

Package ‘pbo’

August 29, 2016

Type Package

Title Probability of Backtest Overfitting

Version 1.3.4

Date 2014-05-18

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Description Following the method of Bailey et al., computes for a collection of candidate models the probability of backtest overfitting, the performance degradation and probability of loss, and the stochastic dominance.

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URL <https://github.com/mrbcuda/pbo>

BugReports <https://github.com/mrbcuda/pbo/issues>

Depends utils, lattice

Suggests PerformanceAnalytics, foreach, grid, latticeExtra, testthat, doParallel, knitr

VignetteBuilder knitr

NeedsCompilation no

Repository CRAN

Date/Publication 2014-05-31 01:49:51

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pbo-package

Probability of backtest overfitting.

Description

Computes the probability of backtest overfitting

Details

Implements algorithms for computing the probability of backtest overfitting, performance degradation and probability of loss, and first- and second-order stochastic dominance, based on the approach specified in Bailey et al., September 2013. Provides a collection of pre-configured plots based on lattice graphics.

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References

See Bailey, David H. and Borwein, Jonathan M. and Lopez de Prado, Marcos and Zhu, Qiji Jim, The Probability of Back-Test Overfitting (September 1, 2013). Available at SSRN. See <http://ssrn.com/abstract=2326253> or <http://dx.doi.org/10.2139/ssrn.2326253>.

dotplot.pbo

PBO in-sample selection dot plot.

Description

Draws an annotated dot plot of study selection sorted by in-sample selection frequency.

Usage

```
## S3 method for class 'pbo'
dotplot(x, data = NULL, main,
        xlab = "Sorted Study Number (N)", ylab = "IS Selection Frequency",
        show_config = TRUE, show_grid = TRUE, sel_threshold = 0, ...)
```

Arguments

x	a pbo object as returned by <code>pbo</code> .
data	should not be used
main	plot title, default computed internally, passed to <code>dotplot</code> .
xlab	x-axis label with default, passed to <code>dotplot</code> .
ylab	y-axis label with default, passed to <code>dotplot</code> .

show_config whether to show the study dimension annotations, default TRUE
 show_grid whether to show the grid panel, default TRUE
 sel_threshold the minimum in-sample frequency subsetting threshold, default 0; selection frequencies at or below this value will be omitted
 ... other parameters as passed to [dotplot](#).

See Also

pbo, histogram.pbo, xyplot.pbo

histogram.pbo *PBO rank logits histogram.*

Description

Draws an annotated histogram of PBO rank logits.

Usage

```
## S3 method for class 'pbo'
histogram(x, data = NULL, show_pbo = TRUE,
  show_regions = TRUE, show_config = TRUE, col_bar = "#cc99cc",
  col_line = "#3366cc", ...)
```

Arguments

x an object of class pbo as returned by [pbo](#).
 data should not be used
 show_pbo whether to show the PBO value annotation, default TRUE
 show_regions whether to show the overfit region annotations, default TRUE
 show_config whether to show the study dimension annotations, default TRUE
 col_bar histogram bar fill color passed to histogram panel
 col_line density plot line color passed to density plot panel
 ... other parameters passed to [histogram](#), [densityplot](#), or [panel.abline](#).

Details

Uses **lattice** function [histogram](#), [densityplot](#), and [panel.abline](#) panels together with class-specific annotations.

See Also

pbo, dotplot.pbo, xyplot.pbo

pbo *Probability of backtest overfitting*

Description

Performs the probability of backtest overfitting computations.

Usage

```
pbo(m, s = 4, f = NA, threshold = 0, inf_sub = 6,
    allow_parallel = FALSE)
```

Arguments

m	a $T \times N$ data frame of returns, where T is the samples per study and N is the number of studies.
s	the number of subsets of m for CSCV combinations; must evenly divide m
f	the function to evaluate a study's performance; required
threshold	the performance metric threshold (e.g. 0 for Sharpe, 1 for Omega)
inf_sub	infinity substitution value for reasonable plotting
allow_parallel	whether to enable parallel processing, default FALSE

Details

This function performs the probability of backtest overfitting calculation using a combinatorially-symmetric cross validation (CSCV) approach.

Value

object of class pbo containing list of PBO calculation results and settings

References

Baily et al., "The Probability of Backtest Overfitting," http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2326253

Examples

```
## Not run:
require(pbo)
require(PerformanceAnalytics)
n <- 100
t <- 1000
s <- 8
m <- data.frame(matrix(rnorm(n*t, mean=0, sd=1),
  nrow=t, ncol=n, byrow=TRUE,
  dimnames=list(1:t, 1:n)),
```

```

    check.names=FALSE)
p <- pbo(m,s,f=Omega,threshold=1)

## End(Not run)

```

pbo_show_config *Writes grid text to a default predetermined location.*

Description

Writes grid text to a default predetermined location.

Usage

```
pbo_show_config(p)
```

Arguments

p an object of class pbo as returned by [pbo](#).

Note

Meant for internal use only.

xyplot.pbo *PBO xy-plots*

Description

Draws an annotated plot of performance degradation and probability of loss.

Usage

```

## S3 method for class 'pbo'
xyplot(x, data = NULL, plotType = "cscv", show_eqn = TRUE,
       show_threshold = TRUE, show_config = TRUE, show_rug = TRUE,
       show_prob = TRUE, show_grid = TRUE, increment = 0.01,
       osr_threshold = 0, sel_threshold = 0, xlab, ylab, main, lwd = 1,
       ylab_left, ylab_right, col_bar, col_line, col_sd1 = "#3366cc",
       col_sd2 = "#339999", lty_sd = c(1, 2, 4), ...)

```

Arguments

x	a pbo object as returned by pbo .
data	should not be used
plotType	one of <code>cscv</code> , <code>degradation</code> , <code>dominance</code> , <code>pairs</code> , <code>ranks</code> or <code>selection</code> .
col_bar	histogram bar fill color
col_line	density plot line color
col_sd1	color of two first-order stochastic dominance lines
col_sd2	color of the single second-order stochastic dominance line
xlab	x-axis label, default computed if not provided
ylab	y-axis label, default computed if not provided
main	plot title, default computed if not provided
lwd	line width, default 1, passed to panels and legends
lty_sd	line type array for stochastic dominance plot, e.g. <code>c(2,3,5)</code>
ylab_left	dominance plot left-hand axis label
ylab_right	dominance plot right-hand axis label
increment	stochastic dominance distribution generator increment, e.g. 0.1 steps
osr_threshold	out-of-sample rank threshold for filtering, default 0
sel_threshold	selection frequency threshold for filtering, default 0
show_eqn	whether to show the line equation annotation, default TRUE
show_threshold	whether to show the probability of loss annotation, default TRUE
show_config	whether to show the study dimension annotations, default TRUE
show_grid	whether to show the panel grid, default TRUE
show_prob	whether to show the probability value in dominance plot, default TRUE
show_rug	whether to show scatter rugs near the axes, default TRUE
...	other parameters passed to xyplot or its panels

Details

Provides several variations of xy-plots suitable for presentation of PBO analysis results. Use the `plotType` argument to indicate which variation or result to plot:

- The `cscv` type shows in-sample and out-of-sample results by CSCV iteration case (default).
- The `degradation` type shows the performance degradation regression fit results and the probability of loss.
- The `dominance` type shows the results of the first-order and second-order stochastic dominance analysis using two axes.
- The `pairs` type shows the in-sample and out-of-sample case selections.
- The `ranks` type shows the sorted performance ranks results.
- The `selection` type shows the case selection frequencies.

See Also

`pbo`, `histogram.pbo`, `xyplot.pbo`

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