z.test	*Z-test*

Description

This function is based on the standard normal distribution and creates confidence intervals and tests hypotheses for both one and two sample problems.

Usage

```
z.test(x, y = NULL, alternative = "two.sided", mu = 0, sigma.x = NULL,
  sigma.y = NULL, conf.level = 0.95)
```

Arguments

`x`	numeric vector; `NA`s and `Inf`s are allowed but will be removed.
`y`	numeric vector; `NA`s and `Inf`s are allowed but will be removed.
`alternative`	character string, one of `"greater"`, `"less"` or `"two.sided"`, or the initial letter of each, indicating the specification of the alternative hypothesis. For one-sample tests, `alternative` refers to the true mean of the parent population in relation to the hypothesized value `mu`. For the standard two-sample tests, `alternative` refers to the difference between the true population mean for `x` and that for `y`, in relation to `mu`.
`mu`	a single number representing the value of the mean or difference in means specified by the null hypothesis
`sigma.x`	a single number representing the population standard deviation for `x`
`sigma.y`	a single number representing the population standard deviation for `y`
`conf.level`	confidence level for the returned confidence interval, restricted to lie between zero and one

Details

If `y` is `NULL`, a one-sample z-test is carried out with `x`. If `y` is not `NULL`, a standard two-sample z-test is performed.

Value

A list of class `htest`, containing the following components:

`statistic`	the z-statistic, with names attribute `"z"`
`p.value`	the p-value for the test
`conf.int`	is a confidence interval (vector of length 2) for the true mean or difference in means. The confidence level is recorded in the attribute `conf.level`. When alternative is not `"two.sided"`, the confidence interval will be half-infinite, to reflect the interpretation of a confidence interval as the set of all values `k` for which one would not reject the null hypothesis that the true mean or difference in means is `k` . Here infinity will be represented by `Inf`.
`estimate`	vector of length 1 or 2, giving the sample mean(s) or mean of differences; these estimate the corresponding population parameters. Component `estimate` has a names attribute describing its elements.
`null.value`	is the value of the mean or difference in means specified by the null hypothesis. This equals the input argument `mu`. Component `null.value` has a names attribute describing its elements.
`alternative`	records the value of the input argument alternative: `"greater"`, `"less"` or `"two.sided"`.
`data.name`	a character string (vector of length 1) containing the actual names of the input vectors `x` and `y`

Null Hypothesis

For the one-sample z-test, the null hypothesis is that the mean of the population from which `x` is drawn is `mu`. For the standard two-sample z-tests, the null hypothesis is that the population mean for `x` less that for `y` is `mu`.

The alternative hypothesis in each case indicates the direction of divergence of the population mean for `x` (or difference of means for `x` and `y`) from `mu` (i.e., `"greater"`, `"less"`, `"two.sided"`).

Author(s)

Alan T. Arnholt

References

Kitchens, L.J. (2003). *Basic Statistics and Data Analysis*. Duxbury.

Hogg, R. V. and Craig, A. T. (1970). *Introduction to Mathematical Statistics, 3rd ed.* Toronto, Canada: Macmillan.

Mood, A. M., Graybill, F. A. and Boes, D. C. (1974). *Introduction to the Theory of Statistics, 3rd ed.* New York: McGraw-Hill.

Snedecor, G. W. and Cochran, W. G. (1980). *Statistical Methods, 7th ed.* Ames, Iowa: Iowa State University Press.

See Also

`zsum.test`, `tsum.test`

Examples

```
x <- rnorm(12)
z.test(x,sigma.x=1)
        # Two-sided one-sample z-test where the assumed value for
        # sigma.x is one. The null hypothesis is that the population
        # mean for 'x' is zero. The alternative hypothesis states
        # that it is either greater or less than zero. A confidence
        # interval for the population mean will be computed.

x <- c(7.8, 6.6, 6.5, 7.4, 7.3, 7., 6.4, 7.1, 6.7, 7.6, 6.8)
y <- c(4.5, 5.4, 6.1, 6.1, 5.4, 5., 4.1, 5.5)
z.test(x, sigma.x=0.5, y, sigma.y=0.5, mu=2)
        # Two-sided standard two-sample z-test where both sigma.x
        # and sigma.y are both assumed to equal 0.5. The null hypothesis
        # is that the population mean for 'x' less that for 'y' is 2.
        # The alternative hypothesis is that this difference is not 2.
        # A confidence interval for the true difference will be computed.

z.test(x, sigma.x=0.5, y, sigma.y=0.5, conf.level=0.90)
        # Two-sided standard two-sample z-test where both sigma.x and
        # sigma.y are both assumed to equal 0.5. The null hypothesis
        # is that the population mean for 'x' less that for 'y' is zero.
```

```
        # The alternative hypothesis is that this difference is not
        # zero.  A 90% confidence interval for the true difference will
        # be computed.
rm(x, y)
```

zsum.test *Summarized z-test*

Description

This function is based on the standard normal distribution and creates confidence intervals and tests hypotheses for both one and two sample problems based on summarized information the user passes to the function. Output is identical to that produced with `z.test`.

Usage

```
zsum.test(mean.x, sigma.x = NULL, n.x = NULL, mean.y = NULL,
  sigma.y = NULL, n.y = NULL, alternative = "two.sided", mu = 0,
  conf.level = 0.95)
```

Arguments

`mean.x`	a single number representing the sample mean of `x`
`sigma.x`	a single number representing the population standard deviation for `x`
`n.x`	a single number representing the sample size for `x`
`mean.y`	a single number representing the sample mean of `y`
`sigma.y`	a single number representing the population standard deviation for `y`
`n.y`	a single number representing the sample size for `y`
`alternative`	is a character string, one of `"greater"`, `"less"` or `"two.sided"`, or the initial letter of each, indicating the specification of the alternative hypothesis. For one-sample tests, `alternative` refers to the true mean of the parent population in relation to the hypothesized value `mu`. For the standard two-sample tests, `alternative` refers to the difference between the true population mean for `x` and that for `y`, in relation to `mu`.
`mu`	a single number representing the value of the mean or difference in means specified by the null hypothesis
`conf.level`	confidence level for the returned confidence interval, restricted to lie between zero and one

Details

If `y` is `NULL` , a one-sample z-test is carried out with `x` . If `y` is not `NULL`, a standard two-sample z-test is performed.

Value

A list of class htest, containing the following components:

statistic	the z-statistic, with names attribute z.
p.value	the p-value for the test
conf.int	is a confidence interval (vector of length 2) for the true mean or difference in means. The confidence level is recorded in the attribute conf.level. When alternative is not "two.sided", the confidence interval will be half-infinite, to reflect the interpretation of a confidence interval as the set of all values k for which one would not reject the null hypothesis that the true mean or difference in means is k. Here, infinity will be represented by Inf.
estimate	vector of length 1 or 2, giving the sample mean(s) or mean of differences; these estimate the corresponding population parameters. Component estimate has a names attribute describing its elements.
null.value	the value of the mean or difference in means specified by the null hypothesis. This equals the input argument mu. Component null.value has a names attribute describing its elements.
alternative	records the value of the input argument alternative: "greater" , "less" or "two.sided".
data.name	a character string (vector of length 1) containing the names x and y for the two summarized samples

Null Hypothesis

For the one-sample z-test, the null hypothesis is that the mean of the population from which x is drawn is mu. For the standard two-sample z-tests, the null hypothesis is that the population mean for x less that for y is mu.

The alternative hypothesis in each case indicates the direction of divergence of the population mean for x (or difference of means of x and y) from mu (i.e., "greater" , "less", "two.sided").

Author(s)

Alan T. Arnholt

References

Kitchens, L. J. (2003). *Basic Statistics and Data Analysis*. Duxbury.

Hogg, R. V. and Craig, A. T. (1970). *Introduction to Mathematical Statistics, 3rd ed*. Toronto, Canada: Macmillan.

Mood, A. M., Graybill, F. A. and Boes, D. C. (1974). *Introduction to the Theory of Statistics, 3rd ed*. New York: McGraw-Hill.

Snedecor, G. W. and Cochran, W. G. (1980). *Statistical Methods, 7th ed*. Ames, Iowa: Iowa State University Press.

See Also

z.test, tsum.test

Examples

```
zsum.test(mean.x=56/30,sigma.x=2, n.x=30, alternative="greater", mu=1.8)
        # Example 9.7 part a. from PASWR.
x <- rnorm(12)
zsum.test(mean(x),sigma.x=1,n.x=12)
        # Two-sided one-sample z-test where the assumed value for
        # sigma.x is one. The null hypothesis is that the population
        # mean for 'x' is zero. The alternative hypothesis states
        # that it is either greater or less than zero. A confidence
        # interval for the population mean will be computed.
        # Note: returns same answer as:
z.test(x,sigma.x=1)
        #
x <- c(7.8, 6.6, 6.5, 7.4, 7.3, 7.0, 6.4, 7.1, 6.7, 7.6, 6.8)
y <- c(4.5, 5.4, 6.1, 6.1, 5.4, 5.0, 4.1, 5.5)
zsum.test(mean(x), sigma.x=0.5, n.x=11 ,mean(y), sigma.y=0.5, n.y=8, mu=2)
        # Two-sided standard two-sample z-test where both sigma.x
        # and sigma.y are both assumed to equal 0.5. The null hypothesis
        # is that the population mean for 'x' less that for 'y' is 2.
        # The alternative hypothesis is that this difference is not 2.
        # A confidence interval for the true difference will be computed.
        # Note: returns same answer as:
z.test(x, sigma.x=0.5, y, sigma.y=0.5)
        #
zsum.test(mean(x), sigma.x=0.5, n.x=11, mean(y), sigma.y=0.5, n.y=8,
conf.level=0.90)
        # Two-sided standard two-sample z-test where both sigma.x and
        # sigma.y are both assumed to equal 0.5. The null hypothesis
        # is that the population mean for 'x' less that for 'y' is zero.
        # The alternative hypothesis is that this difference is not
        # zero.  A 90% confidence interval for the true difference will
        # be computed.  Note: returns same answer as:
z.test(x, sigma.x=0.5, y, sigma.y=0.5, conf.level=0.90)
rm(x, y)
```