**Electricity Demand Estimation For Leading Electricity Distributor**

* This Case-Study is done in Google Collab.
* After plotting the Electricity Consumption values we can see that there is Trend and Seasonality, and with Every Year Electricity Consumption Increases.
* Every Year June, July, August have the most Consumption compared to other Months.
* Decomposition of Data done by Seasonal Decompose function and Decompose function from STL-Decompose Package.
* Train and Test Split done where Test data contain last 6 months Data.
* Forecasting done for Test Data using STL Forecast Method. The RMSE, RMSPE, MAPE of this Model is 5%, 4%, 4%.
* ADF Test done for Train data and applied transformation accordingly for ARIMA and SARIMA Model.

**Other Forecasting Models:**

1. **ETS [Exponential Smoothening] Model**
2. **ARIMA Model**
3. **SARIMA Model**

**1] ETS Model**

|  |  |  |
| --- | --- | --- |
| **Errors** | **Train** | **Test** |
| **RMSE** | **2.53%** | **4.09%** |
| **RMSPE** | **2.33%** | **3.63%** |
| **MAPE** | **1.76%** | **3.40%** |

**2] ARIMA Model for Log Transformation**

|  |  |  |
| --- | --- | --- |
| **Errors** | **Train** | **Test** |
| **RMSE** | **0.08%** | **0.18%** |
| **RMSPE** | **1.91%** | **3.90%** |
| **MAPE** | **1.67%** | **3.42%** |

**ARIMA Model after Exponential Transformation {Original Values}**

|  |  |  |
| --- | --- | --- |
| **Errors** | **Train** | **Test** |
| **RMSE** | **0.18%** | **0.18%** |
| **RMSPE** | **8.73%** | **16.67%** |
| **MAPE** | **7.67%** | **14.73%** |

**3] SARIMA Model for Log Transformation**

|  |  |  |
| --- | --- | --- |
| **Errors** | **Train** | **Test** |
| **RMSE** | **2.48%** | **2.48%** |
| **RMSPE** | **0.52%** | **0.76%** |
| **MAPE** | **0.37%** | **0.73%** |

**SARIMA Model after Exponential Transformation {Original Values}**

|  |  |  |
| --- | --- | --- |
| **Errors** | **Train** | **Test** |
| **RMSE** | **2.48%** | **3.82%** |
| **RMSPE** | **2.40%** | **3.52%** |
| **MAPE** | **1.71%** | **3.39%** |

**To Conclude:**

* **5% of Deviation is acceptable between Train and Test Error.**
* **And whichever model is giving less error is the Best Model.**
* **So from above two Insights we can say that SARIMA Model is the Best Model as it has less error compare to other two Models as it has stability for both Log and Exponential Transformation.**
* **SARIMA Model Diagnostics show that there is Random Walk, White Noise is there as each value has 0 correlation with all other values**
* **We can conclude that SARIMA Model Forecasted Values can be used for next two years Prediction and Shared with Leading Electricity Distributor.**