SALES FORECASTING AND TREND ANALYSIS

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INTRODUCTION

This report explores sales forecasting in retail using SARIMA and Prophet models, focusing on seasonality, trends, and holiday effects. It aims to understand historical sales trends and predict future patterns, focusing on furniture and office supplies from a major retailer. The project examines sales fluctuations, high and low demand periods, and underlying factors, combining statistical analysis with business insights. The findings guide inventory management, budgeting, and strategic planning, promoting a data-driven, proactive business approach.

DATA COLLECTION AND PREPARATION

- Source: Sales data for furniture and office supplies from Kaggle (Jan 2015 - Dec 2022).
- Attributes: Includes 'Order Date', 'Sales', 'Quantity', and 'Category'.
- Cleaning: Imputation of missing values; removal of duplicates.
- Transformation: 'Order Date' converted to datetime format; set as DataFrame index.
- Aggregation: Monthly aggregation of sales data for consistent analysis and forecasting.

EXPLORATORY DATA ANALYSIS (EDA)

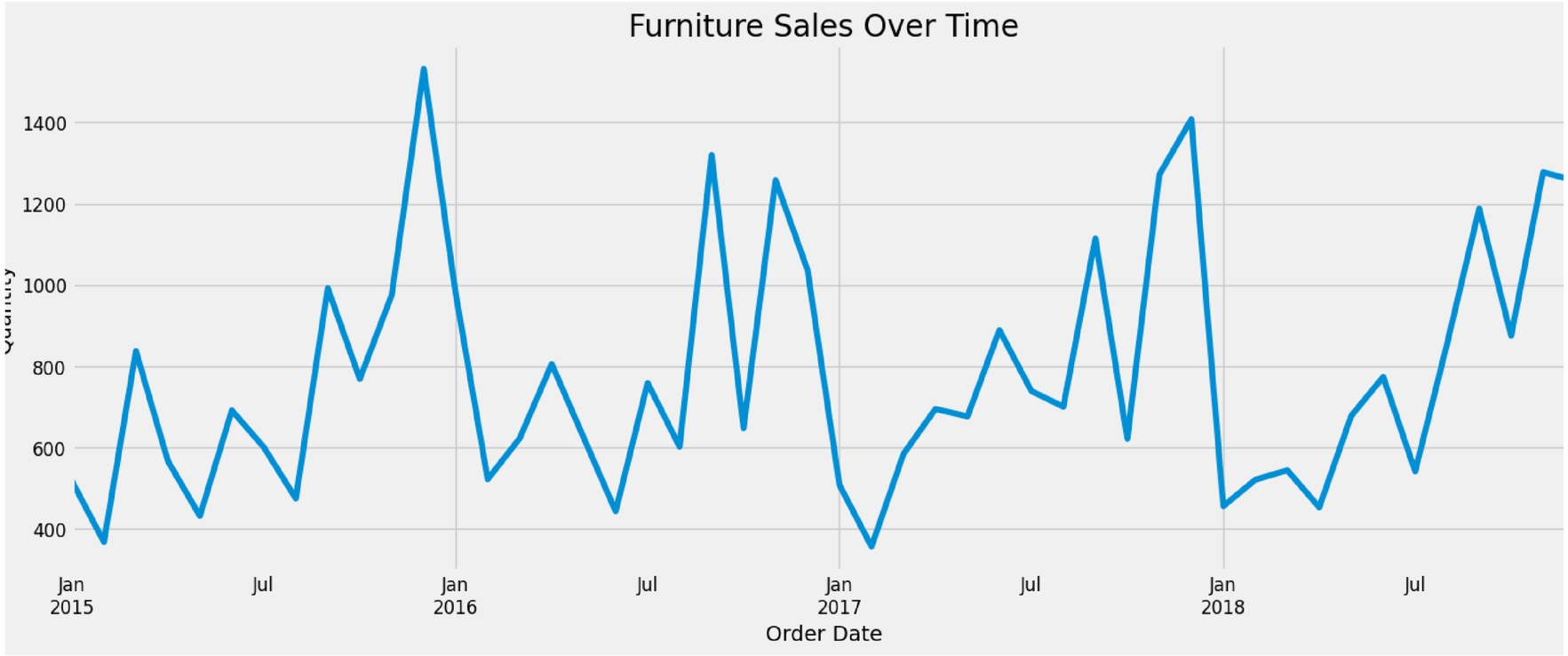


Fig 1: Furniture Sales Over Time

- Visual inspection of furniture sales trends.
- Identification of seasonality and general sales trends.

DECOMPOSITION AND STATIONARITY TESTING

- Seasonal decomposition of sales data.
- Augmented Dickey-Fuller test results indicate stationarity.

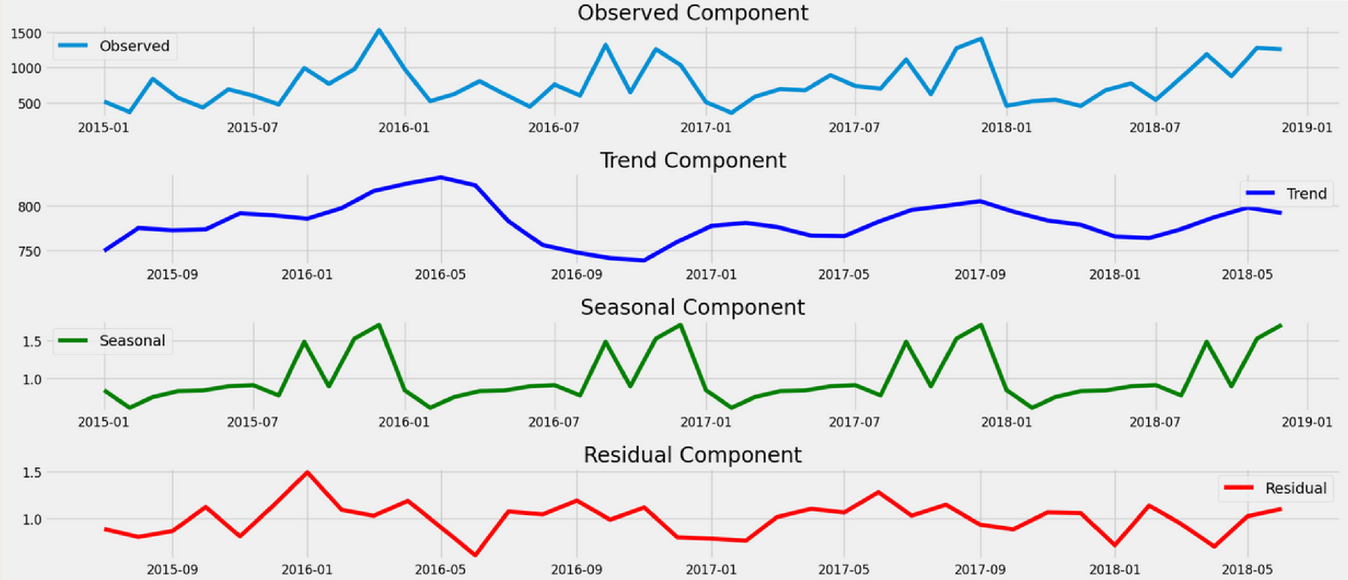


Fig 2: Seasonal Decomposition of Furniture sales

SARIMA MODEL SELECTION AND FORECASTING

- Parameter Tuning: Used the auto_arima function from Python's pmdarima package to automatically select SARIMA model parameters.
- Sales Forecasting: Employed SARIMA for future sales predictions, focusing on confidence intervals and forecast values.
- Plot Analysis: Model effectively captured furniture sales seasonality. Confidence intervals widen in future forecasts, indicating increased uncertainty.
- Comparative Analysis: Initiated comparison of furniture sales with office supplies sales over time.

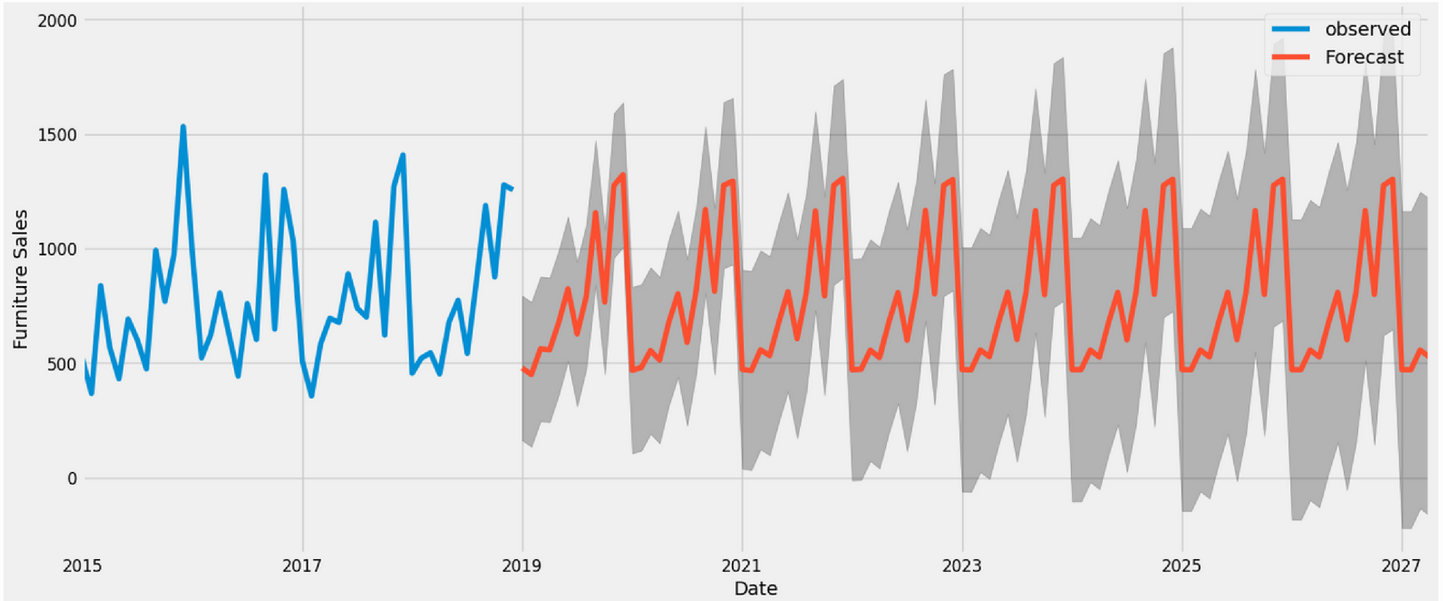


Fig 3: Future Furniture Sales Forecast Using SARIMA Model

COMPARATIVE ANALYSIS: PROPHET MODEL

- Comparison of furniture and office supplies sales trends.
- Insights from trend comparisons and future predictions.

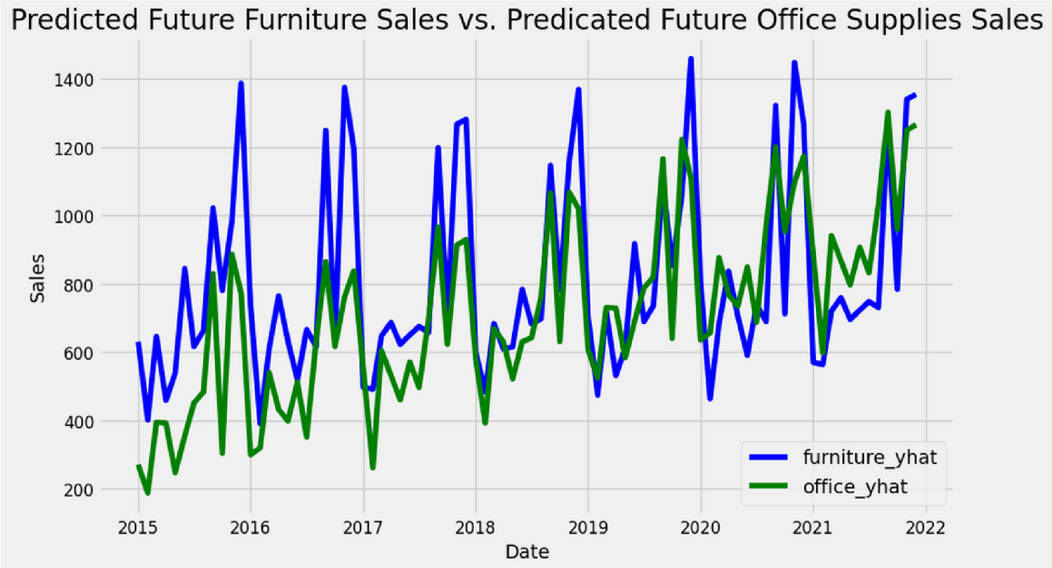


Fig 5: Predicted Furniture Sales versus Office Sales

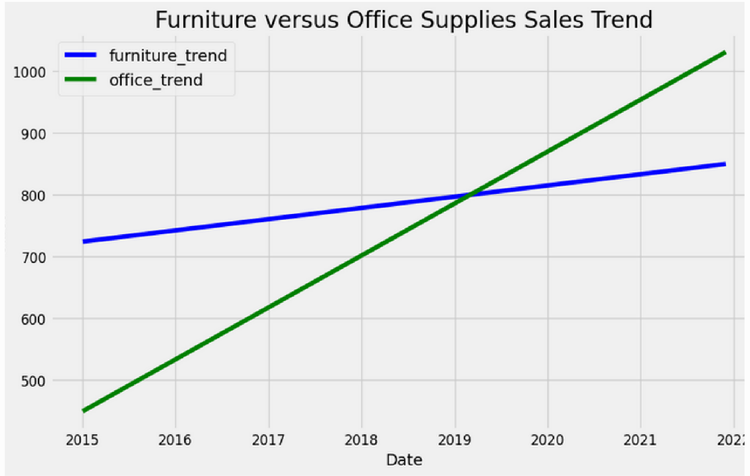
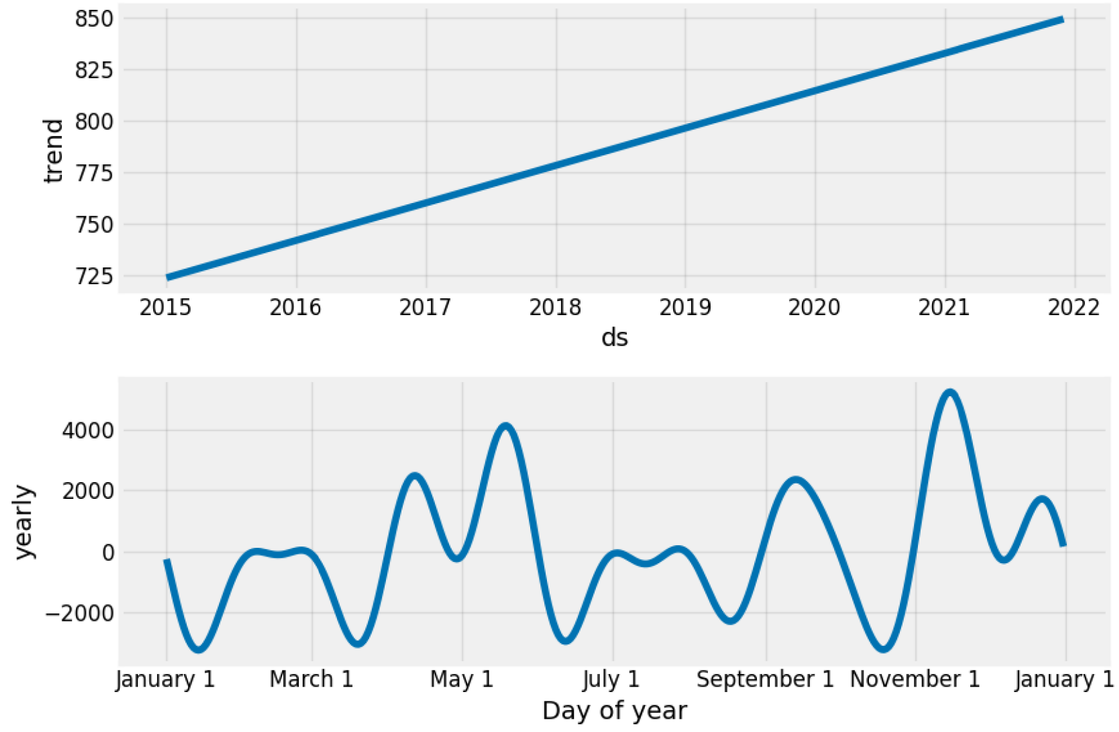


Fig 4: Future versus Office Sales Trend

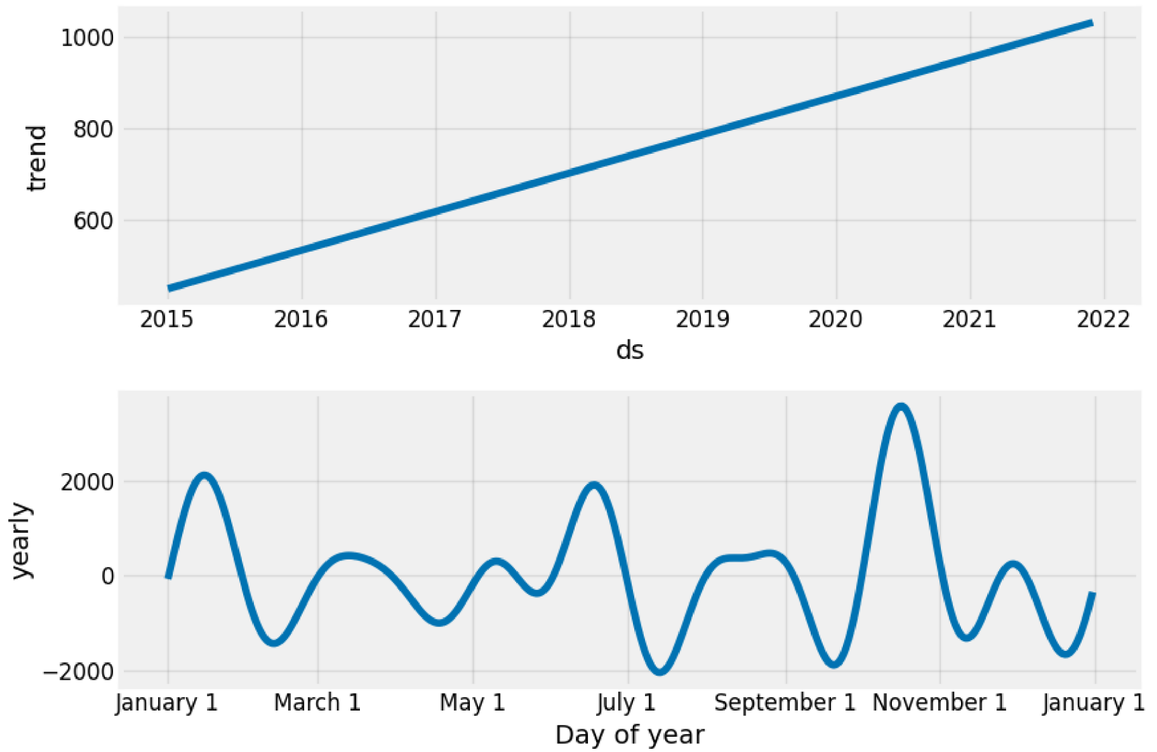
TRENDS AND PATTERNS

Fig 6: Prophet Furniture Forecast Model Components



We now use the Prophet model to inspect the different trends of furniture forecast data vs office forecast data.

Fig 7: Prophet Office Supplies Forecast Model Components



CONCLUSION

Findings:

- The sales for both furniture and office supplies have been increasing linearly over time. However, the office supplies' growth trend outpaces that of furniture sales.

- The worst month for furniture sales is April whereas the worst month for office supplies sales is August. The best month for furniture sales is December and the best month for office supplies sales is November

Recommendations:

The time series analysis provided us with a clear understanding of the sales patterns and forecasted trends. Recommendations include:

- Strategic stocking of inventory before peak seasons and potentially expanding the office supplies line, which shows a promising growth trend.
- Further analysis could explore external factors that may impact sales, such as economic indicators or marketing efforts.