Print

Testing for Equal and Unequal Variances

In SAS, the equality of variance tests and the t test are all going to be grouped together in the output. You'll look at the F test for equal variances. Remember, this probability value is saying that this is the probability of getting a statistic at least this extreme, assuming the null hypothesis is true. And the null hypothesis is that the variances of the two groups are equal.

Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	6.0	7.40	0.0003
Satterthwaite	Unequal	5.8	7.40	0.0004

Equality of Variances				
Method	**Num DF**	**Den DF**	**F Value**	**Pr > F**
Folded F	3	3	1.51	0.7446

In this case, your p-value is 0.7446. Let's say α was set ahead of time to be 0.05. This p-value is certainly greater than α, so you would fail to reject the null hypothesis. You don't have enough evidence to say that the variances are unequal. Therefore, you look at the equal variance t test, or pooled t test, in terms of the means. By default, SAS shows the 95% intervals for both the pooled method, assuming equal variances for group 1 and group 2, and the Satterthwaite method, assuming unequal variances. SAS calculates a pooled t test that uses a weighted average of the two sample variances.

Here the p-value is 0.0003, less than our α, 0.05, so the means of the two groups are not equal, and you would reject the null hypothesis.

If your F statistic has the p-value 0.0185 for your equality of variance test, which is less than your α, then you would reject the null hypothesis. You have reason to believe that the variances are not equal. Therefore, you would look at the unequal variance t test, which is referred to as the Satterthwaite approximation, and look at the p-value 0.0320 to test the group means. SAS calculates a Satterthwaite t test that compensates for unequal variances and enables you to move forward with the equality of means test when the variances are not equal.

In this case, again, the conclusion for the mean is that the means are not equal, especially if α is 0.05.

As an important side note, if you were to choose the equal variance t test in this case, you would not reject the null hypothesis at the 0.05 level. This shows the importance of choosing the appropriate t test. We also verify this assumption, as it pertains to our data, in the demonstration.

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