

# Statistical Analysis on Marketing Campaigns

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## Abstract

Three pay-per-click campaign were run by an e-commerce company on Facebook and the generated data was collected. The data was used to evaluate the effectiveness of the three campaigns. The data was queried to get and statistical methods including analysis of variance, regression and probability distribution for modelling. Results have shown that the cost of advertising was the highest for campaign C and under that campaign it generated the most leads and acquisitions in comparison to other campaigns. Statistical models showed campaign C would generate the most leads and acquisitions but the least return on advertising.

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## 1 OBJECTIVES

The aim of this project is to analyse the effectiveness of the marketing campaign A, B and C. The Facebook advertising data will be queried to understand how the campaigns performed. Various statistical methods will be conducted including Analysis of variance to understand how each campaigns impacted the return on advertising and how the campaigns differed from each other. Burr Distribution will be used to model the probability of acquiring leads for each campaigns. Finally, regression is used to predict the expected number of leads from each campaigns.

## 2 METHODOLOGY

Statistical methods will be used to evaluate the effectiveness of the three campaigns. Analysis of variance with Tukey's post analysis will conducted how the average return on advertising for each campaigns differed. Burr distribution will be used to model the probability of leads and acquisition. Regression will be used to predict the expected the number of leads.

## 3 DATA

The Facebook advertising data consisted of 1148 advertisements with 3 categorical and 10 numerical features but few additional pay-per-clicks key performance indicators were computed to evaluate the effectiveness of the campaigns.

Features	Descriptions
<i>campaign_id</i>	An ID associated with each ad campaign of the advertiser
<i>ad_id</i>	The unique ID for each ad.
age	The age of the person to whom the ad is shown.
gender	The gender of the person to whom the ad is shown.
impressions	The number of times the ad was shown.
clicks	The number of clicks on for that ad.
total conversion	Total number of people who enquired about the product after seeing the ad.
Approved conversion	Total number of people who bought the product after seeing the ad.
Spent	The amount paid by the advertiser to Facebook to show that ad.
Click-through-rate (CTR)	The number of impressions that turn into clicks.
Cost Per Click (CPC)	The price paid to Facebook for clicks.
Return on Advertising Spent (ROAS)	The revenue generated per every dollar spent in on ad campaign.
Conversion	The number of people who enquired or purchased the product after seeing the ad.

## 4 RESULTS

Campaign A and B spent the least on advertisement on average with low standard deviation. Whereas, campaign C spent significantly more than others combined with excess amount of \$90.80 and standard deviation of \$102.61. The high standard deviation implied that cost of advertising varied significantly from the average. Having spent significantly on advertising it was expected that campaign C would have the highest number of impressions whereas campaign A had the least in which the ad was shown 12801 times on average. Also, the ads was shown to more females than males and older age group for all campaigns on average. In regards to clicks, for campaign C 59 people on average clicked on the ad whereas for campaign A and B very few people clicked on the ad. Having taken into account of the number of times the ads was shown and the number of clicks, campaign A and B achieved a higher clicks through rate than campaign C on average. This suggested that for campaign C it did not reach its customers effectively in comparison to campaign A and B. Furthermore, The cost-per-clicks for all campaigns was less than the \$2.00 benchmark but the cost-per-click was the highest for campaign C relative to others and the cost-per-clicks difference for campaign A and B was insignificant.

Campaign C generated the least return on advertising whereas campaign A and B generated return of \$22.14 and \$20.71 on average respectively. Also, more males have generated return on advertising than females across all campaigns.

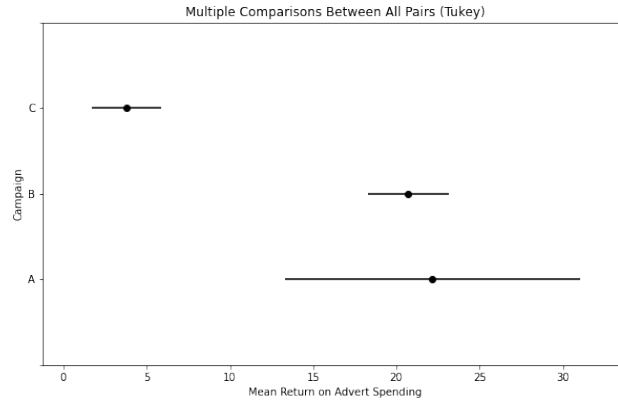


Figure 1: Average return of Return on advertising spending

From analysis of variance analysis, the average return on advertising spent for campaign C was significantly different from campaign A and B. However, the average return on advertising spent for campaign A was not significant different from campaign B as shown in the figure above.

Burr distribution was used to model the probability of total conversion for each campaigns and 100 conversion was used as benchmark. From the analysis, campaign B and C had 29.3% and 29.4% chance of acquiring more than hundred leads respectively, whereas campaign A had the least chance with 17% which is significant from other campaigns. From regression analysis, campaign C had negative impact on total conversion. That is for every investment on advertising, conversion decreases by 31, whereas, for campaign A and B increase leads increase by 3 and 32 respectively. Furthermore, females increase leads insignificantly more than males. Also, on average people in the age group 30-34 and 40-44 increase leads by 22 and 3 respectively whereas age group 35-39 decrease leads.

## 5 CONCLUSION

Data was queried and campaign C spent the most on Facebook advertising. As a result, achieved the highest number of impressions and clicks but however the return on advertising spent was the lowest in comparison to campaign A and B. From statistical models it is expected that under campaign C customers are more likely to enquire or purchase the product than under campaign A and B.