Sampling Distributions

Single population parameter

Assumptions	**Population parameter**	**Sampling distribution**	**Statistical value at $\frac{\alpha}{2}$%**	**Standard Error**
Normal population. Population variance σ^2 known.	mean μ	Sample mean $\bar{X}$ is Normal	$Z_{\alpha/2}$	$\sigma/\sqrt{n}$
Normal population. Population variance σ^2 unknown.	mean μ	Sample mean $\bar{X}$ is t_{n-1}	$t_{n-1;\alpha/2}$	$s/\sqrt{n}$
Any population. Big sample size, $\boldsymbol{n > 30}$. Central Limit Theorem. $\sigma^2 \approx s^2$.	mean μ	Sample mean $\bar{X}$ is Normal	$Z_{\alpha/2}$	$s/\sqrt{n}$
Binary population. Big sample size, $\boldsymbol{n > 30}$. Central Limit Theorem.	proportion π	Sample proportion p is Normal	$Z_{\alpha/2}$	$\sqrt{\frac{p(1-p)}{n}}$

Comparison of two population means, μ_1 and μ_2

Assumptions	Sampling distribution of $\bar{X}_1 - \bar{X}_2$	Statistical value at $\frac{\alpha}{2}\%$	Standard Error of $\bar{X}_1 - \bar{X}_2$
• Normal populations. • Independent samples. • Population variances ${\sigma_1}^2$ and ${\sigma_2}^2$ are **known**.	Normal	$Z_{\alpha/2}$	$\sqrt{\frac{{\sigma_1}^2}{n_1} + \frac{{\sigma_2}^2}{n_2}}$
• Normal populations. • Independent samples. • Population variances are **unknown** but **equal** ${\sigma_1}^2 = {\sigma_2}^2 = \sigma^2$.	$t_{n_1+n_2-2}$	$t_{n_1+n_2-2;\alpha/2}$	$\sqrt{\frac{{s_p}^2}{n_1} + \frac{{s_p}^2}{n_2}}$, ${s_p}^2 = \frac{(n_1 - 1)\ {s_1}^2 + (n_2 - 1)\ {s_2}^2}{n_1 + n_2 - 2}$
• Any population. • Independent samples. • Large sample sizes, $\boldsymbol{n_1 > 30, n_2 > 30}$ • Central Limit Theorem.	Normal	$Z_{\alpha/2}$	$\sqrt{\frac{{s_1}^2}{n_1} + \frac{{s_2}^2}{n_2}}$
• **PAIRED** samples, calculate sample of differences.			

Significance Levels Tree