EAS 509: Statistical Learning II (21047 Fall 23)

ABSTRACT

Title: Leveraging Time Series Analysis for Liquor Sales Insight

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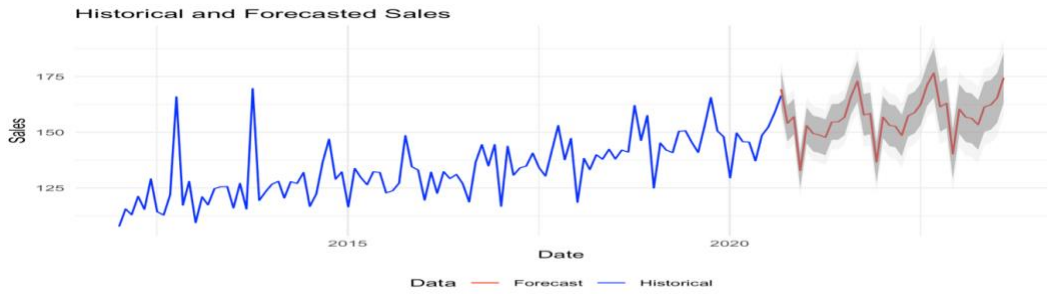
Introduction:

Motivation: In a market where demand fluctuates unpredictably, precise forecasting is a linchpin for the economic stability of liquor retailers.
Significance: The study's importance lies in its contribution to efficient stock management and the alignment of sales strategies with market dynamics, ultimately influencing profitability.
Problem Statement: Existing forecasting models inadequately capture the erratic sales patterns specific to the liquor industry, necessitating a more tailored approach to predict future trends accurately.

Methods:
The study employed the **ARIMA(0,0,0)(1,1,0)[12]** model with drift to analyze monthly liquor sales data. Time series decomposition was utilized to isolate trend, seasonal, and residual components. The model's parameters were estimated, and diagnostics were conducted through the analysis of residuals and autocorrelation functions. Forecast accuracy was assessed using Mean Absolute Error (MAE), Root Mean Squared Error (RMSE), and other pertinent metrics.

Results Highlights:
The ARIMA model identified a positive trend indicating market growth and a stable seasonal pattern corresponding with known sales peaks. Residual analysis revealed no significant autocorrelations, suggesting an adequate model fit. Forecasts for two subsequent years were generated, displaying potential future trends, and allowing for the evaluation of the model's long-term predictive power.

Conclusion:
The ARIMA model demonstrated utility in forecasting liquor sales with a reasonable degree of accuracy. Future work will explore more sophisticated models to handle non-linear patterns and external variables, aiming to improve forecast reliability. This study underscores the potential of time series analysis in informing strategic decisions in the liquor sales industry.



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