

Improving the Usability and Accuracy of a Category Sales Forecasting Tool

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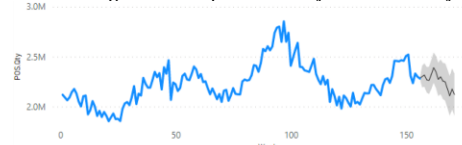
Nestlé USA's Category Advisorships

Nestlé USA is one of Nestlé's operation companies. Nestlé USA's office located in Rogers, Arkansas, manages Nestlé's accounts with Walmart and Sam's Club, part of which involves strategic category management. Currently, Nestlé USA has 3 category advisorships with Walmart: Baking, Chilled Creamers and Frozen Meals. This means that Nestlé works with Walmart, providing them product assortment for the categories chosen, which includes advice on products from their competitors as well.

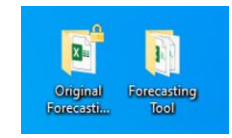


Unsuccessful Attempts to Increase Usability

To increase the usability of the forecasting tool, we attempted to transfer the tool from Rstudio and Rshiny to PowerBi because of Nestlé's proficiencies and preferences. During a meeting with Nestlé's Customer Account Analyst, Ian Rippl, he advised us that transferring the code into PowerBi would still require the use of R studio since PowerBi is more of a visualization software. We also attempted creating a desktop app to create direct access into the forecasting tool to help avoid analysts from modifying the forecasting code.



Forecast Horizon (weeks)	Baking	Chilled Creamers	Frozen Entertaining	Frozen Meals
Current System	30%	10%	10%	28%
R Tool	14%	4%	6%	5%
2	23%	12%	9%	11%
4	21%	12%	8%	10%
6	25%	12%	7%	9%
8	24%	11%	6%	9%
10	22%	11%	5%	9%

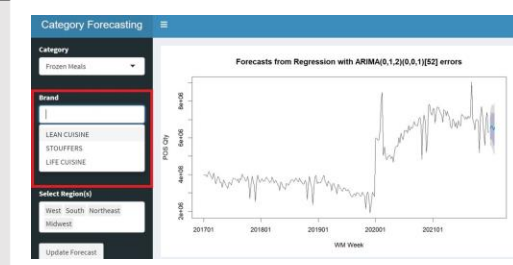


Accurately Forecasting Brand-Level Sales

Analysis was done to determine which brands were able to be forecasted accurately using the forecasting tool. We concluded that the brands had to have an adequate amount of historical data to generate an accurate forecast. We developed code to filter out the brands that don't have enough historical data, so that they won't appear in the tool when selecting a brand. This will prevent Nestlé analysts from choosing a brand that cannot be forecasted.

Nestlé USA Brands

- CARNATION
- COFFEEMATE
- COFFEEMATE BLISS
- COLDBREW
- DIGIGORNO
- GREAT VALUE
- HOT AND PLATTER
- HOT POCKETS
- ICED COFFEE
- LEAN POCKET
- LIBBY'S
- LIFE CUISINE
- NESQUIK
- NESTLE
- SKINNY COW
- STARBUCKS
- STOUTERS
- STREATERY



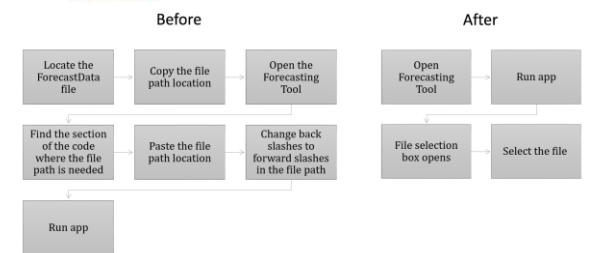
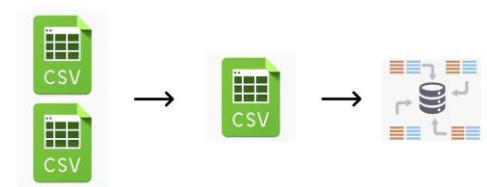
Analyzing Previous Methods of Forecasting

Previously Nestlé used a method call hindcasting to predict their future sales. However, it does not use modern technology, the method is far too simplistic and ignores basic forecasting concepts such as growth, seasonality and unforeseen events. During the 2020-2021 academic year, Nestlé USA tasked an industrial engineering capstone team with improving their forecasting approach. The group created a tool in R studio and R shiny. Nestlé believes there is still room for improvement in this tool, especially the user-friendliness of it. To assess accuracy of Nestlé USA's hindcasting approach and the ARIMA approach of the 2020-2021 capstone team, we use mean absolute percent error (MAPE). MAPE is one of the most common metrics of regression forecasting because of its interpretation of relative error.

Forecast Horizon (weeks)	Baking	Chilled Creamers	Frozen Entertaining	Frozen Meals
Current System	30%	10%	10%	28%
2	9%	3%	5%	4%
4	10%	3%	5%	5%
6	11%	4%	6%	5%
8	11%	3%	6%	5%
10	14%	4%	6%	5%
15	22%	9%	15%	12%
20	29%	11%	14%	11%
25	31%	13%	13%	11%
30	30%	14%	12%	12%

Successful Attempts to Increase Usability

We added a file selection window to simplify the input file selection process for Nestlé. Now rather than changing the file path in the code, all Nestlé analysts must do is select a file that contains all the necessary CSV's. We also developed code that merges historical data with new data. In addition, the code counts the number of weeks in the data to prevent analysts from having to modify the R code.



Extending the Forecast Horizon

We analyzed the effects of COVID-19 on sales data in 2020, by exploring different methods to weighting the 2020 point of sales quantity data in each category to minimize the effects of the unusual spikes in demand. We also created excel files using causal holiday variables that would act as regressors in our model to account for the impact that holidays have on sales.

Forecast Horizon (weeks)	Baking	Chilled Creamers	Frozen Entertaining	Frozen Meals
Current System	38%	7%	31%	23%
2	22%	2%	3%	6%
4	15%	5%	4%	5%
6	18%	6%	6%	5%
8	21%	7%	9%	5%
10	22%	8%	11%	6%
13	18%	9%	12%	6%

	Baking	Chilled Creamers	Frozen Entertaining	Frozen Meals
New Year's Day				
Super Bowl (lag 1)			✓	✓
Super Bowl			✓	✓
Valentine's Day	✓		✓	✓
Easter (lag 1)	✓		✓	✓
Easter	✓	✓	✓	✓
Independence Day				✓
Thanksgiving (lag 3)	✓	✓	✓	✓
Thanksgiving (lag 2)	✓	✓	✓	✓
Thanksgiving (lag 1)	✓	✓	✓	✓
Thanksgiving	✓	✓	✓	✓
Christmas (lag 3)	✓	✓	✓	✓
Christmas (lag 2)	✓	✓	✓	✓
Christmas (lag 1)	✓	✓	✓	✓
Christmas	✓	✓	✓	✓

