Package 'JMdesign'

January 12, 2022

Type Package

Title Joint Modeling of Longitudinal and Survival Data - Power Calculation

Version 1.2

Date 2022-1-12

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Description Performs power calculations for joint modeling of longitudinal and survival data with k-th order trajectories when the variance-covariance matrix, Sigma_theta, is unknown.

License GPL-2

Depends methods

NeedsCompilation no

Repository CRAN

Date/Publication 2022-01-12 22:42:44 UTC

R topics documented:

`JMdesign-package` *Joint Modeling of Longitudinal and Survival Data - Power Calculation*

Description

R function for power determination in joint modeling of longitudinal and survival data with k-th order trajectories and unknown variance-covariance matrix Sigma_theta.

Details

Package:	JMdesign
Type:	Package
Version:	1.1
Date:	2014-10-21
License:	GPL-2

The package contains the R-function powerLongSurv to perform power calculations for joint modeling of longitudinal and survival data when trajectories are of k-th order and the variance-covariance matrix Sigma_theta is unknown.

Author(s)

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References

L. M. Chen, J. G. Ibrahim, and H. Chu. Sample size and power determination in joint modeling of longitudinal and survival data. Statist. Med. 2011, 30 2295-2309

See Also

powerLongSurv, powerLongSurv-class, show-methods

Examples

```
## Example 1.
## **********
## Input elements of Sigma_theta in forumula 4.6;
SigmaTheta <- matrix(c(1.2,0.0,0.0,0.0,0.7,0.0,0.0,0.0,0.8),nrow=3,ncol=3)

N        <-  200; # Total sample size;
nevents  <-  140; # Number of events;
tmedian  <-  0.7; # median survival;
meantf   <-  1.4; # mean follow-up time;
beta     <-  0.2; # Effect of the trajectory;
alpha    <-  0.05;# Type-I Error (2-sided);
sigmae_2 <-  0.09; # measurement error;

## schedule of measurement;
t <- c(0.4, 0.8, 1.2, 1.6, 2) ; # maximum 2 year follow-up;

## Input estimated proportion subjects with 2,3,4,5,6 measurements;
## This is \xi in formula 4.6;
## The data is obtained from the simulated data for the calculation in table 2;
p <- c(0.3, 0.4, 0.15, 0.1, 0.05);

## Input the order of trajectories
ordtraj <- 1 ## linear trajectories
```

```
## Call function
## Linear Trajectories
pLSl <- powerLongSurv(N, nevents, tmedian, meantf, p, t, SigmaTheta,
                      sigmae_2, ordtraj, beta, alpha=0.05)
pLSl
show(pLSl)
unclass(pLSl)

## Constant Trajectories
powerLongSurv(N, nevents, tmedian, meantf, p, t, SigmaTheta, sigmae_2,
              ordtraj=0, beta, alpha=0.05)

## Quadratic Trajectories
powerLongSurv(N, nevents, tmedian, meantf, p, t, SigmaTheta,sigmae_2,
              ordtraj=2, beta, alpha=0.05)

## ************************************************************************

## Example 2.
## **********
## Input elements of Sigma_theta in forumula 4.6;
SigmaTheta <- matrix(c(1.2,0.0,0.0,0.0,0.7,0.0,0.0,0.0,0.8),nrow=3,ncol=3)

N        <-  200; # Total sample size;
nevents  <-  140; # Number of events;
tmedian  <-  0.7; # median survival;
meantf   <-  1.4; # mean follow-up time;
beta     <-  0.2; # Effect of the trajectory;
alpha    <-  0.05;# Type-I Error (2-sided);
sigmae_2 <-  0.09; # measurement error;

## schedule of measurement;
t <- c(0.4, 0.8, 1.2, 1.6);

## Input estimated proportion subjects with 2,3,4,5,6 measurements;
## This is \xi in formula 4.6;
## The data is obtained from the simulated data for the calculation in table 2;
p  <-  c(0.3, 0.4, 0.2, 0.1);

## Input the order of trajectories
ordtraj <- 2 ## quadratic trajectories

## Call function
## Quadratic Trajectories
pLSq <- powerLongSurv(N, nevents, tmedian, meantf, p, t, SigmaTheta,
                      sigmae_2, ordtraj, beta, alpha=0.05)
pLSq
show(pLSq)
unclass(pLSq)

## Constant Trajectories
powerLongSurv(N, nevents, tmedian, meantf, p, t, SigmaTheta, sigmae_2,
```

```
              ordtraj=0, beta, alpha=0.05)

## Linear Trajectories
powerLongSurv(N, nevents, tmedian, meantf, p, t, SigmaTheta, sigmae_2,
              ordtraj=1, beta, alpha=0.05)
```

`powerLongSurv` *Power calculation in joint modeling of longitudinal and survival data - k-th Order Trajectories and Unknown Sigma*

Description

Compute the power in joint modeling of longitudinal and survival data when the variance-covariance matrix Sigma_Theta is unknown and the trajectories are order k.

The function computes power for a one-sided test, either

$$H_0 : \beta = 0 \quad \text{and} \quad H_{1A} : \beta > 0$$

or

$$H_0 : \beta = 0 \quad \text{and} \quad H_{1B} : \beta < 0$$

with Type I error α. The choice of the alternative is determined by the sign of β. Negative values for β indicate that the alternative hypothesis is H_{1B}, while $\beta \geq 0$ indicates that it is H_{1A}.

It creates a `powerLongSurv` object.

Usage

```
powerLongSurv(N, nevents, tmedian, meantf, p, t, SigmaTheta, sigmae_2, ordtraj,
              beta = 0, alpha = 0.05, tol = 1.5e-8)
```

Arguments

`N`	numeric specifying the total sample size; minimum 20.
`nevents`	numeric specifying the number of events; at least 20 and at most N.
`tmedian`	numeric specifying the median survival time; positive
`meantf`	numeric specifying the mean follow-up time; positive and no greater than max(t).
`p`	numeric vector of estimated subject proportions with 2,3,... measurements, respectively, zero proportions allowed.
`t`	numeric vector of measurement times, distinct positive components; same length as `p`.
`SigmaTheta`	numeric matrix specifying the covariance matrix Sigma_Theta
`sigmae_2`	numeric specifying the measurement error; positive.
`ordtraj`	integer specifying the order of trajectories, must be less the order of Sigma_Theta
`beta`	numeric specifying the effect of the trajectory; default value 0.
`alpha`	numeric, strictly between 0.0 and 1.0, specifying the Type-I Error (2-sided), default value 0.05.
`tol`	numeric, For floating point objects x and y, if |x-y| <= tol, x==y. Passed to R function all.equal.

Details

The function `powerLongSurv` is used to calculate the power in joint modeling of longitudinal and survival data.

Value

An object of S4 class `powerLongSurv`, which has the following 12 components

`title`	character string
`subtitle`	character string
`t`	numeric vector
`p`	numeric vector
`N`	integer
`nevents`	integer
`censr`	numeric
`tmedian`	numeric
`meantf`	numeric
`SigmaTheta`	numeric matrix
`ordtraj`	integer
`BSigma`	numeric matrix
`beta`	numeric
`alpha`	numeric
`power`	numeric

Author(s)

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References

L. M. Chen, J. G. Ibrahim, and H. Chu. Sample size and power determination in joint modeling of longitudinal and survival data. Statist. Med. 2011, 30 2295-2309

See Also

`powerLongSurv-class`, `show-methods`

Examples

```
## Example 1.
## **********
## Input elements of Sigma_theta in forumula 4.6;
SigmaTheta <- matrix(c(1.2,0.0,0.0,0.0,0.7,0.0,0.0,0.0,0.8),nrow=3,ncol=3)

N        <-  200; # Total sample size;
nevents  <-  140; # Number of events;
tmedian  <-  0.7; # median survival;
meantf   <-  1.4; # mean follow-up time;
beta     <-  0.2; # Effect of the trajectory;
alpha    <-  0.05;# Type-I Error (2-sided);
sigmae_2 <-  0.09; # measurement error;

## schedule of measurement;
t <- c(0.4, 0.8, 1.2, 1.6, 2) ; # maximum 2 year follow-up;

## Input estimated proportion subjects with 2,3,4,5,6 measurements;
## This is \xi in formula 4.6;
## The data is obtained from the simulated data for the calculation in table 2;
p <- c(0.3, 0.4, 0.15, 0.1, 0.05);

## Input the order of trajectories
ordtraj <- 1 ## linear trajectories

## Call function
## Linear Trajectories
pLSl <- powerLongSurv(N, nevents, tmedian, meantf, p, t, SigmaTheta,
                      sigmae_2, ordtraj, beta, alpha=0.05)
pLSl
show(pLSl)
unclass(pLSl)

## Constant Trajectories
powerLongSurv(N, nevents, tmedian, meantf, p, t, SigmaTheta, sigmae_2,
              ordtraj=0, beta, alpha=0.05)

## Quadratic Trajectories
powerLongSurv(N, nevents, tmedian, meantf, p, t, SigmaTheta, sigmae_2,
              ordtraj=2, beta, alpha=0.05)

## ************************************************************************

## Example 2.
## **********
## Input elements of Sigma_theta in forumula 4.6;
SigmaTheta <- matrix(c(1.2,0.0,0.0,0.0,0.7,0.0,0.0,0.0,0.8),nrow=3,ncol=3)

N        <-  200; # Total sample size;
nevents  <-  140; # Number of events;
tmedian  <-  0.7; # median survival;
meantf   <-  1.4; # mean follow-up time;
```

```
beta     <-  0.2; # Effect of the trajectory;
alpha    <-  0.05;# Type-I Error (2-sided);
sigmae_2 <-  0.09; # measurement error;

## schedule of measurement;
t <- c(0.4, 0.8, 1.2, 1.6);

## Input estimated proportion subjects with 2,3,4,5,6 measurements;
## This is \xi in formula 4.6;
## The data is obtained from the simulated data for the calculation in table 2;
p <- c(0.3, 0.4, 0.2, 0.1);

## Input the order of trajectories
ordtraj <- 2 ## quadratic trajectories

## Call function
## Quadratic Trajectories
pLSq <- powerLongSurv(N,nevents,tmedian,meantf,p,t,SigmaTheta,sigmae_2,ordtraj,beta, alpha = 0.05)
pLSq
show(pLSq)
unclass(pLSq)

## Constant Trajectories
powerLongSurv(N, nevents, tmedian, meantf, p, t, SigmaTheta, sigmae_2,
              ordtraj=0, beta, alpha=0.05)

## Linear Trajectories
powerLongSurv(N, nevents, tmedian, meantf, p, t, SigmaTheta, sigmae_2,
              ordtraj=1, beta, alpha=0.05)
```

---

powerLongSurv-class *Class* "powerLongSurv"

Description

Class of objects like the output of function "powerLongSurv()".

Objects from the Class

Objects can be created by calls of the form new("powerLongSurv",...).

Slots

title: Object of class "character"

subtitle: Object of class "character"

t: Object of class "vector"

p: Object of class "vector"

N: Object of class "integer"

`nevents`: Object of class "integer"

`censr`: Object of class "numeric"

`tmedian`: Object of class "numeric"

`meantf`: Object of class "numeric"

`SigmaTheta`: Object of class "matrix"

`ordtraj`: Object of class "integer"

`BSigma`: Object of class "matrix"

`beta`: Object of class "numeric"

`alpha`: Object of class "numeric"

`power`: Object of class "numeric"

Methods

show `signature(object = "powerLongSurv")`

Author(s)

Emil A. Cornea, Liddy M. Chen, Bahjat F. Qaqish, Haitao Chu, and Joseph G. Ibrahim

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See Also

`powerLongSurv`, `show-methods`

Examples

```
showClass("powerLongSurv")
```

---

show-methods *Methods for Function* show

Description

Methods for function show

Methods

`signature(object = "powerLongSurv")`

Index