

# Package ‘RCMinification’

March 22, 2022

**Version** 1.1

**Title** Random Coefficient Minification Time Series Models

**Author** L. Han [aut, cre]

**Maintainer** L. Han <lengyi.han@ubc.ca>

**Description** Functions and data sets for simulating and fitting minification and random coefficient minification modelling.

**LazyLoad** true

**LazyData** true

**ZipData** no

**License** Unlimited

**NeedsCompilation** no

**Repository** CRAN

**Date/Publication** 2022-03-22 17:40:09 UTC

## R topics documented:

BCfireArea . . . . .	2
BeerVolume . . . . .	2
FWI . . . . .	3
Globaltemps . . . . .	3
longitudinalAcceleration . . . . .	4
nickel . . . . .	4
RCMTmle . . . . .	5
rET . . . . .	6
robustSD . . . . .	6
rRCMT . . . . .	7
<b>Index</b>	<b>8</b>

BCfireArea

*BC Fire Area*

---

**Description**

The BCfireArea time series object consists of 13 observations on annual area burnt in the province of BC.

**Usage**

```
data(BCfireArea)
```

**Format**

A time series object

**Examples**

```
ts.plot(BCfireArea)
```

---

BeerVolume

*Beer Volume Time Series*

---

**Description**

Weekly volumes (in litres) of produced at a large brewery for 137 weeks.

**Usage**

```
data(FWI)
```

**Format**

A time series object

**Examples**

```
acf(BeerVolume)
```

---

FWI	<i>Fire Weather Index Series</i>
-----	----------------------------------

---

**Description**

The FWI list consists of 4 vectors containing daily Fire Weather Index observations.

**Usage**

```
data(FWI)
```

**Format**

This list contains the following vectors:

**PG2008** FWI observations from Prince George, BC for 2008

**PG2009** FWI observations from Prince George, BC for 2009

**ED2013** FWI observations from Edmonton, AB for 2013

**ED2014** FWI observations from Edmonton, AB for 2014

**Examples**

```
RCMTm1e(FWI$PG2009[c(100:300)])
```

---

Globaltemps	<i>Global Average Temperature Changes</i>
-------------	---

---

**Description**

Global average temperatures are recorded in terms of number of Celsius degrees above a baseline temperature from 1880 to 2016. The baseline temperature is the average temperature for the year 1990.

**Usage**

```
data(Globaltemps)
```

**Format**

A numeric vector

**Examples**

```
temps <- ts(Globaltemps, start = 1880, end = 2016)
ts.plot(temps, ylab = "Change in Temperature")
```

---

longitudinalAcceleration

*Longitudinal Acceleration Measurements on an Air Tanker*

---

**Description**

Longitudinal acceleration measurements of an air tanker fighting a forest wildfire taken at 1 second intervals.

**Usage**

```
data(longitudinalAcceleration)
```

**Format**

A time series object

**Examples**

```
acf(longitudinalAcceleration)
```

---

nickel

*Electroless nickel concentrations*

---

**Description**

Electroless nickel concentrations in a chrome plating process were measured at the beginning of each eight hour work shift for a period of 25 days. A concentration of 4.5 ounces per gallon is considered optimal in this application.

**Usage**

```
data(nickel)
```

**Format**

A time series object

**Source**

Farnum, N. (1994) Statistical Quality Control and Improvement. Belmont, Duxbury Press.

**Examples**

```
ts.plot(nickel)
```

---

RCMTmle	<i>Tailed Exponential and Weibull Random Coefficient Minification Maximum Likelihood Estimation</i>
---------	---

---

**Description**

This function estimates parameters for tailed exponential and Weibull random coefficient minification process models from a nonnegative time series.

**Usage**

```
RCMTmle(y)
```

**Arguments**

`y` numeric vector of nonnegative observations.

**Value**

A list containing

<code>n</code>	the number of time series observations.
<code>p</code>	estimated power for transformation from exponential to Weibull.
<code>p.eps</code>	estimated tailed exponential probability parameter when preceding observation is nonzero.
<code>p.delta</code>	estimated tailed exponential probability parameter when preceding observation is 0
<code>mu</code>	estimated mu parameter for lognormal distribution used to simulated random coefficients.
<code>sigma</code>	estimated sigma parameter for lognormal distribution used to simulate random coefficients.
<code>lambda</code>	estimated tailed exponential rate parameter when preceding observation is nonzero.
<code>gamma</code>	estimated tailed exponential rate parameter when preceding observation is 0.
<code>like</code>	maximum value of likelihood.
<code>y</code>	original observations

**Author(s)**

L. Han

**References**

Han, L., Braun, W.J. and Loeppky (2018) Random Coefficient Minification Processes. Statistical Papers, pp 1-22.

rET

*Tailed Exponential Random Number Generator*

---

**Description**

This function simulates sequences of tailed exponential variates which have survivor function  $P(X > x) = (1-p)\exp(-\lambda x)$ , for  $x > 0$  and  $P(X = 0) = p$ .

**Usage**

```
rET(n, prob, rate)
```

**Arguments**

n	number of observations.
prob	vector of probabilities.
rate	vector of exponential rate parameters.

**Author(s)**

L. Han

**References**

Littlejohn, R.P. (1994) A Reversibility Relationship for Two Markovian Time Series Models with Stationary Exponential Tailed Distribution. *Journal of Applied Probability*. 31 pp 575-581.

---

robustSD

*Tatum's Robust Estimate of the Standard Deviation*

---

**Description**

Standard deviation estimate which is insensitive to outliers and random trends.

**Usage**

```
robustSD(x)
```

**Arguments**

x	A numeric vector.
---	-------------------

**Author(s)**

L. Han

**References**

Tatum, L.G. (1997) Robust Estimation of the Process Standard Deviation for Control Charts. Journal of the American Statistical Association 39, pp 127-141.

**Examples**

```
robustSD(EuStockMarkets[,1])
```

---

rRCMT	<i>Tailed Exponential and Weibull Random Coefficient Minification Process Simulator</i>
-------	---

---

**Description**

This function simulates sequences of tailed exponential and Weibull random coefficient minification process variates. Random coefficients are lognormal distributed with parameters mu and sigma.

**Usage**

```
rRCMT(n, p, p.delta, p.eps, lambda, gamma, mu, sigma, RCMTobj)
```

**Arguments**

n	number of observations.
p	power for transformation from exponential to Weibull.
p.delta	tailed exponential probability parameter when preceding observation is 0
p.eps	tailed exponential probability parameter when preceding observation is nonzero.
lambda	tailed exponential rate parameter when preceding observation is nonzero.
gamma	tailed exponential rate parameter when preceding observation is 0.
mu	mu parameter for lognormal distribution used to simulated random coefficients.
sigma	sigma parameter for lognormal distribution used to simulate random coefficients.
RCMTobj	list containing elements n, p, p.delta, p.eps, lambda and gamma

**Author(s)**

L. Han

**References**

Han, L., Braun, W.J. and Loepky (2018) Random Coefficient Minification Processes. Statistical Papers, pp 1-22.

# Index

## \* datasets

BCfireArea, 2  
BeerVolume, 2  
FWI, 3  
Globaltemps, 3  
longitudinalAcceleration, 4  
nickel, 4

## \* statistics

RCMTmle, 5  
rET, 6  
robustSD, 6  
rRCMT, 7

BCfireArea, 2  
BeerVolume, 2

FWI, 3

Globaltemps, 3

longitudinalAcceleration, 4

nickel, 4

RCMTmle, 5  
rET, 6  
robustSD, 6  
rRCMT, 7