

# Package ‘rmetallog’

March 10, 2020

**Type** Package

**Title** R Implementation of the Metalog Distribution

**Version** 1.0.2

**Description** Implementation of the metalog distribution in R.

The metalog distribution is a modern, highly flexible, data-driven distribution.

Metalogs are developed by Keelin (2016) <doi:10.1287/deca.2016.0338>.

This package provides functions to build these distributions from raw data.

Resulting metalog objects are then useful for exploratory and probabilistic analysis.

**Imports** lpSolve, ggplot2

**Suggests** devtools, knitr, rmarkdown

**Depends** R (>= 3.1.0)

**BugReports** <https://github.com/isaacfab/rmetallog/issues>

**License** MIT + file LICENSE

**Encoding** UTF-8

**LazyData** true

**RoxygenNote** 7.0.2

**VignetteBuilder** knitr

**NeedsCompilation** no

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dmetalog	<i>Generate density values with quantiles from a metalog object. This is done through a newtons method approximation.</i>
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### Description

Generate density values with quantiles from a metalog object. This is done through a newtons method approximation.

### Usage

```
dmetalog(m, q, term = 3)
```

### Arguments

m	metalog object created from metalog()
q	y vector of quantiles
term	which metalog distribution to sample from

### Value

A numeric vector of probabilities corresponding to the q quantile vector

### Examples

```
# Load example data
## Not run:
data("fishSize")

# Create a bounded metalog object
myMetalog <- metalog(fishSize$FishSize,
                    bounds=c(0, 60),
                    boundedness = 'b',
                    term_limit = 9,
                    term_lower_bound = 9)

s <- dmetalog(myMetalog,q=c(3,10,25),term = 9)

## End(Not run)
```

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`fishSize`*Fish size measurements from the Pacific Northwest.*

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**Description**

Example data set of fish size measurements (in weight by pounds) from the Pacific Northwest, used for illustrating the flexibility of the metalog distribution. This data set is bi-modal because the fish contain two different populations, one salt and two salt runs. The two salt, fish that have gone back to the ocean twice, are typically larger.

**Usage**`fishSize`**Format**

A single column data frame with 3474 rows:

**FishSize** Recorded sizes of individual steelhead trout

**Source**

<http://www.metalogdistributions.com/>

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`metalog`*Fit the metalog distribution to data*

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**Description**

Fit the metalog distribution to data

**Usage**

```
metalog(  
  x,  
  bounds = c(0, 1),  
  boundedness = "u",  
  term_limit = 13,  
  term_lower_bound = 2,  
  step_len = 0.01,  
  probs = NA,  
  fit_method = "any",  
  save_data = FALSE  
)
```

**Arguments**

x	vector of numeric data
bounds	numeric vector specifying lower or upper bounds, none required if the distribution is unbounded
boundedness	character string specifying unbounded, semi-bounded upper, semi-bounded lower or bounded; accepts values u, su, sl and b (default: 'u')
term_limit	integer between 3 and 30, specifying the number of metalog distributions to generate. Larger term distributions have more flexibility (default: 13)
term_lower_bound	(Optional) the smallest term to generate, used to minimize computation of unwanted terms must be less than term_limit (default is 2)
step_len	(Optional) size of steps to summarize the distribution (between 0 and 0.01) this is only used if the data vector length is greater than 100. Use this if a specific fine grid fit is required. (default is 0.01)
probs	(Optional) probability quantiles, same length as x
fit_method	(Optional) preferred method of fitting distribution: accepts values OLS, LP or any (defaults to any)
save_data	(Optional) Save the original data within the metalog object. This must be done if the distribution is to be updated with new data later.

**Value**

A metalog object with elements

params	A list of the parameters used to create the metalog object
dataValues	a dataframe with the first column the raw data, second column the cumulative probabilities and the third the z vector
Y	The Y matrix values for each quantile and term
A	a dataframe of coefficients for each metalog distribution
M	a dataframe of quantiles (M) and probabilities (m) indexed for each term (i.e. M3,m3 for the third term)
GridPlotCDF()	a function that displays a grid plot of the CDF for each term
VGridPlotPDF()	a function that displays a grid plot of the PDF for each term
Validation	a vector of yes/no indicators of the valid distributions for each term

**Examples**

```
# Load example data
## Not run:
data("fishSize")

# Create a bounded metalog object
myMetalog <- metalog(fishSize$FishSize,
                    bounds=c(0, 60),
                    boundedness = 'b',
```

```
term_limit = 13)

## End(Not run)
```

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plot.metalog

*Plot of the metalog object*

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### Description

Plot of the metalog object

### Usage

```
## S3 method for class 'metalog'
plot(x, ...)
```

### Arguments

x	metalog object created using metalog()
...	ignored; included for S3 generic/method consistency

### Value

A summary plot of the CDF and PDF for each term

### Examples

```
# Load example data
## Not run:
data("fishSize")

# Create a bounded metalog object

myMetalog <- metalog(fishSize$FishSize,
                    bounds=c(0, 60),
                    boundedness = 'b',
                    term_limit = 13)

plot(myMetalog)

## End(Not run)
```

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pmetalog	<i>Generate probabilities with quantiles from a metalog object. This is done through a newtons method approximation.</i>
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### Description

Generate probabilities with quantiles from a metalog object. This is done through a newtons method approximation.

### Usage

```
pmetalog(m, q, term = 3)
```

### Arguments

m	metalog object created from metalog()
q	vector of quantiles
term	which metalog distribution to sample from

### Value

A numeric vector of probabilities corresponding to the q quantile vector

### Examples

```
# Load example data
## Not run:
data("fishSize")

# Create a bounded metalog object
myMetalog <- metalog(fishSize$FishSize,
                    bounds=c(0, 60),
                    boundedness = 'b',
                    term_limit = 9,
                    term_lower_bound = 9)

s <- pmetalog(myMetalog,q=c(3,10,25),term = 9)

## End(Not run)
```

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qmetalogs	<i>Generate quantiles with a probability from a metalogs object</i>
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**Description**

Generate quantiles with a probability from a metalogs object

**Usage**

```
qmetalogs(m, y, term = 3)
```

**Arguments**

m	metalogs object created from metalogs()
y	vector of probabilities
term	which metalogs distribution to sample from

**Value**

A numeric vector of quantiles corresponding to the y probability vector

**Examples**

```
# Load example data
## Not run:
data("fishSize")

# Create a bounded metalogs object
myMetalogs <- metalogs(fishSize$FishSize,
                      bounds=c(0, 60),
                      boundedness = 'b',
                      term_limit = 9,
                      term_lower_bound = 9)

s <- qmetalogs(myMetalogs, y=c(0.25, 0.5, 0.7), term = 9)

## End(Not run)
```

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rmetalogs	<i>Create random samples from an metalogs distribution object</i>
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**Description**

The rmetalogs package implements the metalogs distribution in R

**Usage**

```
rmetalog(m, n = 1, term = 3)
```

**Arguments**

m	metalog object created from metalog()
n	number of observations (default is 1)
term	which metalog distribution to sample from

**Value**

A numeric vector of n random samples from a selected distribution

**Examples**

```
# Load example data
## Not run:
data("fishSize")

# Create a bounded metalog object
myMetalog <- metalog(fishSize$FishSize,
                    bounds=c(0, 60),
                    boundedness = 'b',
                    term_limit = 9,
                    term_lower_bound = 9)

s <- rmetalog(myMetalog, n=1000, term = 9)
hist(s)

## End(Not run)
```

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summary.metalog	<i>Summary of the metalog object</i>
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**Description**

Summary of the metalog object

**Usage**

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

**Arguments**

object	metalog object created from metalog()
...	ignored; included for S3 generic/method consistency



**Value**

A summary of the object

**Examples**

```
# Load example data
## Not run:
data("fishSize")

# Create a bounded metalog object
myMetalog <- metalog(fishSize$FishSize,
                    bounds=c(0, 60),
                    boundedness = 'b',
                    term_limit = 13)

summary(myMetalog)

## End(Not run)
```

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