$H_0: \mu = \mu_0$ vs. $H_1: \mu \lessgtr \mu_0$, $\mu \neq \mu_0$

test statistic $= \dfrac{\bar{x} - \mu_0}{\frac{\sigma}{\sqrt{n}}}$

critical value $1-\alpha$, $1-\frac{\alpha}{2}$

$df = n-1$

$H_0: p = p_0$ vs. $H_1: p \neq p_0$

test statistic (z) $= \dfrac{\hat{p} - p}{\sqrt{\frac{\hat{p}\hat{q}}{n}}}$

$= \dfrac{|\hat{p} - p| - \frac{1}{2n}}{\sqrt{\frac{pq}{n}}}$

critical value $= 1-\frac{\alpha}{2}$

$H_0: \alpha_i = 0$ vs. $H_1: \alpha_i \neq 0$

test statistic $= \dfrac{\text{Between MS}}{\text{Within MS}}$

critical value (F) $= k-1, n-k, 1-\alpha$

$df = k-1, n-k$

Comparasion: $t = \dfrac{\bar{y}_1 - \bar{y}_2}{s\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}$

critical: $n-k$, $1-\frac{\alpha}{2}$ $df = n-k$

$H_0: \mu_d = 0$ vs. $H_1: \mu_d \gtrless 0$, $\mu_d \neq 0$

test statistics (t) $= \dfrac{\bar{x} - \mu_d}{\frac{\sigma}{\sqrt{n}}}$

critical value $1-\alpha$, $1-\frac{\alpha}{2}$

$df = n-1$

$H_0: p_1 = p_2$ vs. $H_1: p_1 \neq p_2$

test statistic (z) $= \dfrac{|\hat{p}_1 - \hat{p}_2| - \left(\frac{1}{2n_1} + \frac{1}{2n_2}\right)}{\sqrt{\hat{p}\hat{q}\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$

critical value $= 1-\frac{\alpha}{2}$

contingency table :-

2x2 $\Rightarrow \chi^2 = \dfrac{(|O-E|-0.5)^2}{E} + \dots$

critical value $1, 1-\alpha$

$df = 1$

RxC $\Rightarrow \chi^2 = \dfrac{(|O-E|)^2}{E} + \dots$

critical value $= R-1 \times C-1, 1-\alpha$

df $(R-1) \times (C-1)$

Goodness of fit $\Rightarrow \dfrac{(O-E)^2}{E} + \dots$

critical value $= \chi^2(g-k-1), 1-\alpha$

df $g-k-1$

$H_0: \mu_1 = \mu_2$ vs. $H_1: \mu_1 \neq \mu_2$

test statistic (t) $= \dfrac{\bar{y}_1 - \bar{x}_2}{s\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}$

critical value $1-\alpha$, $1-\frac{\alpha}{2}$

$df = n_1 + n_2 - 2$

$H_0: \rho = 0$ vs. $H_1: \rho \neq 0$

test statistic (t) $= \dfrac{r\sqrt{n-2}}{\sqrt{1-r^2}}$

critical value $= 1-\frac{\alpha}{2}$

$df = n-2$

$H_0: \rho = \rho_0$ vs. $H_1: \rho \neq \rho_0$

$z = \frac{1}{2} \ln\left(\frac{1+r}{1-r}\right)$

$z_0 = \frac{1}{2} \ln\left(\frac{1+\rho}{1-\rho}\right)$

Variance $= \frac{1}{n-3}$

$\lambda = (z - z_0)\sqrt{n-3}$

critical value (Z) $= 1-\frac{\alpha}{2}$

Confidence Interval

* Population mean μ

$$CI = \bar{X} \pm z_{1-\frac{\alpha}{2}} \times \frac{\sigma}{\sqrt{n}}$$

$$= \bar{X} \pm t_{(n-1, 1-\frac{\alpha}{2})} \times \frac{s}{\sqrt{n}}$$

* Population proportion p

$$CI = \hat{p} \pm z_{1-\frac{\alpha}{2}} \sqrt{\frac{\hat{p}\hat{q}}{n}}$$

* Paired μ_d

$$CI = \bar{d} \pm t_{(n-1, 1-\frac{\alpha}{2})} \frac{s_d}{\sqrt{n}}$$

* mean different $(\mu_1 - \mu_2)$

$$CI = \bar{X}_1 - \bar{X}_2 \pm t_{(n_1+n_2-2, 1-\frac{\alpha}{2})} s \sqrt{\frac{1}{n_1} + \frac{1}{n_2}} \quad (s)$$

$$CI = \bar{Y}_1 - \bar{Y}_2 \pm t_{(n-k, 1-\frac{\alpha}{2})} s \sqrt{\frac{1}{n_1} + \frac{1}{n_2}} \quad (r2)$$

* colerration coefficient (ρ)

$$\rho_1 = \frac{e^{2z_1} - 1}{e^{2z_1} + 1}$$

$$z_1 = \frac{z - z_{(1-\frac{\alpha}{2})}}{\sqrt{n-3}}$$

P-Value

two-tailed :- 2x small area

one tail :- small area

absolute value (| |) ⇒ small value

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goodness of fit

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F-distribution.