Retail Giant Sales Forecasting Case Study

Background – Time Series Case Study

"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.

Now, the store wants to finalise the inventory management plan for the next 6 months. Hence, the objectives of the analysis are:

- Find out the most profitable (and consistent) market segments for the company.
- For these segments, forecast the sales and the demand for the next 6 months, so that the revenue and inventory may be managed accordingly

The analysis has been divided into four parts:

- Data Understanding
- Finding the most profitable segments
- Forecasting sales and demand for each of the profitable segments
- Recommendations for inventory management

- **Data understanding**
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Data Understanding – Major Attributes

The data received for the analysis had 24 attributes. The important ones were –

Attribute	Description
Order Date	Date on which the order was placed
Segment	The market segment to which the customer belongs
Market	Geographical market sector to which the customer belongs
Sales	Total sales value of the transaction
Quantity	Quantity of the product ordered
Profit	Profit made on the transaction

Data Understanding – Segmentation of Data

- The “Market” attribute has 7-factor levels representing the geographical market sector that the customer belongs to.
- Also, the “Segment” attribute tells which of the 3 segments that customer belongs to.

Market
Africa
APAC (Asia Pacific)
Canada
EMEA (Middle East)
EU (European Union)
LATAM (Latin America)
US (United States)

Segment
Consumer
Corporate
Home Office

- Hence, the entire customer population of “Global Mart” can be divided into 7*3 = 21 market segments, such as APAC Consumer, US Home Office etc.

- Data understanding
- **Finding the most profitable segments**
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Finding the Most Profitable Segments – COV points to APAC Consumer and EU Consumer

The coefficient of variation (standard deviation/mean) was used to find the most profitable segments. The segment wise COV values, in increasing order, are*:

Market Segment	COV
APAC Consumer	0.6036
EU Consumer	0.6553
LATAM Consumer	0.6889
EU Corporate	0.6977
APAC Corporate	0.7407
LATAM Corporate	0.8909

Market Segment	COV
US Corporate	1.0396
APAC Home Office	1.0615
US Consumer	1.1085
EU Home Office	1.1281
US Home Office	1.2318
LATAM Home Office	1.3599

Market Segment	COV
Africa Consumer	1.4466
Africa Corporate	1.6850
Africa Home Office	2.0139
EMEA Consumer	2.7499
EMEA Home Office	6.1402
EMEA Corporate	6.8618

- The segments with the lowest COV are **APAC consumer** and **EU consumer**
- This means that these segments have the lowest amount of variation, and hence are the most predictable ones
- Also, since a low COV implies high mean sales, it also implies that these two segments are the most profitable ones

* - COV could not be calculated for any of the 3 Canadian market segments, because of lack of data

- Data understanding
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- **Forecasting sales and demand for each of the profitable segments**
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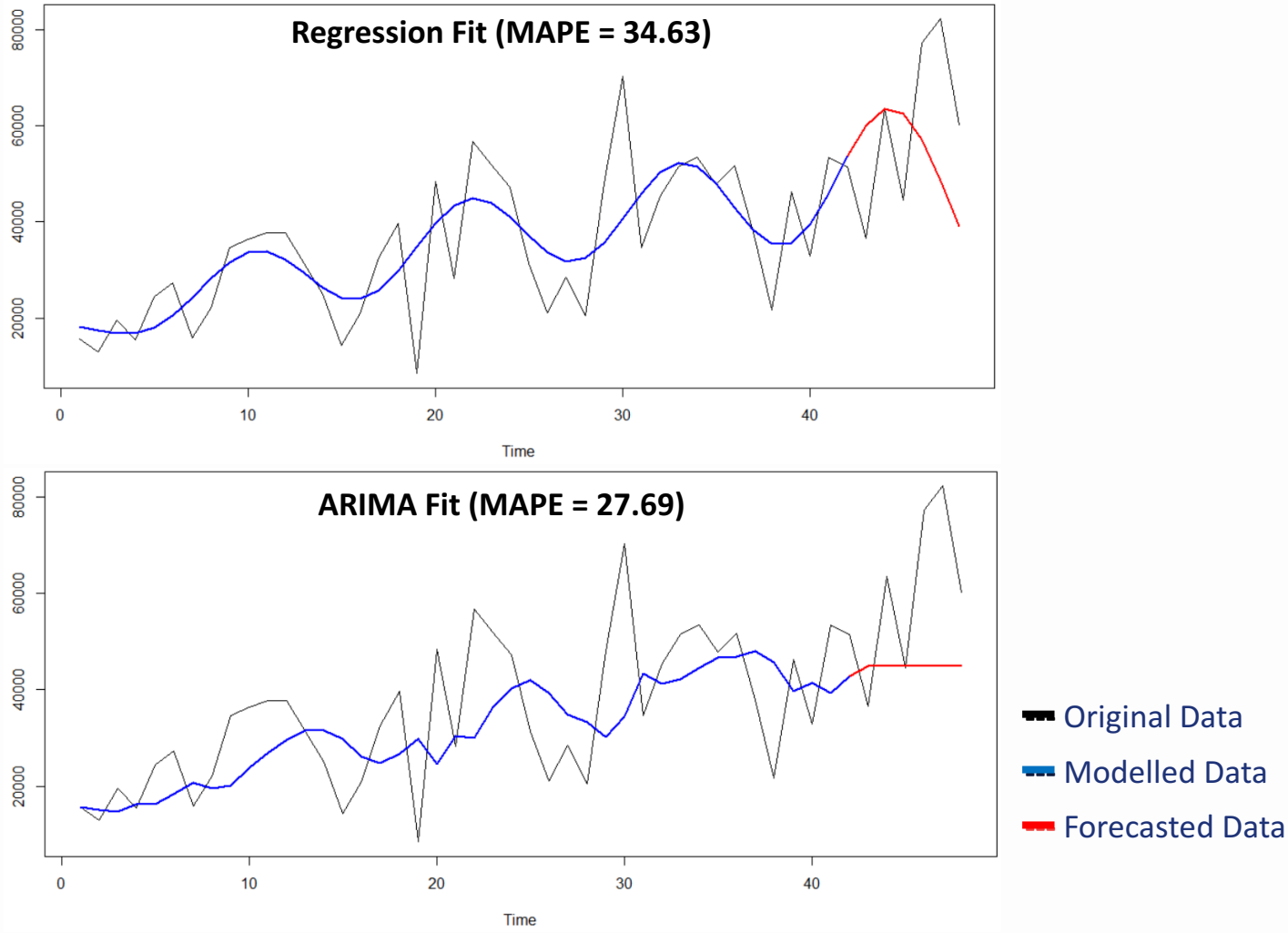
Forecasting Sales and Demand – APAC consumer Sales

APAC Consumer Sales

- Between the regression fit and the ARIMA fit, the former looks like a better fit, visually
- However, the ARIMA fit has a lower MAPE value



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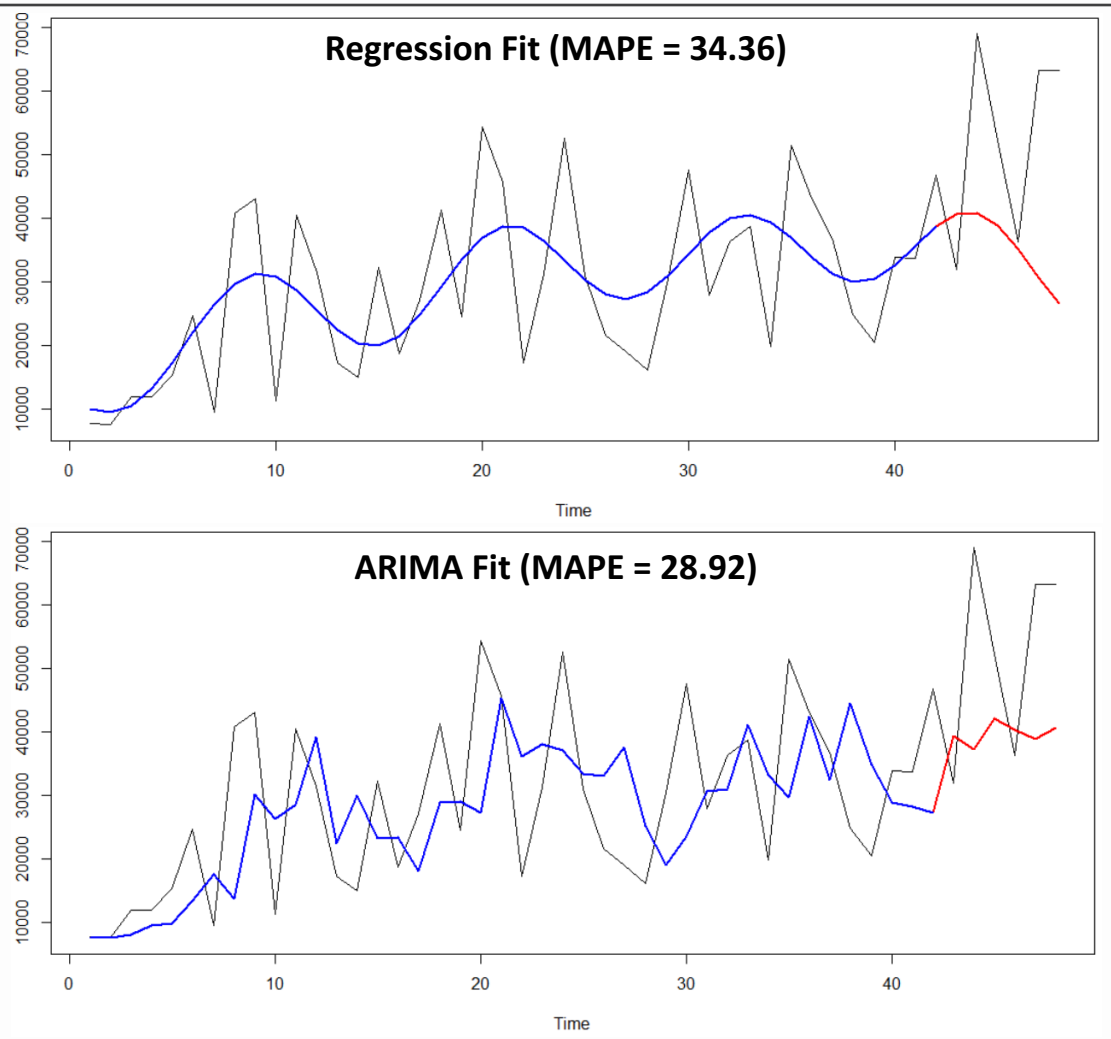
Forecasting Sales and Demand – EU Consumer Sales

EU Consumer Sales

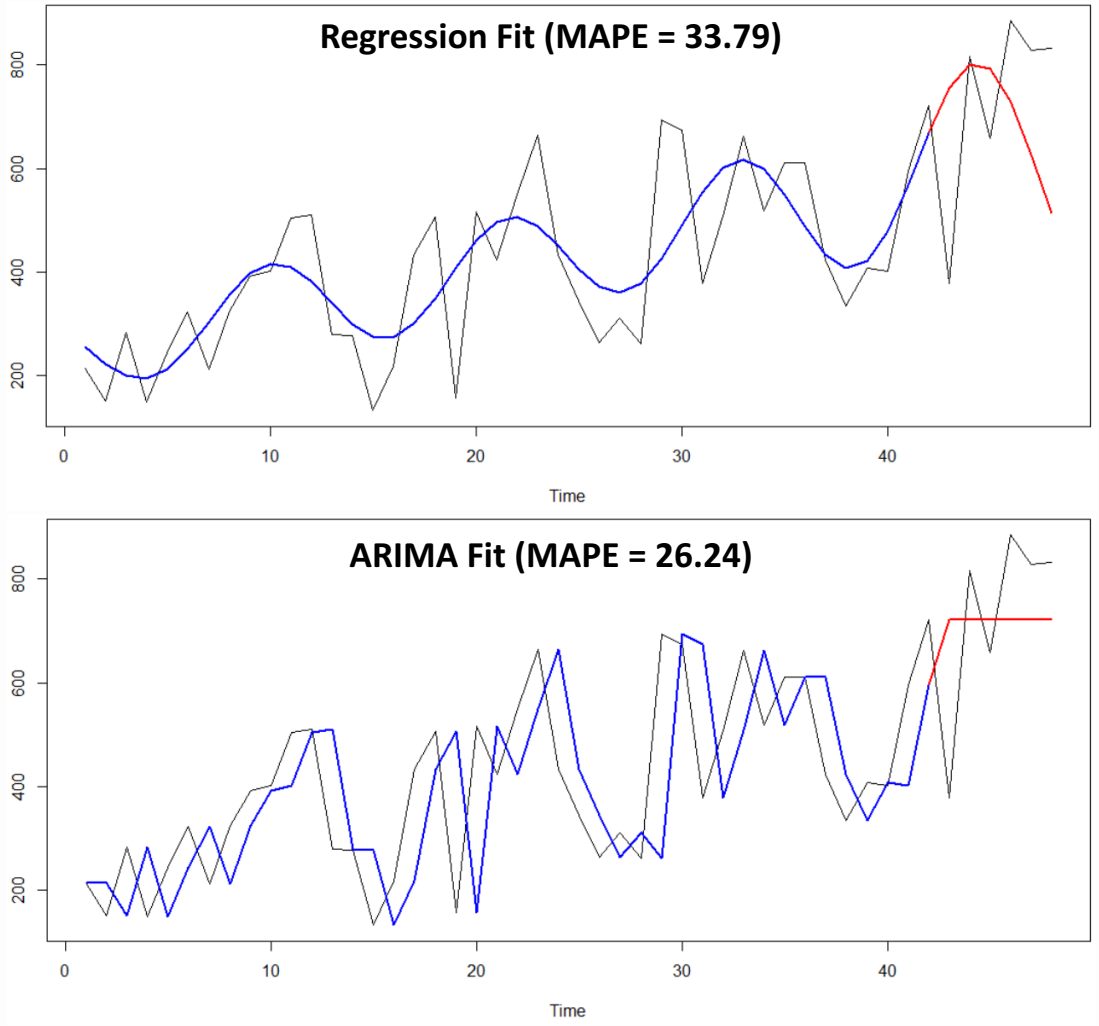
- Visually both the regression fit and the ARIMA fit look similar
- However, the ARIMA fit has a lower MAPE value



Forecasting Sales and Demand – APAC Consumer Demand

APAC Consumer Demand

- Between the regression fit and the ARIMA fit, the latter looks like a better fit, visually
- As expected, the ARIMA fit has a lower MAPE value



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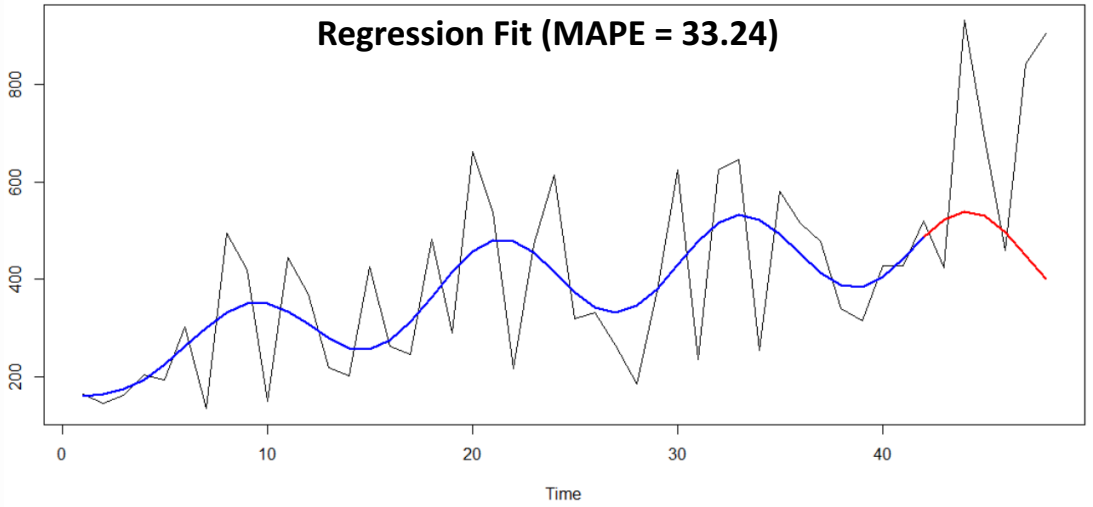
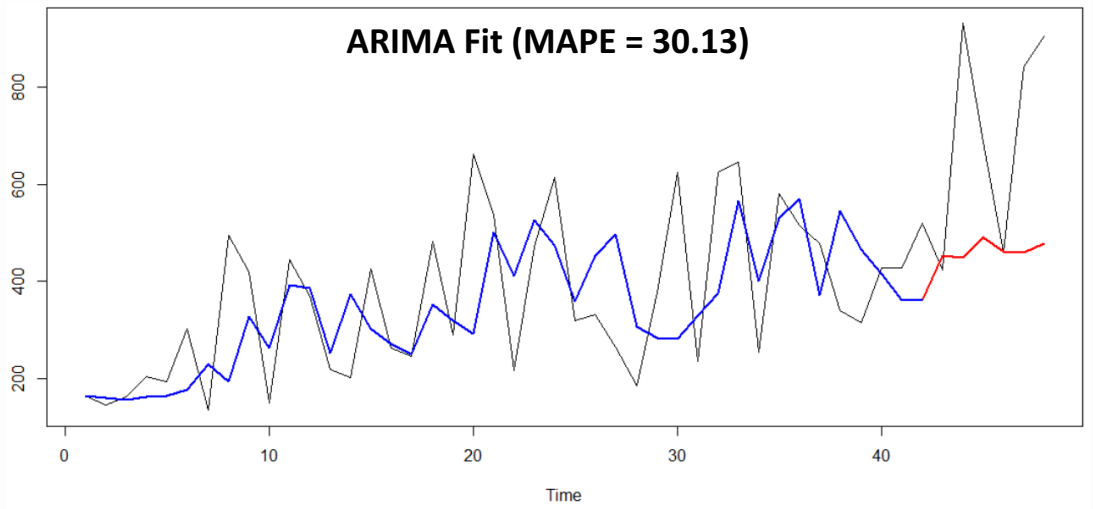
Forecasting Sales and Demand – EU Consumer Demand

EU Consumer Demand

- Both the regression fit and the ARIMA fit looks like very bad fits, when looked at visually
- However, the ARIMA fit has a lower MAPE value





Original Data
Modelled Data
Forecasted Data

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- Data understanding
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- **Recommendations for inventory management**

Recommendations for Inventory Management

Most profitable segments:

- APAC and EU consumer segments seem to be the most profitable ones. Items corresponding to these segments should be kept more in stock.

Inventory Levels:

- Inventory levels should be kept as predicted by the ARIMA model (around 400 units) for the case of EU consumer segment, since the ARIMA model's predictions had a low MAPE value.
- However, the regression model should be used for predicting inventory requirement for the APAC consumer segment, as it is the only one of the two that is able to capture the seasonal behaviour of sales and demand for this segment.
- In general, a buffer of at least 25% should be kept on inventory levels, as none of the models used was extremely accurate (lowest MAPE value was 26.24).