ADOBE® TEST&TARGET™
Powered by Omniture®

Statistical Confidence Calculations

Statistical Methodology

Omniture Test&Target utilizes standard statistics to calculate confidence, confidence intervals, and lift for each campaign. The student's T-test is used for these calculations. For conversions and steps, calculations for binomial distributions are used; for all other calculations a normal distribution is assumed.

Conversion Data Calculations

Conversion Rate

Conversion rate is the number of conversions divided by the number of visitors (or visits or impressions).

$$\text{Conversion Rate (CR)} = \frac{\text{Conversions}}{\text{Visitors}}$$

Confidence

Confidence is the result of the Student's T-Test. Confidence indicates how likely it is that if the test were repeated, the same results would be found.

To calculate confidence, the standard deviation must first be determined.

Standard Deviation

Standard deviation is a measure of the spread or dispersion of a set of data. The standard deviation is simply a way to measure the dispersion of data. If many data points are close to the mean, then the standard deviation is small; if many data points are far from the mean, then the standard deviation is large. Standard deviation is also the square root of the variance.

The conversion rate results are a binomial distribution: visitors either convert or do not convert. Thus, we use the binomial distribution formula for variance:

$$\text{Variance: } \sigma^2 = \text{CR}(1-\text{CR})$$

Since standard deviation is the square root of variance, we get:

$$\text{Standard Deviation: } \sigma = \sqrt{\text{CR}(1-\text{CR})}$$

Standard Error

The standard error is the estimated standard deviation of the error. This error is the "noise" in the results. For the control experience:

$$\text{Standard Error}_{control}: \ SE = \sqrt{\frac{\sigma^2_{control}}{\text{visitors}_{control}}}$$

For alternative experiences:

$$\text{Standard Error}_{alt}: \ SE = \sqrt{\frac{\sigma^2_{control}}{\text{visitors}_{control}} + \frac{\sigma^2_{alt}}{\text{visitors}_{alt}}}$$

The standard error is then used to calculate the signal to noise ratio.

Signal to Noise Ratio

$$\frac{\text{Signal}}{\text{Noise}} = \frac{CR_{alt} - CR_{control}}{SE_{alt}}$$

Confidence

This signal to noise ratio is then used to calculate confidence. Confidence is calculated with the Student's T-Test. It is a 2-tailed distribution, and the degrees of freedom is equal to $\text{visitors}_{control} + \text{visitors}_{alt} - 2$.
In Excel this is calculated with the TDIST() function:

$$\text{Student's T Distribution} = 1 - \text{TDIST}\left(\left|\frac{\text{Signal}_{alt}}{\text{Noise}_{alt}}\right|, \text{Visitors}_{alt} + \text{Visitors}_{control} - 2, 2\right)$$

Confidence refers to the likelihood that the alternative experience's performance relative to control wasn't due to noise. This determines how confident you can be that the results would be repeated if the test were re-run.

Confidence Intervals

The confidence interval displayed in Test&Target is different than the confidence level. While the confidence level shows the likelihood that the test results were not based on noise, the confidence interval assumes a 95% confidence level and shows how much your results could vary and still be within that 95% confidence level. Essentially, this calculation describes how large the standard deviation is in an easily understood way.

The confidence interval is derived from the standard deviation and the sample size (# of visitors). The smaller the standard deviation and the larger the sample size, the narrower your confidence interval.

$$\text{Confidence Interval} = 1.96\left(\frac{\sigma_{alt}}{\sqrt{\text{Visitors}_{alt}}}\right)$$

where ±1.96 is the interval on the normal distribution curve containing 95% of the area under the curve.

Then, determine the high and low bounds for your conversion rate by adding and subtracting this confidence interval from your conversion rate:

$$\text{High Bound CR} = \text{CR} + \text{CI}$$
$$\text{Low Bound CR} = \text{CR} - \text{CI}$$

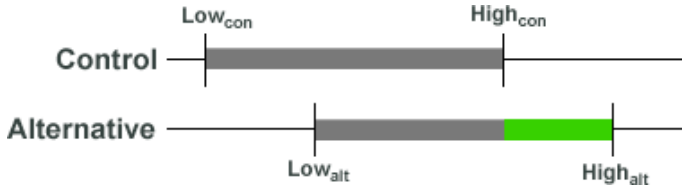
Lift

Lift is the percentage difference of your tested experience vs. control.

$$\text{Lift} = \left(\frac{\text{CR}_{\text{alt}} - \text{CR}_{\text{control}}}{\text{CR}_{\text{control}}} \right)$$

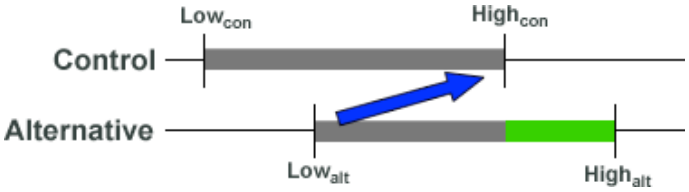
Lift Intervals

Lift intervals describe the best and worst lift a tested experience could have over control. To get this information, the high and low bound of conversion rate for control is compared to the high and low bound of conversion rate for the alternative (or tested) experience. The statistical confidence has already been applied, so no additional statistical equations are involved here.



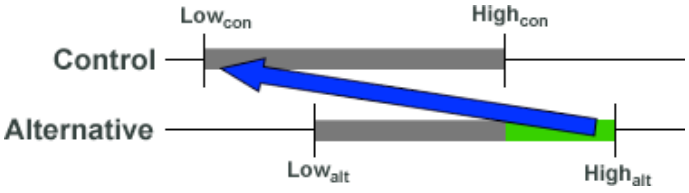
The worst lift the alternative could experience would be if the control performed at its high bound and the alternative performed at its lower bound:

$$\text{Low Bound Lift} = \text{Low}_{\text{alt}} - \text{High}_{\text{con}}$$



Conversely, the best lift the alternative could experience would be if the control performed at its low bound and the alternative performed at its high bound:

$$\text{High Bound Lift} = \text{High}_{\text{alt}} - \text{Low}_{\text{con}}$$



Revenue Data Calculations

Revenue Per Visitor

Revenue per visitor is the total sales number divided by the number of visitors (or visits or impressions).

$$\text{Revenue per Visitor (RPV)} = \frac{\text{Total Sales}}{\text{Visitors}}$$

Standard Deviation

$$\text{Standard Deviation} = \sqrt{\frac{\text{Sum of Squares}}{\text{Visitors}} - \left(\frac{\text{Total Sales}}{\text{Visitors}}\right)^2}$$

Standard Error

For revenue calculations, the standard error calculation is the same for the control and alternate experiences. This calculation is used for the signal/noise ratio.

$$\text{Standard Error} = \frac{\text{Standard Deviation}}{\sqrt{\text{visitors}}}$$

Standard Error of the Difference

This calculates the difference in performance between the alternate experience and the control.

$$\text{Standard Error of the Difference} = \sqrt{\left(\frac{\text{Standard Deviation}^2_{\text{control}}}{\text{Visitors}_{\text{control}}}\right) + \left(\frac{\text{Standard Deviation}^2_{\text{alt}}}{\text{Visitors}_{\text{alt}}}\right)}$$

Signal to Noise Ratio

$$\text{Signal to Noise}_{\text{control}} = \frac{\text{Revenue Per Visitor}_{\text{control}}}{\text{Standard Error}_{\text{control}}}$$

$$\text{Signal to Noise}_{\text{alt}} = \frac{\text{Revenue Per Visitor}_{\text{control}} - \text{Revenue Per Visitor}_{\text{alt}}}{\text{Standard Error of the Difference}_{\text{alt}}}$$

Confidence – Revenue

$$\text{Student's T Distribution} = 1 - \text{TDIST}\left(\left|\frac{\text{Signal}_{\text{alt}}}{\text{Noise}_{\text{alt}}}\right|, \text{Visitors}_{\text{control}} + \text{Visitors}_{\text{alt}} - 2, 2\right)$$

Confidence Interval

$$\text{Confidence Interval} = 1.96 * \text{Standard Error}$$

Then, determine the high and low bounds for your revenue per visitor by adding and subtracting this confidence interval from your revenue per visitor number, just like for conversion rate.

Lift

Lift is the percentage difference of your tested experience vs. control.

$$\text{Lift} = \left(\frac{\text{RPV}_{\text{alt}} - \text{RPV}_{\text{control}}}{\text{RPV}_{\text{control}}} \right)$$

Lift Intervals

The lift intervals are calculated in the same manner as for conversion rate above.

These calculations describe the derivation of all the statistical values displayed in the Test&Target reports. With these calculations, you can download the raw data directly from Test&Target or programmatically access it via the API and run your own analyses.