

# 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.

**License** MIT + file LICENSE

**Depends** R (>= 2.10)

**Imports** Formula, R6

**Suggests** testthat (>= 3.0.0)

**Config/testthat/edition** 3

**Encoding** UTF-8

**LazyData** true

**RoxygenNote** 7.3.2

**NeedsCompilation** no

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## Contents

append_flow . . . . .	2
Bernoulli . . . . .	3
BinomialGLM . . . . .	3
Cinch . . . . .	4
coef.RegressionByComposition . . . . .	4
fitted.RegressionByComposition . . . . .	5
logLik.RegressionByComposition . . . . .	5

LogNormal . . . . .	6
Moebius . . . . .	6
Normal . . . . .	7
Power . . . . .	7
PowerOdds . . . . .	8
predict.RegressionByComposition . . . . .	8
rbc . . . . .	9
residuals.RegressionByComposition . . . . .	10
Scale . . . . .	10
ScaleOdds . . . . .	11
ScaleRisk0 . . . . .	11
ScaleRisk1 . . . . .	11
starr . . . . .	12
summary.RegressionByComposition . . . . .	12
Translate . . . . .	13
TranslateRisk1 . . . . .	13
vcov.RegressionByComposition . . . . .	13
<b>Index</b>	<b>14</b>

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append\_flow

*Append a flow to a CompositeFamily object*

---

### 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".

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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>
------------------------------	---

---

**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

*Lognormal distribution as a CompositeFamily*

---

**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

*Moebius flow*

---

**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>
-------	-------------------

---

**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>
-----	--

---

**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

```

*Compute 'residuals' from a regression by composition*

---

### 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

```

*Scale flow*

---

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

---

**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  
*Summary of a regression by composition*

---

**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.

---

vcov.RegressionByComposition	<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**

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

# Index

## \* datasets

- Cinch, [4](#)
  - Moebius, [6](#)
  - Power, [7](#)
  - PowerOdds, [8](#)
  - Scale, [10](#)
  - ScaleOdds, [11](#)
  - ScaleRisk0, [11](#)
  - ScaleRisk1, [11](#)
  - starr, [12](#)
  - Translate, [13](#)
  - TranslateRisk1, [13](#)
- [append\\_flow](#), [2](#)
- [Bernoulli](#), [3](#)
- [BinomialGLM](#), [3](#)
- [Cinch](#), [4](#)
- [coef.RegressionByComposition](#), [4](#)
- [fitted.RegressionByComposition](#), [5](#)
- [logLik.RegressionByComposition](#), [5](#)
- [LogNormal](#), [6](#)
- [Moebius](#), [6](#)
- [Normal](#), [7](#)
- [Power](#), [7](#)
- [PowerOdds](#), [8](#)
- [predict.RegressionByComposition](#), [8](#)
- [rbc](#), [9](#)
- [residuals.RegressionByComposition](#), [10](#)
- [Scale](#), [10](#)
- [ScaleOdds](#), [11](#)
- [ScaleRisk0](#), [11](#)
- [ScaleRisk1](#), [11](#)
- [starr](#), [12](#)
- [summary.RegressionByComposition](#), [12](#)
- [Translate](#), [13](#)
- [TranslateRisk1](#), [13](#)
- [vcov.RegressionByComposition](#), [13](#)