Last Part: F distribution

Motivation: We wanted to compare σ_1^2 and σ_2^2 by comparing S_1^2 and S_2^2

$N(\mu_1, \sigma^2)$ and $N(\mu_2, \sigma^2)$

$\sigma_1^2 = \sigma_2^2$

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

$\chi^2(n_1-1)$ ← numerator

$\chi^2(n_2-1)$ ← denominator

In defining the F-dist, we start with two χ^2-distributions.

Def. Let $U \sim \chi^2(r_1)$, $V \sim \chi^2(r_2)$

$U \perp V$. Define $W = \frac{(U/r_1)}{(V/r_2)}$

W is called $F(r_1, r_2)$ "F-distribution with r_1 and r_2 degrees of freedom"