Fmax Test: (a.k.a. Hartley's test) $H_o: \sigma_1^2 = \sigma_2^2$ vs. $H_a: \sigma_1^2 \neq \sigma_2^2$ (for 2 samples)

$F_{\max,s} = s^2_{\max} / s^2_{\min}$ $df = n^* - 1$ where $n^* = \max(n_1, n_2)$

Brown & Forythe's HOV Test $H_o: \sigma_1^2 = \sigma_2^2$ vs. $H_a: \sigma_1^2 \neq \sigma_2^2$ (for 2 samples)

- Uses recoded data: $z_{1j} = | x_{1j} - \tilde{x}_1 |$, $z_{2j} = | x_{2j} - \tilde{x}_2 |$ where $\tilde{x}_i$ is the median of sample *i*.
- →H_o: *"deviations from the median are the same in the 2 populations"*

$$F_{B\&F} = \frac{MST}{MSE} = \frac{\sum_{i=1}^{2} n_i (\bar{z}_{i\cdot} - \bar{z}_{\cdot\cdot})^2 / (2-1)}{\sum_{i=1}^{2} \sum_{j=1}^{n_i} n_i (z_{ij} - \bar{z}_{i\cdot})^2 / (N-2)} = \left(\frac{\bar{z}_1 - \bar{z}_2}{SE_{\bar{z}_1 - \bar{z}_2}} \right)^2$$ is defined in chapter 4 *(here with t=2)*

$$T_{B\&F} = \sqrt{F_{B\&F}} = \frac{\bar{z}_1 - \bar{z}_2}{SE_{\bar{z}_1 - \bar{z}_2}}$$ with $df = n_1 + n_2 - 2$ (Note: This is just an equal variance *T*-statistic with s_p^2 in the *SE*)

Rejection Region at the α level of significance: $| T_{B\&F} | \geq t_{\alpha/2,\ n_1+n_2-2}$

- This test is more *robust* to non-normal populations than the Fmax test.
- The text refers to this as ***Levene's (med) test***, but Levene originally used $z_{1j} = | x_{1j} - \bar{x}_1 |$ with $\bar{x}$ rather than $\tilde{x}$

Results for: ch6-1-MouseDiet-v1-1.jmp (Cholesterol reduction after 21 days on a special diet: 14 mice/group)

Oneway Analysis of Z(median) By Diet ($z_{1j} = | x_{1j} - \tilde{x}_1 |$, $z_{2j} = | x_{2j} - \tilde{x}_2 |$)

t Test (Oat-Bean)
Assuming equal variances

Difference	1.5262	t Ratio	0.79695
Std Err Dif	1.9151	DF	26
		Prob > |t|	0.4327

Oneway Analysis of Reduction By Diet
Tests that the Variances are Equal

Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
Bean	14	6.122964	5.045698	4.948514
Oat	14	9.163964	6.483653	6.474729

Test	F Ratio	DFNum	DFDen	p-Value
Brown-Forsythe**	0.6351	1	26	0.4327
Levene	0.5934	1	26	0.4480

**the text calls this test based on $z_{1j} = | x_{1j} - \tilde{x}_1 |$ Levene's (med) Test

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Example:

x1	x2	z1	z2
3	2		
5	6		
6	14		

$T_{B\&F} = 1.26, \quad pvalue = .276$