Point Estimator of the Difference Between Two Population Means

$$\bar{x}_1 - \bar{x}_2$$

Standard Error of $\bar{x}_1 - \bar{x}_2$

$$\sigma_{\bar{x}_1 - \bar{x}_2} = \sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}$$

Interval Estimate of the Difference Between Two Population Means: σ_1 and σ_2 Known

$$\bar{x}_1 - \bar{x}_2 \pm z_{\alpha/2}\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}$$

Test Statistic for Hypothesis Tests About $\mu_1 - \mu_2$: σ_1 and σ_2 Known

$$z = \frac{(\bar{x}_1 - \bar{x}_2) - D_0}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}}$$

Interval Estimate of the Difference Between Two Population Means: σ_1 and σ_2 Unknown

$$\bar{x}_1 - \bar{x}_2 \pm t_{\alpha/2}\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}$$

Test Statistic for Hypothesis Tests About $\mu_1 - \mu_2$: σ_1 and σ_2 Unknown

$$t = \frac{(\bar{x}_1 - \bar{x}_2) - D_0}{\sqrt{\dfrac{s_1^2}{n_1} + \dfrac{s_2^2}{n_2}}}$$

Test Statistic for Hypothesis Tests Involving Matched Samples

$$t = \frac{\bar{d} - \mu_d}{s_d/\sqrt{n}}$$

Point Estimator of the Difference Between Two Population Proportions

$$\bar{p}_1 - \bar{p}_2$$

Standard Error of $\bar{p}_1 - \bar{p}_2$

$$\sigma_{\bar{p}_1 - \bar{p}_2} = \sqrt{\frac{p_1(1 - p_1)}{n_1} + \frac{p_2(1 - p_2)}{n_2}}$$

Interval Estimate of the Difference Between Two Population Proportions

$$\bar{p}_1 - \bar{p}_2 \pm z_{\alpha/2}\sqrt{\frac{\bar{p}_1(1 - \bar{p}_1)}{n_1} + \frac{\bar{p}_2(1 - \bar{p}_2)}{n_2}}$$

Standard Error of $\bar{p}_1 - \bar{p}_2$ when $p_1 = p_2 = p$

$$\sigma_{\bar{p}_1 - \bar{p}_2} = \sqrt{p(1 - p)\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}$$

Pooled Estimator of p when $p_1 = p_2 = p$

$$\bar{p} = \frac{n_1\bar{p}_1 + n_2\bar{p}_2}{n_1 + n_2}$$

Test Statistic for Hypothesis Tests About $p_1 - p_2$

$$z = \frac{(\bar{p}_1 - \bar{p}_2)}{\sqrt{\bar{p}(1 - \bar{p})\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

Interval Estimate of a Population Variance

$$\frac{(n-1)s^2}{\chi^2_{\alpha/2}} \leq \sigma^2 \leq \frac{(n-1)s^2}{\chi^2_{(1-\alpha/2)}}$$

Test Statistic for Hypothesis Tests About a Population Variance

$$\chi^2 = \frac{(n-1)s^2}{\sigma_0^2}$$

Test Statistic for Hypothesis Tests About Population Variances with $\sigma_1^2 = \sigma_2^2$

$$F = \frac{s_1^2}{s_2^2}$$

Test Statistic for Goodness of Fit

$$\chi^2 = \sum_{i=1}^{k} \frac{(f_i - e_i)^2}{e_i}$$

Expected Frequencies for Contingency Tables Under the Assumption of Independence

$$e_{ij} = \frac{(\text{Row } i \text{ Total})(\text{Column } j \text{ Total})}{\text{Sample Size}}$$

Test Statistic for Independence

$$\chi^2 = \sum_i \sum_j \frac{(f_{ij} - e_{ij})^2}{e_{ij}}$$

ANOVA

Overall Sample Mean

$$\bar{\bar{x}} = \frac{\sum_{j=1}^{k}\sum_{i=1}^{n_j} x_{ij}}{n_T}$$

$$n_T = n_1 + n_2 + \cdots + n_k$$

Mean Square Due to Treatments

$$\text{MSTR} = \frac{\text{SSTR}}{k - 1}$$

Sum of Squares Due to Treatments

$$\text{SSTR} = \sum_{j=1}^{k} n_j(\bar{x}_j - \bar{\bar{x}})^2$$

Mean Square Due to Error

$$\text{MSE} = \frac{\text{SSE}}{n_T - k}$$

Sum of Squares Due to Error

$$\text{SSE} = \sum_{j=1}^{k} (n_j - 1)s_j^2$$

Test Statistic for the Equality of *k* Population Means

$$F = \frac{\text{MSTR}}{\text{MSE}}$$

Total Sum of Squares

$$\text{SST} = \sum_{j=1}^{k}\sum_{i=1}^{n_j} (x_{ij} - \bar{\bar{x}})^2$$

Partitioning of Sum of Squares

$$\text{SST} = \text{SSTR} + \text{SSE}$$

TWO WAY ANOVA

Total Sum of Squares

$$\mathrm{SST} = \sum_{i=1}^{b}\sum_{j=1}^{k}(x_{ij} - \bar{\bar{x}})^2$$

Sum of Squares Due to Treatments

$$\mathrm{SSTR} = b\sum_{j=1}^{k}(\bar{x}_{\cdot j} - \bar{\bar{x}})^2$$

Sum of Squares Due to Blocks

$$\mathrm{SSBL} = k\sum_{i=1}^{b}(\bar{x}_{i\cdot} - \bar{\bar{x}})^2$$

Sum of Squares Due to Error

$$\mathrm{SSE} = \mathrm{SST} - \mathrm{SSTR} - \mathrm{SSBL}$$

Fisher's LSD

Test Statistic for Fisher's LSD Procedure

$$t = \frac{\bar{x}_i - \bar{x}_j}{\sqrt{\mathrm{MSE}\left(\frac{1}{n_i} + \frac{1}{n_j}\right)}}$$

Fisher's LSD

$$\mathrm{LSD} = t_{\alpha/2}\sqrt{\mathrm{MSE}\left(\frac{1}{n_i} + \frac{1}{n_j}\right)}$$

Linear Regression:

Simple Linear Regression Model

$$y = \beta_0 + \beta_1 x + \epsilon$$

Simple Linear Regression Equation

$$E(y) = \beta_0 + \beta_1 x$$

Estimated Simple Linear Regression Equation

$$\hat{y} = b_0 + b_1 x$$

Least Squares Criterion

$$\min \Sigma (y_i - \hat{y}_i)^2$$

Slope and *y*-Intercept for the Estimated Regression Equation

$$b_1 = \frac{\Sigma (x_i - \bar{x})(y_i - \bar{y})}{\Sigma (x_i - \bar{x})^2}$$

$$b_0 = \bar{y} - b_1 \bar{x}$$

Sum of Squares Due to Error

$$\text{SSE} = \Sigma (y_i - \hat{y}_i)^2$$

Total Sum of Squares

$$\text{SST} = \Sigma (y_i - \bar{y})^2$$

Sum of Squares Due to Regression

$$\text{SSR} = \Sigma (\hat{y}_i - \bar{y})^2$$

Relationship Among SST, SSR, and SSE

$$\text{SST} = \text{SSR} + \text{SSE}$$

Coefficient of Determination

$$r^2 = \frac{\text{SSR}}{\text{SST}}$$

Sample Correlation Coefficient

$$
\begin{aligned}
r_{xy} &= (\text{sign of } b_1)\sqrt{\text{Coefficient of determination}} \\
&= (\text{sign of } b_1)\sqrt{r^2}
\end{aligned}
$$

Mean Square Error (Estimate of σ^2)

$$s^2 = \text{MSE} = \frac{\text{SSE}}{n-2}$$

Standard Error of the Estimate

$$s = \sqrt{\text{MSE}} = \sqrt{\frac{\text{SSE}}{n-2}}$$

Standard Deviation of b_1

$$\sigma_{b_1} = \frac{\sigma}{\sqrt{\Sigma(x_i - \bar{x})^2}}$$

Estimated Standard Deviation of b_1

$$s_{b_1} = \frac{s}{\sqrt{\Sigma(x_i - \bar{x})^2}}$$

t Test Statistic

$$t = \frac{b_1}{s_{b_1}}$$

Mean Square Regression

$$\text{MSR} = \frac{\text{SSR}}{\text{Number of independent variables}}$$

F Test Statistic

$$F = \frac{\text{MSR}}{\text{MSE}}$$

Estimated Standard Deviation of $\hat{y}_{\text{p}}$

$$s_{\hat{y}_{\text{p}}} = s\sqrt{\frac{1}{n} + \frac{(x_{\text{p}} - \bar{x})^2}{\Sigma(x_i - \bar{x})^2}}$$

Confidence Interval for $E(y_{\text{p}})$

$$\hat{y}_{\text{p}} \pm t_{\alpha/2} s_{\hat{y}_{\text{p}}}$$

Estimated Standard Deviation of an Individual Value

$$s_{\text{ind}} = s\sqrt{1 + \frac{1}{n} + \frac{(x_{\text{p}} - \bar{x})^2}{\Sigma(x_i - \bar{x})^2}}$$