

Package ‘SimTools’

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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. The package provides visualisations that accounts for Monte Carlo variability.

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NeedsCompilation no

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boxplot.Siid	<i>Boxplot for Siid</i>
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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(siid.obj)
```

plot.Siid

*Plot Siid***Description**

Density plots with simultaenous error bars around means and quantiles for iid data.

Usage

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

Arguments

x	: a ‘Siid’ class object
Q	: vector of quantiles
alpha	: confidence level of simultaneous confidence intervals
thresh	: numeric typically less than .005 for the accuracy of the simulteaneous procedure
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 densi ty 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

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

plot.Smcmc

*Plot Smcmc***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	<i>Siid class</i>
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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	<i>Smcmc class</i>
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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)
```

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