

## Response Analysis for marketing campaigns using SAS

Dishant Banga, Sr. Data Analyst, Bridgetree

### ABSTRACT

Response analysis is a critical component of evaluating marketing campaigns, particularly when utilizing a test and control group design. This study presents an approach for conducting a running response analysis using SAS software to examine the impact of a marketing campaign intervention on key performance indicators (KPIs) by comparing results between a test group and a control group. The objective is to quantify the causal effect of the campaign and provide actionable insights for campaign optimization. The analysis employs a robust experimental design, randomly assigning individuals to either a test group, which receives the campaign intervention, or a control group, which remains untreated. The KPIs, such as conversion rates, click-through rates, or revenue, are measured for both groups. SAS statistical procedures, such as PROC TTEST, are utilized to compare the KPIs between the test and control groups. These procedures facilitate the identification of significant differences in response rates attributable to the campaign intervention. In addition, SAS regression procedures, like PROC REG, can be employed to explore the relationship between campaign variables and observed outcomes. The findings from the analysis provide valuable insights into the campaign's effectiveness, empowering marketers to make data-driven decisions for future iterations or resource allocations. By isolating the campaign's impact from external factors, the study enhances the ability to establish a causal relationship between the intervention and the observed outcomes. This study contributes to the field of marketing analysis by showcasing a rigorous methodology for running response analysis using SAS software within a test and control group framework. Marketers can leverage this approach to gain deeper insights into campaign effectiveness, optimize strategies, and allocate resources efficiently. Ultimately, this leads to improved campaign performance and more informed decision-making in marketing endeavors.

### INTRODUCTION

In the dynamic realm of marketing, evaluating the efficacy of campaigns holds utmost significance. A pivotal technique in this endeavor is response analysis, a structured framework designed to dissect and comprehend campaign outcomes, thereby serving as a cornerstone for refining marketing tactics. A particularly impactful strategy within this framework involves the integration of a test and control group design. This review extensively examines the importance of response analysis within the context of a marketing campaign that employs a test and control group structure. It places special emphasis on the utilization of SAS as the analytical instrument for this purpose.

### RESPONSE ANALYSIS AND CAMPAIGN EVALUATION

Response analysis entails a methodical exploration of the correlation between marketing interventions and consumer behaviors. Its scope transcends mere passive observation, empowering marketers to reveal the fundamental causal connections that drive observed results. Within this context, the adoption of a test and control group framework emerges as highly valuable. This structured setup furnishes a controlled setting where the authentic influence of a campaign intervention can be meticulously isolated and precisely quantified[1].

### THE ROLE OF TEST AND CONTROL GROUP DESIGN

At the core of response analysis lies the incorporation of a test and control group configuration. This methodology guarantees that the discerned impacts are inherently linked to the campaign intervention itself, devoid of external influences. By employing a randomized allocation of participants into these groups, the potential for selection bias and confounding variables is notably diminished, consequently enhancing the internal validity of the analysis[2].

## SAS: A VERSATILE ANALYTICAL TOOL

In parallel with the escalating volume and intricacy of marketing data, the demand for potent analytical instruments becomes imperative. In this context, SAS emerges as a comprehensive statistical software suite that presents a spectrum of features adeptly tailored for executing response analysis. Its multifaceted ensemble of statistical techniques, encompassing t-tests, regression analysis, and chi-square tests, empowers researchers to adeptly maneuver through the intricate landscape of marketing data, ultimately yielding substantial and insightful findings[4].

## BRIDGING THEORY WITH PRACTICE

Response analysis functions as a crucial link connecting theoretical frameworks with real-world implementations. Through meticulous examination of the behavioral reactions exhibited by both test and control groups, marketers attain a profound comprehension of the way distinct campaign elements sway consumer behaviors. This empirical discernment establishes a robust groundwork for judicious decision-making, affording marketers the opportunity to refine strategies, efficiently allocate resources, and ultimately attain the pinnacle of campaign success[5].

## DATA-DRIVEN CAMPAIGN OPTIMIZATION

Incorporating response analysis into marketing campaigns presents a methodological pathway toward data-driven optimization. Through the identification of elements that yield positive results, marketers can achieve a more efficient resource allocation. This strategic approach not only facilitates a deeper comprehension of customer preferences but also guarantees that campaigns resonate harmoniously with the intended audience, thereby fostering an elevated level of performance[6].

## CASE STUDY

This example analyzes the effectiveness of a marketing campaign for an e-commerce company. The campaign aims to increase sales by offering a discount to a randomly selected test group while keeping a control group unchanged. In this example various metrics can be used to measure the success of the campaign after running the response analysis are response rate, significance of response rate test over control using T-test, net sales per consumer, Incremental sales per consumer, Incremental margin per consumer and ROI. These metrics may vary from business to business. Below are the certain steps.

1. Data Collection and Preparation: We collected data from an e-commerce platform, including customer profiles, purchase history, and demographic information. The dataset contains information on customer ID, purchase amount, age, gender and other demographics.

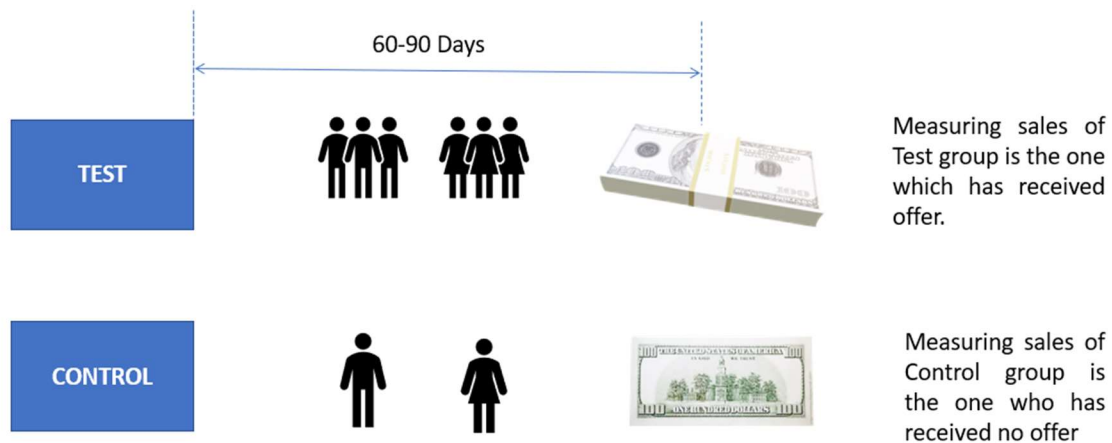


Figure 1. After 60-90 days of campaign is live performance of campaign is measured

2. **Creating Test and Control Groups:** To create the test and control groups, we utilized the SAS `surveysselect` procedure to ensure random assignment. The test to control the ratio will be 1 to 10 based on the total population available for targeting. The sample code to create the groups:

```
proc surveysselect data=customer_data method=srs
  out=test_group(where=(group=1)) out=control_group(where=(group=0));
  strata group;
run;
```

3. **Response Analysis:** As shown in Figure 1 after the campaign is live and in the market for 60-90 days (depending upon the business case) the next step is to measure the performance of the campaign and that is done using Response analysis. It measures the performance of the test group over control group and helps in making business decisions. The basic idea is to match the customer data with the market data to identify which customer got the offer in the test group to identify if they respond or not. Next step is to identify the sales information for each customer. Final step is to join the two intermediate datasets to get the final dataset which can help in pulling the final counts and calculate the other metrics like T-test, net sales per consumer, Incremental sales per consumer, Incremental margin per consumer and ROI. The same code to do the necessary is follows:

```
/*Identifying which of the customers used the marketing offer */
data campaignshop; merge marketing (in=a ) sales (in=b ); by cusotmerID;
if a and b then shop=1;else shop=0 ;
run;
```

```
/*Identifying overall sales of the customer when the offer was live in the market*/
```

```
data campaignsales; set sales; by cusotmerID;
if first.cusotmerID then do; trips=0; totsales=0;
totcost=0;totnetmargin=0;totcpnamt=0; end;
if offerused='Y' ;
trips+1;
totsales+transales;
totcost+trancost;
totnetmargin+tranmargin;
if trancpnamt ne . then totcpnamt+trancpnamt;
if last.cusotmerID;
run;
```

```
/*Joining the offer and sales by each customer*/
```

```
data campaignfinal; merge campaignshop (in=a ) campaignsales (in=b ); by
cusotmerID;
run;
```

```
/* Two-sample t-test for purchase amount */
```

```
proc ttest data=test_group
  var purchase_amount;
  class group;
run;
```

As shown in Table 1, is a simple explanation and example of a marketing campaign along with some numbers to show how the campaign works and how the performance of the campaign is calculated. In the below example the Incremental margin is \$0.60 per customer while the offer price was \$0.50, so the campaign has a ROI of 120% along with incremental profit of \$1 per customer and 4% of Incremental shop rate.

1.1.2023			90 days (post 1.1.2023)					
Population	# of customers	Expense/mail	# of shoppers	Shop Rate	Revenue/customer	Incremental Profit	Margin (60%)	ROI
Test	50,000	\$0.50	10,000	20%	\$10	\$1	\$0.60	120%
Control	5,000	-	800	16%	\$9			

**Table 1. Example of Response analysis results for a marketing campaign**

4. Results and Insights: Based on the numbers shared in Table 1, the response analysis results are as follows:
- indicate that the test group has a higher average purchase amount compared to the control group.
  - The t-test reveals a statistically significant difference in the Shop rate between the test and control groups ( $p < 0.05$ ), suggesting that the promotion has an impact on customer response to the offer.

These insights help businesses to make prompt decisions and future marketing plans. This insight equips marketing practitioners with the ability to fine-tune campaigns, allocate resources judiciously, and optimize strategies [3]

**CONCLUSION**

The response analysis demonstrates that the marketing campaign's special promotion has a significant positive impact on customer purchasing behavior. The test group, which received the promotion, exhibited higher purchase amounts compared to the control group. This insight provides valuable evidence for the campaign's effectiveness in driving sales.

**REFERENCES**

[1] Tucker, C. (2014). Social networks, personalized advertising, and privacy controls. *Journal of Marketing Research*, 51(5), 546-562.

[2] Hansotia, B., & Wang, Z. J. (1998). How many winners are enough? *Marketing Science*, 17(3), 235-247.

[3] Kumar, V., & Petersen, J. A. (2005). Using a customer-level marketing strategy to enhance firm performance: A review of theoretical and empirical evidence. *Journal of the Academy of Marketing Science*, 33(4), 401-419.

[4] SAS Institute Inc. (2021). SAS/STAT® 15.1 User's Guide. Retrieved from [https://documentation.sas.com/doc/en/casstat/15.1/casstat\\_intro\\_overview.htm](https://documentation.sas.com/doc/en/casstat/15.1/casstat_intro_overview.htm)

[5] Lewis, R. A., & Reiley, D. H. (2014). Online ads and offline sales: Measuring the effect of retail advertising via a controlled experiment on Yahoo!. *Quantitative Marketing and Economics*, 12(3), 235-266.

[6] Villanueva, J., Yoo, S. H., & Hanssens, D. M. (2008). The impact of marketing-induced versus word-of-mouth customer acquisition on customer equity growth. *Journal of Marketing Research*, 45(1), 48-59.

[7] Kumar, V., & Trivedi, M. (2017). Impact of Mobile App Reviews on IOS App Performance: An Empirical Investigation. *Journal of Management Information Systems*, 34(2), 510-539.

## ACKNOWLEDGEMENTS

I would like to thank Bridgetree LLC for providing us with all the necessary infrastructure and resources to be able to strengthen our skillset in SAS. We are also grateful to SAS for giving us this opportunity to present and publish our work and learnings.

## CONTACT INFORMATION

Please reach out to us for any comments, feedback or questions:

Name: Dishant Banga

Enterprise: Bridgetree LLC

Charlotte, NC, 28262

E-mail: [dishant.u.banga@gmail.com](mailto:dishant.u.banga@gmail.com)