Time Series Project

Business Case , Decomposed Linear Regression

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Business Case

- Different models perform differently for different KPIs
- We need to figure out which model is best suited to which KPI
- Models in question :
    - Decomposed Linear Regression
    - ARIMA
    - Auto-ARIMA
    - XGBoost regression

Decomposed Linear Regression Model

- Model Structure
- Model Steps
- Model Implementation

Decomposed Linear Regression Model

Any time series visualization may consist of the following components:

- Trend + Seasonality + Error.

We may have different combinations of trends and seasonality. Depending on the nature of the trends and seasonality, a time series can be modeled as an additive or multiplicative time series.

Decomposed Linear Regression Model

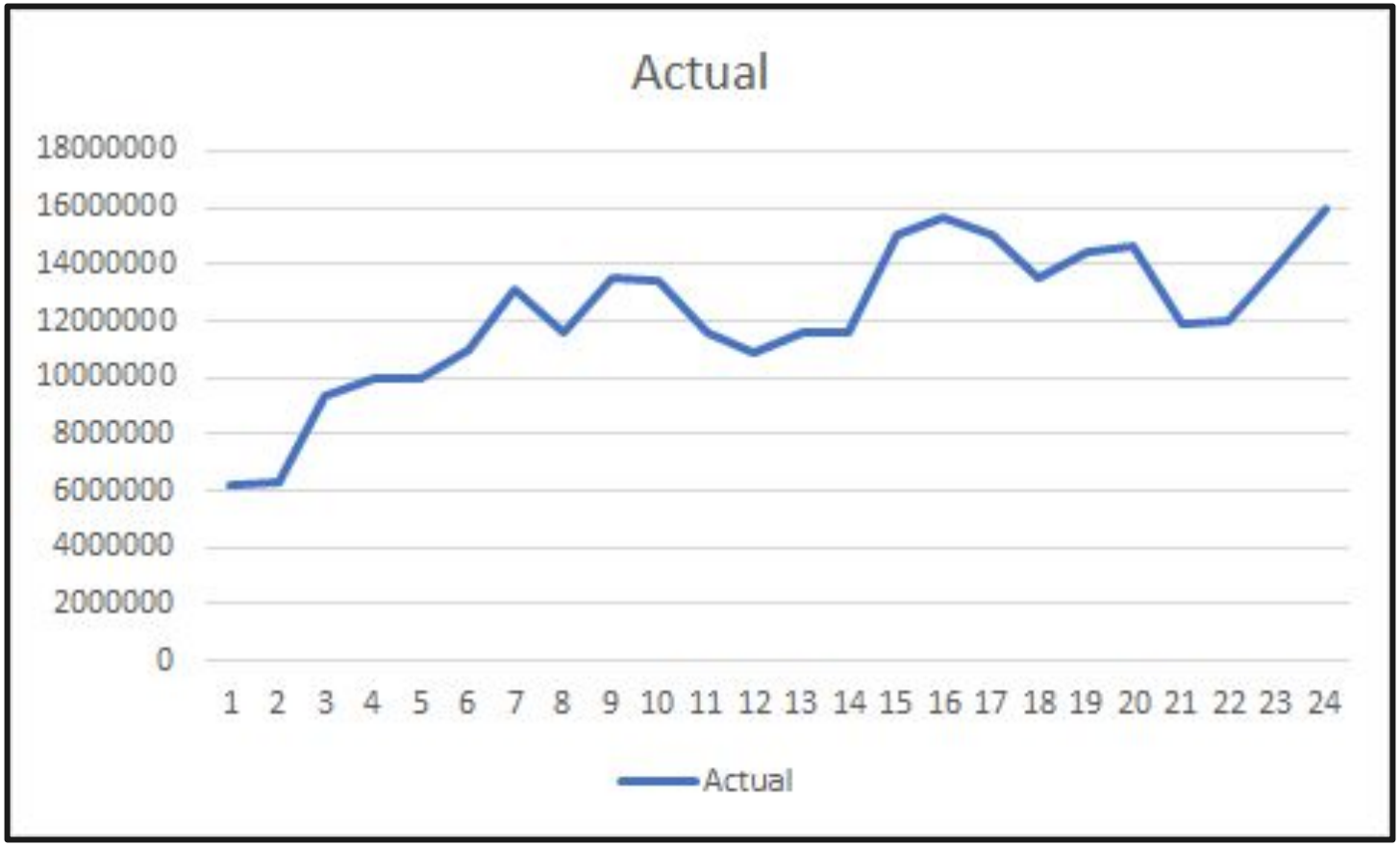
Each observation in the series can be expressed as either a sum or a product of the components.

Additive time series:

- Value = Trend + Seasonality + Error

Multiplicative Time Series:

- Value = Trend x Seasonality x Error


Actual
18000000
16000000
14000000
12000000
10000000
8000000
6000000
4000000
2000000
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Actual

Decomposed Linear Regression Model

Model : Trend * Seasonal * Irregular

Step 1 : Get the probable trend component (By Smoothen Y Values)

Step 2 : Get detrended data (Actual / (Seasonal x Irregular))

Step 3 : Get seasonal component (Seasonal by averaging and removing Irregular)

Step 4 : Get deseasonalized component (Actual / Seasonal)

Decomposed Linear Regression Model

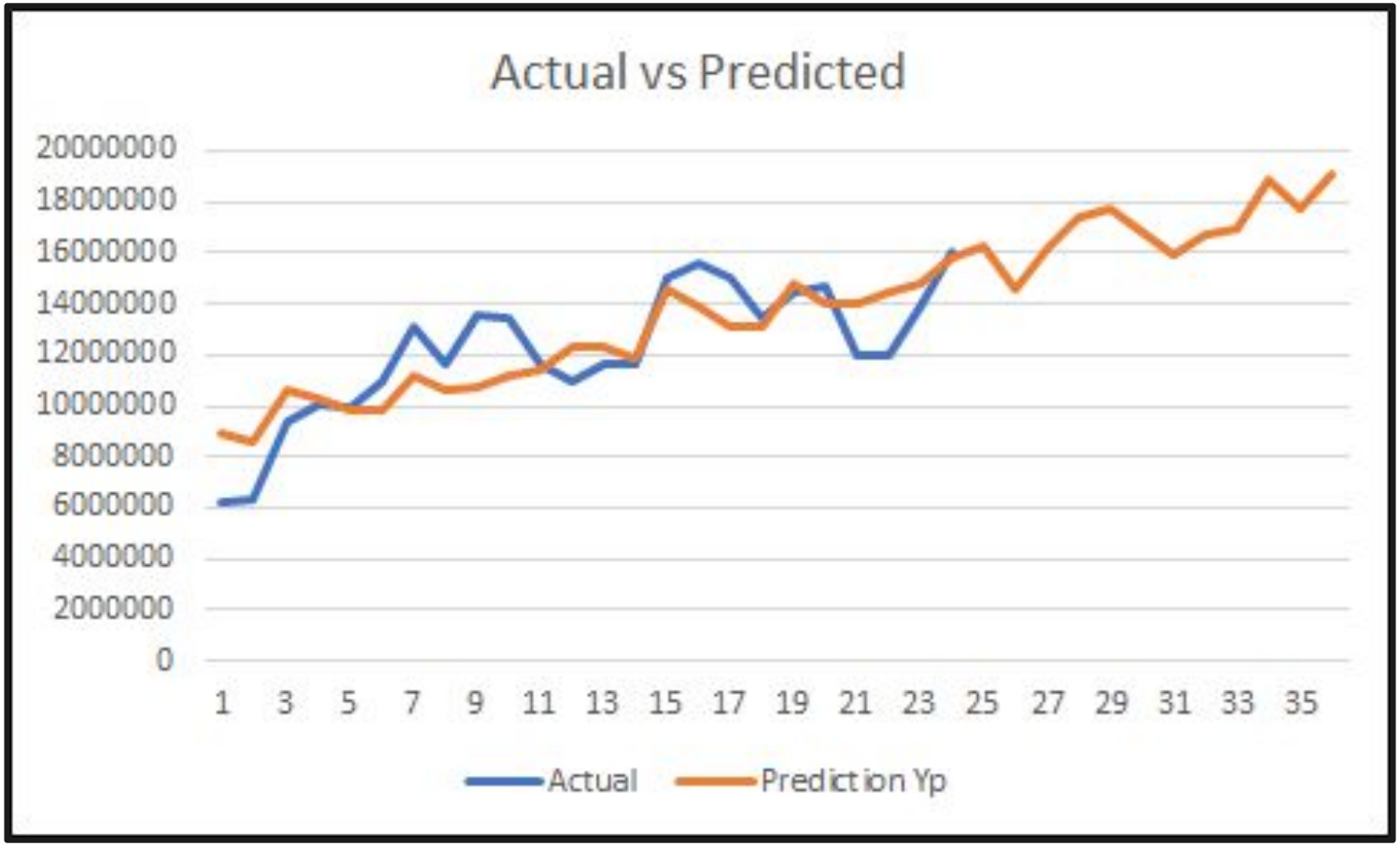
Model : Tt * St * It

Step 5 : Find regression values for deseasonalized values (X = T Code, Y = DS)

Step 6 : Find the Tt component (Tt = Intercept + Coeff*T Code)

Step 7 : Calculate Yp with Tt and St (Yp = St * Tt)

Step 8 : Use further T Code, Tt along with St for Future Prediction


Actual vs Predicted
20000000
18000000
16000000
14000000
12000000
10000000
8000000
6000000
4000000
2000000
0
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35
Actual
Prediction Yp

Python Codebase :

- **Inputs :**
  - Month Level Data + Marketing Spend Data
- **Model :**
  - Decomposed Multiplicative (LR + MLR)
- **Output :**
  - Prediction at Month Level for Next 12 Months