

# Package ‘copulaStan’

February 20, 2026

**Title** Fit Bivariate Gaussian and Clayton Copula Models Using Stan

**Version** 0.5.0

**Description** Provides Stan wrapper functions to fit bivariate Gaussian, Clayton, and Joe copula models with flexible marginal distributions. Models are pre-compiled using 'CmdStan' via the 'instantiate' package for fast sampling.

**Depends** R (>= 4.1.0)

**Imports** posterior, cli, rlang

**License** MIT + file LICENSE

**Encoding** UTF-8

**Roxygen** list(markdown = TRUE)

**RoxygenNote** 7.3.3

**Suggests** cmdstanr, knitr, rmarkdown, testthat (>= 3.0.0), pkgdown, copula

**Config/testthat/edition** 3

**VignetteBuilder** knitr

**URL** <https://benlug.github.io/copulaStan/>

**Additional\_repositories** <https://stan-dev.r-universe.dev>

**NeedsCompilation** no

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<code>coef.copula_fit</code>	<i>Extract point estimates from a copula_fit</i>
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**Description**

Extract point estimates from a copula\_fit

**Usage**

```
## S3 method for class 'copula_fit'  
coef(object, ...)
```

**Arguments**

<code>object</code>	A copula_fit object.
<code>...</code>	Additional arguments (unused).

**Value**

A named numeric vector of posterior means.

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<code>copula_fit</code>	<i>Create a copula_fit object</i>
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**Description**

Create a copula\_fit object

**Usage**

```
copula_fit(fit, copula, marginals, data_dim)
```

**Arguments**

<code>fit</code>	CmdStanMCMC fit object.
<code>copula</code>	Copula type string.
<code>marginals</code>	Character vector of marginal distribution names.
<code>data_dim</code>	Dimensions of the input data.

**Value**

A copula\_fit S3 object.

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fit\_bivariate\_copula    *Fit Bivariate Copula Model*


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## Description

Fits a bivariate copula model to data with marginal parameter estimation. Supports Gaussian, Clayton, and Joe copulas with normal, lognormal, exponential, or beta marginal distributions. Uses CmdStan for Bayesian inference via the cmdstanr package.

## Usage

```
fit_bivariate_copula(
  U,
  copula,
  marginals,
  iter = 1000,
  chains = 4,
  warmup = 1000,
  thin = 1,
  seed = NULL,
  adapt_delta = 0.8,
  max_treedepth = 10,
  parallel_chains = 1,
  refresh = 500
)
```

## Arguments

U	A numeric matrix with exactly two columns containing the observed data. Each column corresponds to one variable.
copula	Character string specifying the copula type. One of "gaussian", "clayton", or "joe".
marginals	A character vector of length 2 specifying the marginal distributions. Each element must be one of "normal", "lognormal", "exponential", or "beta".
iter	Number of sampling iterations per chain (after warmup). Default is 1000.
chains	Number of MCMC chains. Default is 4.
warmup	Number of warmup iterations per chain. Default is 1000.
thin	Thinning rate. Default is 1.
seed	Random seed for reproducibility. Default is NULL.
adapt_delta	Target acceptance rate for NUTS. Default is 0.8.
max_treedepth	Maximum tree depth for NUTS. Default is 10.
parallel_chains	Number of chains to run in parallel. Default is 1.
refresh	How often to print progress (in iterations). Set to 0 for silent. Default is 500.

**Value**

A `copula_fit` object (S3 class) containing:

`fit` The CmdStanMCMC fit object from `cmdstanr`.

`copula` The copula type used.

`marginals` The marginal distributions used.

`data_dim` Dimensions of the input data (rows, columns).

**Examples**

```
## Not run:
library(copula)
library(copulaStan)

set.seed(2024)
n <- 1000
cop <- normalCopula(param = 0.5, dim = 2)
margins <- c("norm", "lnorm")
params <- list(list(mean = 0.8, sd = 2), list(meanlog = 0, sdlog = 0.8))
mvdc_copula <- mvdc(cop, margins = margins, paramMargins = params)
data <- rMvdc(n, mvdc_copula)

fit <- fit_bivariate_copula(data,
  copula = "gaussian",
  marginals = c("normal", "lognormal"),
  seed = 2024
)
print(fit)
summary(fit)

## End(Not run)
```

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get\_stan\_model

*Get the compiled Stan model (compiles on first use, caches for reuse)*

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**Description**

Get the compiled Stan model (compiles on first use, caches for reuse)

**Usage**

```
get_stan_model()
```

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print.copula_fit	<i>Print a copula_fit object</i>
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**Description**

Print a copula\_fit object

**Usage**

```
## S3 method for class 'copula_fit'  
print(x, ...)
```

**Arguments**

x	A copula_fit object.
...	Additional arguments (unused).

**Value**

Invisibly returns x.

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summary.copula_fit	<i>Summarize a copula_fit object</i>
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**Description**

Summarize a copula\_fit object

**Usage**

```
## S3 method for class 'copula_fit'  
summary(object, ...)
```

**Arguments**

object	A copula_fit object.
...	Additional arguments (unused).

**Value**

A tibble of parameter summaries from posterior::summarise\_draws().

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