Math 5090

9/14/2016

Suppose you have a random sample of size 4 from each of two populations that are N(0, σ_1^2) and N(0, σ_2^2). Assume that these random samples are independent from one another. If the outcome of the sample variances are 2 and 3 respectively, find an 80% equal tailed confidence interval for σ_1^2/σ_2^2. You may use the standard notation for percentiles in your answer.

Write an appropriate probability statement.

$$.80 = P\left(f_{.10}(3,3) < \frac{\sigma_1^2}{\sigma_2^2}\ \frac{S_2^2}{S_1^2} < f_{.90}(3,3)\right)$$

Rewrite the statement to isolate σ_1^2/σ_2^2.

$$= P\left(\frac{S_1^2}{S_2^2} f_{.10}(3,3) < \frac{\sigma_1^2}{\sigma_2^2} < \frac{S_1^2}{S_2^2} f_{.90}(3,3)\right)$$

Write the random interval.

$$\left(\frac{S_1^2}{S_2^2} f_{.10}(3,3),\ \frac{S_1^2}{S_2^2} f_{.90}(3,3)\right)$$

Write the outcome of the random interval (i.e. confidence interval).

$$\left(\frac{2}{3} f_{.10}(3,3),\ \frac{2}{3} f_{.9}(3,3)\right)$$

Note that a tighter interval could be obtained by using the fact that $\mu_1 = \mu_2 = 0$. This would use $\frac{\sum X_i^2}{n}$ rather than S^2.