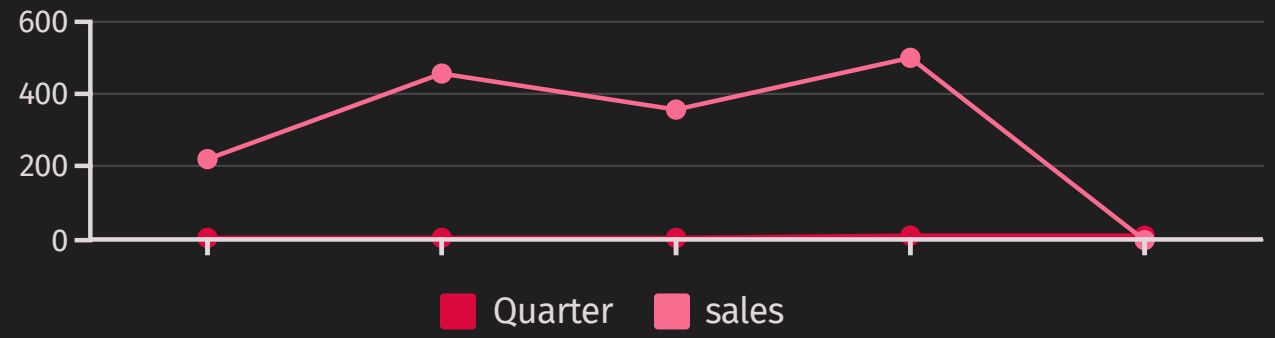
Daily Sales Forecasting Using ARIMA Model

This presentation explores the application of an ARIMA model for accurate dominos daily sales forecasting, helping optimize inventory management and business planning.



Akash S | Capstone Project Presentation

Introduction

Problem Statement

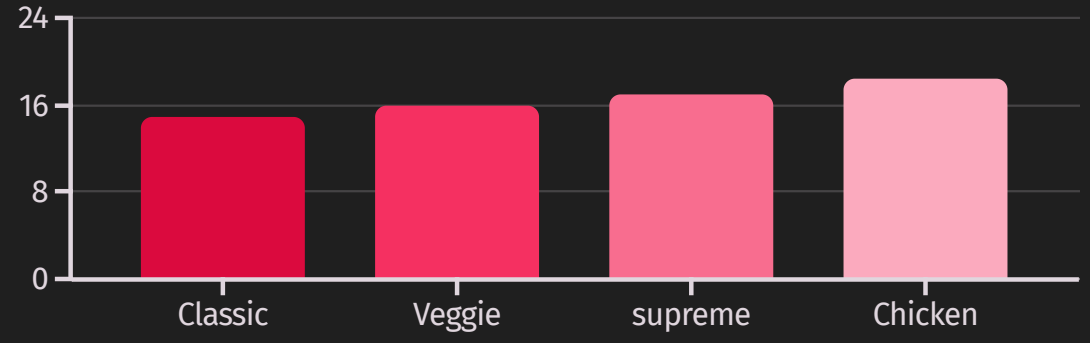
Accurate prediction of daily sales to optimize inventory management and reduce wastage.

Goal

- Forecast daily sales for the next 7 days.
- Use ARIMA to achieve high accuracy in sales prediction.

Objectives:

1. Analyze historical sales data trends.
2. Build and evaluate the ARIMA model.
3. Ensure predictions have low error (MAPE).
4. Demonstrate real-world use for business insights.



Data Understanding

Dataset Summary:

- **Source:** Daily sales dataset (Jan 2015 to Jan 2016).
- **Columns Used:**
  - `order_date` (date of order)
  - `daily_quantity` (units sold per day)

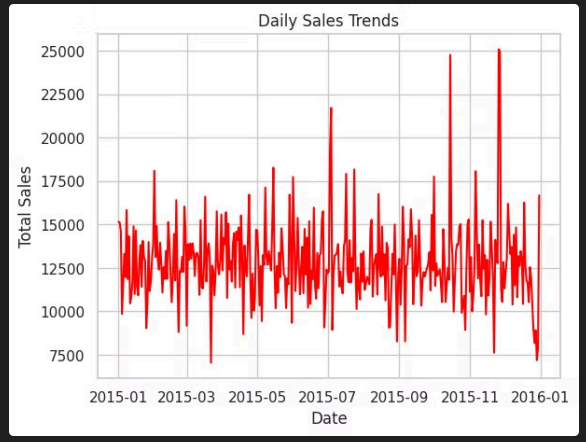
order_date	daily_quantity
2015-01-01	884
2015-01-02	887

Handling Missing Values:

- Checked for nulls.
- Imputed or removed irrelevant/missing records to ensure a clean dataset.

Exploratory Data Analysis (EDA)

Insights Gained



Insights Gained:

1. **Trends & Patterns:**
   - Weekly and monthly patterns identified in sales.
   - Seasonal peaks observed during weekends and holidays.
2. **Visualization Results:**
   - Sales distribution (line chart).
   - Weekly trend analysis (bar plot).

Data Preprocessing & Feature Engineering

Steps Taken

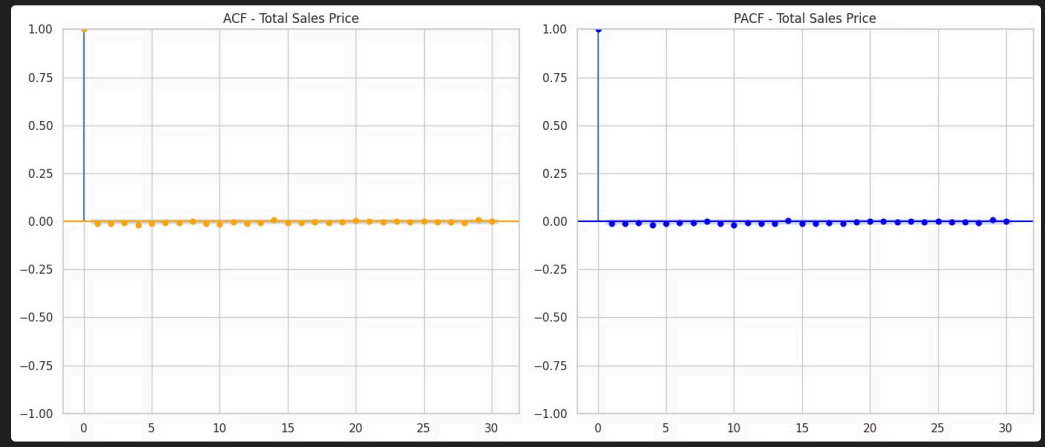
1. **Date Conversion:** Converted `order_date` into datetime format.
2. **Feature Creation:**
   - Extracted day, month, and lag features (previous day's sales).
   - Applied differencing to address **non-stationarity** in data.

ADF Statistic: 0.12194507849525658
p-value: 0.9675278393933101
The series is NOT stationary. Differencing may be required.
ADF Statistic: -3.906220451481631
p-value: 0.0019895419615923553
The series is stationary

Stationarity Check

ADF Test results indicated non-stationarity, addressed by differencing, achieving stationarity.

before and after



ARIMA Model Selection

ARIMA Model	MAPE
(1,1,1)	16.69%

- **ARIMA Overview:**
- ARIMA (AutoRegressive Integrated Moving Average) captures trends and patterns in time series.
- **Parameter Selection:**
- Tuned ARIMA hyperparameters (p=1, d=1, q=1) based on data behavior.
- **Performance Comparison:**
- Evaluated using MAPE:
  - **Final Model:** 16.69% MAPE.
  - Previous models like (3,0,3) had higher errors.

Forecast Results

Date	Predicted Sales (units)
2016-01-01	797.68
2016-01-02	753.62
2016-01-03	763.14

Performance Metric:

- MAPE = **16.69%** → Accurate model for real-world forecasting.

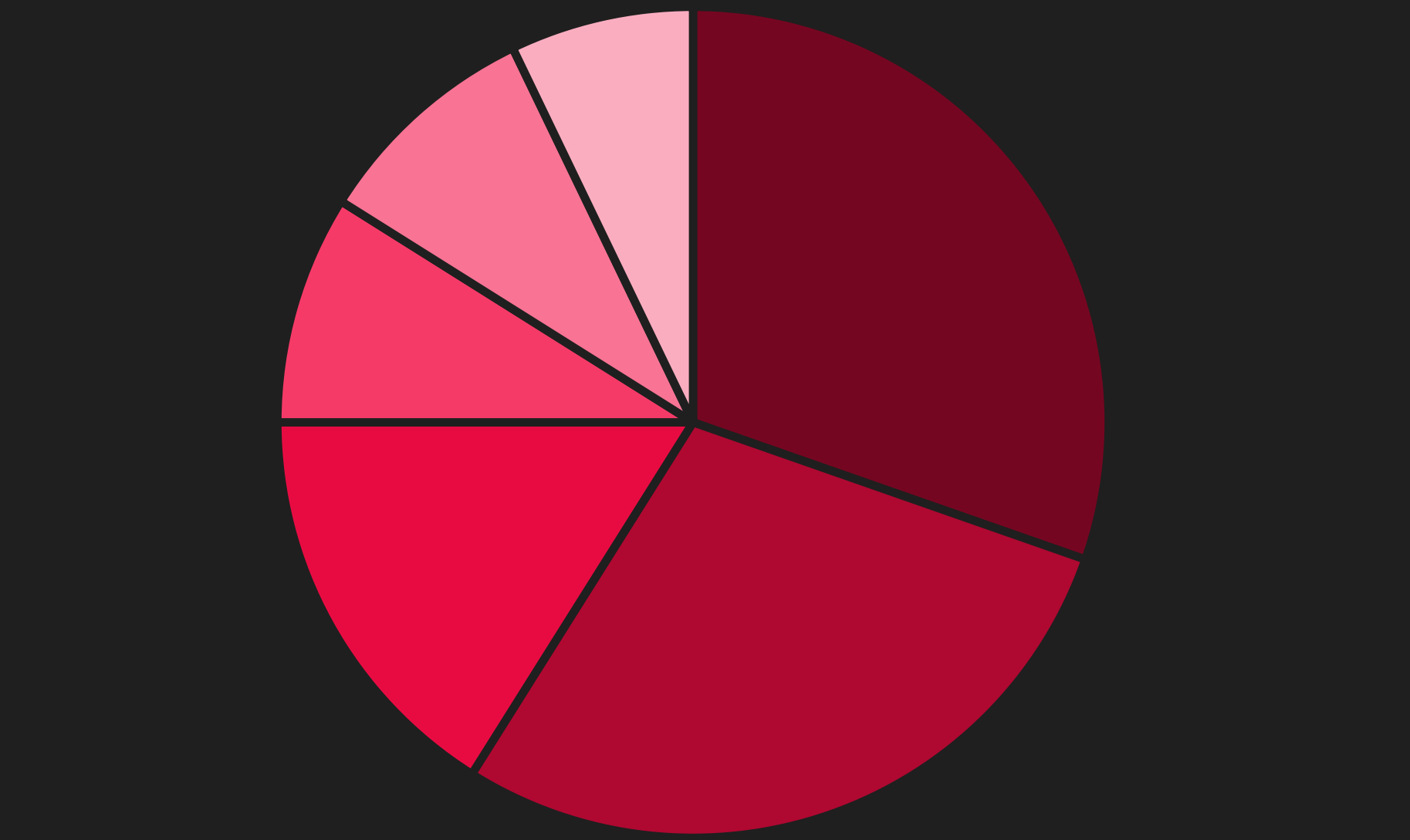
Visual:

- Plot of **Actual vs Forecasted Sales** (Line Chart).
- Table of forecasted results for the next 7 days.

Business Application

Ingredient Mapping :

- Predicting **ingredients** for pizza sales based on forecasted demand.

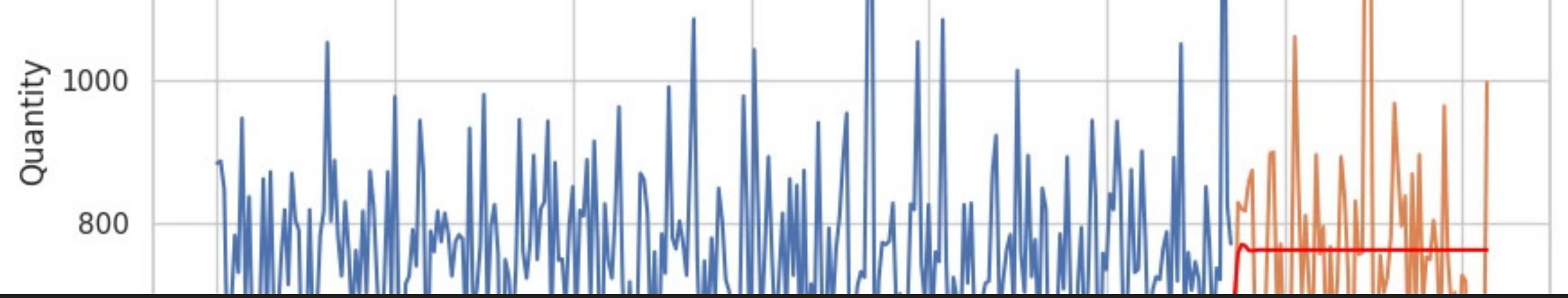


259.55

Mozzarella Cheese

347.09

Pepperoni



Conclusion & Key Insights

TSummary of Project:

- Successfully built an ARIMA model to predict daily sales.
- Achieved **16.69% MAPE** – indicating reliable and accurate predictions.
- Enhanced inventory management and planning with real-world applications.

Key Insights:

- Data preprocessing and stationarity checks were critical for ARIMA performance.
- Forecasted values closely match actual trends.