

Multiple Proportions

Confidence Interval does not apply

One Categorical Variable
(Goodness of Fit)

Two Categorical Variables
(Test of Independence)

(Assuming # of Rows $R=2$ & # of Columns l)

Hypotheses:

$H_0: p_1 = p_{1,0}, p_2 = p_{2,0}, \dots, p_k = p_{k,0}$
 $H_a: \text{At least one } p_i \neq p_{i,0} \text{ for } i \in \{1, \dots, k\}$

Parameters: p_1, p_2, \dots, p_k
Point estimates: $\hat{p}_1, \hat{p}_2, \dots, \hat{p}_k$

Hypotheses

$H_0: p_1 = p_2 = p_3 = \dots = p_k$
 $H_a: \text{At least one } p_i \text{ is different for } i \in \{1, \dots, k\}$

Test Statistic Random Variable (Assuming H_0)

$$\chi^2 = \sum_{\text{all cells}} \frac{(\text{observed} - \text{expected})^2}{\text{expected}} \sim \chi^2 (\text{df} = k - 1)$$

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Observed Test Statistic

$$\chi^2_{\text{obs}} = \sum_i \frac{(n_{\text{obs},i} - n_{\text{exp},i})^2}{n_{\text{exp},i}}$$

Observed Test Statistic

χ^2_{obs} : Replace "observed" w/ values in table & expected with $\frac{(\text{row } i \text{ total}) \times (\text{column } j \text{ total})}{\text{table total}}$

P-value

$$P(\chi^2 \geq \chi^2_{\text{obs}})$$

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