

Package ‘rbc’

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Title Regression by Composition

Version 0.1.1

Description Flexible statistical modelling using a modular framework for regression, in which groups of transformations are composed together and act on probability distributions.

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Depends R (>= 2.10)

Imports Formula, R6

Suggests testthat (>= 3.0.0)

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append_flow	<i>Append a flow to a CompositeFamily object</i>
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Description

Append a flow to a CompositeFamily object

Usage

append_flow(family, flow)

Arguments

- family a CompositeFamily object
- flow a Flow object

Value

a new CompositeFamily object

Examples

```
append_flow(Normal(0, 1), Translate)

Reduce(append_flow, list(Scale, Translate), init = Normal(0, 1))
```

Bernoulli

*Bernoulli distribution as a CompositeFamily***Description**

Bernoulli distribution as a CompositeFamily

Usage

```
Bernoulli(prob = 0.5)
```

Arguments

prob the probability of a success

Value

a new BinaryFamily object

Examples

```
dist <- Bernoulli()
dist$probability()
```

BinomialGLM

*BinomialGLM flow***Description**

BinomialGLM flow

Usage

```
BinomialGLM(link = "logit")
```

Arguments

link the model link function, passed to binomial(). As usual, this can be a name/expression, a literal character string, a length-one character vector, or an object of class "link-glm".

Cinch	<i>Cinch flow</i>
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Description

Cinch flow

Usage

Cinch

Format

An object of class Flow (inherits from R6) of length 6.

coef.RegressionByComposition	<i>Extract regression coefficients from a regression by composition</i>
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Description

Extract regression coefficients from a regression by composition

Usage

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

Arguments

object	a RegressionByComposition object; usually the result of a call to rbc()
...	ignored

`fitted.RegressionByComposition`*Compute fitted values from a regression by composition*

Description

Compute fitted values from a regression by composition

Usage

```
## S3 method for class 'RegressionByComposition'  
fitted(object, ...)
```

Arguments

<code>object</code>	a <code>RegressionByComposition</code> object; usually the result of a call to <code>rbc()</code>
<code>...</code>	further arguments passed to the R6 method <code>\$fitted()</code> associated with the model's <code>CompositeFamily</code>

`logLik.RegressionByComposition`*Extract log-likelihood from a regression by composition*

Description

Extract log-likelihood from a regression by composition

Usage

```
## S3 method for class 'RegressionByComposition'  
logLik(object, ...)
```

Arguments

<code>object</code>	a <code>RegressionByComposition</code> object; usually the result of a call to <code>rbc()</code>
<code>...</code>	ignored

LogNormal	<i>Lognormal distribution as a CompositeFamily</i>
-----------	--

Description

Lognormal distribution as a CompositeFamily

Usage

```
LogNormal(meanlog = 0, sdlog = 1)
```

Arguments

meanlog	the mean of the logarithm
sdlog	the standard deviation of the logarithm

Value

a new ContinuousFamily object

Examples

```
dist <- LogNormal()
log(dist$quantile(0.95))
```

Moebius	<i>Moebius flow</i>
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Description

Moebius flow

Usage

```
Moebius
```

Format

An object of class Flow (inherits from R6) of length 6.

Normal	<i>Normal distribution as a CompositeFamily</i>
--------	---

Description

Normal distribution as a CompositeFamily

Usage

```
Normal(mean = 0, sd = 1)
```

Arguments

mean	the mean
sd	the standard deviation

Value

a new ContinuousFamily object

Examples

```
dist <- Normal()  
dist$quantile(0.95)
```

Power	<i>Power flow</i>
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Description

Power flow

Usage

Power

Format

An object of class Flow (inherits from R6) of length 6.

PowerOdds	<i>PowerOdds flow</i>
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Description

PowerOdds flow

Usage

PowerOdds

Format

An object of class Flow (inherits from R6) of length 6.

predict.RegressionByComposition	<i>Compute predicted values from a regression by composition</i>
---------------------------------	--

Description

Compute predicted values from a regression by composition

Usage

```
## S3 method for class 'RegressionByComposition'
predict(object, newdata, ...)
```

Arguments

- | | |
|---------|--|
| object | a RegressionByComposition object; usually the result of a call to rbc() |
| newdata | data.frame containing new data |
| ... | further arguments passed to the R6 method \$fitted() associated with the model's CompositeFamily |

rbc	<i>Fit a regression by composition model</i>
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Description

Fit a regression by composition model

Usage

```
rbc(formula, init, flows, family, data, par, hessian = TRUE)
```

Arguments

formula	a formula object, with model components separated by ' '
init	the initial distribution
flows	a list of flows
family	(optional) an object of class 'CompositeFamily'; if supplied, 'init' and 'flows' are ignored
data	a data frame
par	a vector of starting values
hessian	logical; use Hessian matrix in model fitting?

Value

an rbc object

Examples

```
## Annette Dobson (1990)
## "An Introduction to Generalized Linear Models".
## Page 9: Plant Weight Data.
ctl <- c(4.17, 5.58, 5.18, 6.11, 4.50, 4.61, 5.17, 4.53, 5.33, 5.14)
trt <- c(4.81, 4.17, 4.41, 3.59, 5.87, 3.83, 6.03, 4.89, 4.32, 4.69)
dobson <- data.frame(
  weight = c(ctl, trt),
  group = gl(2, 10, 20, labels = c("Ctl", "Trt"))
)
dobson_fit <- rbc(weight ~ 1 | 1 + group,
  init = Normal(0, 1),
  flows = list(Scale, Translate),
  data = dobson
)

starr_fit <- rbc(
  weight ~ 1 | 0 + I((280 + age)^(-1)) | 1 | 1,
  init = LogNormal(),
  flows = list(Power, Moebius, Scale, Translate),
```

```
data = na.omit(subset(starr, id %in% unique(id)[1:10]))
)
```

residuals.RegressionByComposition
<i>Compute 'residuals' from a regression by composition</i>

Description

Compute 'residuals' from a regression by composition

Usage

```
## S3 method for class 'RegressionByComposition'
residuals(object, ...)
```

Arguments

object	a RegressionByComposition object; usually the result of a call to rbc()
...	ignored

Value

a vector of probabilities of the same length as the data

Scale	<i>Scale flow</i>
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Description

Scale flow

Usage

Scale

Format

An object of class Flow (inherits from R6) of length 6.

ScaleOdds	<i>ScaleOdds flow</i>
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Description

ScaleOdds flow

Usage

ScaleOdds

Format

An object of class Flow (inherits from R6) of length 6.

ScaleRisk0	<i>ScaleRisk0 flow</i>
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Description

ScaleRisk0 flow

Usage

ScaleRisk0

Format

An object of class Flow (inherits from R6) of length 6.

ScaleRisk1	<i>ScaleRisk1 flow</i>
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Description

ScaleRisk1 flow

Usage

ScaleRisk1

Format

An object of class Flow (inherits from R6) of length 6.

starr	<i>Growth from birth to 3 years in healthy babies in the US</i>
-------	---

Description

Growth from birth to 3 years in healthy babies in the US

Usage

starr

Format

starr:
A data frame with 104,798 rows and 5 columns:
id Anonymized identifier
sex Sex of baby
age Age of baby, in days
height Jittered height of baby, in cm
weight Jittered weight of baby, in kg ...

Source

[doi:10.5061/dryad.4j0zpc8jf](https://doi.org/10.5061/dryad.4j0zpc8jf)

References

[doi:10.1186/s12874024021451](https://doi.org/10.1186/s12874024021451)

summary.RegressionByComposition	<i>Summary of a regression by composition</i>
---------------------------------	---

Description

Summary of a regression by composition

Usage

```
## S3 method for class 'RegressionByComposition'  
summary(object, compact = FALSE, ...)
```

Arguments

object	a RegressionByComposition object; usually the result of a call to rbc()
compact	logical; should coefficients from all flows be compressed into a single matrix?
...	ignored

Translate	<i>Translate flow</i>
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Description

Translate flow

Usage

Translate

Format

An object of class Flow (inherits from R6) of length 6.

TranslateRisk1	<i>TranslateRisk1 flow</i>
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Description

TranslateRisk1 flow

Usage

TranslateRisk1

Format

An object of class Flow (inherits from R6) of length 6.

<code>vcov.RegressionByComposition</code>	<i>Extract variance-covariance matrix from a regression by composition</i>
---	--

Description

Extract variance-covariance matrix from a regression by composition

Usage

```
## S3 method for class 'RegressionByComposition'
vcov(object, ...)
```

Arguments

<code>object</code>	a RegressionByComposition object; usually the result of a call to <code>rbc()</code>
<code>...</code>	ignored

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