R Package Copula

Jun Yan

Department of Statistics and Actuarial Science,
University of Iowa

Backgrounds

- Copulas have become a widely used tool for modeling multivariate dependence in a variety of fields.
- Software implementation is important in promoting the application of copulas.
- `Splus` has a collection of functions for copulas modeling in the `finmetrics` module.
  - Commercial
  - Bivariate copulas only
- Need a platform for the development of copula methods and applications.

Why R

- Quote from `http://www.r-project.org`: "`R` is a free software environment for statistical computing and graphics."
- Open source.
- Compiles and runs on a wide variety of UNIX platforms, Windows and MacOS.
- Cutting-edge development; hundreds of contributed packages.
- Excellent graphics.
- Easy interface with lower level compiled code (C/C++, Fortran)
- Active developer-user interaction.

Features of the Copula Package

- Classes (S4) of commonly used copula families
  - Elliptical copulas: normal, t, Clayton, Frank, and Gumbel
  - Archimedian copulas
  - Extreme value copulas (to be implemented)
- Dimension can be greater than 2.
- Methods
  - density
  - distribution
  - random number generator
- Graphics: perspective plot, contour plot.

Load the Package

The package `copula` depends on contributed packages `mvtnorm`, `scatterplot3d`, and package `sn`.

```
> library(copula)
```

Here is a list of the documented topics

```
Index:

Copula                          The Copula Distribution
Mvdc                            Multivariate Distribu-
tion via Copula
archmCopula                     Construc-
tion of Archimedean Copula Class
                                Object
archmCopula-class               Class "archmCopula"
contour-methods                 Methods for Function con-
tour in Package
```

Copula Objects