M33G: September 19th, 2025.

F-Distribution.

Def'n. Let U and V be chi-squared r.v.s w/ ν_1 and ν_2 degrees of freedom, resp., and independent.

Then, the r.v.

$$F = \frac{U/\nu_1}{V/\nu_2}$$

is said to be F-distributed w/ ν_1 numerator df and ν_2 denominator df.

We write $\boxed{F \sim F(\nu_1, \nu_2) \sim F_{\nu_1, \nu_2}}$

Theorem. Let two independent random samples of size n_1 and n_2, resp., be draw from two normal population w/ variances σ_1^2 and σ_2^2, resp.

Say, the two sample variances are denoted by S_1^2 and S_2^2, resp.

Then, the statistic

$$F = \frac{S_1^2/\sigma_1^2}{S_2^2/\sigma_2^2} \sim F(n_1 - 1, n_2 - 1)$$

Corollary. If $\sigma_1 = \sigma_2$, then $\boxed{F = \frac{S_1^2}{S_2^2} \sim F(n_1 - 1, n_2 - 1)}$

$$S^2 = \frac{1}{\underset{n-1}{\cancel{n}}} \sum_{i=1}^{n} (x_i - \bar{x})^2$$

$+\mu - \mu$

$$\frac{S^2}{\sigma^2} = \frac{1}{n-1} \sum_{i=1}^{n} \frac{(x_i - \bar{x})^2}{\sigma^2}$$

Add link to derivation!