

Time series and forecasting

Background:

A smartphone company, XYZ, sells a range of smartphones in different countries around the world. The company has been experiencing fluctuations in sales over the past few years, which makes it difficult to plan for inventory and production. The company is looking for a solution to forecast sales accurately so that they can plan for production and inventory accordingly.

Objective:

To develop a time series model that accurately forecasts sales for the next year, which will enable the company to plan for production and inventory accordingly.

Data:

The company has sales data for the past three years (2019, 2020, and 2021) for all its products in different countries. The data includes monthly sales figures in units, and the country-wise sales figures have been aggregated to create a global sales figure. The data also includes information on promotions, discounts, and other marketing activities carried out during the period.

Methodology:

The following methodology was used to develop the time series model:

Data Preparation: The data was cleaned, and missing values were imputed using appropriate methods. The data was also checked for outliers and seasonality.

Exploratory Data Analysis (EDA): The data was analyzed to identify patterns, trends, and seasonality. EDA helped in gaining insights into the data and identifying any issues that needed to be addressed before building the model.

Time Series Modeling: Different time series models were developed using techniques such as ARIMA, Exponential Smoothing, and Seasonal Decomposition. The models were evaluated using statistical measures such as Mean Absolute Error (MAE), Mean Squared Error (MSE), and Root Mean Squared Error (RMSE).

Model Selection: The model with the best performance was selected based on statistical measures and visual inspection of the forecasted values.

Forecasting: The final model was used to forecast sales for the next year, and the results were presented to the management for decision-making.

Results:

After analyzing the data and developing different time series models, the model that provided the best forecast was the Seasonal ARIMA model. The model had a MAE of 4, MSE of 23, and RMSE of 4.8, indicating that the model had low forecasting error. The model was used to forecast sales for the next year, and the results were presented to the management.

Questions:

Q.1. Which time series model provided the best forecast?

Q.2. What statistical measures were used to evaluate the models?

Q.3. What insights were gained from the EDA process?

Q.4. How will the forecasted sales figures be used by the company?