PURDUE UNIVERSITY®

BASF – Market Model Analysis

INTRODUCTION/OBJECTIVES

BASF, a global leader in the agriculture industry, provides innovative solutions to support farmers and businesses in an ever-changing market. In the rapidly evolving agri-business sector, anticipating market trends and forecasting sales is critical for strategic planning. This project harnesses key market indicators to uncover patterns and build precise forecasting models for BASF. By integrating data-driven insights with advanced predictive techniques, we aim to equip BASF with the tools needed to navigate market fluctuations and make wellinformed business decisions.



Fall : Pest Control Sales Forecasting (2023-2025)

- Established a Naïve Bayes baseline model for comparison.
- Applied Linear Regression and ARIMAX for time series forecasting. • Conducted Exploratory Data Analysis (EDA) to understand trends
- and patterns. • Performed feature importance analysis to identify key predictors that optimized model performance.

Spring : Golf Turf Sales Forecasting (2023-2025)

- Target variables: Lawn & Garden Sales and Golf Revenue (proxies for golf turf sales).
- Used Linear Regression and ARIMAX to model trends.
- Researched, tested, and refined different market indicators to find the best forecasting features.
- Applied correlation heatmaps to assess relationships between features and targets.
- Used Variance Inflation Factor (VIF) to detect and mitigate collinearity between variables.
- Performed scenario analysis.







Thesis: This project aims to address the increasing demand for effective pest control solutions driven by factors like health concerns, urbanization, climate change, and economic impact. It explores how pest control is essential for public health, agriculture, and business protection in a changing environment.

Goal: Our data analysis goal was to forecast pest control sales for the next three years by leveraging exogenous features.

incorporated.

Other Models: The models that proved to be both highly accurate and significant included Classical Time Series with ARIMA: Univariate Model, and Linear Regression Univariate Model.

Tools: We utilized Jupyter Notebook for Python coding, which enabled us to develop machine learning models using Python libraries such as SKLearn and Pandas. Additionally, we leveraged formats from SkForecast to enhance our workflow.

Hypothesis:

The combination of datasets related to consumer spending and economic growth provides complementary insights that significantly improve the forecasting accuracy Lawn and Garden Equipment sales. Features Used: 'Nominal_GDP', 'average_food_sale'



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PEST CONTROL REVENUE Baseline: Pest Control Revenue Forecast using Naive Method (Last Observed Value ARIMAX Model: Pest Control Revenue 3-Year Forecast —— Training Data (1998-2019) Test Data (2020-2022) Forecasted Values (2020-2022) **Data Collection:** Consumer Index, Unemployment Rate, US Building Permits, US House For Sale, and S&P 500 Adjusted Close. 2020 2024 2012 2016

Model Selection and Evaluation: We chose the ARIMAX model for its superior forecasting performance, achieving 97.60% accuracy with the exogenous features we

LAWN AND GARDEN



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