Ari Iwunze

Twitter Ad Campaign Pricing Product A/B Testing

A/B Testing Roadmap

01 **Define Goal**

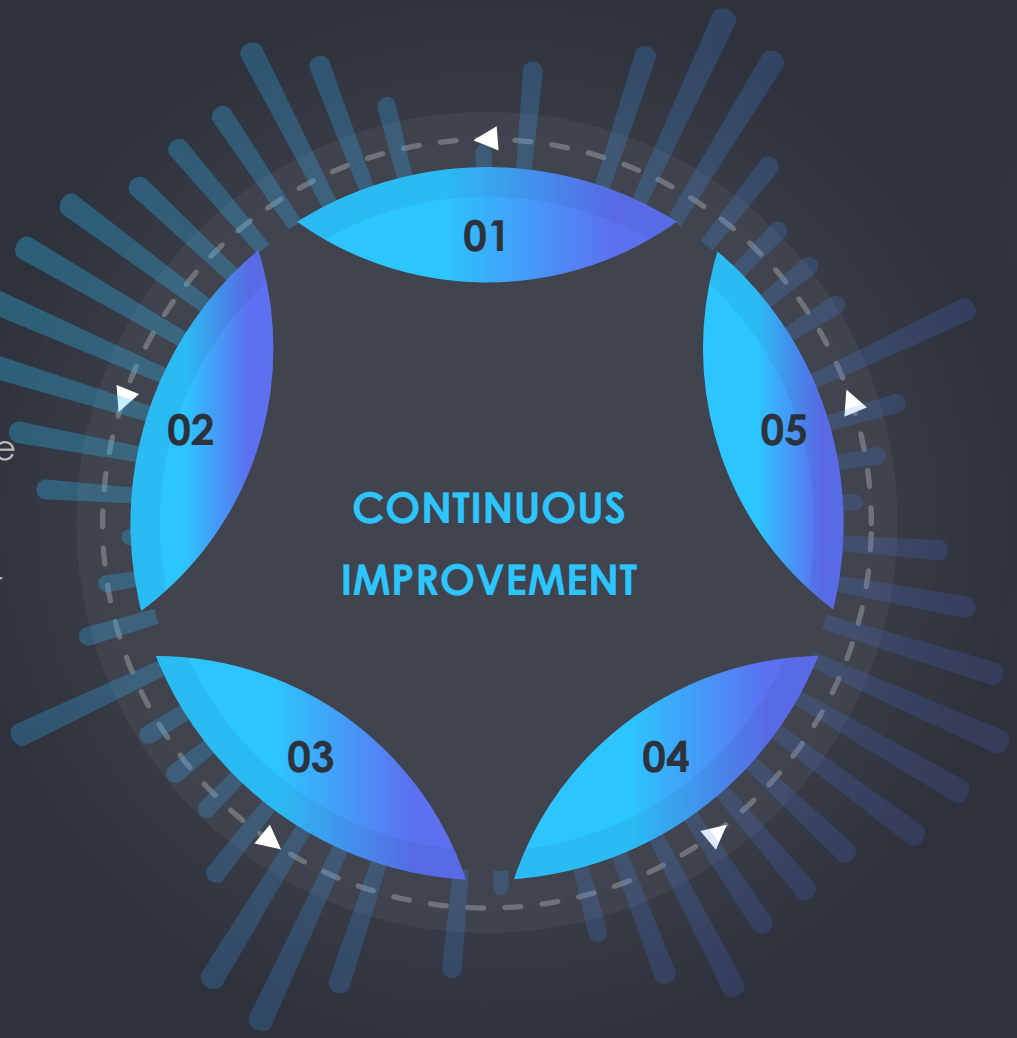
1. Reduce overspending.
2. Increase consumers budget.
3. Increase Customer satisfaction.

02 **Ideas**

1. Our metrics will be the average overspending rate and budget.
2. Run a Two-way ANOVA Test for overspending and then for the campaign budget.

03 **Implement Changes**

Optimize the algorithm by implementing best practices.



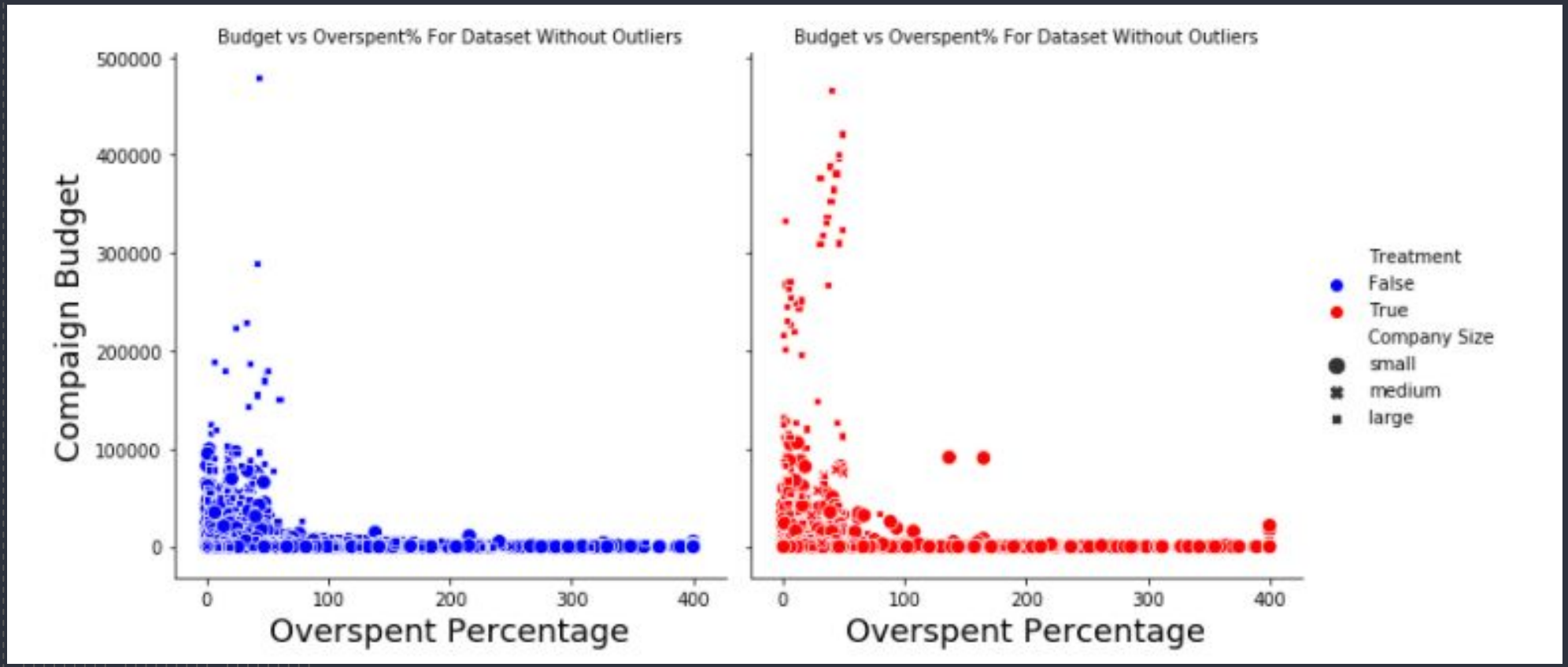
04 **Conclude Results**

Keep the main thing front and center. Analyze the results in order to draw conclusions that specifically address our goal for this experiment.

05 **Keep Testing**

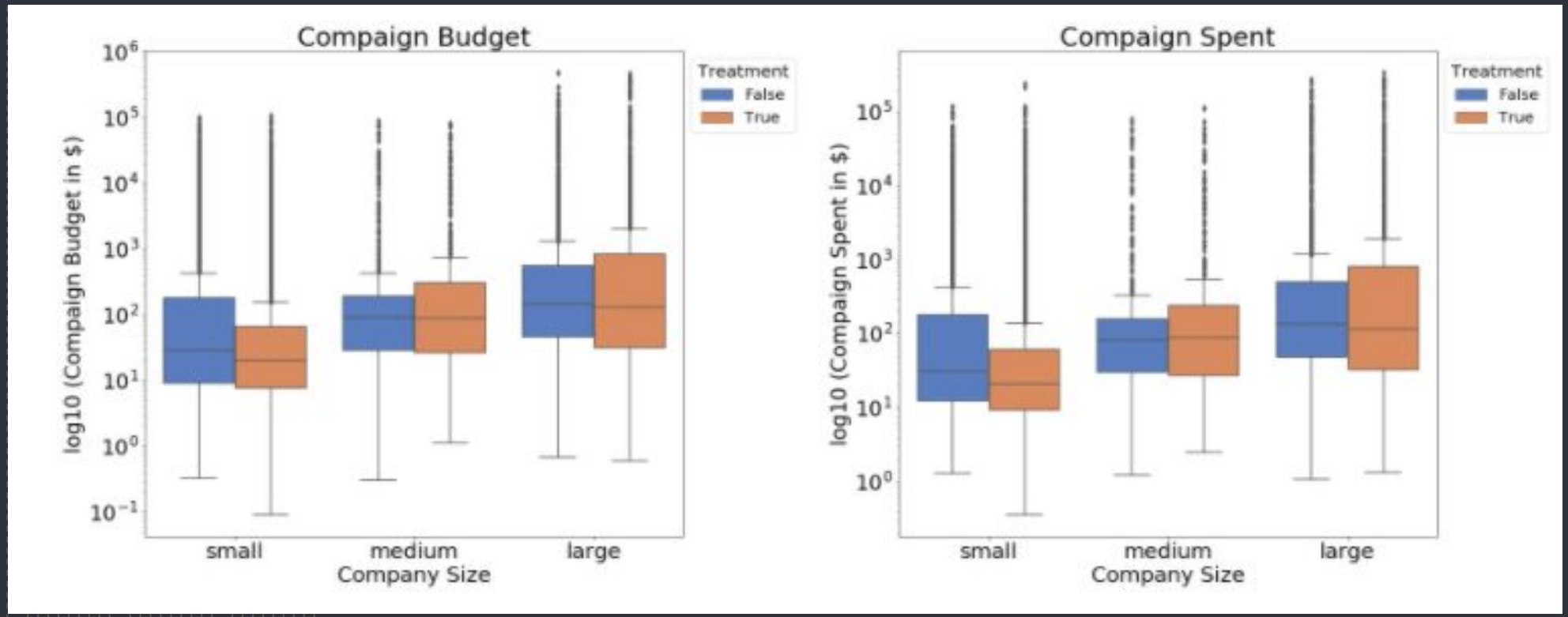
Tweak the product until the average rate of overspending is down by a substantially and statistically significant amount.

Scatter Plot of Campaign Budget vs Overspending Percentage



- Companies that spend more, have lower overspending.
- The product increased the effect of the budget on overspending percentage.

Box Plot To Visualize Interquartile Range

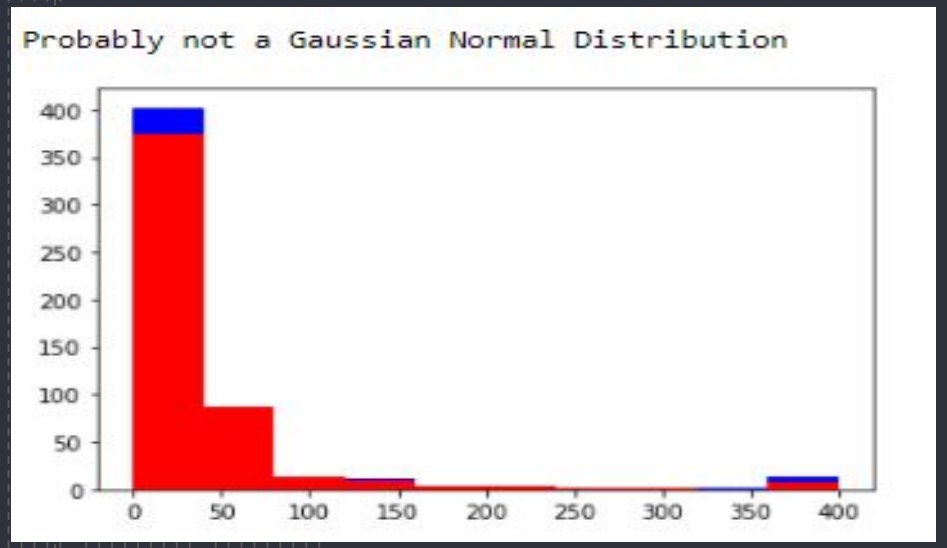


- The treatment group has a lower median budget and spending for small and larger sized companies.
- The treatment group has a larger IQR budget and spending for medium and larger sized companies.
- The treatment group has a smaller IQR budget and spending for smaller sized companies.
- Medium sized companies have roughly the same median budget and spending.

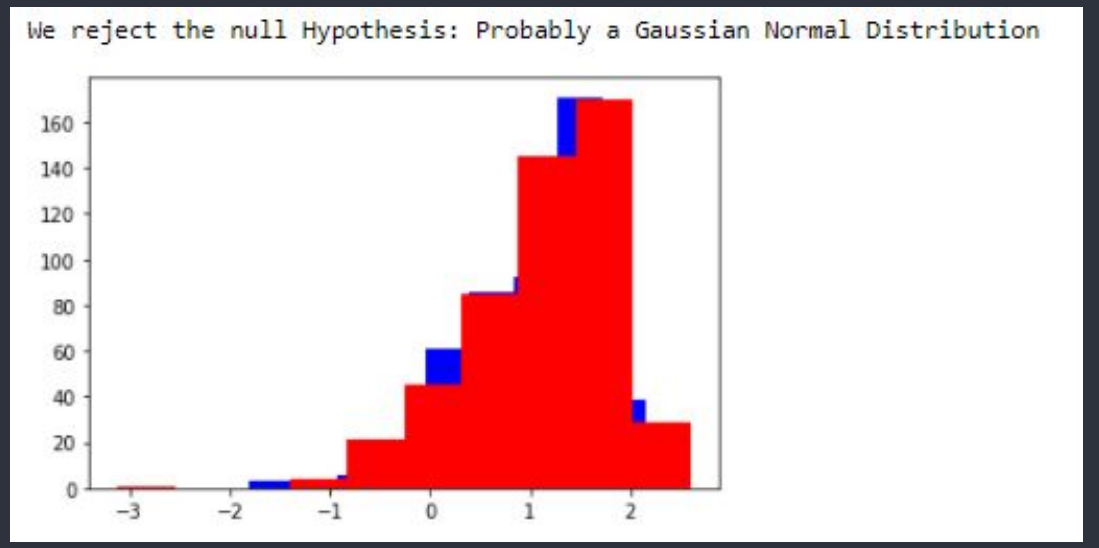
Testing For Normalization & Homogeneity

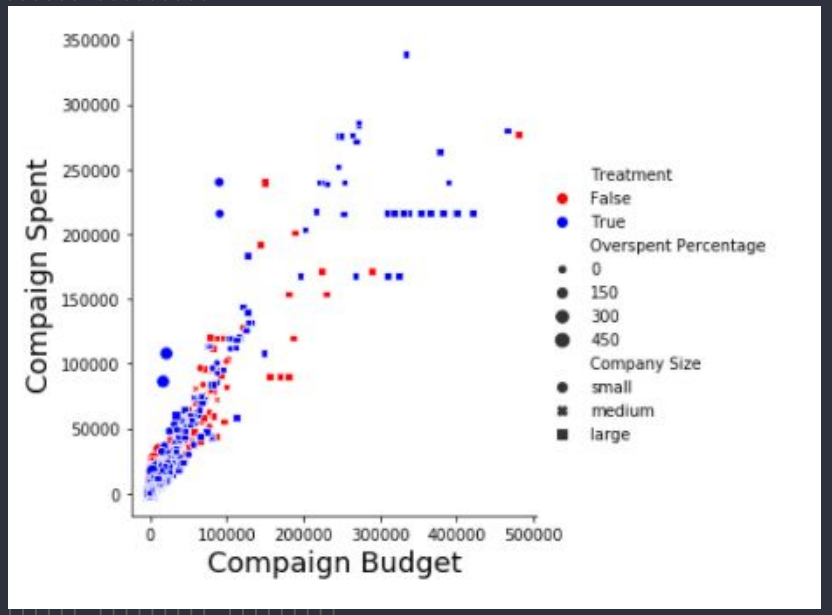
The dataset is heavily skewed to the left so a log transformation will be performed to reveal normality

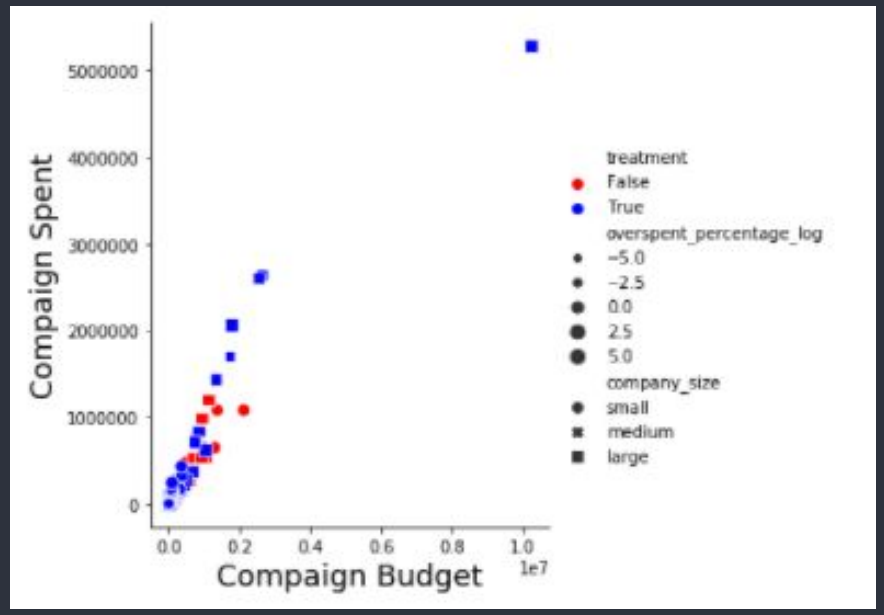
Untransformed



Log10 transformed







There's still some visual difference in variance after log transformation so the Bartlett test for homogeneity will be performed.

A/B Testing: Analyzing Overspending Means

VARIATION A

50% companies
use the product

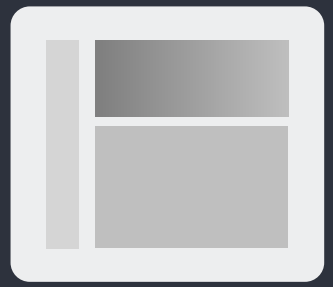
34.3%

Overspending Rate

3% Reduction In Average Overspending

VARIATION B

50% companies
don’t use the product



37.3%

Overspending Rate

A/B Testing: Analyzing Overspending Means By Company Size

Treatment/Company Size	Large	Medium	Small
CONTROL	26.2%	20.8	47.1
TREATED	22.5%	24.6	41.9
DIFFERENCE	-3.7%	+3.8%	-5.2%

Average overspending reduced by 3%

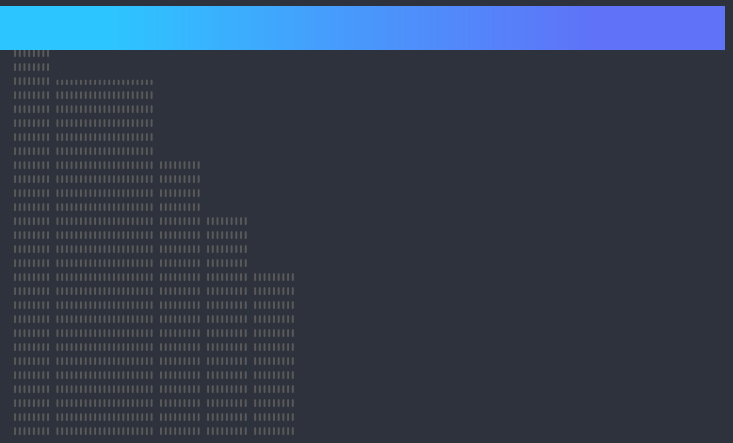
Analyzing Campaign Budget Means By Company Size

Treatment/Company Size	Large	Medium	Small
CONTROL	$5,933.96	$6,343.85	$3,538.65
TREATED	$1,7561	$4,612.67	$1,585.47
DIFFERENCE	+8668.79	-799.42	+1130.2

Average Budget went up by $8,999

Question 1

How many campaigns have overspend of greater than 1% of their budget in the control group? In the treatment group?



01

Q1. Results

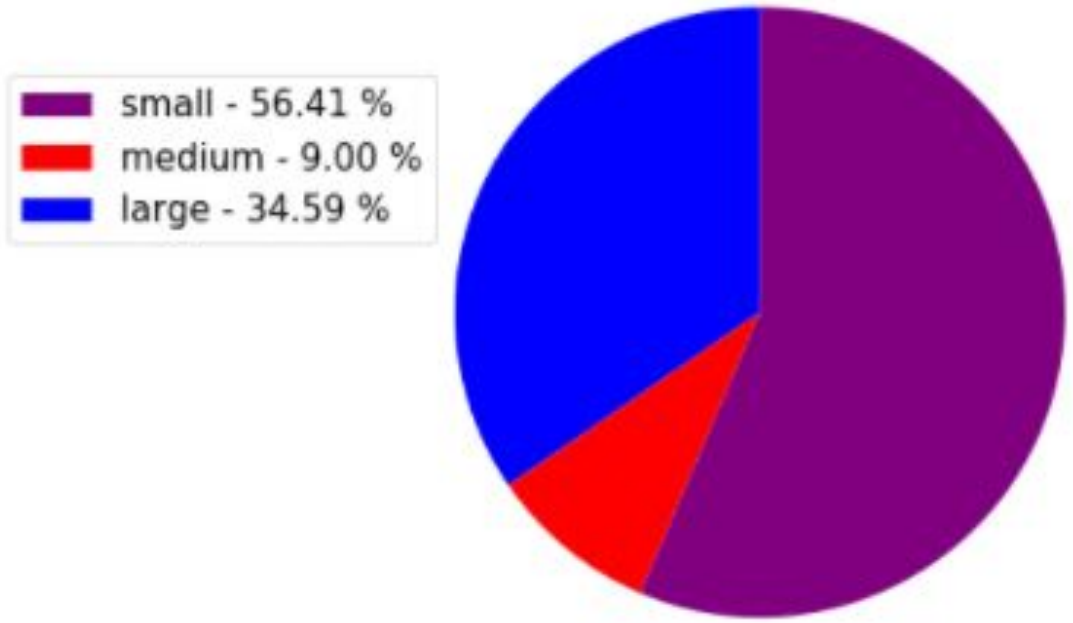
GROUPS	SMALL	MEDIUM	LARGE
CONTROL	56.41%	9.00%	34.59%
TREATED	60.02%	8.72%	31.26%

TOTAL : 14,378

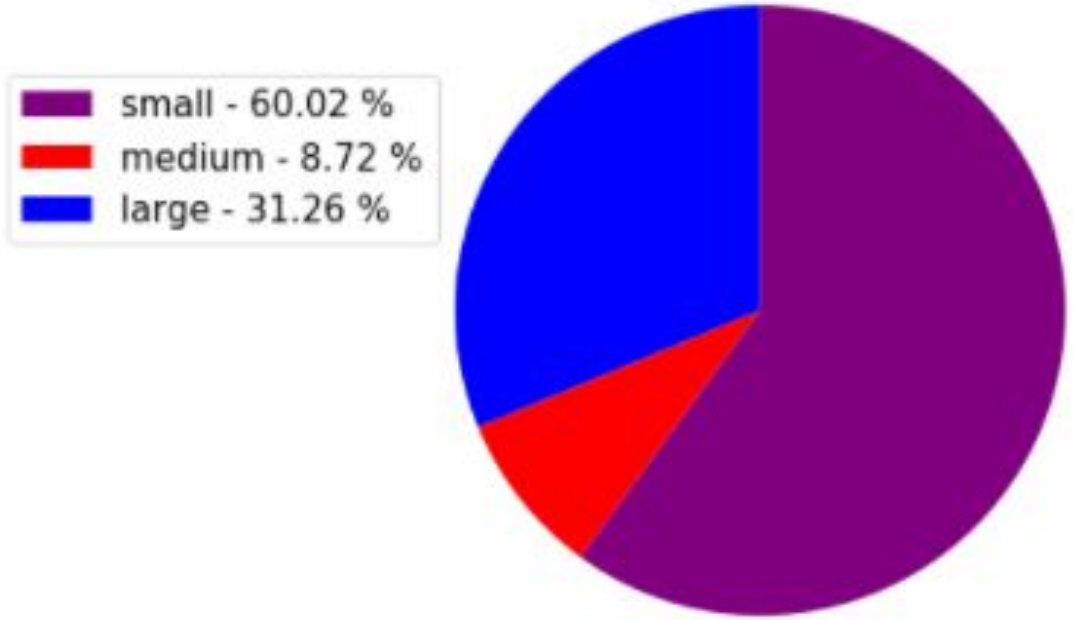
CONTROL : 7187

TREATED : 7191

Controlled Group By Company Size



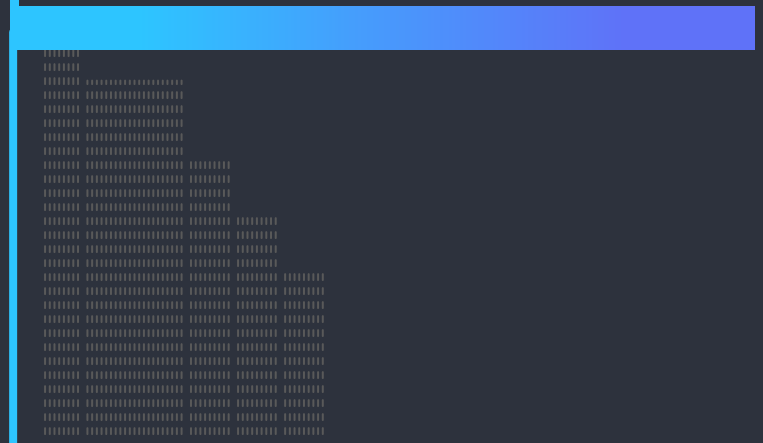
Treated Group By Company Size



Question 2

a) Was the new product effective at reducing overspending?

b) Was it more or less effective depending on the company size?

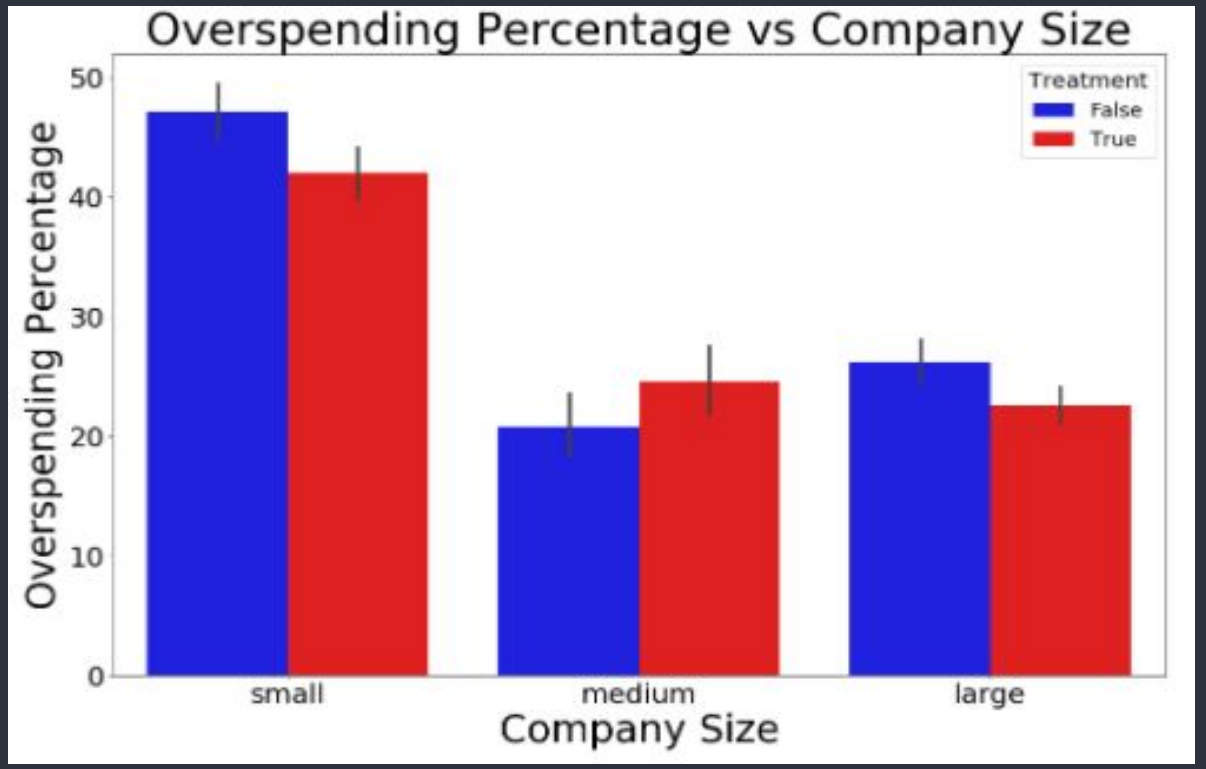


Hypothesis Testing

1st null hypothesis: The product has no effect on overspending.

2nd null hypothesis: The company size has no effect on overspending.

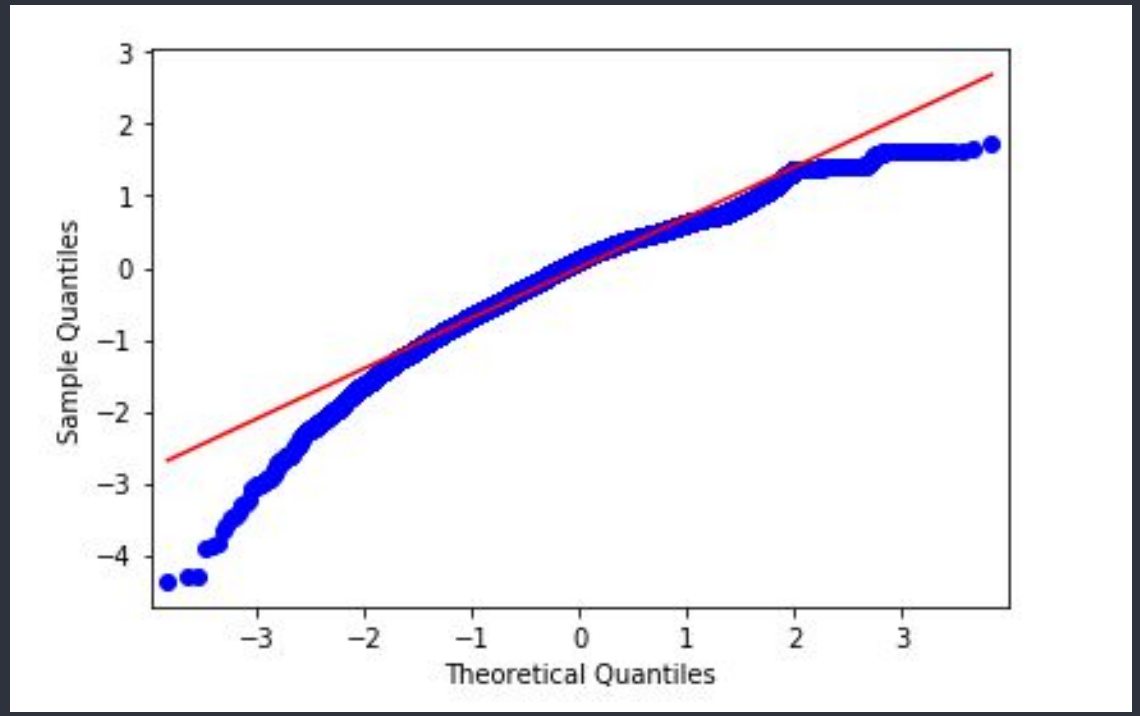
3rd null hypothesis: Interaction between the product and the company size & treatment has no effect on overspending.



Q2. A/B Testing Results: Two-Way ANOVA Pairwise TukeyHSD

VARIABLES	P-VALUE	SSE	DF	REJECT NULL HYPOTHESIS
TREATMENT	0.231	0.7	1.0	NO
COMPANY SIZE	0.000	212.5	2.0	YES
TREATMENT & COMPANY SIZE	0.001	6.7	2.0	YES

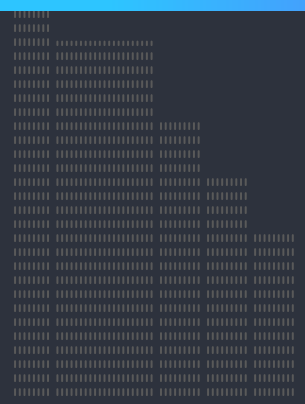
Top Interactions	No. Rejected Hypothesis
Control & Medium	5
Control & Small	4
Treatment & Small	4



Residuals Plot

Question 3

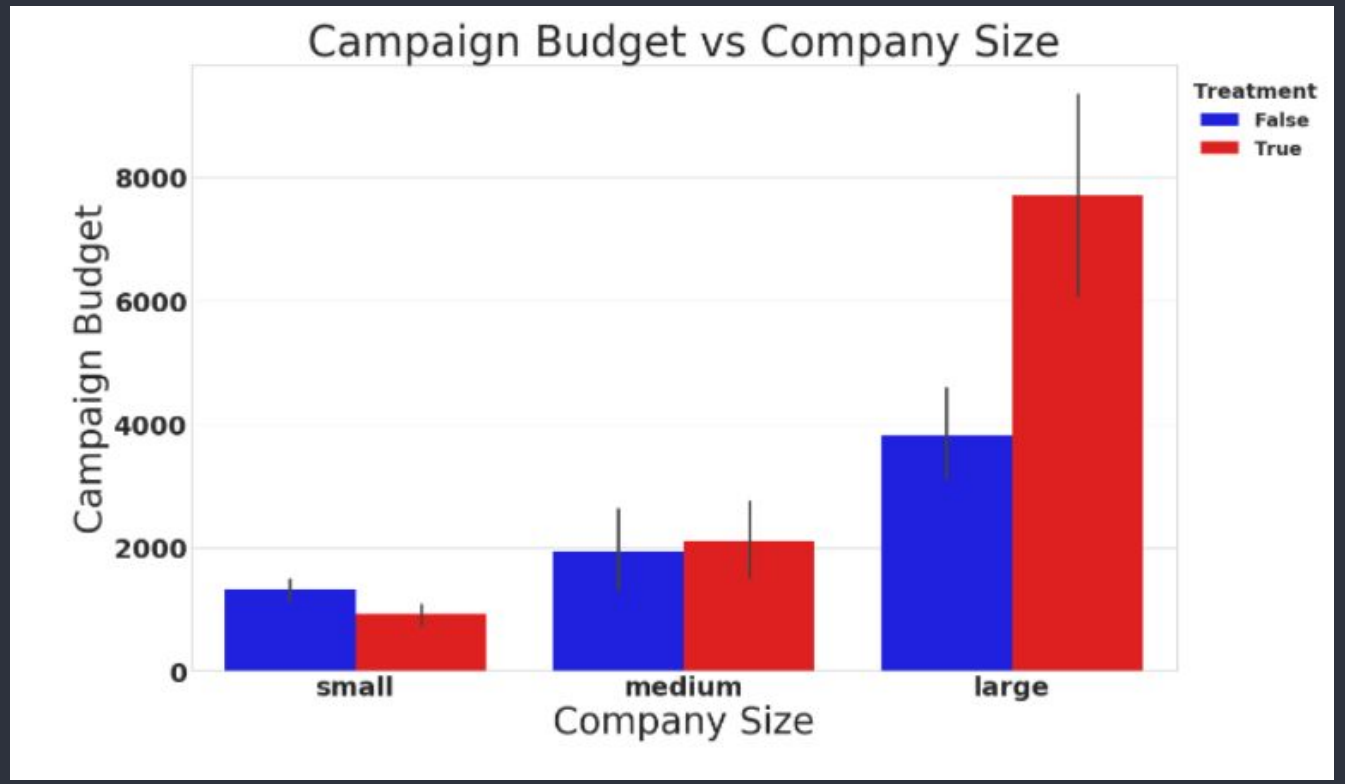
Are certain advertisers in the treatment group entering lower budgets because they are wary of the new product?



Hypothesis Testing

1st null hypothesis: The product has no effect on budget.

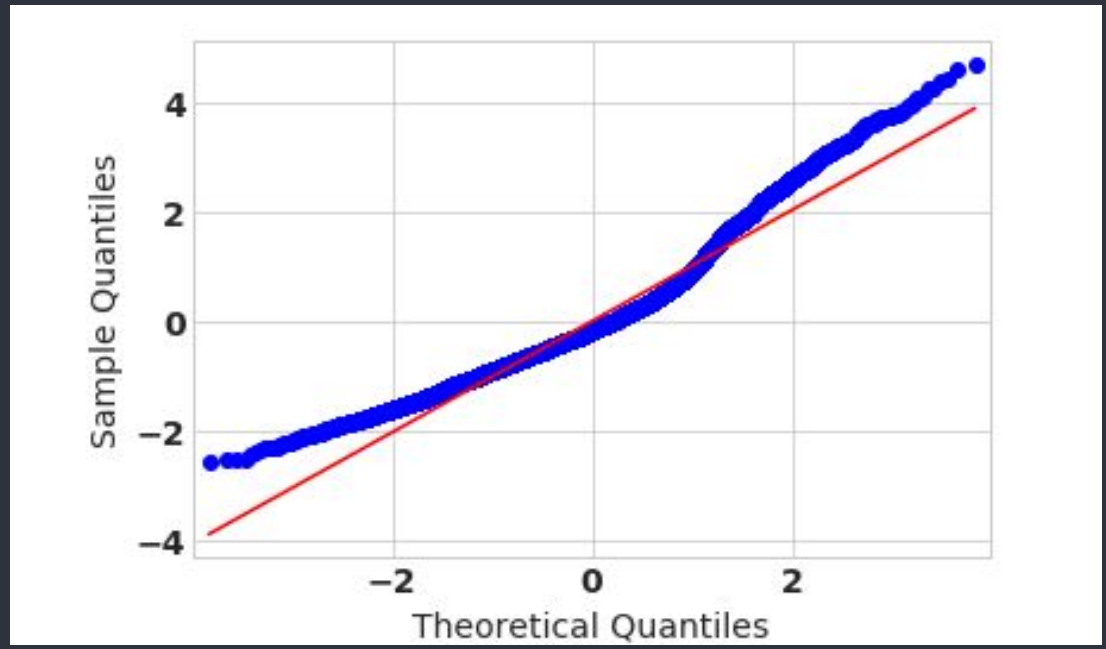
2nd null hypothesis: Interaction between the product and the company size & treatment has no effect on campaign budget.



Q3. A/B Testing Results: Two-Way ANOVA & Pairwise TukeyHSD

VARIABLES	P-VALUE	SSE	DF	REJECT NULL HYPOTHESIS
TREATMENT	0.000	52.38	1.0	YES
COMPANY SIZE	0.000	1586.06	2.0	YES
TREATMENT & COMPANY SIZE	0.000	89.21	2.0	YES

Top Interactions	No. Rejected Hypothesis
Control & Small	5
Treatment & Small	5
Control & Large	4



Residuals Plot

Conclusion

1. The product has a significant effect on the overspending rate specifically in the smaller companies. And from the visualization, it can be seen that overspending was reduced even though they significantly reduced their budget while on the new product. Average overspending did go down by 3%.
2. The product has a significant effect on the budget setting for all groups. And from the visualizing earlier, the smaller companies were the only ones to reduce their budgets while medium and larger companies increased. Average budget did go up by $8999.

Recommendation

1. Use the product only on the small companies since it reduced overspending and also the large companies since it increased their budgets.
2. Try different techniques to take care of the heteroscedasticity like the weighted regression model.
3. Test the product for an extra week specifically on the large & medium sized companies and develop better products for them.

Ari Iwunze

THANK YOU