TIME SERIES ANALYSIS: GLOBAL MART

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AGENDA

1. Business Problem and Objective

2. Business Understanding

3. Primary Data Analysis

4. Preliminary Data Preparation and Exploratory Data Analysis (EDA)

5. Model Building and Evaluation

6. Conclusion and Business recommendations

1. BUSINESS PROBLEM AND OBJECTIVE

Business Problem

- Global Mart wanted to manage its revenue and inventory. In order to achieve this, the online super giant wants to forecast the sales and the demand for the next 6 months

- As the store caters to 7 different markets and in 3 major segments, the store wants to identify 2 most profitable and consistent segments

Business Objective

To predict sales and demand for next 6 months and identify 2 most profitable segments

2. BUSINESS UNDERSTANDING

1. The store caters to 7 different market segments and in 3 major categories i.e. 21market buckets

2. Not all 21 market buckets are important from store's point of view

3. As a sales operations manager, need to identify:
    1. The most consistent segments
    2. The most profitable segments

3. PRIMARY DATA ANALYSIS

The data set provided showcased the data for past 4 years consisting of 51,290 rows. Further, the data consists of 26 columns of which the important ones are outlined below:

1. Order Date

2. Market

3. Sales

4. Quantity

5. Profit

6. Category

4. PRELIMINARY DATA PREPARATION AND EDA

Standardization of Data

- Standardized date formats of Ship date and Order date
- Converted quantity to numeric data type

Derived columns

- Derived month of Order date to a separate column
- Concatenated market and segment variables to find out the required 21 market buckets

Checking NULLs in the data

- Postal code has NULL or N/A values. However, the postal code is of very low significance for this data set. Therefore, the N/A values had not been trimmed.

Numeric Variable analysis

- Numerical variables had been analyzed using box plots and outliers are capped with the standard values

Data Grouping

The data has been grouped into:

- Month-wise from 2011 to 2014
- Derived column (data concatenated for market and segment variables)

PROFIT ANALYSIS

By analyzing profit and derived column (market and segment- concatenated columns) we found that Consumer APAC and Consumer EU are the most profitable segments.
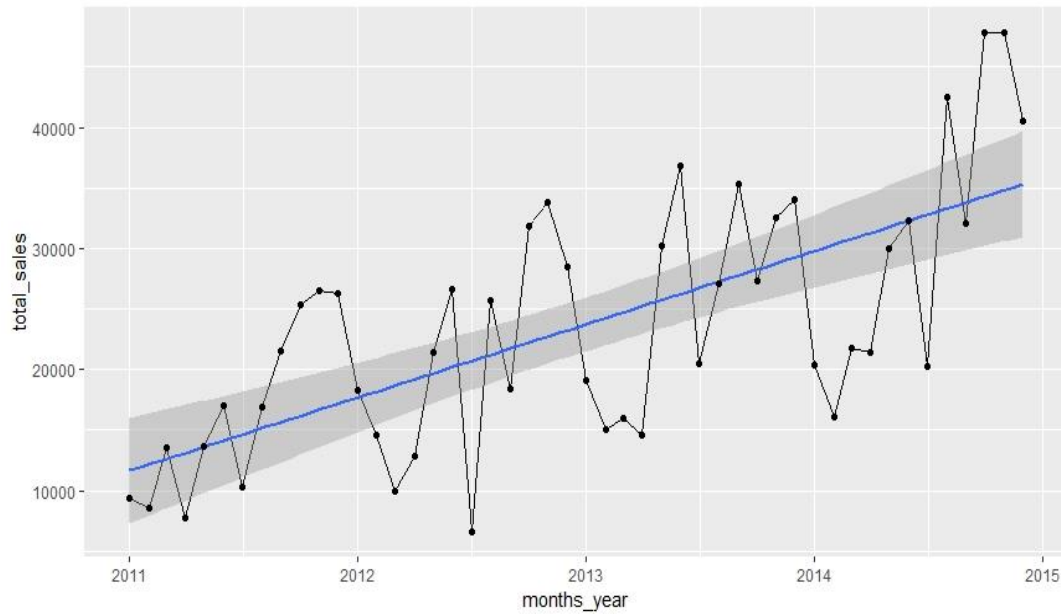
Total Profit vs Derived Column
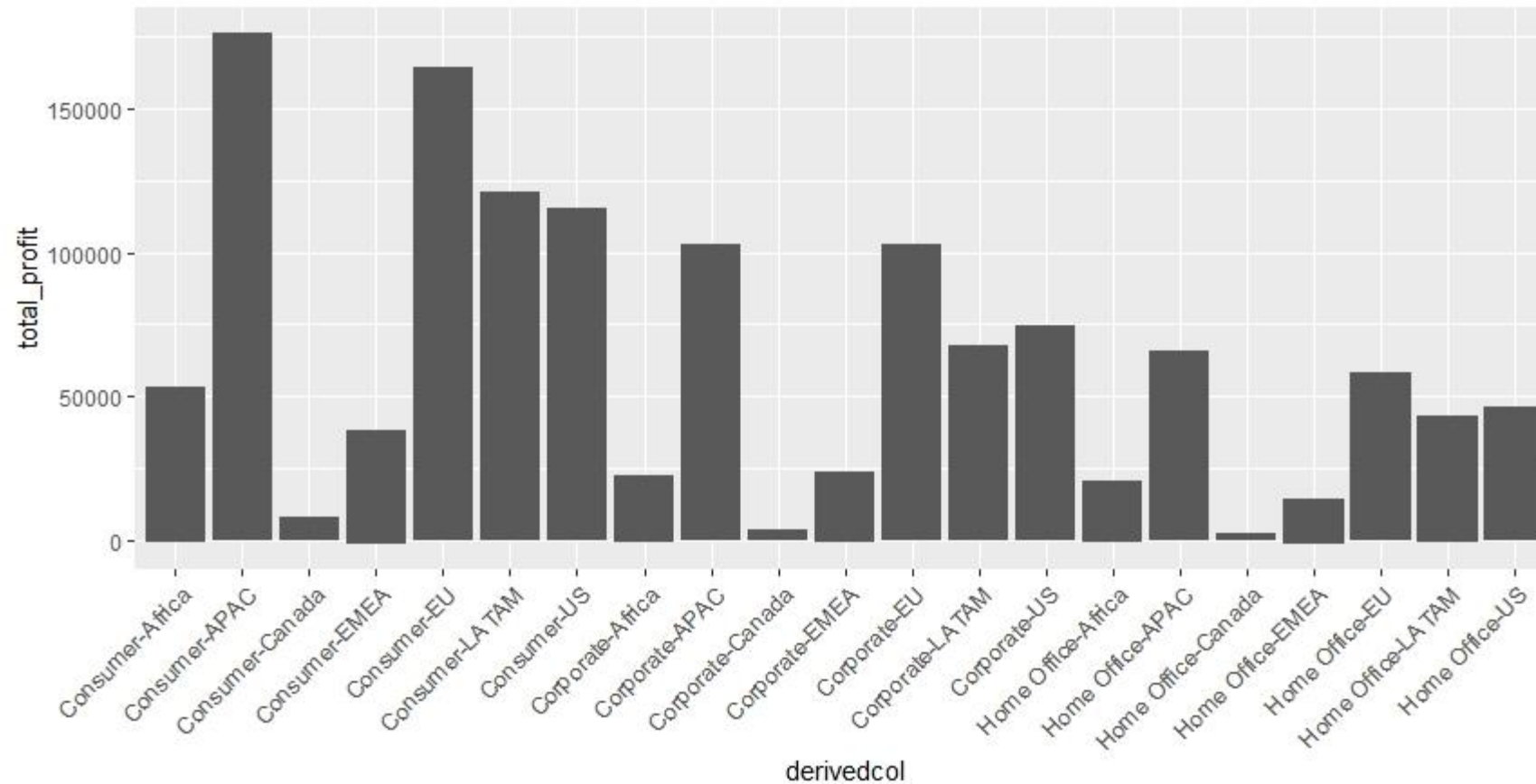
CONSISTENCY ANALYSIS (APAC)

- The Consumer APAC segment is consistently showing an upward trend in the sales figures from 2011 to 2014
- The trend-line (month-wise average sales) is pursuing a linear growth rate.
- The volume figure also follows the similar trend over the years (i.e. 2011 to 2014)

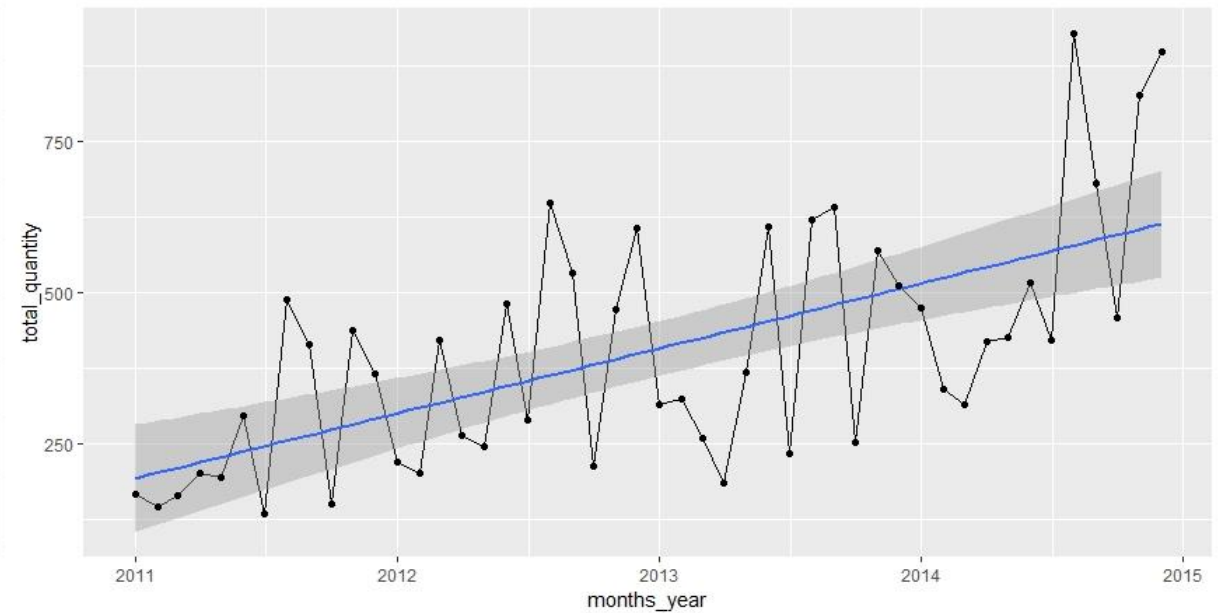Consumer APAC Sales by Month

Consumer APAC Quantity by Month
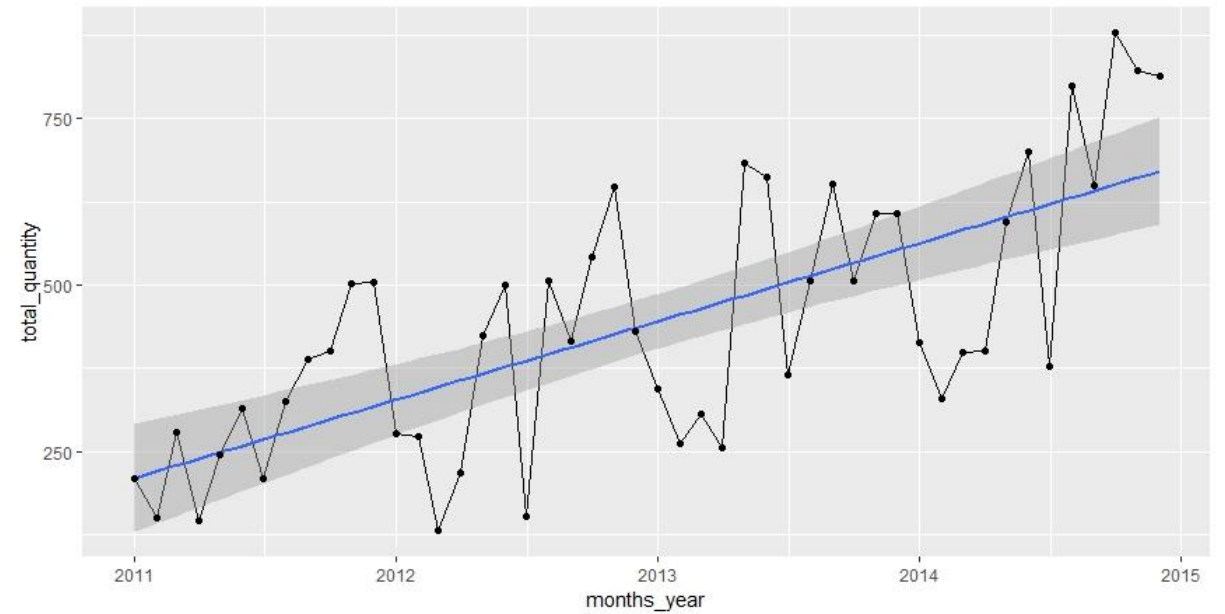
CONSISTENCY ANALYSIS (EU)

- The Consumer EU segment is the 2nd most consistent segment
- Like Consumer APAC, Consumer EU also depicts a linear growth trend for both:
  - Sales by month
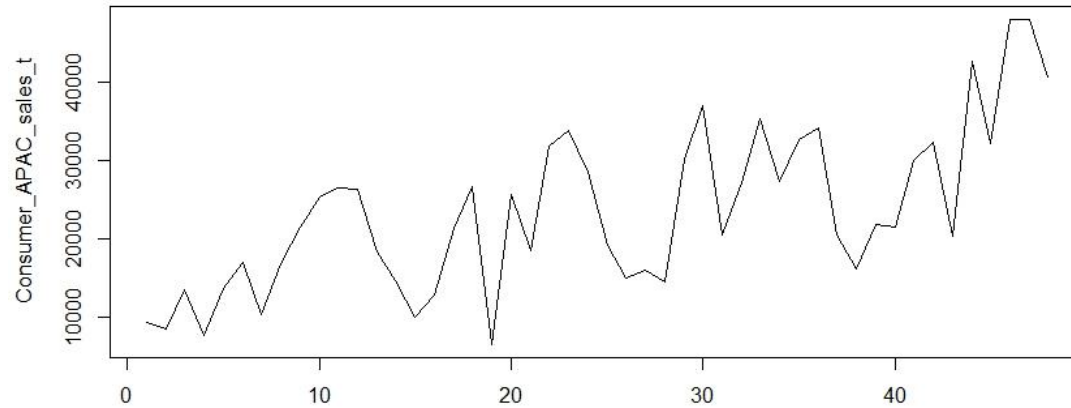 - Volume by month

### Consumer EU Sales by Month
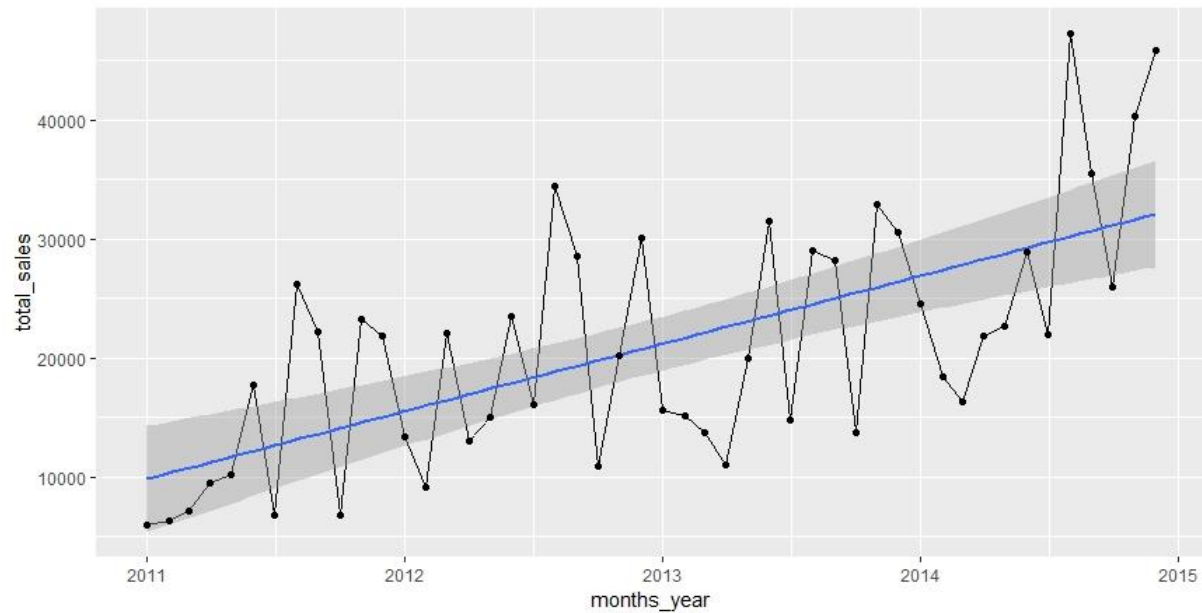
Consumer EU Quantity by Month

TIME SERIES ANALYSIS (APAC)

Based on the time series analysis, we found that the sales figure is having an increasing trend over the months. We can also observe the impact of seasonal sales. However, at an overall level, the graph is having an upward trend.
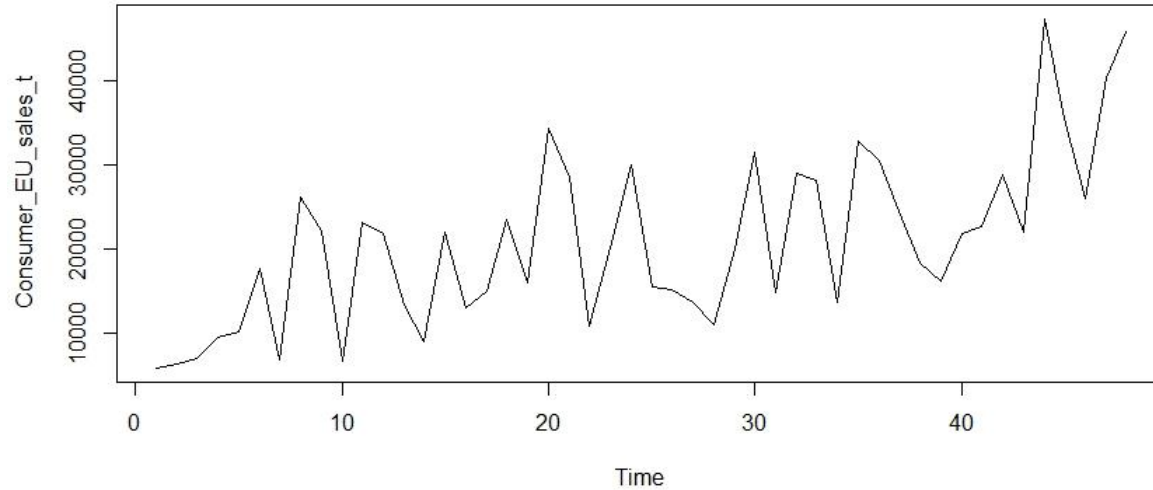

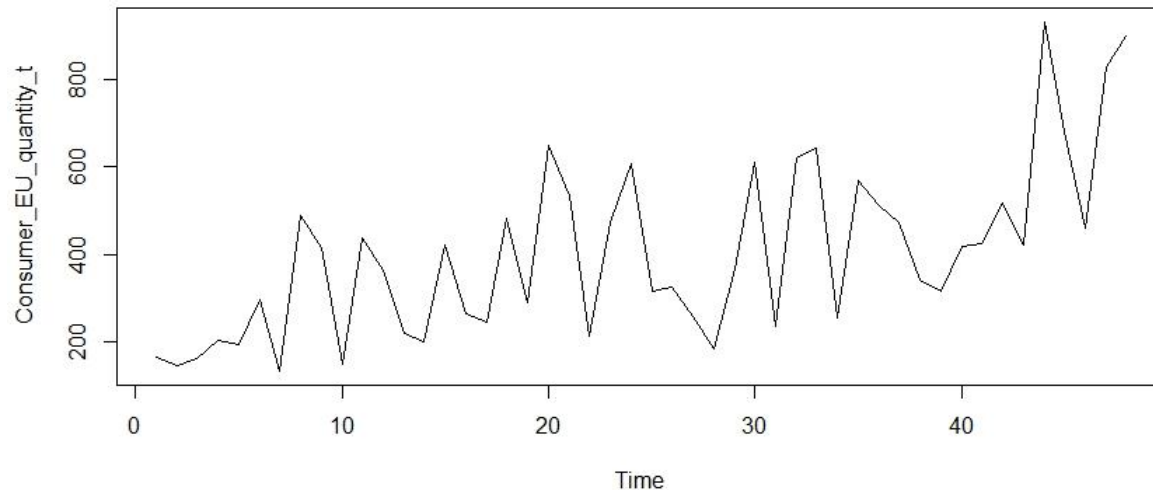The time series analysis for the APAC (Sales vs Time (i.e. number of months))
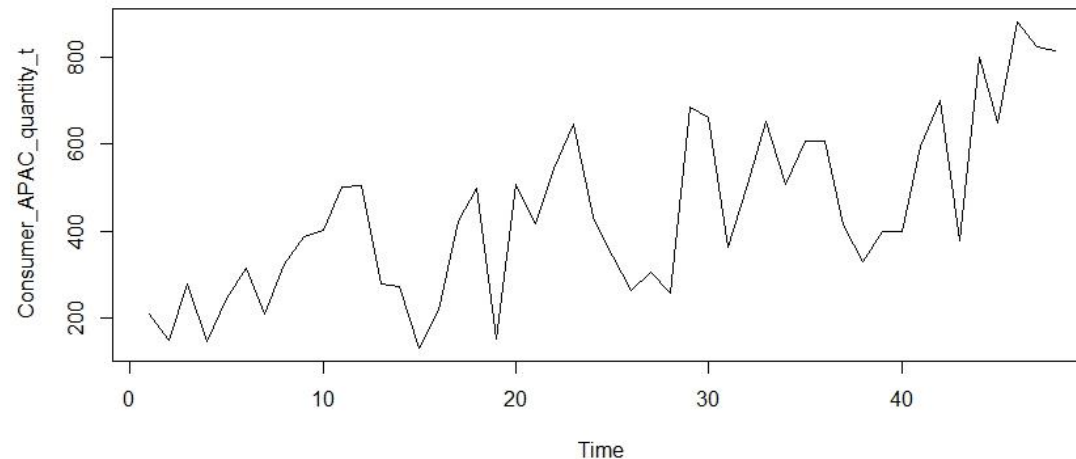
The time series analysis for the APAC (Quantity vs Time (i.e. number of months))

TIME SERIES ANALYSIS (EU)

Similarly, the EU sales figures are depicting an increasing trend over the months and EU too is having an upward growth trends for both sales and quantity.
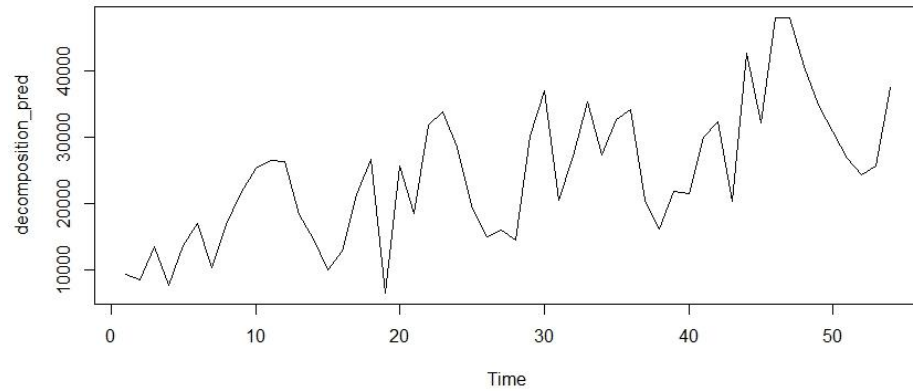

The time series analysis for the EU (Sales vs Time (i.e. number of months))
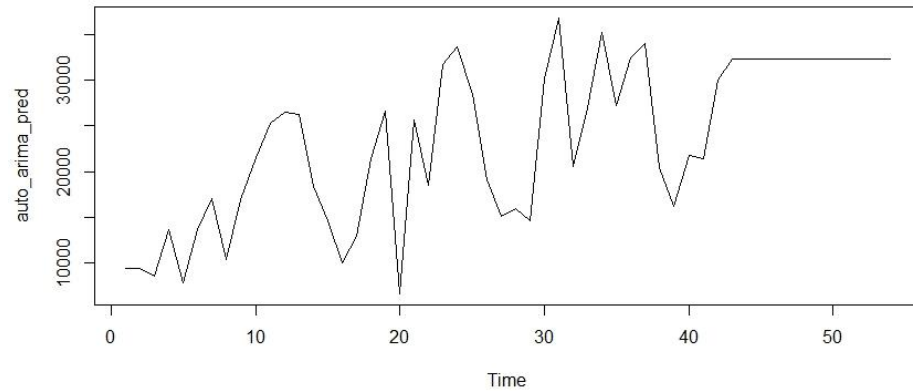

The time series analysis for the EU (Quantity vs Time (i.e. number of months))
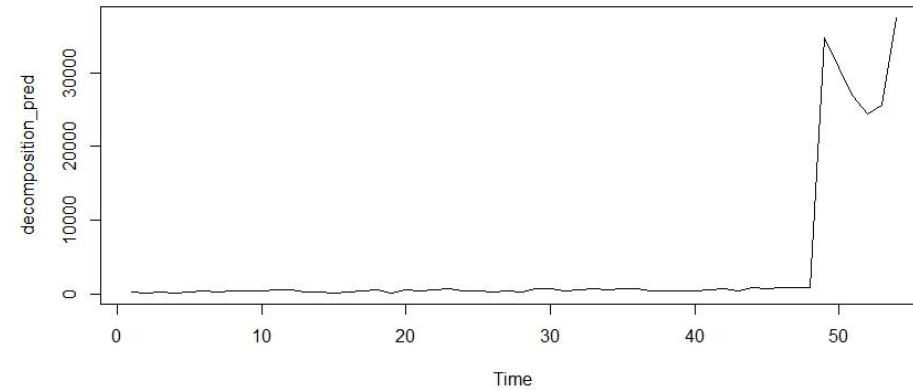
SALES AND QUANTITY PREDICTION : APAC

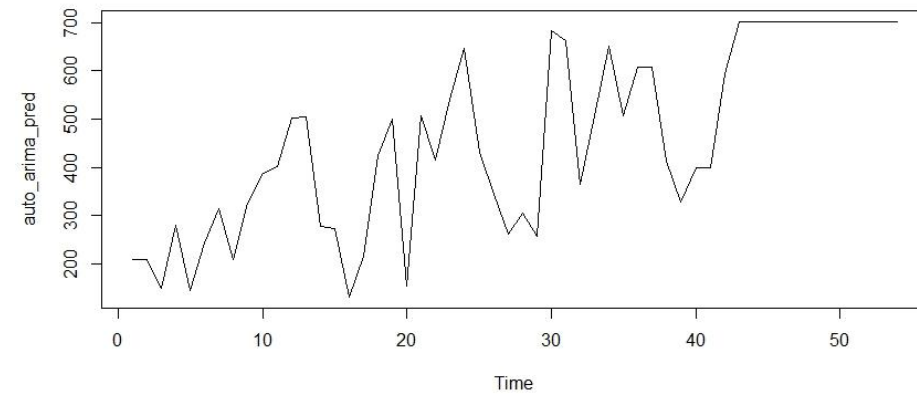1. Sales prediction using classical decomposition

3. Quantity prediction using classical decomposition

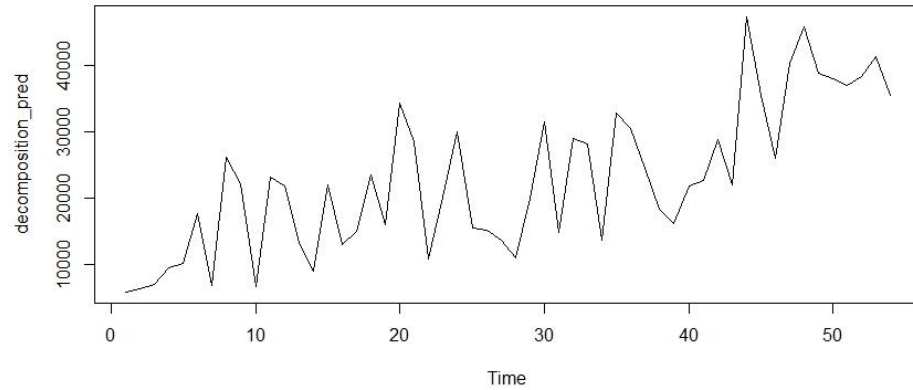2. Sales prediction using auto-arima

4. Quantity prediction using auto-arima

SALES AND QUANTITY PREDICTION : EU

1. Sales prediction using classical decomposition
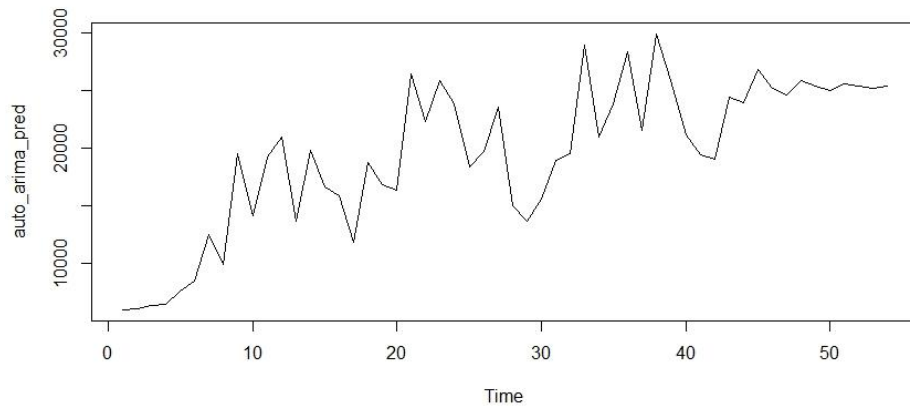
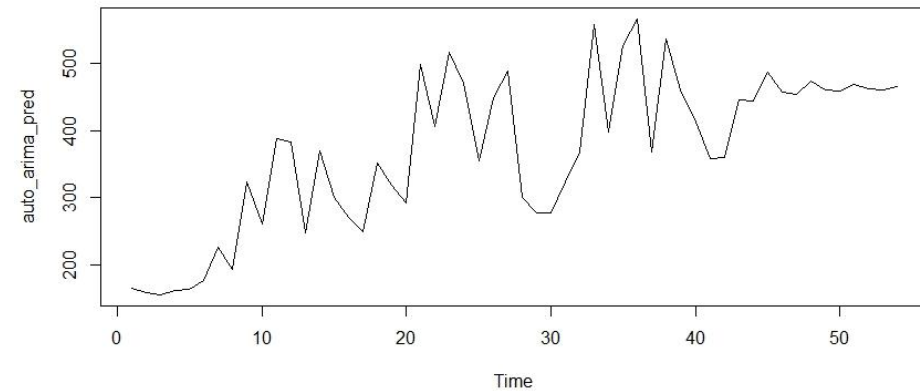### 3. Quantity prediction using classical decomposition

2. Sales prediction using auto-arima
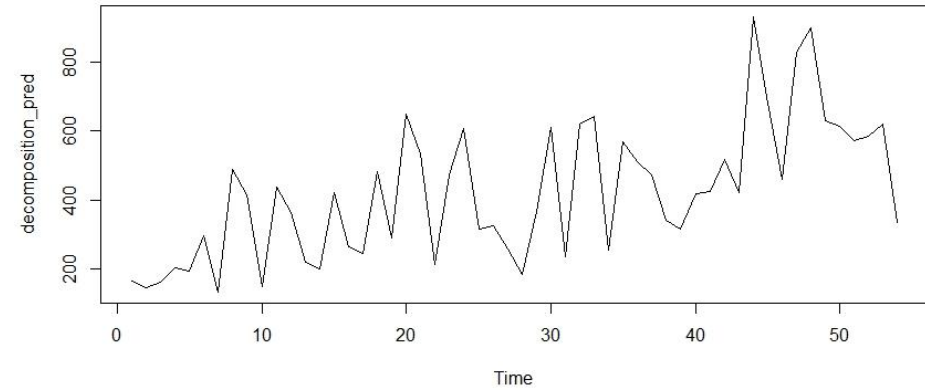
4. Quantity prediction using auto-arima

SALES AND QUANTITY PREDICTIONS

By analyzing both Consumer APAC and Consumer EU it is found that the classical decomposition method is most preferred method as the mean absolute percentage error (MAPE) using:

1. Classical decomposition is 26

2. Auto – Arima is 29

Therefore, Classical Decomposition is preferred over Auto Arima to check the accuracy of the modelling.

BUSINESS FORECAST AND RECOMMENDATIONS

The in-depth analysis of the shared data provides us with the an insight that:

1. In terms of profitability, Consumer APAC and Consumer EU are the 2 most significant and consistent segment among the 21 market buckets

2. Even though the quantity prediction for APAC has just picked up the trend in the later part of the FY 2014, a steady growth rate for sales is witnessed and this trend is expected to continue for next 6 months

3. Similarly, EU even though the market is witnessing a seasonal swing the growth trend for this market remain at an constant pace and expected to continue for next 6 months

Recommendation:

The market buckets consumer APAC and consumer EU, even though having consistent growth rate also witnessing a market fluctuation due to which the seasonal events can play a greater role to increase the profit margin. Stores in respective region need to consider the seasonal change and push for a larger quantity of sale keeping the upward trend in consideration, marketing activities such as seasonal offers/discounts will enhance the sales volume covering both profit and sales volume.

THANK YOU