Package ‘VC2copula’

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Title Extend the ‘copula’ Package with Families and Models from ‘VineCopula’

Version 0.1.1

Description Provides new classes for (rotated) BB1, BB6, BB7, BB8, and Tawn copulas, extends the existing Gumbel and Clayton families with rotations, and allows to set up a vine copula model using the ‘copula’ API. Corresponding objects from the ‘VineCopula’ API can easily be converted.

License GPL-3

Encoding UTF-8

LazyData true

URL https://github.com/tnagler/VC2copula

BugReports https://github.com/tnagler/VC2copula/issues

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Imports VineCopula (>= 2.3.0), methods

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**Constructors for BB1 copulas**

**Description**

Constructs an object of the BB1Copula (survival sur, 90 degree rotated r90 and 270 degree rotated r270) family for given parameters.

**Usage**

```r
BB1Copula(param = c(1, 1))
surBB1Copula(param = c(1, 1))
r90BB1Copula(param = c(-1, -1))
r270BB1Copula(param = c(-1, -1))
```

**Arguments**

- `param` The parameter `param` defines the copula through theta and delta.

**Value**

One of the respective BB1 copula classes (BB1Copula, surBB1Copula, r90BB1Copula, r270BB1Copula).
References


See Also

See also BB6Copula(), BB7Copula(), BB8Copula() and joeCopula() for further wrapper functions to the VineCopula-package().

Examples

library(copula)

persp(BB1Copula(c(1, 1.5)), dCopula, zlim = c(0, 10))
persp(surBB1Copula(c(1, 1.5)), dCopula, zlim = c(0, 10))
persp(r90BB1Copula(c(-1, -1.5)), dCopula, zlim = c(0, 10))
persp(r270BB1Copula(c(-1, -1.5)), dCopula, zlim = c(0, 10))
Constructors for BB6 copulas

Description

Constructs an object of the BB6Copula (survival sur, 90 degree rotated r90 and 270 degree rotated r270) family for given parameters.

Usage

BB6Copula(param = c(1, 1))

surBB6Copula(param = c(1, 1))

r90BB6Copula(param = c(-1, -1))

r270BB6Copula(param = c(-1, -1))

Arguments

param The parameter param defines the copula through theta and delta.

Value

One of the respective BB6 copula classes (BB6Copula, surBB6Copula, r90BB6Copula, r270BB6Copula).

References


See Also

See also BB6Copula(), BB7Copula(), BB8Copula() and joeCopula() for further wrapper functions to the VineCopula-package().

Examples

library(copula)

persp(BB6Copula(c(1, 1.5)), dCopula, zlim = c(0, 10))
persp(surBB6Copula(c(1, 1.5)), dCopula, zlim = c(0, 10))
persp(r90BB6Copula(c(-1, -1.5)), dCopula, zlim = c(0, 10))
persp(r270BB6Copula(c(-1, -1.5)), dCopula, zlim = c(0, 10))
BB6Copula-class  

**Description**

Wrapper classes representing the BB6, survival BB6, 90 degree and 270 degree rotated BB6 copula families (Joe 1997) from VineCopula-package().

**Objects from the Classes**

Objects can be created by calls of the form new("BB6Copula",...), new("surBB6Copula",...), new("r90BB6Copula",...) and new("r270BB6Copula",...) or by the functions BB6Copula(), surBB6Copula(), r90BB6Copula() and r270BB6Copula().

**References**


**See Also**

See also BB6Copula, BB7Copula, BB8Copula and joeCopula for further wrapper classes to the VineCopula-package().

**Examples**

showClass("BB6Copula")

---

BB7Copula  

**Constructor for BB7 copulas**

**Description**

Constructs an object of the BB7Copula (survival sur, 90 degree rotated r90 and 270 degree rotated r270) family for given parameters.

**Usage**

BB7Copula(param = c(1, 1))

surBB7Copula(param = c(1, 1))

r90BB7Copula(param = c(-1, -1))

r270BB7Copula(param = c(-1, -1))
**Arguments**

param

The parameter param defines the copula through theta and delta.

**Value**

One of the respective BB7 copula classes (BB7Copula, surBB7Copula, r90BB7Copula, r270BB7Copula).

**References**


**See Also**

See also BB6Copula(), BB7Copula(), BB8Copula() and joeCopula() for further wrapper functions to the VineCopula-package().

**Examples**

library(copula)

persp(BB7Copula(c(1, 1.5)), dCopula, zlim = c(0, 10))
persp(surBB7Copula(c(1, 1.5)), dCopula, zlim = c(0, 10))
persp(r90BB7Copula(c(-1, -1.5)), dCopula, zlim = c(0, 10))
persp(r270BB7Copula(c(-1, -1.5)), dCopula, zlim = c(0, 10))
BB8Copula

See Also

See also BB7Copula, BB7Copula, BB8Copula and joeCopula for further wrapper classes to the VineCopula-package().

Examples

showClass("BB7Copula")

---

BB8Copula

Constructors for BB8 copulas

Description

Constructs an object of the BB8Copula (survival sur, 90 degree rotated r90 and 270 degree rotated r270) family for given parameters.

Usage

BB8Copula(param = c(1, 1))

surBB8Copula(param = c(1, 1))

r90BB8Copula(param = c(-1, -1))

r270BB8Copula(param = c(-1, -1))

Arguments

param The parameter param defines the copula through theta and delta.

Value

One of the respective BB8 copula classes (BB8Copula, surBB8Copula, r90BB8Copula, r270BB8Copula).

References


See Also

See also BB6Copula(), BB7Copula(), BB8Copula() and joeCopula() for further wrapper functions to the VineCopula-package().
Examples

```r
library(copula)

persp(BB8Copula(c(2, 0.9)), dCopula, zlim = c(0, 10))
persp(survBB8Copula(c(2, 0.9)), dCopula, zlim = c(0, 10))
persp(r90BB8Copula(c(-2, -0.9)), dCopula, zlim = c(0, 10))
persp(r270BB8Copula(c(-2, -0.9)), dCopula, zlim = c(0, 10))
```

---

**BB8Copula-class**  
**BB8 copula models**

Description

Wrapper classes representing the BB8, survival BB8, 90 degree and 270 degree rotated BB8 copula families (Joe 1997) from `VineCopula-package()`.

Objects from the Classes

Objects can be created by calls of the form `new("BB8Copula",...)`, `new("surBB8Copula",...)`, `new("r90BB8Copula",...)` and `new("r270BB8Copula",...)` or by the functions `BB8Copula()`, `surBB8Copula()`, `r90BB8Copula()` and `r270BB8Copula()`.

References


See Also

See also `BB8Copula`, `BB8Copula`, `BB8Copula` and `joeCopula` for further wrapper classes to the `VineCopula-package()`.

Examples

```r
showClass("BB8Copula")
```
BiCop2copula  Construction of a Copula Object from a VineCopula Family Index

Description
A VineCopula family index along with its parameters is used to construct a corresponding copula object.

Usage
BiCop2copula(family, par, par2 = 0, obj = NULL)
copulaFromFamilyIndex(family, par, par2 = 0)

Arguments
family a family index as defined in VineCopula-package().
par first parameter.
par2 second parameter.
obj BiCop() object containing the family and parameter specification.

Details
If the family and parameter specification is stored in a [BiCop()] object obj, the alternative version

BiCop2copula(u1, u2, obj)

can be used.

Value
An object inheriting copula corresponding to the specific family.

Examples
# normalCopula with parameter 0.5
BiCop2copula(1, 0.5)

# rotated Tawn T2 copula
BiCop2copula(224, -2, 0.5)
Partial Derivatives of Copulas

Description

Similar to \texttt{dCopula()} and \texttt{pCopula()} the function \texttt{dduCopula} evaluates the partial derivative \( \frac{\partial}{\partial u} C(u, v) \) and the function \texttt{ddvCopula} evaluates the partial derivative \( \frac{\partial}{\partial v} C(u, v) \) of the provided copula.

Usage

\texttt{dduCopula(u, copula, ...)}

Arguments

\begin{itemize}
  \item \texttt{u} \hspace{1cm} Pairs of values for which the partial derivative should be evaluated.
  \item \texttt{copula} \hspace{1cm} The copula object representing the family member of interest.
  \item \texttt{...} \hspace{1cm} additional arguments can be passed on to the underlying functions.
\end{itemize}

Value

A vector of the evaluated partial derivatives of the same length as rows in \texttt{u}.

Examples

\begin{verbatim}
library(copula)
BB1Cop <- BB1Copula()
BB1CopSmpl <- rCopula(100, BB1Cop)

# conditional probabilities of a Gaussian copula given u
BB1GivenU <- dduCopula(BB1CopSmpl, BB1Cop)

# vs. conditional probabilities of a Gaussian copula given v
BB1GivenV <- ddvCopula(BB1CopSmpl[, c(2, 1)], BB1Cop)

plot(BB1GivenU, BB1GivenV)
abline(0, 1)
\end{verbatim}
Constructors for Joe copulas

Description
Constructs an object of the (survival surJoeBiCopula, 90 degree rotated r90JoeBiCopula and 270 degree rotated r270JoeBiCopula) family for a given parameter. Note that package copula-package() provides a class joeCopula as well.

Usage
joeBiCopula(param = 2)
surJoeBiCopula(param = 2)
r90JoeBiCopula(param = -2)
r270JoeBiCopula(param = -2)

Arguments
param The parameter param defines the copula through \( \theta \).

Value
One of the respective Joe copula classes (joeBiCopula, surJoeBiCopula, r90JoeBiCopula, r270JoeBiCopula).

References

See Also
See also BB1Copula(), BB6Copula(), BB7Copula() and BB8Copula() for further wrapper functions to the VineCopula-package().

Examples

library(copula)
persp(surJoeBiCopula(1.5), dCopula, zlim = c(0, 10))
persp(r90JoeBiCopula(-1.5), dCopula, zlim = c(0, 10))
persp(r270JoeBiCopula(-1.5), dCopula, zlim = c(0, 10))
**joeBiCopula-class**  
*Joe copula models*

**Description**

Wrapper classes representing the bivariate Joe, survival Joe, 90 degree and 270 degree rotated Joe copula families (Joe 1997) from VineCopula-package(). Note that package copula-package() provides a class joeCopula as well.

**Objects from the Classes**

Objects can be created by calls of the form new("joeBiCopula",...), new("surJoeBiCopula",...), new("r90JoeBiCopula",...) and new("r270JoeBiCopula",...) or by the functions joeBiCopula(), surJoeBiCopula(), r90JoeBiCopula() and r270JoeBiCopula().

**References**


**See Also**

See also BB1Copula, BB6Copula, BB7Copula and BB8Copula for further wrapper classes to the VineCopula-package().

**Examples**

```r
showClass("surJoeBiCopula")
```

**surClaytonCopula**  
*Constructors for survival and rotated Clayton Copulas*

**Description**

These are wrappers to functions from VineCopula-package().

**Usage**

```r
surClaytonCopula(param = 1)
r90ClaytonCopula(param = -1)
r270ClaytonCopula(param = -1)
```
surClaytonCopula-class

Arguments

param

A single parameter defining the Copula.

Value

An object of class surClaytonCopula, r90ClaytonCopula or r270ClaytonCopula respectively.

Examples

library(copula)

persp(surClaytonCopula(1.5), dCopula, zlim = c(0, 10))
persp(r90ClaytonCopula(-1.5), dCopula, zlim = c(0, 10))
persp(r270ClaytonCopula(-1.5), dCopula, zlim = c(0, 10))

surClaytonCopula-class

Survival and rotated Clayton copula models

Description

A class representing rotated versions of the Clayton copula family (survival, 90 and 270 degree rotated).

Objects from the Class

Objects can be created by calls of the form new("surClaytonCopula",...), new("r90ClaytonCopula",...) and new("r270ClaytonCopula",...) or by the function surClaytonCopula(), r90ClaytonCopula() and r270ClaytonCopula() respectively.

See Also

VineCopula-package()

Examples

library(copula)

class

persp(surClaytonCopula(.5), dCopula, zlim = c(0, 10))
persp(r90ClaytonCopula(-.5), dCopula, zlim = c(0, 10))
persp(r270ClaytonCopula(-.5), dCopula, zlim = c(0, 10))
surGumbelCopula-class

Constructors for survival and rotated Gumbel Copulas

Description

These are wrappers to functions from VineCopula-package().

Usage

surGumbelCopula(param = 1)

r90GumbelCopula(param = -1)

r270GumbelCopula(param = -1)

Arguments

param A single parameter defining the Copula.

Value

An object of class surGumbelCopula, r90GumbelCopula or r270GumbelCopula respectively.

Examples

library(copula)

persp(surGumbelCopula(1.5), dCopula, zlim = c(0, 10))
persp(r90GumbelCopula(-1.5), dCopula, zlim = c(0, 10))
persp(r270GumbelCopula(-1.5), dCopula, zlim = c(0, 10))

surGumbelCopula-class Survival and rotated Gumbel copula models

Description

A class representing rotated versions of the Gumbel copula family (survival, 90 and 270 degree rotated).

Objects from the Class

Objects can be created by calls of the form new("surGumbelCopula",...), new("r90GumbelCopula",...) and new("r270GumbelCopula",...) or by the function surGumbelCopula(), r90GumbelCopula() and r270GumbelCopula() respectively.
tawnT1Copula

See Also

VineCopula-package()

Examples

library(copula)

persp(surGumbelCopula(5), dCopula, zlim = c(0, 10))
persp(r90GumbelCopula(-5), dCopula, zlim = c(0, 10))
persp(r270GumbelCopula(-5), dCopula, zlim = c(0, 10))

tawnT1Copula Constructor for Tawn copulas (type 1)

Description

Constructs an object of the tawnT1Copula (survival sur, 90 degree rotated r90 and 270 degree rotated r270) family for given parameters.

Usage

tawnT1Copula(param = c(2, 0.5))
surTawnT1Copula(param = c(2, 0.5))
r90TawnT1Copula(param = c(-2, 0.5))
r270TawnT1Copula(param = c(-2, 0.5))

Arguments

param The parameter param defines the copula through param1 and param2.

Value

One of the Tawn type 1 copula classes (tawnT1Copula, surTawnT1Copula, r90TawnT1Copula, r270TawnT1Copula).

See Also

tawnT1Copula() and the package VineCopula-package() for implementation details.
Examples

```
library(copula)

persp(tawnT1Copula(), dCopula, zlim = c(0, 10))
persp(surTawnT1Copula(), dCopula, zlim = c(0, 10))
persp(r90TawnT1Copula(), dCopula, zlim = c(0, 10))
persp(r270TawnT1Copula(), dCopula, zlim = c(0, 10))
```

tawnT1Copula-class  
*Tawn copula models (type 1)*

Description

S4-class representation of the Tawn Copula family of type 1 and rotated versions there of.

Objects from the Class

Objects can be created by calls of the form `new("tawnT1Copula",...). or through the explicit constructors `tawnT1Copula`, `surTawnT1Copula`, `r90TawnT1Copula` and `r270TawnT1Copula` respectively.

See Also

`tawnT1Copula` and the package *VineCopula-package* for implementation details.

Examples

```
showClass("tawnT1Copula")
```

tawnT2Copula  
*Constructor for Tawn copulas (type 2)*

Description

Constructs an object of the `tawnT2Copula` (survival sur, 90 degree rotated `r90` and 270 degree rotated `r270`) family for given parameters.

Usage

```
tawnT2Copula(param = c(2, 0.5))
surTawnT2Copula(param = c(2, 0.5))
r90TawnT2Copula(param = c(-2, 0.5))
r270TawnT2Copula(param = c(-2, 0.5))
```
Arguments

param The parameter param defines the copula through param1 and param2.

Value

One of the Tawn type 2 copula classes (tawnT2Copula, surTawnT2Copula, r90TawnT2Copula, r270TawnT2Copula).

See Also

tawnT2Copula() and the package VineCopula-package() for implementation details.

Examples

library(copula)

persp(tawnT2Copula(), dCopula, zlim = c(0, 10))
persp(surTawnT2Copula(), dCopula, zlim = c(0, 10))
persp(r90TawnT2Copula(), dCopula, zlim = c(0, 10))
persp(r270TawnT2Copula(), dCopula, zlim = c(0, 10))
vineCopula Constructor of the Class vineCopula.

Description

Constructs an instance of the vineCopula class.

Usage

vineCopula(RVM, type = "CVine")

Arguments

- **RVM**: An object of class RVineMatrix generated from RVineMatrix in the package VineCopula-package or an integer (e.g. 4L) defining the dimension (an independent Gaussian C-vine of this dimension will be constructed).
- **type**: A predefined type if only the dimension is provided and ignored otherwise, the default is a canonical vine

Value

An instance of the vineCopula class.

Author(s)

Benedikt Graeler

References


Examples

```r
# a C-vine of independent copulas
vine <- vineCopula(4L, "CVine")

library(copula)
library(lattice)

cloud(V1 ~ V2 + V3, as.data.frame(rCopula(500, vine)))
```
vineCopula-class

Class "vineCopula"

Description

A class representing vine copulas in a object oriented implementations. Many functions go back to
the package VineCopula-package

Objects from the Class

Objects can be created by calls of the form new("vineCopula",...) or through the function
vineCopula.

Author(s)

Benedikt Graeler

References

Aas, K., C. Czado, A. Frigessi, and H. Bakken (2009). Pair-copula constructions of multiple de-

See Also

RVineMatrix from package VineCopula-package

Examples

showClass("vineCopula")
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