Package ‘batchmeans’

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Title Consistent Batch Means Estimation of Monte Carlo Standard Errors
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Perform consistent batch means estimation on a vector of values from a Markov chain.

Usage

\[ \text{bm}(x, \text{size} = \text{"sqroot"}, \text{warn} = \text{FALSE}) \]

Arguments

- **x**: a vector of values from a Markov chain.
- **size**: the batch size. The default value is “\text{sqroot}”, which uses the square root of the sample size. “\text{cuberoot}” will cause the function to use the cube root of the sample size. A numeric value may be provided if neither “\text{sqroot}” nor “\text{cuberoot}” is satisfactory.
- **warn**: a logical value indicating whether the function should issue a warning if the sample size is too small (less than 1,000).

Value

\text{bm} returns a list with two elements:

- **est**: the mean of the vector.
- **se**: the MCMC standard error based on the consistent batch means estimator.

References


The following article is less technical and contains a direct comparison to the Gelman-Rubin diagnostic.


See Also

\text{bmmat}, which applies \text{bm} to each column of a matrix or data frame.
Examples

# Simulate a sample path of length 10,000 for an AR(1) chain with rho equal to 0.7.

X = numeric(10000)
X[1] = 1
for (i in 1:9999)
  X[i + 1] = 0.7 * X[i] + rnorm(1)

# Estimate the mean and MCSE.

bm(X)

Description

Apply bm to each column of a matrix or data frame of MCMC samples.

Usage

bmmat(x)

Arguments

x a matrix or data frame with each row being a draw from the multivariate distribution of interest.

Value

bmmat returns a matrix with ncol(x) rows and two columns. The row names of the matrix are the same as the column names of x. The column names of the matrix are “est” and “se”. The jth row of the matrix contains the result of applying bm to the jth column of x.

See Also

bm, which performs consistent batch means estimation for a vector.
ess

Estimate effective sample size (ESS) as described in Kass et al. (1998) and Robert and Casella (2004; p. 500).

Description

Estimate effective sample size (ESS) as described in Kass et al. (1998) and Robert and Casella (2004; p. 500).

Usage

ess(x, imse = TRUE, verbose = FALSE)

Arguments

x a vector of values from a Markov chain.

imse logical. If TRUE, use an approach that is analogous to Geyer’s initial monotone positive sequence estimator (IMSE), where correlations beyond a certain lag are removed to reduce noise.

verbose logical. If TRUE and imse = TRUE, inform about the lag at which truncation occurs, and warn if the lag is probably too small.

Details

ESS is the size of an iid sample with the same variance as the current sample. ESS is given by

\[ ESS = \frac{T}{\eta}, \]

where

\[ \eta = 1 + 2 \sum \text{all lag autocorrelations}. \]

Value

The function returns the estimated effective sample size.

References


estvssamp

Create a plot that shows how Monte Carlo estimates change with increasing sample size.

Description

Create a plot that shows how Monte Carlo estimates change with increasing sample size.

Usage

estvssamp(x, fun = mean, main = "Estimate vs Sample Size", add = FALSE, ...)

Arguments

x a sample vector.
fun a function such that \( E(fun(x)) \) is the quantity of interest. The default is fun = mean.
main an overall title for the plot. The default is “Estimates vs Sample Size”.
add logical. If TRUE, add to a current plot.
... additional arguments to the plotting function.

Value

NULL

Examples

# Simulate a sample path of length 10,000 for an AR(1) chain with rho equal to 0.7.

X = numeric(10000)
X[1] = 1
for (i in 1:9999)
  X[i + 1] = 0.7 * X[i] + rnorm(1)

# Plot MC estimates versus sample size.
estvssamp(X)
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