Package ‘asympTest’

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Title A Simple R Package for Classical Parametric Statistical Tests and Confidence Intervals in Large Samples

Author Cqts Team

Maintainer Pierre Lafaye de Micheaux <lafaye@unsw.edu.au>

Depends R (>= 1.8.0)

Description One and two sample mean and variance tests (differences and ratios) are considered. The test statistics are all expressed in the same form as the Student t-test, which facilitates their presentation in the classroom. This contribution also fills the gap of a robust (to non-normality) alternative to the chi-square single variance test for large samples, since no such procedure is implemented in standard statistical software.

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asymp.test

Asymptotic tests

Description

Performs one and two sample asymptotic (no gaussian assumption on distribution) parametric tests on vectors of data.

Usage

asymp.test(x,...)

## Default S3 method:
asymp.test(x, y = NULL,
parameter = c("mean", "var", "dMean", "dVar", "rMean", "rVar"),
alternative = c("two.sided", "less", "greater"),
reference = 0, conf.level = 0.95, rho = 1, ...)
## S3 method for class 'formula'
asymp.test(formula, data, subset, na.action, ...)

Arguments

- **x**: a (non-empty) numeric vector of data values.
- **y**: an optional (non-empty) numeric vector of data values.
- **parameter**: a character string specifying the parameter under testing, must be one of "mean", "var", "dMean" (default), "dVar", "rMean", "rVar".
- **alternative**: a character string specifying the alternative hypothesis, must be one of "two.sided" (default), "greater" or "less". You can specify just the initial letter.
- **reference**: a number indicating the reference value of the parameter (difference or ratio true value for two sample test).
- **conf.level**: confidence level of the interval.
- **rho**: optional parameter (only used for parameters "dMean" and "dVar") for penalization (or enhancement) of the contribution of the second parameter.
- **formula**: a formula of the form lhs ~ rhs where lhs is a numeric variable giving the data values and rhs a factor with two levels giving the corresponding groups.
- **data**: an optional matrix or data frame (or similar: see model.frame) containing the variables in the formula formula. By default the variables are taken from environment(formula).
- **subset**: an optional vector specifying a subset of observations to be used.
- **na.action**: a function which indicates what should happen when the data contain NAs. Defaults togetOption("na.action").
- **...**: further arguments to be passed to or from methods.
Details

Asymptotic parametric test and confidence intervals are based on the following unified statistic:

$$\frac{\hat{\theta}(Y) - \theta}{\hat{\sigma}_\theta(Y)}$$

which asymptotically follows a $N(0, 1)$.

$\theta$ stands for the parameter under testing (mean/variance, difference/ratio of means or variances).

The term $\hat{\sigma}_\theta(Y)$ is calculated by the ad-hoc seTheta function (see seMean).

Value

A list with class "htest" containing the following components:

- **statistic** the value of the unified $\theta$ statistic.
- **p.value** the p-value for the test.
- **conf.int** a confidence interval for the parameter appropriate to the specified alternative hypothesis.
- **estimate** the estimated parameter depending on whether it was a one-sample test or a two-sample test (in which case the estimated parameter can be a difference/ratio in means/variances).
- **null.value** the specified hypothesized value of parameter depending on whether it was a one-sample test or a two-sample test.
- **alternative** a character string describing the alternative hypothesis.
- **method** a character string indicating what type of asymptotic test was performed.
- **data.name** a character string giving the name(s) of the data.

Author(s)

J.-F. Coeurjolly, R. Drouilhet, P. Lafaye de Micheaux, J.-F. Robineau

References


See Also

t.test, var.test for normal distributed data.
Examples

```r
## one sample
x <- rnorm(70, mean = 1, sd = 2)
asymp.test(x)
asymp.test(x, par="mean", alt="g")
asymp.test(x, par="mean", alt="l", ref=2)
asymp.test(x, par="var", alt="g")
asymp.test(x, par="var", alt="l", ref=2)
## two samples
y <- rnorm(50, mean = 2, sd = 1)
asymp.test(x, y)
asymp.test(x, y, "rMean","l",.75)
asymp.test(x, y, "dMean","l",0, rho=.75)
asymp.test(x, y, "dVar")
## Formula interface
asymp.test(uptake~Type, data=CO2)
```

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**DIGdata**  

**DIG NHLBI Teaching Dataset**

**Description**

A clinical trial focused dataset was developed using the Digitalis Investigation Group (DIG). This dataset was designed to replicate the results found in the February 1997 New England Journal of Medicine article. Note that statistical processes such as permutations within treatment groups were used to completely anonymize the data; therefore, inferences derived from the teaching dataset may not be valid. The DIG Trial was a randomized, double-blind, multicenter trial with more than 300 centers in the United States and Canada participating. The purpose of the trial was to examine the safety and efficacy of Digoxin in treating patients with congestive heart failure in sinus rhythm. Data on 5281 male and 1519 female collected.

**Format**

This data frame contains the following columns:

- **ID** Patient ID
- **TRTMT** (0=Placebo, 1=Treatment)
- **AGE** Calculated: age at randomization
- **RACE** Q5: Race, 1=White 2=Nonwhite
- **SEX** (1 = male or 2 = female)
- **EJFPER** Q3: Ejection fraction (percent)
- **EJFMETH** Q3A: Ejection Fraction method
- **CHESTX** Q6: Chest X-ray (CT-Ratio)
- **BMI** Calculated: Body Mass Index (kg per M-squared)
- **KLEVEL** Q9A: Serum Potassium level
CREAT  Q9: Serum Creatinine (mg per dL)
DIGDOSER  Q10: Recommended Digoxin dose
CHFDUR  Q12: Duration of CHF (months)
RALES  Q13: Rales
ELEVJVP  Q14: Elevated jugular venous pressure
PEDEMA  Q15: Peripheral Edema
RESTDYS  Q16: Dyspnea at Rest
EXERTDYS  Q17: Dyspnea on Exertion
ACTLIMIT  Q18: Limitation of activity
S3  Q19: S3 Gallop
PULCONG  Q20: Pulmonary congestion
NSYM  Calculated: Sum of Q13-Q20, Y or N status
HEARTRTE  Q21: Heart Rate (beats per min)
DIABP  Q22: Diastolic BP (mmHg)
SYSBP  Q22: Systolic BP (mmHg)
FUNCTCLS  Q23: NYHA Functional Class
CHFETIOL  Q24: CHF Etiology
PREVMI  Q25: Previous Myocardial Infarction
ANGINA  Q26: Current Angina
DIABETES  Q27: History of Diabetes
HYPERTEN  Q28: History of Hypertension
DIGUSE  Q29: Digoxin within past week
DIURETK  Q30: Potassium sparing Diuretics
DIURET  Q31: Other Diuretics
KSUPP  Q31A: Potassium supplements
ACEINHIB  Q32: Ace inhibitors
NITRATES  Q33: Nitrates
HYDRAL  Q34: Hydralazine
VASOD  Q35: Other Vasodilators
DIGDOSE  Q36: Dose of Digoxin per Placebo prescribed
CVD  Hosp: Cardiovascular Disease
CVDDAYS  Days randomization to First CVD Hosp
WHF  Hosp: Worsening Heart Failure
WHFDAYS  Days randomization to First WHF Hosp
DIG  Hosp: Digoxin Toxicity
DIGDAYS  Days rand. to First Digoxin Tox Hosp
MI  Hosp: Myocardial Infarction
MIDAYS Days randomization to First MI Hosp
UANG Hosp: Unstable Angina
UANGDAYS Days rand. to First Unstable Angina Hosp
STRK Hosp: Stroke
STRKDAYS Days randomization to First Stroke Hosp
SVA Hosp: Supraventricular Arrhythmia
SVADAYS Days rand. to First SupraVent Arr. Hosp
VENA Hosp: Ventricular Arrhythmia
VENADAYS Days rand. to First Vent. Arr. Hosp
CREV Hosp: Coronary Revascularization
CREVDAYS Days rand. to First Cor. Revasc.
OCVD Hosp: Other Cardiovascular Event
OCVDDAYS Days rand. to First Other CVD Hosp
RINF Hosp: Respiratory Infection
RINF DAYS Days rand. to First Resp. Infection Hosp
OTH Hosp: Other noncardiac, nonvascular
OTHDAYS Days rand. to 1st Other Non CVD Hosp
HOSP Hosp: Any Hospitalization
HOSPDAYS Days randomization to First Any Hosp
NHOSP Number of Hospitalizations
DEATH Vital Status of Patient 1=Death 0=Alive
DEATHDAY Days till last followup or death
REASON Cause of Death
DWHF Primary Endpt: Death or Hosp from HF
DWHFDAYS Days rand. to death or Hosp from WHF

Source
NHLBI Teaching Dataset

References

Examples
data(DIGdata)
Description

se functions compute the Standard Error of respectively mean, variance, difference of means, of variances and ratio of means and variances.

Usage

```r
seMean(x, ...) # Default S3 method:
seMean(x, ...) seVar(x, ...)
# Default S3 method:
seVar(x, ...) seDMean(x, ...)
# Default S3 method:
seDMean(x, y, rho = 1, ...)
seDMeanG(x, ...)
# Default S3 method:
seDMeanG(x, y, ...)
seDVar(x, ...)
# Default S3 method:
seDVar(x, y, rho = 1, ...)
seRMean(x, ...)
# Default S3 method:
seRMean(x, y, r0, ...)
seRVar(x, ...)
# Default S3 method:
seRVar(x, y, r0, ...)
```

Arguments

- `x` a (non-empty) numeric vector of data values.
- `y` an optional (non-empty) numeric vector of data values.
- `rho` optional parameter for penalization (or enhancement) of the contribution of the second parameter.
- `r0` an optional parameter for ratio of means (seRMean) or variances (seRVar). It acts as parameter r in seDMean and seDVar. Defaults are mean(x)/mean(y) in seRMean and var(x)/var(y) for seRVar.
- `...` further arguments to be passed to or from methods.

Details

se functions performs classical standard error estimation for parameters mean, variance, difference of means or variances, ratio of means or variances.
Value

Return the value of the estimated standard error for the corresponding parameter.

Author(s)

J.-F. Coeurjolly, R. Drouilhet, P. Lafaye de Micheaux, J.-F. Robineau

References


See Also

asymp.test that used estimated standard error for asymptotic parametric tests.

Examples

x <- rnorm(70, mean = 1, sd = 2)
y <- rnorm(50, mean = 2, sd = 1)
## mean statistic
asymp.test(x)$stat
mean(x)/seMean(x)
## variance statistic
asymp.test(x,param="var",alt="l",param0=2)$stat
(var(x)-2)/seVar(x)
## difference of means statistic
asymp.test(x,y)$stat
(mean(x)-mean(y))/seDMean(x,y)
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