

Package ‘backtest’

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Type Package

Title Exploring portfolio-based conjectures about financial instruments

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Description The backtest package provides facilities for exploring portfolio-based conjectures about financial instruments (stocks, bonds, swaps, options, et cetera).

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Depends R (>= 2.3.0), methods, grid, lattice

License GPL (>= 2)

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backtest-package *Exploring portfolio-based conjectures about financial instruments*

Description

The backtest package provides facilities for exploring portfolio-based conjectures about financial instruments (stocks, bonds, swaps, options, et cetera).

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 Type: Package
 Version: 0.3-0
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starmine	StarMine Rankings, 1995

Further information is available in the following vignettes:

backtest Using the backtest package (source, pdf)

Author(s)

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Maintainer: Jeff Enos <jeff@kanecap.com>

backtest *Creating an Object of Class Backtest*

Description

Conducts a backtest and returns the results as an object of class backtest.

Usage

```
backtest(x,
         in.var,
         ret.var,
         universe,
         by.var = NULL,
         date.var = NULL,
         id.var = NULL,
         buckets = 5,
         natural = FALSE,
         do.spread = TRUE,
         by.period = TRUE,
         overlaps = 1)
```

Arguments

<code>x</code>	A data frame containing the data to be analysed in the backtest. The details of what this data frame must contain are given below.
<code>in.var</code>	A character vector which indicates the name of the column or columns in <code>x</code> to be used as input variables.
<code>ret.var</code>	A character vector which indicates the name of the column or columns in <code>x</code> to be used as return variables.
<code>by.var</code>	An optional character value, specifying a second variable in <code>x</code> to be used for categorising the data. The details of how categories are created are given below.
<code>id.var</code>	An optional character value which indicates the name of the column in <code>x</code> containing a unique identifier for each observation. <code>id.var</code> must be specified if <code>natural</code> is <code>TRUE</code> .
<code>date.var</code>	An optional character vector which indicates the name of the column in <code>x</code> to be used as a date for each observation. <code>date.var</code> must be specified if <code>natural</code> is <code>TRUE</code> . In order to call <code>plot</code> , the contents of <code>date.var</code> must be of class <code>Date</code> or be coercible to an object of class <code>Date</code> via <code>as.Date</code> .
<code>buckets</code>	An optional numeric vector which specifies how many quantiles to create according to <code>in.var</code> and <code>by.var</code> .
<code>universe</code>	An optional expression for selecting a subset of <code>x</code> . The details of how this expression may be constructed are given below.
<code>natural</code>	An optional logical value. If <code>TRUE</code> , the <code>summary</code> method returns additional information and the backtest object may be plotted. The details of how a natural backtest differs from a pooled backtest are given below.
<code>do.spread</code>	An optional logical value. If <code>TRUE</code> the <code>summary</code> method displays information about the spread between the extreme quantiles. If <code>FALSE</code> this information is suppressed. Defaults to <code>TRUE</code> .
<code>by.period</code>	An optional logical value. If <code>TRUE</code> the quantiles are recalculated within each date period. If <code>FALSE</code> the quantiles are calculated all at once. Defaults to <code>TRUE</code> .
<code>overlaps</code>	An optional integer which specifies how many periods to combine portfolios of in order to weight a current period. If <code>overlaps</code> is the default of 1, backtest

behaves as normal and only uses a periods own data to determine the portfolio. If `overlaps` is set to `n > 1`, a period's portfolio is calculated by giving $1/n$ weight to the previous `n` periods.

Details

Data frames for `backtest` must, at a minimum, contain a column of class `numeric` to be referenced by the `in.var` and `ret.var` arguments.

The `in.var` is the primary variable by which the `backtest` categorises observations. It must reference a numeric column in `x`. Using the values in `x`, `backtest` breaks the values into equal sized quantiles, or `buckets`.

The `by.var` is the secondary variable by which the `backtest` categorises observations. When specifying both `in.var` and `by.var`, `backtest` organises the observations into a `n` by `j` matrix where `n` is the number of quantiles or categories created for the `by.var` and `j` is the number of quantiles created for the `in.var`. By default, `backtest` creates 5 quantiles.

If `natural` is `TRUE`, the data and arguments must meet certain requirements. First, the frequency of the observations and `ret.var` must be the same. Second, an `id.var` and `date.var` are required. Third, a `by.var` is not allowed. Note that the code does not verify that the `backtest` is truly natural; `backtest` accepts the value passed by the user as valid.

Value

Returns an object of class `backtest`.

The functions `show` and `summary` are used to obtain and print a short description and longer summary of the results of the `backtest`. The accessor functions `counts`, `totalCounts`, `marginals`, `mean`, `naCounts`, and `turnover` extract different parts of the value returned by `backtest`.

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See Also

[backtest-class](#)

Examples

```
data(starmine)

## Backtest with 1 'in.var' and 1 'ret.var'

bt <- backtest(starmine, in.var = "smi", ret.var = "ret.0.1.m", by.period = FALSE)
summary(bt)

## Backtest with 2 'in.var' values, 1 'ret.var', and a 'by.var'

bt <- backtest(starmine, in.var = c("smi", "cap.usd"),
```

```

ret.var = "ret.0.1.m", by.var = "sector", by.period = FALSE)
summary(bt)

## Backtest with 1 'in.var', 1 'by.var', and 1 'ret.var'. Number of
## buckets changed from default of 5 to 4. Change in number of buckets
## only affects the 'in.var' because the 'by.var' column in 'starmine'
## contains character data. For each value in this column there is a
## unique category.

bt <- backtest(starmine, in.var = "smi", by.var = "sector",
ret.var = "ret.0.1.m", buckets = 4, by.period = FALSE)
summary(bt)

## Backtest with 1 'in.var', multiple 'ret.var', and a
## universe restriction

bt <- backtest(starmine, in.var = "smi",
ret.var = c("ret.0.1.m", "ret.0.6.m"),
universe = sector == "HiTec", by.period = FALSE)
summary(bt)

## Running a natural backtest with 2 'in.vars', 1 'ret.var'
## 10 buckets

bt <- backtest(starmine, in.var = c("smi", "cap.usd"),
ret.var = "ret.0.1.m", date.var = "date",
id.var = "id", buckets = 10,
natural = TRUE, by.period = FALSE)
summary(bt)

## The same backtest, but calculating quantiles within periods.

bt <- backtest(starmine, in.var = c("smi", "cap.usd"),
ret.var = "ret.0.1.m", date.var = "date",
id.var = "id", buckets = 10,
natural = TRUE, by.period = TRUE)
summary(bt)

plot(bt, type = "turnover")
plot(bt, type = "return")
plot(bt, type = "cumreturn")
plot(bt, type = "cumreturn.split")

```

backtest-class *Class "backtest"*

Description

Contains results from the backtest function.

Details

The primary method for accessing the `backtest` results is through the `summary` method. `summary` provides different displays depending on the type of `backtest` object. These displays are shown in the examples section. Accessor methods such as `means`, `counts`, `marginals`, `naCounts`, `turnover`, and `ci` may be used to extract other types of information from the object.

A `backtest` object with a `natural` value of `TRUE` may be graphed by calling the `plot` method. The default `plot` method graphs `return`. The other plots, `turnover` and `cumulative return`, must be explicitly specified as `plot(object, type = "turnover")` or `plot(object, type = "cumreturn")`.

The `backtest` object does not store the data frame used to create the `backtest`. It only stores the results and the names of the vectors used in calculating these results.

The results of a `backtest` are stored in a 5-dimensional array, `results`. The 1st dimension contains one value for every element of `ret.var`. The 2nd dimension contains one value for every element of `in.var`. The 3rd dimension contains one value for every element in `1:buckets[1]`, a vector from 1 through the number of `by.var` buckets. The 4th dimension contains one value for every element in `1:buckets[2]`, a vector from 1 through the number of `in.var` buckets. The 5th dimension contains 4 elements: `means`, `counts`, `trim.means`, and `NAs`.

Objects from the Class

Objects can be created by calls to the function `backtest(data, in.var, ret.var, ...)`.

Slots

in.var: Object of class "character" specifying the `in.var` values for this backtest.

ret.var: Object of class "character" containing the `ret.var` values for this backtest.

by.var: Object of class "character" containing the `by.var`, if specified, for this backtest.

date.var: Object of class "character" containing the `date.var`, if specified, for this backtest.

buckets: Object of class "numeric" containing the number(s) of buckets used create quantiles from the `in.var` and `by.var` values.

results: A 5-dimensional array containing the results of the backtest.

rawstats: Object of class "data.frame" containing some summary statistics for this backtest.

natural: Object of class "logical" expressing whether or not the intervals between observations, as specified by `date.var`, and returns, as specified by `ret.var`, match. If the interval between dates is one month, the interval between returns should also be one month.

Methods

show signature(object = "backtest"): Prints the variables used in this backtest.

summary signature(object = "backtest"): Prints the results of the backtest.

summaryStats signature(object = "backtest"): Returns a data frame with spreads for each `date.var` value and each `in.var`.

- means** signature(object = "backtest"): Returns a list of matrices, with one matrix for each `in.var`, where the value of each cell is the mean of the returns for that `in.var` and `by.var` combination.
- counts** signature(object = "backtest"): Returns a list of matrices, with one matrix for each `in.var`, where the value of each cell is the number of observations for that `in.var` and `by.var` combination.
- totalCounts** signature(object = "backtest"): Returns a data frame in the same format as the spreads data frame returned by `summaryStats`: contains the sum of counts for all buckets (or high and low buckets if argument `low.high.only` is set to `TRUE`) of non-NA `in.var` values that went into the spread calculations.
- marginals** signature(object = "backtest"): Returns a list of matrices, one matrix for each `in.var`, where the value of each cell is the number of observations for that `in.var` and `by.var` combination. Different from `counts` because the marginal sums have been appended to the matrices.
- naCounts** signature(object = "backtest"): Returns a list of matrices, with one matrix for each `in.var`, where the value of each cell is the number of NA observations for that `in.var` and `by.var` combination.
- ci** signature(object = "backtest"): Returns a matrix of confidence intervals for spreads.
- turnover** signature(object = "backtest"): Returns a `data.frame` of the turnovers if the `backtest` is natural.
- plot** signature(x = "backtest", y = "missing"): Plots returns, cumulative returns, or turnover, when passed a `type` argument of `return`, `cumreturn`, or `turnover`, respectively.

Author(s)

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See Also

[backtest](#)

Examples

```
data(starmine)
bt <- backtest(starmine, in.var = "smi", ret.var = "ret.0.1.m", by.period = FALSE)

## Summary for a pooled backtest

summary(bt)

## A natural backtest

bt <- backtest(starmine, in.var = "smi", ret.var = "ret.0.1.m",
               date.var = "date", id.var = "id", natural = TRUE, by.period = FALSE)

## Summary for a natural backtest
```

```

summary(bt)

## Other access methods

means(bt)
counts(bt)
marginals(bt)
naCounts(bt)

## Plotting methods

plot(bt, type = "turnover")
plot(bt, type = "return")
plot(bt, type = "cumreturn")

```

starmine

StarMine Rankings, 1995

Description

StarMine rankings of some stocks in 1995, with corresponding returns and other data.

Usage

```
data(starmine)
```

Format

A data frame containing 53328 observations on the following 23 variables.

date Date on which the observation was recorded. The dates have a monthly frequency. Dates range from 1995-01-31 to 1995-11-30.

id Unique identifier for each stock.

symbol Company symbol.

name Full company name.

country Country of the exchange on which the company is listed. This factor has levels AUS, CHE, DEU, DNK, ESP, FIN, FRA, GBR, HKG, ITA, JPN, NLD, NOR, NZL, SWE and USA

sector Sector specification. This factor has levels Durbl, Enrgy, HiTec, Hlth, Manuf, Money, NoDur, Other, Shops, Telcm and Utils

sec An alternative sector specification. This factor has levels CND, CNS, COM, ENE, FIN, HTH, IND, MAT, TEC and UTL.

ind Industry specification. This factor has levels AERDF, AIRLN, AUTOP, AUTOS, BANKS, BEVGS, BIOTC, BUILD, CHEMS, CNENG, CNFIN, CNMAT, COMEQ, COMPT, COMSS, CONGL, CPMKT, DICNS, DISTR, DVFIN, DVTEL, ELEQI, ELEQT, ELUTL, ENEQS, FDPD, FDRET, GSUTL, HEPST, HEQSP, HETEC, HOTEL, HSDUR, HSPRD, INSUR, INTSS, IPPET, ITCAT,

ITCON, LEISR, LFSCI, LOGIS, MACHN, MEDIA, METAL, MGFIN, MLRET, MLUTL, OFFIC, OILGS, PACKG, PAPER, PHARM, PRPRD, REALE, REDEV, REITS, RRAIL, SEMIP, SEMIS, SHIPS, SMOKE, SOFTW, SPRET, TEXAP, TRADE, TRINF, WIREL and WTUTL

size cap.usd normalized to N(0,1).

smi StarMine Indicator (smi) score

liq Liquidity of the company.

ret.0.1.m One-month forward return of the company.

ret.0.6.m Six-month forward return of the company.

ret.1.0.m One-month prior return of the company.

ret.6.0.m Six-month prior return of the company.

ret.12.0.m Twelve-month prior return of the company.

mn.dollar.volume.20.d Mean dollar volume of the past 20 days.

md.dollar.volume.120.d Median dollar volume of the past 120 days.

cap.usd Market capitalisation of the company in USD.

cap Market capitalisation of the company in local currency.

sales Annual gross sales of the company.

net.income Annual net income of the company.

common.equity Annual common equity of the company.

Details

starmine contains selected attributes such as sector, market capitalisation, country, and various measures of return for a universe of approximately 6,000 stocks. The data is on a monthly frequency from January 31, 1995 to November 30, 1995.

Note

We would like to thank StarMine Corporation for allowing us to include this data in the backtest package.

Source

StarMine Corporation. For more information, see <http://www.starmine.com>.

Examples

```
data(starmine)
head(starmine)
```

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