Summary of Hypothesis Test Formulas for ANOVA, Linear Regression, Correlation Analysis and Non-Parametric Tests

Test Type	Test Statistic	Decision Rule
One-Way ANOVA equal means across K groups: $H_0\!: \mu_1 = \cdots = \mu_k$	$F_{calc} = \frac{SSG/(K-1)}{SSW/(n-K)}$	One-tailed upper test, reject if: $F_{calc} > F_{(\alpha,K-1,n-K)}$
Two-Way ANOVA without replication H_0: equal means across K Groups H_0: equal means across H Blocks	$F_{calc}^{Groups} = \frac{SSG/(K-1)}{SSE/(K-1)(H-1)}$ $F_{calc}^{Blocks} = \frac{SSB/(H-1)}{SSE/(K-1)(H-1)}$	One-tailed upper tests, reject if: $F_{calc}^{Groups} > F_{(\alpha,K-1,(K-1)(H-1))}$ $F_{calc}^{Blocks} > F_{(\alpha,H-1,(K-1)(H-1))}$
Two-Way ANOVA with replication, m repeated observations per cell. H_0: equal means across K Groups H_0: equal means across H Blocks H_0: No interaction effects	$F_{calc}^{Groups} = \frac{SSG/(K-1)}{SSE/HK(m-1)}$ $F_{calc}^{Blocks} = \frac{SSB/(H-1)}{SSE/HK(m-1)}$ $F_{calc}^{Inter.} = \frac{SSI/(K-1)(H-1)}{SSE/HK(m-1)}$	One-tailed upper tests, reject if: $F_{calc}^{Groups} > F_{(\alpha,K-1,HK(m-1))}$ $F_{calc}^{Blocks} > F_{(\alpha,H-1,HK(m-1))}$ $F_{calc}^{Inter.} > F_{(\alpha,(K-1)(H-1),HK(m-1))}$
Linear Regression $H_0\!: \beta_1 = k$	Given b_1 *and* S_{b_1} $t_{calc} = \frac{b_1 - k}{S_{b_1}}$	$H_A\!: \beta_1 > k$ Reject if $t_{calc} > t_{(\alpha,n-2)}$ $H_A\!: \beta_1 < k$ Reject if $t_{calc} < 0$ *and* $\lvert t_{calc}\rvert > t_{(\alpha,n-2)}$ $H_A\!: \beta_1 \neq k$ Reject if $\lvert t_{calc}\rvert > t_{(\alpha/2,n-2)}$
Multi-group test with linear regression Given SSE_U, DF_U, SSE_R, DF_R H_0: slope effects same across groups	$F_{calc} = \frac{(SSE_R - SSE_U)/(DF_R - DF_U)}{SSE_U/DF_U}$	One-tailed upper test, reject if $F_{calc} > F_{(\alpha,DF_R-DF_U,DF_U)}$
Correlation Analysis $H_0\!: \rho_{XY} = 0$	$t_{calc} = \frac{r_{XY}\sqrt{n-2}}{\sqrt{1-r_{XY}^2}}$	$H_A\!: \rho > 0$ Reject if $t_{calc} > t_{(\alpha,n-2)}$ $H_A\!: \rho < 0$ Reject if $t_{calc} < 0$ *and* $\lvert t_{calc}\rvert > t_{(\alpha,n-2)}$ $H_A\!: \rho \neq 0$ Reject if $\lvert t_{calc}\rvert > t_{(\alpha/2,n-2)}$
Correlation Analysis: Equal correlations across two groups $H_0\!: \rho_1 = \rho_2$	$z_{r_1} = \frac{1}{2}\ln\left(\frac{1+r_1}{1-r_1}\right)$ $z_{r_2} = \frac{1}{2}\ln\left(\frac{1+r_2}{1-r_2}\right)$ $Z_{calc} = \frac{z_{r_1} - z_{r_2}}{\sqrt{\frac{1}{n_1-3} + \frac{1}{n_2-3}}}$	$H_A\!: \rho_1 > \rho_2$ Reject if $z_{calc} > Z_{(\alpha)}$ $H_A\!: \rho_1 < \rho_2$ Reject if $Z_{calc} < 0$ *and* $\lvert Z_{calc}\rvert > Z_{(\alpha)}$ $H_A\!: \rho_1 \neq \rho_2$ Reject if $\lvert Z_{calc}\rvert > Z_{(\alpha/2)}$

Correlation Analysis: Equal correlations across K groups	Use z_r transforms as defined above $$\chi^2_{calc} = \sum_{j=1}^{k}\left[(n_j - 3)z^2_{r_j}\right] - \frac{\left[\sum_{j=1}^{k}(n_j - 3)z_{r_j}\right]^2}{\sum_{j=1}^{k}(n_j - 3)}$$	One-tailed upper test, reject if: $$\chi^2_{calc} > \chi^2_{(\alpha,K-1)}$$
Non-parametric test of Homogeneity (Goodness of fit) H_0: Observed frequencies across K groups are consistent with Expected frequencies	$$\chi^2_{calc} = \sum_{i=1}^{K}\frac{(O_i - E_i)^2}{E_i}$$	One-tailed upper test, reject if: $$\chi^2_{calc} > \chi^2_{(\alpha,K-1)}$$
Non-parametric test of Independence H_0: Observed frequencies across K groups are independent of m categories	$$\chi^2_{calc} = \sum_{i=1}^{m}\sum_{j=1}^{k}\frac{(O_{ij} - E_{ij})^2}{E_{ij}}$$	One-tailed upper test, reject if: $$\chi^2_{calc} > \chi^2_{(\alpha,(m-1)(K-1))}$$