Optimizing Your Optimizations by Maximizing the Financial and Business Impacts of SAS® Marketing Optimization Scenarios

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ABSTRACT

Whether you are a current SAS® Marketing Optimization user who wants to fine tune your scenarios, a SAS® Marketing Automation user who wants to understand more about how SAS Marketing Optimization might improve your campaigns, or completely new to the world of marketing optimizations, this session covers ideas and insights for getting the highest strategic impact out of SAS Marketing Optimization. SAS Marketing Optimization is powerful analytical software, but like all software, what you get out is largely predicated by what you put in. Building scenarios is as much an art as it is a science, and how you build those scenarios directly impacts your results. What questions should you be asking to establish the best objectives? What suppressions should you consider? We develop and compare multiple what-if scenarios and discuss how to leverage SAS Marketing Optimization as a business decisioning tool in order to determine the best scenarios to deploy for your campaigns. The following topics are discussed in depth: establishing high-impact objectives, with an emphasis on setting objectives that impact organizational key performance indicators (KPIs); performing and interpreting sensitivity analysis; return on investment (ROI); evaluating opportunity costs; and comparing what-if scenarios.

INTRODUCTION

As a marketer, you continually face the challenge of developing campaigns that produce significant financial results. SAS® Marketing Optimization is a market leader in helping you do this in a more automated fashion, while leveraging sophisticated optimization algorithms. You can improve your optimization results even more by using the money making features built into SAS® Marketing Optimization designed to obtain the maximum business objectives to drive improvements in your Key Performance Indicators (KPIs). As you design your SAS Marketing Optimization scenarios, your primary goal is often to maximize the Return on Investment (ROI) and profitability of your campaigns. This paper will illustrate how to modify and enhance your scenarios to achieve optimal results based on your organization’s unique goals. The features you will learn how to leverage are:

- KPI Based Objective
- ROI Equations
- Sensitivity Analysis
- Opportunity Costs
- Scenario Comparisons

ALIGNING YOUR SAS MARKETING OPTIMIZATION OBJECTIVE WITH KEY PERFORMANCE INDICATORS (KPIs)

It is important to align your SAS Marketing Optimization scenario objective with your corporate or department Key Performance Indicators. KPIs are a refined set of metrics that represent a key set of metrics that uniquely reflect the health of an organization and give leading indicators of change. All KPIs are metrics, but not all metrics are KPIs. Below are some of the questions you should consider when establishing KPIs.

- What should you measure?
- How many KPIs should you have?
- How often should you measure?
- Who is accountable for the KPIs?
• How complex should your KPIs be?
• What should you use as a benchmark?
• How do you ensure your KPIs reflect strategic drivers?

Figure 1 gives just a few examples of common marketing-based KPIs addressing profitability, conversion, and behavior.

**COMMON KPIs**

**Profitability Indicators**
- $ ROI - Contributions of $1 invested
- $ Total Profits
- $ Gross Margins
- $ AOV
- % Rate of Default

**Conversion Metrics**
- % Response Rate
- % Close Rate

**Digital Behavior**
- % Click Rate
- % Open Rate

**Figure 1. Common KPI Metrics for SAS Marketing Optimization Objectives**

Once you have identified your KPIs, it is important that you build scenarios with those KPIs as your Objectives in a set of optimization scenarios. You will then be able to compare the results of scenarios built with a variety of hard hitting objectives to determine the best one to promote and deploy. By doing this, you will advance your SAS Marketing Optimization project by creating a test and learn decisioning tool.

**ESTABLISHING A BEST PRACTICES TEST AND LEARN PROCESS FOR SAS MARKETING OPTIMIZATION**

You should establish a rigorous test and learn process to get the most out of your SAS Marketing Optimization campaigns. SAS Marketing Optimization does an excellent job of solving the problem that you put in front of it, but you have to be the one that evaluates the alternatives from a business perspective and gives it the best problems to solve based on the best objective and constraint limits. Additionally, there is often missed opportunity, caused by constraints that are too tight or too loose, that can be identified and evaluated using Opportunity Costs, Sensitivity Analysis, ROI measures and Report Only Constraints. All of these features give you the insights necessary to evaluate and modify your constraints in order to improve your results. An example of a process flow you can use to improve your optimization results is shown in Figure 2.
As you can see, there are a variety of features built into SAS Marketing Optimization that are designed to help you evaluate and improve the financial impacts of your optimizations so that you can achieve the unique KPIs established by your organization.

**COMPUTING ROI FOR REPORTS**

In order to compute ROI for reports and scenario comparisons, identify or create the core measurements to be used in the calculation. Display 1 shows a typical example of creating calculated measures for expected cost, expected revenue, and expected profit.
Display 1. Creating Calculated Measures for ROI Formula
These calculated measures are then available to use in the Compute ROI formula in the Objective Page. For example, in Display 2, ROI is calculated by \( \frac{\text{exp\_profit}}{\text{exp\_cost}} \) calculated measures.

Display 2. Compute ROI and Perform Sensitivity Analysis

In addition to Compute ROI, the Objective page (Display 2) contains the options for Perform Sensitivity Analysis, Sensitivity Range, as well as the option to solve the problem with a Sample using a Sample Seed Value (see Display 10 for another example).

You are now able to evaluate the ROI calculations in your results. By comparing multiple scenarios, as shown in Display 3, you are able to see the ROI approximations for alternative business objectives.

Display 3. View ROI Value of Scenario on Results Page
USING OPPORTUNITY COSTS AND SENSITIVITY ANALYSIS

Sensitivity Analysis and Opportunity Costs have a symbiotic relationship and should be used together to inform selections and adjustments to test alternative scenarios. Both of them indicate constraints that can be adjusted to improve results. Display 4 indicates two constraints that can be adjusted for improvements in the Objective.

OPPORTUNITY COSTS

Display 4. Identify Opportunity Costs

As you can see in Display 4, the first two constraints show opportunity cost. Opportunity cost is an estimate, or approximation, of the marginal change in the objective value if the limit of a constraint is increased by one unit, while keeping all other constraints unchanged. You can use the opportunity cost information to identify constraints most likely to have the largest impact if adjusted. Opportunity costs can be positive (indicating the opportunity to increase the constraint limits) or negative (indicating the opportunity to decrease a constraint limit). See further discussion of negative impacts below.

Always re-run your scenario to determine the true impact of your constraint adjustments. Re-running the scenario with adjusted constraints will not result in exact increases indicated in the original scenario, but will be similar due to the heuristic nature of SAS Marketing Optimization algorithms.

Note: Opportunity costs are not calculated for Average and Ratio constraints, Report Only constraints, and Customer and Household level constraints.

SENSITIVITY ANALYSIS

Sensitivity Analysis provides a chart showing a range around a constraint and its relationship, or impact, on your objective. Positive or negative slope on the sensitivity graph indicates opportunity to increase or decrease the constraint being graphed to improve your objective. The difference between sensitivity analysis and opportunity cost is that sensitivity analysis is a graph of the range and the approximate impact of changing the constraint across that range, whereas opportunity cost is the approximation of the impact one unit of change in the constraint has on the objective. Steep slopes (Displays 4-7) indicate high opportunity, or sensitivity, while flat slopes (Display 8) indicate little to no opportunity.
Display 5. Sensitivity Analysis for Max Budget $50k

The sensitivity analysis graphs the relationship between a constraint and the objective. Display 5 shows out of the box functionality for the sensitivity analysis graph.

Display 6. Adjust Max Budget to Maximize Expected Revenue (Objective)

In Display 6, the additional solid lines indicate the current, existing constraint of a maximum budget of $50k. The dotted line indicates that an increase in budget to $68.5k would increase revenue from $116.5 to $117.2.

Note: This is a REVENUE objective, so profit and ROI might actually decline if the increase in budget causes each unit, or dollar, to be less productive. Depending on campaign goals, this might or might not be desired.
Another example of a positive sloping sensitivity analysis, Display 7, indicates a modest revenue increase of approximately $6,000 (from 1,165,000 to 1,171,000) from when you increase the number of offers made to customers with a credit score of less than 600 from 7k to 8.8k offers. At this point, it becomes more of a business decision. You should consider if it is worth the risk incurred by taking on more low credit customers versus the relatively small increase in revenue by making the additional offers. There will be times that you choose to not adjust even though there is some opportunity to improve your objective.

No slope, or a negative slope, as seen in Display 8, shows that the objective has low sensitivity to the constraint. In this example, the number of calls in Week 1 has no impact on revenue until you exceed 6,300 calls, at which point, revenue declines slightly.
Opportunity cost can be negative with the corresponding sensitivity analysis showing a negative slope as you can see in Display 9 and Display 10. Display 9 Constraint Summary indicates that for each additional Disability DM offer, expected PROFIT declines by approximately $29.84 across the entire scenario. This indicates that the most profitable number of Disability DM offers to make is less than 15k.

By looking at the Sensitivity Analysis in Display 10, you will be able to determine a good level of Disability DM offers to make. Consider re-running the scenario with a limit of 11k Disability DM offers to determine the approximate impact.

<table>
<thead>
<tr>
<th>Type</th>
<th>Name</th>
<th>Operator</th>
<th>Limit</th>
<th>Value</th>
<th>Opportunity Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Budget</td>
<td>Max $175K</td>
<td>At most</td>
<td>175,000.00</td>
<td>174,999.05</td>
<td>15.74</td>
</tr>
<tr>
<td>Budget</td>
<td>Max $22K for Wellness Camp</td>
<td>At most</td>
<td>22,000.00</td>
<td>22,001.10</td>
<td>8.33</td>
</tr>
<tr>
<td>Budget</td>
<td>Max $25K for hoxsell 1K ded DM</td>
<td>At most</td>
<td>25,000.00</td>
<td>10,367.50</td>
<td>0.00</td>
</tr>
<tr>
<td>Cellsize</td>
<td>Min 15K Disability DM</td>
<td>At least</td>
<td>15,000.00</td>
<td>15,001.00</td>
<td>-29.84</td>
</tr>
<tr>
<td>Channel</td>
<td>Wk10 CallCenter 20K</td>
<td>At most</td>
<td>20,000.00</td>
<td>19,999.00</td>
<td>16.90</td>
</tr>
<tr>
<td>Channel</td>
<td>Wk11 CallCenter 18.5K</td>
<td>At most</td>
<td>18,500.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Channel</td>
<td>Wk12 CallCenter 15K</td>
<td>At most</td>
<td>15,000.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Display 9. Negative Opportunity Cost

Display 10. Corresponding Negatively Sloped Sensitivity Analysis

Opportunity cost calculations are calculated by default for all scenarios. Sensitivity analysis is an advanced feature that requires that you set it on the Objective page (Display 11) and place flags on the Constraint Page (Display 12). Running sensitivity analysis will increase your run time, with the incremental time varying by scenario complexity and the number of constraints on which you run the sensitivity analysis.
RUNNING WHAT IF SCENARIOS AND COMPARING SCENARIOS

How do you use all this information to improve your results? The best way is to establish a Best Practices protocol, giving yourself time in your process to leverage SAS Marketing Optimization as a test lab by running multiple What If scenarios.

SOLVE ON A SAMPLE

On the Objective page, flag Solve problem on a sample, as in Display 11. This will facilitate your testing by allowing your scenarios to run at a fraction of the time. You can also set a random seed value.

Display 11. Solve Problem on Sample to Run “What Ifs”

The percentage of the original customer file that you choose to use can vary based on the size of your data set. Often, your set is large enough that a 10% sample is adequate. If in doubt about the sample size you are using, increase your sample ratio (%), keeping in mind, the larger the data set, the longer it will take to run your test scenarios. You can also always get a reality check by running a sample size calculator as well.

Note: If you use a sample to solve your scenario, as in Display 11, please be sure to un-flag this feature prior to finalizing and promoting your scenario.

REPORT ONLY CONSTRAINTS

In addition to constraints used in your optimization, you can also include Report Only Constraints in order to better understand the expected business impacts of various scenarios. They are built on the Constraints page, shown in Display 12, based on calculations made on existing measurements and appear in the Results.
As you can see in Display 13, you must flag to use the constraint in the optimization. Processing time increases for each constraint selected. *Report Only Constraints* have no impact on the optimization itself, but you are able to see the estimated impact of them based on the calculations and decisions of the optimization.
Note: *Report Only Constraints* are not available for Sensitivity Analysis. This makes sense when you consider that they have no impact on the optimization of the objective.

**COMPARING MULTIPLE SCENARIOS**

Within SAS Marketing Optimization, you can compare any scenarios you have built and optimized. Within any scenario that you would like to compare, after running the optimization, you can go to the Results page. At the top is a small edit box for Comparison: Multiple as shown in Display 14. When you select this, you get a list of all scenarios available for comparison as seen in Display 15. The default listing shows any scenarios that are built on the same input files. You can also select *Show all scenarios* to compare any scenarios within the same business context, regardless of their input files.

**Display 13. Add “Report Only” Constraints**

**Display 14. “Comparison: Multiple” Flag**
By selecting Constraint Comparisons, you can view, side by side, the results of multiple scenarios. In Display 16, you can compare scenarios with primary objectives of Sales, Revenue, and Profit. You can also see the usefulness of the Report Only constraints in understanding the business relationships between the various objectives.

Tip: Using short scenario names helps to view constraint limits, optimization values and opportunity costs in Display 16 in one view without the need to scroll.

Display 16. Sales, Profit, and Revenue Scenario Comparisons

The view in Display 16 offers a wealth of information. This is a good snapshot to use if you need to communicate with others in your organization about alternative approaches you are considering for your final campaign constraints to promote. Information contained includes opportunity costs, budget, offer quantities, as well as expected cost, % default, sales, revenue, and profit.

CONCLUSION

SAS Marketing Optimization offers a wealth of profitability indicators and built in functionality to increase the impact your campaigns have on your KPIs. By building and testing your scenarios with this in mind, you will get the best results out of your optimized campaigns. It is critical that you select the optimal objective that will produce the highest impact on your KPIs. Across your campaigns, you can choose to vary the objective function to drive a variety of KPIs and achieve various business results. Keep in mind that SAS Marketing Optimization prioritizes the objective you give it, sometimes at the expense of other objectives.
metrics. SAS Marketing Optimization is extremely powerful and becomes increasingly so, as you learn more about how to use it for pre-testing as a decision management tool. What If Scenarios can also be invaluable tools for communicating within the organization. For example, you can use scenario approximations to make a case to increase or decrease operational constraints like budget, credit lines, agent distribution, or offer timing just to name a few. By using all of these built in features, you will be able to modify your scenarios to achieve the optimal impact.

REFERENCES

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