Hypothesis test to see whether there is a difference in the conversion rate between the two groups.

H_0: $\hat{P}_A = \hat{P}_B$

H_1: $\hat{P}_A \neq \hat{P}_B$

Type of Test: Two sample Z-Test with pooled proportion

$$\hat{P}_A = convertion\ rate\ of\ control\ group$$

$$\hat{P}_B = convertion\ rate\ of\ treatment\ group$$

$$\hat{P} = estimate\ of\ proportions$$

$$SE = standard\ error$$

$$n_A = number\ of\ users\ in\ Control\ group, A$$

$$n_B = number\ of\ users\ in\ Treatment\ group, B$$

$$\hat{P} = \frac{\hat{P}_A n_A + \hat{P}_B n_B}{n_A n_B}$$

$$= \frac{0.0392(24343) + 0.0463(24600)}{24343 + 24600}$$

$\hat{P}$= 0.0428

$$z^* = \frac{(\hat{p}_A - \hat{p}_B)}{\sqrt{\hat{p}^*(1-\hat{p}^*)(\frac{1}{n_1}+\frac{1}{n_2})}} = \frac{\hat{P}_A - \hat{P}_B}{SE}$$

SE=√ 0.0428 (1-0.0428) (1/24343 + 1/24600)

= 0.00183

Z = (0.0392-0.0463)/0.00183

= -3.8798 Excel: Norm.s.dist (-3.6798)

Therefore, P-value = 0.000052271

P-value = 0.0001

Significance level α=0.05

Hence, p-value of 0.0001 < α-value of 0.05

Conclusion: We reject the Null hypothesis that the conversion rate of the control group, A is equal to that of the treatment group, B. We have enough evidence to support the Alternative hypothesis which states that the difference in the conversion rates of the control and treatment group is statistically significant.

95% Confidence interval for the difference in the conversion rate between the treatment and control groups

Confidence interval = Sample statistic ± Margin of Error

= Sample Statistic ± Critical Value X Standard Error

Sample Statistic, $\hat{P} = \hat{P}_A - \hat{P}_B$

= 0.0392-0.0463

=-0.0071

Critical Value, $z_{\alpha/2}$

= 0.05/2

=$z_{0.025}$

=-1.96

Standard Error Unpooled = 0.00183

Confidence interval= -0.0071± -1.96 X 0.00183

= -0.0071 ± -0.0036

Confidence Interval: 0.0035<p<0.0107

Conclusion: We are 95% sure that the true conversion rate in the combined population of the control and treatment groups is likely to fall within 0.0035 and $0.0107.

Hypothesis test to see whether there is a difference in the average amount spent per user between the two groups.

$H_0: \bar{x}_A = \bar{x}_B$ $\bar{x}_A = 3.375$ SE= $\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}$

$H_1: \bar{x}_A \neq \bar{x}_B$ $\bar{x}_B = 3.391$

S_1=sample standard deviation Control group, A=25.93639

S_2=sample standard deviation Treatment group, B=25.41411

N_1=sample size of control group, A=24343

N_2=sample size of Treatment group, B=24600

Type of test: Two Sample T test

$$t^* = \frac{\overline{x_1} - \overline{x_2} - 0}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$

.$\bar{x}_A - \bar{x}_B = -0.016$

SE = 0.2321

Therefore, t = -0.016/0.2321

= -0.0689 Excel

P(|t| ≥ 0.0689)

= 0.0527465

= 1- 0.0527465

=0.472535 X 2

=0.94507

P-value = 0.94507 while α=0.05 at 95% confidence level

0.94507 > 0.05

Conclusion: the p-value of 0.945 is not statistically significant, therefore we fail to reject the Null Hypothesis that there is no difference in the mean amount spent per user between the control and treatment groups. We, therefore, do not have enough evidence to support the Alternative hypothesis that the mean amount spent per user between the control and treatment groups are different.

95% confidence interval for the difference in the average amount spent per user between the treatment and control groups.

Confidence Interval = Test Statistic ± critical value X standard error

= -0.016 ± -1.96 X 0.232

= -0.016 ± -0.455

= 0.439 < µ < -0.471

Conclusion: We are 95% sure that the true average amount spent in the combined population of the control and treatment groups is likely to fall within $-0.439 and $0.471.

RECOMMENDATION

I recommend launching the banner based on two premises:

- A significant positive difference was observed in the conversion rates between the control and treatment groups. In like manner, there was a positive difference, albeit marginal, in the average amount spent per user between the control and treatment groups.
- Furthermore, hoisting a digital banner on the website constitutes a lightweight expenditure that carries minimal financial risk even if the positive results derived from the experiment are not prolonged. In other words, this risk will have no jeopardizing effect on the business.