

ztest

One-sample z-test

Syntax

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

Description

`h = ztest(x,m,sigma)` performs a z-test of the null hypothesis that data in the vector `x` are a random sample from a normal distribution with mean `m` and standard deviation `sigma`, against the alternative that the mean is not `m`. The result of the test is returned in `h`. `h = 1` indicates a rejection of the null hypothesis at the 5% significance level. `h = 0` indicates a failure to reject the null hypothesis at the 5% significance level.

`x` can also be a matrix or an N -dimensional array. For matrices, `ztest` performs separate z-tests along each column of `x` and returns a vector of results. For N -dimensional arrays, `ztest` works along the first non-singleton dimension of `x`.

The test treats NaN values as missing data, and ignores them.

`h = ztest(...,alpha)` performs the test at the $(100*\alpha)\%$ significance level. The default, when unspecified, is `alpha = 0.05`.

`h = ztest(...,alpha,tail)` performs the test against the alternative specified by the string `tail`. There are three options for `tail`:

- 'both' — Mean is not `m` (two-tailed test). This is the default, when `tail` is unspecified.
- 'right' — Mean is greater than `m` (right-tail test)
- 'left' — Mean is less than `m` (left-tail test)

`tail` must be a single string, even when `x` is a matrix or an N -dimensional array.

`h = ztest(...,alpha,tail,dim)` works along dimension `dim` of `x`. Use `[]` to pass in default values for `alpha` or `tail`.

`[h,p] = ztest(...)` returns the p -value of the test. The p -value is the probability, under the null hypothesis, of observing a value as extreme or more extreme of the test statistic

$$z = \frac{\bar{x} - \mu}{\sigma / \sqrt{n}}$$

where $\bar{x}$ is the sample mean, $\mu = m$ is the hypothesized population mean, σ is the population standard deviation, and n is the sample size. Under the null hypothesis, the test statistic will have a standard normal distribution, $N(0,1)$.

`[h,p,ci] = ztest(...)` returns a $100*(1 - \alpha)\%$ confidence interval on the population mean.

`[h,p,ci,zval] = ztest(...)` returns the value of the test statistic.

Example

Simulate a random sample of size 100 from a normal distribution with mean 0.1 and standard deviation 1:

```
x = normrnd(0.1,1,1,100);
```

Test the null hypothesis that the sample comes from a standard normal distribution:

```
[h,p,ci] = ztest(x,0,1)
h =
    0
p =
    0.1391
ci =
   -0.0481    0.3439
```

The test fails to reject the null hypothesis at the default $\alpha = 0.05$ significance level. Under the null hypothesis, the probability of observing a value as extreme or more extreme of the test statistic, as indicated by the p -value, is greater than α . The 95% confidence interval on the mean contains 0.

Simulate a larger random sample of size 1000 from the same distribution:

```
y = normrnd(0.1,1,1,1000);
```

Test again if the sample comes from a normal distribution with mean 0:

```
[h,p,ci] = ztest(y,0,1)
h =
     1
p =
    5.5160e-005
ci =
    0.0655    0.1895
```

This time the test rejects the null hypothesis at the default $\alpha = 0.05$ significance level. The p -value has fallen below $\alpha = 0.05$ and the 95% confidence interval on the mean does not contain 0.

Because the p -value of the sample y is less than 0.01, the test will still reject the null hypothesis when the significance level is lowered to $\alpha = 0.01$:

```
[h,p,ci] = ztest(y,0,1,0.01)
h =
     1
p =
    5.5160e-005
ci =
    0.0461    0.2090
```

This example will produce slightly different results each time it is run, because of the random sampling.

See Also

[ttest](#), [ttest2](#)

 [zscore](#)

[Bibliography](#) 