Suppose that S^2 is the sample variance based on a sample of size n from a normal population with unknown mean and variance.

1. Derive a $100(1 - \alpha)\%$ upper confidence limit for σ^2.

2. Derive a $100(1 - \alpha)\%$ lower confidence limit for σ^2.

Review A $100(1-\alpha)\%$ Confidence Interval for σ^2 !?

Since $\dfrac{(n-1)S^2}{\sigma^2}$ has $\chi^2_{(n-1)}$

Therefore $P\left(\chi^2_{1-\frac{\alpha}{2}} \leq \dfrac{(n-1)S^2}{\sigma^2} \leq \chi^2_{\frac{\alpha}{2}}\right) = 1-\alpha$

Then $P\left(\dfrac{(n-1)S^2}{\chi^2_{\frac{\alpha}{2}}} \leq \sigma^2 \leq \dfrac{(n-1)S^2}{\chi^2_{1-\frac{\alpha}{2}}}\right) = 1-\alpha$

1. $100(1-\alpha)\%$ Upper confidence limit for σ^2 is $\dfrac{(n-1)S^2}{\chi^2_{1-\frac{\alpha}{2}}}$

2. $100(1-\alpha)\%$ lower confidence limit for σ^2 is $\dfrac{(n-1)S^2}{\chi^2_{\frac{\alpha}{2}}}$