The Mood test :

In parametric statistical inference the F test is used to test the ~~nu~~ null by hypothesis that two population dispersion parameters are equall. In the parametric case the measures of dispersion are the two population variances usually designated σ_1^2 and σ_2^2. The F test however is not very reliable when the population of interest are not normally distributed. We discuss the two distribution free alternations to the free parameters. A F test to testing the equality of dispersion parameter.

The first test assume that two unknown population median are equal. (mood test) while. The second does not depend on the assumption. (Moses test).

The Mood test :

The first test for dispersion we consider is one proposed by Mood.

Assumption :

The data consist of two random sample $x_1, x_2, \ldots x_n$ and $y_1, y_2, \ldots y_n$ from population One and two respectively $\Rightarrow n_1 < n_2$

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The population distribution are continuous.
The two samples are independent.
The data are measured on at least ordinal scale.
The two population are identical (including equal median) except for a possible difference in dispersion

→ Hypothesis

If we denote the dispersion prameter of popⁿ one and two by σ_1 and σ_2 respectively. we may test the following null hypothesis against their respective alternatives.

The two samples are independent
The data are measured on at least ordinal scale.
The two popⁿ are identical (including equal median) except for a possible difference in dispersion

Hypothesis:-

~~Ho:~~ if we denot the dispersion parameter of popⁿ one and two by σ_1 and σ_2 respectively, we may test the following null hypothesis against there respective alternative.

a) $H_0 = \sigma_1 = \sigma_2$
$H_1 = \sigma_1 \neq \sigma_2$ } two sided

b) $H_0: \sigma_1 \leq \sigma_2$
$H_1: \sigma_1 > \sigma_2$

$H_0: \sigma_1 \geq \sigma_2$
c) $H_1: \sigma_1 < \sigma_2$

⇒ The Symbol σ should interpreted not as the pop S.D but as a ~~as general~~ general measure of dispersion.

Test - Statistic:-

$$M = \sum_{i=1}^{n} \left(r_i - \frac{N+1}{2} \right)^2$$

where

$N = n_1 + n_2$ and r is the rank of ith observation of x in the joint ranking of the X and Y

M ... the mean of ranks assigns to the ... observations when the X and Y observations are combined and rank in order of magnitude from smaller to larger.

Decision

Suffeciently for small value of M causes us to reject null hypothesis a and c and suffeciently large value of M causes us to reject null hypotheses a and b.

The objective of this test is to determine whether M is small or large to cause us to reject Ho.

Decision:

(a) For the two sided test Reject Ho at the α level of significence approximely equal to α if

The computed value of M less then or equal to M'. $M' = \alpha$

if the computed M is greater then or equal to M''

$M'' = 1-\alpha$

(a) $M \leq M'_{\frac{\alpha}{2}}$ $M \geq M''_{1-\frac{\alpha}{2}}$

(b) For one sided test we reject Ho at α level of significence approximely equal to α if computed M is greater then or equal to M''.

b) $M \geq M''_{1-\alpha}$ ~~$M \leq M'_{\alpha}$~~

(c) For one sided test we reject Ho at α level of significence approximately equal to α if computed M is less then or equal to M'

c) $M \leq M'_{\alpha}$ ~~$M \geq M''_{1-\alpha}$~~

Example.

Given the data of two groups X and Y. we wish to know whether the dispersion with respect to the variable of interest is different in the two popⁿ represented by these sample and $\alpha = 0.05$?

X		Y	
3.84	8	3.97	9
2.62	5	2.5	4
1.19	1	2.70	6
2	2	3.36	7
		2.30	3

$H_0: \sigma_1 = \sigma_2$

$H_1: \sigma_1 \neq \sigma_2$

Test - Statistic:-

$$M = \sum_{i=1}^{n_1} \left(x - \frac{N+1}{2}\right)^2$$

$$= \frac{N+1}{2}$$

$$= \frac{n_1+n_2+1}{2}$$

$$= \frac{10}{2}$$

$$= 5$$

$$= \Sigma (1-5)^2 + (2-5)^2 + (5-5)^2 + (8-5)^2$$

$$= 16 + 9 + 0 + 9$$

$$M = 34$$

$M' = \frac{\alpha}{2}$

Decision:-

Tabulated value

M' and M''

$M' = 6$ $M'' = 45$

$6 < 34 < 45$

So we do not reject null hypothesis and conclude that the two popⁿ dispersion parameter may be equal