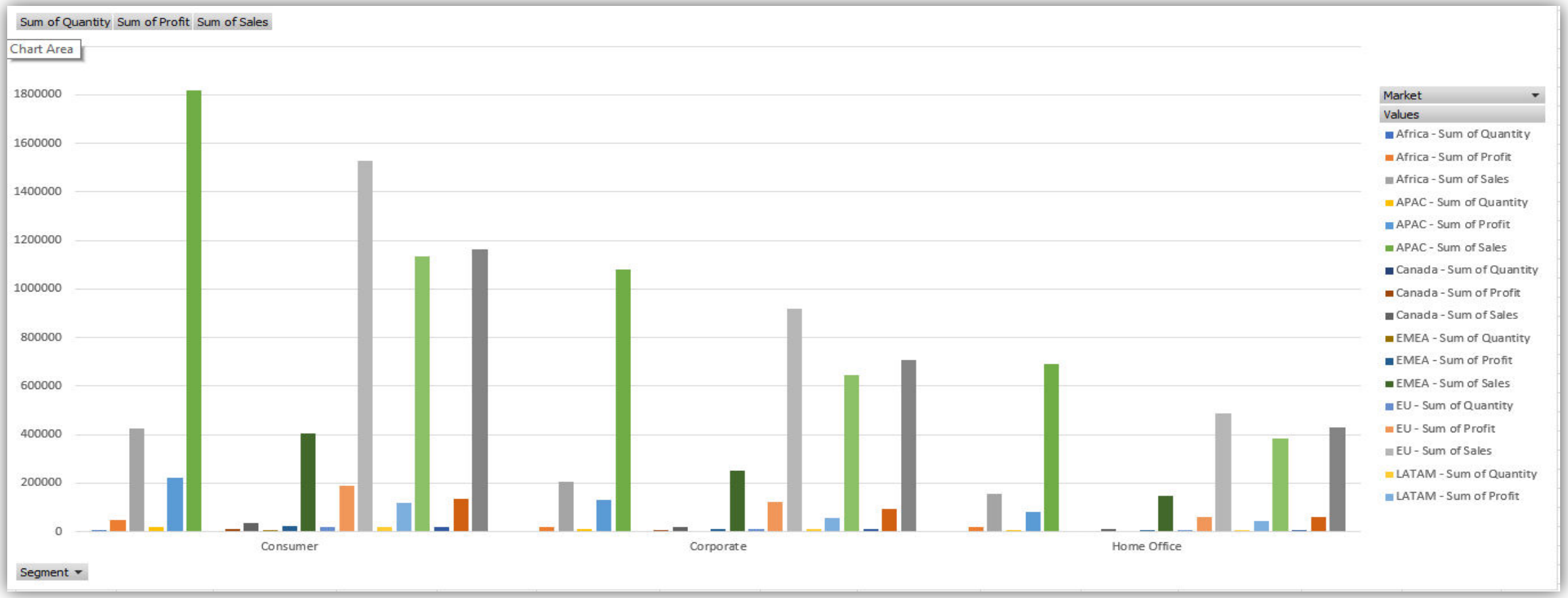


Data understanding is based on the details provided in the data dictionary and the business understanding obtained.

The key data components being analysed from a forecasting perspective are:

- Period → Time series analysis
- Market and Segment information
- Sales, quantity and Profit

Understanding Data – Market –Sector Relation Analysis



Inference that the majority of the sales and profit are from the consumer segment.

Data Preparation

Preparing Data – Top Segment-Market Analysis

The aggregated data based on the mean profit, standard deviation and the coefficient of variation. The aggregated information is across the 7 segments and 3 markets combination and hence 21 combinations of aggregated information.

	Segment	Market	mean_Profit	sdev	cv	count
1	Consumer	Africa	995.2520625	1313.319627	1.319584934	48
2	Consumer	APAC	4642.032508	2934.378529	0.632132266	48
3	Consumer	Canada	230.4214286	321.5098195	1.395312152	42
4	Consumer	EMEA	531.928625	1164.003918	2.188270876	48
5	Consumer	EU	3930.993906	2454.139843	0.624305176	48
6	Consumer	LATAM	2513.186083	1662.429478	0.661482844	48
7	Consumer	US	2794.150192	2828.769785	1.012390026	48
8	Corporate	Africa	430.9784375	765.4631248	1.776105388	48
9	Corporate	APAC	2702.859058	1886.830486	0.698086894	48
10	Corporate	Canada	148.1311765	230.014408	1.552775138	34
11	Corporate	EMEA	260.398625	1163.227313	4.467102364	48
12	Corporate	EU	2570.707906	1963.5252	0.763807197	48
13	Corporate	LATAM	1205.737945	978.0002712	0.811121749	48
14	Corporate	US	1916.231958	1920.847931	1.00240888	48
15	Home Office	Africa	425.2618125	761.2167962	1.789995654	48
16	Home Office	APAC	1738.442788	1818.373564	1.045978376	48
17	Home Office	Canada	124.1292	278.4789806	2.243460689	25
18	Home Office	EMEA	122.2138125	718.7084765	5.880746716	48
19	Home Office	EU	1265.584469	1413.034336	1.11650733	48
20	Home Office	LATAM	898.64862	1056.53921	1.175697805	48
21	Home Office	US	1256.222469	1377.004842	1.09614728	48

Preparing Data – Top 2 segment – market Analysis Result

	Segment	Market	mean_Profit	sdev	cv	count
1	Consumer	EU	3930.994	2454.140	0.6243052	48
2	Consumer	APAC	4642.033	2934.379	0.6321323	48

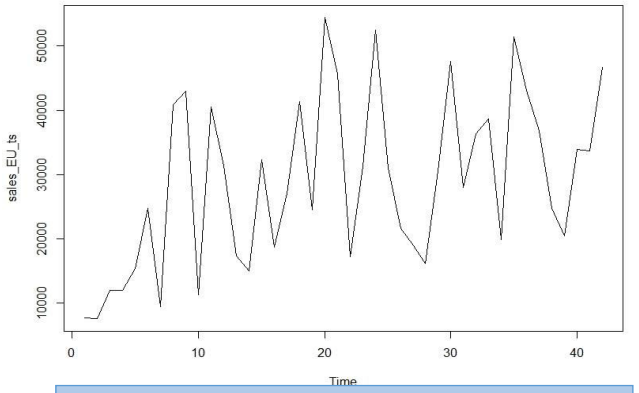
Among the aggregated information in the 21 segment – market combination, the most profitable and consistently performing segment – market combination is selected.

Conclusion that the segment-market to be analysed for forecasting sales is **Consumer** segment in **EU** and **APAC** markets.

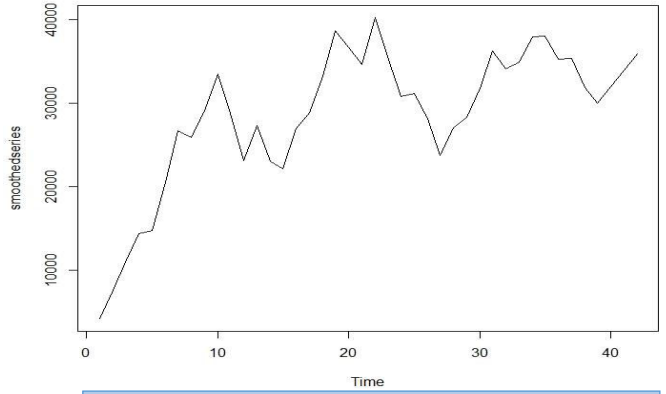
Data Modelling

Perform modelling for both **EU** and **APAC** Markets

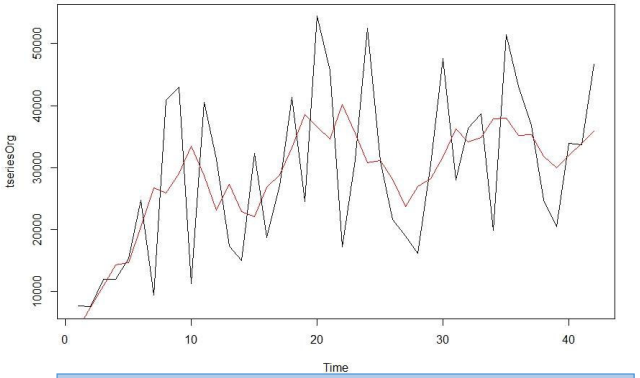
Data Modelling and Prediction– EU Sales



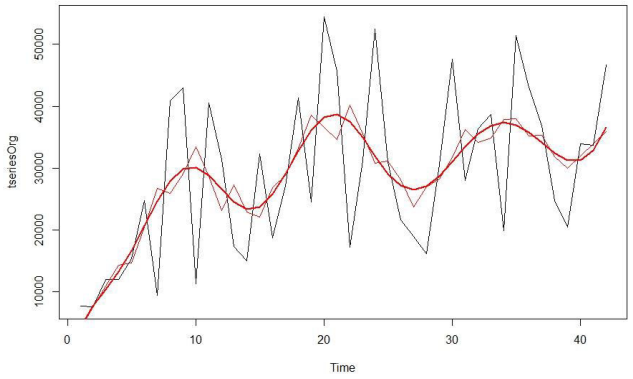
Plot of original time series data for the EU sales revenue.



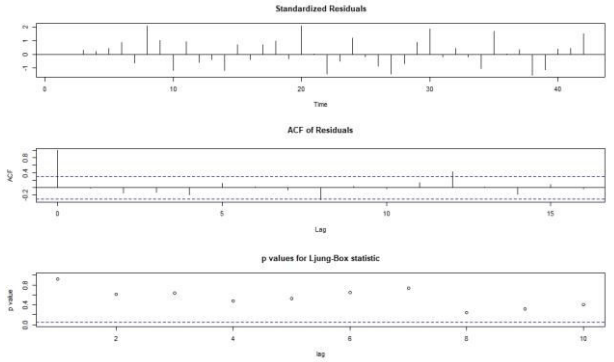
Plot of smoothened time series data for the EU sales revenue.



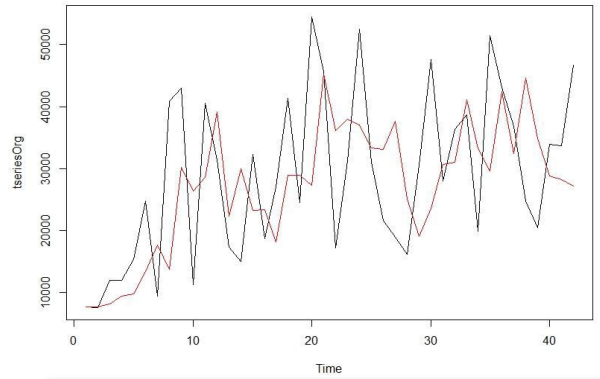
Dual plot of original and smoothened time series data for the EU sales revenue.



Model evaluation – original vs prediction – **Classical decomposition**

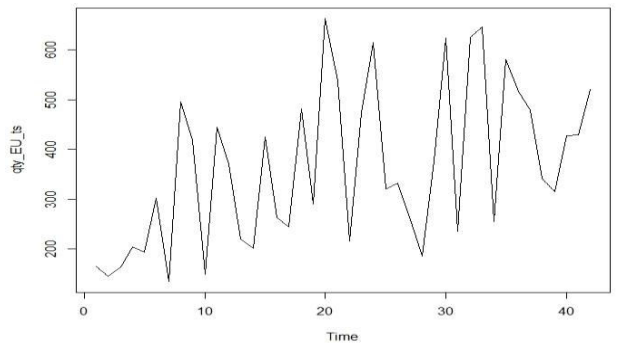


ARIMA FIT – Residual analysis

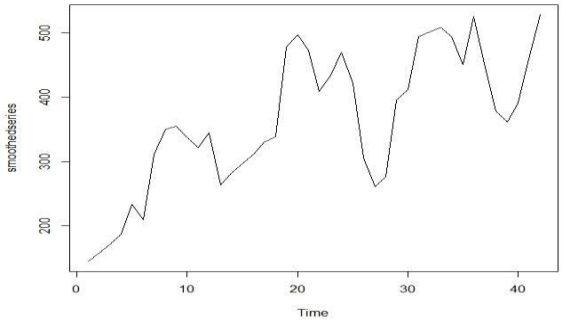


Model evaluation – original vs prediction – **ARIMA**

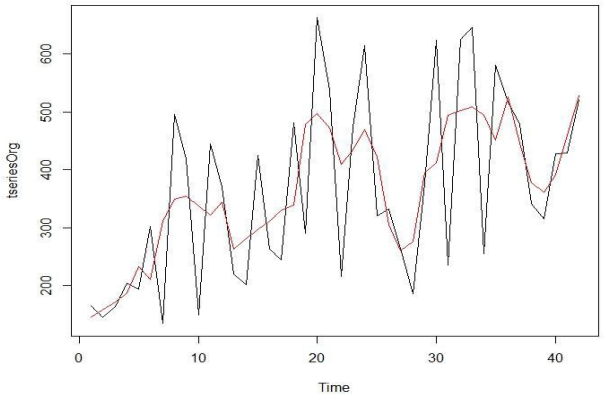
Data Modelling and Prediction– EU Quantity



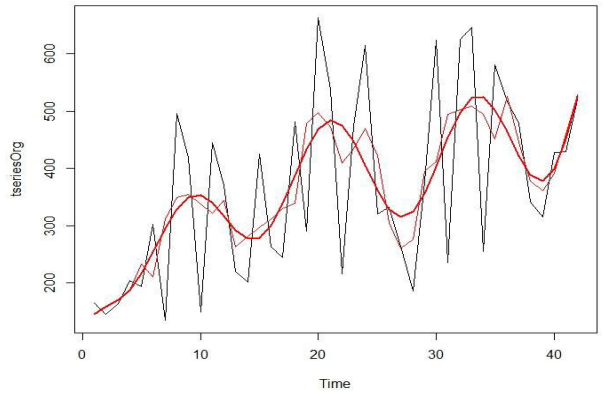
Plot of original time series data for the EU Quantity.



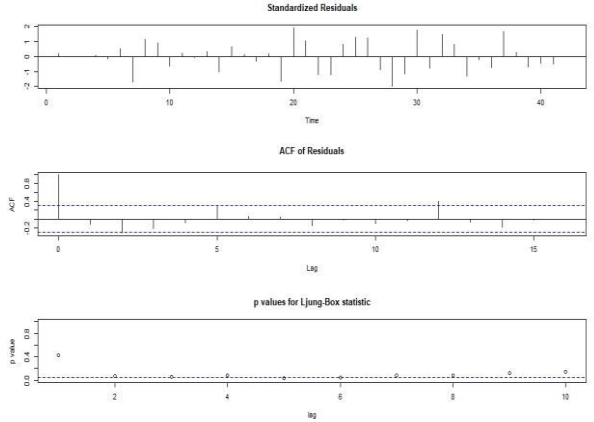
Plot of smoothened time series data for the EU quantity.



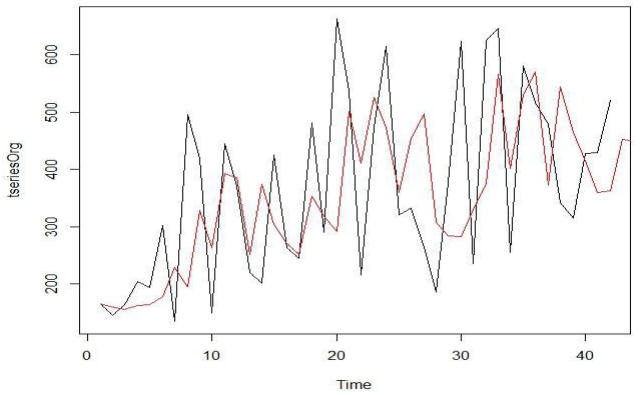
Dual plot of original and smoothened time series data for the EU quantity.



Model evaluation – original vs prediction – **Classical decomposition**

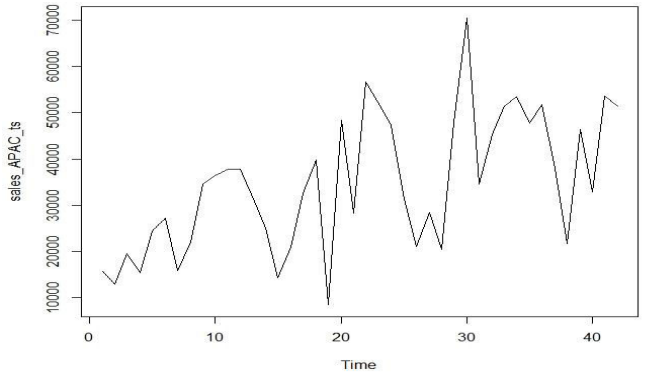


ARIMA FIT – Residual analysis

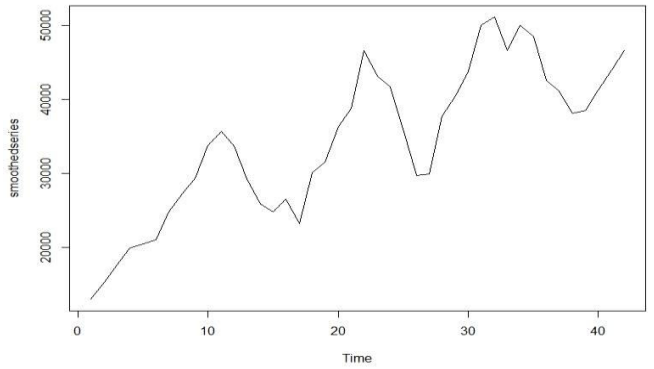


Model evaluation – original vs prediction – ARIMA

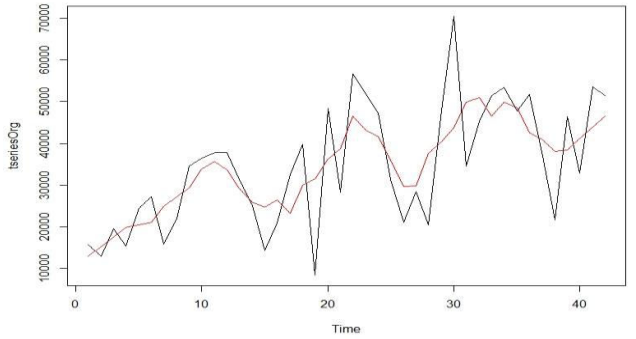
Data Modelling and Prediction– APAC Sales



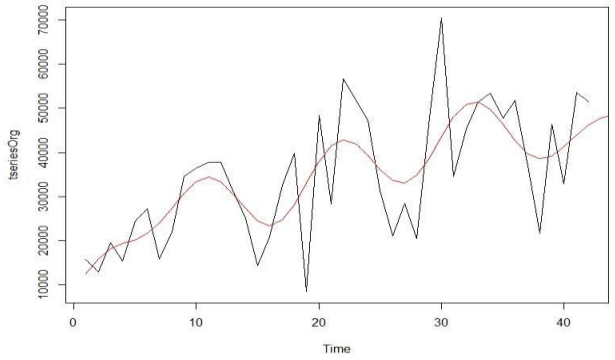
Plot of original time series data for the APAC sales revenue.



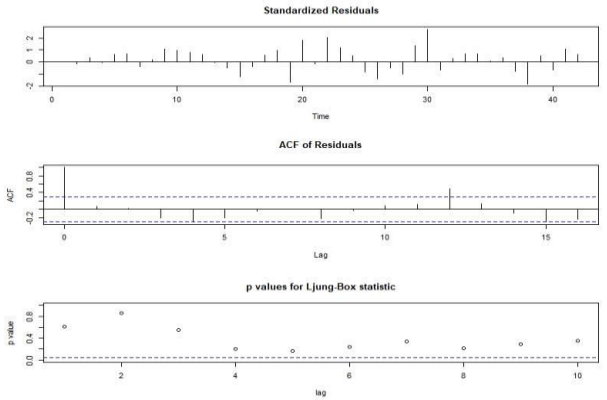
Plot of smoothened time series data for the APAC sales revenue.



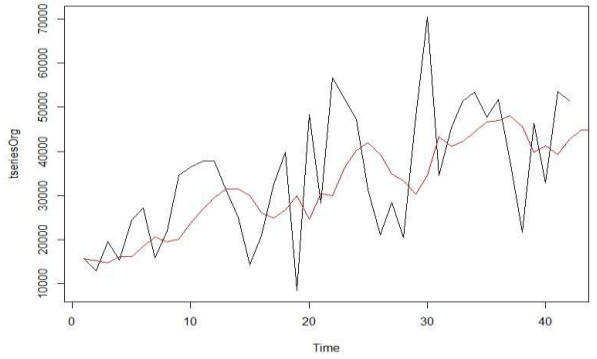
Dual plot of original and smoothened time series data for the APAC sales revenue.



Model evaluation – original vs prediction – **Classical decomposition**

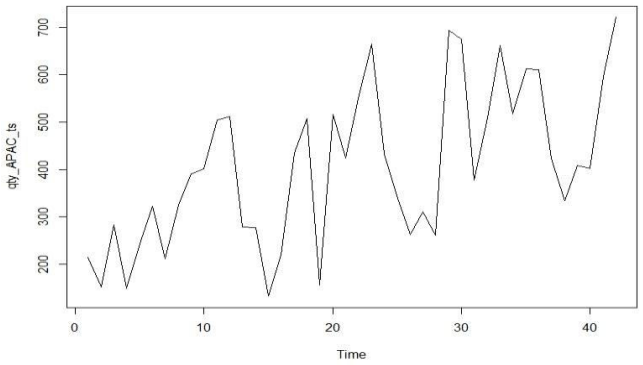


ARIMA FIT – Residual analysis

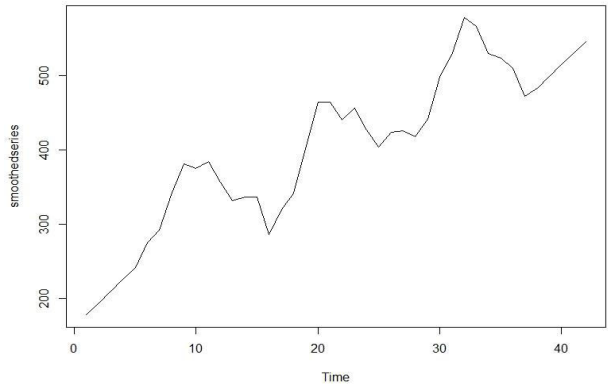


Model evaluation – original vs prediction – ARIMA

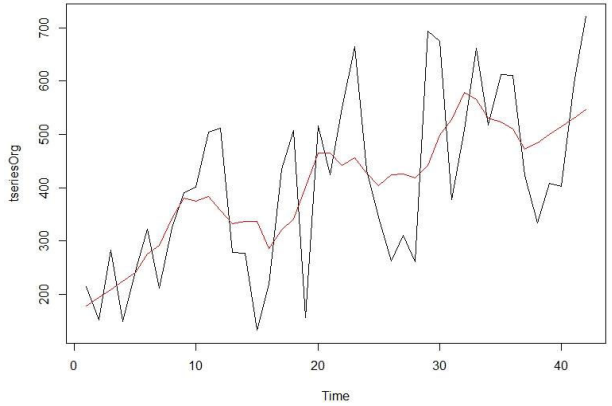
Data Modelling and Prediction– APAC Quantity



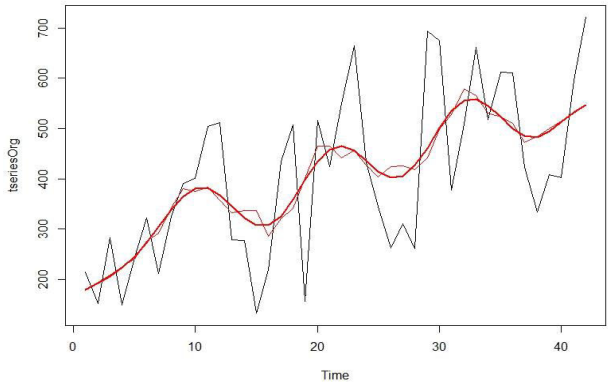
Plot of original time series data for the APAC Quantity.



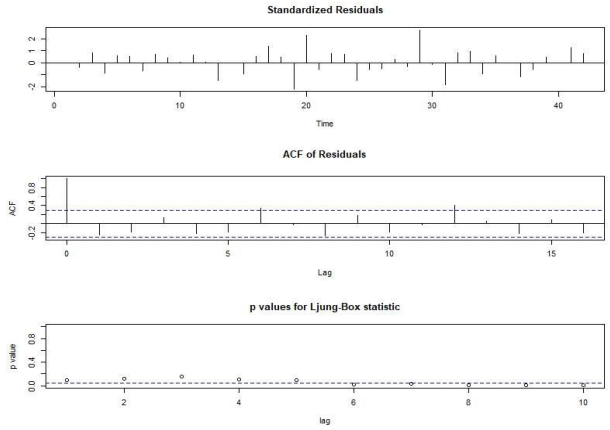
Plot of smoothened time series data for the APAC quantity.



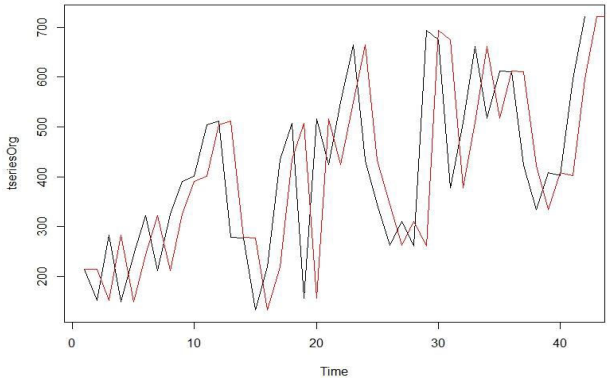
Dual plot of original and smoothened time series data for the APAC quantity.



Model evaluation – original vs prediction – **Classical decomposition**



ARIMA FIT – Residual analysis



Model evaluation – original vs prediction – ARIMA

Data Model Fitment– MAPE Analysis

EU

```
#################################################################################
#                      Model Summary - EU - SALES                               #
#################################################################################
#   Method                  Classical Decomposition            ARIMA            #
#-------------------------------------------------------------------------------#
#   MAPE                    28.27                              28.92            #
#-------------------------------------------------------------------------------#
#   Evaluation :  Based on the MAPE values are close, but we do observe that    #
#   Classical decomposition gives a ARIMA(0,0,0) model . We chose to use classical#
#   approach for EU .                                                           #
#################################################################################
```

```
#################################################################################
#                      Model Summary - EU - Quantity                            #
#################################################################################
#   Method                  Classical Decomposition            ARIMA            #
#-------------------------------------------------------------------------------#
#   MAPE                    30.39                              30.13            #
#-------------------------------------------------------------------------------#
#   Evaluation :  Through both methods we see that the series is stationary.    #
#   Based on the MAPE values are close, We chose to use ARIMA Fit               #
#   approach for EU .                                                           #
#################################################################################
```

APAC

```
#################################################################################
#                      Model Summary - APAC - Sales                             #
#################################################################################
#   Method                  Classical Decomposition            ARIMA            #
#-------------------------------------------------------------------------------#
#   MAPE                    23.86                              27.68            #
#-------------------------------------------------------------------------------#
#   Evaluation :  Through both methods we see that the series is stationary.    #
#   ARMA fit after classical decomposition is ARMA(0,0,0)                       #
#   Based on the MAPE values are close, We chose to use ARIMA Fit               #
#   approach for EU .                                                           #
#################################################################################
```

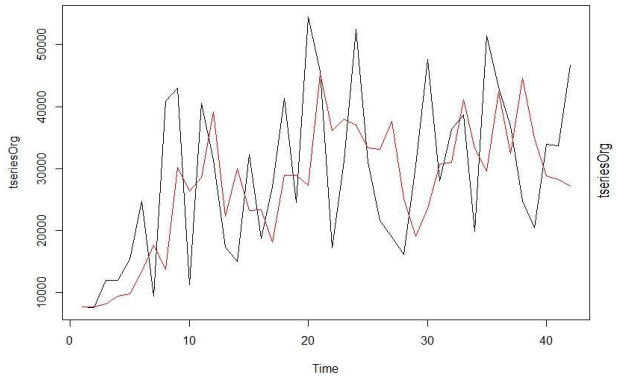
```
#################################################################################
#                      Model Summary - APAC - Quantity                          #
#################################################################################
#   Method                  Classical Decomposition            ARIMA            #
#-------------------------------------------------------------------------------#
#   MAPE                    30.49                              26.24            #
#-------------------------------------------------------------------------------#
#   Evaluation :  Through both methods we see that the series is stationary.    #
#   Based on the MAPE values are close, We chose to use ARIMA Fit               #
#   approach for APAC quantity .                                                #
#################################################################################
```

Business Conclusion

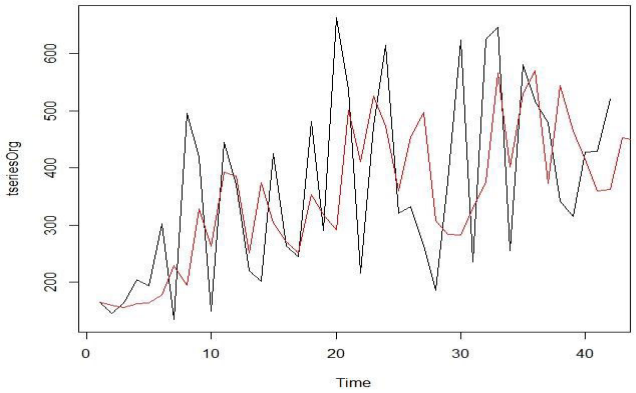
The primary business need for the business forecasting for the quantity and sales in the top 2 segments and markets was being attempted in this exercise. It was possible to establish the following:

1. Using the data summarization method in EDA, it was possible to deduce that the market-sector and segment that could be used for business focus are: **Consumer Segment** in **EU** and **APAC** markets.

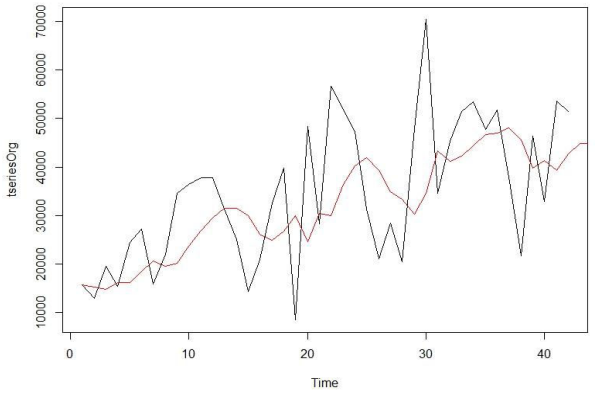
2. Successfully establish the predictions and forecasting of the sales and quantity in the EU and APAC markets in consumer segment.



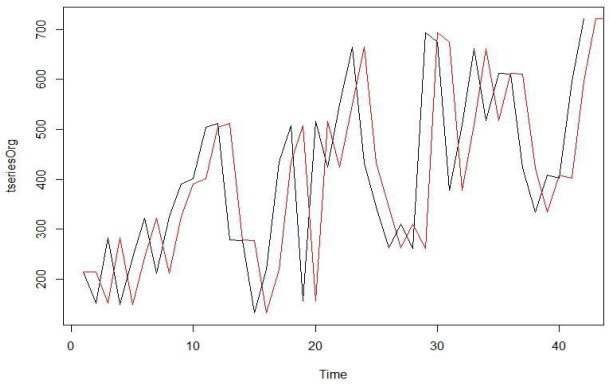
EU – Sales Prediction



EU – Quantity Prediction



APAC – Sales Prediction



APAC – Quantity Prediction

Thank you