Package ‘Copula.surv’

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Type Package

Title Association Analysis of Bivariate Survival Data Based on Copulas

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Author Takeshi Emura

Maintainer Takeshi Emura <takeshiemura@gmail.com>

Description Perform association analysis of bivariate survival data based on copula models.
Two different ways to estimate the association parameter in copula models are implemented.
A goodness-of-fit test for a given copula model is implemented.
See Emura, Lin and Wang (2010) <doi.org/10.1016/j.csda.2010.03.013> for details.

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`Copula.surv-package` *Analysis of Doubly-Truncated Data*

Description

Perform association analysis of bivariate survival data based on copula models. Two different ways to estimate the association parameter in copula models are implemented. A goodness-of-fit test for a given copula model is implemented. See Emura, Lin and Wang (2010) <doi.org/10.1016/j.csda.2010.03.013> for details.

Details

Details are seen from the references.

Author(s)

Takeshi Emura Maintainer: Takeshi Emura <takeshiemura@gmail.com>

References

Emura T, Lin CW, Wang W (2010) A goodness-of-fit test for Archimedean copula models in the presence of right censoring, Compt Stat Data Anal 54: 3033-43

`Test.Clayton` *A goodness-of-fit test for the Clayton copula*

Description

Perform a goodness-of-fit test for the Clayton copula based on Emura, Lin and Wang (2010). The test is asymptotically equivalent to the test of Shih (1998).

Usage

```
Test.Clayton(x.obs,y.obs,dx,dy,lower=0.001,upper=50)
```

Arguments

`x.obs`	censored times for X
`y.obs`	censored times for Y
`dx`	censoring indicators for X
`dy`	censoring indicators for Y
`lower`	lower bound for the association parameter
`upper`	upper bound for the association parameter

Details

See the references.

Value

`theta1`	association parameter by the pseudo-likelihood estimator
`theta2`	association parameter by the unweighted estimator
`Stat`	log(theta1)-log(theta2)
`Z`	Z-value of the goodness-of-fit for the Clayton copula
`P`	P-value of the goodness-of-fit for the Clayton copula

Author(s)

Takeshi Emura

References

Emura T, Lin CW, Wang W (2010) A goodness-of-fit test for Archimedean copula models in the presence of right censoring, Compt Stat Data Anal 54: 3033-43

Shih JH (1998) A goodness-of-fit test for association in a bivariate survival model. Biometrika 85: 189-200

Examples

```
n=20
theta_true=2 ## association parameter ##
r1_true=2 ## hazard for X
r2_true=2 ## hazard for Y

set.seed(1)
V1=runif(n)
V2=runif(n)
X=-1/r1_true*log(1-V1)
W=(1-V1)^(-theta_true)
Y=1/theta_true/r2_true*log(  1-W+W*(1-V2)^(-theta_true/(theta_true+1))  )
C=runif(n,min=0,max=5)

x.obs=pmin(X,C)
y.obs=pmin(Y,C)
dx=X<=C
dy=Y<=C

Test.Clayton(x.obs,y.obs,dx,dy)
```

`U1.Clayton` *Estimation of an association parameter via the pseudo-likelihood*

Description

Estimate the association parameter of the Clayton copula using bivariate survival data. The estimator was derived by Clayton (1978) and reformulated by Emura, Lin and Wang (2010).

Usage

```
U1.Clayton(x.obs,y.obs,dx,dy,lower=0.001,upper=50)
```

Arguments

`x.obs`	censored times for X
`y.obs`	censored times for Y
`dx`	censoring indicators for X
`dy`	censoring indicators for Y
`lower`	lower bound for the association parameter
`upper`	upper bound for the association parameter

Details

Details are seen from the references.

Value

`theta`	association parameter
`tau`	Kendall's tau (=theta/(theta+2))

Author(s)

Takeshi Emura

References

Clayton DG (1978). A model for association in bivariate life tables and its application to epidemiological studies of familial tendency in chronic disease incidence. Biometrika 65: 141-51.

Emura T, Lin CW, Wang W (2010) A goodness-of-fit test for Archimedean copula models in the presence of right censoring, Compt Stat Data Anal 54: 3033-43

Examples

```
n=200
theta_true=2 ## association parameter ##
r1_true=1 ## hazard for X
r2_true=1 ## hazard for Y

set.seed(1)
V1=runif(n)
V2=runif(n)
X=-1/r1_true*log(1-V1)
W=(1-V1)^(-theta_true)
Y=1/theta_true/r2_true*log(  1-W+W*(1-V2)^(-theta_true/(theta_true+1))  )
C=runif(n,min=0,max=5)

x.obs=pmin(X,C)
y.obs=pmin(Y,C)
dx=X<=C
dy=Y<=C
```

```
U1.Clayton(x.obs,y.obs,dx,dy)
```

U2.Clayton *Estimation of an association parameter via the unweighted estimator*

Description

Estimate the association parameter of the Clayton copula using bivariate survival data. The estimator was defined as the unweighted estimator in Emura, Lin and Wang (2010).

Usage

```
U2.Clayton(x.obs,y.obs,dx,dy)
```

Arguments

`x.obs`	censored times for X
`y.obs`	censored times for Y
`dx`	censoring indicators for X
`dy`	censoring indicators for Y

Details

Details are seen from the references.

Value

`theta`	association parameter
`tau`	Kendall's tau (=theta/(theta+2))

Author(s)

Takeshi Emura

References

Emura T, Lin CW, Wang W (2010) A goodness-of-fit test for Archimedean copula models in the presence of right censoring, Compt Stat Data Anal 54: 3033-43

Examples

```
n=200
theta_true=2 ## association parameter ##
r1_true=1 ## hazard for X
r2_true=1 ## hazard for Y

set.seed(1)
V1=runif(n)
V2=runif(n)
X=-1/r1_true*log(1-V1)
W=(1-V1)^(-theta_true)
Y=1/theta_true/r2_true*log(  1-W+W*(1-V2)^(-theta_true/(theta_true+1))  )
C=runif(n,min=0,max=5)

x.obs=pmin(X,C)
y.obs=pmin(Y,C)
dx=X<=C
dy=Y<=C

U2.Clayton(x.obs,y.obs,dx,dy)
```

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