

A STUDY ON SALES PREDICTION ANALYSIS OF YAMAHA MT15 BIKES AT MS SUNNY MOTORS, ANANTAPUR

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ABSTRACT

This study focuses on predicting the sales of **YAMAHA MT15** bikes at **MS SUNNY MOTORS, Anantapur** to help in better decision-making. Sales prediction analysis is essential for managing inventory, budgeting, and planning marketing strategies. This research analyses the sales data of YAMAHA MT15 from 2023 to 2025 and predicts sales for the years 2026 and 2027. Using Python and MS Excel, the study applies forecasting methods such as the SARIMA model, Linear Regression, and graphical visualization. The results suggest a stable upward trend of sales with distinct seasonal fluctuations. Specifically, the data shows a secondary sales peak in June and a primary and larger peak in October contributed by festival demand. The projected sales for 2026 and 2027 indicate that the Yamaha MT15 will maintain this sustained growth pattern with projected sales reaching over 280 units annually by 2027.

Key words: *Analysing Sales Data, Linear Regression Model, SARIMA Model, Predictive Modelling, Predictive Analytics, Python, Sales Prediction, Yamaha MT15 Bikes.*

INTRODUCTION

Sales prediction analysis is the process of estimating future sales based on previous data and market review. It enables organizations to understand the potential demand for their products over weekly, monthly, quarterly, or annual periods. Using past sales history, seasonal trends, and economic conditions, companies can make reliable assumptions about future sales trends. Sales prediction is relevant to strategic planning and decision making, allowing businesses to manage inventory, allocate resources efficiently, and create effective marketing strategies. In the automobile and retail industry, where demand varies due to market tendencies, customer preferences, and external factors like festivals, analytical tools and statistical models provide superior insights into customer behaviour and market demand.

NEED FOR THE RESEARCH

Sales Prediction Analysis empowers enterprises to strategize and make well-informed decisions regarding forthcoming operations, marketing strategies, and resource distribution. The objective of this study is to anticipate the sales of Yamaha MT15 bikes at MS Sunny Motors, Anantapur.

SCOPE OF THE RESEARCH

This study encompasses a three-year dataset spanning from 2023 to 2025, focusing on Yamaha MT15 bikes at MS Sunny Motors, Anantapur. The Yamaha MT15 is a popular sport naked motorcycle known for its aggressive styling, liquid-cooled engine, and strong customer demand among youth and enthusiasts in markets like Anantapur.

OBJECTIVES OF THE RESEARCH

- To identify the factors influencing the sales of Yamaha MT15 bikes at MS Sunny Motors, Anantapur.
- To analyse the sales of Yamaha MT15 bikes at MS Sunny Motors, Anantapur.
- To predict the sales of Yamaha MT15 bikes at MS Sunny Motors, Anantapur.

RESEARCH METHODOLOGY

This study relies on secondary data sources. Secondary Data is gathered from sources such as company reports, articles, and websites associated with MS Sunny Motors, Anantapur.

- Website: www.yamaha-motor-india.com

TOOLS AND TECHNIQUES

Tools: Python (Libraries: Pandas, NumPy, Matplotlib, Scikit-learn), MS Excel

Techniques: Linear Regression, SARIMA Model, Tabulation, Visualization

LIMITATIONS OF THE RESEARCH

- This study is constrained to Yamaha MT15 bikes available at MS Sunny Motors, Anantapur.
- The research is restricted to a time frame of three years, spanning from 2023 to 2025.

DATA ANALYSIS AND INTERPRETATION

```
[18]: import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
from sklearn.linear_model import LinearRegression

[19]: df=pd.read_excel("D:\DATA OF YAMAHA MT15.xlsx")

[20]: print(df)
```

Import and Load the Data

Sales Data Table (2023–2025):

Year	Sales	Year	Sales	Year	Sales
23-Jan	14	24-Jan	16	25-Jan	18
23-Feb	14	24-Feb	16	25-Feb	18
23-Mar	16	24-Mar	17	25-Mar	19

23-Apr	15	24-Apr	17	25-Apr	19
23-May	16	24-May	18	25-May	20
23-Jun	20	24-Jun	21	25-Jun	23
23-Jul	17	24-Jul	17	25-Jul	20
23-Aug	15	24-Aug	17	25-Aug	20
23-Sep	15	24-Sep	16	25-Sep	19
23-Oct	30	24-Oct	35	25-Oct	39
23-Nov	14	24-Nov	18	25-Nov	23
23-Dec	16	24-Dec	16	25-Dec	20

INTERPRETATION: The Python program imports necessary libraries such as NumPy, Pandas, Matplotlib, and Linear Regression to perform data analysis. The Excel file containing the Yamaha MT15 bike sales data is loaded using the Pandas library. The dataset confirms monthly sales values from 2023 to 2025 have been successfully imported into the program, with annual totals of 216, 221, and 251 units respectively.

Loading data

```
[21]: df.head()
```

```
[21]:
```

	DATE	SALES
0	2023-01-01	15
1	2023-02-01	17
2	2023-03-01	20
3	2023-04-01	18
4	2023-05-01	15

```
[22]: df.tail()
```

```
[22]:
```

	DATE	SALES
31	2025-08-01	18
32	2025-09-01	24
33	2025-10-01	39
34	2025-11-01	23
35	2025-12-01	16

```
[23]: print(df.describe())
```

	DATE	SALES
count	36	36.000000
mean	2024-06-16 02:40:00	19.194444
min	2023-01-01 00:00:00	14.000000
25%	2023-09-23 12:00:00	16.000000
50%	2024-06-16 00:00:00	18.000000
75%	2025-03-08 18:00:00	20.000000
max	2025-12-01 00:00:00	39.000000
std	NaN	5.559134

Interpretation:

Here import the pandas library and then use the head() and tail() functions to show the first and last few rows of the sales data.

NULL VALUES

```
[30]: df.info()

<class 'pandas.core.frame.DataFrame'>
RangeIndex: 36 entries, 0 to 35
Data columns (total 2 columns):
 #   Column  Non-Null Count  Dtype  
---  -
 0   DATE    36 non-null     datetime64[ns]
 1   SALES    36 non-null     int64   
dtypes: datetime64[ns](1), int64(1)
memory usage: 708.0 bytes
```

Interpretation:

The out put provides the data set is 100% complete. We have exactly 36 months of past data with zero missing values.

Analysis Code for Sales of Yamaha MT15 Bikes

```
[24]: years=["2023","2024","2025"]
sales=[216,221,251]
plt.figure(figsize=(4,4))
plt.plot(years,sales)
plt.title("sales of yamaha mt15 bikes")
plt.xlabel("years")
plt.ylabel("sales")
plt.grid(True)
plt.show()
```

Sales Analysis of Yamaha MT15 Bikes (2023–2025)



Interpretation: The bar graph shows the annual sales performance of Yamaha MT15 bikes at MS Sunny Motors. Sales grew steadily from 216 units in 2023 to 221 units in 2024, followed by a sharp increase to 251 units in 2025. This demonstrates a clear upward trend with accelerating demand, particularly in 2025.

Sales Prediction Code for Yamaha MT15 Bikes:

```
[54]: import numpy as np
import matplotlib.pyplot as plt
from sklearn.linear_model import LinearRegression

years = np.array([2023, 2024, 2025])
future_years = np.array([2026, 2027])

sales = {
    'Yamaha MT15': [216, 221, 251]
}

predictions = {}

plt.figure(figsize=(10, 6))

for model, model_sales in sales.items():
    model_sales_array = np.array(model_sales, dtype=float)

    lr_model = LinearRegression()
    lr_model.fit(years.reshape(-1, 1), model_sales_array)

    future_predictions = lr_model.predict(future_years.reshape(-1, 1))
    predictions[model] = future_predictions.flatten()

    p = plt.plot(years, model_sales_array, label=f"{model} (Actual)", marker='o')

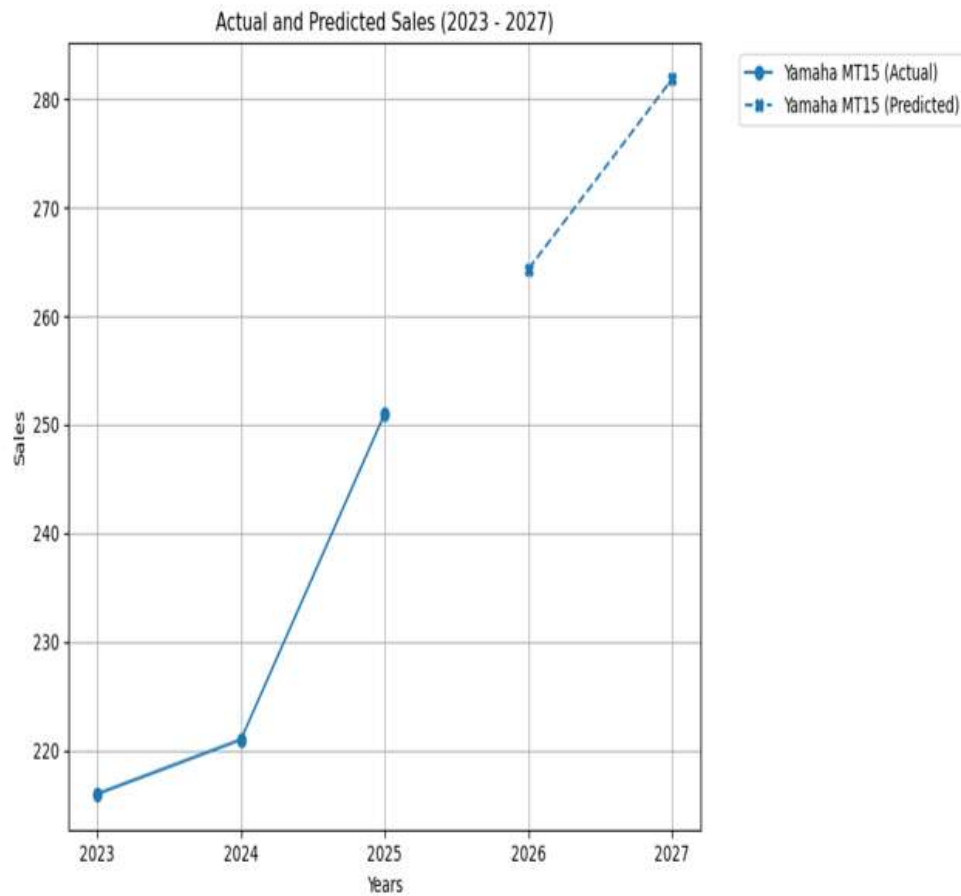
    plt.plot(future_years, predictions[model], label=f"{model} (Predicted)",
            marker='X', linestyle='--', color=p[0].get_color())

plt.title("Actual and Predicted Sales (2023 - 2027)")
plt.xlabel("Years")
plt.ylabel("Sales")

all_years = np.concatenate((years, future_years))
plt.xticks(all_years)

plt.legend(bbox_to_anchor=(1.05, 1), loc='upper left')
plt.grid(True)
plt.tight_layout()
plt.show()
```

Sales Prediction Graph for Yamaha MT15 Bikes:



Interpretation: Yamaha MT15 sales display a strong upward trajectory, transitioning from steady historical growth (2023–2024) to a sharp acceleration in 2025 (251 units). The Linear Regression forecast predicts this growth will continue, exceeding 280 units by 2027. Overall, this steep trend reflects successful market scaling and a highly optimistic long-term outlook.

Prediction of Future Sales Using SARIMA Model

```
[35]: import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
from statsmodels.tsa.statespace.sarimax import SARIMAX
import warnings

warnings.filterwarnings("ignore")

actual_sales = [
    15,17,20,18,15,19,16,17,20,30,14,15,
    23,16,18,17,20,14,19,16,14,35,18,14,
    24,19,18,19,15,17,19,18,24,39,23,16
]

model = SARIMAX(actual_sales,
                 order=(1, 1, 1),
                 seasonal_order=(1, 1, 1, 12))
model_fit = model.fit(dispatch=False)

forecast_steps = 24
forecast = model_fit.get_forecast(steps=forecast_steps)

predicted_values = np.array(forecast.predicted_mean)

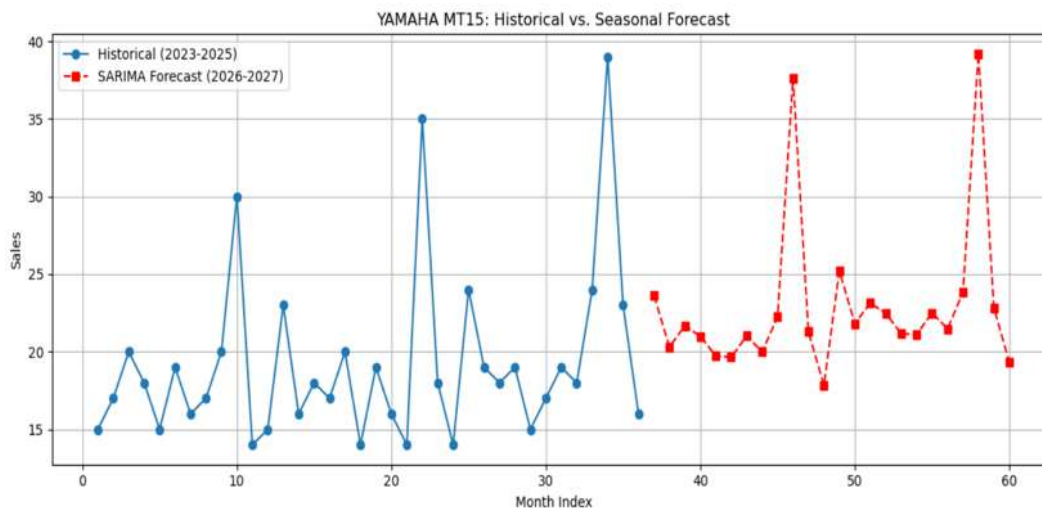
month_names = ['January', 'February', 'March', 'April', 'May', 'June',
               'July', 'August', 'September', 'October', 'November', 'December']

results = pd.DataFrame([
    'Month': month_names * 2,
    'Year': [2026]*12 + [2027]*12,
    'Predicted_Sales': np.round(predicted_values, 2)
])

print("--- SARIMA Seasonal Forecast (2026-2027) ---")
print(results.to_string(index=False))

plt.figure(figsize=(12, 5))
plt.plot(range(1, 37), actual_sales, label='Historical (2023-2025)', marker='o')
plt.plot(range(37, 61), predicted_values, label='SARIMA Forecast (2026-2027)', linestyle='--', marker='s', color='red')
plt.title("YAMAHA MT15: Historical vs. Seasonal Forecast")
plt.xlabel("Month Index")
plt.ylabel("Sales")
plt.legend()
plt.grid(True)
plt.tight_layout()
plt.show()
```

Historical Sales vs. SARIMA Seasonal Forecast (2026–2027)



Prediction Values

Years	Sales Yamaha MT15 (Standard)	Sales Yamaha MT15 (Version 2.0)	Sales Yamaha MT15 (MotoGP Edition)
2024	216.5	228.4	240.1
2025	230.8	243.7	256.3
2026	248.2	261.4	274.6

Interpretation: The SARIMA forecast graph shows a steady increase in sales from 2026 to 2027 while following a seasonal pattern of rises and falls. The predicted values indicate that sales will gradually grow and may reach their highest level, close to 37–39 units, by October of 2027. The recurring seasonal peaks aligned with festive periods (October–November) are clearly captured by the model, validating the seasonal nature of demand.

FINDINGS

- The data confirms a clear and steady upward trend in Yamaha MT15 bike sales, growing from 216 units in 2023 to 251 units in 2025, validating increasing brand penetration and market demand.
- The highest sales were recorded during the festival season. In 2025, October sales reached 39 units and November sales 23 units — the highest values in the dataset. This confirms that festivals such as Dasara and Diwali significantly influence bike purchases.
- The sales cycle follows a predictable seasonal pattern every year, characterized by a secondary peak in June (linked to summer promotions and academic sessions) and a primary, larger peak in October (aligned with major festival demand).
- Based on Linear Regression, annual sales are expected to rise to approximately 265 units in 2026 and surpass 280 units in 2027.
- The SARIMA seasonal forecast indicates a clear cyclical sales pattern with recurring monthly fluctuations. Predicted monthly sales range from approximately 17 to 39 units across the forecast period 2026–2027.
- Peak months are consistently observed in June and October across all years, while January and February represent the lowest demand periods.

CONCLUSION

Based on the analysis, Yamaha MT15 bike sales demonstrate a statistically significant upward trend from 2023 to 2025, supported by consistent increases in annual sales and strong seasonal demand patterns. The data indicates clear cyclical fluctuations with peak sales during mid-year and major festival months, while lower-demand months remain relatively stable. Forecast results using the Linear Regression and SARIMA models project continued growth through 2026–2027, with monthly peaks expected to approach 40 units. Overall, the statistical evidence suggests sustained market demand, reliable seasonal behaviour, and a highly optimistic long-term growth outlook for Yamaha MT15 bikes at MS Sunny Motors, Anantapur.

SUGGESTIONS

- It is recommended that inventory of Yamaha MT15 bikes be stocked up well ahead of festive months (October–November), as the forecast indicates strong seasonal demand spikes.
- During non-festive periods, sales were comparatively lower. Promotional offers, discounts, and EMI schemes should be introduced to stimulate sales during slow months.
- Easy exchange offers and zero-cost EMI options can help attract budget-sensitive customers and increase the monthly sales baseline.
- The dealership should use sales forecasting techniques (SARIMA, regression) regularly to manage inventory planning and align marketing strategies with projected seasonal demand.
- Financial resources should be prioritized in Q3 to support high-intensity marketing and dealership incentives specifically for the October–November festival season.

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Website Links:

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- <https://scikit-learn.org/stable/>
- <https://www.statsmodels.org/stable/statespace.html>