MATLAB Functions for Hypothesis Testing

One Sample z-test

The MATLAB function:

\[
[h, p, ci, zval] = ztest(x, m, sigma, alpha, tail, dim)
\]

performs a z-test of the null hypothesis \( H_0: \mu = m \).

The array \( x \) is assumed to contain data from a normal population with known standard deviation \( \sigma \). The test is performed at significance level \( \alpha \). The string argument \( \text{tail} \) must be either 'both', 'right' or 'left' indicating that the alternate hypothesis is either two-tailed (\( \mu \neq m \)), upper-tailed (\( \mu > m \)), or lower-tailed (\( \mu < m \)). If \( x \) is a matrix the test is performed on each column of the matrix, the \( \text{dim} \) argument may be used to indicate that the test be performed over a different dimension of the matrix. Arguments \( \alpha, \text{tail} \) and \( \text{dim} \) are optional. Default values of \( \alpha \) and \( \text{tail} \) are 0.05 and 'both'.

Return value \( h \) is 0 if the null hypothesis is accepted or 1 if it is rejected. \( p \) is the P-value. \( ci \) is a 100(1-\( \alpha \))% confidence interval. \( zval \) is the value of the test statistic.

One Sample or Paired Data t-test

The MATLAB function:

\[
[h, p, ci, stats] = ttest(x, m, alpha, tail)
\]

performs a one sample t-test of the null hypothesis \( H_0: \mu = m \).

The MATLAB function:

\[
[h, p, ci, stats] = ttest(x, y, alpha, tail)
\]

performs a paired-data t-test of the null hypothesis \( H_0: \mu_x = \mu_y \).

Input arguments \( \alpha \) and \( \text{tail} \) are as described under One Sample z-test above.

Return arguments \( h, p \) and \( ci \) are as described under One Sample z-test above. \( \text{stats} \) is a structure contains the members: \( tstat \) – the value of the test statistic, \( df \) – the degrees of freedom, and \( sd \) – the estimated population standard deviation.

Two Sample t-test

The MATLAB function:

\[
[h, p, ci, stats] = ttest2(x, y, alpha, tail, vartype, dim)
\]

performs a two-sample unpaired t-test of the null hypothesis \( H_0: \mu_x = \mu_y \). By default (or when \( vartype = \text{'equal'} \)) the test is performed assuming equal population variances. Set \( vartype \) to \( \text{'unequal'} \) to perform the tests assuming unequal variances. Note that \( vartype = \text{'unequal'} \) corresponds to the case discussed in class.

Other tests

Refer to the documentation for the \( \text{vartest} \) and the \( \text{vartest2} \) functions for tests regarding population variances.