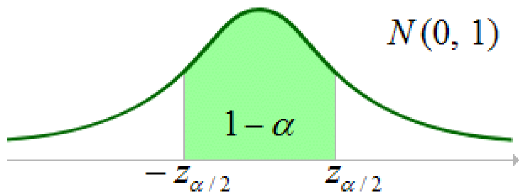
Confidence interval estimation

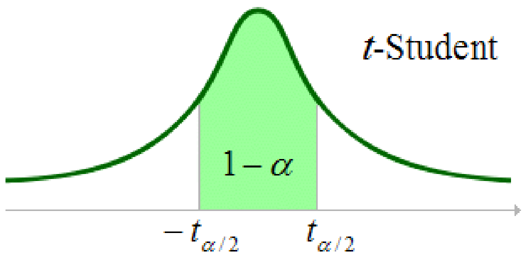
Mean of population
(known population variance)

$$\mu \in \left(\bar{x} - z_{\frac{\alpha}{2}} \frac{\sigma}{\sqrt{n}} \; , \; \bar{x} + z_{\frac{\alpha}{2}} \frac{\sigma}{\sqrt{n}} \right)$$



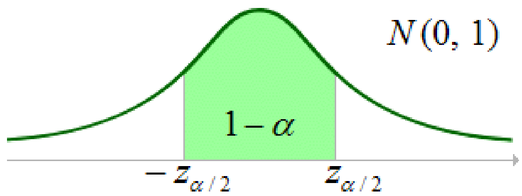
Mean of population
(unknown population variance)

$$\mu \in \left(\bar{x} - t_{\left(\frac{\alpha}{2}, n-1\right)} \frac{S}{\sqrt{n}} \; , \; \bar{x} + t_{\left(\frac{\alpha}{2}, n-1\right)} \frac{S}{\sqrt{n}} \right)$$



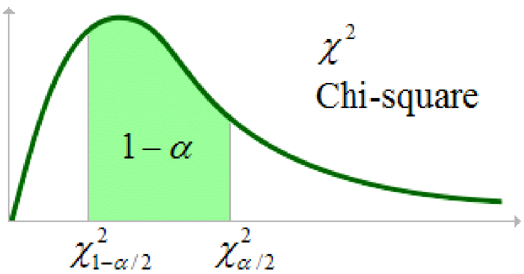
Ratio of population

$$p \in \left(\hat{p} - z_{\frac{\alpha}{2}} \sqrt{\frac{\hat{p}\,(1-\hat{p})}{n}} \; , \; \hat{p} + z_{\frac{\alpha}{2}} \sqrt{\frac{\hat{p}\,(1-\hat{p})}{n}} \right)$$



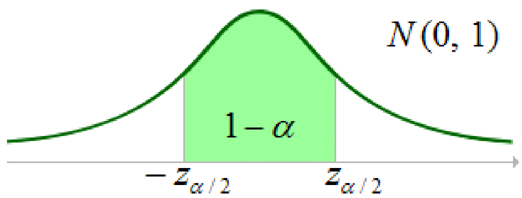
Variance of population

$$\sigma^2 \in \left(\frac{(n-1)\,S^2}{\chi^2_{\left(\frac{\alpha}{2}, n-1\right)}} \; , \; \frac{(n-1)\,S^2}{\chi^2_{\left(1-\frac{\alpha}{2}, n-1\right)}} \right)$$



Mean difference of two populations
(known population variances)

$$\mu_1 - \mu_2 \in \left(\bar{x}_1 - \bar{x}_2 \; \pm \; z_{\frac{\alpha}{2}} \sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}} \right)$$



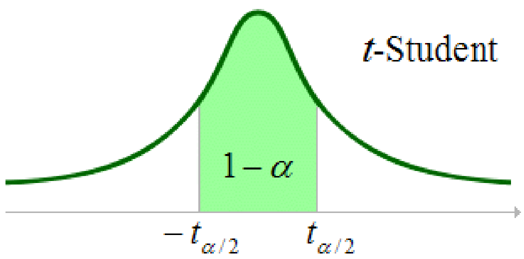
Mean difference of two populations
(unknown and equal population variances)

$$\mu_1 - \mu_2 \in \left(\bar{x}_1 - \bar{x}_2 \; \pm \; t_{\left(\frac{\alpha}{2},\, n_1+n_2-2\right)} S_P \sqrt{\frac{1}{n_1} + \frac{1}{n_2}} \right)$$

Where: $S_P^2 = \dfrac{(n_1-1)\,S_1^2 + (n_2-1)\,S_2^2}{n_1 + n_2 - 2}$

(Pooled variance of the samples)

$$\sigma_1^2 = \sigma_2^2$$

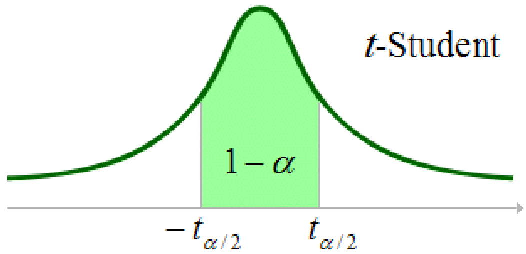


Mean difference of two populations
(unknown and different population variances)

$$\mu_1 - \mu_2 \in \left(\bar{x}_1 - \bar{x}_2 \ \pm\ t_{\left(\frac{\alpha}{2},\, \nu\right)} \sqrt{\frac{S_1^2}{n_1} + \frac{S_2^2}{n_2}} \right)$$

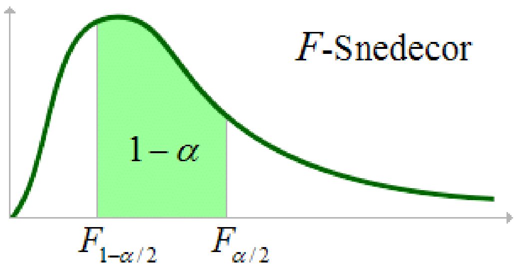
Where: $$\nu \approx \frac{\left(S_1^2/n_1 + S_2^2/n_2\right)^2}{\frac{\left(S_1^2/n_1\right)^2}{n_1 - 1} + \frac{\left(S_2^2/n_2\right)^2}{n_2 - 1}}, \quad \sigma_1^2 \neq \sigma_2^2$$

(Welch approximation)



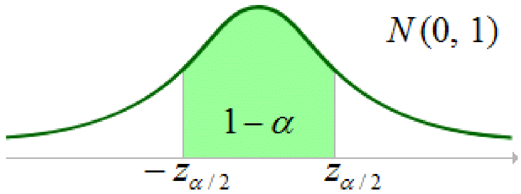
Variance ratio of two populations

$$\frac{\sigma_1^2}{\sigma_2^2} \in \left(\frac{S_1^2}{S_2^2} F_{\left(1-\frac{\alpha}{2},\, n_2-1,\, n_1-1\right)} \ ,\ \frac{S_1^2}{S_2^2} F_{\left(\frac{\alpha}{2},\, n_2-1,\, n_1-1\right)} \right)$$



Ratio difference of two populations

$$p_1 - p_2 \in \left(\hat{p}_1 - \hat{p}_2 \ \pm\ z_{\frac{\alpha}{2}} \sqrt{\frac{\hat{p}_1 (1 - \hat{p}_1)}{n_1} + \frac{\hat{p}_2 (1 - \hat{p}_2)}{n_2}} \right)$$



μ	Mean of the population
$\bar{x}$	Mean of the sample
σ	Standard deviation of the population
S	Standard deviation of the sample
p	Ratio of the population
$\hat{p}$	Ratio of the sample
n	Sample size
α	Significance level
$1-\alpha$	Confidence level
$z_{\frac{\alpha}{2}}$	Percentage point of the Normal distribution with an upper cumulative probability of $\frac{\alpha}{2}$
$t_{(\alpha,\nu)}$	Percentage point of the *t*-Student distribution with an upper cumulative probability α and ν degrees of freedom.
$\chi^2_{(\alpha,\nu)}$	Percentage point of the Chi-square distribution with an upper cumulative probability α and ν degrees of freedom.
$F_{(\alpha,\, \nu_1,\, \nu_2)}$	Percentage point of *F*-Snedecor distribution with an upper cumulative probability α and ν_1 and ν_2 degrees of freedom