

Package ‘RPEIF’

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Type Package

Title Computation and Plots of Influence Functions for Risk and Performance Measures

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Description Computes the influence functions time series of the returns for the risk and performance measures as mentioned in Chen and Martin (2018) [<https://www.ssrn.com/abstract=3085672>](https://www.ssrn.com/abstract=3085672), as well as in Zhang et al. (2019) [<https://www.ssrn.com/abstract=3415903>](https://www.ssrn.com/abstract=3415903). Also evaluates estimators influence functions at a set of parameter values and plots them to display the shapes of the influence functions.

License GPL (≥ 2)

Biarch true

Imports xts, zoo, stats, RobStatTM

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Contents

IF	2
IF.DSR	4

IF.ES	6
IF.ESratio	8
IF.LPM	10
IF.Mean	12
IF.OmegaRatio	13
IF.RachevRatio	15
IF.robMean	17
IF.SD	19
IF.SemiSD	21
IF.SoR	23
IF.SR	25
IF.VaR	26
IF.VaRratio	28
nuisParsFn	30

Index	32
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IF *Influence Function for Available Risk and Performance Measures*

Description

IF returns the data and plots the shape of either the IF or the IF TS for a specified estimator.

Usage

```
IF(
  estimator,
  returns = NULL,
  evalShape = FALSE,
  retVals = NULL,
  nuisPars = NULL,
  k = 4,
  IFplot = FALSE,
  IFprint = TRUE,
  prewhiten = FALSE,
  ar.prewhiten.order = 1,
  cleanOutliers = FALSE,
  cleanMethod = c("locScaleRob")[1],
  family = c("mopt", "opt", "bisquare")[1],
  eff = 0.99,
  ...
)
```

Arguments

estimator	The estimator of interest.
returns	Returns data of the asset or portfolio. This can be a numeric or an xts object.
evalShape	Evaluation of the shape of the IF risk or performance measure if TRUE. Otherwise, a TS of the IF of the provided returns is computed.
retVals	Values used to evaluate the shape of the IF.
nuisPars	Nuisance parameters used for the evaluation of the shape of the IF (if no returns are provided).
k	Range parameter for the shape of the IF (the SD gets multiplied k times).
IFplot	If TRUE, the plot of the IF shape or IF TS of the returns is produced.
IFprint	If TRUE, the data for the IF shape or the IF TS of the returns is returned.
prewhiten	Boolean variable to indicate if the IF TS is pre-whitened (TRUE) or not (FALSE).
ar.prewhiten.order	Order of AR parameter for the pre-whitening. Default is AR(1).
cleanOutliers	Boolean variable to indicate whether outliers are cleaned with a robust location and scale estimator.
cleanMethod	Robust method used to clean outliers from the TS. Default choice is "locScaleRob".
family	Family for robust m-estimator of location. Must be one of "mopt" (default), "opt" or "bisquare".
eff	Tuning parameter for the normal distribution efficiency for robust methods.
...	Additional parameters passed on to influence function of risk or performance measure.

Details

For further details on the usage of the `nuisPars` argument, please refer to Section 3.1 for the RPEIF vignette.

Author(s)

Anthony-Alexander Christidis, <anthony.christidis@stat.ubc.ca>

Examples

```
# Plot of IF using the wrapper function
# This example works without any additional packages
outIF <- IF(estimator = "Mean",
            returns = NULL, evalShape = TRUE, retVals = NULL, nuisPars = list(mu = 0.005),
            IFplot = TRUE, IFprint = TRUE)

# Examples using PerformanceAnalytics data
if (requireNamespace("PerformanceAnalytics", quietly = TRUE)) {
  # Loading data (hedge funds returns)
  data(edhec, package = "PerformanceAnalytics")
  colnames(edhec) = c("CA", "CTAG", "DIS", "EM", "EMN", "ED", "FIA",
```

```

"GM", "LS", "MA", "RV", "SS", "FoF")

# Plot of IF using wrapper function and with a specified TS
outIF <- IF(estimator = "Mean",
            returns = edhec[, "CA"], evalShape = TRUE,
            retVals = seq(-0.1, 0.1, by = 0.001), nuisPars = NULL,
            IFplot = TRUE, IFprint = TRUE)

# Computing the IF of the returns (with prewhitening) with a plot of IF TS
outIF <- IF(estimator = "Mean",
            returns = edhec[, "CA"], evalShape = FALSE, retVals = NULL, nuisPars = NULL,
            IFplot = TRUE, IFprint = TRUE,
            compile = TRUE, prewhiten = FALSE)
}

```

IF.DSR

Influence Function - Downside Sharpe Ratio

Description

IF.DSR returns the data and plots the shape of either the IF or the IF TS for the Downside Sharpe Ratio.

Usage

```

IF.DSR(
  returns = NULL,
  evalShape = FALSE,
  retVals = NULL,
  nuisPars = NULL,
  k = 4,
  IFplot = FALSE,
  IFprint = TRUE,
  rf = 0,
  prewhiten = FALSE,
  ar.prewhiten.order = 1,
  cleanOutliers = FALSE,
  cleanMethod = c("locScaleRob")[1],
  eff = 0.99,
  ...
)

```

Arguments

returns	Returns data of the asset or portfolio. This can be a numeric or an xts object.
evalShape	Evaluation of the shape of the IF risk or performance measure if TRUE. Otherwise, a TS of the IF of the provided returns is computed.

retVals	Values used to evaluate the shape of the IF.
nuisPars	Nuisance parameters used for the evaluation of the shape of the IF (if no returns are provided).
k	Range parameter for the shape of the IF (the SD gets multiplied k times).
IFplot	If TRUE, the plot of the IF shape or IF TS of the returns is produced.
IFprint	If TRUE, the data for the IF shape or the IF TS of the returns is returned.
rf	Risk-free interest rate.
prewhiten	Boolean variable to indicate if the IF TS is pre-whitened (TRUE) or not (FALSE).
ar.prewhiten.order	Order of AR parameter for the pre-whitening. Default is AR(1).
cleanOutliers	Boolean variable to indicate whether outliers are cleaned with a robust location and scale estimator.
cleanMethod	Robust method used to clean outliers from the TS. Default choice is "locScaleRob".
eff	Tuning parameter for the normal distribution efficiency for the "locScaleRob" robust data cleaning.
...	Additional parameters.

Details

For further details on the usage of the nuisPars argument, please refer to Section 3.1 for the RPEIF vignette.

Value

Influence function of DSR.

Author(s)

Anthony-Alexander Christidis, <anthony.christidis@stat.ubc.ca>

Examples

```
# Plot of IF with nuisance parameter with return value
# This example works without any additional packages
outIF <- IF.DSR(returns = NULL, evalShape = TRUE,
               retVals = NULL, nuisPars = NULL,
               IFplot = TRUE, IFprint = TRUE)

# Examples using PerformanceAnalytics data
if (requireNamespace("PerformanceAnalytics", quietly = TRUE)) {
  data(edhec, package = "PerformanceAnalytics")
  colnames(edhec) = c("CA", "CTAG", "DIS", "EM", "EMN", "ED", "FIA",
                    "GM", "LS", "MA", "RV", "SS", "FoF")

  # Plot of IF a specified TS
  outIF <- IF.DSR(returns = edhec[, "CA"], evalShape = TRUE,
                 retVals = seq(-0.1, 0.1, by = 0.001), nuisPars = NULL,
```

```

IFplot = TRUE, IFprint = TRUE)

# Computing the IF of the returns (with prewhitening) with a plot of IF TS
outIF <- IF.DSR(returns = edhec[, "CA"], evalShape = FALSE,
               retVals = NULL, nuisPars = NULL,
               IFplot = TRUE, IFprint = TRUE,
               prewhiten = FALSE)
}

```

IF.ES

Influence Function - Expected Shortfall (ES)

Description

IF.ES returns the data and plots the shape of either the IF or the IF TS for the ES

Usage

```

IF.ES(
  returns = NULL,
  evalShape = FALSE,
  retVals = NULL,
  nuisPars = NULL,
  k = 4,
  IFplot = FALSE,
  IFprint = TRUE,
  alpha.ES = 0.05,
  prewhiten = FALSE,
  ar.prewhiten.order = 1,
  cleanOutliers = FALSE,
  cleanMethod = c("locScaleRob")[1],
  eff = 0.99,
  ...
)

```

Arguments

returns	Returns data of the asset or portfolio. This can be a numeric or an xts object.
evalShape	Evaluation of the shape of the IF risk or performance measure if TRUE. Otherwise, a TS of the IF of the provided returns is computed.
retVals	Values used to evaluate the shape of the IF.
nuisPars	Nuisance parameters used for the evaluation of the shape of the IF (if no returns are provided).
k	Range parameter for the shape of the IF (the SD gets multiplied k times).
IFplot	If TRUE, the plot of the IF shape or IF TS of the returns is produced.

IFprint	If TRUE, the data for the IF shape or the IF TS of the returns is returned.
alpha.ES	Tail Probability.
prewhiten	Boolean variable to indicate if the IF TS is pre-whitened (TRUE) or not (FALSE).
ar.prewhiten.order	Order of AR parameter for the pre-whitening. Default is AR(1).
cleanOutliers	Boolean variable to indicate whether outliers are cleaned with a robust location and scale estimator.
cleanMethod	Robust method used to clean outliers from the TS. Default choice is "locScaleRob".
eff	Tuning parameter for the normal distribution efficiency for the "locScaleRob" robust data cleaning.
...	Additional parameters.

Details

For further details on the usage of the `nuisPars` argument, please refer to Section 3.1 for the RPEIF vignette.

Value

Influence function of the ES.

Author(s)

Anthony-Alexander Christidis, <anthony.christidis@stat.ubc.ca>

Examples

```
# Plot of IF with nuisance parameter with return value
# This example works without any additional packages
outIF <- IF.ES(returns = NULL, evalShape = TRUE,
              retVals = NULL, nuisPars = NULL,
              IFplot = TRUE, IFprint = TRUE)

# Examples using PerformanceAnalytics data
if (requireNamespace("PerformanceAnalytics", quietly = TRUE)) {
  data(edhec, package = "PerformanceAnalytics")
  colnames(edhec) = c("CA", "CTAG", "DIS", "EM", "EMN", "ED", "FIA",
                    "GM", "LS", "MA", "RV", "SS", "FoF")

  # Plot of IF a specified TS
  outIF <- IF.ES(returns = edhec[, "CA"], evalShape = TRUE,
                retVals = seq(-0.1, 0.1, by = 0.001), nuisPars = NULL,
                IFplot = TRUE, IFprint = TRUE)

  # Computing the IF of the returns (with prewhitening) with a plot of IF TS
  outIF <- IF.ES(returns = edhec[, "CA"], evalShape = FALSE,
                retVals = NULL, nuisPars = NULL,
                IFplot = TRUE, IFprint = TRUE,
                prewhiten = FALSE)
```

```
}

```

IF.ESratio

Influence Function - Expected Shortfall (ES) Ratio

Description

IF.ESratio returns the data and plots the shape of either the IF or the IF TS for the Expected Shortfall Ratio.

Usage

```
IF.ESratio(
  returns = NULL,
  evalShape = FALSE,
  retVals = NULL,
  nuisPars = NULL,
  k = 4,
  IFplot = FALSE,
  IFprint = TRUE,
  alpha = 0.1,
  rf = 0,
  prewhiten = FALSE,
  ar.prewhiten.order = 1,
  cleanOutliers = FALSE,
  cleanMethod = c("locScaleRob")[1],
  eff = 0.99,
  ...
)
```

Arguments

returns	Returns data of the asset or portfolio. This can be a numeric or an xts object.
evalShape	Evaluation of the shape of the IF risk or performance measure if TRUE. Otherwise, a TS of the IF of the provided returns is computed.
retVals	Values used to evaluate the shape of the IF.
nuisPars	Nuisance parameters used for the evaluation of the shape of the IF (if no returns are provided).
k	Range parameter for the shape of the IF (the SD gets multiplied k times).
IFplot	If TRUE, the plot of the IF shape or IF TS of the returns is produced.
IFprint	If TRUE, the data for the IF shape or the IF TS of the returns is returned.
alpha	Tail Probability.
rf	Risk-free interest rate.

prewhiten	Boolean variable to indicate if the IF TS is pre-whitened (TRUE) or not (FALSE).
ar.prewhiten.order	Order of AR parameter for the pre-whitening. Default is AR(1).
cleanOutliers	Boolean variable to indicate whether outliers are cleaned with a robust location and scale estimator.
cleanMethod	Robust method used to clean outliers from the TS. Default choice is "locScaleRob".
eff	Tuning parameter for the normal distribution efficiency for the "locScaleRob" robust data cleaning.
...	Additional parameters.

Details

For further details on the usage of the `nuisPars` argument, please refer to Section 3.1 for the RPEIF vignette.

Value

Influence function of ESratio.

Author(s)

Anthony-Alexander Christidis, <anthony.christidis@stat.ubc.ca>

Examples

```
# Plot of IF with nuisance parameter with return value
# This example works without any additional packages
outIF <- IF.ESratio(returns = NULL, evalShape = TRUE,
                  retVals = NULL, nuisPars = NULL,
                  IFplot = TRUE, IFprint = TRUE)

# Examples using PerformanceAnalytics data
if (requireNamespace("PerformanceAnalytics", quietly = TRUE)) {
  data(edhec, package = "PerformanceAnalytics")
  colnames(edhec) = c("CA", "CTAG", "DIS", "EM", "EMN", "ED", "FIA",
                    "GM", "LS", "MA", "RV", "SS", "FoF")

  # Plot of IF a specified TS
  outIF <- IF.ESratio(returns = edhec[, "CA"], evalShape = TRUE,
                    retVals = seq(-0.1, 0.1, by = 0.001), nuisPars = NULL,
                    IFplot = TRUE, IFprint = TRUE)

  # Computing the IF of the returns (with prewhitening) with a plot of IF TS
  outIF <- IF.ESratio(returns = edhec[, "CA"], evalShape = FALSE,
                    retVals = NULL, nuisPars = NULL,
                    IFplot = TRUE, IFprint = TRUE,
                    prewhiten = FALSE)
}
```

IF.LPM

*Influence Function - Lower Partial Moment (LPM)***Description**

IF.LPM returns the data and plots the shape of either the IF or the IF TS for the LPM

Usage

```
IF.LPM(
  returns = NULL,
  evalShape = FALSE,
  retVals = NULL,
  nuisPars = NULL,
  k = 4,
  IFplot = FALSE,
  IFprint = TRUE,
  const = 0,
  order = 1,
  prewhiten = FALSE,
  ar.prewhiten.order = 1,
  cleanOutliers = FALSE,
  cleanMethod = c("locScaleRob")[1],
  eff = 0.99,
  ...
)
```

Arguments

returns	Returns data of the asset or portfolio. This can be a numeric or an xts object.
evalShape	Evaluation of the shape of the IF risk or performance measure if TRUE. Otherwise, a TS of the IF of the provided returns is computed.
retVals	Values used to evaluate the shape of the IF.
nuisPars	Nuisance parameters used for the evaluation of the shape of the IF (if no returns are provided).
k	Range parameter for the shape of the IF (the SD gets multiplied k times).
IFplot	If TRUE, the plot of the IF shape or IF TS of the returns is produced.
IFprint	If TRUE, the data for the IF shape or the IF TS of the returns is returned.
const	Constant threshold.
order	Order of LPM. Can only take values 1 or 2.
prewhiten	Boolean variable to indicate if the IF TS is pre-whitened (TRUE) or not (FALSE).
ar.prewhiten.order	Order of AR parameter for the pre-whitening. Default is AR(1).

<code>cleanOutliers</code>	Boolean variable to indicate whether outliers are cleaned with a robust location and scale estimator.
<code>cleanMethod</code>	Robust method used to clean outliers from the TS. Default choice is "locScaleRob".
<code>eff</code>	Tuning parameter for the normal distribution efficiency for the "locScaleRob" robust data cleaning.
<code>...</code>	Additional parameters.

Details

For further details on the usage of the `nuisPars` argument, please refer to Section 3.1 for the RPEIF vignette.

Value

Influence function of LPM.

Author(s)

Anthony-Alexander Christidis, <anthony.christidis@stat.ubc.ca>

Examples

```
# Plot of IF with nuisance parameter with return value
# This example works without any additional packages
outIF <- IF.LPM(returns = NULL, evalShape = TRUE,
               retVals = NULL, nuisPars = NULL,
               IFplot = TRUE, IFprint = TRUE)

# Examples using PerformanceAnalytics data
if (requireNamespace("PerformanceAnalytics", quietly = TRUE)) {
  data(edhec, package = "PerformanceAnalytics")
  colnames(edhec) = c("CA", "CTAG", "DIS", "EM", "EMN", "ED", "FIA",
                    "GM", "LS", "MA", "RV", "SS", "FoF")

  # Plot of IF a specified TS
  outIF <- IF.LPM(returns = edhec[, "CA"], evalShape = TRUE,
                 retVals = seq(-0.1, 0.1, by = 0.001), nuisPars = NULL,
                 IFplot = TRUE, IFprint = TRUE)

  # Computing the IF of the returns (with prewhitening) with a plot of IF TS
  outIF <- IF.LPM(returns = edhec[, "CA"], evalShape = FALSE,
                 retVals = NULL, nuisPars = NULL,
                 IFplot = TRUE, IFprint = TRUE,
                 prewhiten = FALSE)
}
```

IF.Mean

*Influence Function - Mean***Description**

IF.Mean returns the data and plots the shape of either the IF or the IF TS for the mean.

Usage

```
IF.Mean(
  returns = NULL,
  evalShape = FALSE,
  retVals = NULL,
  nuisPars = NULL,
  k = 4,
  IFplot = FALSE,
  IFprint = TRUE,
  prewhiten = FALSE,
  ar.prewhiten.order = 1,
  cleanOutliers = FALSE,
  cleanMethod = c("locScaleRob")[1],
  eff = 0.99,
  ...
)
```

Arguments

returns	Returns data of the asset or portfolio. This can be a numeric or an xts object.
evalShape	Evaluation of the shape of the IF risk or performance measure if TRUE. Otherwise, a TS of the IF of the provided returns is computed.
retVals	Values used to evaluate the shape of the IF.
nuisPars	Nuisance parameters used for the evaluation of the shape of the IF (if no returns are provided).
k	Range parameter for the shape of the IF (the SD gets multiplied k times).
IFplot	If TRUE, the plot of the IF shape or IF TS of the returns is produced.
IFprint	If TRUE, the data for the IF shape or the IF TS of the returns is returned.
prewhiten	Boolean variable to indicate if the IF TS is pre-whitened (TRUE) or not (FALSE).
ar.prewhiten.order	Order of AR parameter for the pre-whitening. Default is AR(1).
cleanOutliers	Boolean variable to indicate whether outliers are cleaned with a robust location and scale estimator.
cleanMethod	Robust method used to clean outliers from the TS. Default choice is "locScaleRob".
eff	Tuning parameter for the normal distribution efficiency for the "locScaleRob" robust data cleaning.
...	Additional parameters.

Details

For further details on the usage of the `nuisPars` argument, please refer to Section 3.1 for the RPEIF vignette.

Value

Influence function for the specified risk or performance measure.

Author(s)

Anthony-Alexander Christidis, <anthony.christidis@stat.ubc.ca>

Examples

```
# Plot of IF with nuisance parameter with return value
# This example works without any additional packages
outIF <- IF.Mean(returns = NULL, evalShape = TRUE, retVals = NULL, nuisPars = NULL,
                IFplot = TRUE, IFprint = TRUE)

# Examples using PerformanceAnalytics data
if (requireNamespace("PerformanceAnalytics", quietly = TRUE)) {
  data(edhec, package = "PerformanceAnalytics")
  colnames(edhec) = c("CA", "CTAG", "DIS", "EM", "EMN", "ED", "FIA",
                    "GM", "LS", "MA", "RV", "SS", "FoF")

  # Plot of IF a specified TS
  outIF <- IF.Mean(estimator = "mean",
                  returns = edhec[, "CA"], evalShape = TRUE,
                  retVals = seq(-0.1, 0.1, by = 0.001), nuisPars = NULL,
                  IFplot = TRUE, IFprint = TRUE)

  # Computing the IF of the returns (with prewhitening) with a plot of IF TS
  outIF <- IF.Mean(returns = edhec[, "CA"], evalShape = FALSE,
                  retVals = NULL, nuisPars = NULL,
                  IFplot = TRUE, IFprint = TRUE,
                  prewhiten = FALSE)
}
```

 IF.OmegaRatio

Influence Function - Omega Ratio

Description

IF.OmegaRatio returns the data and plots the shape of either the IF or the IF TS for the Omega Ratio.

Usage

```

IF.OmegaRatio(
  returns = NULL,
  evalShape = FALSE,
  retVals = NULL,
  nuisPars = NULL,
  k = 4,
  IFplot = FALSE,
  IFprint = TRUE,
  const = 0,
  prewhiten = FALSE,
  ar.prewhiten.order = 1,
  cleanOutliers = FALSE,
  cleanMethod = c("locScaleRob")[1],
  eff = 0.99,
  ...
)

```

Arguments

returns	Returns data of the asset or portfolio. This can be a numeric or an xts object.
evalShape	Evaluation of the shape of the IF risk or performance measure if TRUE. Otherwise, a TS of the IF of the provided returns is computed.
retVals	Values used to evaluate the shape of the IF.
nuisPars	Nuisance parameters used for the evaluation of the shape of the IF (if no returns are provided).
k	Range parameter for the shape of the IF (the SD gets multiplied k times).
IFplot	If TRUE, the plot of the IF shape or IF TS of the returns is produced.
IFprint	If TRUE, the data for the IF shape or the IF TS of the returns is returned.
const	Constant threshold.
prewhiten	Boolean variable to indicate if the IF TS is pre-whitened (TRUE) or not (FALSE).
ar.prewhiten.order	Order of AR parameter for the pre-whitening. Default is AR(1).
cleanOutliers	Boolean variable to indicate whether outliers are cleaned with a robust location and scale estimator.
cleanMethod	Robust method used to clean outliers from the TS. Default choice is "locScaleRob".
eff	Tuning parameter for the normal distribution efficiency for the "locScaleRob" robust data cleaning.
...	Additional parameters.

Details

For further details on the usage of the nuisPars argument, please refer to Section 3.1 for the RPEIF vignette.

Value

Influence function of Omega Ratio.

Author(s)

Anthony-Alexander Christidis, <anthony.christidis@stat.ubc.ca>

Examples

```
# Plot of IF with nuisance parameter with return value
# This example works without any additional packages
outIF <- IF.OmegaRatio(returns = NULL, evalShape = TRUE,
                      retVals = NULL, nuisPars = NULL,
                      IFplot = TRUE, IFprint = TRUE)

# Examples using PerformanceAnalytics data
if (requireNamespace("PerformanceAnalytics", quietly = TRUE)) {
  data(edhec, package = "PerformanceAnalytics")
  colnames(edhec) = c("CA", "CTAG", "DIS", "EM", "EMN", "ED", "FIA",
                    "GM", "LS", "MA", "RV", "SS", "FoF")

  # Plot of IF a specified TS
  outIF <- IF.OmegaRatio(returns = edhec[, "CA"], evalShape = TRUE,
                        retVals = seq(-0.1, 0.1, by = 0.001), nuisPars = NULL,
                        IFplot = TRUE, IFprint = TRUE)

  # Computing the IF of the returns (with prewhitening) with a plot of IF TS
  outIF <- IF.OmegaRatio(returns = edhec[, "CA"], evalShape = FALSE,
                        retVals = NULL, nuisPars = NULL,
                        IFplot = TRUE, IFprint = TRUE,
                        prewhiten = FALSE)
}
```

IF.RachevRatio

Influence Function - Rachev Ratio

Description

IF.RachevRatio returns the data and plots the shape of either the IF or the IF TS for the Rachev Ratio.

Usage

```
IF.RachevRatio(
  returns = NULL,
  evalShape = FALSE,
  retVals = NULL,
  nuisPars = NULL,
```

```

k = 4,
IFplot = FALSE,
IFprint = TRUE,
alpha = 0.1,
beta = 0.1,
prewhiten = FALSE,
ar.prewhiten.order = 1,
cleanOutliers = FALSE,
cleanMethod = c("locScaleRob")[1],
eff = 0.99,
...
)

```

Arguments

returns	Returns data of the asset or portfolio. This can be a numeric or an xts object.
evalShape	Evaluation of the shape of the IF risk or performance measure if TRUE. Otherwise, a TS of the IF of the provided returns is computed.
retVals	Values used to evaluate the shape of the IF.
nuisPars	Nuisance parameters used for the evaluation of the shape of the IF (if no returns are provided).
k	Range parameter for the shape of the IF (the SD gets multiplied k times).
IFplot	If TRUE, the plot of the IF shape or IF TS of the returns is produced.
IFprint	If TRUE, the data for the IF shape or the IF TS of the returns is returned.
alpha	Lower tail probability.
beta	Upper tail probability.
prewhiten	Boolean variable to indicate if the IF TS is pre-whitened (TRUE) or not (FALSE).
ar.prewhiten.order	Order of AR parameter for the pre-whitening. Default is AR(1).
cleanOutliers	Boolean variable to indicate whether outliers are cleaned with a robust location and scale estimator.
cleanMethod	Robust method used to clean outliers from the TS. Default choice is "locScaleRob".
eff	Tuning parameter for the normal distribution efficiency for the "locScaleRob" robust data cleaning.
...	Additional parameters.

Details

For further details on the usage of the `nuisPars` argument, please refer to Section 3.1 for the RPEIF vignette.

Value

Influence function of Rachev Ratio.

Author(s)

Anthony-Alexander Christidis, <anthony.christidis@stat.ubc.ca>

Examples

```
# Plot of IF with nuisance parameter with return value
# This example works without any additional packages
outIF <- IF.RachevRatio(returns = NULL, evalShape = TRUE,
                       retVals = NULL, nuisPars = NULL,
                       IFplot = TRUE, IFprint = TRUE)

# Examples using PerformanceAnalytics data
if (requireNamespace("PerformanceAnalytics", quietly = TRUE)) {
  data(edhec, package = "PerformanceAnalytics")
  colnames(edhec) = c("CA", "CTAG", "DIS", "EM", "EMN", "ED", "FIA",
                    "GM", "LS", "MA", "RV", "SS", "FoF")

  # Plot of IF a specified TS
  outIF <- IF.RachevRatio(returns = edhec[, "CA"], evalShape = TRUE,
                         retVals = seq(-0.1, 0.1, by = 0.001), nuisPars = NULL,
                         IFplot = TRUE, IFprint = TRUE)

  # Computing the IF of the returns (with prewhitening) with a plot of IF TS
  outIF <- IF.RachevRatio(returns = edhec[, "CA"], evalShape = FALSE,
                         retVals = NULL, nuisPars = NULL,
                         IFplot = TRUE, IFprint = TRUE,
                         prewhiten = FALSE)
}
```

 IF.robMean

Influence Function - Robust M-Estimator of Mean

Description

IF.robMean returns the data and plots the shape of either the IF or the IF TS for the M-estimator of Mean.

Usage

```
IF.robMean(
  returns = NULL,
  family = c("mopt", "opt", "bisphere")[1],
  eff = 0.95,
  evalShape = FALSE,
  retVals = NULL,
  nuisPars = NULL,
  k = 4,
  IFplot = FALSE,
```

```

  IFprint = TRUE,
  prewhiten = FALSE,
  ar.prewhiten.order = 1,
  ...
)

```

Arguments

returns	Returns data of the asset or portfolio. This can be a numeric or an xts object.
family	Family for robust m-estimator of Mean. Must be one of "mopt" (default), "opt" or "bisquare".
eff	Tuning parameter for the normal distribution efficiency. Default is 0.99.
evalShape	Evaluation of the shape of the IF risk or performance measure if TRUE. Otherwise, a TS of the IF of the provided returns is computed.
retVals	Values used to evaluate the shape of the IF.
nuisPars	Nuisance parameters used for the evaluation of the shape of the IF (if no returns are provided).
k	Range parameter for the shape of the IF (the SD gets multiplied k times).
IFplot	If TRUE, the plot of the IF shape or IF TS of the returns is produced.
IFprint	If TRUE, the data for the IF shape or the IF TS of the returns is returned.
prewhiten	Boolean variable to indicate if the IF TS is pre-whitened (TRUE) or not (FALSE).
ar.prewhiten.order	Order of AR parameter for the pre-whitening. Default is AR(1).
...	Additional parameters.

Details

For further details on the usage of the `nuisPars` argument, please refer to Section 3.1 for the RPEIF vignette.

Value

Influence function for M-estimator of Mean

Author(s)

Anthony-Alexander Christidis, <anthony.christidis@stat.ubc.ca>

Examples

```

# Examples using PerformanceAnalytics data
if (requireNamespace("PerformanceAnalytics", quietly = TRUE)) {
  data(edhec, package = "PerformanceAnalytics")
  colnames(edhec) = c("CA", "CTAG", "DIS", "EM", "EMN", "ED", "FIA",
                    "GM", "LS", "MA", "RV", "SS", "FoF")

  # Plot of IF shape

```

```

outIF <- IF.robMean(returns = edhec[,"CA"], evalShape = TRUE,
                  retVals = NULL,
                  IFplot = TRUE, IFprint = TRUE)

# Plot of IF a specified TS
outIF <- IF.robMean(returns = edhec[,"CA"], evalShape = TRUE,
                  retVals = seq(-0.1, 0.1, by = 0.001),
                  IFplot = TRUE, IFprint = TRUE)

# Computing the IF of the returns (with prewhitening) with a plot of IF TS
outIF <- IF.robMean(returns = edhec[,"CA"], evalShape = FALSE,
                  retVals = NULL,
                  IFplot = TRUE, IFprint = TRUE,
                  prewhiten = FALSE)
}

```

IF.SD

Influence Function - Standard Deviation

Description

IF.SD returns the data and plots the shape of either the IF or the IF TS for the standard deviation

Usage

```

IF.SD(
  returns = NULL,
  evalShape = FALSE,
  retVals = NULL,
  nuisPars = NULL,
  k = 4,
  IFplot = FALSE,
  IFprint = TRUE,
  prewhiten = FALSE,
  ar.prewhiten.order = 1,
  cleanOutliers = FALSE,
  cleanMethod = c("locScaleRob")[1],
  eff = 0.99,
  ...
)

```

Arguments

returns	Vector of the returns of the asset or portfolio.
evalShape	Evaluation of the shape of the IF risk or performance measure if TRUE. Otherwise, a TS of the IF of the provided returns is computed.
retVals	Values used to evaluate the shape of the IF.

<code>nuisPars</code>	Nuisance parameters used for the evaluation of the shape of the IF (if no returns are provided).
<code>k</code>	Range parameter for the shape of the IF (the SD gets multiplied <code>k</code> times).
<code>IFplot</code>	If TRUE, the plot of the IF shape or IF TS of the returns is produced.
<code>IFprint</code>	If TRUE, the data for the IF shape or the IF TS of the returns is returned.
<code>prewhiten</code>	Boolean variable to indicate if the IF TS is pre-whitened (TRUE) or not (FALSE).
<code>ar.prewhiten.order</code>	Order of AR parameter for the pre-whitening. Default is AR(1).
<code>cleanOutliers</code>	Boolean variable to indicate whether outliers are cleaned with a robust location and scale estimator.
<code>cleanMethod</code>	Robust method used to clean outliers from the TS. Default choice is "locScaleRob".
<code>eff</code>	Tuning parameter for the normal distribution efficiency for the "locScaleRob" robust data cleaning.
<code>...</code>	Additional parameters.

Details

For further details on the usage of the `nuisPars` argument, please refer to Section 3.1 for the RPEIF vignette.

Value

Influence function of the standard deviation.

Author(s)

Anthony-Alexander Christidis, <anthony.christidis@stat.ubc.ca>

Examples

```
# Plot of IF with nuisance parameter with return value
# This example works without any additional packages
outIF <- IF.SD(returns = NULL, evalShape = TRUE, retVals = NULL, nuisPars = NULL,
              IFplot = TRUE, IFprint = TRUE)

# Examples using PerformanceAnalytics data
if (requireNamespace("PerformanceAnalytics", quietly = TRUE)) {
  data(edhec, package = "PerformanceAnalytics")
  colnames(edhec) = c("CA", "CTAG", "DIS", "EM", "EMN", "ED", "FIA",
                    "GM", "LS", "MA", "RV", "SS", "FoF")

  # Plot of IF a specified TS
  outIF <- IF.SD(returns = edhec[, "CA"], evalShape = TRUE,
                retVals = seq(-0.1, 0.1, by = 0.001), nuisPars = NULL,
                IFplot = TRUE, IFprint = TRUE)

  # Computing the IF of the returns (with prewhitening) with a plot of IF TS
  outIF <- IF.SD(returns = edhec[, "CA"], evalShape = FALSE,
```

```

        retVals = NULL, nuisPars = NULL,
        IFplot = TRUE, IFprint = TRUE,
        prewhiten = FALSE)
}

```

IF.SemiSD

Influence Function - Semi-Standard Deviation (SemiSD)

Description

IF.SemiSD returns the data and plots the shape of either the IF or the IF TS for the SemiSD

Usage

```

IF.SemiSD(
  returns = NULL,
  evalShape = FALSE,
  retVals = NULL,
  nuisPars = NULL,
  k = 4,
  IFplot = FALSE,
  IFprint = TRUE,
  prewhiten = FALSE,
  ar.prewhiten.order = 1,
  cleanOutliers = FALSE,
  cleanMethod = c("locScaleRob")[1],
  eff = 0.99,
  ...
)

```

Arguments

returns	Returns data of the asset or portfolio. This can be a numeric or an xts object.
evalShape	Evaluation of the shape of the IF risk or performance measure if TRUE. Otherwise, a TS of the IF of the provided returns is computed.
retVals	Values used to evaluate the shape of the IF.
nuisPars	Nuisance parameters used for the evaluation of the shape of the IF (if no returns are provided).
k	Range parameter for the shape of the IF (the SD gets multiplied k times).
IFplot	If TRUE, the plot of the IF shape or IF TS of the returns is produced.
IFprint	If TRUE, the data for the IF shape or the IF TS of the returns is returned.
prewhiten	Boolean variable to indicate if the IF TS is pre-whitened (TRUE) or not (FALSE).
ar.prewhiten.order	Order of AR parameter for the pre-whitening. Default is AR(1).

<code>cleanOutliers</code>	Boolean variable to indicate whether outliers are cleaned with a robust location and scale estimator.
<code>cleanMethod</code>	Robust method used to clean outliers from the TS. Default choice is "locScaleRob".
<code>eff</code>	Tuning parameter for the normal distribution efficiency for the "locScaleRob" robust data cleaning.
<code>...</code>	Additional parameters.

Details

For further details on the usage of the `nuisPars` argument, please refer to Section 3.1 for the RPEIF vignette.

Value

Influence function of SemiSD.

Author(s)

Anthony-Alexander Christidis, <anthony.christidis@stat.ubc.ca>

Examples

```
# Plot of IF with nuisance parameter with return value
# This example works without any additional packages
outIF <- IF.SemiSD(returns = NULL, evalShape = TRUE,
                  retVals = NULL, nuisPars = NULL,
                  IFplot = TRUE, IFprint = TRUE)

# Examples using PerformanceAnalytics data
if (requireNamespace("PerformanceAnalytics", quietly = TRUE)) {
  data(edhec, package = "PerformanceAnalytics")
  colnames(edhec) = c("CA", "CTAG", "DIS", "EM", "EMN", "ED", "FIA",
                    "GM", "LS", "MA", "RV", "SS", "FoF")

  # Plot of IF a specified TS
  outIF <- IF.SemiSD(returns = edhec[, "CA"], evalShape = TRUE,
                    retVals = seq(-0.1, 0.1, by = 0.001), nuisPars = NULL,
                    IFplot = TRUE, IFprint = TRUE)

  # Computing the IF of the returns (with prewhitening) with a plot of IF TS
  outIF <- IF.SemiSD(returns = edhec[, "CA"], evalShape = FALSE,
                    retVals = NULL, nuisPars = NULL,
                    IFplot = TRUE, IFprint = TRUE,
                    prewhiten = FALSE)
}
```

Description

IF . SoR returns the data and plots the shape of either the IF or the IF TS for the Sortino Ratio.

Usage

```
IF.SoR(
  returns = NULL,
  evalShape = FALSE,
  retVals = NULL,
  nuisPars = NULL,
  k = 4,
  IFplot = FALSE,
  IFprint = TRUE,
  threshold = c("const", "mean")[1],
  const = 0,
  rf = 0,
  prewhiten = FALSE,
  ar.prewhiten.order = 1,
  cleanOutliers = FALSE,
  cleanMethod = c("locScaleRob")[1],
  eff = 0.99,
  ...
)
```

Arguments

returns	Returns data of the asset or portfolio. This can be a numeric or an xts object.
evalShape	Evaluation of the shape of the IF risk or performance measure if TRUE. Otherwise, a TS of the IF of the provided returns is computed.
retVals	Values used to evaluate the shape of the IF.
nuisPars	Nuisance parameters used for the evaluation of the shape of the IF (if no returns are provided).
k	Range parameter for the shape of the IF (the SD gets multiplied k times).
IFplot	If TRUE, the plot of the IF shape or IF TS of the returns is produced.
IFprint	If TRUE, the data for the IF shape or the IF TS of the returns is returned.
threshold	Parameter of threshold is either "mean" or "const". Default is "mean".
const	The threshold if threshold is "const".
rf	Risk-free interest rate.
prewhiten	Boolean variable to indicate if the IF TS is pre-whitened (TRUE) or not (FALSE).

<code>ar.prewhiten.order</code>	Order of AR parameter for the pre-whitening. Default is AR(1).
<code>cleanOutliers</code>	Boolean variable to indicate whether outliers are cleaned with a robust location and scale estimator.
<code>cleanMethod</code>	Robust method used to clean outliers from the TS. Default choice is "locScaleRob".
<code>eff</code>	Tuning parameter for the normal distribution efficiency for the "locScaleRob" robust data cleaning.
<code>...</code>	Additional parameters.

Details

For further details on the usage of the `nuisPars` argument, please refer to Section 3.1 for the RPEIF vignette.

Value

Influence function of SoR.

Author(s)

Anthony-Alexander Christidis, <anthony.christidis@stat.ubc.ca>

Examples

```
# Plot of IF with nuisance parameter with return value
# This example works without any additional packages
outIF <- IF.SoR(returns = NULL, evalShape = TRUE,
               retVals = NULL, nuisPars = NULL,
               IFplot = TRUE, IFprint = TRUE)

# Examples using PerformanceAnalytics data
if (requireNamespace("PerformanceAnalytics", quietly = TRUE)) {
  data(edhec, package = "PerformanceAnalytics")
  colnames(edhec) = c("CA", "CTAG", "DIS", "EM", "EMN", "ED", "FIA",
                    "GM", "LS", "MA", "RV", "SS", "FoF")

  # Plot of IF a specified TS
  outIF <- IF.SoR(returns = edhec[, "CA"], evalShape = TRUE,
                 retVals = seq(-0.1, 0.1, by = 0.001), nuisPars = NULL,
                 IFplot = TRUE, IFprint = TRUE)

  # Computing the IF of the returns (with prewhitening) with a plot of IF TS
  outIF <- IF.SoR(returns = edhec[, "CA"], evalShape = FALSE,
                 retVals = NULL, nuisPars = NULL,
                 IFplot = TRUE, IFprint = TRUE,
                 prewhiten = FALSE)
}
```

IF.SR

*Influence Function - Sharpe Ratio (SR)***Description**

IF.SR returns the data and plots the shape of either the IF or the IF TS for the SR

Usage

```
IF.SR(
  returns = NULL,
  evalShape = FALSE,
  retVals = NULL,
  nuisPars = NULL,
  k = 4,
  IFplot = FALSE,
  IFprint = TRUE,
  rf = 0,
  prewhiten = FALSE,
  ar.prewhiten.order = 1,
  cleanOutliers = FALSE,
  cleanMethod = c("locScaleRob")[1],
  eff = 0.99,
  ...
)
```

Arguments

returns	Returns data of the asset or portfolio. This can be a numeric or an xts object.
evalShape	Evaluation of the shape of the IF risk or performance measure if TRUE. Otherwise, a TS of the IF of the provided returns is computed.
retVals	Values used to evaluate the shape of the IF.
nuisPars	Nuisance parameters used for the evaluation of the shape of the IF (if no returns are provided).
k	Range parameter for the shape of the IF (the SD gets multiplied k times).
IFplot	If TRUE, the plot of the IF shape or IF TS of the returns is produced.
IFprint	If TRUE, the data for the IF shape or the IF TS of the returns is returned.
rf	Risk-free interest rate.
prewhiten	Boolean variable to indicate if the IF TS is pre-whitened (TRUE) or not (FALSE).
ar.prewhiten.order	Order of AR parameter for the pre-whitening. Default is AR(1).
cleanOutliers	Boolean variable to indicate whether outliers are cleaned with a robust location and scale estimator.
cleanMethod	Robust method used to clean outliers from the TS. Default choice is "locScaleRob".

eff Tuning parameter for the normal distribution efficiency for the "locScaleRob" robust data cleaning.

... Additional parameters.

Details

For further details on the usage of the nuisPars argument, please refer to Section 3.1 for the RPEIF vignette.

Value

Influence function of the SR.

Author(s)

Anthony-Alexander Christidis, <anthony.christidis@stat.ubc.ca>

Examples

```
# Plot of IF with nuisance parameter with return value
# This example works without any additional packages
outIF <- IF.SR(returns = NULL, evalShape = TRUE,
              retVals = NULL, nuisPars = NULL,
              IFplot = TRUE, IFprint = TRUE)

# Examples using PerformanceAnalytics data
if (requireNamespace("PerformanceAnalytics", quietly = TRUE)) {
  data(edhec, package = "PerformanceAnalytics")
  colnames(edhec) = c("CA", "CTAG", "DIS", "EM", "EMN", "ED", "FIA",
                    "GM", "LS", "MA", "RV", "SS", "FoF")

  # Plot of IF a specified TS
  outIF <- IF.SR(returns = edhec[, "CA"], evalShape = TRUE,
                retVals = seq(-0.1, 0.1, by = 0.001), nuisPars = NULL,
                IFplot = TRUE, IFprint = TRUE)

  # Computing the IF of the returns (with prewhitening) with a plot of IF TS
  outIF <- IF.SR(returns = edhec[, "CA"], evalShape = FALSE,
                retVals = NULL, nuisPars = NULL,
                IFplot = TRUE, IFprint = TRUE,
                prewhiten = FALSE)
}
```

IF.VaR

Influence Function - Value at Risk (VaR)

Description

IF.VaR returns the data and plots the shape of either the IF or the IF TS for the Value at Risk

Usage

```

IF.VaR(
  returns = NULL,
  evalShape = FALSE,
  retVals = NULL,
  nuisPars = NULL,
  k = 4,
  IFplot = FALSE,
  IFprint = TRUE,
  alpha = 0.05,
  prewhiten = FALSE,
  ar.prewhiten.order = 1,
  cleanOutliers = FALSE,
  cleanMethod = c("locScaleRob")[1],
  eff = 0.99,
  ...
)

```

Arguments

returns	Returns data of the asset or portfolio. This can be a numeric or an xts object.
evalShape	Evaluation of the shape of the IF risk or performance measure if TRUE. Otherwise, a TS of the IF of the provided returns is computed.
retVals	Values used to evaluate the shape of the IF.
nuisPars	Nuisance parameters used for the evaluation of the shape of the IF (if no returns are provided).
k	Range parameter for the shape of the IF (the SD gets multiplied k times).
IFplot	If TRUE, the plot of the IF shape or IF TS of the returns is produced.
IFprint	If TRUE, the data for the IF shape or the IF TS of the returns is returned.
alpha	The tail probability of interest.
prewhiten	Boolean variable to indicate if the IF TS is pre-whitened (TRUE) or not (FALSE).
ar.prewhiten.order	Order of AR parameter for the pre-whitening. Default is AR(1).
cleanOutliers	Boolean variable to indicate whether outliers are cleaned with a robust location and scale estimator.
cleanMethod	Robust method used to clean outliers from the TS. Default choice is "locScaleRob".
eff	Tuning parameter for the normal distribution efficiency for the "locScaleRob" robust data cleaning.
...	Additional parameters.

Details

For further details on the usage of the nuisPars argument, please refer to Section 3.1 for the RPEIF vignette.

Value

Influence function of the VaR.

Author(s)

Anthony-Alexander Christidis, <anthony.christidis@stat.ubc.ca>

Examples

```
# Plot of IF with nuisance parameter with return value
# This example works without any additional packages
outIF <- IF.VaR(returns = NULL, evalShape = TRUE,
               retVals = NULL, nuisPars = NULL,
               IFplot = TRUE, IFprint = TRUE)

# Examples using PerformanceAnalytics data
if (requireNamespace("PerformanceAnalytics", quietly = TRUE)) {
  data(edhec, package = "PerformanceAnalytics")
  colnames(edhec) = c("CA", "CTAG", "DIS", "EM", "EMN", "ED", "FIA",
                    "GM", "LS", "MA", "RV", "SS", "FoF")

  # Plot of IF a specified TS
  outIF <- IF.VaR(returns = edhec[, "CA"], evalShape = TRUE,
                 retVals = seq(-0.1, 0.1, by = 0.001), nuisPars = NULL,
                 IFplot = TRUE, IFprint = TRUE)

  # Computing the IF of the returns (with prewhitening) with a plot of IF TS
  outIF <- IF.VaR(returns = edhec[, "CA"], evalShape = FALSE,
                 retVals = NULL, nuisPars = NULL,
                 IFplot = TRUE, IFprint = TRUE,
                 prewhiten = FALSE)
}
```

IF.VaRratio

Influence Function - Value at Risk (VaR) Ratio

Description

IF.VaRratio returns the data and plots the shape of either the IF or the IF TS for the VaR Ratio.

Usage

```
IF.VaRratio(
  returns = NULL,
  evalShape = FALSE,
  retVals = NULL,
  nuisPars = NULL,
  k = 4,
```

```

IFplot = FALSE,
IFprint = TRUE,
alpha = 0.05,
rf = 0,
prewhiten = FALSE,
ar.prewhiten.order = 1,
cleanOutliers = FALSE,
cleanMethod = c("locScaleRob")[1],
eff = 0.99,
...
)

```

Arguments

returns	Returns data of the asset or portfolio. This can be a numeric or an xts object.
evalShape	Evaluation of the shape of the IF risk or performance measure if TRUE. Otherwise, a TS of the IF of the provided returns is computed.
retVals	Values used to evaluate the shape of the IF.
nuisPars	Nuisance parameters used for the evaluation of the shape of the IF (if no returns are provided).
k	Range parameter for the shape of the IF (the SD gets multiplied k times).
IFplot	If TRUE, the plot of the IF shape or IF TS of the returns is produced.
IFprint	If TRUE, the data for the IF shape or the IF TS of the returns is returned.
alpha	The tail probability of interest.
rf	Risk-free interest rate.
prewhiten	Boolean variable to indicate if the IF TS is pre-whitened (TRUE) or not (FALSE).
ar.prewhiten.order	Order of AR parameter for the pre-whitening. Default is AR(1).
cleanOutliers	Boolean variable to indicate whether outliers are cleaned with a robust location and scale estimator.
cleanMethod	Robust method used to clean outliers from the TS. Default choice is "locScaleRob".
eff	Tuning parameter for the normal distribution efficiency for the "locScaleRob" robust data cleaning.
...	Additional parameters.

Details

For further details on the usage of the `nuisPars` argument, please refer to Section 3.1 for the RPEIF vignette.

Value

Influence function of the VaRratio.

Author(s)

Anthony-Alexander Christidis, <anthony.christidis@stat.ubc.ca>

Examples

```
# Plot of IF with nuisance parameter with return value
# This example works without any additional packages
outIF <- IF.VaRratio(returns = NULL, evalShape = TRUE,
                    retVals = NULL, nuisPars = NULL,
                    IFplot = TRUE, IFprint = TRUE)

# Examples using PerformanceAnalytics data
if (requireNamespace("PerformanceAnalytics", quietly = TRUE)) {
  data(edhec, package = "PerformanceAnalytics")
  colnames(edhec) = c("CA", "CTAG", "DIS", "EM", "EMN", "ED", "FIA",
                    "GM", "LS", "MA", "RV", "SS", "FoF")

  # Plot of IF a specified TS
  outIF <- IF.VaRratio(returns = edhec[, "CA"], evalShape = TRUE,
                      retVals = seq(-0.1, 0.1, by = 0.001), nuisPars = NULL,
                      IFplot = TRUE, IFprint = TRUE)

  # Computing the IF of the returns (with prewhitening) with a plot of IF TS
  outIF <- IF.VaRratio(returns = edhec[, "CA"], evalShape = FALSE,
                      retVals = NULL, nuisPars = NULL,
                      IFplot = TRUE, IFprint = TRUE,
                      prewhiten = FALSE)
}
```

 nuisParsFn

Nuisance Parameters Computation

Description

nuis.pars returns the value of the nuisance parameters used in the evaluation of the shape of influence functions for risk and performance measures.

Usage

```
nuisParsFn(mu = 0.01, sd = 0.05, c = 0, alpha = 0.1, beta = 0.1)
```

Arguments

mu	Mean parameter.
sd	Standard deviation parameter.
c	Constant value for threshold.
alpha	Parameters for the lower tail quantile.
beta	Parameter for the upper tail quantile.

Details

For further details on the usage of the `nuisParsFn` function, please refer to Section 3.1 for the RPEIF vignette.

Value

List of nuisance parameters.

Author(s)

Anthony-Alexander Christidis, <anthony.christidis@stat.ubc.ca>

Examples

```
# Nuisance parameters using default values
defaultNuisance <- nuisParsFn()

# Nuisance parameters using specified values
specifiedNuisance <- nuisParsFn(mu=0.02, sd=0.1, c=0.01, alpha=0.05, beta=0.1)
```

Index

IF, [2](#)
IF.DSR, [4](#)
IF.ES, [6](#)
IF.ESratio, [8](#)
IF.LPM, [10](#)
IF.Mean, [12](#)
IF.OmegaRatio, [13](#)
IF.RachevRatio, [15](#)
IF.robMean, [17](#)
IF.SD, [19](#)
IF.SemiSD, [21](#)
IF.SoR, [23](#)
IF.SR, [25](#)
IF.VaR, [26](#)
IF.VaRratio, [28](#)

nuisParsFn, [30](#)