

Two sample hypothesis tests

For $X_1 \sim N(\mu_1, \sigma_1^2)$, $X_2 \sim N(\mu_2, \sigma_2^2)$, σ_1^2 , σ_2^2 unknown; random sample evidence \bar{x}_1 , \bar{x}_2 , s_1^2 , s_2^2 , n_1 and n_2 .

1. Null hypothesis, $H_0 = \mu_1 - \mu_2 = c$; 2-sided alternative $H_1 : \mu_1 - \mu_2 \neq c$. Test statistic $t_{\text{calc}} = \frac{(\bar{x}_1 - \bar{x}_2 - c)}{s\sqrt{1/n_1 + 1/n_2}} \sim t_{(n_1+n_2-2)}$, and $s^2 = \frac{(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2}{(n_1 + n_2 - 2)}$, assuming $\sigma_1^2 = \sigma_2^2$. Reject H_0 if $|t_{\text{calc}}| \geq t_{\alpha/2}$ the critical value of t with $(n_1 + n_2 - 2)$ df.

2. Null hypothesis $H_0 : \sigma_1^2 = \sigma_2^2$; alternative $H_1 : \sigma_1^2 > \sigma_2^2$. Test statistic $F_{\text{calc}} = \frac{(n_1 - 1)s_1^2}{(n_2 - 1)s_2^2} \sim F_{n_1-1, n_2-1}$. Reject H_0 if $F_{\text{calc}} > F_{\alpha}$ the critical value of F with $n_1 - 1$ and $n_2 - 1$ df.

Confidence interval for a population mean - σ^2 unknown

If X has mean μ and variance σ^2 , with $n > 30$ an approximate 100(1- α)% confidence interval for μ is $\bar{x} - \frac{t_{\alpha/2}s}{\sqrt{n}}$ to $\bar{x} + \frac{t_{\alpha/2}s}{\sqrt{n}}$.

If $X \sim N(\mu, \sigma^2)$ the interval is exact for all n .