Package 'CutpointsOEHR'

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Type Package

Title Optimal Equal-HR Method to Find Two Cutpoints for U-Shaped
Relationships in Cox Model

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Description Use optimal equal-HR method to determine two optimal cutpoints of a continuous predic-
tor that has a U-shaped relationship with survival outcomes based on Cox regres-
sion model. The optimal equal-HR method estimates two optimal cut-points that have approxi-
mately the same log hazard value based on Cox regression model and divides individu-
als into different groups according to their HR values.

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Imports survival

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Description

Use optimal equal-HR method to determine two optimal cutpoints of a continuous predictor that has a U-shape relationship with survival outcomes based on Cox regression model.

Usage

```
findcutpoints(cox_pspline_fit, data, nquantile = 100, exclude = 0.05,
  eps = 0.01, shape = "U")
```

Arguments

cox_pspline_fit

Cox model with psplined x, e.g. coxph(Surv(t,d)~pspline(x,df=0,caic=T),data=test).

data
a dataframe contain survival outcome and a continuous variable which needs to find two optimal cutpoints.

nquantile
an integer; the default value is 100, which means using the 100-quantiles of log relative hazard to find cutpoints.

exclude
a decimals; it is used for excluding extreme values of log relative hazardthe. The default value is 0.05, which log relative hazard values smaller than 5th percentile or larger than 95th percentile are excluded.

eps
a decimals; the default value is 0,01. It restrict the difference between the log relative hazard values of two cadidate cutpoints to be less than 0.01.

shape
a string; equals "U" or "inverseU"

Details

A function to find two optimal cutpoints

Examples

```
#### Example 1. Find two optimal cutpoints in an univariate Cox model
# Fit an univariate Cox model with pspline
require(survival)
result <- coxph(Surv(t,d)~pspline(x,df=0,caic=TRUE),data=test)
# Visualize the relationship
# Explore whether there is a U-shaped relationship between x and log relative hazard
termplot(result,se=TRUE,col.term=1,ylab='log relative hazard')
# Find two opitmal cutpoints using optimal equal-HR method.
cuts <- findcutpoints(cox_pspline_fit = result, data = test, shape='U')
cuts$optimal # output two optimal cutpoints

#### Example 2. Find two optimal cutpoints in a multivariate Cox model
```

```
# Fit a multivariate Cox model with pspline
# The independent variable which is need to find cutpoints should be placed before other covariates.
# To find cutpoints of x, Surv(t,d)~pspline(x)+x1 should be used instead of Surv(t,d)~x1+pspline(x)
require(survival)
result <- coxph(Surv(t,d)~pspline(x,df=0,caic=TRUE)+x1,data=test)
# The rest procedure is the same as example 1
# Visualize the relationship
# Explore whether there is a U-shaped relationship between x and log relative hazard
termplot(result,se=TRUE,col.term=1,ylab='log relative hazard')
# Find two opitmal cutpoints of the first independent variable.
cuts <- findcutpoints(cox_pspline_fit = result, data = test, shape='U')
cuts$optimal # output two optimal cutpoints
```

---

test   *A simulation data to test cutpointsOEHR*

Description

A dataframe named 'test'contains simulated (t,d,x,x1). The relationship of log relative hazard and x is set to to quandratic, which results in a U-shaped relationship.

Usage

```
test
```

Format

a dataframe contains 200 rows and 4 variables. The 4 varibles are

t simulated times of developing survival outcomes like deaths, relapes, etc.

d censoring indicator, 1 means that survival outcomes are not observed, 0 means survival outcomes are observed. The censoring proportion is set to be 20 percent.

x a continuous variable which has U-shaped relationship with log relative hazard.

x1 a continuous variable which has linear relationship with log relative hazard.

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