



# RETAIL-GIANT SALES FORECASTING

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# Business Objective

- Sales/operations manager, has to predict the sales and the demand for the next 6 months, that would help manage the revenue and inventory of the company accordingly.
- Predict the 2 most profitable (and consistent) segment and forecast the sales and demand for these segments.

## Business Summary

- “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.

## Analysis Approach

- Data Understanding and Preparation
- Model Building
- Model Evaluation
- Forecasting

## Data Understanding

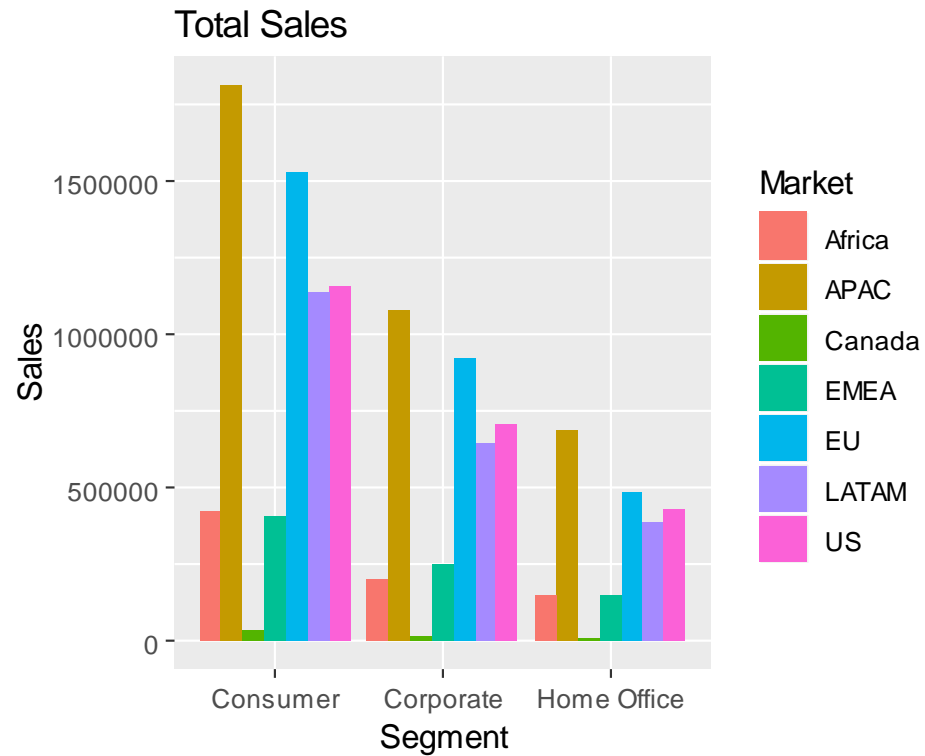
- The data has the transaction level data, where each row represents a particular order made on the online store. .
- Total number of records – 5120 against 24 fields.
- The “Market” attribute has 7-factor levels representing the geographical market sector that the customer belongs to.
- The “Segment” attribute(Customer ,Corporate and Home office) tells which of the 3 segments that customer belongs to.

## Analysis Approach Findings

- Total number of required columns for analysis – 7 Columns.
- Created subset based on Segment and Market that is required for Analysis.
- Calculated the co-efficient of variance using the formula  $CV = \text{sd}(\text{profit}) * 100 / \text{mean}(\text{Profit})$  .
- Aggregated the Sales, Profit & Quantity & CV.
- The 2 most consistently profitable segments are APAC Consumer and EU Consumer.

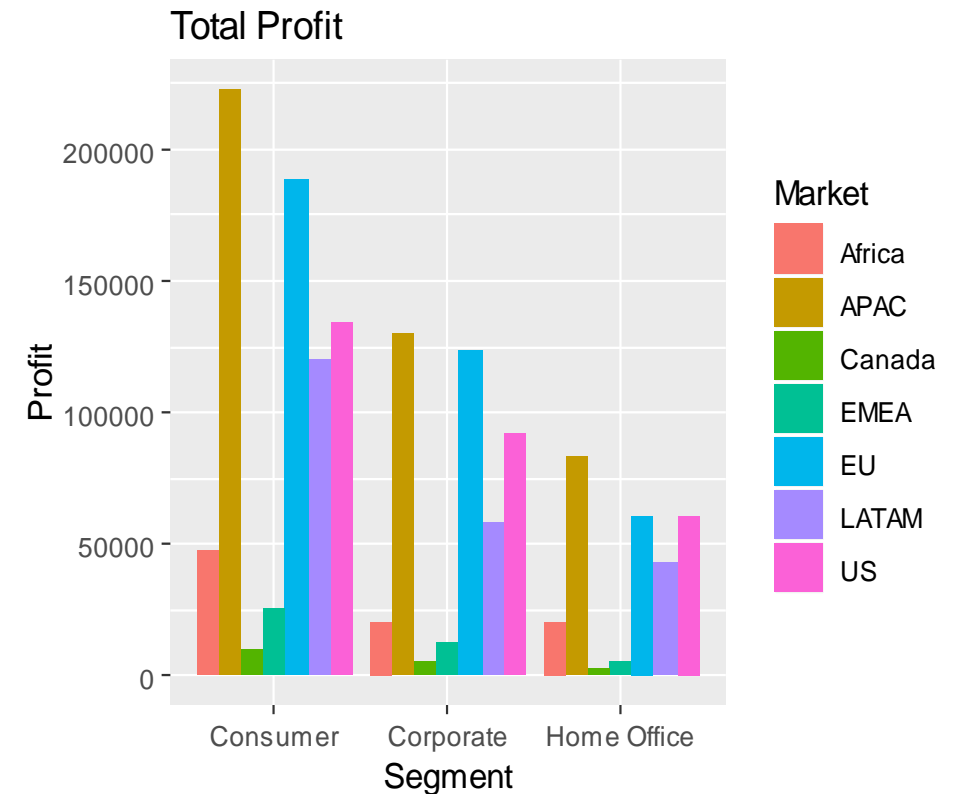
Market Segment	Coefficient of Variance	Profit
APAC_consumer	0.63	222817.6
EU _Consumer	0.624	188687.7

## Analysis of Market Segment against Sales



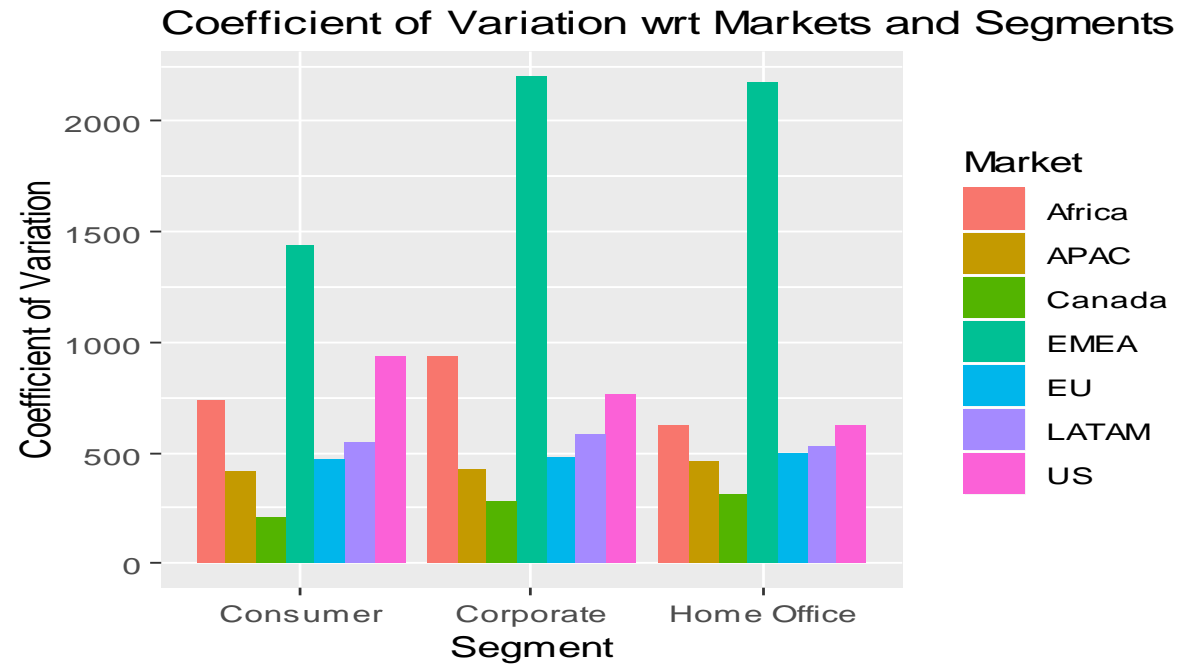
➡ APAC and EU Consumer Show high show high Sales.

## Analysis of Market Segment against Profit



➡ APAC and EU Consumer Show high show high Profit.

## Analysis of Market Segment against CV Value



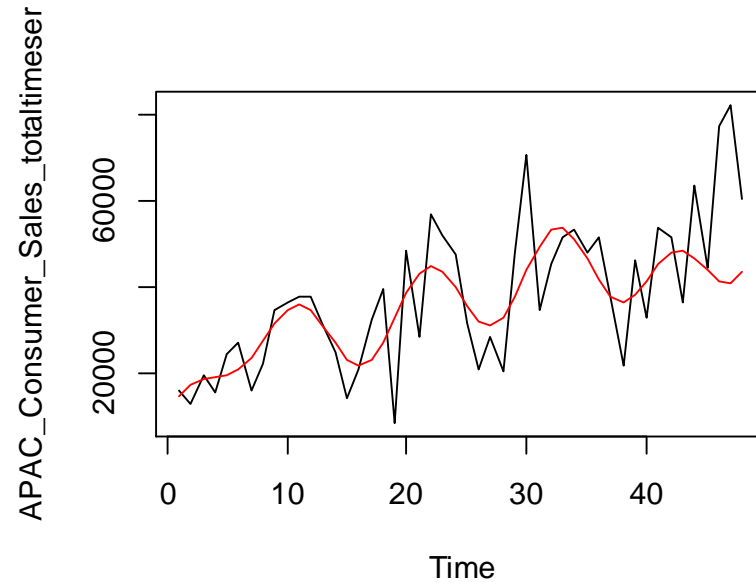
- The graph shows that APAC and EU consumer has the least CV value.

## Analysis of Consumer Sales Forecast

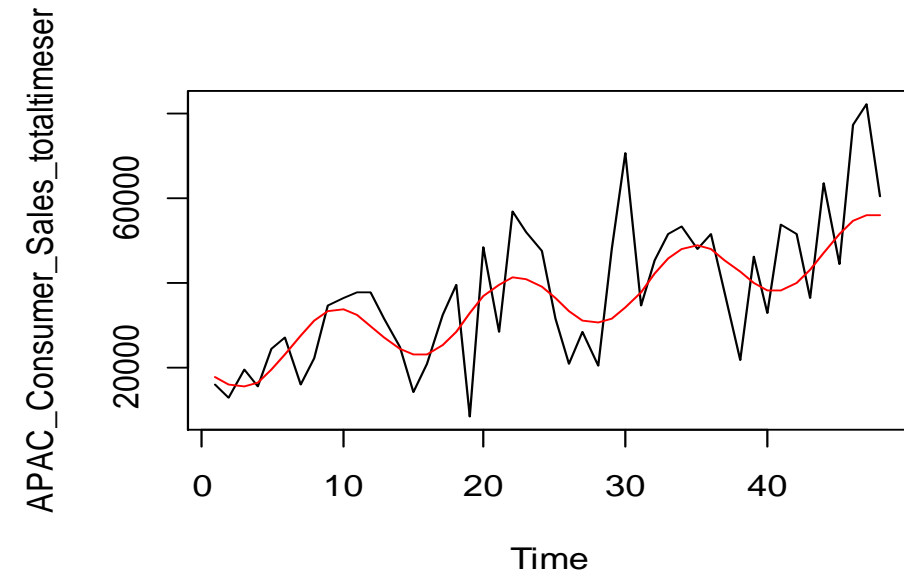
- Converting the data frame of EU consumer and APAC consumer data subsets in to time series.
- First 42(1-42) rows are used for modelling ,the remaining 6 (43-48) rows are used to validate the data and (49-54) are used to forecast data.
- The time series was smoothened using Moving Average Method and HoltWinter's method.
- The train data is modelled using Moving Average, Exponential and ARIMA Models.
- The models are evaluated using Mean Average Percentage Value (MAPE).
- Residual ACF plots are used to check the white noise.

# APAC Consumer Sales Forecast

**Linear Regression Model**



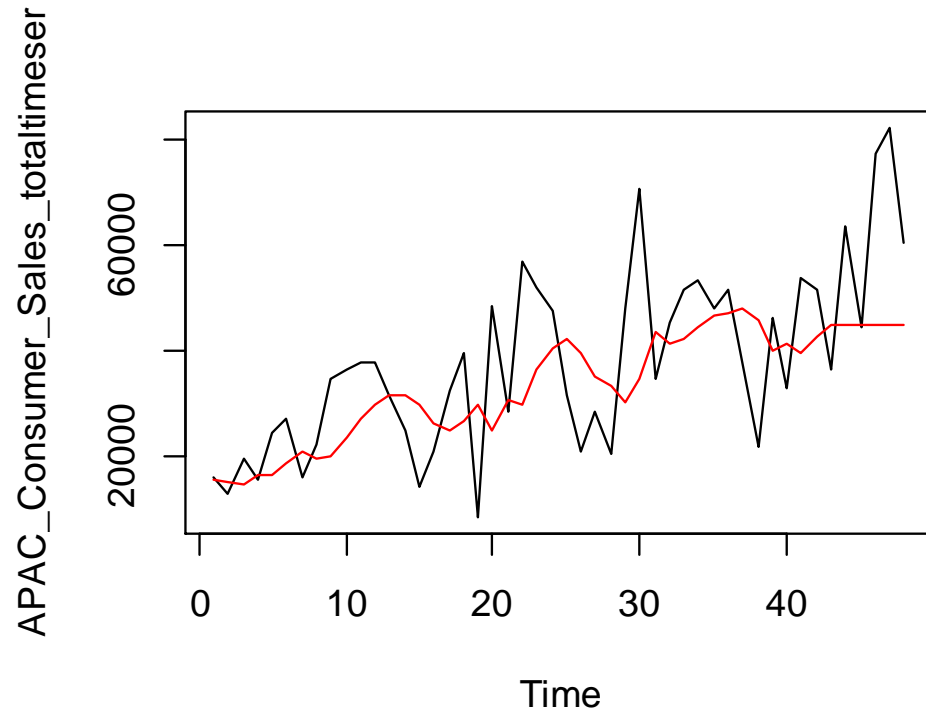
**Exponential Regression Model**



- It is observed that **Moving average** has a **MAPE** value of **31.07429** and **Exponential smoothing** has a **MAPE** value of **21.2284**.

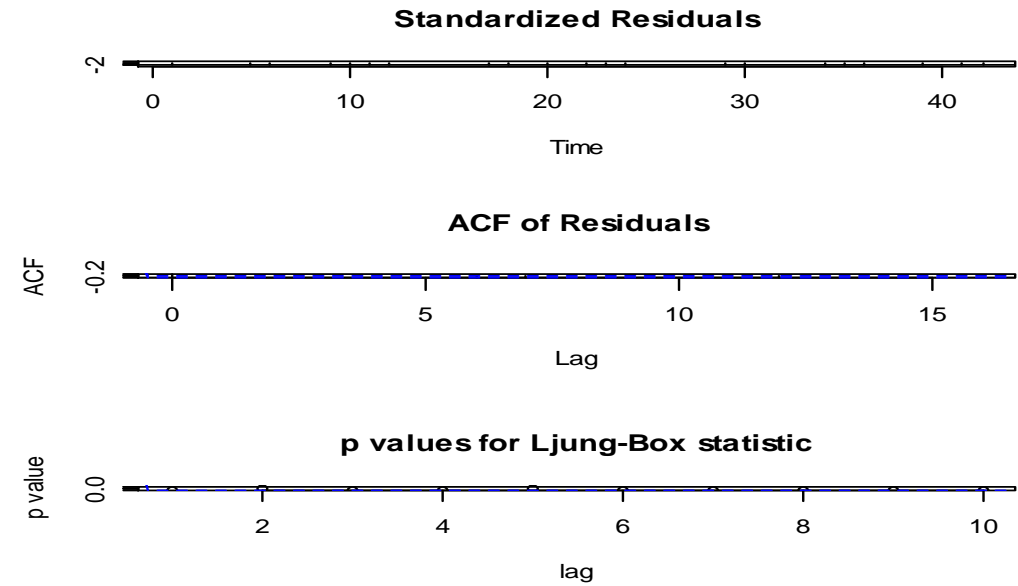


## ARIMA MODEL

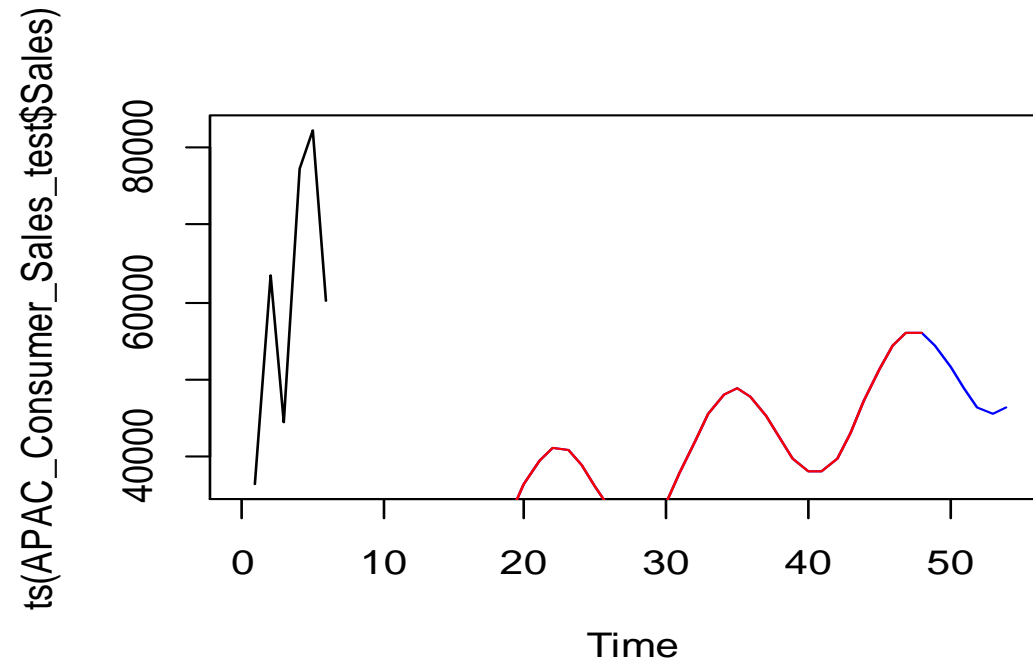


**MAPE Value of ARIMA model is  
27.68**

## RESIDUAL PLOT

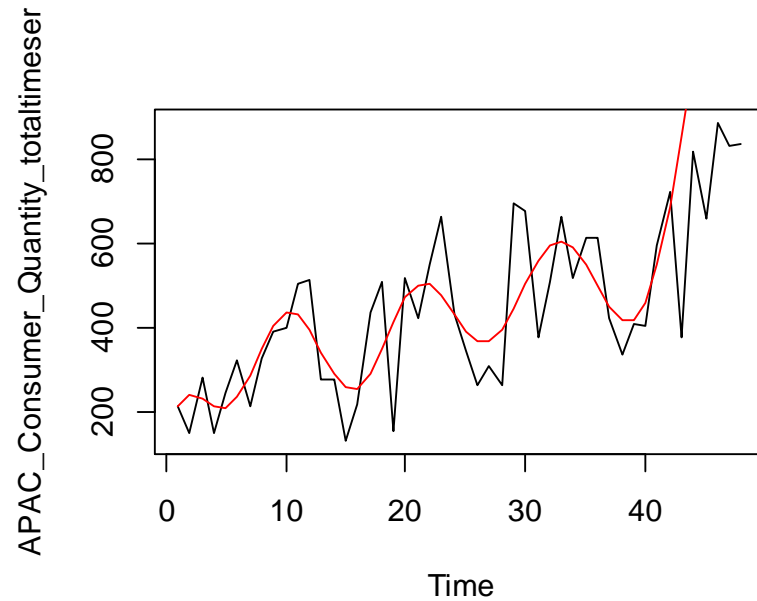


## APAC Consumer Sales Forecast on Test Data

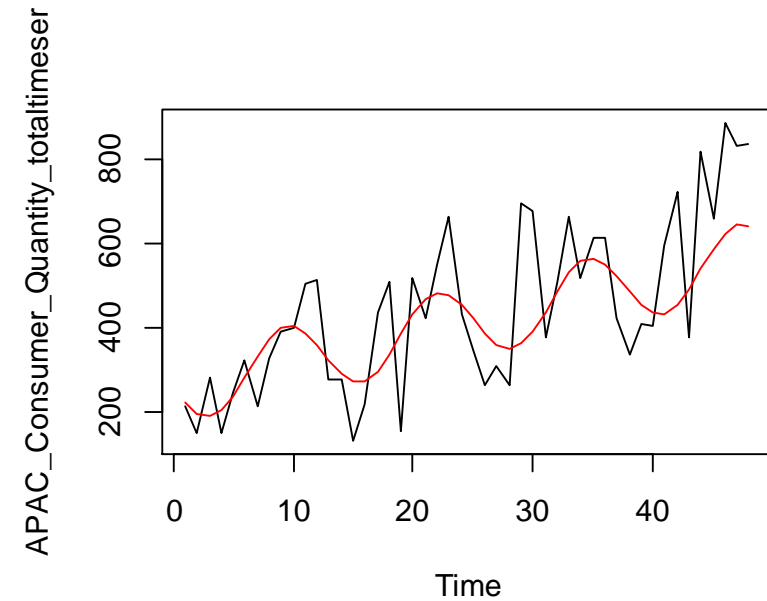


- We have forecasted the test data using exponential smoothing model, as the MAPE value is smaller compared to the other models.

# APAC Consumer Quantity Forecast

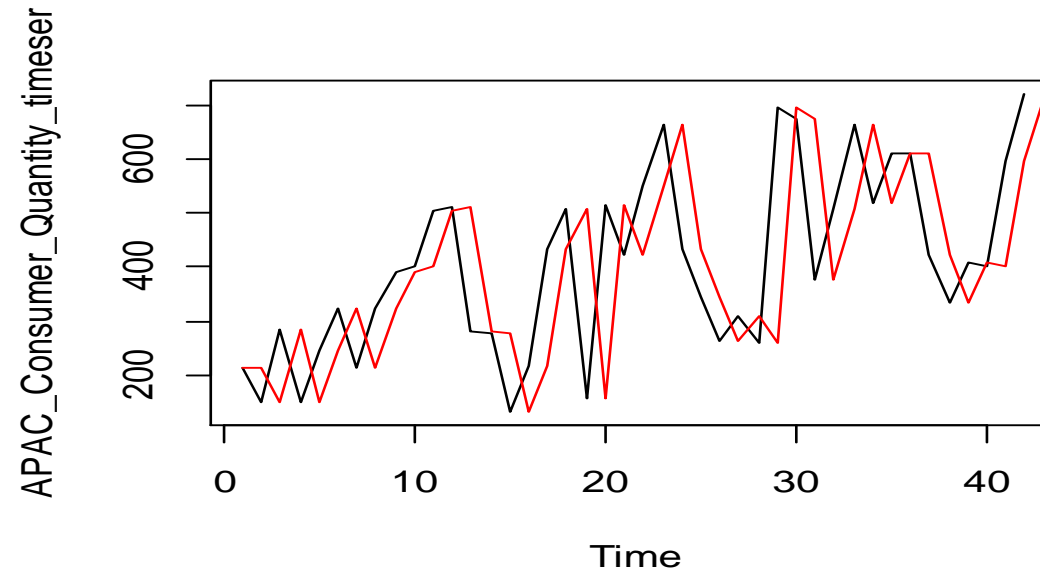


**MAPE Value of MA model is 62.10289**



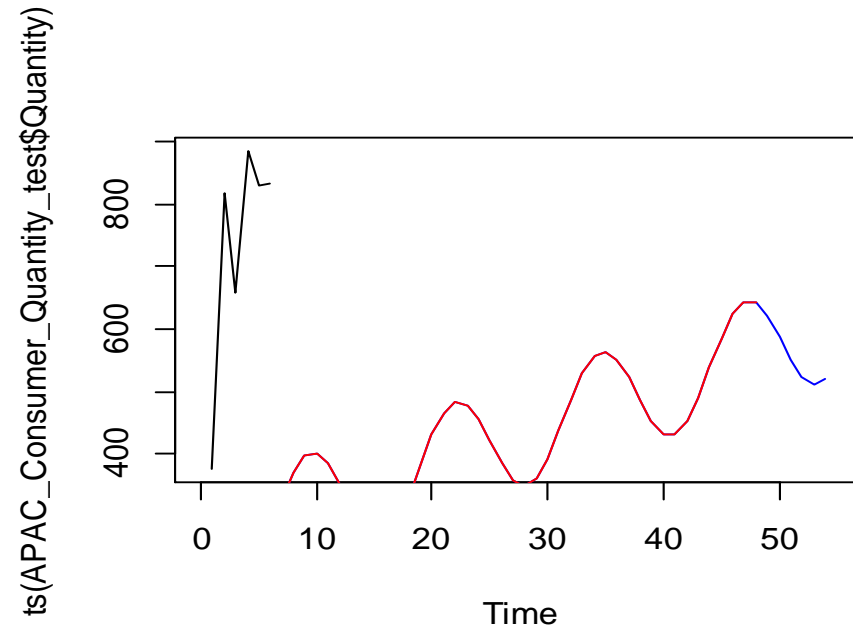
**MAPE Value of Exponential smoothing model is 25.0091**

# APAC Consumer Quantity Forecast



**MAPE** Value of **ARIMA** model is 26.24458

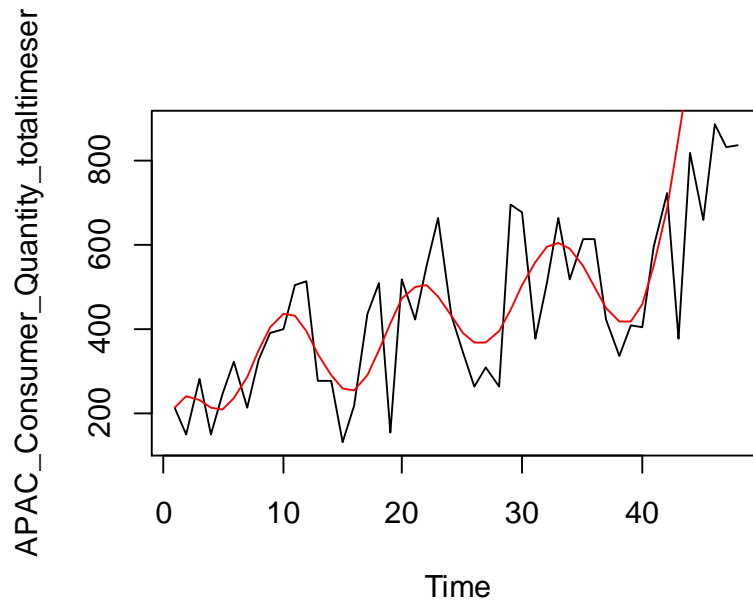
## APAC Consumer Quantity Forecast on Test Data



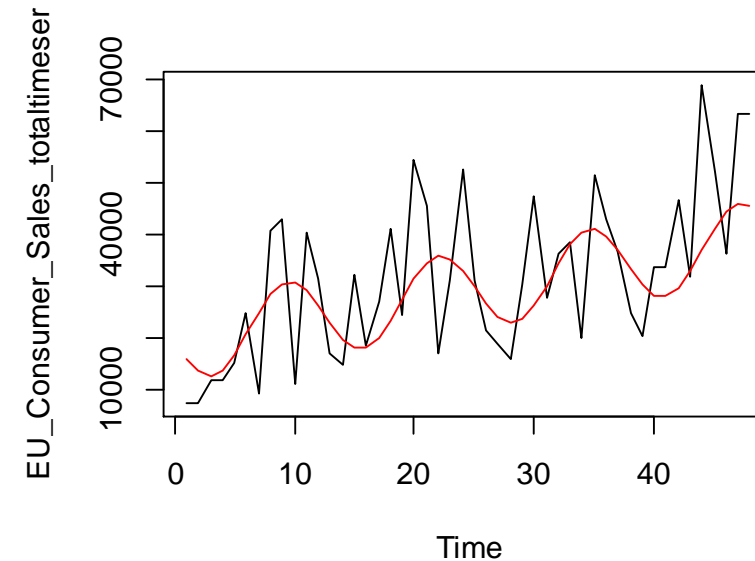
- Forecasted the Test data using Exponential smoothing as the MAPE value is smaller Compared to the other models.

# EU Consumer Sales Forecast

**MA Model**

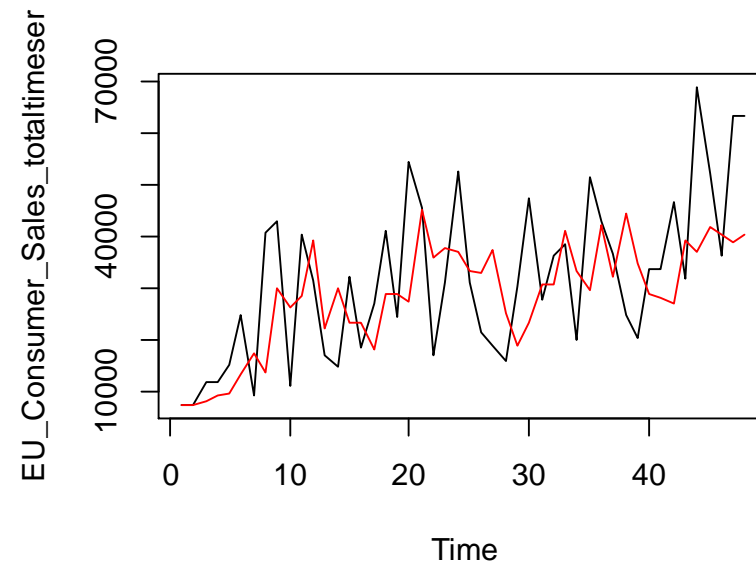


**Exponential Model**



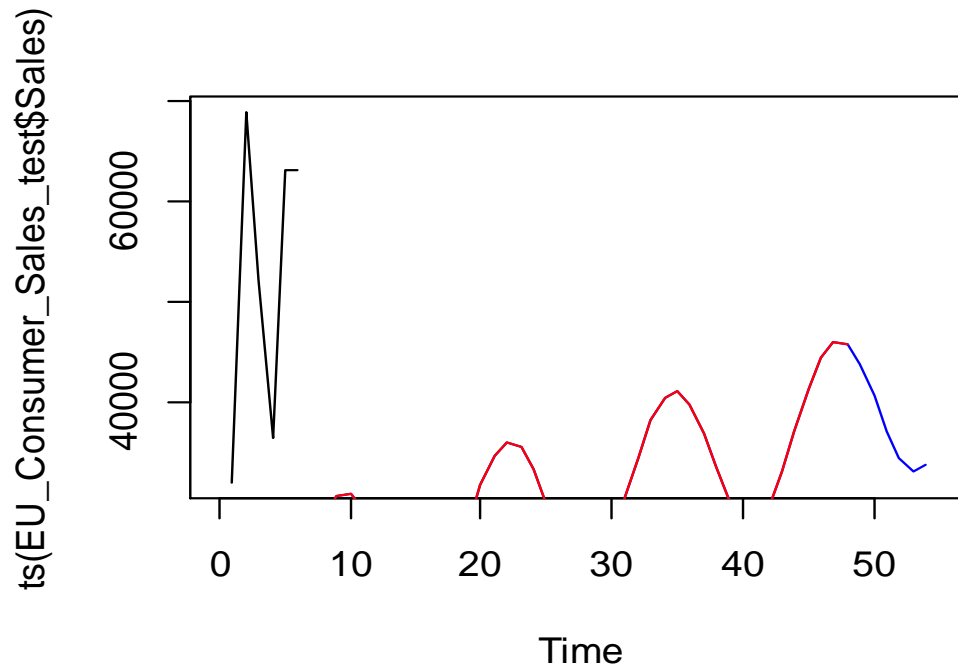
☛ The **MAPE** values of **MA** model and **Exponential** model are **62.10289** and **24.60974** respectively.

## ARIMA Model



➤ **MAPE** Value of **ARIMA** model is **28.9226**.

## EU Consumer Sales Forecast on Test Data

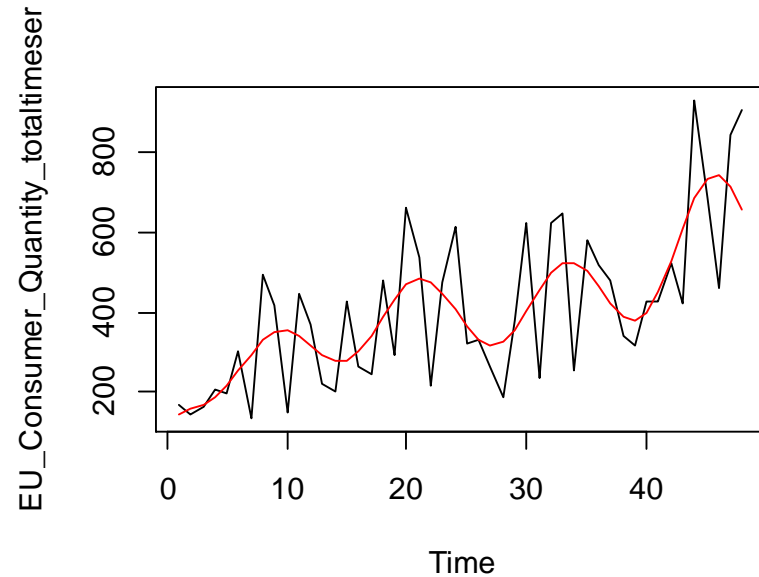


➤ We Forecast the test data using exponential Smoothing as its **MAPE** value is lesser compared to other models.

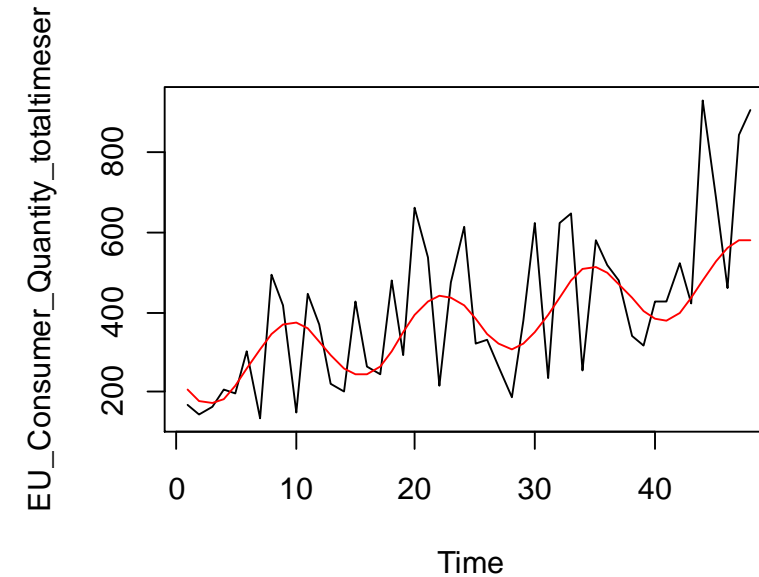


# EU Consumer Quantity Forecast

**MA Model**

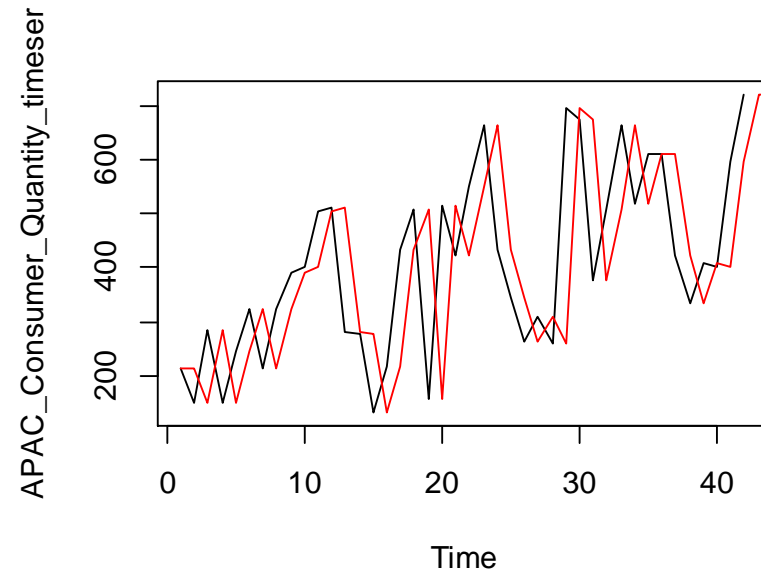


**Exponential Smoothing Model**

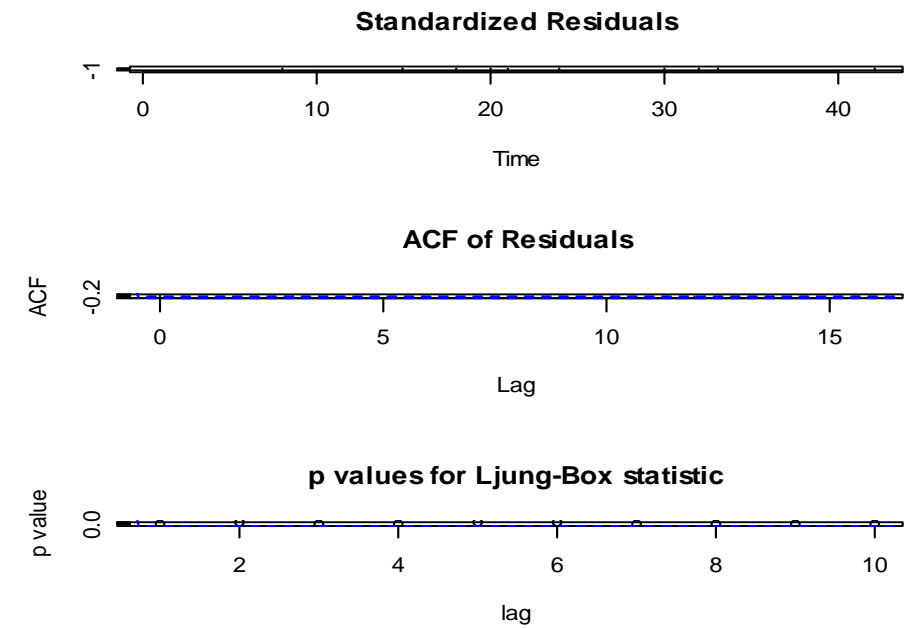


- **MAPE** value of **MA** model is **30.39741** and **MAPE** value of **Exponential Smoothing model** is **27.40062**.

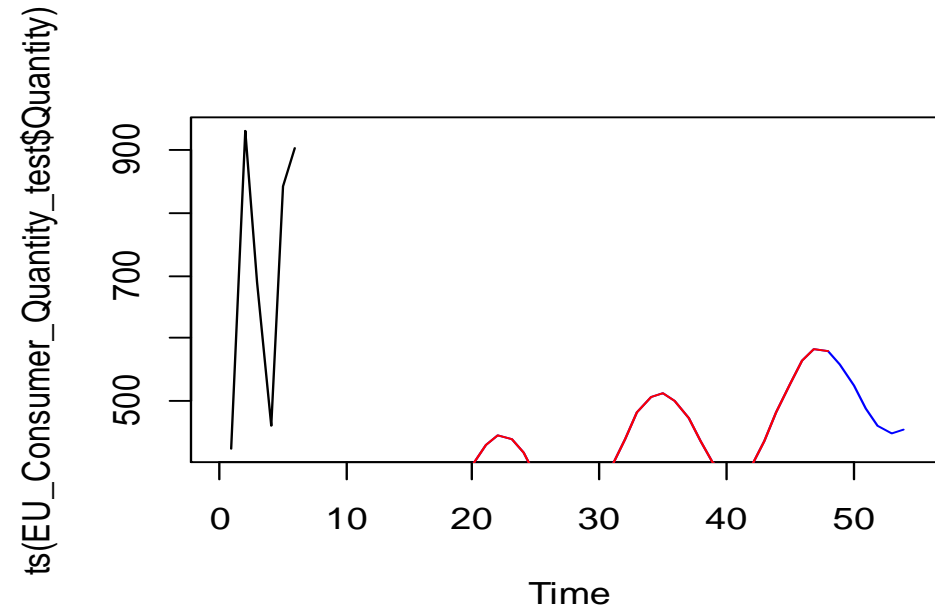
## ARIMA MODEL



## RESIDUAL PLOT



## EU Consumer Quantity Forecast on Test Data



- We have modelled the validated data using exponential Smoothing as its MAPE value is less compared to the rest of the models.

## Conclusions

- The two most profitable segments of “Global Mart” is APAC Consumer and EU Consumer.
- We have forecasted the sales and quantity for the next six months based on lowest MAPE value achieved through moving average modelling,exponential modelling and ARIMA modelling on the data set.
- We have chosen the Exponential smoothing model to model the market segments ,since the MAPE value is low.

### MODELS AND MAPE VALUES

Market _Segment	Moving Average	Exponential Smoothing	ARIMA
APAC_Sales	31.07429	21.22845	27.68952
APAC_Quantity	62.10289	25.0091	26.24458
EU_Sales	92.95788	24.60974	28.9226
EU_Quantity	30.39741	27.40062	30.13319