# **Scope**

This document outlines the methodology used for calculating the contributions for a TPO model which can be used for both log-log and semi-log models.

# **Background:**

TPO models are built at either PPG or SKU level based on the weekly data.

Dependent variable is log of sales units and following are the different independent variables:

**Baseline variables:**

* Median Base Price
* Competitor Regular Price
* Seasonality
* ACV Selling
* Trend
* Quarter Flags
* Month Number

**Promo – Related Variables:**

* TPR
* Holiday Flags
* Pantry Loading
* Display
* Catalogue
* Competitor Promoted Discount
* ACV Display only
* ACV Feature and Display
* ACV Feature only

The modelling equation used is

where are the Base Variables and are Promo related variables

# **Approach:**

There are multiple ways you can arrive at the contributions. Following are the 2 potential approaches which provides reasonable results:

**Approach 1**

Split the factors into two sets – base factors and promo factors and calculate contributions for each of them independently

Follow the steps below to calculate the contributions

1. Identify Base variables (e.g., trend, seasonality, median Base price, Category Sales etc.)

2. Use sequential approach to compute contributions for base factors as shown below

2a) Calculate the contribution of intercept =

2b) Calculate the Contribution of using the below equation

= …………..………….eq(1)

Ideal recommended order is as follows

* Median base price of own PPG
* Competitor price
* Trend Flag/Month Flags etc.
* SI
* ACV

It’s better to keep variables with higher magnitude at the end otherwise the contribution through them becomes very high

3. The total contribution of all base variables will be

B= …………..………….eq(2)

where is the contribution of the ith Base Variable

4. Calculate the contribution of Promo related variables in order independent manner

=

where is Raw contribution of promo variable k

5. Sum all Promo related variable contributions calculated in step 4 is

S= ………..………….eq(3)

6. Allocate the difference (Y-B-S), (where B and S calculated from equation 2 and 3 above) to all the Promo related components in step 4 in proportion

………..…………..…eq(4)

Where is the Actual contribution of promo variable K

Finally using equations (1) and (4) the total outcome can be decomposed into variable level attributions as below

**Approach 2:**

Define baseline scenario, calculate the baseline sales, and then calculate the contribution of each component with respect to the baseline.

**Steps for Contribution Calculation**

1. Define baseline scenario. Following is the recommended baseline

**Table 1.1: Baseline Scenario**

|  |  |
| --- | --- |
| **Variable** | **Baseline value** |
| PPG Price | Max price in the last 26 weeks |
| PPG TPR | Set to 0 (Not included in Baseline) |
| Competitor TPR | Set to 0 (Not included in Baseline) |
| Competitor Price | Max price in the last 26 weeks |
| Seasonality | Set to 1 |
| ACV | Use as is |
| ACV Selling | Use as is |
| ACV\_Disp\_Only | Set to 0 |
| ACV\_Feat\_Disp | Set to 0 |
| ACV\_Feat\_Only | Set to 0 |
| Category trend | Use as is |
| Quarter Flags | Use as is |
| Month Flags | Use as is |
| Date Flags | Set to 0 (Not included in Baseline) |
| Pantry Loading | Set to 0 (Not included in Baseline) |
| Trend Variable | Use as is |
| Catalogue/Display | Set to 0 (Not included in Baseline) |

**1.Predict Total Sales ():** Predict total sales based on the model parameters and the weekly data provided by the user.

**2.Predict Baseline Sales (B):** Estimate the Baseline Sales initializing the variables to the base value mentioned in the Table 1.1

B= ………..…………..…………..…eq(5)

**3.Generate Incremental sales:** Predicted Total Sales - Baseline Sales = - B

4. Allocate the incremental sales obtained in step 3 to two sets of components

4.1) Variables that are not part of the baseline, primarily promo-related where in the baseline scenario it was set to 0 (like TPR, Pantry loading, Seasonality, ACV) referred as

4.2) Variables that are part of the baseline but actual values in the week are different from what was defined in the baseline scenario (for example Median base price is set to Max price in the last 26 weeks in Baseline – Median Base price in the week) referred as . Base Variables that are not “as is” in the baseline scenario.

5. Calculate the raw contributions of the Promo variables specified in 4.1 as

)

6. Calculate the raw contributions of the Baseline variables specified in 4.2 as

7. Total Contribution from Promo variables and Incremental Base variables is

…………..…………..…eq(6)

8. Allocate the difference (Y-B-S), (where B and S calculated from Eq.5 and Eq.6) to all the components in step 4 in proportion

…………..…………..…eq(7)

……..…………..……..…eq(8)

Where is the Actual contribution of promo variable k and is the actual contribution of incremental Base variable.

Finally using equations (5) (7) and (8) the total outcome can be decomposed into variable level attributions as below

**Summary:**

Find below the pros and cons for the two approaches:

|  |  |  |
| --- | --- | --- |
|  | **Approach 1** | **Approach 2** |
| Pros | No need to define a baseline scenario Simple, straight forward approach | Baseline sales are stable |
| Cons | Baseline sales may fluctuate Decomposition of components in baseline may yield very high contributions | Contributions are dependent on the definition of baseline scenario, which is subjective Cannot decompose components that are part of baseline |

Given this, recommendation is to go with Approach 1. However, validate the contributions from each of these approaches before finalizing the approach.