

1. Here is the probability statement for the confidence limits on a variance:

$$P\{L_{lower} \leq \sigma^2 \leq L_{upper}\} = 1 - \alpha$$

$$P\left\{\frac{(n-1)s^2}{(X^2_{\alpha/2[n-1]})} \leq \sigma^2 \leq \frac{(n-1)s^2}{(X^2_{1-\alpha/2[n-1]})}\right\} = 1 - \alpha$$

$$P\left\{\frac{36 \cdot 0.01082}{(54.4373)} \leq \sigma^2 \leq \frac{36 \cdot 0.01082}{(21.3359)}\right\} = 1 - 0.05$$

Using a value of $\alpha = 5\%$, compute the upper and lower limit on the variance in glutamic acid in chimpanzees (Data from exercise 8.1 in Sokal and Rohlf 2012).

$n = 37$ $s^2 = 0.01082$

$1 - \alpha/2$	$X^2_{df=36}$	$X^2_{df=37}$	$X^2_{df=38}$	$X^2_{df=39}$
0.025	21.3359	22.1056	22.8785	23.6543
0.050	23.2686	24.0749	24.8839	25.6954
0.100	25.6433	26.4921	27.3430	28.1958
0.900	47.2122	48.3634	49.5126	50.6598
0.950	50.9985	52.1923	53.3835	54.5722
0.975	54.4373	55.6680	56.8955	58.1201

$L_{lower} =$ 0.007155

$L_{upper} =$ 0.01826

Difference is 0.0111

2. If you increase the sample size n from 37 to 40, what happens to $X^2_{\alpha/2[n-1]}$?

It becomes larger

3. If you increase the sample size n from 37 to 40, does the confidence limit increase or decrease ?

It decreases from 0.0111
to $[0.01784 - 0.00726] = 0.01058$