

# Package ‘SimTools’

December 6, 2020

**Version** 1.0-0

**Date** 2020-06-20

**Title** Toolkit for Simulation output including Monte Carlo and MCMC

**Author** Dootika Vats <dootika@iitk.ac.in>,  
James M. Flegal <jflegal@ucr.edu>,  
Galin Jones <galin@umn.edu>,  
Gunjan Jalori.

**Maintainer** Dootika Vats <dootika@iitk.ac.in>

**Imports** mcmcse, mvtnorm

**Description** Toolkit for Simulation output including Monte Carlo and MCMC

**License** GPL (>= 2)

**Encoding** UTF-8

**RoxygenNote** 7.1.1

**NeedsCompilation** no

## R topics documented:

boxplot.Siid . . . . .	1
plot.Smcmc . . . . .	3
Siid . . . . .	4
Smcmc . . . . .	4

<b>Index</b>	<b>6</b>
--------------	----------

---

boxplot.Siid	<i>Boxplot for Siid</i>
--------------	-------------------------

---

## Description

Boxplots with simultaenous error bars around all quantiles for iid data.

## Usage

```
## S3 method for class 'Siid'
boxplot(x, ..., alpha = 0.05, thresh = 0.001, mean.col = 'plum4',
        quan.col = 'lightsteelblue3', opaq = .6, range = 1.5, width = NULL, varwidth = FALSE,
        outline = TRUE, plot = TRUE, border = par("fg"), col = 'white',
        ann = !add, horizontal = FALSE, add = FALSE)
```

**Arguments**

<code>x</code>	: a 'Siid' class object
<code>...</code>	: arguments sent to <code>boxplot</code>
<code>alpha</code>	: confidence level of simultaneous confidence intervals
<code>thresh</code>	: numeric typically less than .005 for the accuracy of the simultaneous procedure
<code>mean.col</code>	: color for the mean confidence interval
<code>quan.col</code>	: color for the quantile confidence intervals
<code>opaq</code>	: opacity of <code>mean.col</code> and <code>quan.col</code> . A value of 0 is transparent and 1 is completely opaque.
<code>range</code>	: as defined for base <code>boxplot</code>
<code>width</code>	: as defined for base <code>boxplot</code>
<code>varwidth</code>	: as defined for base <code>boxplot</code>
<code>outline</code>	: as defined for base <code>boxplot</code>
<code>plot</code>	: logical indicating whether the plot is to be constructed
<code>border</code>	: as defined for base <code>boxplot</code>
<code>col</code>	: as defined for base <code>boxplot</code>
<code>ann</code>	: as defined for base <code>boxplot</code>
<code>horizontal</code>	: as defined for base <code>boxplot</code>
<code>add</code>	: as defined for base <code>boxplot</code>

**Value**

returns the base `boxplot` with simultaneous confidence intervals around all quantiles

**References**

Robertson, N., Flegal, J. M., Vats, D., and Jones, G. L., "Assessing and Visualizing Simultaneous Simulation Error", *Journal of Computational and Graphical Statistics*, 2020.

**Examples**

```
# Generating iid data
chain <- matrix(rnorm(3*1e3), nrow = 1e3, ncol = 3)
siid.obj <- Siid(chain)
boxplot(chain)
```

---

plot.Smcmc	<i>Plot Smcmc</i>
------------	-------------------

---

## Description

Density plots with simultaneous error bars around means and quantiles for MCMC data. The error bars account for the correlated nature of the process.

## Usage

```
## S3 method for class 'Smcmc'
plot(x, Q = c(0.1, 0.9), alpha = 0.05, thresh = 0.001, iid = FALSE, plot = TRUE,
      mean = TRUE, border = NA, mean.col = 'plum4', quan.col = 'lightsteelblue3',
      opaq = 0.7, auto.layout = TRUE, ask = dev.interactive(),...)
```

## Arguments

x	: a 'Smcmc' class object
Q	: vector of quantiles
alpha	: confidence level of simultaneous confidence intervals
thresh	: numeric typically less than .005 for the accuracy of the simultaneous procedure
iid	: logical argument for constructing density plot for iid samples. Defaults to FALSE
plot	: logical argument for is plots are to be returned
mean	: logical argument whether the mean is to be plotted
border	: whether a border is required for the simultaneous confidence intervals
mean.col	: color for the mean confidence interval
quan.col	: color for the quantile confidence intervals
opaq	: opacity of mean.col and quan.col. A value of 0 is transparent and 1 is completely opaque.
auto.layout	: logical argument for an automatic layout of plots
ask	: activating interactive plots
...	: arguments passed on to the density plot in base R

## Value

returns a plot of the univariate density estimates with simultaneous confidence intervals wherever asked. If plot == FALSE a list of estimates and simultaneous confidence intervals.

## References

Robertson, N., Flegal, J. M., Vats, D., and Jones, G. L., "Assessing and Visualizing Simultaneous Simulation Error", Journal of Computational and Graphical Statistics, 2020.

**Examples**

```
# Producing Markov chain
chain <- numeric(length = 1e3)
chain[1] <- 0
err <- rnorm(1e3)
for(i in 2:1e3)
{
  chain[i] <- .3*chain[i-1] + err[i]
}
chain <- Smcmc(chain)
plot(chain)
```

Siid

*Siid class***Description**

Class for independent and identically distributed (iid) samples

**Usage**

```
Siid(data, varnames = colnames(data))
```

**Arguments**

`data` : an iid output matrix with `nsim` rows and `p` columns  
`varnames` : a character string equal to the number of columns in data

**Value**

an Siid class object

**Examples**

```
# Generating iid data
chain <- matrix(rnorm(3*1e3), nrow = 1e3, ncol = 3)
siid.obj <- Siid(chain)
```

Smcmc

*Smcmc class***Description**

Smcmc class for simulated data using Markov chain Monte Carlo

**Usage**

```
Smcmc(data, batch.size = FALSE, varnames = colnames(data))
```

**Arguments**

`data` : an MCMC output matrix with `nsim` rows and `p` columns  
`batch.size` : logical vector, if true, calculates the batch size appropriate for this Markov chain. Setting to TRUE saves time in future steps.  
`varnames` : a character string equal to the number of columns in `data`

**Value**

an Smcmc class object

**Examples**

```
# Producing Markov chain
chain <- numeric(length = 1e3)
chain[1] <- 0
err <- rnorm(1e3)
for(i in 2:1e3)
{
  chain[i] <- .3*chain[i-1] + err[i]
}
smcmc.obj <- Smcmc(chain)
```

# Index

`as.Siid(Siid)`, [4](#)  
`as.Smcmc(Smcmc)`, [4](#)

`boxplot.Siid`, [1](#)

`is.iid(Siid)`, [4](#)  
`is.mcmc(Smcmc)`, [4](#)

`plot.Smcmc`, [3](#)

`Siid`, [4](#)  
`Smcmc`, [4](#)