



# GLOBAL MART

WHERE THE WORLD COMES TO SHOP !



## OBJECTIVE : PREDICTING SALES AND DEMAND

GLOBAL MART TAKES ORDERS AND DELIVERS ACROSS THE GLOBE AND DEALS WITH ALL THE MAJOR PRODUCT CATEGORIES - CONSUMER, CORPORATE & HOME OFFICE.

THE OBJECTIVE IS TO FORECAST THE SALES/DEMAND FOR NEXT 6 MONTHS TO MANAGE THE REVENUE AND INVENTORY ACCORDINGLY.



1. Classical decomposition and auto ARIMA is used for forecasting sales and demands for Global.



2. The collective data caters to 7 different market segments and in 3 major categories (consumer, corporate & home office.).



3. Coefficient of variation and the profit is used to find two most profitable segments and to forecast sales and quantity for them for next 6 months.

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## APPROACH

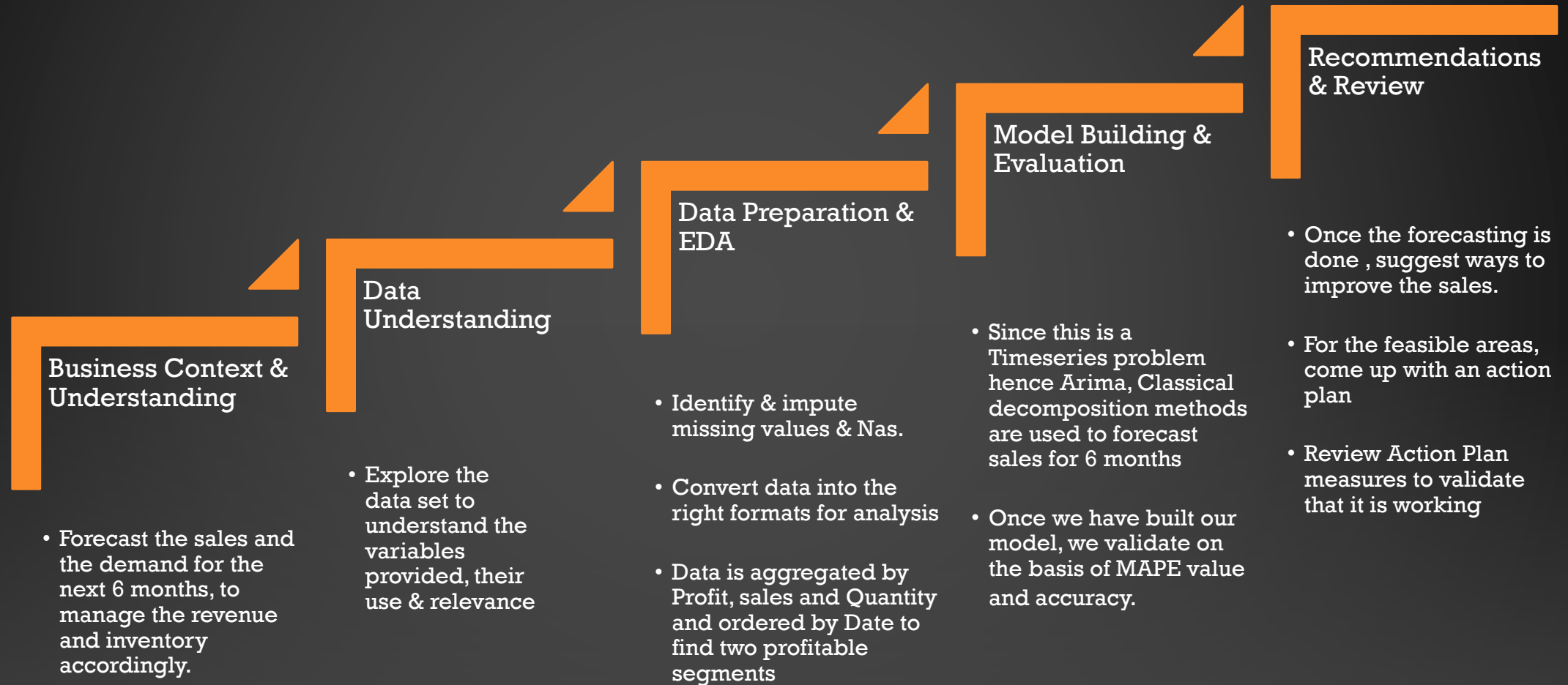
## The Data Summary:

```
$ Row.ID      : int  32298 26341 25330 13524 47221 22732 305
$ Order.ID    : Factor w/ 25035 levels "AE-2011-9160",...: 15
1399 ...
$ Order.Date  : chr   "2012-07" "2013-02" "2013-10" "2013-01"
$ Ship.Date   : Date, format: "2012-07-31" "2013-02-07" "201
$ Ship.Mode   : Factor w/ 4 levels "First Class",...: 2 3 1 1
$ Customer.ID : Factor w/ 1590 levels "AA-10315","AA-10375",
.
$ Customer.Name : Factor w/ 795 levels "Aaron Bergman",...: 633
$ Segment      : Factor w/ 3 levels "Consumer","Corporate",...
$ City         : Factor w/ 3636 levels "Aachen","Aalen",...: 2
$ State        : Factor w/ 1094 levels "'Ajman","'Amman",...:
$ Country      : Factor w/ 147 levels "Afghanistan",...: 140 7
$ Market       : Factor w/ 7 levels "Africa","APAC",...: 7 2 2
$ Region       : Factor w/ 13 levels "Africa","Canada",...: 6
$ Product.ID   : Factor w/ 10292 levels "FUR-ADV-10000002",...
907 ...
$ Category     : Factor w/ 3 levels "Furniture","office suppl
$ Sub.Category  : Factor w/ 17 levels "Accessories",...: 1 6 14
$ Product.Name : Factor w/ 3788 levels "\"while you were out\"
2510 2421 3165 2996 2532 922 1430 911 ...
$ Sales        : num  2310 3709 5175 2893 2833 ...
$ Quantity     : int   7 9 9 5 8 5 4 6 5 13 ...
$ Discount     : num   0 0.1 0.1 0.1 0 0.1 0 0 0.2 0.4 ...
$ Profit       : num  762.2 -288.8 920 -96.5 311.5 ...
$ environment(fun = NULL) : num  934 924 915 910 903 ...
$ Order.Priority: Factor w/ 4 levels "critical","High",...: 1 1
> environment(filter)ConsumerCorporate205 6601
```

Grouped by:  
Market  
Segment

Market	Segment	Sales	Quantity	Profit
APAC	Consumer			
EU	Consumer			

# The Data Journey :



# DATA PREPARATION AND UNDERSTANDING:

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1. The data currently has the transaction level data, where each row represents a particular order made on the online store.



2. There are 24 attributes related to each such transaction. The “Market” attribute has 7-factor levels representing the geographical market sector and 3 “Segments” that customer belongs to.



3. The whole dataset is divided into the 21 segments based on the market and the customer segment level.

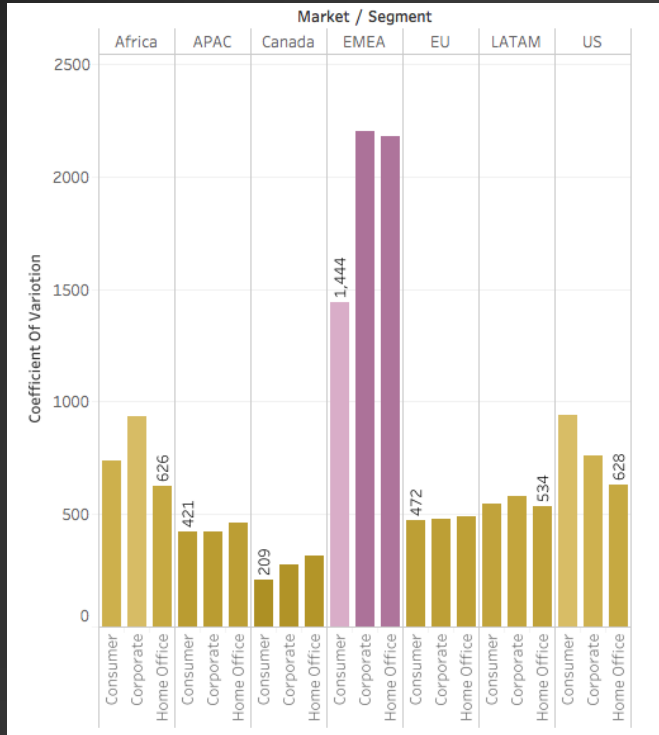


4. The dataset is aggregated by 3 attributes - Sales, Quantity & Profit, over the Order Date to arrive at monthly values for these attributes .



5. Find two most profitable and consistently profitable segments using coefficient of variation of the Profit and time series is created for them for Sales and Demand.





EU AND APAC -HIGHEST PROFITABLE AND HAVE LOWEST COVARIANCE COEFFICIENT (MEASURE OF ERROR) IN “CONSUMER SECTOR”.



- Now since we have most profitable sectors we will create a Time series for APAC and EU market for both Sales and Demand(Quantity).
- These timeseries are gone through smoothening process(MA and exponential smoothening ) to remove noise and get a clear pattern in data.
- Classical Decomposition and AutoArima() has been used on Smoothened series to Forecast sales and demand each for last 6 month.
- The model is evaluated on some matrices discussed later in the slide.

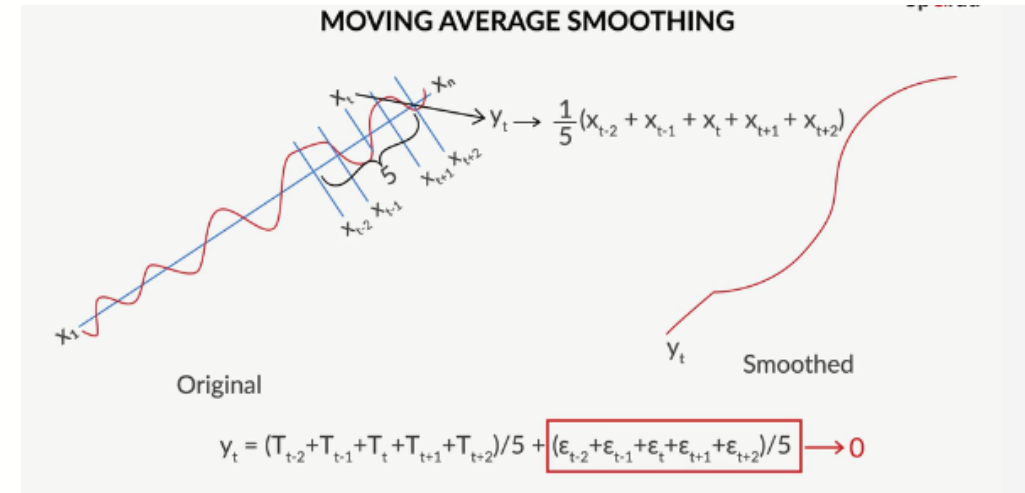


# SMOOTHENING PROCESS USED:

- Moving average:

It forecasts the next value(s) in a time series based on the average of a fixed finite number 'p' of the previous values. It evens out the signal as well as the noise.

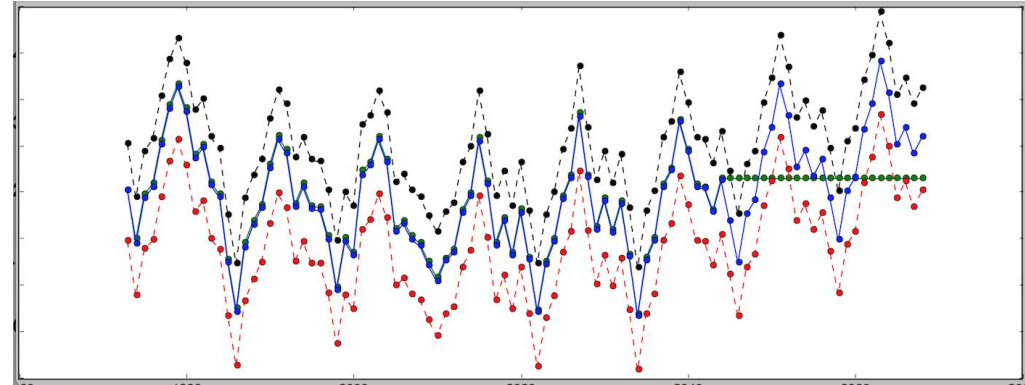
$$\hat{y}_t = \frac{1}{p}(y_{t-1} + y_{t-2} + y_{t-3} \dots + y_{t-p})$$



# SMOOTHENING PROCESS USED:

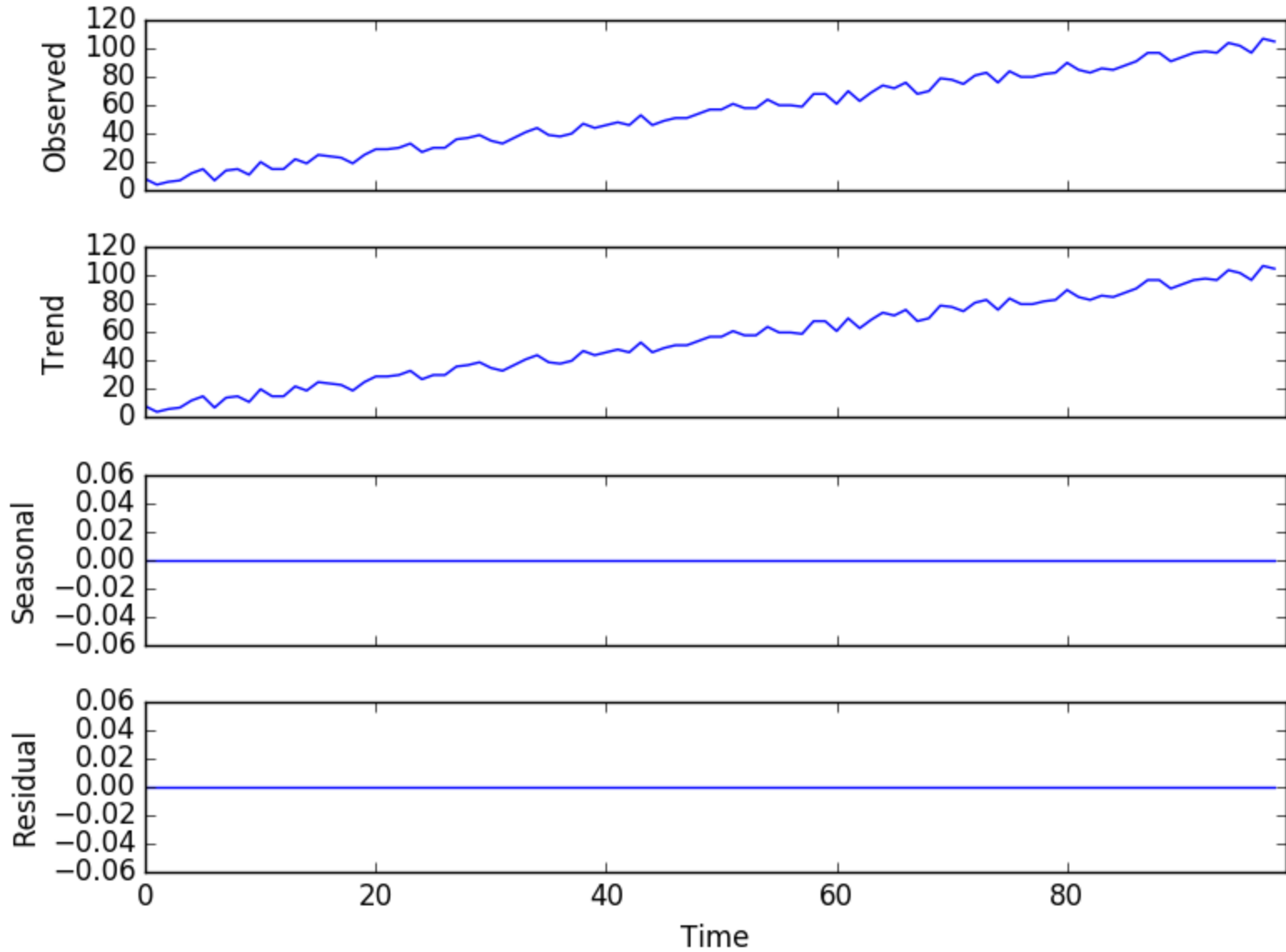
- Holt Winters:

It's an exponentially weighted moving average **filter** for the level, trend, and seasonal components of a time series



## FORECASTING TECHNIQUE USED:

- Classical Decomposition:  
**Decompose** a **time series** into seasonal, trend and irregular components using moving averages. Deals with additive or multiplicative seasonal component.



# FORECASTING TECHNIQUE USED:

- `Auto.Arima()`..

Arima uses AR (autoregressive term), I (differencing term) and MA (moving average term). AR term refers to the past values used for forecasting the next value. MA term is used to defines number of past forecast errors used to predict the future values. Order of differencing specifies the number of times the differencing operation is performed on series to make it stationary.

1. Visualize the time series

2. Stationarize the series

3. Plot ACF/PACF charts and find optimal parameters

4. Build the ARIMA model

5. Make Predictions



# EVALUATION METRICS:



## 1. ACCURACY.

Measure of the precision of forecasted series.

ACCURACY(Forecasted time series, actual Time series) results into below matrices.

	ME	RMSE	MAE	MPE	MAPE	ACF1	Theil's U
Test set	75.81151	101.6301	75.81151	9.580049	9.580049	0.2850971	2.488527

## 2. MAPE VALUE:

It is a measure of prediction accuracy of a **forecasting** method in **statistics**, for example in trend estimation, also used as a Loss function for regression problems in Machine Learning. Lower the mape value, the better is the fit.

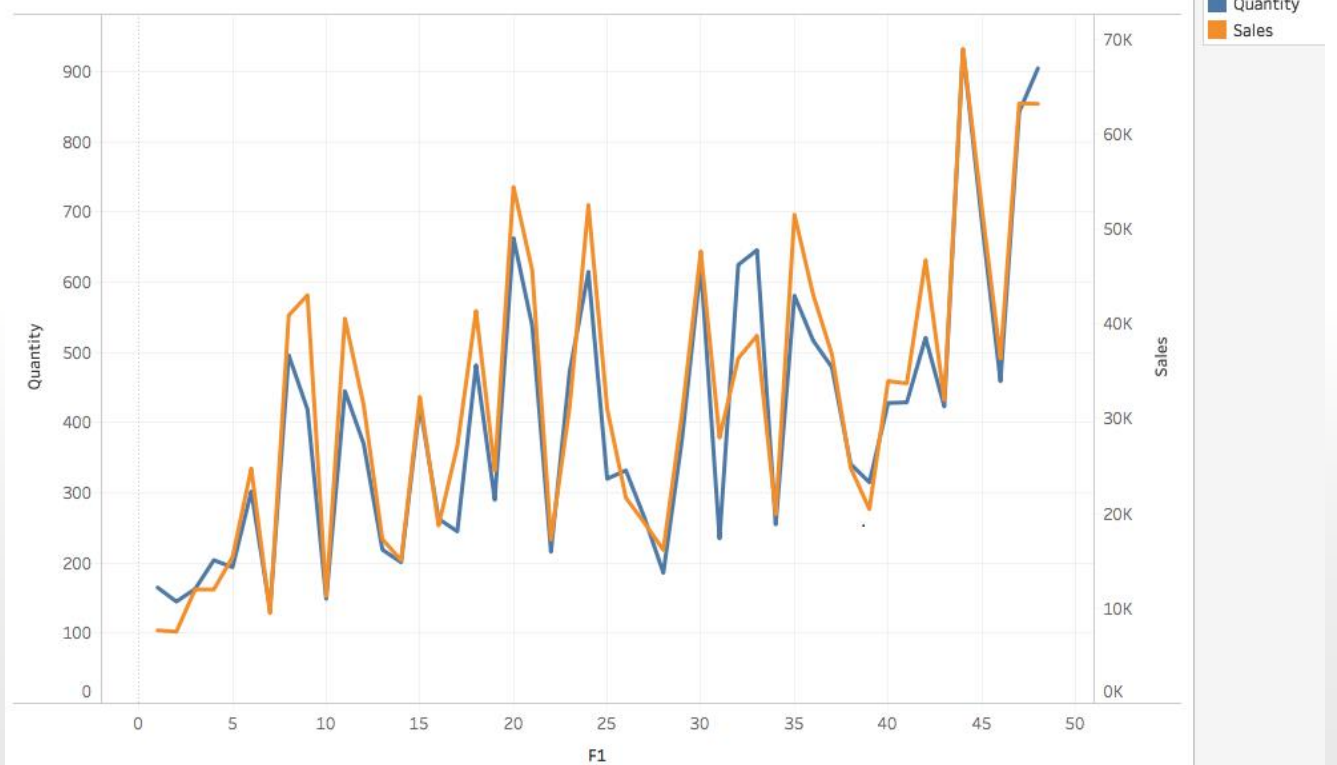
# APAC CONSUMER REGION: FORECASTING SALES AND DEMAND



## ACTUAL SCENARIO FOR SALES AND DEMAND FOR APAC REGION.

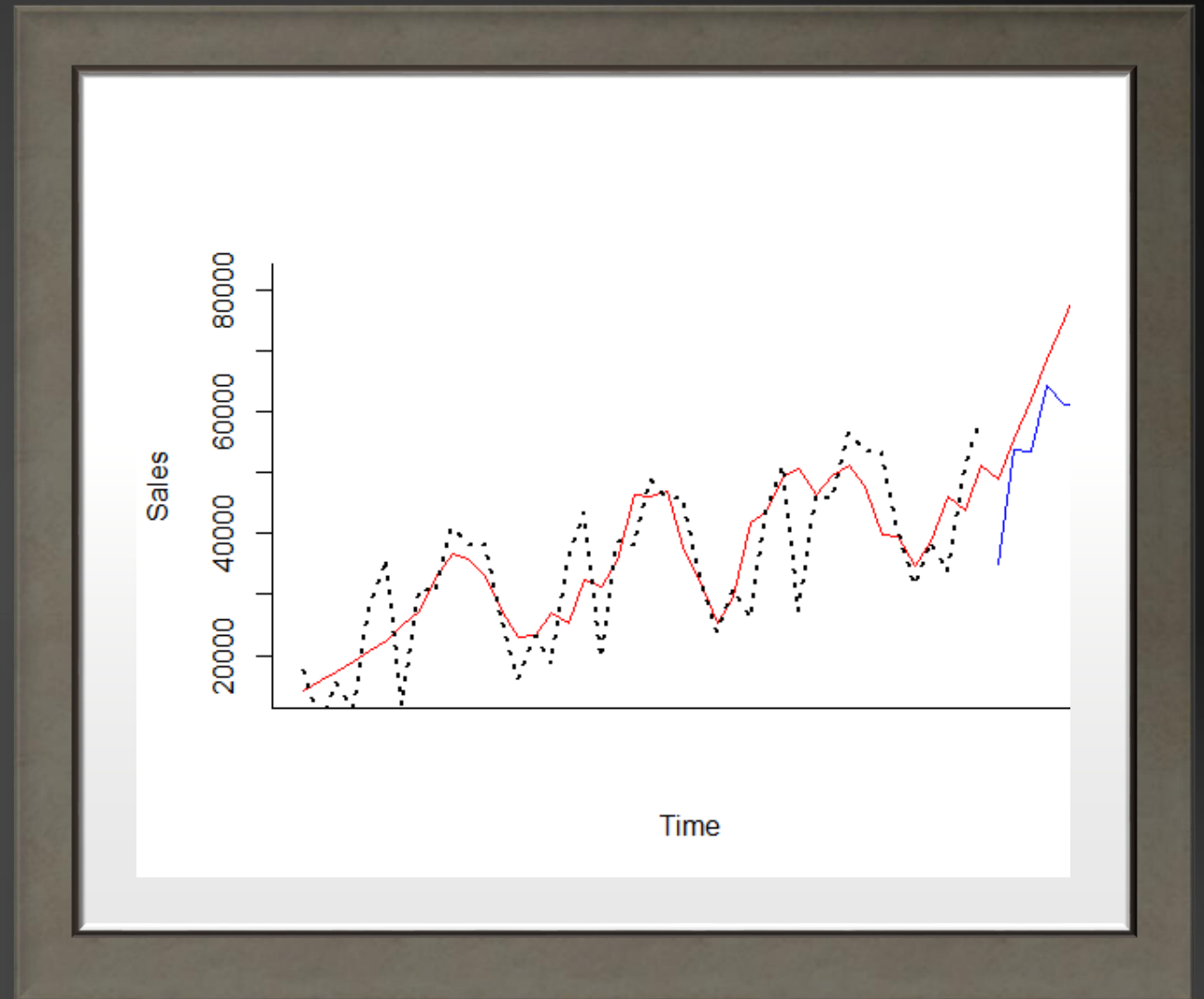
The Sale has become stagnant after 48 months from 2011- in 2015 while demand is still increasing for APAC region

Sales-Demand curve APAC



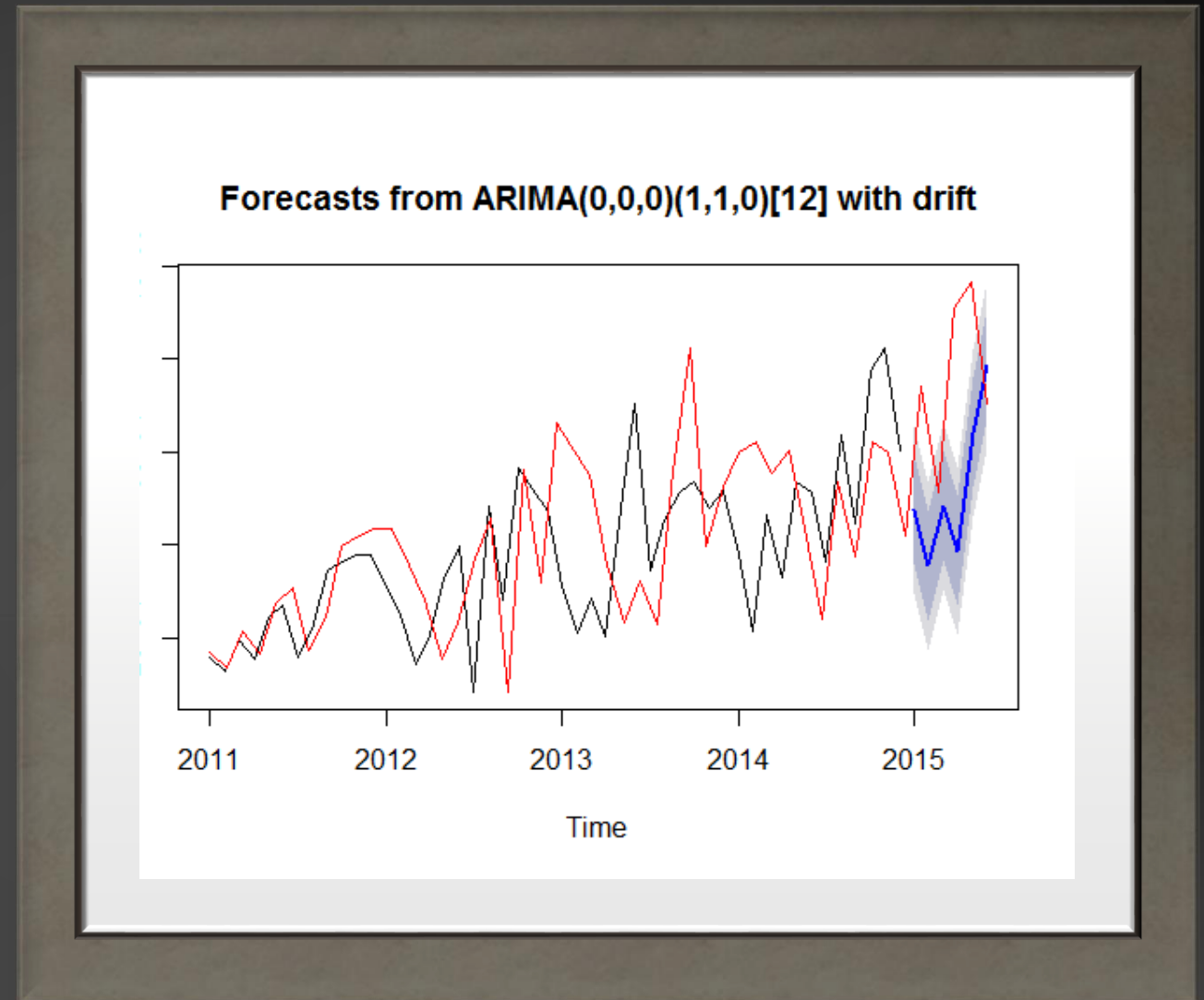
## SALES FORECASTING BY CLASSICAL DECOMPOSITION FOR APAC.

- The plot shows actual sales(black dotted line) and Forecasted sales (red line)
- The sales increase in next 6 months with same seasonality and the Accuracy is quiet good.
- MAPE VALUE=13.93



# SALES FORECASTING BY ARIMA MODEL FOR APAC.

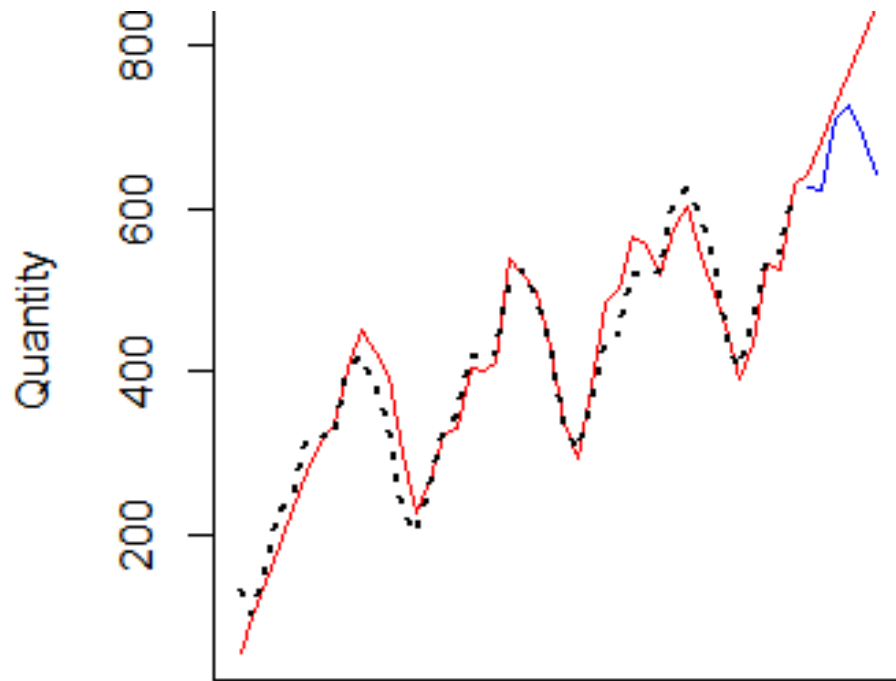
- The plot shows forecasted sales(black dotted line) With a prediction for 6month (in blue) and actual sales (red line)
- The accuracy is quiet good and though is a decrease in forcsted sales as actual for next 6 months with same seasonality as observed in part.
- Mape value is quiet good for both training and test Dataset with no overfitting problems



	ME	RMSE	MAE	MPE	MAPE	MASE	ACF1	Theil's U
Training set	116.6153	7769.887	5193.268	-6.546853	17.68447	0.4655306	-0.05528939	NA
Test set	5202.2416	9498.391	7454.207	6.967048	11.77618	0.6682038	-0.16587906	0.317472

## DEMAND FORECASTING BY CLASSICAL DECOMPOSITION.

- The plot shows actual demand(black dotted line) and Forecasted demand (red line)
- Demand forecast has increasing trend and seasonality as past values and have the good accuracy .The MAPE value is 9.5



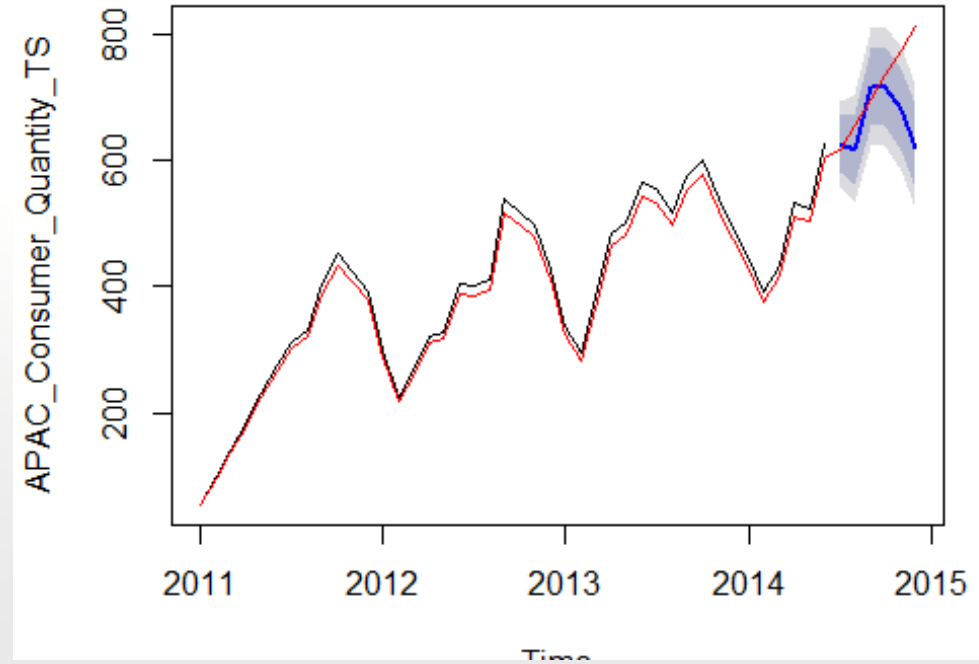


## DEMAND FORECASTING BY ARIMA MODEL.

- The plot shows forecasted sales(black dotted line) With a prediction for 6month (in blue) and actual demand (red line)
- Demand forecast shows decreasing trend as actual demand
- Mape value is quiet good for both test and rain dataset.

	ME	RMSE	MAE	MPE	MAPE	MASE	ACF1	Theil's U
Training set	-1.403102	27.77779	19.25782	-0.425584	4.80180	0.1972463	-0.2038329	NA
Test set	82.200701	111.34294	82.20070	10.369414	10.36941	0.8419327	0.2809352	2.727369

Forecasts from ARIMA(1,0,0)(1,1,0)[12] with drift

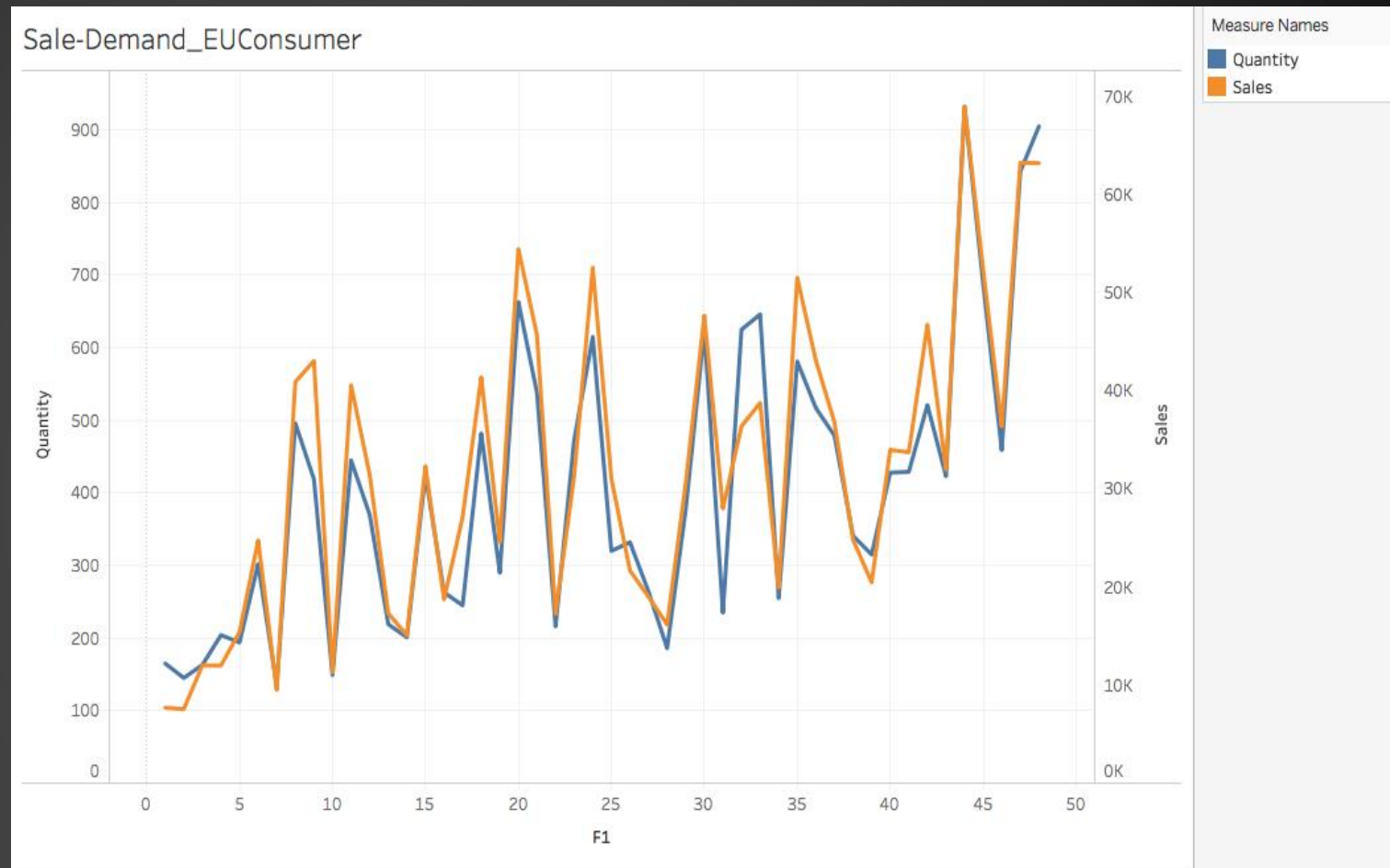


# EU CONSUMER REGION: FORECASTING SALES AND DEMAND



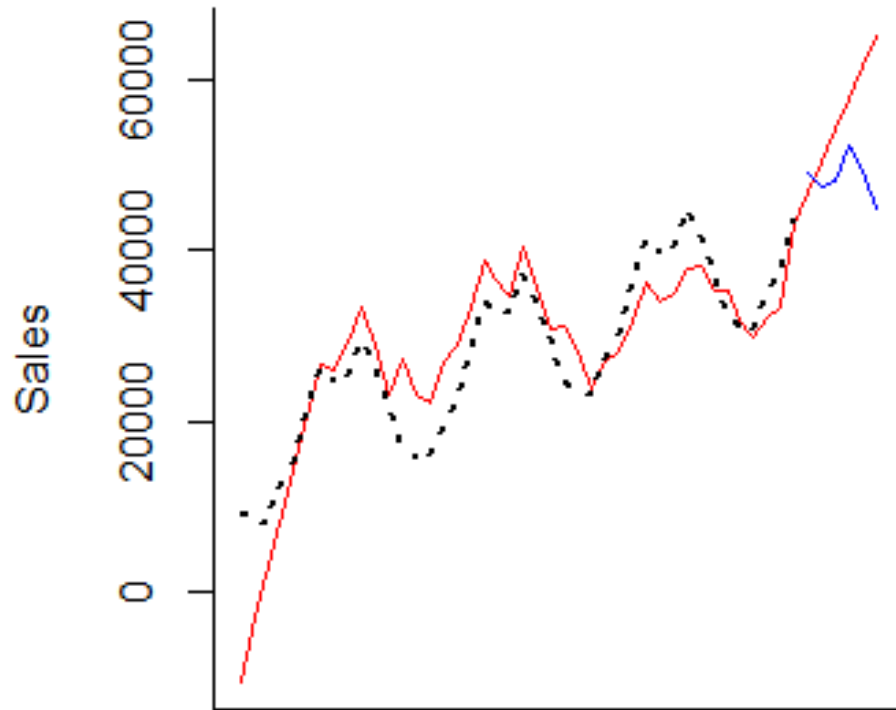
# ACTUAL SCENARIO FOR SALES AND DEMAND FOR EU REGION.

The Sale has become stagnant after 48 months from 2011- in 2015 while demand is still increasing for EU region



## SALES FORECASTING BY CLASSICAL DECOMPOSITION FOR EU.

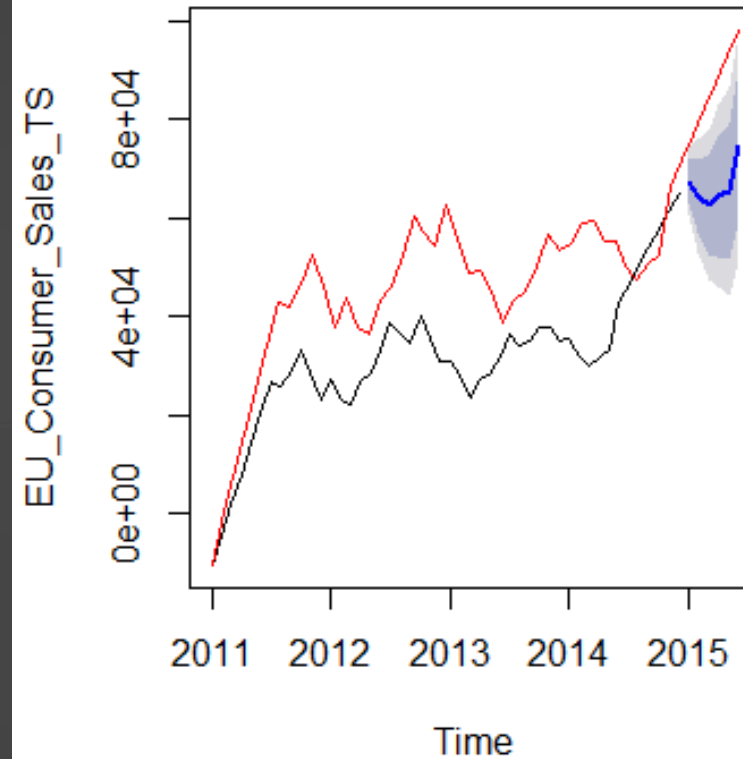
- The plot shows actual sales(black dotted line) and Forecasted sales (red line)
- The sales increase steeply in next 6 months the Accuracy is quiet good.
- MAPE VAUE= 13.80817



## SALES FORECASTING BY ARIMA MODEL FOR EU.

- The plot shows forecasted sales(black dotted line) With a prediction for 6month (in blue) and actual sales (red line)
- The forecasted sale has the increasing trend and seasonality as the past values.
- Mape value is quiet good for both train and test dataset.

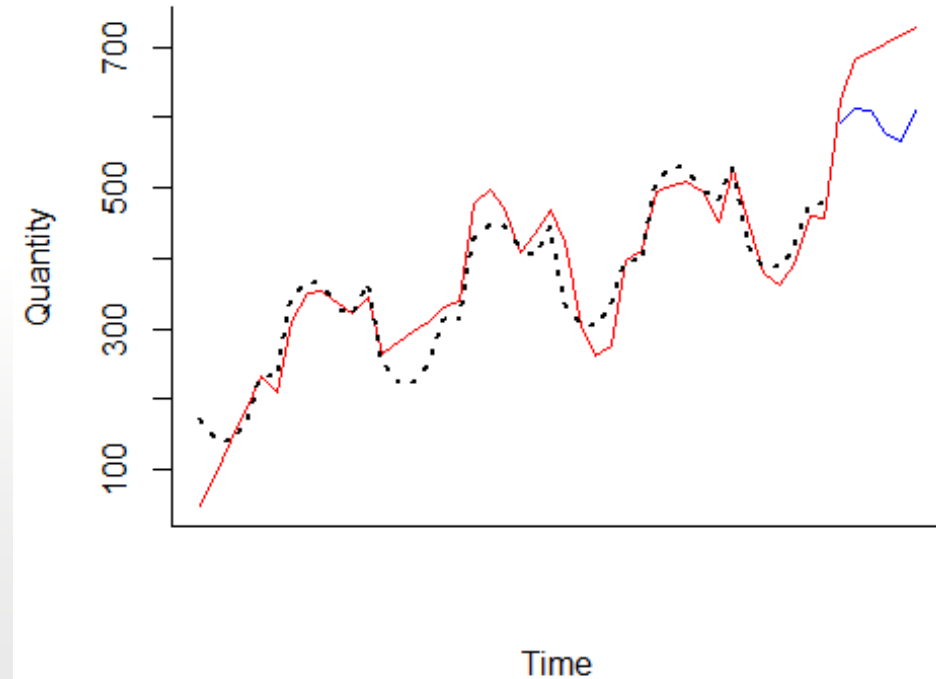
Forecasts from ARIMA(2,0,0)(0,1,0)[12



	ME	RMSE	MAE	MPE	MAPE	MASE	ACF1	Theil's U
Training set	782.2367	2431.875	1647.451	2.320232	5.098584	0.2030675	-0.13437610	NA
Test set	745.8123	2565.329	1892.920	0.940308	3.343440	0.2333244	0.03055521	0.5896106

## DEMAND FORECASTING BY CLASSICAL DECOMPOSITION FOR EU.

- The plot shows actual demand(black dotted line) and Forecasted demand (red line)
- Demand forecast has increasing trend as past values and have the good accuracy .
- The MAPE value is 13.72



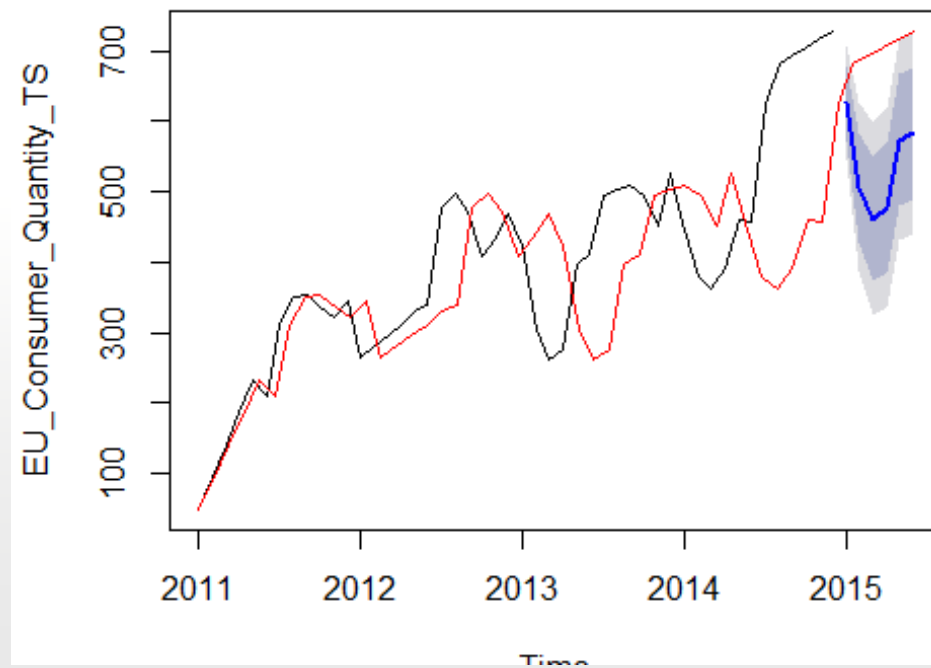


## DEMAND FORECASTING BY ARIMA FOR EU.

- The plot shows forecasted demand(black dotted line) With a prediction for 6month (in blue) and actual demand (red line)
- Plot shows the same trend as previous and demand is increasing.
- The accuracy is good for forecasted demand. The Mape values Are also acceptable with no overfitting.

	ME	RMSE	MAE	MPE	MAPE	MASE	ACF1	Theil's U
Training set	-5.060199	36.49403	23.47439	-1.944133	6.244317	0.2628711	0.07176955	NA
Test set	137.758015	144.39915	137.75802	19.685536	19.685536	1.5426429	0.42759865	5.264786

Forecasts from ARIMA(2,0,0)(1,1,0)[12] with drift



# RECOMMENDATIONS FOR INCREASING SALES FOR GLOBAL MART.

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Global Mart has a good prospect for sales and demand for coming 6 months ,still the store can thrive for better prospects in future.



The sales moves faster than ever today. In the blink of an eye, new competitors emerge, products similar to yours are released, and before you know it, it's a race to the bottom.



Here are some basic steps GLOBALMART can take to improve their sales performance, reduce cost of selling, and ensure the increasing demand and sale trends.





## 1. Clarify your mission.



Begin by understanding your business niche. What do you do best? Who needs what you do? How do you best approach these prospects? How much are they willing to pay?



## 2. Break the mission into specific goals



Write down the activity goals (calls per day, proposals per month, referrals per call, etc.) that you can control. Set results goals (sales per month, amount per sale, profit per sale, etc.) to measure your progress, and track them closely. Increase your activity and measure the results. Goals focus your attention and energize your action.



### **3. Sell to customer needs:**

Emphasize the features of your product or service that reduce costs and solve problems for the customer. Sometimes you can reposition your wares



### **4. Create and maintain favorable attention.:**

Effective marketing, referrals, strong sales skills, and strategic questions are the keys to creating favorable attention. Diligent follow-through and above-and-beyond customer service are the keys to maintaining it.



### **5. Sell on purpose.:**

Know both what to do and why you're doing it at every step along the way. Who are you targeting and why? What are you going to tell them and why? What are you going to ask them and why? What is your proposal going to look like and why?





## **6. Ask, listen, and act.**

Better than any others, these three words summarize success in sales. Your questions must be creative, planned, relevant, and direct. Your listening skills must be highly developed. You must respond and take action that proves that you listened to the customer and want the sale.



## **7. Take the responsibility but not the credit.**

Realize that you are the team leader. The company looks to you for direction and supports your effort. To build a strong support team willing to go the extra mile when you need it, give your team the credit for everything that goes right, and take the blame when it goes wrong.



## **8. Work on the basics.**

Even the best of the best have room for improvement. Make a decision to improve your weaknesses, and set goals to force yourself to do the things you don't like to do. Be more creative in your prospecting, fact finding, and presentation skills. Imagine the perfect salesperson and compare yourself to the





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**9. Develop your attitude.**



Your attitude is controllable. Conquer your fears. Change the beliefs that limit your success. Your thought habits control your commitment, enthusiasm, persistence, resilience, happiness, and confidence. Be aware of them, decide which ones are unproductive, and then make a commitment to change. With time and effort, you can become the person you want to be.



**10. Maximize your time.**



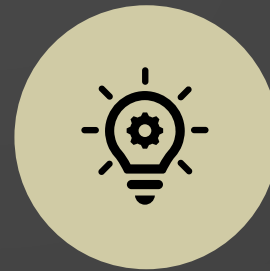
Focus on your goals. Test every activity for its importance and urgency. Create an ideal schedule, and test your actual time use against it daily. Remember, just one hour a day used more productively adds up to more than six extra weeks of productive time a year.

# RECOMMENDATIONS FOR INCREASING DEMAND FOR GLOBAL MART.



Creating a new product is an exciting venture, especially if market and consumer research has revealed a need, but comprehensive solutions aren't available yet.

Customers want solutions for their problems, but they can't quite identify what they need. This is where you come in.



Here are some great ways GLOBALMART can use to generate buzz and address the audience's most pressing needs with the product you've created.



## 1. Product Scarcity.



Scarcity is often used to bolster sales, but it can also be used to create massive brand lift. It plays on the customer's fear of missing out .

Promoting “out of stock” items is another effective approach to developing product scarcity



## 2. Information Scarcity



If you really understand your target audience, then you already know what will get their attention. If you leak just enough information before launch, you can generate tremendous buzz as your audience searches everywhere for more information.





### 3. Make It Exclusive

People generally want something more when they can't have it. They demand to know why they can't have it, what factor excludes them, and how they can possibly get access to it. Exclusivity plays on the scarcity mindset and fears of missing out, except there are plenty of products to go around.



### 4. Partner with Rock stars

When you're launching a new product, incorporating influencers into your marketing strategy can really give your product the boost it needs to get off the ground.



### 5. Constantly innovate

After launching the original version of your product, immediately switch your focus to improving on it with the help of customer feedback. Figure out how you can make it better and complete it faster, then launch a new version to capture more of your audience.





THANK-YOU