Package 'JFE'

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Type Package

Title Tools and GUI for Analyzing Time Series Data of Just Finance and Econometrics

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Description Support the analysis of financial and econometric time series, including data download.

License GPL (>= 2)

LazyData TRUE

LazyLoad yes

Depends R (>= 3.6),xts,fPortfolio

Imports tcltk, tcltk2, zoo

Suggests BurStFin, data.table, fAssets, fBasics, forecast, FRAPO, htmltools, iClick, knitr, lubridate, MASS, openxlsx, quantmod, rmarkdown, rugarch, timeDate, timeSeries

NeedsCompilation no

Repository CRAN

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R topics documented:

`ActivePremium` *Active Premium or Active Return*

Description

The return on an investment's annualized return minus the benchmark's annualized return.

Usage

```
ActivePremium(Ra, Rb, scale = NA)
```

Arguments

Ra	return vector of the portfolio
Rb	return vector of the benchmark asset
scale	number of periods in a year (daily scale = 252, monthly scale = 12, quarterly scale = 4)

Details

Active Premium = Investment's annualized return - Benchmark's annualized return. With a view to speeding computation. I re-write the code of some ratios of the package PerformanceAnalytics, and use the same name for comparing the performance enhancing. Interested readers may compare speed improvement with the use of system.time().
See package `PerformanceAnalytics` for technical details.

Author(s)

Ho Tsung-wu <tsungwu@ntnu.edu.tw>, College of Management, National Taiwan Normal University.

Examples

```
  data(assetReturns)
assetReturns=assetReturns["2011::2018"] #short sample for fast example
Ra=assetReturns[, -29]
Rb=assetReturns[,29] #DJI
  ActivePremium(Ra, Rb)
```

AdjustedSharpeRatio *Adjusted Sharpe ratio of the return distribution*

Description

Adjusted Sharpe ratio was introduced by Pezier and White (2006) to adjusts for skewness and kurtosis by incorporating a penalty factor for negative skewness and excess kurtosis.

Usage

```
AdjustedSharpeRatio(R, Rf = 0, FUN = "StdDev")
```

Arguments

R	an xts, vector, matrix, data frame, timeSeries or zoo object of asset returns
Rf	the risk free rate
FUN	one of "StdDev" or "VaR" or "ES" to use as the denominator for unadjusted Sharpe ratio, default="StdDev"

Details

See documents in package PerformanceAnalytics for technical details.
Carl Bacon(2008) Practical portfolio performance measurement and attribution, second edition, p.99.

Author(s)

Ho Tsung-wu <tsungwu@ntnu.edu.tw>, College of Management, National Taiwan Normal University.

Examples

```
    data(assetReturns)

AdjustedSharpeRatio(assetReturns)
```

AppraisalRatio *Appraisal ratio of the return distribution*

Description

Appraisal ratio is the Jensen's alpha adjusted for specific risk. The numerator is divided by specific risk instead of total risk.

Usage

```
AppraisalRatio(Ra, Rb, Rf = 0, method = c("appraisal", "modified",
  "alternative"))
```

Arguments

Ra	an xts, vector, matrix, data frame, timeSeries or zoo object of asset returns
Rb	return vector of the benchmark asset
Rf	risk free rate, in same period as your returns
method	is one of "appraisal" to calculate appraisal ratio, "modified" to calculate modified Jensen's alpha or "alternative" to calculate alternative Jensen's alpha.

Details

Modified Jensen's alpha is Jensen's alpha divided by beta.

Alternative Jensen's alpha is Jensen's alpha divided by systematic risk.

See also documents in package PerformanceAnalytics for technical details.
Carl Bacon (2008) Practical portfolio performance measurement and attribution, second edition, p.77.

Author(s)

Ho Tsung-wu <tsungwu@ntnu.edu.tw>, College of Management, National Taiwan Normal University.

Examples

```
    data(assetReturns)
Ra=assetReturns[, -29]
Rb=assetReturns[,29] #DJI
AppraisalRatio(Ra, Rb, method="appraisal")
```

BernardoLedoitRatio *Bernardo and Ledoit ratio of the return distribution*

Description

To calculate Bernardo and Ledoit ratio we take the sum of the subset of returns that are above 0 and we divide it by the opposite of the sum of the subset of returns that are below 0

Usage

```
BernardoLedoitRatio(R)
```

Arguments

R	an xts, vector, matrix, data frame, timeSeries or zoo object of asset returns

Details

See documents in package `PerformanceAnalytics` for technical details.
Carl Bacon (2008) Practical portfolio performance measurement and attribution, second edition, p.95.

Author(s)

Ho Tsung-wu <tsungwu@ntnu.edu.tw>, College of Management, National Taiwan Normal University.

Examples

```
    data(assetReturns)
BernardoLedoitRatio(R=assetReturns)
```

BurkeRatio *Burke ratio of the return distribution*

Description

To calculate Burke ratio we take the difference between the portfolio return and the risk free rate and we divide it by the square root of the sum of the square of the drawdowns. To calculate the modified Burke ratio we just multiply the Burke ratio by the square root of the number of datas.

Usage

```
BurkeRatio(R, Rf = 0, modified = FALSE)
```

Arguments

R	an xts, vector, matrix, data frame, timeSeries or zoo object of asset returns
Rf	the risk free rate
modified	a boolean to decide which ratio to calculate between Burke ratio and modified Burke ratio.

Details

See documents in package PerformanceAnalytics for technical details.
Carl Bacon (2008) Practical portfolio performance measurement and attribution, second edition, p.90-91.

Author(s)

Ho Tsung-wu <tsungwu@ntnu.edu.tw>, College of Management, National Taiwan Normal University.

Examples

```
  data(assetReturns)
assetReturns=assetReturns["2011::2018"] #short sample for fast example
  BurkeRatio(assetReturns,Rf=0)
```

CalmarRatio *calculate a Calmar or Sterling reward/risk ratio Calmar and Sterling Ratios are yet another method of creating a risk-adjusted measure for ranking investments similar to the* SharpeRatio.

Description

Both the Calmar and the Sterling ratio are the ratio of annualized return over the absolute value of the maximum drawdown of an investment. The Sterling ratio adds an excess risk measure to the maximum drawdown, traditionally and defaulting to 0.1.

Usage

```
CalmarRatio(R, scale = NA)

SterlingRatio(R, scale = NA, excess = 0.1)
```

Arguments

R	an xts, vector, matrix, data frame, timeSeries or zoo object of asset returns
scale	number of periods in a year (daily scale = 252, monthly scale = 12, quarterly scale = 4)
excess	for Sterling Ratio, excess amount to add to the max drawdown, traditionally and default 0.1

Details

It is also traditional to use a three year return series for these calculations, although the functions included here make no effort to determine the length of your series. If you want to use a subset of your series, you'll need to truncate or subset the input data to the desired length.
See also package PerformanceAnalytics for technical details.
Bacon, Carl (2008) Practical Portfolio Performance Measurement and Attribution. Wiley.

Author(s)

Ho Tsung-wu <tsungwu@ntnu.edu.tw>, College of Management, National Taiwan Normal University.

Examples

```
  data(assetReturns)
R=assetReturns[, -29]

#    SterlingRatio(R)
```

`CAPM.jensenAlpha` *Jensen's alpha of the return distribution*

Description

The Jensen's alpha is the intercept of the regression equation in the Capital Asset Pricing Model and is in effect the exess return adjusted for systematic risk.

Usage

```
CAPM.jensenAlpha(Ra, Rb, Rf = 0)
```

Arguments

`Ra`	an xts, vector, matrix, data frame, timeSeries or zoo object of asset returns
`Rb`	return vector of the benchmark asset
`Rf`	risk free rate, in same period as your returns

Details

See documents in package `PerformanceAnalytics` for technical details.
Carl Bacon (2008) Practical portfolio performance measurement and attribution, second edition 2008 p.72

Author(s)

Ho Tsung-wu <tsungwu@ntnu.edu.tw>, College of Management, National Taiwan Normal University.

Examples

```
  data(assetReturns)
assetReturns=assetReturns["2011::2018"] #short sample for fast example
Ra=assetReturns[, -29]
Rb=assetReturns[,29] #DJI

CAPM.jensenAlpha(Ra, Rb)
```

data-sets *Assets Data Sets*

Description

assetReturns contains DJ component stocks returns data. macrodata contains US unemployment(unrate) and year-to-year changes in three regional business cycle indices (OED, NAFTA, and G7).

Usage

```
data(assetReturns)
data(macrodata)
```

Value

assetReturns is a time series object of package `xts`; the others are time series objects of package `timeSeries`.

DownsideDeviation *downside risk (deviation, variance) of the return distribution*

Description

Downside deviation, semideviation, and semivariance are measures of downside risk.

Usage

```
DownsideDeviation(R, MAR = 0, method = c("full", "subset"),potential = FALSE)
```

Arguments

`R`	an xts, vector, matrix, data frame, timeSeries or zoo object of asset returns
`MAR`	Minimum Acceptable Return, in the same periodicity as your returns
`method`	one of "full" or "subset", indicating whether to use the length of the full series or the length of the subset of the series below the MAR as the denominator, defaults to "full"
`potential`	if TRUE, calculate downside potential instead, default FALSE

Details

Downside deviation, similar to semi deviation, eliminates positive returns when calculating risk. Instead of using the mean return or zero, it uses the Minimum Acceptable Return as proposed by Sharpe (which may be the mean historical return or zero). It measures the variability of underperformance below a minimum targer rate. The downside variance is the square of the downside potential.

To calculate it, we take the subset of returns that are less than the target (or Minimum Acceptable Returns (MAR)) returns and take the differences of those to the target. We sum the squares and divide by the total number of returns to get a below-target semi-variance.
See also documents in package `PerformanceAnalytics` for technical details. Sortino, F. and Price, L.(1994) Performance Measurement in a Downside Risk Framework. Journal of Investing. Fall, 59-65.
Carl Bacon (2008) Practical portfolio performance measurement and attribution, second edition.
Plantinga, A., van der Meer, R. and Sortino, F. (2001) The Impact of Downside Risk on Risk-Adjusted Performance of Mutual Funds in the Euronext Markets. July 19.

Author(s)

Ho Tsung-wu <tsungwu@ntnu.edu.tw>, College of Management, National Taiwan Normal University.

Examples

```
  data(assetReturns)
assetReturns=assetReturns["2011::2018"] #short sample for fast example
R=assetReturns[, -29]
  DownsideDeviation(R, MAR = 0)
```

`DRatio` *d ratio of the return distribution*

Description

The d ratio is similar to the Bernado Ledoit ratio but inverted and taking into account the frequency of positive and negative returns.

Usage

```
DRatio(R)
```

Arguments

`R`	an xts, vector, matrix, data frame, timeSeries or zoo object of asset returns

Details

It has values between zero and infinity. It can be used to rank the performance of portfolios. The lower the d ratio the better the performance, a value of zero indicating there are no returns less than zero and a value of infinity indicating there are no returns greater than zero.
See also documents in package `PerformanceAnalytics` for technical details.
Carl Bacon (2008) Practical portfolio performance measurement and attribution, second edition, p.95

Author(s)

Ho Tsung-wu <tsungwu@ntnu.edu.tw>, College of Management, National Taiwan Normal University.

Examples

```
  data(assetReturns)
R=assetReturns[, -29]

  DRatio(R)
```

`DrawdownPeak` *Drawdawn peak of the return distribution*

Description

Drawdawn peak is for each return its drawdown since the previous peak

Usage

```
DrawdownPeak(R)
```

Arguments

`R`	an xts, vector, matrix, data frame, timeSeries or zoo object of asset returns

Author(s)

Ho Tsung-wu <tsungwu@ntnu.edu.tw>, College of Management, National Taiwan Normal University.

Examples

```
  data(assetReturns)
R=assetReturns[, -29]
# Not run
# DrawdownPeak(R)
```

getBIS *Download time series data from Bank of International Settlement*

Description

It downloads effective exchange rates from Bank of International Settlement.

Usage

```
getBIS(sheet="Real", type="broad")
```

Arguments

sheet	The name of spreedsheet of effective exchange rates (EER)of BIS, it has two options: "Real" and "Nominal", the default is "Real" for REER.
type	The type of EER, it has two types: "broad" and "narrow". The default is "broad".

Details

This function connects with <"https://www.bis.org/statistics/eer/"> and downloads the specified data. The rownames of downloaded data embeds the timestamp already, which can be directly transformed into time series via, as.timeSeries.

Value

data	The data object.
country.info	The country information with abbreviated symbol.
data.info	The information about effective exchange rates.

Author(s)

Ho Tsung-wu <tsungwu@ntnu.edu.tw>, College of Management, National Taiwan Normal University.

Examples

```
output=getBIS(sheet=c("Nominal","Real")[1], type=c("broad","narrow")[1])
output$data
output$data.info
output$country.info
```

getFed *Download financial and economic time series data from the Fed*

Description

It downloads financial and economic time series data from the Fed.

Usage

```
getFed(var.name="UNRATE", from="1900-01-01",end=Sys.Date(), do.plot=TRUE)
```

Arguments

var.name	The name of variable as used by <"https://fred.stlouisfed.org">. For example, "UNRATE" denotes unemployment rate, "CPIAUCSL" is monthly consumer price index, "GDP" is Gross domestic product, and "ICSA" is the initial claim seasonally adjusted. User please check with the web for symbol.
from	The starting date, the default is 1900-01-01 to ensure the very beginning.
end	The ending date of data retrieved, the default is Sys.Date().
do.plot	Whether to plot the retrieved data, the default is TRUE. Please set this value to be FALSE to avoid too many plotting, if you want to loop more downloads. It applies functionseriesPlot() from package fBasics.

Details

This function connects with <"https://fred.stlouisfed.org"> and downloads the specified market data. The rownames of downloaded data is embedded by the timestamp already.

Value

data	The data retrieved.

Author(s)

Ho Tsung-wu <tsungwu@ntnu.edu.tw>, College of Management, National Taiwan Normal University.

Examples

```
getFed(var.name="UNRATE")$data
```

`getFrench.Factors` *Download seven asset pricing factors data from the data library of Dr. French*

Description

It downloads seven factors data used for asset pricing analysis from the data library of Dr. Kenneth R. French at Dartmouth College.

Usage

```
getFrench.Factors(filename="F-F_Research_Data_5_Factors_2x3")
```

Arguments

`filename`	The name of data file as listed in <"http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.h which is an important database for asset pricing literature, this function supports seven factor files: "F-F_Research_Data_Factors",# Fama/French 3 Factors "F-F_Research_Data_5_Factors_2x3",# Fama/French 5 Factors "F-F_Momentum_Factor", # Fama/French Momentum Factors "F-F_Momentum_Factor_daily", # Fama/French Momentum Factors(daily) "F-F_Research_Data_Factors_weekly",# Fama/French 3 Factors(weekly) "F-F_Research_Data_Factors_daily", # Fama/French 3 Factors(daily) "F-F_Research_Data_5_Factors_2x3_daily" # Fama/French 5 Factors (daily)

Details

This function connects with <"http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html"> and downloads the specified factors data. Sometimes, the datafile contains multiple data tables, hence the code returns a list.

Value

`ff.factor`	The data retrieved and arranged.

Author(s)

Ho Tsung-wu <tsungwu@ntnu.edu.tw>, College of Management, National Taiwan Normal University.

Examples

```
getFrench.Factors(filename="F-F_Research_Data_Factors")
```

getFrench.Portfolios *Download 24 asset pricing factors data from the data library of Dr. French*

Description

It downloads 24 factors data used for asset pricing analysis from the data library of Dr. Kenneth R. French at Dartmouth College.

Usage

```
getFrench.Portfolios(filename="Portfolios_Formed_on_ME")
```

Arguments

filename	The name of portfolio data file as listed in (http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_l the default is "Portfolios_Formed_on_ME". So far, this function supports retrieving 24 portfolio data files: "Portfolios_Formed_on_ME",#Portfolios Formed on Size "Portfolios_Formed_on_BE-ME",#On Book-to-Market "Portfolios_Formed_on_OP", #On Operating Profitability "Portfolios_Formed_on_INV",#On Investment "6_Portfolios_2x3", #6 Ports on Size and Book-to-Market "25_Portfolios_5x5", #25 Ports on Size and Book-to-Market "100_Portfolios_10x10", #100 Ports on Size and Book-to-Market "6_Portfolios_ME_INV_2x3", #6 Ports on Size and Investment "25_Portfolios_ME_INV_5x5",#25 Ports on Size and Investment "100_Portfolios_ME_INV_10x10",#100 Ports on Size and Investment "25_Portfolios_BEME_OP_5x5",#25 Ports on Book-to-Market and Operating Profitability "25_Portfolios_BEME_INV_5x5",#25 Ports on Book-to-Market and Investment "25_Portfolios_OP_INV_5x5",#25 Ports on Operating Profitability and Investment "32_Portfolios_ME_BEME_OP_2x4x4",#32 Ports on Size,Book-to-Market and Operating Profitability "32_Portfolios_ME_BEME_INV_2x4x4",#32 Ports on Size,Book-to-Market and Investment "32_Portfolios_ME_OP_INV_2x4x4",#32 Ports on Size,Operating Profitability and Investment "5_Industry_Portfolios", # Industry Portfolios by c(5,10,12,17,30,38,48,49)

Details

This function connects with <"http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html"> and downloads the specified portfolio data constructed by factors. Currently, we support on retriving and arranging 24 portfolio datasets. Sometimes, the datafile contains multiple data tables, hence the code returns a list. Since the csv spreedsheet on the web is not structured data table, it does not

only contain irregular headings, but also 7, or more, data tablesr; and the trivial portfolio data tables labelled by "Portfolio Formed by ..." are omitted. Check the "table.names" of output object.

Value

data	The data retrieved and arranged.
table.names	The names of data table.
file.name	The file name of portfolio data.

Author(s)

Ho Tsung-wu <tsungwu@ntnu.edu.tw>, College of Management, National Taiwan Normal University.

Examples

```
output=getFrench.Portfolios(filename="5_Industry_Portfolios")
output$file.name
dim(output$data[[1]])
output$data
output$table.names
```

---

getTWSE.fiveSecond *Download Download 5-second index price from the Taiwan Stock Exchange*

Description

It downloads Download 5-second financial index from the Taiwan Stock Exchange.

Usage

```
getTWSE.fiveSecond(ymd=NULL,skip=2,index.names=NULL)
```

Arguments

ymd	The year-month-day format of data retrived, for example, "2022-05-03". If unspecified, the default is the Sys.date(); if Saturday, it moves back to Friday; if Sunday, it moves to Monday.
skip	The rows to skip, since the web usually contains empty space or notes in the beginning, currently, skip 2 lines is OK, however, it skipped 1. Therefore, the parameter can be checked if it changes again.
index.names	The colnames (names of index price) of the dataset are originally in Chinese characters, to avoid language problem, we changed it to V1~V34. Users may offer your own colnames here.

Details

This function connects with <"https://www.twse.com.tw/exchangeReport/MI_5MINS_INDEX"> and downloads the specified market data. The rownames of downloaded data embeds the timestamp already.

Value

data	The data retrieved.

Author(s)

Ho Tsung-wu <tsungwu@ntnu.edu.tw>, College of Management, National Taiwan Normal University.

Examples

```
#getTWSE.fiveSecond(ymd="2022-05-03",skip=2,index.names=NULL)$data
```

InformationRatio *InformationRatio = ActivePremium/TrackingError*

Description

The Active Premium divided by the Tracking Error.

Usage

```
InformationRatio(Ra, Rb, scale = NA)
```

Arguments

Ra	an xts, vector, matrix, data frame, timeSeries or zoo object of asset returns
Rb	return vector of the benchmark asset
scale	number of periods in a year (daily scale = 252, monthly scale = 12, quarterly scale = 4)

Details

InformationRatio = ActivePremium/TrackingError

This relates the degree to which an investment has beaten the benchmark to the consistency with which the investment has beaten the benchmark.
See also documents in package `PerformanceAnalytics` for technical details.
Sharpe, W.F. The Sharpe Ratio (1994) Journal of Portfolio Management,Fall, 49-58 William Sharpe now recommends `InformationRatio` preferentially to the original `SharpeRatio`.

Author(s)

Ho Tsung-wu <tsungwu@ntnu.edu.tw>, College of Management, National Taiwan Normal University.

Examples

```
  data(assetReturns)
Ra=assetReturns[, -29]
Rb=assetReturns[,29] #DJI

  InformationRatio(Ra, Rb)
```

JFE *Display the JFE User Interface*

Description

Start the JFE GUI (graphical user interface)

Usage

```
JFE()
```

Details

After loading the package, in the command prompt, type JFE() to start it. JFE is a menu-driven GUI designed to support the analysis of financial time series data with the aid of several R packages. The version 1.1 focuses on: Firstly, price visualization, including technical charting(by package quantmod); secondly, assets selection based on Performance index(by package PerformanceAnalytics); thirdly, portfolio optimization (by package "fPORTFOLIO").
This command is an internal function to start the JFE GUI. To avoid unexpected problems of time series object, the imported data must be time series object (xts, or timeSeries) loaded by either .RData or .rda, file of .csv or other format is not supported; that is to say, users have only to know how to construct a R time-series object.
If execution of All-in-one from backtesting fails, then it is a problem associated with undocumented functions. Please re-install this package from Github via devtools::install_github("tsungwu/JFE"), detailed are also explained in Github and <"http://web.ntnu.edu.tw/~tsungwu/R_DevOps/R_DevOps.htm">.

Value

Generate a menu-driven GUI

Author(s)

Ho Tsung-wu <tsungwu@ntnu.edu.tw>, College of Management, National Taiwan Normal University.

Examples

```
JFE()
```

`KellyRatio` *calculate Kelly criterion ratio (leverage or bet size) for a strategy*

Description

Kelly criterion ratio (leverage or bet size) for a strategy.

Usage

```
KellyRatio(R, Rf = 0)
```

Arguments

`R`	a vector of returns to perform a mean over
`Rf`	risk free rate, in same period as your returns

Details

The Kelly Criterion was identified by Bell Labs scientist John Kelly, and applied to blackjack and stock strategy sizing by Ed Thorpe.
As a performance metric, the Kelly Ratio is calculated retrospectively on a particular investment as a measure of the edge that investment has over the risk free rate. It may be use as a stack ranking method to compare investments in a manner similar to the various ratios related to the Sharpe ratio. See also documents in package `PerformanceAnalytics` for technical details.

Author(s)

Ho Tsung-wu <tsungwu@ntnu.edu.tw>, College of Management, National Taiwan Normal University.

Examples

```
  data(assetReturns)
R=assetReturns[, -29]

  KellyRatio(R, Rf=0)
```

M2Sortino *M squared for Sortino of the return distribution*

Description

M squared for Sortino is a M^2 calculated for Downside risk instead of Total Risk

Usage

```
M2Sortino(Ra, Rb, MAR = 0)
```

Arguments

Ra	an xts, vector, matrix, data frame, timeSeries or zoo object of asset return
Rb	return vector of the benchmark asset
MAR	the minimum acceptable return

Details

See documents in package `PerformanceAnalytics` for technical details.
Carl Bacon (2008) Practical portfolio performance measurement and attribution, second edition, p.102-103.

Author(s)

Ho Tsung-wu <tsungwu@ntnu.edu.tw>, College of Management, National Taiwan Normal University.

Examples

```
  data(assetReturns)
Ra=assetReturns[, -29]
Rb=assetReturns[,29] #DJI

M2Sortino(Ra, Rb, MAR=0)
```

MartinRatio *Martin ratio of the return distribution*

Description

To calculate Martin ratio we divide the difference of the portfolio return and the risk free rate by the Ulcer index

Usage

```
MartinRatio(R, Rf = 0)
```

Arguments

R	an xts, vector, matrix, data frame, timeSeries or zoo object of asset returns
Rf	risk free rate, in same period as your returns

Details

Carl Bacon, *Practical portfolio performance measurement and attribution*, second edition 2008 p.91.
See also package PerformanceAnalytics.

Author(s)

Ho Tsung-wu <tsungwu@ntnu.edu.tw>, College of Management, National Taiwan Normal University.

Examples

```
  data(assetReturns)
R=assetReturns[, -29]

# Not run
# MartinRatio(R)
```

maxDrawdown *caclulate the maximum drawdown from peak equity*

Description

To find the maximum drawdown in a return series, we need to first calculate the cumulative returns and the maximum cumulative return to that point. Any time the cumulative returns dips below the maximum cumulative returns, it's a drawdown. Drawdowns are measured as a percentage of that maximum cumulative return, in effect, measured from peak equity.

Usage

```
maxDrawdown(R, geometric = TRUE, invert = TRUE)
```

Arguments

R	an xts, vector, matrix, data frame, timeSeries or zoo object of asset returns
geometric	utilize geometric chaining (TRUE) or simple/arithmetic chaining (FALSE) to aggregate returns, default TRUE
invert	TRUE/FALSE whether to invert the drawdown measure. see Details.

Details

The option to `invert` the measure should appease both academics and practitioners. The default option `invert=TRUE` will provide the drawdown as a positive number. This should be useful for optimization (which usually seeks to minimize a value), and for tables (where having negative signs in front of every number may be considered clutter). Practitioners will argue that drawdowns denote losses, and should be internally consistent with the quantile (a negative number), for which `invert=FALSE` will provide the value they expect. Individually, different preferences may apply for clarity and compactness. As such, we provide the option, but make no value judgment on which approach is preferable.

Bacon, C. (2008) Practical Portfolio Performance Measurement and Attribution. Wiley. 2004. p. 88
See also documents in package `PerformanceAnalytics` for technical details.

Author(s)

Ho Tsung-wu <tsungwu@ntnu.edu.tw>, College of Management, National Taiwan Normal University.

Examples

```
  data(assetReturns)
R=assetReturns[, -29]

  maxDrawdown(R)
```

MeanAbsoluteDeviation *Mean absolute deviation of the return distribution*

Description

To calculate Mean absolute deviation we take the sum of the absolute value of the difference between the returns and the mean of the returns and we divide it by the number of returns.

Usage

```
MeanAbsoluteDeviation(R)
```

Arguments

R	an xts, vector, matrix, data frame, timeSeries or zoo object of asset returns

Details

Carl Bacon (2008) Practical portfolio performance measurement and attribution, second edition, p.62.
See documents in package `PerformanceAnalytics` for technical details.

Author(s)

Ho Tsung-wu <tsungwu@ntnu.edu.tw>, College of Management, National Taiwan Normal University.

Examples

```
  data(assetReturns)
assetReturns=assetReturns["2011::2018"] #short sample for fast example
R=assetReturns[, -29]

MeanAbsoluteDeviation(R)
```

OmegaSharpeRatio *Omega-Sharpe ratio of the return distribution*

Description

The Omega-Sharpe ratio is a conversion of the omega ratio to a ranking statistic in familiar form to the Sharpe ratio.

Usage

```
OmegaSharpeRatio(R, MAR = 0)
```

Arguments

R	an xts, vector, matrix, data frame, timeSeries or zoo object of asset returns
MAR	Minimum Acceptable Return, in the same periodicity as your returns

Details

To calculate the Omega-Sharpe ration we subtract the target (or Minimum Acceptable Returns (MAR)) return from the portfolio return and we divide it by the opposite of the Downside Deviation.
Carl Bacon(2008) Practical portfolio performance measurement and attribution, second edition , p.95.
See documents in package `PerformanceAnalytics` for technical details.

Author(s)

Ho Tsung-wu <tsungwu@ntnu.edu.tw>, College of Management, National Taiwan Normal University.

Examples

```
  data(assetReturns)
R=assetReturns[, -29]
  OmegaSharpeRatio(R)
```

`PainIndex` *Pain index of the return distribution*

Description

The pain index is the mean value of the drawdowns over the entire analysis period. The measure is similar to the Ulcer index except that the drawdowns are not squared. Also, it's different than the average drawdown, in that the numerator is the total number of observations rather than the number of drawdowns.

Usage

```
PainIndex(R)
```

Arguments

`R`	an xts, vector, matrix, data frame, timeSeries or zoo object of asset returns

Details

Visually, the pain index is the area of the region that is enclosed by the horizontal line at zero percent and the drawdown line in the Drawdown chart.
Carl Bacon (2008) Practical portfolio performance measurement and attribution, second edition, p.89 Becker, Thomas (2006) Zephyr Associates.
See also documents in package `PerformanceAnalytics` for technical details.

Author(s)

Ho Tsung-wu <tsungwu@ntnu.edu.tw>, College of Management, National Taiwan Normal University.

Examples

```
  data(assetReturns)
R=assetReturns[, -29]
# Not run
# PainIndex(R)
```

`PainRatio` *Pain ratio of the return distribution*

Description

To calculate Pain ratio we divide the difference of the portfolio return and the risk free rate by the Pain index

Usage

```
PainRatio(R, Rf = 0)
```

Arguments

`R`	an xts, vector, matrix, data frame, timeSeries or zoo object of asset returns
`Rf`	risk free rate, in same period as your returns

Details

See also documents in package `PerformanceAnalytics` for technical details.

Author(s)

Ho Tsung-wu <tsungwu@ntnu.edu.tw>, College of Management, National Taiwan Normal University.

References

Carl Bacon(2008) Practical portfolio performance measurement and attribution, second edition, p.91

Examples

```
  data(assetReturns)
assetReturns=assetReturns["2011::2018"] #short sample for fast example
R=assetReturns[, -29]
  PainRatio(R)
```

ProspectRatio *Prospect ratio of the return distribution*

Description

Prospect ratio is a ratio used to penalise loss since most people feel loss greater than gains.

Usage

```
ProspectRatio(R, MAR)
```

Arguments

R	an xts, vector, matrix, data frame, timeSeries or zoo object of asset returns
MAR	the minimum acceptable return

Details

Carl Bacon (2008) Practical portfolio performance measurement and attribution, second edition, p.100.
See also package `PerformanceAnalytics`

Author(s)

Ho Tsung-wu <tsungwu@ntnu.edu.tw>, College of Management, National Taiwan Normal University.

Examples

```
  data(assetReturns)
R=assetReturns[, -29]

  ProspectRatio(R, MAR=0)
```

Return.annualized *calculate an annualized return for comparing instruments with different length history*

Description

An average annualized return is convenient for comparing returns.

Usage

```
Return.annualized(R, scale = NA, geometric = TRUE)
```

Arguments

R	an xts, vector, matrix, data frame, timeSeries or zoo object of asset returns
scale	number of periods in a year (daily scale = 252, monthly scale = 12, quarterly scale = 4)
geometric	utilize geometric chaining (TRUE) or simple/arithmetic chaining (FALSE) to aggregate returns, default TRUE

Details

Annualized returns are useful for comparing two assets. To do so, you must scale your observations to an annual scale by raising the compound return to the number of periods in a year, and taking the root to the number of total observations.
Bacon, Carl(2008) Practical Portfolio Performance Measurement and Attribution. Wiley , p. 6.
See also documents in package `PerformanceAnalytics` for details.

Author(s)

Ho Tsung-wu <tsungwu@ntnu.edu.tw>, College of Management, National Taiwan Normal University.

Examples

```
  data(assetReturns)
R=assetReturns[, -29]

  Return.annualized(R)
```

---

riskOptimalPortfolio *Compute risk optimal portfolios maxDD, aveDD and CDaR*

Description

It calls `FRAPO` to compute risk optimal portfolio satisfying the constraint of draw downs and returns a S4 object of class `fPORTFOLIO`.

Usage

```
riskOptimalPortfolio(data, Type="AveDD",value)
```

Arguments

data	timeSeries object of price data. Please remember the asset data must be price, not returns.
Type	Drawdown types, we call package FRAPO to support three methods:"maxDD","aveDD",and "CDaR". For details, please see document of package FRAPO.
value	Positive numerical number for Type.

Details

The risk optimal portfolio calls FRAPO and wrapp the results as a S4 object of class fPORTFOLIO, all get functions of fPORTFOLIO are applicable.
Roncalli Thierry(2014) Introduction to Risk parity and Budgeting, 2014, CRC inc.
See also packages fPORTFOLIO and FRAPO

Value

returns an S4 object of class fPORTFOLIO.

Author(s)

Ho Tsung-wu <tsungwu@ntnu.edu.tw>, College of Management, National Taiwan Normal University.

Examples

```
# Risk optimal portfolio takes time, example below is commented.
#data(LPP2005,package="fPortfolio")
Data =  fPortfolio::LPP2005[,1:6]#select 6 assets price
Data.RET=timeSeries::returns(Data) # Transform into returns to compute VALUE below
#VALUE=abs(mean(drawdowns(apply(Data.RET,1,mean))))
#output=riskOptimalPortfolio(Data,Type="AveDD",value=VALUE) # data input must be price.
#show(output)
#getWeights(output)
#getCovRiskBudgets(output)
```

---

riskParityPortfolio *Compute risk parity portfolio*

Description

It calls FRAPO to compute portfolio weights with equal risk contribution, or equal covariance risk budget, then returns a S4 object of class fPORTFOLIO.

Usage

```
riskParityPortfolio(data, covmat="cov", strategy="minrisk",Type="MV")
```

Arguments

data	timeSeries object of returns data
covmat	Function to compute mltvariate covariance matrix, we support five methods:"cov","ledoitWolf","shrink"," The default is sample covariance "cov".
strategy	strategyPortfolio as in package fPortfolio, we support 5 cases in fPortfolio package: "GMVP","maxreturn","minrisk", "tangency" and "All Assets". The default is "minrisk".
Type	portfolio type as in package fPortfolio, the default is "MV".

Details

The risk parity portfolio has two options: the first is to select a subset of assets and compute risk parity weights. To this end, we implement one of four portfolio strategies: "GMVP","maxreturn","minrisk", "tangency". The idea is that each portfolio strategy will pick the desirable assets by assigning weights, the assets with non-zero weights are selected ones; afterwards, we compute risk parity weights of these assets. Secondly, for "All Assets", all assets are included and compute an optimal weight vector satisfying risk parity condition,namely, equal risk contribution or covariance risk budget.

GMVP or Global minimum risk Portfolio: The function `minvariancePortfolio` returns the portfolio with the minimal risk on the efficient frontier. To find the minimal risk point the target risk returned by the function `efficientPortfolio` is minimized.

tangency or maximal returns/risk ratio Portfolio: The function `tangencyPortfolio` returns the portfolio with the highest return/risk ratio on the efficient frontier. For the Markowitz portfolio this is the same as the Sharpe ratio. To find this point on the frontier the return/risk ratio calculated from the target return and target risk returned by the function .

minrisk or Minumum Risk: The function `minriskPortfolio` is an efficient portfolio which lies on the efficient frontier. The `efficientPortfolio` function returns the properties of the efficient portfolio as an S4 object of class `fPORTFOLIO`

maxreturn or Maximum Return Portfolio: The function `maxreturnPortfolio` returns the portfolio with the maximal return for a fixed target risk.

Risk parity portfolio calls `FRAPO`, which requires symmetric covariance matrices, so far we support only five covariance methods.
Roncalli Thierry(2014) Introduction to Risk parity and Budgeting, 2014, CRC inc.
See also packages `fPORTFOLIO` and `FRAPO`

Value

returns an S4 object of class `"fPORTFOLIO"`.

Author(s)

Ho Tsung-wu <tsungwu@ntnu.edu.tw>, College of Management, National Taiwan Normal University.

Examples

```
data(assetReturns)
assetReturns=assetReturns[,11:15]
output=riskParityPortfolio(assetReturns, covmat="cov", strategy="minrisk")
show(output)
getWeights(output)
getCovRiskBudgets(output)
```

SharpeRatio *calculate a traditional or modified Sharpe Ratio of Return over StdDev or VaR or ES*

Description

The Sharpe ratio is simply the return per unit of risk (represented by variability). In the classic case, the unit of risk is the standard deviation of the returns.

Usage

```
SharpeRatio(R, Rf = 0, alpha = 0.05, FUN="StdDev",annualize=FALSE)
```

Arguments

R	an xts, vector, matrix, data frame, timeSeries or zoo object of asset returns
Rf	risk free rate, in same period as your returns
alpha	Tail probability for VaR or ES, default alpha=.05
FUN	one of "StdDev" or "VaR" or "ES" to use as the denominator
annualize	if TRUE, annualize the measure, default FALSE

Details

Laurent Favre and Jose-Antonio Galeano. Mean-Modified Value-at-Risk Optimization with Hedge Funds. Journal of Alternative Investment, Fall 2002, v 5.
Sharpe, W.F. The Sharpe Ratio (1994) Journal of Portfolio Management,Fall, 49-58.
See also package `PerformanceAnalytics` for details.

Author(s)

Ho Tsung-wu <tsungwu@ntnu.edu.tw>, College of Management, National Taiwan Normal University.

Examples

```
  data(assetReturns)
R=assetReturns[, -29]

SharpeRatio(R)
```

SharpeRatio.annualized

calculate annualized Sharpe Ratio

Description

The Sharpe Ratio is a risk-adjusted measure of return that uses standard deviation to represent risk.

Usage

```
SharpeRatio.annualized(R, Rf = 0, alpha=0.05,scale = NA, geometric = TRUE, FUN = "StdDev")
```

Arguments

R	an xts, vector, matrix, data frame, timeSeries or zoo object of asset returns
Rf	risk free rate, in same period as your returns
alpha	Tail probability for VaR or ES, default alpha=.05
scale	number of periods in a year (daily scale = 252, monthly scale = 12, quarterly scale = 4)
geometric	utilize geometric chaining (TRUE) or simple/arithmetic chaining (FALSE) to aggregate returns,default TRUE
FUN	one of "StdDev" or "VaR" or "ES" to use as the denominator, default="StdDev"

Details

The Sharpe ratio is simply the return per unit of risk (represented by variance). The higher the Sharpe ratio, the better the combined performance of "risk" and return.William Sharpe now recommends Information Ratio preferentially to the original Sharpe Ratio.
Sharpe, W.F. The Sharpe Ratio (1994) Journal of Portfolio Management,Fall, 49-58.
See also package `PerformanceAnalytics` for details.

Author(s)

Ho Tsung-wu <tsungwu@ntnu.edu.tw>, College of Management, National Taiwan Normal University.

Examples

```
  data(assetReturns)
R=assetReturns[, -29]
  SharpeRatio.annualized(R)
```

SkewnessKurtosisRatio *Skewness-Kurtosis ratio of the return distribution*

Description

Skewness-Kurtosis ratio is the division of Skewness by Kurtosis.

Usage

```
SkewnessKurtosisRatio(R)
```

Arguments

R	an xts, vector, matrix, data frame, timeSeries or zoo object of asset returns

Details

It is used in conjunction with the Sharpe ratio to rank portfolios. The higher the rate the better.
Carl Bacon (2008) Practical portfolio performance measurement and attribution, second edition,p.100.
See also package `PerformanceAnalytics`.

Author(s)

Ho Tsung-wu <tsungwu@ntnu.edu.tw>, College of Management, National Taiwan Normal University.

Examples

```
  data(assetReturns)
R=assetReturns[, -29]
  SkewnessKurtosisRatio(R)
```

SortinoRatio *calculate Sortino Ratio of performance over downside risk*

Description

Sortino proposed an improvement on the Sharpe Ratio to better account for skill and excess performance by using only downside semivariance as the measure of risk.

Usage

```
SortinoRatio(R, MAR = 0)
```

Arguments

R	an xts, vector, matrix, data frame, timeSeries or zoo object of asset returns
MAR	Minimum Acceptable Return, in the same periodicity as your returns

Details

Sortino contends that risk should be measured in terms of not meeting the investment goal. This gives rise to the notion of Minimum Acceptable Return or MAR. All of Sortino's proposed measures include the MAR, and are more sensitive to downside or extreme risks than measures that use volatility(standard deviation of returns) as the measure of risk.
Choosing the MAR carefully is very important, especially when comparing disparate investment choices. If the MAR is too low, it will not adequately capture the risks that concern the investor, and if the MAR is too high, it will unfavorably portray what may otherwise be a sound investment. When comparing multiple investments, some papers recommend using the risk free rate as the MAR. Practitioners may wish to choose one MAR for consistency, several standardized MAR values for reporting a range of scenarios, or a MAR customized to the objective of the investor.
Sortino, F. and Price, L. (1994) Performance Measurement in a Downside Risk Framework.Journal of Investing. Fall, 59-65.
See also package `PerformanceAnalytics`.

Author(s)

Ho Tsung-wu <tsungwu@ntnu.edu.tw>, College of Management, National Taiwan Normal University.

Examples

```
  data(assetReturns)
R=assetReturns[, -29]

  SortinoRatio(R)
```

---

table.AnnualizedReturns

Annualized Returns Summary: Statistics and Stylized Facts

Description

Table of Annualized Return, Annualized Std Dev, and Annualized Sharpe

Usage

```
table.AnnualizedReturns(R, scale = NA, Rf = 0, geometric = TRUE,
  digits = 4)
```

Arguments

R	an xts, vector, matrix, data frame, timeSeries or zoo object of asset returns
scale	number of periods in a year (daily scale = 252, monthly scale = 12, quarterly scale = 4)
Rf	risk free rate, in same period as your returns
geometric	utilize geometric chaining (TRUE) or simple/arithmetic chaining (FALSE) to aggregate returns, default TRUE
digits	number of digits to round results to

Author(s)

Ho Tsung-wu <tsungwu@ntnu.edu.tw>, College of Management, National Taiwan Normal University.

Examples

```
  data(assetReturns)
Ra=assetReturns[, -29]
  table.AnnualizedReturns(R=Ra)
```

TrackingError *Calculate Tracking Error of returns against a benchmark*

Description

A measure of the unexplained portion of performance relative to a benchmark.

Usage

```
TrackingError(Ra, Rb, scale = NA)
```

Arguments

Ra	an xts, vector, matrix, data frame, timeSeries or zoo object of asset returns
Rb	return vector of the benchmark asset
scale	number of periods in a year (daily scale = 252, monthly scale = 12, quarterly scale = 4)

Details

Tracking error is calculated by taking the square root of the average of the squared deviations between the investment's returns and the benchmark's returns, then multiplying the result by the square root of the scale of the returns.
Sharpe, W.F. The Sharpe Ratio(1994) Journal of Portfolio Management,Fall, 49-58.
See also package PerformanceAnalytics.

Author(s)

Ho Tsung-wu <tsungwu@ntnu.edu.tw>, College of Management, National Taiwan Normal University.

Examples

```
  data(assetReturns)
assetReturns=assetReturns["2011::2018"] #short sample for fast example
Ra=assetReturns[, -29]
Rb=assetReturns[,29] #DJI

  TrackingError(Ra, Rb)
```

TreynorRatio *calculate Treynor Ratio or modified Treynor Ratio of excess return over CAPM beta*

Description

The Treynor ratio is similar to the Sharpe Ratio, except it uses beta as the volatility measure (to divide the investment's excess return over the beta).

Usage

```
TreynorRatio(Ra, Rb, Rf = 0, scale = NA, modified = FALSE)
```

Arguments

Ra	an xts, vector, matrix, data frame, timeSeries or zoo object of asset returns
Rb	return vector of the benchmark asset
Rf	risk free rate, in same period as your returns
scale	number of periods in a year (daily scale = 252, monthly scale = 12, quarterly scale = 4)
modified	a boolean to decide whether to return the Treynor ratio or Modified Treynor ratio

Details

To calculate modified Treynor ratio, we divide the numerator by the systematic risk instead of the beta.
See also package PerformanceAnalytics.

Author(s)

Ho Tsung-wu <tsungwu@ntnu.edu.tw>, College of Management, National Taiwan Normal University.

Examples

```
  data(assetReturns)
assetReturns=assetReturns["2011::2018"] #short sample for fast example
Ra=assetReturns[, -29]
Rb=assetReturns[,29] #DJI

  TreynorRatio(Ra, Rb)
```

`UlcerIndex` *calculate the Ulcer Index*

Description

Developed by Peter G. Martin in 1987 (Martin and McCann, 1987) and named for the worry caused to the portfolio manager or investor. This is similar to drawdown deviation except that the impact of the duration of drawdowns is incorporated by selecting the negative return for each period below the previous peak or high water mark. The impact of long, deep drawdowns will have significant impact because the underperformance since the last peak is squared.

Usage

```
UlcerIndex(R)
```

Arguments

`R`	a vector, matrix, data frame, timeSeries or zoo object of asset returns

Details

This approach is sensitive to the frequency of the time periods involved and penalizes managers that take time to recover to previous highs.

Martin, P. and McCann, B. (1989) The investor's Guide to Fidelity Funds: Winning Strategies for Mutual Fund Investors. John Wiley & Sons, Inc.
See also package `PerformanceAnalytics`.

Author(s)

Ho Tsung-wu <tsungwu@ntnu.edu.tw>, College of Management, National Taiwan Normal University.

Examples

```
  data(assetReturns)
R=assetReturns[, -29]
  maxDrawdown(R)
```

`VolatilitySkewness` *Volatility and variability of the return distribution*

Description

Volatility skewness is a similar measure to omega but using the second partial moment. It's the ratio of the upside variance compared to the downside variance. Variability skewness is the ratio of the upside risk compared to the downside risk.

Usage

```
VolatilitySkewness(R, MAR = 0, stat = c("volatility", "variability"))
```

Arguments

`R`	an xts, vector, matrix, data frame, timeSeries or zoo object of asset returns
`MAR`	Minimum Acceptable Return, in the same periodicity as your returns
`stat`	one of "volatility", "variability" indicating whether to return the volatility skewness or the variability skweness

Details

Carl Bacon (2008) Practical portfolio performance measurement and attribution, second edition, p.97-98.
See package `PerformanceAnalytics` for technical details.

Author(s)

Ho Tsung-wu <tsungwu@ntnu.edu.tw>, College of Management, National Taiwan Normal University.

Examples

```
  data(assetReturns)
R=assetReturns[, -29]
  VolatilitySkewness(R, MAR=0, stat="volatility")
```

Index