# Sales Forecasting Using SAS For Global Retail Inc.

Final project report by

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# Summary

The worldwide sales director needs to build a pipeline that automatically provides sales forecasts for the next year.

Global Retail Inc. is a company with stores across the globe and presence in all continents.

## Agenda

**Understanding problem** The GR sales forecasting project is aimed at taking advantage of the information available inside of the company to predict the sales for the next year.

**Duration** of presentation: ~15 min

- Sales forecasting project was split in phases and was completed in 1 month.

**Output** Forecasted sales data

# Business Overview

## Business Information

- Global Retail (GR) has been enjoying significant challenges in revenue and profit during the last four years, from 2015 to 2018. GR is a retail company spread across worldwide with a presence in all continents. They have three line of business – Home Office, Consumer and Corporate; and three different Category of products – Technology, Office Supplies and Furniture.

- **Business Challenge**
  - The worldwide sales director need to predict a pipeline that provides a monthly forecast for sales numbers

# Business Overview

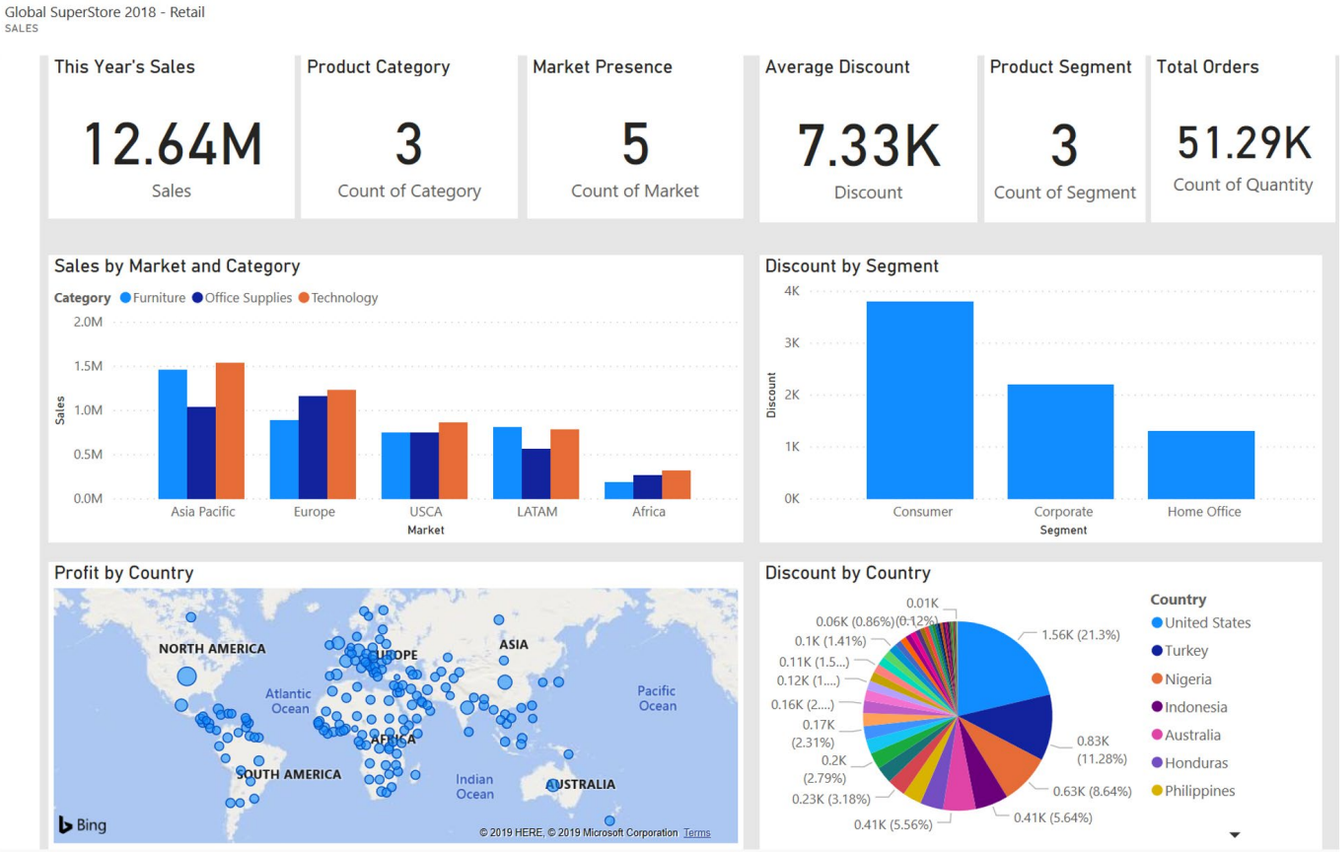



**Figure 1 – Sales Dashboard**

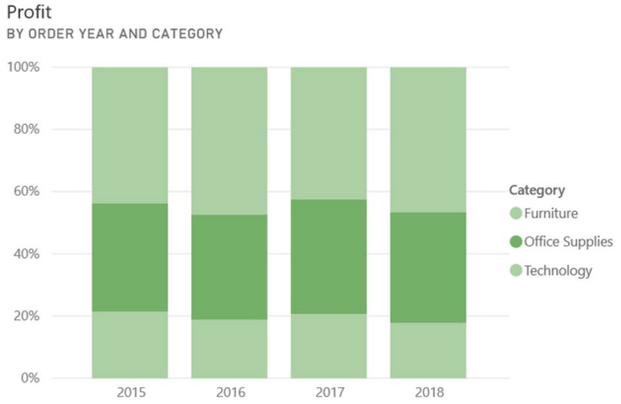



*Figure 2 - Profit by Category by Year*

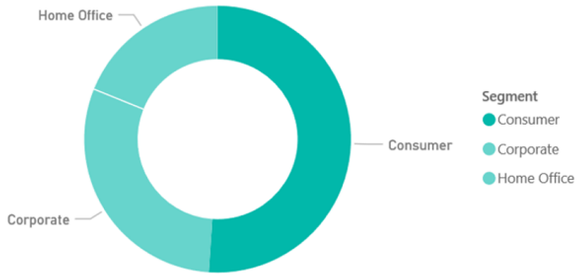



*Figure 3 - Profit by Market Segment*

# Dataset & Forecasting Methods

## Dataset

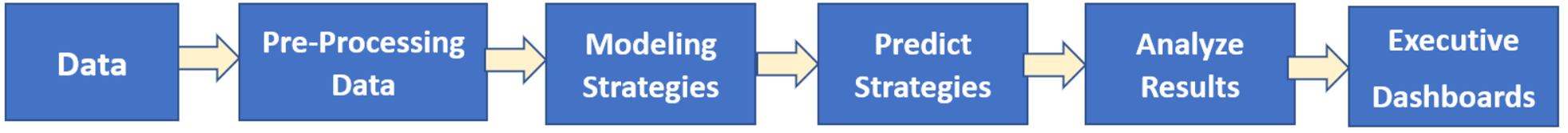
- The dataset is a second-hand data obtained from Microsoft dataset templates available at Microsoft AI Gallery.
- The dataset Global Super Store is related to a Retail company distributed across the globe.
- Empty columns were deleted
- Data not required for forecasting was discarded and only time-series data was kept

## Methods

- Three different methods were used to forecast the sales data for coming 12 months
  1. SAS Forecasting
  2. ARIMA Model
  3. MS Excel for Forecasting

- Primary methods is SAS Forecasting while other two methods were ised to compare and validate the output from the SAS forecasting

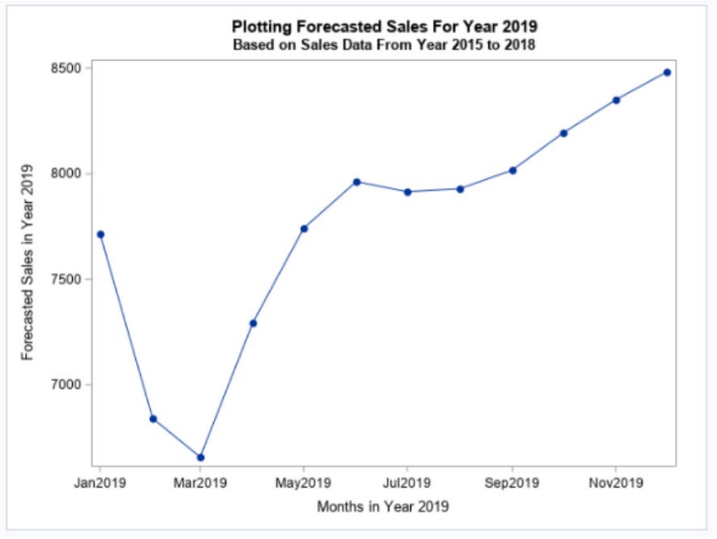
## Approach

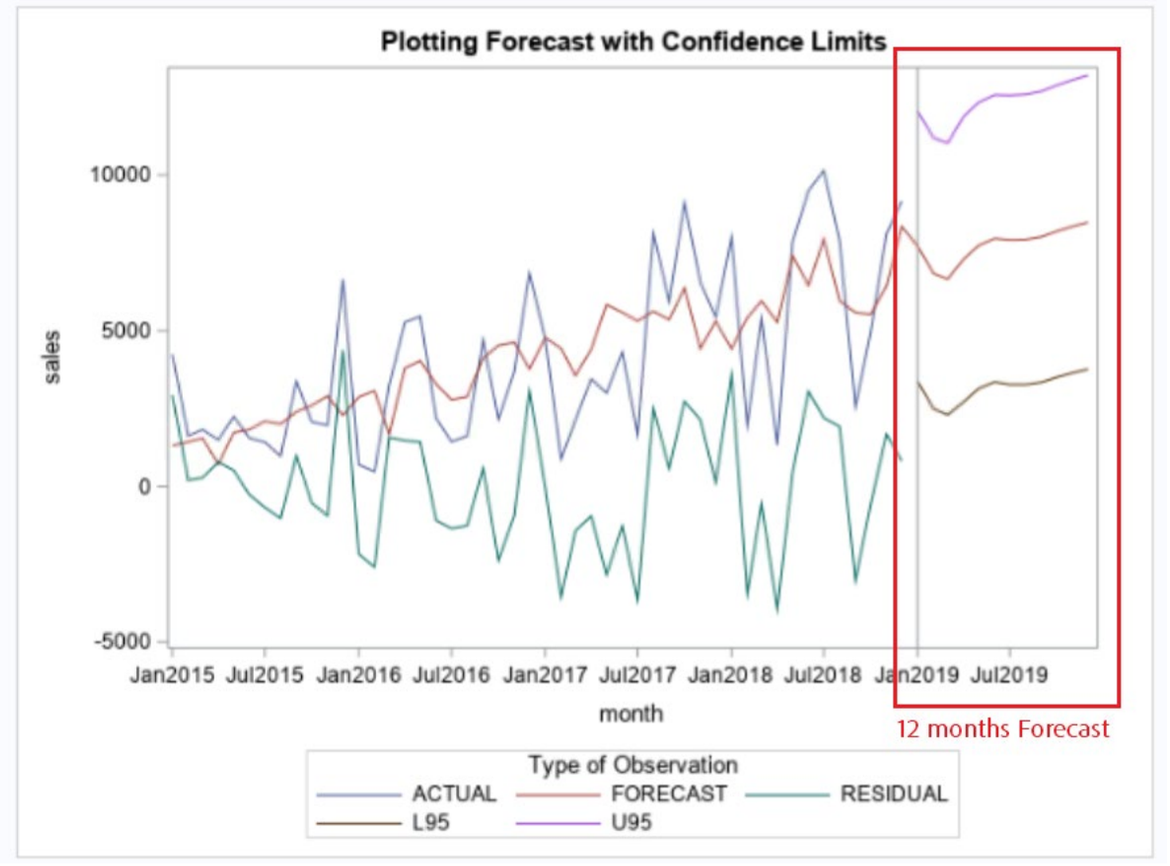


# Forecasting – Next 12 Months

**Forecast - Sales in Year 2019**
**Monthly Forecasted Sales Data For Year 2019**

| Obs | month | _TYPE_ | _LEAD_ | sales |
|---|---|---|---|---|
| 1 | JAN2019 | FORECAST | 1 | 7715.3578531 |
| 2 | FEB2019 | FORECAST | 2 | 6841.3649163 |
| 3 | MAR2019 | FORECAST | 3 | 6658.2371929 |
| 4 | APR2019 | FORECAST | 4 | 7293.9167955 |
| 5 | MAY2019 | FORECAST | 5 | 7741.8908118 |
| 6 | JUN2019 | FORECAST | 6 | 7963.0137145 |
| 7 | JUL2019 | FORECAST | 7 | 7915.2746884 |
| 8 | AUG2019 | FORECAST | 8 | 7929.1702917 |
| 9 | SEP2019 | FORECAST | 9 | 8017.5542708 |
| 10 | OCT2019 | FORECAST | 10 | 8194.2212128 |
| 11 | NOV2019 | FORECAST | 11 | 8350.6499318 |
| 12 | DEC2019 | FORECAST | 12 | 8482.6197972 |



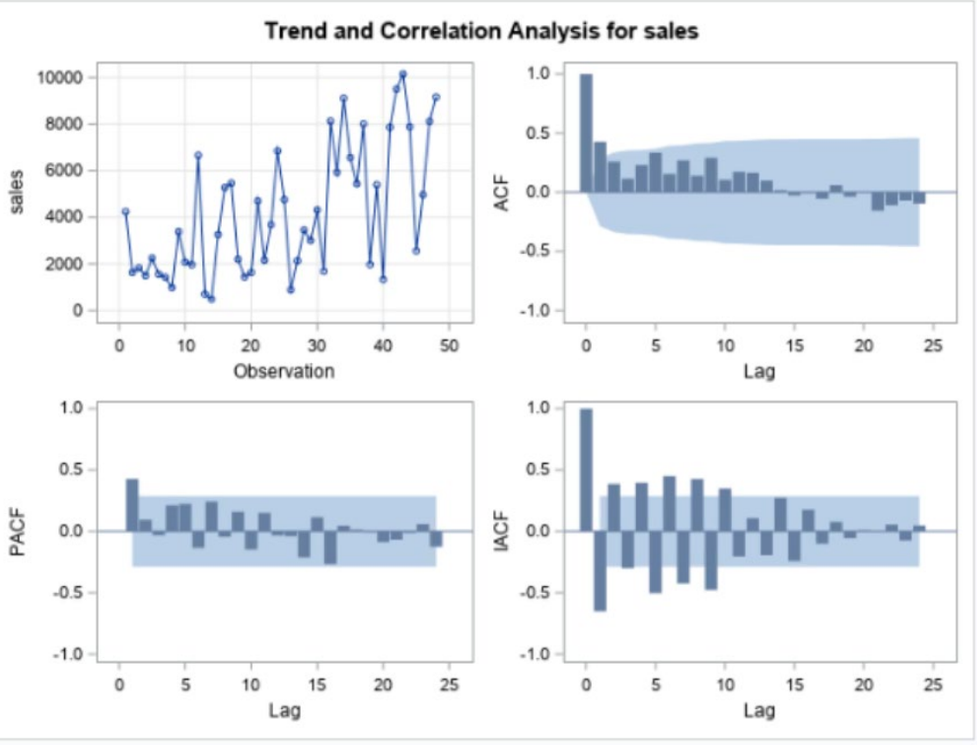
# Forecasting – ARIMA Model

| Name of Variable = sales | |
|---|---|
| Mean of Working Series | 4155.083 |
| Standard Deviation | 2741.552 |
| Number of Observations | 48 |

| Autocorrelation Check for White Noise | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| To Lag | Chi-Square | DF | Pr > ChiSq | Autocorrelations | | | | | |
| 6 | 24.10 | 6 | 0.0005 | 0.428 | 0.260 | 0.115 | 0.230 | 0.335 | 0.156 |
| 12 | 39.26 | 12 | <.0001 | 0.270 | 0.141 | 0.292 | 0.105 | 0.174 | 0.165 |
| 18 | 40.53 | 18 | 0.0018 | 0.099 | 0.017 | -0.027 | -0.007 | -0.055 | 0.060 |
| 24 | 45.35 | 24 | 0.0053 | -0.038 | 0.004 | -0.157 | -0.110 | -0.071 | -0.096 |

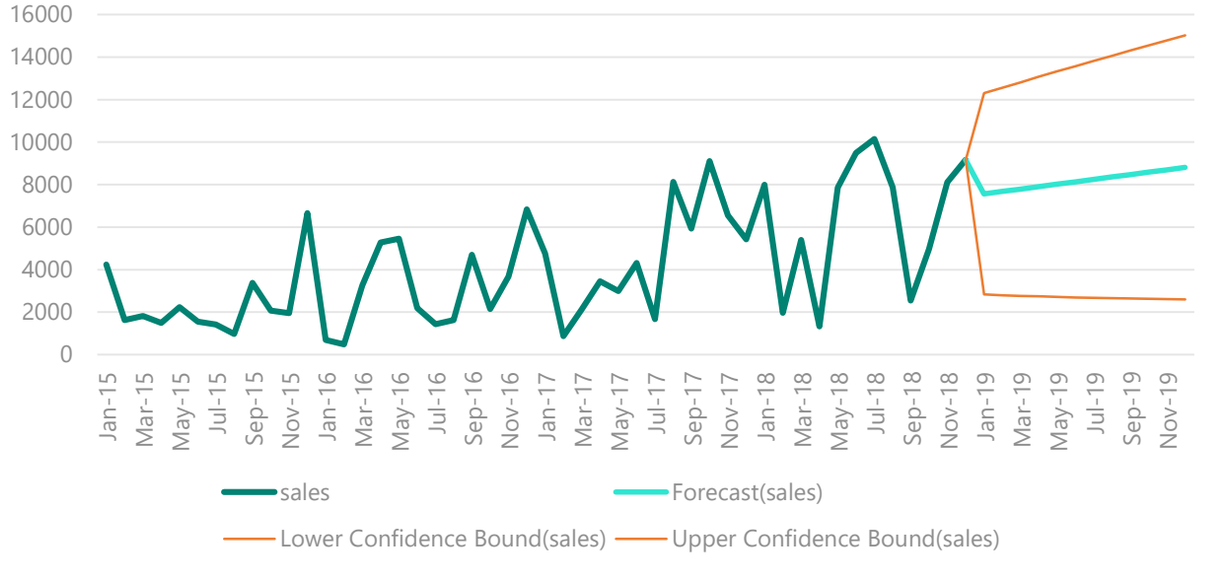
| Name of Variable = sales | |
|---|---|
| Period(s) of Differencing | 1 |
| Mean of Working Series | 104.766 |
| Standard Deviation | 2871.085 |
| Number of Observations | 47 |
| Observation(s) eliminated by differencing | 1 |

| Autocorrelation Check for White Noise | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| To Lag | Chi-Square | DF | Pr > ChiSq | Autocorrelations | | | | | |
| 6 | 16.17 | 6 | 0.0129 | -0.365 | 0.019 | -0.212 | -0.060 | 0.232 | -0.267 |




| Forecasts for variable sales | | | | |
|---|---|---|---|---|
| Obs | Forecast | Std Error | 95% Confidence Limits | |
| 49 | 7553.1399 | 2447.6779 | 2755.7794 | 12350.5005 |
| 50 | 7270.9016 | 2572.0822 | 2229.7132 | 12312.0899 |
| 51 | 7276.2731 | 2607.8835 | 2164.9155 | 12387.6308 |
| 52 | 7344.0452 | 2631.6147 | 2186.1751 | 12501.9153 |
| 53 | 7425.3558 | 2652.9389 | 2225.6912 | 12625.0205 |
| 54 | 7509.6038 | 2673.6344 | 2269.3767 | 12749.8310 |
| 55 | 7594.4891 | 2694.0729 | 2314.2033 | 12874.7750 |
| 56 | 7679.5127 | 2714.3364 | 2359.5111 | 12999.5143 |
| 57 | 7764.5662 | 2734.4452 | 2405.1521 | 13123.9804 |
| 58 | 7849.6263 | 2754.4063 | 2451.0892 | 13248.1634 |
| 59 | 7934.6878 | 2774.2235 | 2497.3097 | 13372.0658 |
| 60 | 8019.7496 | 2793.9001 | 2543.8061 | 13495.6930 |

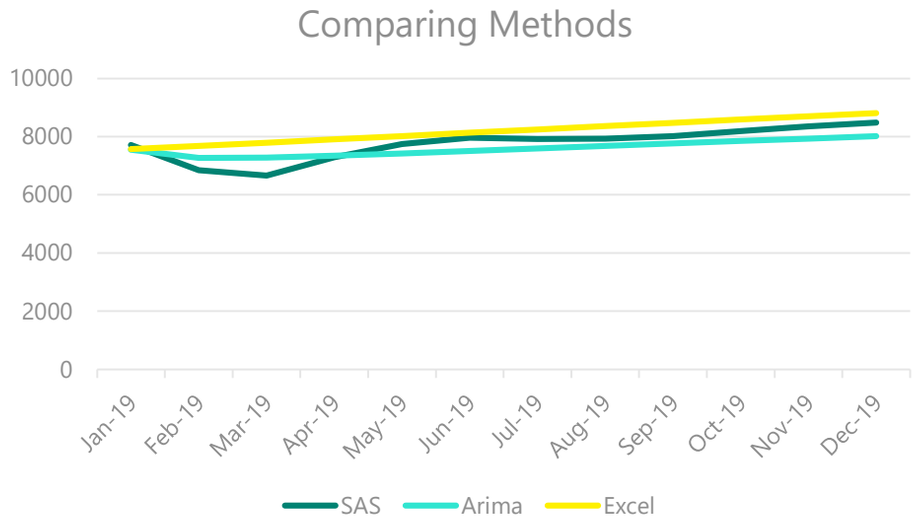
# Forecasting – MS Excel




| month | sales | Forecast(sales) | Lower Confidence Bound(sales) | Upper Confidence Bound(sales) |
|---|---|---|---|---|
| Nov-18 | 8113 | | | |
| Dec-18 | 9161 | 9161 | 9161 | 9161 |
| Jan-19 | | 7568 | 2833 | 12302 |
| Feb-19 | | 7681 | 2800 | 12562 |
| Mar-19 | | 7794 | 2769 | 12819 |
| Apr-19 | | 7907 | 2742 | 13073 |
| May-19 | | 8021 | 2717 | 13324 |
| Jun-19 | | 8134 | 2694 | 13573 |
| Jul-19 | | 8247 | 2674 | 13820 |
| Aug-19 | | 8360 | 2656 | 14064 |
| Sep-19 | | 8473 | 2640 | 14307 |
| Oct-19 | | 8587 | 2626 | 14547 |
| Nov-19 | | 8700 | 2613 | 14786 |
| Dec-19 | | 8813 | 2602 | 15024 |

# Comparing Different Methods Used

**Comparing three methods** - When we compared the forecast values of three different models, we found that the though results were not same (which was also not an expectation) they fall in-line, and sales were predicted to increase in all the models.



# Conclusion

The project involved working with a dataset provided by a retail organization and group was tasked to provide a sales forecast for the next 12 months considering sales data for the previous 48 months.

SAS was used to forecast the sales numbers.

From the forecasting exercise, it is concluded that the sales numbers will go up in the next 12 months, and a month-wise forecast was provided to the organization.

Using this data organization can ensure that their manufacturing, procurement, sales, marketing, and distribution teams are prepared well in advance for deeps and spikes in sales numbers.

# Thank you

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