BREAKFAST AT THE FRAT

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1.0 Introduction

This report examines the effects of various promotional strategies on product sales within the "Breakfast at the Frat" dataset using the SCAN*PRO model. The goal is to uncover how these promotional activities impact sales across different product categories and provide valuable insights into their effectiveness. By investigating these factors, the insights can aid managers in guiding their marketing efforts towards optimising sales performance in a competitive retail environment.

2.0 What is the marketing problem?

This report focuses on addressing a marketing problem related to the effectiveness of various promotional strategies—display, Feature, and Temporary Price Reduction (TPR_Only)—in driving sales across different product categories within the retail industry. The dataset "Breakfast at the Frat" covers products like mouthwash, pretzels, frozen pizza, and boxed cereal over a period of 156 weeks and serves as the basis for this analysis.

The main objective is to identify promotional tactics that significantly impact sales and provide tailored recommendations to retailers to optimise their marketing mix. The main challenge is to extract valuable insights from the complex. These real-world sales data can enable more strategic promotional planning, enhance sales performance, and improve competitive positioning in the marketplace.

3.0 Data Exploration:

The SCAN*PRO model is an econometric model that helps to measure the impact of different marketing mix elements on product sales at the retail level. It allows us to calculate both own and cross-elasticities, which means we can determine how changes in pricing and promotion of one product affect the sales of that product and other competing products.

The general form of the SCAN*PRO model equation is as follows:

$$q_{kjt} = \left(\prod_{r=1}^{n} \left(\frac{p_{krt}}{\bar{p}_{kr}} \right)^{\beta_{rj}} \right) \times \left(\prod_{l=1}^{2} D_{lkrt}^{\gamma_{lrj}} \right) \times \left(\prod_{t=1}^{T} X_t^{\delta_{jt}} \right) \times \left(\prod_{k=1}^{K} Z_k^{\lambda_{kj}} \right) \times e^{u_{kjt}}$$

Where:

- q_{kjt} = unit sales of product j in store k during week t

- p_{krt} = price of product r in store k during week t

- $\bar{p}_{kr}$ = average price of product r over all periods

- $\beta_{rj}, \gamma_{lrj}, \delta_{jt}, \lambda_{kj}$ = parameters to be estimated

- D_{lkrt} = binary variables for promotional activities (e.g., display and feature ads)

- X_t = external variables affecting sales (e.g., seasonality factors)

- Z_k = store-specific effects

- $e^{u_{kjt}}$ = error term

## 4.0 Pre-processing and cleaning:

The "Breakfast at the Frat" dataset is a comprehensive collection of sales and promotion information related to five products from three brands across four categories: mouthwash, pretzels, frozen pizza, and boxed cereal. It includes detailed data on unit sales, household visits, spend data by product and store, base price, actual shelf price, and promotional support details such as display, feature advertisements, and temporary price reductions (TPR_Only). For this dataset, the implementation of the SCAN*PRO model was conducted using Python.

Before commencing the analysis, the dataset required cleaning. Initially, the dataset consisted of separate files for transaction data, product lookup, and store lookup, which made it necessary to merge them into a single dataset for easy analysis. During this process, the column "PARKING_SPACE_QTY" was removed due to a high incidence of null values. Furthermore, rows from the "PRICE" and "BASE_PRICE" columns containing null values were eliminated. These null values represented a mere 0.004270% of the dataset for both columns, a proportion so negligible that their removal was unlikely to impact the overall analysis.

5.0 Explanatory Data Analysis (EDA):

5.1 Trend Analysis:

To begin the EDA, we will view the trend over time for each category.
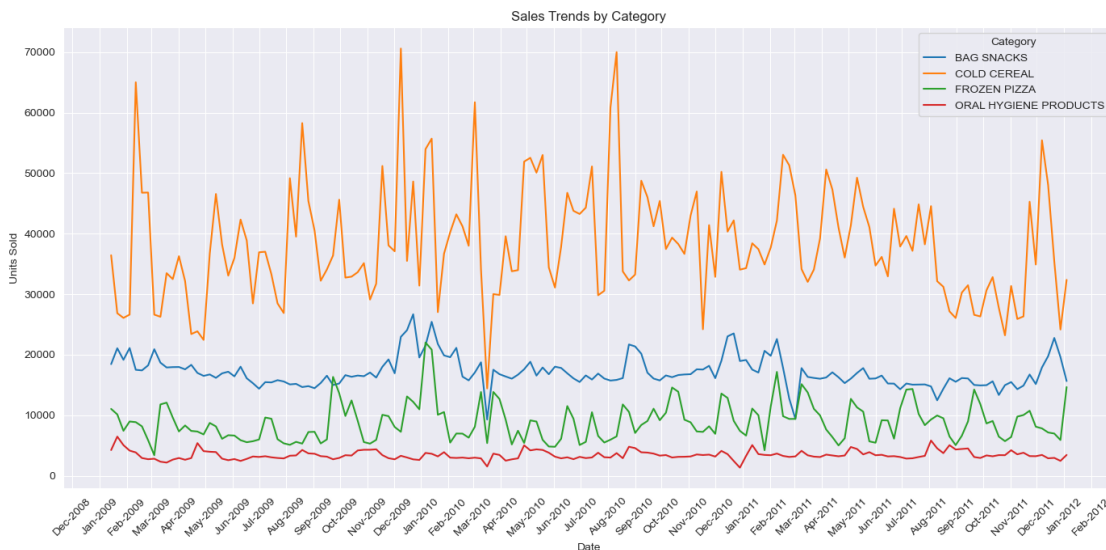
Graph 1: Trends for categories

Based on the graph, the following observations can be made:

Bag Snacks: Sales show significant fluctuations, suggesting that promotions substantially impact sales. The peaks in sales may be correlated with aggressive marketing strategies or discount offers.

Cold Cereal: The rhythmic sales pattern indicates that seasonal promotions or recurring marketing events effectively boost sales at regular intervals.

Frozen Pizza: Sales have an overall upward trajectory with pronounced peaks, indicating successful promotional campaigns that boost sales in the short term, contribute to brand growth, and increase baseline demand over time.

Oral Hygiene Products: The sales trend is relatively stable with less pronounced peaks, implying that promotions may have a less dramatic impact on sales. This is likely because these products are essential, and consistent demand drives their sales.

Based on sales trends, promotional strategies affect different product categories differently. Bag Snacks and Cold Cereal categories are the most responsive to promotions, while Oral Hygiene Products tend to maintain steady sales regardless of promotions. Frozen Pizza has responded positively to promotions, resulting in long-term sales growth.

5.2 Seasonality Analysis:

It is essential to understand the seasonal trends of sales, from year-long patterns to fluctuations throughout the seasons. Analysing these trends helps identify periods of high demand and slower times, providing a better understanding of consumer behaviour throughout the year. The upcoming graph will visually represent the sales variations over the months, shedding light on these fluctuations.
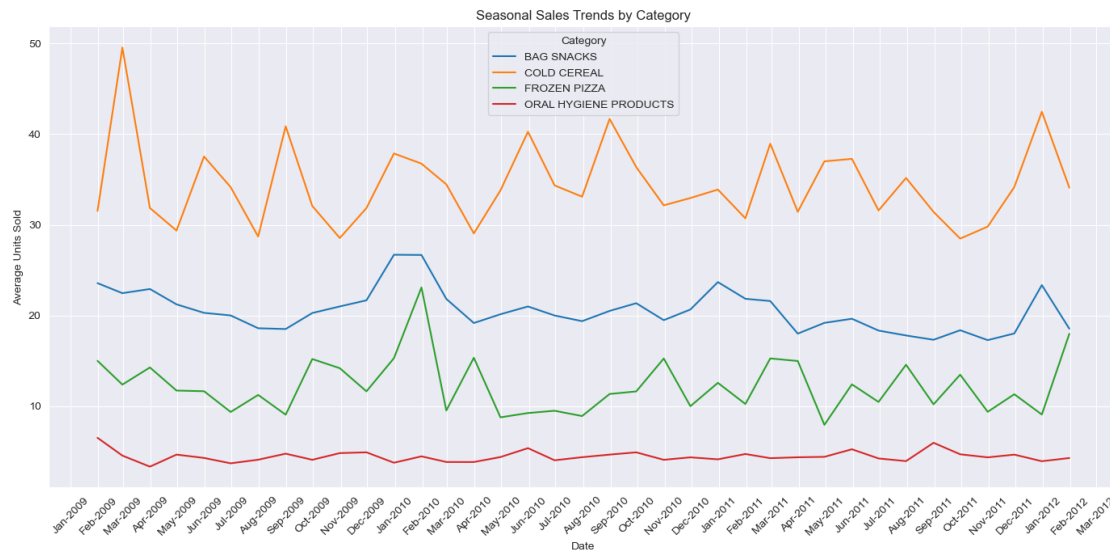
Graph 2: Seasonality for each category

Based on the graph, we can observe the following patterns in the sales of different categories of products:

Bag Snacks: Bag snack sales show a relatively consistent pattern, with peaks in May and a notable peak in March of the second year. There's a trough in the later months of the year, roughly between September and November.

Cold Cereal: This category shows a significant peak in the early months of the year, around January or February, followed by a dip. After that, we see a gradual increase with minor fluctuations throughout the year. The sales then decrease again towards the end of the year.

Frozen Pizza: There is a pronounced peak in February of the first year and another in March of the second year. The trend generally shows higher sales in the first few months of each year. The sales then decrease and flatten out in the middle of the year, with some variability.

Oral Hygiene Products: The sales for these products seem less seasonal and more erratic than the others. There is a slight increase around February each year, and a dip appears to occur in the latter part of the year, around November and December.

Overall, each category has its own unique pattern, but a common theme seems to be higher sales at the beginning of the year for Cold Cereal and Frozen Pizza, and to a

lesser extent for Bag Snacks, with Oral Hygiene Products showing the least seasonality. Next, the impact of each type of promotion will be evaluated with every category.

5.3 Impact of Promotional Type on Average Units sold:
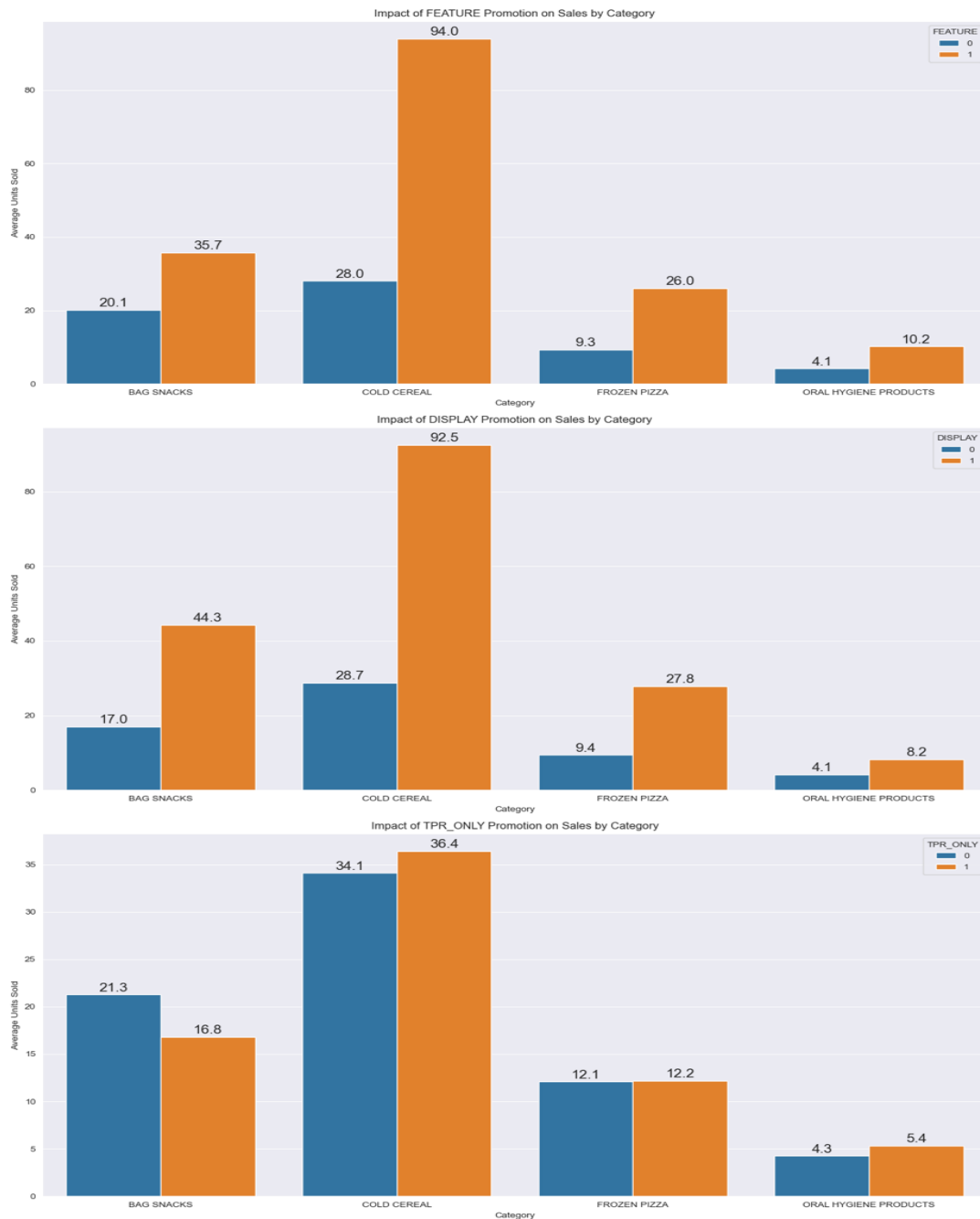
Graph 3: Average units sold for different promotion types.

Based on the analysis of average sales as a metric, it is evident that FEATURE and DISPLAY promotions have the most significant impact on product sales. For example, FEATURE promotions increase Cold Cereal sales from an average of 28 to 94 units, a remarkable threefold increase. DISPLAY promotions are equally effective, boosting Cold Cereal sales from 28.7 to 92.5 average units sold. Bag Snacks and Frozen Pizza also experienced notable gains with these promotions, with Bag Snacks selling on average 35.7 and 44.3 units under FEATURE and DISPLAY promotions, respectively. In comparison, Frozen Pizza sales rise to 26 and 27.8 units. Oral Hygiene Products show the least responsiveness but still show a slight uptick in average sales. On the other hand, TPR_ONLY promotions have a less pronounced influence, highlighting the pre-eminence of FEATURE and DISPLAY promotions in driving higher average sales across these categories.

A correlation matrix can also be used to understand the relationship between Units, Price, Feature, Display and TRP_ONLY.

5.4 Correlation Matrix:
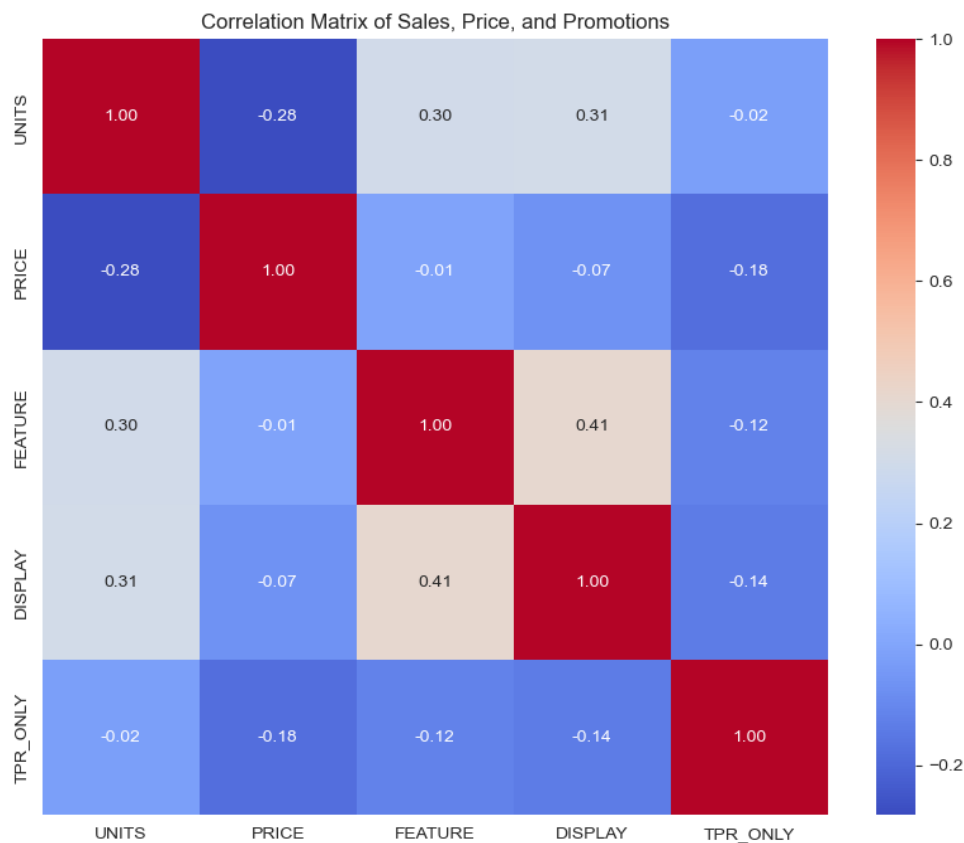
Graph 4: Correlation Matrix

Sales data shows that FEATURE and DISPLAY promotions positively correlate with unit sales, with correlation coefficients of 0.30 and 0.31, respectively. This suggests that these promotions, which increase product visibility and attractiveness, effectively drive sales. Interestingly, TPR_ONLY promotions, which involve only temporary price

reductions, show no significant correlation with sales, indicating that price cuts alone, without the added boost of visibility, might not be enough to increase sales volume significantly.

The relationship between promotional strategies is also revealing. FEATURE and DISPLAY promotions are positively correlated at 0.41, suggesting that these strategies often complement each other or have a compounding effect on sales. On the other hand, TPR_ONLY promotions have a slight negative correlation with both FEATURE and DISPLAY promotions, indicating that these price-focused promotions are less likely to coincide with visibility-focused strategies. This matrix underscores that for effective sales strategies, FEATURE and DISPLAY promotions could be more impactful than just price reductions and that managing pricing is crucial to maintaining sales performance.

6.0 Implementation of SCAN*PRO Model:

The SCAN*PRO model is designed to analyse the impact of various promotional activities on product sales over time. To implement this model, the first step is converting the dataset into a time series.

Then, the dataset was filtered for each unique product category to maintain consistency within category-specific models. A log transformation was applied to both 'UNITS' and 'PRICE' to stabilise variance and normalise the data. This mitigates the effects of any skewness in the distribution of these variables.

Interaction terms were created between the log-transformed price and each promotion type, providing an understanding of how price changes and promotional activities affect sales. The model also incorporated seasonal effects by extracting the month from the 'WEEK_END_DATE' and creating dummy variables, capturing the potential seasonal variability in sales.

The model's predictor variables included log-transformed price, promotional indicators, their interaction terms, and the seasonal dummies.

Finally, an Ordinary Least Squares (OLS) regression model was fitted to the data, which employs a multiplicative model to estimate price and promotion elasticity. The OLS model was validated by splitting the data into training (80%) and testing (20%) sets.

The complete equation used for the SCAN*PRO model is:

$$\log(\text{UNITS} + 1)$$
$$= \beta_0 + \beta_1 \cdot \log(\text{PRICE} + 0.01) + \beta_2 \cdot \text{FEATURE} + \beta_3 \cdot \text{DISPLAY} + \beta_4 \cdot \text{TPR\_ONLY}$$

$$+\beta_5 \cdot (\log(\text{PRICE} + 0.01) \times \text{FEATURE}) + \beta_6 \cdot (\log(\text{PRICE} + 0.01) \times \text{DISPLAY}) + \beta_7$$
$$\cdot (\log(\text{PRICE} + 0.01) \times \text{TPR\_ONLY})$$

$$+\Sigma(\beta_{\text{month}_i} \cdot \text{month}_i) + \epsilon$$

Where:

- $\log(\text{UNITS} + 1)$ Is the natural logarithm of the units sold plus one to handle zero sales.

- $\log(\text{PRICE} + 0.01)$ is the natural logarithm of the price plus a small constant to handle zero price.

- FEATURE, DISPLAY, and TPR_ONLY are binary variables that indicate whether a promotion was active (1 if yes, 0 if no).

- β_0 is the intercept of the model.

- β_1 to β_7 are the coefficients for the price, promotional variables, and their interactions, indicating the impact of each on the logarithm of units sold.

- β_{month_i} represents the coefficients for the month dummy variables, capturing the seasonal effects, with month_1 (January) likely omitted as the reference category.

- month_i are the dummy variables for the months.

- ϵ is the error term capturing all other variations not explained by the model.

7.0 Results of OLS model:

Before testing the model on the entire dataset, the data was split into training (80%) and testing (20%). When trained on the entire dataset, the OLS model displayed higher predictive power (RSME results) but captured a lower R-squared value. Therefore, the summary results below are from the training and testing OLS results. This is because it captures how the promotional types affect the units sold better.

Category: Bag Snacks

```
=== Category: BAG SNACKS ===
OLS Regression Results
==============================================================================
Dep. Variable:             log_UNITS   R-squared:                       0.313
Model:                           OLS   Adj. R-squared:                  0.313
Method:                Least Squares   F-statistic:                     2634.
Date:               Sun, 07 Apr 2024   Prob (F-statistic):               0.00
Time:                       23:46:51   Log-Likelihood:             -1.2829e+05
No. Observations:             104084   AIC:                         2.566e+05
Df Residuals:                 104065   BIC:                         2.568e+05
Df Model:                         18
Covariance Type:           nonrobust
==============================================================================
                         coef    std err          t      P>|t|      [0.025      0.975]
------------------------------------------------------------------------------
const                  3.4507      0.012    294.678      0.000       3.428       3.474
log_PRICE             -1.2925      0.009   -141.791      0.000      -1.310      -1.275
FEATURE               -0.0181      0.026     -0.695      0.487      -0.069       0.033
DISPLAY                0.8669      0.015     56.255      0.000       0.837       0.897
TPR_ONLY              -0.3182      0.015    -20.574      0.000      -0.348      -0.288
log_PRICE_FEATURE      0.1899      0.039      4.838      0.000       0.113       0.267
log_PRICE_DISPLAY     -0.2577      0.022    -11.902      0.000      -0.300      -0.215
log_PRICE_TPR_ONLY     0.2014      0.022      9.112      0.000       0.158       0.245
month_2               -0.0177      0.012     -1.463      0.143      -0.041       0.006
month_3               -0.0440      0.012     -3.771      0.000      -0.067      -0.021
month_4               -0.0006      0.012     -0.047      0.962      -0.024       0.023
month_5                0.0303      0.012      2.505      0.012       0.007       0.054
month_6                0.0201      0.013      1.604      0.109      -0.004       0.045
month_7               -0.0401      0.013     -3.077      0.002      -0.066      -0.015
month_8               -0.0485      0.013     -3.604      0.000      -0.075      -0.022
month_9               -0.0422      0.013     -3.310      0.001      -0.067      -0.017
month_10               0.0170      0.014      1.259      0.208      -0.009       0.044
month_11               0.0441      0.013      3.274      0.001       0.018       0.071
month_12               0.1753      0.013     13.908      0.000       0.151       0.200
==============================================================================
Omnibus:                    1120.335   Durbin-Watson:                   1.955
Prob(Omnibus):                 0.000   Jarque-Bera (JB):              811.237
Skew:                         -0.113   Prob(JB):                    6.95e-177
Kurtosis:                      2.631   Cond. No.                         23.2
==============================================================================

Notes:
[1] Standard Errors assume that the covariance matrix of the errors is correctly specified.
```

Table 1: Bag Snacks

The data shows that DISPLAY has a strong positive effect on units sold, as indicated by its significant positive coefficient of 0.8669. On the other hand, FEATURE is not statistically significant with a p-value greater than 0.05, meaning that it may not substantially influence sales volume. Furthermore, TPR_ONLY has a negative coefficient of -0.3182, which suggests that offering discounts without display or feature might decrease the perceived value.

Category: Oral Hygiene Products

```
=== Category: ORAL HYGIENE PRODUCTS ===
OLS Regression Results
==============================================================================
Dep. Variable:             log_UNITS   R-squared:                       0.215
Model:                           OLS   Adj. R-squared:                  0.215
Method:                Least Squares   F-statistic:                     1457.
Date:               Sun, 07 Apr 2024   Prob (F-statistic):               0.00
Time:                       23:46:52   Log-Likelihood:                 -80310.
No. Observations:              95904   AIC:                         1.607e+05
Df Residuals:                  95885   BIC:                         1.608e+05
Df Model:                         18
Covariance Type:           nonrobust
==============================================================================
                        coef    std err          t      P>|t|      [0.025      0.975]
------------------------------------------------------------------------------
const                 1.9095      0.009    205.873      0.000       1.891       1.928
log_PRICE            -0.3780      0.005    -71.531      0.000      -0.388      -0.368
FEATURE               0.6053      0.017     35.843      0.000       0.572       0.638
DISPLAY               0.4826      0.015     31.211      0.000       0.452       0.513
TPR_ONLY              0.1352      0.011     11.821      0.000       0.113       0.158
log_PRICE_FEATURE    -0.1109      0.015     -7.364      0.000      -0.140      -0.081
log_PRICE_DISPLAY    -0.0665      0.012     -5.499      0.000      -0.090      -0.043
log_PRICE_TPR_ONLY   -0.0103      0.009     -1.106      0.269      -0.029       0.008
month_2              -0.0336      0.008     -4.037      0.000      -0.050      -0.017
month_3              -0.0815      0.008    -10.090      0.000      -0.097      -0.066
month_4              -0.0681      0.008     -8.328      0.000      -0.084      -0.052
month_5              -0.0730      0.008     -8.788      0.000      -0.089      -0.057
month_6              -0.1213      0.009    -13.858      0.000      -0.138      -0.104
month_7              -0.1206      0.009    -13.195      0.000      -0.139      -0.103
month_8              -0.0607      0.009     -6.551      0.000      -0.079      -0.043
month_9              -0.0683      0.009     -7.843      0.000      -0.085      -0.051
month_10             -0.0353      0.009     -3.820      0.000      -0.053      -0.017
month_11             -0.0268      0.009     -2.889      0.004      -0.045      -0.009
month_12             -0.1148      0.009    -12.926      0.000      -0.132      -0.097
==============================================================================
Omnibus:                    2791.519   Durbin-Watson:                   1.951
Prob(Omnibus):                 0.000   Jarque-Bera (JB):             3039.576
Skew:                          0.435   Prob(JB):                         0.00
Kurtosis:                      2.939   Cond. No.                         21.4
==============================================================================

Notes:
[1] Standard Errors assume that the covariance matrix of the errors is correctly specified.
```

Table 2: Oral Hygiene Products

Both FEATURE (0.6053) and DISPLAY (0.4826) have significant positive effects on sales, suggesting their effectiveness. TPR_ONLY has a positive impact (0.1352), though less than FEATURE and DISPLAY.

Category: COLD CEREAL

```
=== Category: COLD CEREAL ===
OLS Regression Results
==============================================================================
Dep. Variable:            log_UNITS   R-squared:                       0.210
Model:                          OLS   Adj. R-squared:                  0.210
Method:               Least Squares   F-statistic:                     2056.
Date:              Sun, 07 Apr 2024   Prob (F-statistic):               0.00
Time:                      23:46:52   Log-Likelihood:             -1.5469e+05
No. Observations:            139302   AIC:                         3.094e+05
Df Residuals:                139283   BIC:                         3.096e+05
Df Model:                        18
Covariance Type:          nonrobust
==============================================================================
                       coef    std err          t      P>|t|      [0.025      0.975]
------------------------------------------------------------------------------------
const                3.1227      0.011    274.488      0.000       3.100       3.145
log_PRICE            0.0045      0.009      0.495      0.621      -0.013       0.022
FEATURE              0.6587      0.034     19.475      0.000       0.592       0.725
DISPLAY              1.4663      0.035     42.249      0.000       1.398       1.534
TPR_ONLY             0.6390      0.024     26.828      0.000       0.592       0.686
log_PRICE_FEATURE    0.1051      0.041      2.543      0.011       0.024       0.186
log_PRICE_DISPLAY   -0.9972      0.042    -23.957      0.000      -1.079      -0.916
log_PRICE_TPR_ONLY  -0.3523      0.029    -12.192      0.000      -0.409      -0.296
month_2             -0.0335      0.009     -3.632      0.000      -0.052      -0.015
month_3             -0.1715      0.009    -19.288      0.000      -0.189      -0.154
month_4             -0.0917      0.009    -10.113      0.000      -0.110      -0.074
month_5             -0.0861      0.010     -9.051      0.000      -0.105      -0.067
month_6             -0.0589      0.010     -5.979      0.000      -0.078      -0.040
month_7             -0.1016      0.010    -10.369      0.000      -0.121      -0.082
month_8              0.0081      0.010      0.802      0.422      -0.012       0.028
month_9             -0.1102      0.010    -11.572      0.000      -0.129      -0.091
month_10            -0.0954      0.010     -9.474      0.000      -0.115      -0.076
month_11            -0.1355      0.010    -13.439      0.000      -0.155      -0.116
month_12            -0.1506      0.010    -15.830      0.000      -0.169      -0.132
==============================================================================
Omnibus:                   2996.991   Durbin-Watson:                   1.927
Prob(Omnibus):                0.000   Jarque-Bera (JB):             3306.881
Skew:                        -0.338   Prob(JB):                         0.00
Kurtosis:                     3.336   Cond. No.                         46.8
==============================================================================

Notes:
[1] Standard Errors assume that the covariance matrix of the errors is correctly specified.
```

Table 3: Cold Cereal

DISPLAY promotions have the highest positive coefficient (1.4663), followed by FEATURE (0.6587) and TPR_ONLY (0.6390), all of which significantly affect sales positively.

Category: Frozen Pizza

```
=== Category: FROZEN PIZZA ===
OLS Regression Results
==============================================================================
Dep. Variable:           log_UNITS    R-squared:                     0.377
Model:                         OLS    Adj. R-squared:                0.377
Method:              Least Squares    F-statistic:                   3078.
Date:             Sun, 07 Apr 2024    Prob (F-statistic):             0.00
Time:                     23:46:52    Log-Likelihood:              -92865.
No. Observations:            91456    AIC:                        1.858e+05
Df Residuals:                91437    BIC:                        1.859e+05
Df Model:                       18
Covariance Type:         nonrobust
==============================================================================
                      coef    std err          t      P>|t|      [0.025      0.975]
------------------------------------------------------------------------------------
const               3.5289      0.017    212.819      0.000       3.496       3.561
log_PRICE          -0.8945      0.009   -103.807      0.000      -0.911      -0.878
FEATURE            -0.2166      0.053     -4.061      0.000      -0.321      -0.112
DISPLAY             1.3903      0.045     31.142      0.000       1.303       1.478
TPR_ONLY            0.0601      0.050      1.205      0.228      -0.038       0.158
log_PRICE_FEATURE   0.5424      0.035     15.653      0.000       0.475       0.610
log_PRICE_DISPLAY  -0.4910      0.029    -16.885      0.000      -0.548      -0.434
log_PRICE_TPR_ONLY  0.0467      0.033      1.412      0.158      -0.018       0.112
month_2             0.0626      0.011      5.909      0.000       0.042       0.083
month_3            -0.1035      0.010    -10.223      0.000      -0.123      -0.084
month_4            -0.1046      0.010    -10.156      0.000      -0.125      -0.084
month_5            -0.1072      0.010    -10.268      0.000      -0.128      -0.087
month_6            -0.1580      0.010    -15.049      0.000      -0.179      -0.137
month_7            -0.0957      0.011     -8.331      0.000      -0.118      -0.073
month_8            -0.0985      0.012     -8.378      0.000      -0.122      -0.075
month_9            -0.0694      0.011     -6.227      0.000      -0.091      -0.048
month_10           -0.0543      0.012     -4.634      0.000      -0.077      -0.031
month_11           -0.0335      0.012     -2.879      0.004      -0.056      -0.011
month_12            0.0360      0.011      3.292      0.001       0.015       0.057
==============================================================================
Omnibus:                   210.021    Durbin-Watson:                 1.882
Prob(Omnibus):               0.000    Jarque-Bera (JB):            208.935
Skew:                       -0.110    Prob(JB):                   4.27e-46
Kurtosis:                    2.918    Cond. No.                       61.7
==============================================================================

Notes:
[1] Standard Errors assume that the covariance matrix of the errors is correctly specified.
```

Table 4: Frozen Pizza

DISPLAY promotions had a significant positive effect (coefficient of 1.3903), while
FEATURE had a negative impact (coefficient of -0.2166), an interesting deviation from
other categories. TPR_ONLY had a slightly positive coefficient (0.0601), indicating a
marginal effect.

8.0 Analysis of results:

After analysing the impact of different promotional types on units sold across various categories, it is evident that specific strategies have distinct advantages. For Bag Snacks, DISPLAY promotions emerge as a highly effective method for boosting sales. This suggests that product placement and visibility strategies could significantly enhance performance. However, the TPR_ONLY strategy, indicating price reductions, shows a negative impact. This implies that such price cuts may not always resonate well with consumers or could devalue the product's perceived worth. Managers might consider innovative display techniques or combining price promotions with other activities to mitigate these effects.

Oral Hygiene Products benefit substantially from both FEATURE and DISPLAY promotions. This indicates that these products respond well to increased visibility through in-store advertisements or physical placement. TPR_ONLY promotions also show a positive, albeit smaller, impact on sales. This suggests that strategic use of price reductions, aligned with thematic health awareness months, could incentivise purchases without compromising perceived value.

For Cold Cereal, the analysis again highlights the significance of DISPLAY promotions. This suggests a strong consumer response to visual merchandising. The effectiveness of FEATURE and TPR_ONLY promotions in this category suggests a balanced approach. Combining price promotions with feature advertising and creative displays could yield the best results. This leverages multiple avenues to attract consumer attention and drive sales.

In the Frozen Pizza category, DISPLAY promotions are crucial, underscored by the importance of product visibility. However, FEATURE promotions present a negative impact, suggesting that the way these promotions are implemented may need revaluation. Focusing on unique selling points or offering taste tests could enhance effectiveness. TPR_ONLY promotions show a slight positive impact. This indicates that price promotions can still play a role in a comprehensive promotional strategy when used judiciously and combined with display strategies.

8.1 General Analysis Across Categories:

The R-squared values range from 0.210 to 0.377 across categories, indicating moderate model explanatory power. Higher R-squared values in categories like Frozen Pizza suggest promotional types and other variables in the model explain a more significant proportion of variance in sales. RMSE values measure the model's prediction error, with lower values indicating better model performance. Managers should consider these factors in promotional planning to enhance sales effectiveness.

These insights give managers a roadmap for optimising promotional activities across categories. Decisions should lean heavily towards leveraging DISPLAY strategies

across the board, ensuring products are seen and presented in an engaging manner. FEATURE promotions should be strategic, focusing on creating compelling narratives around products rather than just visibility. TPR_ONLY promotions, while effective in specific contexts, should be used sparingly and in combination with other strategies to prevent potential negative impacts on perceived value. Ultimately, a mix of these promotional activities, tailored to the unique dynamics of each category and consumer behaviour, will be vital to driving sales and enhancing brand engagement.

9.0 Model Improvements:

Three key improvements could enhance the model used in our analysis. First, incorporating more granular time variables such as week-of-the-month or day-of-the-week could capture the nuances of consumer shopping behaviour more accurately, especially during specific promotional periods or holidays. This addition would offer a deeper understanding of sales dynamics, aiding in more targeted promotional planning.

Second, expanding on the interaction terms within the model could uncover complex patterns of how different promotional strategies can be synergistically employed. For instance, exploring the combined effects of Display and Feature promotions or their interactions with specific times of the year might provide insights into optimising sales strategies.

Lastly, integrating external data sources like economic indicators, competitor activities, or weather conditions could improve the model's predictive accuracy. This broader contextual understanding would enable more strategic promotional activities by aligning them with periods when consumers are most likely influenced, potentially leading to higher units sold across different categories.

10.0 Conclusion:

In our analysis, we have processed the dataset and identified key promotional strategies. We applied the SCAN*PRO model to understand their impact on sales across different product categories. Through this approach, we discovered the varying effectiveness of promotions such as Features, Displays, and TPR_ONLY. This information can guide managers towards more informed, category-specific promotional tactics. By understanding which types of promotions drive sales most efficiently, managers can optimise marketing budgets, enhance sales performance, and ultimately increase profitability.