

# Forecasting Weekly Soft Drink Demand Using Time Series Models

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**Abstract—** This report is about forecasting weekly soft drink demand using three models: SARIMA, TES, and LSTM. The goal was to see which one gives the most accurate short-term forecast. After comparing the results using MAE, RMSE, and MAPE, TES performed the best. It matched the seasonal pattern in the data better than the others. The results can help businesses plan their production and inventory more effectively.(Abstract)

**Keywords—**Time series, forecasting, sarima, soft drink demand, Exponential Smoothing, LSTM

## I. INTRODUCTION

Forecasting demand helps businesses make better decisions around production, inventory, and overall planning. This report looks at how to predict weekly soft drink demand using time series models. Since the data shows seasonal patterns, it's important to pick a model that can capture those trends well. I worked with three different models (SARIMA, TES, and LSTM) to see which one gives the most accurate short-term forecast. The goal was to find the best fit for the data and support smarter planning to avoid overstocking or running out of product.

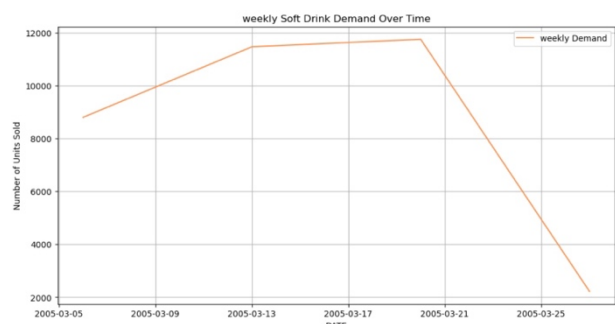
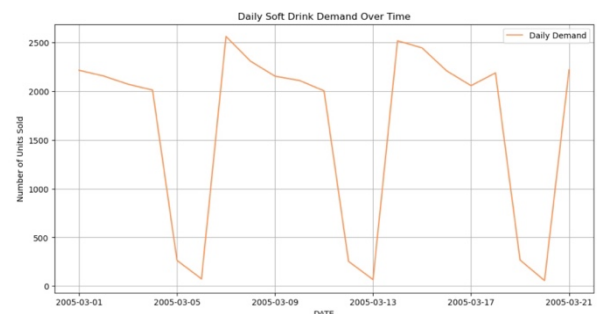
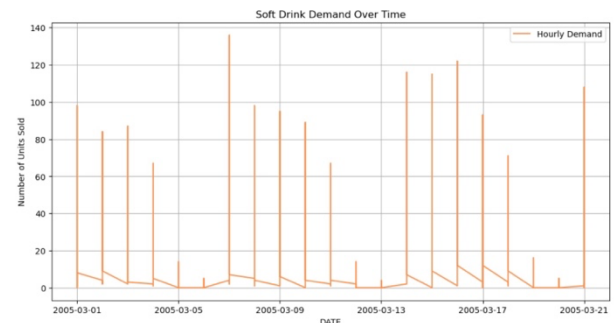
## II. EXECUTIVE SUMMARY

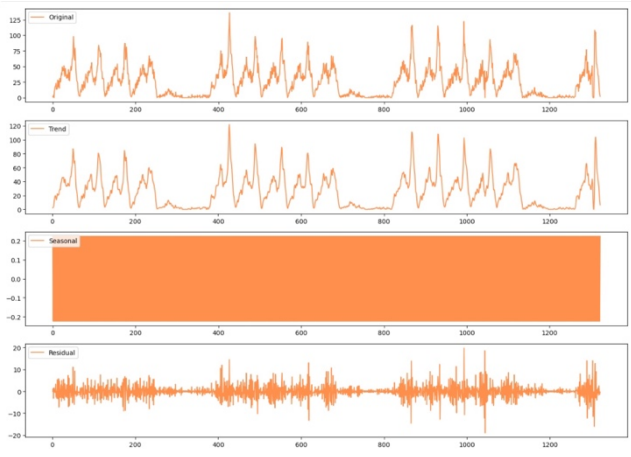
This report investigates different ways to forecast weekly soft drink demand to help with short-term planning. I tested three models (SARIMA, TES, and LSTM) and compared how they performed using common error metrics. TES ended up giving the most reliable results. It picked up on the seasonality in the data and gave accurate forecasts. These insights can be useful for making smarter decisions around inventory and production.

## III. VISUAL INSIGHTS

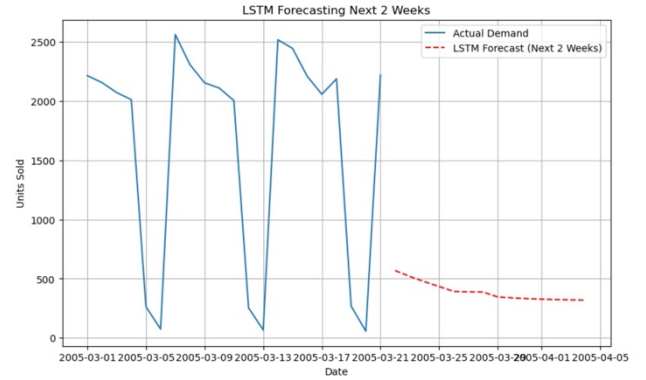
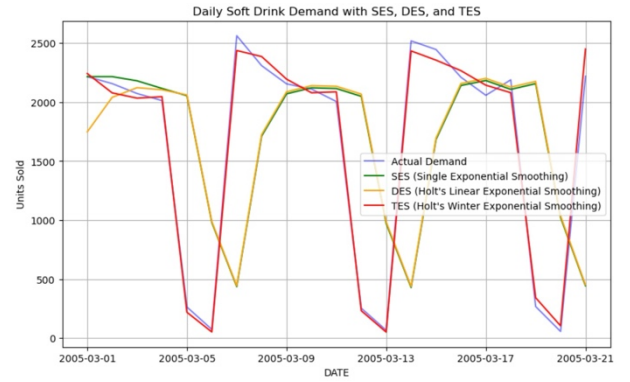
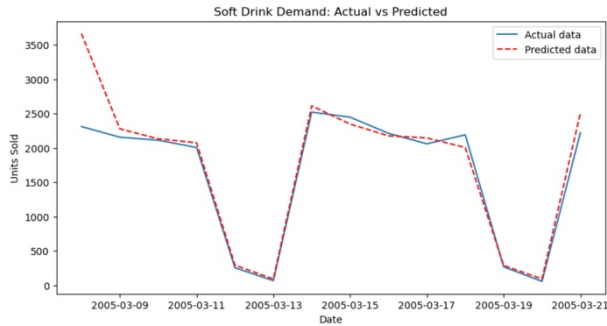
I started by looking at the raw demand data, then broke it down into daily and weekly views to better understand the pattern. The daily plot showed a strong repeating cycle every 7 days, which pointed to clear seasonality. The weekly view also showed a similar trend but was a bit more smoothed out.

When I decomposed the data, the trend line slightly decreased, and the seasonality stayed consistent.





TES followed the actual values closely and captured both the trend and seasonal pattern. SARIMA missed some of the variation, and LSTM predictions looked too flat visually, even though the error metrics seemed low. Based on the plots, TES clearly aligned best with the real demand.



### III. METHODOLOGY

To start, I checked the demand data for trends, seasonality, and stationarity. The ADF test showed that the series wasn't stationary, so I applied differencing before fitting SARIMA. For TES, I used an additive model since the seasonality looked consistent over time. LSTM was trained using a sequence of past demand values and scaled before fitting. I used a train-test split to evaluate the models fairly and forecasted the next two weeks for each one. The performance of all models was compared using MAE, RMSE, and MAPE to see which one gave the most accurate results.

### IV. RECOMMENDATIONS

Based on the analysis, I suggest relying on the TES model for short-term forecasting, as it provided the most accurate and consistent results. It handled the seasonal demand patterns well and closely followed the actual sales data. This can help with more confident production and inventory planning, reducing the risk of overstock or running out of product. Although the LSTM model had low error metrics, its predictions didn't fully match the real demand pattern. SARIMA also showed weaker performance compared to TES. To maintain accuracy, I recommend updating the forecast regularly with new data and keeping an eye on any changes in demand trends that could impact future planning.

Model	EVALUATION		
	MAE	RMSE	MAPE
TES	74.728	90.426	13.101
SARIMA	176.003	377.747	15.923
LSTM	0.334	0.422	Inf%

## REFERENCES

- [1] "IEEE - The world's largest technical professional organization dedicated to advancing technology for the benefit of humanity."  
[Online]. Available: <https://www.ieee.org>