# Two Sample Equivalence Test for Means

Use to determine if there is statistical evidence to demonstrate that two population means are within a specified difference of each other (i.e., "equivalent").

Coating.jmp (Help > Sample Data Folder > Quality Control)

Equivalence Test for Equivalence of Two Mean

1. From an open JMP data table, select **Analyze > Fit Y by X**.
2. Select one or more continuous variables from **Select Columns**, click **Y, Response** and a categorial variable for **X, Factor**. Click **OK**. Here we chose Weight for the Response and Product for the Factor.
3. From the report window, select **Equivalence Tests > Means** under the **red triangle**.
4. Specify the the **Alpha Level** and the **difference** between the two means considered practically equivalent (i.e., Margin of Equivalence). Click **OK**. Here we chose an alpha of 0.025 (i.e., 1 - 2(0.025) = 95% Confidence Level), and a difference of +/- 3.
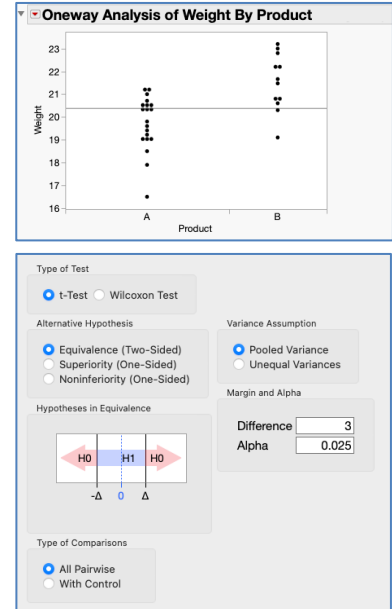
The Null and Alternative Hypothesis in this Equivalence Test is:

$H_0: \mu_A - \mu_B \leq -3$ or $\mu_A - \mu_B \geq 3$ vs. $H_A: -3 < \mu_A - \mu_B < 3$

* This approach is known as "Two One-sided t-tests" (TOST).

- Rejecting the Null Hypothesis in favor of the Alternative is concluding there is enough statistical evidence to believe the population means are within +/- 3 of each other. In other words, "They're Equivalent".
- The framework of an Equivalence Test reverses the roles of the Null and Alternative Hypothesis in a traditional hypothesis test where the hypotheses are: $H_0: \mu_A = \mu_B$ vs. $H_A: \mu_A \neq \mu_B$.
  In the traditional test, if the data does not produce enough statistical evidence to believe the Alterantive Hypothesis, it does not mean that statistical evidence was produced to believe the Null Hypothesis. Instead, the data simply did not produce enough statistical evidence to reject it.

JMP will display results of the two separate one-sided tests and $(1 - 2\alpha)$ Confidence Interval, along witih a graph comparing it to the Margin of Equivalence. The Null hypothesis is rejcted in favor of the Alternarive when the largest p-value is less than α. When this is the case, the $(1 - 2\alpha)$ Confidence Interval will be completely within the Margin of Equivalence as in this example.
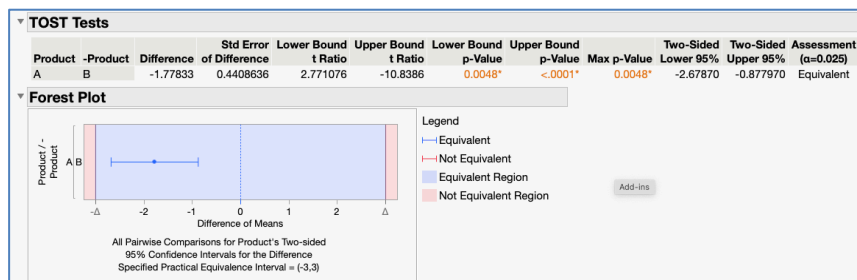
Note: Conducting a traditional two-sample t-test comparing the two means will result in a p-value of 0.003. That is, enough statistical evidence to conclude the means are not equal. The equivalence test done here provided statistical evidence that the means are not different from each other by more than 3.

Visit **Oneway Analysis > Additional Examples of the Oneway Platform > Example of an Equivalence Test** in **JMP Help** to learn more.