



Topic: 1.8 – F distributions

**F-Test**

To test whether there is any significant difference between two population variance.

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

Los: 1% or 5%

Dof:  $V_1 = n_1 - 1$      $V_2 = n_2 - 1$

**Test Statistics**

$$F = \frac{S_1^2}{S_2^2} = \frac{\text{Greater variance}}{\text{Smaller variance}}$$
$$= S_2^2 / S_1^2$$
$$S_1^2 = \frac{\sum (x_1 - \bar{x}_1)^2}{n_1 - 1}$$
$$S_2^2 = \frac{\sum (x_2 - \bar{x}_2)^2}{n_2 - 1}$$

$S_1^2 > S_2^2$  (or)  $S_2^2 > S_1^2$



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**Problems:-**

1. In one sample of 10 observations from a normal population, the sum of the squares of the deviations of the sample values from the sample mean is 102.4 and in another sample of 12 observations from another normal population, the sum of the squares of the deviations of the sample values from the sample mean is 120.5. Examine whether the two normal population

have the same variance. (54)

$$n_1 = 10 \quad n_2 = 12$$
$$\sum (x_1 - \bar{x}_1)^2 = 102.4 \quad \sum (x_2 - \bar{x}_2)^2 = 120.5$$
$$S_1^2 = \frac{\sum (x_1 - \bar{x}_1)^2}{n_1 - 1} \quad S_2^2 = \frac{\sum (x_2 - \bar{x}_2)^2}{n_2 - 1}$$
$$= \frac{102.4}{9} \quad = \frac{120.5}{11}$$
$$= 11.37 \quad = 10.95$$
$$S_1^2 > S_2^2$$



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$$\begin{aligned}H_0 &: \sigma_1^2 = \sigma_2^2 \\H_1 &: \sigma_1^2 \neq \sigma_2^2 \\ \text{LOS} &= 5\% \\ \text{Dof } V_1 &= n_1 - 1 = 9 \quad V_2 = n_2 - 1 = 11 \\ \text{Test statistics.} \\ F &= \frac{S_1^2}{S_2^2} = \frac{11.37}{10.95} = 1.038\end{aligned}$$

$$\begin{aligned}\text{Critical Value.} \\ \alpha &= 5\% \quad V_1 = 9 \quad V_2 = 11 \\ F_\alpha &= 2.90 \\ \text{Conclusion: } & \text{C.V } T.V \\ & 1.132 < 2.90 \\ & H_0 \text{ accepted.}\end{aligned}$$