

Hypothesis Testing Roadmap

Taught in Green Belt Taught in Black Belt Taught in ToolMaster

Tips to Remember

1. Proper sample size selection is required for tests to be effective.
2. H_A can be $<$, $>$, or \neq .
3. If $p > \alpha$, then fail to reject H_0 .
4. If $p \leq \alpha$, then reject H_0 .
5. An α -risk of 0.05 is typical.

Abbreviations

B.S. = Basic Statistics
CI = Confidence Interval

Building Models

Tests for Significance (All types of models)

For each model as a whole:
 H_0 : Model is not Significant
 H_A : Model is Significant

For each factor in a model:
 H_0 : Model is not Significant
 H_A : Model is Significant

Fitted Line Plot Stat>Regression>Fitted Line Plot Variable Y One, Continuous X Assumes Normality & Equal Variances	Binary Logistic Regression Stat>Regression>Binary Logistic Regression Binomial, Attribute Y Multiple, Continuous or Discrete Xs
Multiple Regression Stat>Regression>Regression Variable Y Multiple, Continuous Xs Assumes Normality & Equal Variances	Ordinal Logistic Regression Stat>Regression>Ordinal Logistic Regression Multinomial, Attribute, Ordinal Y Multiple, Continuous or Discrete Xs
ANOVA/DOE Stat>ANOVA>General Linear Model Variable Y Multiple, Discrete Xs Assumes Normality & Equal Variances	Nominal Logistic Regression Stat>Regression>Nominal Logistic Regression Multinomial, Attribute, Unordered Y Multiple, Continuous or Discrete Xs

Start

> 1

Attribute Data

Xs

One

Type of Y

Attribute

Values for Y

Two (Binomial)

Levels of X

Chi-Square Analysis GOF
 H_0 : Distribution fits Assumption
 H_A : Distribution does not fit
 Stat>Tables>Chi Square
 Goodness of Fit Test (One Variable)

Chi-Square Analysis
 H_0 : Variables are Independent
 H_A : Variables are NOT Independent
 Stat>Tables>Chi Square Test
 (Two-Way Table in Worksheet)

1 Proportion Test
 $H_0: P = P_{Tgt}$
 $H_A: P \neq P_{Tgt}$
 Stat>B.S.>1 Proportion Test

2 Proportion Test
 $H_0: P_1 = P_2$
 $H_A: P_1 \neq P_2$
 Stat>B.S.> 2 Proportion Test

Analysis of Means (Binomial)
 $H_{0,1,2,\dots,k}: P_1, P_2, \dots, P_k = P_{Pooled}$
 $H_{A,1,2,\dots,k}: P_1, P_2, \dots, P_k \neq P_{Pooled}$
 Stat>ANOVA>Analysis of Means

Variable Data - Non-Normal

Normal?

No

Levels of X

> Two (Groups)

One (Group)

Median or σ ?

M

1 Sample Sign Test
1 Sample Wilcoxon

$H_0: M = M_{Tgt}$
 $H_A: M \neq M_{Tgt}$

Stat>Nonparametrics>1 Sample Sign or
Stat>Nonparametrics>1 Sample Wilcoxon

Two (Groups)

Levene's Test

$H_0: \sigma_1^2 = \sigma_2^2 = \dots = \sigma_k^2$
 H_A : at least one is different

Stat>ANOVA>
Test for Equal Variances

Equal?

No

Proceed with caution

Yes

Kruskal-Wallis or
Mood's Median Test

$H_0: M_1 = M_2 = \dots = M_k$
 H_A : at least one is different

Stat>Nonparametrics>Kruskal-Wallis
Stat>Nonparametrics>Mood's Median Test

Levene's Test

$H_0: \sigma_1^2 = \sigma_2^2 = \dots = \sigma_k^2$
 H_A : at least one is different

Stat>ANOVA>
Test for Equal Variances

Equal?

No

Proceed with caution

Yes

1 Variance Test

$H_0: \sigma = \sigma_{Tgt}$
 $H_A: \sigma \neq \sigma_{Tgt}$

Stat>B.S.>1 Variance

Mann-Whitney Test

$H_0: M_1 = M_2$
 $H_A: M_1 \neq M_2$

Stat>Nonparametrics>Mann-Whitney

Variable Data - Normal

Normal?

Yes

Normality Test

H_0 : Sample is from a Normal Population
 H_A : Sample is Not from a Normal Population

Stat>B.S.>Graphical Summary

Levels of X

> Two (Groups)

One (Group)

Paired Data?

Yes

Paired t Test

$H_0: \mu_{1-2} = 0$
 $H_A: \mu_{1-2} \neq 0$

Stat>B.S.>1 Paired t

No

μ or σ ?

No

1 Sample t Test

$H_0: \mu = \mu_{Tgt}$
 $H_A: \mu \neq \mu_{Tgt}$

Stat>B.S.>1 Sample t

Yes

F- Test

$H_0: \sigma_1^2 = \sigma_2^2$
 $H_A: \sigma_1^2 \neq \sigma_2^2$

Stat>B.S.>2 Variances

2 Sample t Test

$H_0: \mu_1 = \mu_2$
 $H_A: \mu_1 \neq \mu_2$

Stat>B.S.>2 Sample t

Equal?

Yes

Assume equal variances

No

Assume equal variances

ANOVA One-Way

$H_0: \mu_1 = \mu_2 = \dots = \mu_k$
 H_A : At least 1 is different

Stat>ANOVA>One-Way

Bartlett's Test

$H_0: \sigma_1^2 = \sigma_2^2 = \sigma_3^2 \dots$
 H_A : at least σ^2 is different

Stat>ANOVA>
Test for Equal Variances

Equal?

No

Proceed with caution

Yes

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