Package ‘VC2copula’

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

Version 0.1.2

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.

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Encoding UTF-8

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

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

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Imports VineCopula (>= 2.3.0), methods

LinkingTo VineCopula

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Description

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

Usage

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).
BB1Copula-class

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  

Constructors 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))
BB7Copula-class

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**

```r
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**

```r
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

library(copula)

persp(BB8Copula(c(2, 0.9)), dCopula, zlim = c(0, 10))
persp(surBB8Copula(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))
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}
fitCopula

A dedicated method to use the estimation routines from the VineCopula package

Description

Bivariate copulas are estimated based on BiCopEst and vine copulas through RVineStructureSelect or RVineCopSelect depending on the method argument.

Usage

BCfitCopula(copula, data, method = "ml")

Arguments

copula an object of the desired copula class
data a matrix holding the U(0,1) distributed data columns
method for BIVARIATE copulas either "ml" or "itau" for maximum likelihood estimation or inverse tau estimation (for one parameter families) respectively. See BiCopEst for details. In case of a VINE copulas a list with names entries StructureSelect (default: FALSE), indeptest (default: FALSE), familyset (default: 'NA') and indeptest (default: FALSE). See RVineStructureSelect or RVineCopSelect for details.

Value

an object of class fitCopula as in the copula package.

Examples

u <- rCopula(1000, tawnT1Copula(c(3, 0.5)))
fitCopula(tawnT1Copula(), u)

joeBiCopula

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))

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)
```

**Arguments**

- `param` A single parameter defining the Copula.

**Value**

An object of class `surClaytonCopula`, `r90ClaytonCopula` or `r270ClaytonCopula` respectively.
surGumbelCopula

Examples

```r
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

```r
library(copula)

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

*Constructors for survival and rotated Gumbel Copulas*

Description

These are wrappers to functions from `VineCopula-package()`
Usage

```r
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

```r
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))
```

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.

See Also

- VineCopula-package()

Examples

```r
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))
```
### Description

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

### Usage

```r
# tawnT1Copula
tawnT1Copula(param = c(2, 0.5))

# surTawnT1Copula
surTawnT1Copula(param = c(2, 0.5))

# r90TawnT1Copula
r90TawnT1Copula(param = c(-2, 0.5))

# r270TawnT1Copula
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

```r
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

```r
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)))
```
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


See Also

RVineMatrix from package VineCopula-package

Examples

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