**DATA ANALYSIS (EXPLORATORY ANALYSIS)**

**Question 1:**

* Which products are most price sensitive? (i.e., which products see an increase in sales when their prices change)

**Solution:**

In exploratory analysis that requires the sensitivity of one variable in relation to another is a call for linear regression analysis which is the analysis that depicts the multiplier in one variable (dependent variable) as a result of a unit change in another variable (Independent variable) using the slope of the linear regression equation **(Y=β0 ± β1 X + Є)**

Y=Dependent Variable

β0 = Intercept--------------A constant value of the dependent variable when the independent variable is 0

β1 = Slope ------------The multiplier effect on the (Y) as a result of a unit change in (X)

X = Independent Variable

Є = Error

Note: Before our exploratory analysis, a data wrangling task was done on our dataset, which included but not limited to data cleaning, data enriching and data transformations

Going forward using Python module OLS (Ordinary Least Square) from statsmodels.formula.api to analyze our dataset after merging the product and data table in a bid to answer the question above. My findings are the product whose sales is most sensitive to price change are

|  |  |  |
| --- | --- | --- |
| Product ID | Multiplier Effect(Slope) | Narration |
| 1111009477 | **5.02** | This Multiplier number indicates a 5.02% increase in sales value given  a unit change in the price of the product |
| 1111009507 | **4.93** | This Multiplier number indicates a 4.93% increase in sales value given  a unit change in the price of the product |
| 3800039118 | **-4.66** | This Multiplier number indicates a 4.66% decrease in sales value given  a unit change in the price of the product |
| 1111009497 | **3.98** | This Multiplier number indicates a 3.98% increase in sales value given  a unit change in the price of the product |
| 3000006610 | **-3.90** | This Multiplier number indicates a 3.90% decrease in sales value given  a unit change in the price of the product |

***Please find attached the python notebook file that have the code for the analysis***

**Question 2:**

* Are any products or product categories sales driven by seasonal factors?

**Solution:**

After my analysis. It was gather that Yes, there are product categories driven by seasonal factors. It could be seen from the line graph (Find attached Python notebook for the Python codes of this analysis) that Product category: FROZEN PIZZA responded to seasonal factors because it was the most unstable (most Zigzag) compared to other product category,reaching its sales peak in the later days of December,2009 which likely is new year celebration period.

Another product category worthy of notice is BAG SNACKS with a subtle response to seasonal factors compare to FROZEN PIZZA. BAG SNACKS had a steady rise in sales from mid-2009 to December,2009 before falling around January, 2010

For ORAL HYGIEN PRODUCT category there is a possible fall in sales value at the end of or beginning of the year

**Question 3:**

* What is the impact on sales of promotions, displays, or being featured in the circular?

**Solution:**

From my findings having used a bar chart to display average sales of product with promotions and without promotion with the purpose to compare to enable us know the impact of promotions on our products

Observations:

It was observed that there was an impact of promotions on sales only from the FEATURE AND DISPLAY promotions due to an increase in average sales when this two promotion was applied compared to average sales without FEATURE OR DISPLAY promotion.

For the TPR\_ONLY promotion our observations showed there was no impact of this kind of promotion on sales value as average sales without the promotion was higher than average sale with the TPR\_ONLY promotions

**Question 4:**

* Are there any trends in sales of products or product categories that are worth exploring further?

**Solution:**

From my analysis, my observation is Yes, there is a trend of product category that is worth exploring further. This trend can be seen on our line plot in the month of March,2010 where all the product category sales value fell in the same month of the same year.

In my opinion such trend is worth looking further at, to ascertain what may have transpired that month and year to have caused such a simultaneous fall in all the product categories, a good guess could suggest some internal business lapses or a national or global unrest which may be economical or otherwise. This is a discussion for another day

**Analysis Process:**

* Used statistical methods (linear regression) to determine price sensitivity.
* Analyzed seasonal trends by aggregating sales data by month.
* Evaluated the impact of marketing strategies by comparing average sales with and without promotions, displays, and circular features.
* Visualized sales trends over time using line plots.

**Business Insights:**

* Focus on increasing prices for products 1111009477,1111009497,1111009507 to maximize sales and also to reduce prices for products 3000006610 and 3800039118 during promotional periods to maximize sales.
* Increase stock for category FROZEN PIZZA products during New Year’s celebrations.
* Continue using promotions, displays, and Features as effective strategies to boost sales and abolishing temporal price reduction promotion or creating an advertisement strategy for temporal price reduction

**Recommendations for Further Analysis:**

* Conduct an awareness campaign or advertisement of TPR\_ONLY promotions to get customers more informed about it. The reason of lack of impact may include unawareness by majority of customers
* Investigate customer demographics to tailor marketing efforts more effectively.
* Of course analyze competitor data to identify additional market opportunities.