

# Sales Forecasting Report for Langa Cash n Carry Stores

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## Executive Summary

The purpose of this project was to develop accurate sales forecasting models for Langa Cash n Carry Stores. These models are intended to support inventory management, financial planning, and strategic decision-making by providing reliable sales predictions for various product categories and store locations over different time horizons. This report outlines the methodology, analysis, findings, and recommendations based on the sales forecasting project.

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## Introduction

Langa Cash n Carry Stores operate in five locations: Langa, Nyanga, Gugulethu, Pinelands, and Thornton. Accurate sales forecasting is critical for these stores to ensure optimal stock levels, reduce costs, and enhance customer satisfaction. Traditional methods of forecasting based on intuition and past experience are no longer sufficient in today's data-driven world. This project aimed to build data-driven sales forecasting models using historical sales data and external factors.

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## Data Collection and Preparation

### Data Sources

- **Historical Sales Data:** Collected from all five store locations for multiple product categories (Fresh Produce, Dairy, Canned Goods, Bakery, Frozen Foods).
- **External Factors:** Included economic indicators and promotional periods.

## Data Preparation

- **Handling Missing Values:** Imputed missing values using the median of the respective columns.
  - **Feature Engineering:** Created additional features to capture temporal patterns, such as day of the week, month, and year.
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## Exploratory Data Analysis (EDA)

### Sales Trends

Sales trends over time were visualized to identify patterns and seasonality. For example, a line chart showing sales trends for Langa Fresh Produce revealed clear seasonal peaks and troughs.

### Sales Distribution

Boxplots were created to analyze sales distribution by day of the week and month. This helped identify periodic sales fluctuations and confirmed that certain days and months consistently saw higher sales volumes.

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## Model Selection and Training

An ARIMA (AutoRegressive Integrated Moving Average) model was selected for its effectiveness in capturing temporal dependencies in time series data. The data was split into training and testing sets to validate the model's accuracy. The ARIMA model was then trained on the historical sales data, with parameters optimized for the best fit.

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## Model Evaluation

The model's performance was evaluated by comparing its predictions against actual sales in the test dataset. The actual vs. predicted sales values were plotted, showing a close alignment and demonstrating the model's accuracy. The Root Mean Squared Error (RMSE) was calculated to quantify the model's performance.

### Evaluation Metric:

- **RMSE:** 9.184774172849416

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## Forecasting Future Sales

The model was used to generate sales forecasts for the next year. These forecasts were visualized alongside historical sales data, providing a clear view of expected trends.

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## Insights and Actions

### Key Insights

- **Seasonal Trends:** Identified peaks in sales during summer and holiday months.
- **Promotional Impact:** Promotional periods significantly boosted sales.
- **Inventory Optimization:** Potential areas for inventory optimization were highlighted.

### Recommended Actions

1. **Inventory Management:** Align stock levels with forecasted demand to minimize stockouts and overstock situations.
  2. **Promotional Planning:** Schedule promotions during identified peak periods to maximize sales impact.
  3. **Financial Planning:** Use forecasts to make informed financial decisions and budget allocations.
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## Conclusion

This project has demonstrated the value of data-driven sales forecasting for Langa Cash n Carry Stores. By leveraging advanced analytics and data visualization, the stores can now navigate the complexities of the retail market with confidence. The sales forecasting models provide actionable insights to optimize operations, enhance financial planning, and improve overall business performance.

