Important Errors, Sum of Squares, Degrees of Freedom and Hypothesis Testing Formulas PDF

Formulas
Examples
with Units

List of 19
Important Errors, Sum of Squares, Degrees of Freedom and Hypothesis Testing Formulas

1) Degrees of Freedom Formulas

1.1) Degrees of Freedom in Chi-square Goodness of Fit Test Formula

Evaluate Formula

Formula: $DF = N_{Groups} - 1$

Example: $8 = 9 - 1$

1.2) Degrees of Freedom in Chi-square Independence Test Formula

Evaluate Formula

Formula: $DF = \left(N_{Rows} - 1\right) \cdot \left(N_{Columns} - 1\right)$

Example: $8 = \left(5 - 1\right) \cdot \left(3 - 1\right)$

1.3) Degrees of Freedom in F Test Formula

Evaluate Formula

Formula: $DF = N - 1$

Example: $9 = 10 - 1$

1.4) Degrees of Freedom in Independent Samples t Test Formula

Evaluate Formula

Formula: $DF = N_X + N_Y - 2$

Example: $8 = 6 + 4 - 2$

1.5) Degrees of Freedom in One Sample t Test Formula

Evaluate Formula

Formula: $DF = N - 1$

Example: $9 = 10 - 1$

1.6) Degrees of Freedom in One-way ANOVA Test within Groups Formula

Evaluate Formula

Formula: $DF = N_{Total} - N_{Groups}$

Example: $8 = 17 - 9$

1.7) Degrees of Freedom in Simple Linear Regression Test Formula

Evaluate Formula

Formula: $DF = N - 2$

Example: $8 = 10 - 2$

2) Errors Formulas

2.1) Residual Standard Error of Data Formula

Evaluate Formula

Formula

$$RSE_{Data} = \sqrt{\frac{RSS_{(Error)}}{N_{(Error)} - 1}}$$

Example

$$2.0101 = \sqrt{\frac{400}{100 - 1}}$$

2.2) Residual Standard Error of Data given Degrees of Freedom Formula

Evaluate Formula

Formula

$$RSE_{Data} = \sqrt{\frac{RSS_{(Error)}}{DF_{(Error)}}}$$

Example

$$2.0101 = \sqrt{\frac{400}{99}}$$

2.3) Standard Error of Data Formula

Evaluate Formula

Formula

$$SE_{Data} = \frac{\sigma_{(Error)}}{\sqrt{N_{(Error)}}}$$

Example

$$2.5 = \frac{25}{\sqrt{100}}$$

2.4) Standard Error of Data given Mean Formula

Evaluate Formula

Formula

$$SE_{Data} = \sqrt{\left(\frac{\Sigma x^2}{N_{(Error)}^2}\right) - \left(\frac{\mu^2}{N_{(Error)}}\right)}$$

Example

$$2.5 = \sqrt{\left(\frac{85000}{100^2}\right) - \left(\frac{15^2}{100}\right)}$$

2.5) Standard Error of Data given Variance Formula

Evaluate Formula

Formula

$$SE_{Data} = \sqrt{\frac{\sigma^2 Error}{N_{(Error)}}}$$

Example

$$2.5 = \sqrt{\frac{625}{100}}$$

2.6) Standard Error of Difference of Means Formula

Evaluate Formula

Formula

$$SE_{\mu 1-\mu 2} = \sqrt{\left(\frac{\sigma_X^2}{N_{X(Error)}}\right) + \left(\frac{\sigma_Y^2}{N_{Y(Error)}}\right)}$$

Example

$$1.5492 = \sqrt{\left(\frac{4^2}{20}\right) + \left(\frac{8^2}{40}\right)}$$

2.7) Standard Error of Proportion Formula

Evaluate Formula

Formula

$$SEP = \sqrt{\frac{p \cdot (1 - p)}{N_{(Error)}}}$$

Example

$$0.05 = \sqrt{\frac{0.5 \cdot (1 - 0.5)}{100}}$$

3) Hypothesis Testing Formulas

3.1) One Sample t Statistic for Mean Formula

Evaluate Formula

Formula

$$t = \frac{\bar{x} - \mu_{Population}}{SE}$$

Example

$$2 = \frac{25 - 20}{2.5}$$

3.2) Standardized Test Statistic Formula

Evaluate Formula

Formula

$$t_{Standardized} = \frac{S - P}{\sigma}$$

Example

$$2.4 = \frac{160 - 40}{50}$$

4) Sum of Squares Formulas

4.1) Residual Sum of Squares Formula

Evaluate Formula

Formula

$$RSS = \left(RSE^2\right) \cdot DF_{(SS)}$$

Example

$$56 = \left(2^2\right) \cdot 14$$

4.2) Residual Sum of Squares given Residual Standard Error Formula

Evaluate Formula

Formula

$$RSS = \left(RSE^2\right) \cdot \left(N_{(SS)} - 1\right)$$

Example

$$56 = \left(2^2\right) \cdot (15 - 1)$$

4.3) Sum of Squares Formula

Evaluate Formula

Formula

$$SS = \sigma^2 \cdot N_{(SS)}$$

Example

$$240 = 16 \cdot 15$$

Variables used in list of Errors, Sum of Squares, Degrees of Freedom and Hypothesis Testing Formulas above

- **DF** Degrees of Freedom
- $DF_{(Error)}$ Degrees of Freedom in Standard Error
- $DF_{(SS)}$ Degrees of Freedom in Sum of Squares
- **N** Sample Size
- $N_{(Error)}$ Sample Size in Standard Error
- $N_{(SS)}$ Sample Size in Sum of Square
- $N_{Columns}$ Number of Columns
- N_{Groups} Number of Groups
- N_{Rows} Number of Rows
- N_{Total} Total Sample Size
- N_X Size of Sample X
- $N_{X(Error)}$ Size of Sample X in Standard Error
- N_Y Size of Sample Y
- $N_{Y(Error)}$ Size of Sample Y in Standard Error
- **p** Sample Proportion
- **P** Parameter
- **RSE** Residual Standard Error
- RSE_{Data} Residual Standard Error of Data
- **RSS** Residual Sum of Squares
- $RSS_{(Error)}$ Residual Sum of Squares in Standard Error
- **S** Statistic
- **SE** Standard Error
- SE_{Data} Standard Error of Data
- $SE_{\mu 1-\mu 2}$ Standard Error of Difference of Means
- **SEP** Standard Error of Proportion
- **SS** Sum of Squares
- **t** t Statistic
- $t_{Standardized}$ Standardized Test Statistic
- $\bar{x}$ Sample Mean
- μ Mean of Data
- $\mu_{Population}$ Population Mean

Constants, Functions, Measurements used in list of Errors, Sum of Squares, Degrees of Freedom and Hypothesis Testing Formulas above

- Functions: **sqrt**, sqrt(Number)
  A square root function is a function that takes a non-negative number as an input and returns the square root of the given input number.

- σ Standard Deviation of Statistic
- $\sigma_{(Error)}$ Standard Deviation of Data
- σ_X Standard Deviation of Sample X
- σ_Y Standard Deviation of Sample Y
- σ^2 Variance of Data
- $\sigma^2 Error$ Variance of Data in Standard Error
- Σx^2 Sum of Squares of Individual Values

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