2 Independent Samples

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Variances equal

$$t = \frac{\overline{x_1} - \overline{x_2}}{s\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}$$

Variances Unequal

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

$H_0: \mu_1 = \mu_2$ $H_1: \mu_1 \neq \mu_2$

```
    ...: result = ttest_ind(chilled['uptake'],
nonchilled['uptake'],
    ...:                    equal_var=True)
    ...: test_stat = result[0]
    ...: p_value = result[1]
    ...: print("Test Statistic =", test_stat)
    ...: print("P - Value =", p_value)
Test Statistic = -3.0484611149819503
P - Value = 0.00309573325254164 84 < 0.05
```

∴ We reject H_0

$H_0: \mu_{chilled} \geq \mu_{non-chilled}$ $H_1: \mu_{chilled} < \mu_{non-chilled}$

```
    ...: result = ttest_ind(chilled['uptake'], nonchilled['uptake'],
    ...:                    alternative="less", equal_var=True)
    ...: test_stat = result[0]
    ...: p_value = result[1]
    ...: print("Test Statistic =", test_stat)
    ...: print("P - Value =", p_value)
Test Statistic = -3.0484611149819503
P - Value = 0.0015478666262708242 < 0.05
```

∴ We reject H_0 at 5% l.o.s.

Conclusion :- Mean of chilled may be less than mean of nonchilled

Puromycin

$H_0: \sigma_1^2 = \sigma_2^2$ $H_1: \sigma_1^2 \neq \sigma_2^2$

```
In [35]: result = bartlett(treated['rate'], untreated['rate'])
    ...: test_stat = result[0]
    ...: p_value = result[1]
    ...: print("Test Statistic =", test_stat)
```

```
In [35]: result = bartlett(treated['rate'], untreated['rate'])
    ...: test_stat = result[0]
    ...: p_value = result[1]
    ...: print("Test Statistic =", test_stat)
    ...: print("P - Value =", p_value)
Test Statistic = 1.3347300574703427
P - Value = 0.2479654757261583
```

> 0.05

Conclusion :- Variances may be equal

$H_0: \mu_1 = \mu_2$ $H_1: \mu_1 \neq \mu_2$

```
    ...: result = ttest_ind(treated['rate'],
untreated['rate'],
    ...:                    equal_var=True)
    ...: test_stat = result[0]
    ...: p_value = result[1]
    ...: print("Test Statistic =", test_stat)
    ...: print("P - Value =", p_value)
Test Statistic = 1.6112266721746469
P - Value = 0.1220595563419023
```

> 0.05

Means May be equal

Mann-Whitney U Test

Test is for 2 independent Samples
Test does not assume any specific distribution of population
It is a non-parametric test.