Grand Valley State University
Math and Stats Center

Hypothesis Test Flow Chart

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How many variables?

One Variable

Categorical

One-Sample z-test for proportion

To test whether a population proportion is different than some hypothesized value.

Hypothesis Test:

$H_0: p = p_0$
$H_a: p \neq p_0$ or ><

$$z = \frac{\hat{p} - p_0}{\sqrt{\frac{p_0(1-p_0)}{n}}}$$

p-value=normalcdf(lower,upper,0,1)

Quantitative

One-Sample t-test for mean

To test whether there is a difference between a population mean and some hypothesized value.

Hypothesis Test:

$H_0: \mu = \mu_0$
$H_a: \mu \neq \mu_0$ or ><

$$t = \frac{\bar{x} - \mu_0}{\frac{s}{\sqrt{n}}}$$

p-value = tcdf(lower, upper, df)

Two Variables

Both Categorical

Two-Sample Proportion

To test whether two population proportions differ.

Hypothesis Test:

$H_0: p_1 = p_2$
$H_a: p_1 \neq p_2$ or ><

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

Where $\hat{p} = \frac{x_1 + x_2}{n_1 + n_2}$

p-value = normalcdf(lower, upper, 0,1)

Chi-Square

Used to test for a relationship in population between two categorical variables

Hypothesis Test:

H_0: There is no relationship in population between Var 1 & Var 2
H_a: There is a relationship in population between Var 1 & Var 2

$$X^2 = \sum \frac{(observed - expected)^2}{expected}$$

p-value = X^2cdf(lower, upper, df)

One of Each

Two-Sample t-test

To test for a difference in two independent population means

Hypothesis Test:

H_0: $\mu_1 = \mu_2$
H_a: $\mu_1 = \mu_2$ or ><

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

p-value = tcdf(lower, upper, df)

ANOVA F-test

To test whether at least one group mean differs from the others

Hypothesis Test:

H_0: $\mu_1 = \mu_2 = \mu_3 \ldots \mu_i$
H_a: at lease one μ_i different from others

$$F = \frac{MSB}{MSE}$$

p-value = Fcdf(lower, upper,df$_1$, df$_2$)

Both Quantitative

Paired t-test

To test whether there is an average difference between two dependent (paired) populations

Hypothesis Test:

H_0: $\mu_d = 0$
H_a: $\mu_d \neq 0$ or ><

$$t = \frac{\bar{x}_d}{\frac{s_d}{\sqrt{n}}}$$

Where $s_d = \sqrt{\frac{\sum(d_i - \bar{d})^2}{n-1}}$

p-value = tcdf(lower, upper, df)

Simple Linear Regression

To test for a linear relationship in population between two quantitative variables

Population Regression Model:

$$Y = \beta_0 + \beta_1 X_1 + \varepsilon$$

Overall F-test:

$$F = \frac{MSB}{MSE}$$

p-value = Fcdf(lower, upper,df$_1$, df$_2$)