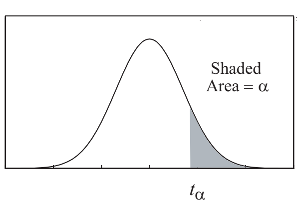
MATH 371

Sampling Distributions related to the normal distribution

Assume $Y_i \overset{iid}{\sim} \text{Norm}(\mu, \sigma^2), i = 1, \ldots n.$

Name	Statistic	Distribution
Sample Mean	$\overline{Y} = \frac{1}{n}\sum_{i=1}^{n} Y_i$	$N(\mu, \frac{\sigma^2}{n})$
Standard Normal	$Z = \frac{\overline{Y}-\mu}{\sigma_{\overline{Y}}} = \frac{\sqrt{n}(\overline{Y}-\mu)}{\sigma}$	$N(0,1)$
Sum of Squares of S.N.	$\sum_{i=1}^{n} Z_i^2 = \frac{1}{\sigma^2}\sum_{i=1}^{n}(Y_i-\mu)^2$	$\chi^2(n)$
μ estimated	$\frac{(n-1)S^2}{\sigma^2} = \frac{1}{\sigma^2}\sum_{i=1}^{n}(Y_i-\overline{Y})^2$	$\chi^2(n-1)$
	$T = \frac{Z}{\sqrt{\frac{\chi^2(\nu)}{\nu}}}$	t-distribution with ν degrees of freedom
σ estimated	$\boxed{T = \frac{\sqrt{n}(\overline{Y}-\mu)}{S}}$	t-distribution with $n-1$ degrees of freedom
	$F = \frac{\frac{\chi^2(\nu_1)}{\nu_1}}{\frac{\chi^2(\nu_2)}{\nu_2}}$	F-distribution ν_1 numerator, ν_2 denominator d.f.
	$\boxed{F = \frac{S_1^2}{S_2^2}} = \frac{\frac{S_1^2}{\sigma_1^2}}{\frac{S_2^2}{\sigma_2^2}}, \quad \text{if } \sigma_1^2 = \sigma_2^2$	F-distribution $n_1 - 1$ numerator, $n_2 - 1$ denominator d.f. for samples of size n_1 and n_2

Reading tables:



t_α is the value on the horizontal axis that cuts off an area (probability) of α.