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Final Project Report

A data-driven inventory optimization strategy: Coconut Oil Sales Quantities Forecast

Student: Vimanya Fernando (20210225)

Supervisor: Yaalini Balathasan

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School of Business Computing

University of Westminster

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ABSTRACT

Renuka Foods, a leading entity in the food manufacturing industry in Sri Lanka, encounters substantial challenges in inventory management and forecasting. The reliance on basic internal forecasting methods, due to the high cost of Salesforce's forecasting extension, has led to inaccuracies in inventory forecasting. These inaccuracies result in oversupply, which ties up capital and increases storage costs, and undersupply, which causes stockouts, lost sales, and disrupted cash flow. These issues impact the financial department, inventory management team, and overall business operations, especially during seasonal periods.

The aim of this project was to develop a more accurate and efficient forecasting model to improve inventory management, reduce financial strain, and enhance operational efficiency at this Company. The methodology involved incorporating external factors into a time series model, including Sri Lankan coconut prices, coconut oil selling prices and the Colombo Consumer Price Index.

Both a basic LSTM model and an SARIMAX model with feature engineering were developed to determine the more accurate model. The forecasting models were implemented using Python and trained on pre-processed historic data to predict coconut sales quantities for 3 months. The performance of both models was assessed using evaluation metrics, and the LSTM model was selected as the more accurate model, with a Mean Absolute Error (MAE) of 18.70, a Root Mean Squared Error (RMSE) of 23.99, and an R^2 Score of 0.56. The final model output was integrated into a Microsoft Power BI dashboard, providing insights to support production management decision-making and detailing sales performance.

The final results indicate that incorporating a systematic forecasting model with external influencing factors outperforms traditional methods. The conclusions drawn from this project suggest that advanced forecasting models can effectively address inventory management challenges, reduce financial strain, and enhance overall operational efficiency at this Company. These observations highlight the importance of accurate sales forecasting in optimizing inventory levels and supporting strategic business decisions.

Subject Descriptors: Inventory Management, Sales Forecasting, Time Series Analysis. Machine Learning, Data Analytics, Operational Efficiency, Supply Chain Management, Business Intelligence