

Package ‘RobAStBase’

January 2, 2012

Version 0.8.1

Date 2011-09-02

Title Robust Asymptotic Statistics

Description Base S4-classes and functions for robust asymptotic statistics.

Depends R(>= 2.7.0), methods, distr(>= 2.0), distrEx(>= 2.0),distrMod(>= 2.0), RandVar(>= 0.6.3)

Suggests ROptEst

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LazyLoad yes

License LGPL-3

Encoding latin1

URL <http://robast.r-forge.r-project.org/>

LastChangedDate {\$LastChangedDate: 2011-01-05 19:34:04 +0100 (Mi, 05 Jan 2011) \$}

LastChangedRevision {\$LastChangedRevision: 443 \$}

SVNRevision 439

Repository CRAN

Date/Publication 2011-10-19 13:18:16

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RobAStBase-package *Robust Asymptotic Statistics*

Description

Base S4-classes and functions for robust asymptotic statistics.

Details

Package: RobAStBase
Version: 0.8
Date: 2010-12-03
Depends: R(>= 2.7.0), methods, distr(>= 2.0), distrEx(>= 2.0), distrMod(>= 2.0), RandVar(>= 0.6.3)
LazyLoad: yes
License: LGPL-3
URL: <http://robast.r-forge.r-project.org/>
SVNRevision: 439

Package versions

Note: The first two numbers of package versions do not necessarily reflect package-individual development, but rather are chosen for the RobAStXXX family as a whole in order to ease updating "depends" information.

Author(s)

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Maintainer: Matthias Kohl <matthias.kohl@stamats.de>

References

M. Kohl (2005). Numerical Contributions to the Asymptotic Theory of Robustness. Dissertation. University of Bayreuth.

See Also

[distr-package](#), [distrEx-package](#), [distrMod-package](#)

Examples

```
library(RobAStBase)

## some L2 differentiable parametric family from package distrMod, e.g.
B <- BinomFamily(size = 25, prob = 0.25)

## classical optimal IC
IC0 <- optIC(model = B, risk = asCov())
plot(IC0) # plot IC
checkIC(IC0, B)
```

ALEstimate-class

ALEstimate-class.

Description

Class of asymptotically linear estimates.

Objects from the Class

Objects can be created by calls of the form `new("ALEstimate", ...)`.

Slots

`name` Object of class "character": name of the estimator.

`estimate` Object of class "ANY": estimate.

`estimate.call` Object of class "call": call by which estimate was produced.

`samplesize` object of class "numeric" — the samplesize (only complete cases are counted) at which the estimate was evaluated.

`completeness` object of class "logical" — complete cases at which the estimate was evaluated.

`asvar` object of class "OptionalNumericOrMatrix" which may contain the asymptotic (co)variance of the estimator.

`asbias` Optional object of class "numeric": asymptotic bias.

`pIC` Optional object of class InfluenceCurve: influence curve.

`nuis.idx` object of class "OptionalNumeric": indices of estimate belonging to the nuisance part.

`fixed` object of class "OptionalNumeric": the fixed and known part of the parameter

`Infos` object of class "matrix" with two columns named `method` and `message`: additional informations.

`trafo` object of class "list": a list with components `fct` and `mat` (see below).

`untransformed.estimate` Object of class "ANY": untransformed estimate.

`untransformed.asvar` object of class "OptionalNumericOrMatrix" which may contain the asymptotic (co)variance of the untransformed estimator.

Extends

Class "Estimate", directly.

Methods

pIC signature(object = "ALEstimate"): accessor function for slot `pIC`.

show signature(object = "ALEstimate")

confint signature(object = "ALEstimate", method = "missing"): compute asymptotic (LAN-based) confidence interval neglecting any bias.

confint signature(object = "ALEstimate", method = "symmetricBias"): compute asymptotic (LAN-based) confidence interval incorporating bias symmetrically.

confint signature(object = "ALEstimate", method = "onesidedBias"): compute asymptotic (LAN-based) confidence interval incorporating bias one-sided; i.e., positive or negative, respectively.

confint signature(object = "ALEstimate", method = "asymmetricBias"): compute asymptotic (LAN-based) confidence interval incorporating bias asymmetrically.

Author(s)

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See Also

[Estimate-class](#)

Examples

```
## prototype
new("ALEstimate")
```

BdStWeight-class *Robust Weight classes for bounded, standardized weights*

Description

Classes for bounded, robust, standardized weights.

Objects from the Class

Objects can be created by calls of the form `new("BdStWeight", ...)`; to fill slot `weight`, you will use the generating functions `getweight` and `minbiasweight`.

Slots

`name` Object of class "character"; inherited from class `RobWeight`.

`weight` Object of class "function" — the weight function; inherited from class `RobWeight`.

`clip` Object of class "numeric" — clipping bound(s); inherited from class `BoundedWeight`.

`stand` Object of class "matrix" — standardization.

Extends

Class "RobWeight", via class "BoundedWeight". Class "BoundedWeight", directly.

Methods

stand signature(object = "BdStWeight"): accessor function for slot `stand`.

stand<- signature(object = "BdStWeight", value = "matrix"): replacement function for slot `stand`. This replacement method should be used with great care, as the slot `weight` is not simultaneously updated and hence, this may lead to inconsistent objects.

Author(s)

Peter Ruckdeschel <Peter.Ruckdeschel@itwm.fraunhofer.de>

References

Hampel et al. (1986) *Robust Statistics*. The Approach Based on Influence Functions. New York: Wiley.

Rieder, H. (1994) *Robust Asymptotic Statistics*. New York: Springer.

Kohl, M. (2005) *Numerical Contributions to the Asymptotic Theory of Robustness*. Bayreuth: Dissertation.

See Also

[BoundedWeight-class](#), [RobWeight-class](#), [IC](#), [InfluenceCurve-class](#)

Examples

```
## prototype  
new("BdStWeight")
```

BoundedWeight-class *Robust Weight classes for bounded weights*

Description

Classes for bounded, robust weights.

Objects from the Class

Objects can be created by calls of the form `new("BoundedWeight", ...)`.

Slots

`name` Object of class "character"; inherited from class `RobWeight`.

`weight` Object of class "function" — the weight function; inherited from class `RobWeight`.

`clip` Object of class "numeric" — clipping bound(s).

Extends

Class `"RobWeight"`, directly.

Methods

clip signature(`x1` = "BoundedWeight"): accessor function for slot `clip`.

clip<- signature(`object` = "BoundedWeight", `value` = "numeric"): replacement function for slot `clip`. This replacement method should be used with great care, as the slot `weight` is not simultaneously updated and hence, this may lead to inconsistent objects.

Author(s)

Peter Ruckdeschel <Peter.Ruckdeschel@itwm.fraunhofer.de>

References

Hampel et al. (1986) *Robust Statistics*. The Approach Based on Influence Functions. New York: Wiley.

Rieder, H. (1994) *Robust Asymptotic Statistics*. New York: Springer.

Kohl, M. (2005) *Numerical Contributions to the Asymptotic Theory of Robustness*. Bayreuth: Dissertation.

See Also

[RobWeight-class](#), [IC](#), [InfluenceCurve-class](#)

Examples

```
## prototype  
new("BoundedWeight")
```

`checkIC`*Generic Function for Checking ICs*

Description

Generic function for checking centering and Fisher consistency of ICs.

Usage

```
checkIC(IC, L2Fam, ...)
```

Arguments

IC	object of class "IC"
L2Fam	L2-differentiable family of probability measures.
...	additional parameters

Details

The precisions of the centering and the Fisher consistency are computed.

Value

The maximum deviation from the IC properties is returned.

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

References

Rieder, H. (1994) *Robust Asymptotic Statistics*. New York: Springer.
Kohl, M. (2005) *Numerical Contributions to the Asymptotic Theory of Robustness*. Bayreuth: Dissertation.

See Also

[L2ParamFamily-class](#), [IC-class](#)

Examples

```
IC1 <- new("IC")  
checkIC(IC1)
```

Description

Plots 2-4 influence curves to the same model.

Usage

```
comparePlot(obj1, obj2, ... )
## S4 method for signature 'IC,IC'
comparePlot(obj1, obj2, obj3 = NULL, obj4 = NULL,
            data = NULL, ..., withSweave = getdistrOption("withSweave"),
            main = FALSE, inner = TRUE, sub = FALSE,
            col = par("col"), lwd = par("lwd"), lty,
            col.inner = par("col.main"), cex.inner = 0.8,
            bmar = par("mar")[1], tmar = par("mar")[3],
            with.legend = TRUE, legend.bg = "white",
            legend.location = "bottomright", legend.cex = 0.8,
            mfColRow = TRUE, to.draw.arg = NULL,
            cex.pts = 1, col.pts = par("col"),
            pch.pts = 1, jitter.fac = 1, with.lab = FALSE,
            lab.pts = NULL, lab.font = NULL,
            which.lbs = NULL, which.Order = NULL, return.Order = FALSE)
```

Arguments

obj1	object of class "InfluenceCurve"
obj2	object of class "InfluenceCurve" to be compared with obj1
obj3	optional: object of class "InfluenceCurve" to be compared with obj1
obj4	optional: object of class "InfluenceCurve" to be compared with obj1
data	optional data argument — for plotting observations into the plot;
withSweave	logical: if TRUE (for working with Sweave) no extra device is opened
main	logical: is a main title to be used? or just as argument main in plot.default .
col	color[s] of ICs in arguments obj1 [...,obj4].
lwd	linewidth[s] of ICs in arguments obj1 [...,obj4].
lty	line-type[s] of ICs in arguments obj1 [...,obj4].
inner	logical: do panels have their own titles? or character vector of / cast to length 'number of plotted dimensions'; if argument to.draw.arg is used, this refers to a vector of length length(to.draw.arg), the actually plotted dimensions. For further information, see also description of argument main in plot.default .

sub	logical: is a sub-title to be used? or just as argument sub in <code>plot.default</code> .
tmar	top margin – useful for non-standard main title sizes
bmar	bottom margin – useful for non-standard sub title sizes
cex.inner	magnification to be used for inner titles relative to the current setting of cex; as in <code>par</code>
col.inner	character or integer code; color for the inner title
with.legend	logical; shall a legend be plotted?
legend.location	a valid argument x for <code>legend</code> — the place where to put the legend on the last issued plot
legend.bg	background color for the legend
legend.cex	magnification factor for the legend
mfColRow	shall default partition in panels be used — defaults to TRUE
to.draw.arg	Either NULL (default; everything is plotted) or a vector of either integers (the indices of the subplots to be drawn) or characters — the names of the subplots to be drawn: these names are to be chosen either among the row names of the trafo matrix <code>rownames(trafo(eval(obj1@CallL2Fam)@param))</code> or if the last expression is NULL a vector " <code>dim<dimnr></code> ", <code>dimnr</code> running through the number of rows of the trafo matrix.
cex.pts	size of the points of the data argument plotted
col.pts	color of the points of the data argument plotted
pch.pts	symbol of the points of the data argument plotted
with.lab	logical; shall labels be plotted to the observations?
lab.pts	character or NULL; labels to be plotted to the observations; if NULL observation indices;
lab.font	font to be used for labels
jitter.fac	jittering factor used in case of a <code>DiscreteDistribution</code> for plotting points of the data argument in a jittered fashion.
which.lbs	either an integer vector with the indices of the observations to be plotted into graph or NULL — then no observation is excluded
which.Order	for each of the given ICs, we order the observations (descending) according to the norm given by the corresponding <code>normtype(object)</code> ; then <code>which.Order</code> either is an integer vector with the indices of the <i>ordered</i> observations (remaining after a possible reduction by argument <code>which.lbs</code>) to be plotted into graph or NULL — then no (further) observation is excluded.
return.Order	logical; if TRUE, a list of length maximally four with order vectors is returned — one for the ordering w.r.t. each of the given ICs; more specifically, the order of the (remaining) observations given by their original index is returned (remaining means: after a possible reduction by argument <code>which.lbs</code> , and ordering is according to the norm given by <code>normtype(object)</code>); otherwise we return <code>invisible()</code> as usual.
...	further arguments to be passed to plot

Details

Any parameters of `plot.default` may be passed on to this particular plot method.

For `main`-, `inner`, and `sub`titles given as arguments `main`, `inner`, and `sub`, top and bottom margins are enlarged to 5 resp. 6 by default but may also be specified by `tmar` / `bmar` arguments. If `main` / `inner` / `sub` are logical then if the respective argument is `FALSE` nothing is done/plotted, but if it is `TRUE`, we use a default main title taking up the calling arguments in case of `main`, default inner titles taking up the class and (named) parameter slots of arguments in case of `inner`, and a "generated on <data>"-tag in case of `sub`. Of course, if `main` / `inner` / `sub` are character, this is used for the title; in case of `inner` it is then checked whether it has correct length. In all title arguments, the following patterns are substituted:

```
"%C1", "%C2", ["%C3", ["%C4"]] class of argument obj<i>, i=1,..4
```

```
"%A1", "%A2", ["%A3", ["%A4"]] deparsed argument obj<i>, i=1,..4
```

```
"%D" time/date-string when the plot was generated
```

If argument `...` contains argument `ylim`, this may either be as in `plot.default` (i.e. a vector of length 2) or a vector of length $2 \times (\text{number of plotted dimensions})$; in the case of longer length, these are the values for `ylim` for the plotted dimensions of the IC, one pair for each dimension.

Author(s)

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References

Kohl, M. (2005) *Numerical Contributions to the Asymptotic Theory of Robustness*. Bayreuth: Dissertation.

See Also

[L2ParamFamily-class](#), [IC-class](#), [plot](#)

Examples

```
if(require(ROptEst)){
  N0 <- NormLocationScaleFamily(mean=0, sd=1)
  N0.Rob1 <- InfRobModel(center = N0, neighbor = ContNeighborhood(radius = 0.5))

  IC1 <- optIC(model = N0, risk = asCov())
  IC2 <- optIC(model = N0.Rob1, risk = asMSE())

  comparePlot(IC1, IC2)

  data <- r(N0)(20)
  comparePlot(IC1, IC2, data=data, with.lab = TRUE,
              which.lbs = c(1:4, 15:20),
              which.Order = 1:6,
              return.Order = TRUE)
```



```
Risks, Infos, clip = Inf, cent = 0, stand = as.matrix(1),
lowerCase = NULL, neighborRadius = 0, w = new("HampelWeight"),
normtype = NormType(), biastype = symmetricBias(),
modifyIC = NULL)
```

Arguments

name	object of class "character".
CallL2Fam	object of class "call": creates an object of the underlying L2-differentiable parametric family.
Curve	object of class "EuclRandVarList"
Risks	object of class "list": list of risks; cf. RiskType-class .
Infos	matrix of characters with two columns named method and message: additional informations.
clip	positive real: clipping bound.
cent	real: centering constant
stand	matrix: standardizing matrix
w	HampelWeight: weight object
lowerCase	optional constant for lower case solution.
neighborRadius	radius of the corresponding (unconditional) contamination neighborhood.
biastype	BiasType: type of the bias
normtype	NormType: type of the norm
modifyIC	object of class "OptionalFunction": function of two arguments, which are an L2 parametric family and an optional influence curve. Returns an object of class "IC". This function is mainly used for internal computations!

Value

Object of class "ContIC"

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

References

- Rieder, H. (1994) *Robust Asymptotic Statistics*. New York: Springer.
- Kohl, M. (2005) *Numerical Contributions to the Asymptotic Theory of Robustness*. Bayreuth: Dissertation.

See Also

[IC-class](#), [ContIC](#), [HampIC-class](#)

Examples

```
IC1 <- ContIC()
plot(IC1)
```

ContIC-class

Influence curve of contamination type

Description

Class of (partial) influence curves of contamination type; i.e., influence curves η of the form

$$\eta = (A\Lambda - a) \min(1, b/|A\Lambda - a|)$$

with clipping bound b , centering constant a and standardizing matrix A . Λ stands for the L2 derivative of the corresponding L2 differentiable parametric family created via the call in the slot `CallL2Fam`.

Objects from the Class

Objects can be created by calls of the form `new("ContIC", ...)`. More frequently they are created via the generating function `ContIC`, respectively via the method `generateIC`.

Slots

`CallL2Fam`: object of class "call": creates an object of the underlying L2-differentiable parametric family.

`name`: object of class "character"

`Curve`: object of class "EuclRandVarList"

`modifyIC`: Object of class "OptionalFunction": function of two arguments, which are an L2 parametric family and an optional influence curve. Returns an object of class "IC". This slot is mainly used for internal computations!

`Risks`: object of class "list": list of risks; cf. [RiskType-class](#).

`Infos`: object of class "matrix" with two columns named `method` and `message`: additional informations.

`clip`: object of class "numeric": clipping bound.

`cent`: object of class "numeric": centering constant.

`stand`: object of class "matrix": standardizing matrix.

`weight`: object of class "HampelWeight": weight function

`biastype`: object of class "BiasType": bias type (symmetric/onsided/asymmetric)

`normtype`: object of class "NormType": norm type (Euclidean, information/self-standardized)

`lowerCase`: object of class "OptionalNumeric": optional constant for lower case solution.

`neighborRadius`: object of class "numeric": radius of the corresponding (unconditional) contamination neighborhood.

Extends

Class "HampIC", directly.
 Class "IC", by class "HampIC".
 Class "InfluenceCurve", by class "IC".

Methods

CallL2Fam<- signature(object = "ContIC"): replacement function for slot CallL2Fam.
cent signature(object = "ContIC"): accessor function for slot cent.
cent<- signature(object = "ContIC"): replacement function for slot cent.
clip signature(x1 = "ContIC"): accessor function for slot clip.
clip<- signature(object = "ContIC"): replacement function for slot clip.
stand<- signature(object = "ContIC"): replacement function for slot stand.
lowerCase<- signature(object = "ContIC"): replacement function for slot lowerCase.
neighbor signature(object = "ContIC"): generates an object of class "ContNeighborhood" with radius given in slot neighborRadius.
generateIC signature(neighbor = "ContNeighborhood", L2Fam = "L2ParamFamily"): generate an object of class "ContIC". Rarely called directly.
show signature(object = "ContIC")

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

References

Rieder, H. (1994) *Robust Asymptotic Statistics*. New York: Springer.
 Kohl, M. (2005) *Numerical Contributions to the Asymptotic Theory of Robustness*. Bayreuth: Dissertation.

See Also

[IC-class](#), [ContIC HampIC-class](#)

Examples

```
IC1 <- new("ContIC")
plot(IC1)
```

ContNeighborhood *Generating function for ContNeighborhood-class*

Description

Generates an object of class "ContNeighborhood".

Usage

```
ContNeighborhood(radius = 0)
```

Arguments

radius non-negative real: neighborhood radius.

Value

Object of class "ContNeighborhood"

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

References

Rieder, H. (1994) *Robust Asymptotic Statistics*. New York: Springer.

Kohl, M. (2005) *Numerical Contributions to the Asymptotic Theory of Robustness*. Bayreuth: Dissertation.

See Also

[ContNeighborhood-class](#)

Examples

```
ContNeighborhood()

## The function is currently defined as
function(radius = 0){
  new("ContNeighborhood", radius = radius)
}
```

ContNeighborhood-class

Contamination Neighborhood

Description

Class of (unconditional) contamination neighborhoods.

Objects from the Class

Objects can be created by calls of the form `new("ContNeighborhood", ...)`. More frequently they are created via the generating function `ContNeighborhood`.

Slots

type Object of class "character": "(uncond.) convex contamination neighborhood".

radius Object of class "numeric": neighborhood radius.

Extends

Class "UncondNeighborhood", directly.

Class "Neighborhood", by class "UncondNeighborhood".

Methods

No methods defined with class "ContNeighborhood" in the signature.

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

References

Rieder, H. (1994) *Robust Asymptotic Statistics*. New York: Springer.

Kohl, M. (2005) *Numerical Contributions to the Asymptotic Theory of Robustness*. Bayreuth: Dissertation.

See Also

[ContNeighborhood](#), [UncondNeighborhood-class](#)

Examples

```
new("ContNeighborhood")
```

cutoff *Generating function(s) for class 'cutoff'*

Description

Generating function(s) for class cutoff.

Usage

```
cutoff(name = "empirical", body.fct0,
       cutoff.quantile = 0.95,
       norm = NormType(), QF, nsim = 100000)
cutoff.sememp()
cutoff.chisq()
```

Arguments

name	argument for name slot of cutoff object
body.fct0	a call generated by code wrapped to substitute resp. quote; the body of the fct slot of the cutoff object
cutoff.quantile	numeric (in [0,1]); the corresponding slot value for the cutoff object
norm	an object of class NormType – the norm/distance by which to produce the cutoff - value.
nsim	integer: the sample size used for determining the quantiles of $(x^T Q x)^{1/2}$ for x multivariate standard normal and Q a corresponding quadratic form
QF	a quadratic (positive semidefinite, symmetric) matrix used as quadratic form

Details

cutoff generates a valid object of class "cutoff". As function slot fct may only have a formal argument data, the other arguments to determine the cutoff value, i.e. norm, QF, nsim, cutoff.quantile, nsim have to enter the scope of this function by lexical scoping; now cutoff.quantile, norm, QF are to be taken from the calling environment (not from the defining one), so we have delay evaluation of the function body, which is why we assume it to be given wrapped into substitute resp. quote. body.fct0 is by default (i.e. if argument body.fct0 is missing) set to quote(quantile(slot(norm, "fct")(data), cutoff.quantile)), internally, i.e.; to an empirical quantile of the corresponding norms.

cutoff.sememp() is a helper function generating the theoretical (asymptotic) quantile of (the square root of) a corresponding quadratic form, assuming multivariate normality; to determine this quantile nsim simulations are used.

cutoff.chisq() is a helper function generating the theoretical (asymptotic) quantile of (the square root of) a (self-standardized) quadratic form, assuming multivariate normality; i.e.; a corresponding quantile of a Chi-Square distribution.

Value

Object of class "cutoff".

Author(s)

Peter Ruckdeschel <Peter.Ruckdeschel@itwm.fraunhofer.de>

See Also

[cutoff-class](#), [ddPlot](#)

Examples

```
cutoff()
cutoff.sememp()
cutoff.chisq()
```

cutoff-class

Cutoff class for distance-distance plots

Description

Class of methods to determine cutoff point for distance-distance plots; used to derive other cutoff methods later by method dispatch.

Objects from the Class

Objects could in principle be created by calls of the form `new("cutoff", ...)`. More frequently they are created via the generating function `cutoff`, respectively via the helper functions `cutoff.sememp` and `cutoff.chisq`.

Slots

name: object of class "character"; defaults to "empirical" in prototype;

fct: an object of of class "function"; for this class layer, this function must only have one argument `data` (which may but need not be used to determine the cutoff point empirically); in derived classes this restriction could be dropped, if corresponding special methods for `ddPlot` are derived. Defaults to `function(data) quantile(data)`.

cutoff.quantile: Object of class "numeric": a probability (in $[0,1]$) to determine the respective quantile (empirical or theoretical) to plot the cutoff line; defaults to 0.95 in prototype;

Methods

cutoff.quantile signature(object = "cutoff"): accessor function for slot `cutoff.quantile`.

cutoff.quantile<- signature(object = "cutoff"): replacement function for slot `cutoff.quantile`.

fct signature(object = "cutoff"): accessor function for slot `fct`.

name signature(object = "cutoff"): accessor function for slot `name`.

Author(s)

Peter Ruckdeschel <Peter.Ruckdeschel@itwm.fraunhofer.de>

See Also

[ddPlot](#), [outlyingPlotIC](#) [cutoff](#)

Examples

```
cutoff()
```

 ddPlot-methods

Methods for Function ddPlot in Package 'RobAStBase'

Description

ddPlot-methods

Usage

```
ddPlot(data, dist.x, dist.y, cutoff.x, cutoff.y, ...)
## S4 method for signature 'matrix'
ddPlot(data, dist.x = NormType(), dist.y = NormType(),
       cutoff.x, cutoff.y, ...,
       cutoff.quantile.x = 0.95, cutoff.quantile.y = cutoff.quantile.x,
       transform.x, transform.y = transform.x,
       id.n, lab.pts, adj, cex.idn,
       col.idn, lty.cutoff, lwd.cutoff, col.cutoff, text.abline = TRUE,
       text.abline.x = NULL, text.abline.y = NULL,
       cex.abline = par("cex"), col.abline = col.cutoff,
       font.abline = par("font"), adj.abline = c(0,0),
       text.abline.x.x = NULL, text.abline.x.y = NULL,
       text.abline.y.x = NULL, text.abline.y.y = NULL,
       text.abline.x.fmt.cx = "%7.2f", text.abline.x.fmt.qx = "%4.2f%",
       text.abline.y.fmt.cy = "%7.2f", text.abline.y.fmt.qy = "%4.2f%")
## S4 method for signature 'numeric'
ddPlot(data, dist.x = NormType(), dist.y = NormType(),
       cutoff.x, cutoff.y, ...,
       cutoff.quantile.x = 0.95, cutoff.quantile.y = cutoff.quantile.x,
       transform.x, transform.y = transform.x,
       id.n, lab.pts, adj, cex.idn,
       col.idn, lty.cutoff, lwd.cutoff, col.cutoff, text.abline = TRUE,
       text.abline.x = NULL, text.abline.y = NULL,
       cex.abline = par("cex"), col.abline = col.cutoff,
       font.abline = par("font"), adj.abline = c(0,0),
       text.abline.x.x = NULL, text.abline.x.y = NULL,
       text.abline.y.x = NULL, text.abline.y.y = NULL,
```

```

      text.abline.x.fmt.cx = "%7.2f", text.abline.x.fmt.qx = "%4.2f%%",
      text.abline.y.fmt.cy = "%7.2f", text.abline.y.fmt.qy = "%4.2f%%")
## S4 method for signature 'data.frame'
ddPlot(data, dist.x = NormType(), dist.y = NormType(),
      cutoff.x, cutoff.y, ...,
      cutoff.quantile.x = 0.95, cutoff.quantile.y = cutoff.quantile.x,
      transform.x, transform.y = transform.x,
      id.n, lab.pts, adj, cex.idn,
      col.idn, lty.cutoff, lwd.cutoff, col.cutoff, text.abline = TRUE,
      text.abline.x = NULL, text.abline.y = NULL,
      cex.abline = par("cex"), col.abline = col.cutoff,
      font.abline = par("font"), adj.abline = c(0,0),
      text.abline.x.x = NULL, text.abline.x.y = NULL,
      text.abline.y.x = NULL, text.abline.y.y = NULL,
      text.abline.x.fmt.cx = "%7.2f", text.abline.x.fmt.qx = "%4.2f%%",
      text.abline.y.fmt.cy = "%7.2f", text.abline.y.fmt.qy = "%4.2f%%")

```

Arguments

<code>data</code>	data coercable to matrix; the data at which to produce the <code>ddPlot</code> .
<code>...</code>	further arguments to be passed to <code>plot.default</code> , <code>text</code> , and <code>abline</code>
<code>dist.x</code>	object of class <code>NormType</code> ; the distance for the x axis.
<code>dist.y</code>	object of class <code>NormType</code> ; the distance for the y axis.
<code>cutoff.x</code>	object of class <code>cutoff</code> ; the cutoff information for the x axis (the vertical line discriminating 'good' and 'bad' points).
<code>cutoff.y</code>	object of class <code>cutoff</code> ; the cutoff information for the y axis (the horizontal line discriminating 'good' and 'bad' points).
<code>cutoff.quantile.x</code>	numeric; the cutoff quantile for the x axis.
<code>cutoff.quantile.y</code>	numeric; the cutoff quantile for the y axis.
<code>transform.x</code>	function; a transformation to be performed before determining the distances of the x axis.
<code>transform.y</code>	function; a transformation to be performed before determining the distances of the y axis.
<code>id.n</code>	a set of indices (or a corresponding logical vector); to select a subset of the data in argument data.
<code>lab.pts</code>	a vector of labels for the (unsubsetting) data.
<code>adj</code>	the corresponding argument for <code>text</code> for labelling the outliers.
<code>cex.idn</code>	the corresponding <code>cex</code> argument for <code>text</code> for labelling the outliers.
<code>col.idn</code>	the corresponding <code>col</code> argument for <code>text</code> for labelling the outliers.
<code>lty.cutoff</code>	the corresponding <code>lty</code> argument for <code>abline</code> for drawing the cutoff lines; either one <code>lty</code> -value (one value or vector) or a list of length 2 of <code>lty</code> -values.
<code>lwd.cutoff</code>	(vector cast to length 2): the corresponding <code>lwd</code> argument for <code>abline</code> for drawing the cutoff lines.

<code>col.cutoff</code>	(vector cast to length 2): the corresponding <code>col</code> argument for <code>abline</code> for drawing the cutoff lines.
<code>text.abline</code>	vector of logicals (cast to length 2): shall text be added to cutoff lines.
<code>text.abline.x</code>	text to be added to cutoff lines in x direction; if NULL (default) we use “[pp] %-cutoff = [ff]” where [pp] is the percentag up to 2 digits and [ff] is the cutoff value up to 2 digits.
<code>text.abline.y</code>	text to be added to cutoff lines in y direction; if NULL (default) we use “[pp] %-cutoff = [ff]” where [pp] is the percentag up to 2 digits and [ff] is the cutoff value up to 2 digits.
<code>cex.abline</code>	vector of numerics (cast to length 2): cex-value for added cutoff text.
<code>col.abline</code>	vector of length 2: color for added cutoff text.
<code>font.abline</code>	vector of length 2: font for added cutoff text.
<code>adj.abline</code>	cast to 2 x 2 matrix (by recycling rules): adjustment values for added cutoff text.
<code>text.abline.x.y</code>	y-coordinate of text to be added to cutoff lines in x direction; if NULL (default) set to <code>mid of mean(par("usr")[c(3, 4)])</code> .
<code>text.abline.y.x</code>	x-coordinate of text to be added to cutoff lines in y direction; if NULL (default) set to <code>mid of mean(par("usr")[c(1, 2)])</code> .
<code>text.abline.x.x</code>	x-coordinate of text to be added to cutoff lines in x direction; if NULL (default) set to 1.05 times the cutoff value.
<code>text.abline.y.y</code>	y-coordinate of text to be added to cutoff lines in y direction; if NULL (default) set to 1.05 times the cutoff value.
<code>text.abline.x.fmt.cx</code>	format string (see <code>gettextf</code>) to format the cutoff value in label in x direction.
<code>text.abline.x.fmt.qx</code>	format string to format cutoff probability in label in x direction.
<code>text.abline.y.fmt.cy</code>	format string to format the cutoff value in label in y direction.
<code>text.abline.y.fmt.qy</code>	format string to format cutoff probability in label in y direction.

Details

The `matrix`-method calls `.ddPlot.MatNtNtCoCo`, the `numeric`- and `data.frame`-methods coerce argument `data` to `matrix` — the `numeric`-method by a call to `matrix(data, nrow=1)`, in the `data.frame`-methods by a call to `t(as.matrix(data))`.

In arguments `text.abline.x` and `text.abline.y` the following patterns are substituted:

```

"%qx" cutoff-quantile in x-direction
"%qy" cutoff-quantile in y-direction
"%cx" cutoff-value in x-direction
"%cy" cutoff-value in y-direction

```

Value

a list with items

id.x	the indices of (possibly transformed) data (within subset id.n) beyond the x-cutoff
id.y	the indices of (possibly transformed) data (within subset id.n) beyond the y-cutoff
id.xy	the indices of (possibly transformed) data (within subset id.n) beyond the x-cutoff and the y-cutoff
qtx	the quantiles of the distances of the (possibly transformed) data in x direction
qty	the quantiles of the distances of the (possibly transformed) data in y direction
cutoff.x.v	the cutoff value in x direction
cutoff.y.v	the cutoff value in y direction

Author(s)

Peter Ruckdeschel <Peter.Ruckdeschel@itwm.fraunhofer.de>

Examples

```
MX <- matrix(rnorm(1500),nrow=6)
QM <- matrix(rnorm(36),nrow=6); QM <- QM %*% t(QM)
ddPlot(data=MX, dist.y=QFNorm(QuadF=PosSemDefSymmMatrix(QM)))
```

evalIC

Generic function for evaluating ICs

Description

Generic function for evaluating ICs.

Usage

```
evalIC(IC, x)
```

Arguments

IC	object of class "IC"
x	numeric vector or matrix

Details

The list of random variables contained in the slot Curve is evaluated at x.

Value

In case x is numeric a vector and in case x is matrix a matrix is returned.

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

References

- Rieder, H. (1994) *Robust Asymptotic Statistics*. New York: Springer.
- Kohl, M. (2005) *Numerical Contributions to the Asymptotic Theory of Robustness*. Bayreuth: Dissertation.

See Also

[IC-class](#)

FixRobModel

Generating function for FixRobModel-class

Description

Generates an object of class "FixRobModel".

Usage

```
FixRobModel(center = ParamFamily(modifyParam =  
function(theta) Norm(mean = theta)), neighbor = ContNeighborhood())
```

Arguments

center object of class "ProbFamily"
neighbor object of class "UncondNeighborhood"

Value

Object of class "FixRobModel"

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

References

- Rieder, H. (1994) *Robust Asymptotic Statistics*. New York: Springer.
- Kohl, M. (2005) *Numerical Contributions to the Asymptotic Theory of Robustness*. Bayreuth: Dissertation.

See Also

[FixRobModel-class](#)

Examples

```
(M1 <- FixRobModel())

## The function is currently defined as
function(center = ParamFamily(), neighbor = ContNeighborhood()){
  new("FixRobModel", center = center, neighbor = neighbor)
}
```

FixRobModel-class	<i>Robust model with fixed (unconditional) neighborhood</i>
-------------------	---

Description

Class of robust models with fixed (unconditional) neighborhoods.

Objects from the Class

Objects can be created by calls of the form `new("FixRobModel", ...)`. More frequently they are created via the generating function `FixRobModel`.

Slots

`center` Object of class "ProbFamily".

`neighbor` Object of class "UncondNeighborhood".

Extends

Class "RobModel", directly.

Methods

neighbor<- signature(object = "FixRobModel"): replacement function for slot `neighbor<-`
show signature(object = "FixRobModel")

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

References

Rieder, H. (1994) *Robust Asymptotic Statistics*. New York: Springer.

Kohl, M. (2005) *Numerical Contributions to the Asymptotic Theory of Robustness*. Bayreuth: Dissertation.

See Also

[ProbFamily-class](#), [UncondNeighborhood-class](#), [FixRobModel](#)

Examples

```
new("FixRobModel")
```

`generateIC`*Generic function for the generation of influence curves*

Description

This function is rarely called directly. It is used by other functions to create objects of class "IC".

Usage

```
generateIC(neighbor, L2Fam, ...)
```

Arguments

<code>neighbor</code>	Object of class "Neighborhood".
<code>L2Fam</code>	L2-differentiable family of probability measures.
<code>...</code>	additional parameters

Value

Object of class "IC"

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

References

Rieder, H. (1994) *Robust Asymptotic Statistics*. New York: Springer.
Kohl, M. (2005) *Numerical Contributions to the Asymptotic Theory of Robustness*. Bayreuth: Dissertation.

See Also

[IC-class](#), [ContIC-class](#), [TotalVarIC-class](#)

`generateIC.fct-methods`*Generic Function for making ICs consistent at a possibly different model*

Description

Generic function for providing centering and Fisher consistency of ICs.

Usage

```
generateIC.fct(neighbor, L2Fam, ...)
```

Arguments

<code>neighbor</code>	object of class "UncondNeighborhood"
<code>L2Fam</code>	L2-differentiable family of probability measures; may be missing.
<code>...</code>	additional parameters

Value

An IC at the model.

Methods

generateIC.fct signature(IC = "UncondNeighborhood", L2Fam = "L2ParamFamily": ...)

Author(s)

Peter Ruckdeschel <Peter.Ruckdeschel@itwm.fraunhofer.de>

References

Rieder, H. (1994) *Robust Asymptotic Statistics*. New York: Springer.

Kohl, M. (2005) *Numerical Contributions to the Asymptotic Theory of Robustness*. Bayreuth: Dissertation.

See Also

[L2ParamFamily-class](#), [IC-class](#)

getBiasIC

Generic function for the computation of the asymptotic bias for an IC

Description

Generic function for the computation of the asymptotic bias for an IC.

Usage

```
getBiasIC(IC, neighbor, ...)

## S4 method for signature 'IC,UncondNeighborhood'
getBiasIC(IC, neighbor, L2Fam, biastype = symmetricBias(),
          normtype = NormType(), tol = .Machine$double.eps^0.25, numbeval = 1e5)
```

Arguments

IC	object of class "InfluenceCurve"
neighbor	object of class "Neighborhood".
...	additional parameters
L2Fam	object of class "L2ParamFamily".
biastype	object of class "BiasType"
normtype	object of class "NormType"
tol	the desired accuracy (convergence tolerance).
numbeval	number of evaluation points.

Value

The bias of the IC is computed.

Methods

IC = "IC", neighbor = "UncondNeighborhood" determines the as. bias by random evaluation of the IC; this random evaluation is done by the internal S4-method `.evalBiasIC`; this latter dispatches according to the signature `IC, neighbor, biastype`.

For signature `IC="IC", neighbor = "ContNeighborhood", biastype = "BiasType"`, also an argument `normtype` is used to be able to use self- or information standardizing norms; besides this the signatures `IC="IC", neighbor = "TotalVarNeighborhood", biastype = "BiasType", IC="IC", neighbor = "ContNeighborhood", biastype = "onesidedBias"`, and `IC="IC", neighbor = "ContNeighborhood", biastype = "asymmetricBias"` are implemented.

Note

This generic function is still under construction.

Author(s)

Peter Ruckdeschel <Peter.Ruckdeschel@itwm.fraunhofer.de>

References

- Huber, P.J. (1968) Robust Confidence Limits. *Z. Wahrscheinlichkeitstheor. Verw. Geb.* **10**:269–278.
- Rieder, H. (1980) Estimates derived from robust tests. *Ann. Stats.* **8**: 106–115.
- Rieder, H. (1994) *Robust Asymptotic Statistics*. New York: Springer.
- Kohl, M. (2005) *Numerical Contributions to the Asymptotic Theory of Robustness*. Bayreuth: Dissertation.
- Ruckdeschel, P. and Kohl, M. (2005) Computation of the Finite Sample Bias of M-estimators on Neighborhoods.

See Also

[getRiskIC-methods](#), [InfRobModel-class](#)

getBoundedIC

getBoundedIC

Description

Generates a bounded influence curve.

Usage

```
getBoundedIC(L2Fam, D=trafo(L2Fam@param))
```

Arguments

L2Fam	object of class "L2ParamFamily"
D	matrix with as many columns as length(L2Fam@param)

Value

(a bounded) pIC (to matrix D) given as object of class "EuclRandVariable"

Author(s)

Peter Ruckdeschel <Peter.Ruckdeschel@itwm.fraunhofer.de>

References

- Rieder, H. (1994) *Robust Asymptotic Statistics*. New York: Springer.

getRiskIC

Generic function for the computation of a risk for an IC

Description

Generic function for the computation of a risk for an IC.

Usage

```
getRiskIC(IC, risk, neighbor, L2Fam, ...)

## S4 method for signature 'IC,asCov,missing,missing'
getRiskIC(IC, risk, tol = .Machine$double.eps^0.25)

## S4 method for signature 'IC,asCov,missing,L2ParamFamily'
getRiskIC(IC, risk, L2Fam, tol = .Machine$double.eps^0.25)

## S4 method for signature 'IC,trAsCov,missing,missing'
getRiskIC(IC, risk, tol = .Machine$double.eps^0.25)

## S4 method for signature 'IC,trAsCov,missing,L2ParamFamily'
getRiskIC(IC, risk, L2Fam, tol = .Machine$double.eps^0.25)

## S4 method for signature 'IC,asBias,UncondNeighborhood,missing'
getRiskIC(IC, risk, neighbor, tol = .Machine$double.eps^0.25)

## S4 method for signature 'IC,asBias,UncondNeighborhood,L2ParamFamily'
getRiskIC(IC, risk, neighbor, L2Fam, tol = .Machine$double.eps^0.25)

## S4 method for signature 'IC,asMSE,UncondNeighborhood,missing'
getRiskIC(IC, risk, neighbor, tol = .Machine$double.eps^0.25)

## S4 method for signature 'IC,asMSE,UncondNeighborhood,L2ParamFamily'
getRiskIC(IC, risk, neighbor, L2Fam, tol = .Machine$double.eps^0.25)

## S4 method for signature 'TotalVarIC,asUnOvShoot,UncondNeighborhood,missing'
getRiskIC(IC, risk, neighbor)

## S4 method for signature 'IC,fiUnOvShoot,ContNeighborhood,missing'
getRiskIC(IC, risk, neighbor, sampleSize, Algo = "A", cont = "left")

## S4 method for signature 'IC,fiUnOvShoot,TotalVarNeighborhood,missing'
getRiskIC(IC, risk, neighbor, sampleSize, Algo = "A", cont = "left")
```

Arguments

IC object of class "InfluenceCurve"

risk	object of class "RiskType".
neighbor	object of class "Neighborhood".
L2Fam	object of class "L2ParamFamily".
...	additional parameters
tol	the desired accuracy (convergence tolerance).
sampleSize	integer: sample size.
Algo	"A" or "B".
cont	"left" or "right".

Details

To make sure that the results are valid, it is recommended to include an additional check of the IC properties of IC using `checkIC`.

Value

The risk of an IC is computed.

Methods

IC = "IC", risk = "asCov", neighbor = "missing", L2Fam = "missing" asymptotic covariance of IC.

IC = "IC", risk = "asCov", neighbor = "missing", L2Fam = "L2ParamFamily" asymptotic covariance of IC under L2Fam.

IC = "IC", risk = "trAsCov", neighbor = "missing", L2Fam = "missing" asymptotic covariance of IC.

IC = "IC", risk = "trAsCov", neighbor = "missing", L2Fam = "L2ParamFamily" asymptotic covariance of IC under L2Fam.

IC = "IC", risk = "asBias", neighbor = "ContNeighborhood", L2Fam = "missing" asymptotic bias of IC under convex contaminations; uses method `getBiasIC`.

IC = "IC", risk = "asBias", neighbor = "ContNeighborhood", L2Fam = "L2ParamFamily" asymptotic bias of IC under convex contaminations and L2Fam; uses method `getBiasIC`.

IC = "IC", risk = "asBias", neighbor = "TotalVarNeighborhood", L2Fam = "missing" asymptotic bias of IC in case of total variation neighborhoods; uses method `getBiasIC`.

IC = "IC", risk = "asBias", neighbor = "TotalVarNeighborhood", L2Fam = "L2ParamFamily" asymptotic bias of IC under L2Fam in case of total variation neighborhoods; uses method `getBiasIC`.

IC = "IC", risk = "asMSE", neighbor = "UncondNeighborhood", L2Fam = "missing" asymptotic mean square error of IC.

IC = "IC", risk = "asMSE", neighbor = "UncondNeighborhood", L2Fam = "L2ParamFamily" asymptotic mean square error of IC under L2Fam.

IC = "TotalVarIC", risk = "asUnOvShoot", neighbor = "UncondNeighborhood", L2Fam = "missing" asymptotic under-/overshoot risk of IC.

IC = "IC", risk = "fiUnOvShoot", neighbor = "ContNeighborhood", L2Fam = "missing" finite-sample under-/overshoot risk of IC.

IC = "IC", risk = "fiUnOvShoot", neighbor = "TotalVarNeighborhood", L2Fam = "missing" finite-sample under-/overshoot risk of IC.

Note

This generic function is still under construction.

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

Peter Ruckdeschel <Peter.Ruckdeschel@itwm.fraunhofer.de>

References

Huber, P.J. (1968) Robust Confidence Limits. *Z. Wahrscheinlichkeitstheor. Verw. Geb.* **10**:269–278.

Rieder, H. (1980) Estimates derived from robust tests. *Ann. Stats.* **8**: 106–115.

Rieder, H. (1994) *Robust Asymptotic Statistics*. New York: Springer.

Kohl, M. (2005) *Numerical Contributions to the Asymptotic Theory of Robustness*. Bayreuth: Dissertation.

Ruckdeschel, P. and Kohl, M. (2005) Computation of the Finite Sample Risk of M-estimators on Neighborhoods.

See Also

[getRiskIC, InfRobModel-class](#)

getweight-methods *Generating weights*

Description

Generates weight functions of Hampel / BdSt type for different bias and norm types.

Usage

```
getweight(Weight, neighbor, biastype, ...)
minbiasweight(Weight, neighbor, biastype, ...)
## S4 method for signature 'HampelWeight,ContNeighborhood,BiasType'
getweight(Weight, neighbor, biastype, normW)
## S4 method for signature 'HampelWeight,ContNeighborhood,BiasType'
minbiasweight(Weight, neighbor, biastype, normW)
## S4 method for signature 'HampelWeight,ContNeighborhood,onesidedBias'
getweight(Weight, neighbor, biastype, ...)
```

```

## S4 method for signature 'HampelWeight,ContNeighborhood,onesidedBias'
minbiasweight(Weight, neighbor, biastype, ...)
## S4 method for signature 'HampelWeight,ContNeighborhood,asymmetricBias'
getweight(Weight, neighbor, biastype, ...)
## S4 method for signature 'HampelWeight,ContNeighborhood,asymmetricBias'
minbiasweight(Weight, neighbor, biastype, ...)
## S4 method for signature 'BdStWeight,TotalVarNeighborhood,BiasType'
getweight(Weight, neighbor, biastype, ...)
## S4 method for signature 'BdStWeight,TotalVarNeighborhood,BiasType'
minbiasweight(Weight, neighbor, biastype, ...)

```

Arguments

Weight	Object of class "RobWeight".
neighbor	Object of class "Neighborhood".
biastype	Object of class "BiasType".
normW	Object of class "NormType" — only for signature HampelWeight,ContNeighborhood,BiasType.
...	possibly additional (unused) arguments — like in a call to the less specific methods.

Details

These functions generate the weight function in slot `weight` in a corresp. object of class `RobWeight` and descendants.

Value

Object of class "HampelWeight" resp. "BdStWeight"

Methods

getweight signature(Weight = "HampelWeight", neighbor = "ContNeighborhood", biastype = "BiasType") with additional argument `biastype` of class "BiasType": produces weight slot...

minbiasweight signature(Weight = "HampelWeight", neighbor = "ContNeighborhood", biastype = "BiasType") with additional argument `biastype` of class "BiasType": produces weight slot...

getweight signature(Weight = "HampelWeight", neighbor = "ContNeighborhood", biastype = "onesidedBias"): produces weight slot...

minbiasweight signature(Weight = "HampelWeight", neighbor = "ContNeighborhood", biastype = "onesidedBias"): produces weight slot...

getweight signature(Weight = "HampelWeight", neighbor = "ContNeighborhood", biastype = "asymmetricBias"): produces weight slot...

minbiasweight signature(Weight = "HampelWeight", neighbor = "ContNeighborhood", biastype = "asymmetricBias"): produces weight slot...

getweight signature(Weight = "BdStWeight", neighbor = "TotalVarNeighborhood", biastype = "BiasType"): produces weight slot...

minbiasweight signature(Weight = "BdStWeight", neighbor = "TotalVarNeighborhood", biastype = "BiasType"): produces weight slot...

Author(s)

Peter Ruckdeschel <Peter.Ruckdeschel@itwm.fraunhofer.de>

References

Hampel et al. (1986) *Robust Statistics*. The Approach Based on Influence Functions. New York: Wiley.

Rieder, H. (1994) *Robust Asymptotic Statistics*. New York: Springer.

Kohl, M. (2005) *Numerical Contributions to the Asymptotic Theory of Robustness*. Bayreuth: Dissertation.

See Also

[BdStWeight-class](#), [HampelWeight-class](#), [IC-class](#)

HampelWeight-class *Robust Weight classes for weights of Hampel type*

Description

Classes for weights of Hampel type.

Objects from the Class

Objects can be created by calls of the form `new("HampelWeight", ...)`; to fill slot `weight`, you will use the generating functions `getweight` and `minbiasweight`.

Slots

`name` Object of class "character"; inherited from class `RobWeight`.

`weight` Object of class "function" — the weight function; inherited from class `RobWeight`.

`clip` Object of class "numeric" — clipping bound(s); inherited from class `BoundedWeight`.

`stand` Object of class "matrix" — standardization; inherited from class `BdStWeight`.

`cent` Object of class "numeric" — centering.

Extends

Class "RobWeight", via class "BoundedWeight". Class "BoundedWeight", via class "BdStWeight".

Class "BdStWeight", directly.

Methods

cent signature(object = "HampelWeight"): accessor function for slot cent.

cent<- signature(object = "HampelWeight", value = "matrix"): replacement function for slot cent. This replacement method should be used with great care, as the slot weight is not simultaneously updated and hence, this may lead to inconsistent objects.

Author(s)

Peter Ruckdeschel <Peter.Ruckdeschel@itwm.fraunhofer.de>

References

Hampel et al. (1986) *Robust Statistics. The Approach Based on Influence Functions*. New York: Wiley.

Rieder, H. (1994) *Robust Asymptotic Statistics*. New York: Springer.

Kohl, M. (2005) *Numerical Contributions to the Asymptotic Theory of Robustness*. Bayreuth: Dissertation.

See Also

[BdStWeight-class](#), [BoundedWeight-class](#), [RobWeight-class](#), [IC](#), [InfluenceCurve-class](#)

Examples

```
## prototype
new("HampelWeight")
```

HampIC-class

Influence curve of Hampel type

Description

Class of (partial) influence curves of Hampel (= total variation or contamination) type; used as common mother class for classes ContIC and TotalVarIC.

Objects from the Class

Objects can be created by calls of the form `new("HampIC", ...)`.

Slots

CallL2Fam object of class "call": creates an object of the underlying L2-differentiable parametric family.

name object of class "character"

Curve object of class "EuclRandVarList"

modifyIC Object of class "OptionalFunction": function of two arguments, which are an L2 parametric family and an optional influence curve. Returns an object of class "IC". This slot is mainly used for internal computations!

Risks object of class "list": list of risks; cf. [RiskType-class](#).

Infos object of class "matrix" with two columns named method and message: additional informations.

stand object of class "matrix": standardizing matrix.

weight object of class "RobWeight": weight function

biastype object of class "BiasType": bias type (symmetric/onsided/asymmetric)

normtype object of class "NormType": norm type (Euclidean, information/self-standardized)

lowerCase object of class "OptionalNumeric": optional constant for lower case solution.

neighborRadius object of class "numeric": radius of the corresponding (unconditional) contamination neighborhood.

Extends

Class "IC", directly.

Class "InfluenceCurve", by class "IC".

Methods

stand signature(object = "HampIC"): accessor function for slot stand.

weight signature(object = "HampIC"): accessor function for slot weight.

biastype signature(object = "HampIC"): accessor function for slot biastype.

normtype signature(object = "HampIC"): accessor function for slot normtype.

lowerCase signature(object = "HampIC"): accessor function for slot lowerCase.

neighborRadius signature(object = "HampIC"): accessor function for slot neighborRadius.

neighborRadius<- signature(object = "HampIC"): replacement function for slot neighborRadius.

Author(s)

Peter Ruckdeschel <Peter.Ruckdeschel@itwm.fraunhofer.de>

References

Rieder, H. (1994) *Robust Asymptotic Statistics*. New York: Springer.

Kohl, M. (2005) *Numerical Hampributions to the Asymptotic Theory of Robustness*. Bayreuth: Dissertation.

See Also

[IC-class](#)

Examples

```
IC1 <- new("HampIC")
plot(IC1)
```

 IC *Generating function for IC-class*

Description

Generates an object of class "IC".

Usage

```
IC(name, Curve = EuclRandVarList(RealRandVariable(Map = list(function(x){x}),
                                                Domain = Reals())),
  Risks, Infos, CallL2Fam = call("L2ParamFamily"), modifyIC = NULL)
```

Arguments

name	Object of class "character"; the name of the IC.
CallL2Fam	object of class "call": creates an object of the underlying L2-differentiable parametric family.
Curve	object of class "EuclRandVarList".
Risks	object of class "list": list of risks; cf. RiskType-class .
Infos	matrix of characters with two columns named method and message: additional informations.
modifyIC	Object of class "OptionalFunction": function of two arguments, which are an L2 parametric family and an optional influence curve. Returns an object of class "IC" at the parameter value of the L2 parametric family. This function is mainly used for internal computations!

Value

Object of class "IC"

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

References

Hampel et al. (1986) *Robust Statistics*. The Approach Based on Influence Functions. New York: Wiley.

Rieder, H. (1994) *Robust Asymptotic Statistics*. New York: Springer.

Kohl, M. (2005) *Numerical Contributions to the Asymptotic Theory of Robustness*. Bayreuth: Dissertation.

See Also

[IC-class](#)

Examples

```
IC1 <- IC()
plot(IC1)
```

 IC-class

Influence curve

Description

Class of (partial) influence curves.

Objects from the Class

Objects can be created by calls of the form `new("IC", ...)`. More frequently they are created via the generating function `IC`.

Slots

`CallL2Fam` Object of class "call": creates an object of the underlying L2-differentiable parametric family.

`modifyIC` Object of class "OptionalFunction": function of two arguments, which are an L2 parametric family and an optional influence curve. Returns an object of class "IC". This slot is mainly used for internal computations!

`name` Object of class "character".

`Curve` Object of class "EuclRandVarList".

`Risks` Object of class "list": list of risks; cf. [RiskType-class](#).

`Infos` Object of class "matrix" with two columns named `method` and `message`: additional informations.

Extends

Class "InfluenceCurve", directly.

Methods

CallL2Fam signature(object = "IC"): accessor function for slot `CallL2Fam`.

CallL2Fam<- signature(object = "IC"): replacement function for slot `CallL2Fam`.

modifyIC signature(object = "IC"): accessor function for slot `modifyIC`.

checkIC signature(IC = "IC", L2Fam = "missing"): check centering and Fisher consistency of IC assuming the L2-differentiable parametric family which can be generated via the slot `CallL2Fam` of IC.

checkIC signature(IC = "IC", L2Fam = "L2ParamFamily"): check centering and Fisher consistency of IC assuming the L2-differentiable parametric family `L2Fam`.

evalIC signature(IC = "IC", x = "numeric"): evaluate IC at x.

evalIC signature(IC = "IC", x = "matrix"): evaluate IC at the rows of x.
infoPlot signature(object = "IC"): Plot absolute and relative information of IC.
plot signature(x = "IC", y = "missing")
show signature(object = "IC")

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

References

Hampel et al. (1986) *Robust Statistics. The Approach Based on Influence Functions*. New York: Wiley.
 Rieder, H. (1994) *Robust Asymptotic Statistics*. New York: Springer.
 Kohl, M. (2005) *Numerical Contributions to the Asymptotic Theory of Robustness*. Bayreuth: Dissertation.

See Also

[InfluenceCurve-class, IC](#)

Examples

```
IC1 <- new("IC")
plot(IC1)
```

InfluenceCurve

Generating function for InfluenceCurve-class

Description

Generates an object of class "InfluenceCurve".

Usage

```
InfluenceCurve(name, Curve = EuclRandVarList(EuclRandVariable(Domain = Reals())),
               Risks, Infos)
```

Arguments

name	character string: name of the influence curve
Curve	object of class "EuclRandVarList"
Risks	list of risks
Infos	matrix of characters with two columns named method and message: additional informations

Value

Object of class "InfluenceCurve"

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

References

Hampel et al. (1986) *Robust Statistics*. The Approach Based on Influence Functions. New York: Wiley.

Rieder, H. (1994) *Robust Asymptotic Statistics*. New York: Springer.

Kohl, M. (2005) *Numerical Contributions to the Asymptotic Theory of Robustness*. Bayreuth: Dissertation.

See Also

[InfluenceCurve-class](#)

Examples

```
InfluenceCurve()

## The function is currently defined as
InfluenceCurve <- function(name, Curve = EuclRandVarList(EuclRandVariable(Domain = Reals())),
                          Risks, Infos){
  if(missing(name))
    name <- "influence curve"
  if(missing(Risks))
    Risks <- list()
  if(missing(Infos))
    Infos <- matrix(c(character(0),character(0)), ncol=2,
                    dimnames=list(character(0), c("method", "message")))

  return(new("InfluenceCurve", name = name, Curve = Curve,
            Risks = Risks, Infos = Infos))
}
```

InfluenceCurve-class *Influence curve*

Description

Class of influence curves (functions).

Objects from the Class

Objects can be created by calls of the form `new("InfluenceCurve", ...)`. More frequently they are created via the generating function `InfluenceCurve`.

Slots

name object of class "character"
Curve object of class "EuclRandVarList"
Risks object of class "list": list of risks; cf. [RiskType-class](#).
Infos object of class "matrix" with two columns named method and message: additional informations.

Methods

name signature(object = "InfluenceCurve"): accessor function for slot name.
name<- signature(object = "InfluenceCurve"): replacement function for slot name.
Curve signature(object = "InfluenceCurve"): accessor function for slot Curve.
Map signature(object = "InfluenceCurve"): accessor function for slot Map of slot Curve.
Domain signature(object = "InfluenceCurve"): accessor function for slot Domain of slot Curve.
Range signature(object = "InfluenceCurve"): accessor function for slot Range of slot Curve.
Infos signature(object = "InfluenceCurve"): accessor function for slot Infos.
Infos<- signature(object = "InfluenceCurve"): replacement function for slot Infos.
addInfo<- signature(object = "InfluenceCurve"): function to add an information to slot Infos.
Risks signature(object = "InfluenceCurve"): accessor function for slot Risks.
Risks<- signature(object = "InfluenceCurve"): replacement function for slot Risks.
addRisk<- signature(object = "InfluenceCurve"): function to add a risk to slot Risks.
show signature(object = "InfluenceCurve")

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

References

Hampel et al. (1986) *Robust Statistics. The Approach Based on Influence Functions*. New York: Wiley.
 Rieder, H. (1994) *Robust Asymptotic Statistics*. New York: Springer.
 Kohl, M. (2005) *Numerical Contributions to the Asymptotic Theory of Robustness*. Bayreuth: Dissertation.

See Also

[InfluenceCurve](#), [RiskType-class](#)

Examples

```
new("InfluenceCurve")
```

 infoPlot

Plot absolute and relative information

Description

Plot absolute and relative information of influence curves.

Usage

```
infoPlot(object, ...)
## S4 method for signature 'IC'
infoPlot(object, data = NULL, ...,
         withSweave = getdistrOption("withSweave"),
         col = par("col"), lwd = par("lwd"), lty,
         colI = grey(0.5), lwdI = 0.7*par("lwd"), ltyI = "dotted",
         main = FALSE, inner = TRUE, sub = FALSE,
         col.inner = par("col.main"), cex.inner = 0.8,
         bmar = par("mar")[1], tmar = par("mar")[3],
         with.legend = TRUE, legend.bg = "white",
         legend.location = "bottomright", legend.cex = 0.8,
         mfColRow = TRUE, to.draw.arg = NULL,
         cex.pts = 1, col.pts = par("col"),
         pch.pts = 1, jitter.fac = 1, with.lab = FALSE,
         lab.pts = NULL, lab.font = NULL,
         which.lbs = NULL, which.Order = NULL, return.Order = FALSE,
         ylab.abs = "absolute information",
         ylab.rel = "relative information")
```

Arguments

object	object of class "InfluenceCurve"
data	optional data argument — for plotting observations into the plot;
withSweave	logical: if TRUE (for working with Sweave) no extra device is opened
main	logical: is a main title to be used? or just as argument main in plot.default .
inner	logical: do panels have their own titles? or character vector of / cast to length 'number of compared dimensions'; if argument to.draw.arg is used, this refers to a vector of length 1 (absolute information) + length(to.draw.arg), the actually plotted relative informations. For further information, see also main in plot.default .
sub	logical: is a sub-title to be used? or just as argument sub in plot.default .
tmar	top margin – useful for non-standard main title sizes
bmar	bottom margin – useful for non-standard sub title sizes
col	color of IC in argument object.

lwd	linewidth of IC in argument object.
lty	line-type of IC in argument object.
colI	color of the classically optimal IC
lwdI	linewidth of the classically optimal IC
ltyI	line-type of the classically optimal IC
cex.inner	magnification to be used for inner titles relative to the current setting of cex; as in par
col.inner	character or integer code; color for the inner title
with.legend	logical; shall a legend be plotted?
legend.location	a valid argument <i>x</i> for legend — the place where to put the legend on the last issued plot — or a list of length (number of plotted panels) of such arguments, one for each plotted panel.
legend.bg	background color for the legend
legend.cex	magnification factor for the legend
mfColRow	shall default partition in panels be used — defaults to TRUE
to.draw.arg	Either NULL (default; everything is plotted) or a vector making a selection among the relative information plots; the absolute information being plotted in any case. This vector is either a vector of integers (the indices of the subplots to be drawn) or characters — the names of the subplots to be drawn: these names are to be chosen either among the row names of the trafo matrix <code>rownames(trafo(eval(object@CallL2Fam))@par</code> or if the last expression is NULL a vector " <code>dim<dimnr></code> ", <code>dimnr</code> running through the number of rows of the trafo matrix.
cex.pts	size of the points of the data argument plotted
col.pts	color of the points of the data argument plotted
pch.pts	symbol of the points of the data argument plotted
with.lab	logical; shall labels be plotted to the observations?
lab.pts	character or NULL; labels to be plotted to the observations; if NULL observation indices;
lab.font	font to be used for labels
jitter.fac	jittering factor used in case of a <code>DiscreteDistribution</code> for plotting points of the data argument in a jittered fashion.
which.lbs	either an integer vector with the indices of the observations to be plotted into graph or NULL — then no observation is excluded
which.Order	we order the observations (descending) according to the norm given by <code>normtype(object)</code> ; then <code>which.Order</code> either is an integer vector with the indices of the <i>ordered</i> observations (remaining after a possible reduction by argument <code>which.lbs</code>) to be plotted into graph or NULL — then no (further) observation is excluded.
return.Order	logical; if TRUE, a list of length two with order vectors is returned — one for ordering w.r.t. the given IC, one for ordering w.r.t. the classically optimal IC; more specifically, the order of the (remaining) observations given by their original index is returned (remaining means: after a possible reduction by argument <code>which.lbs</code> , and ordering is according to the norm given by <code>normtype(object)</code>); otherwise we return <code>invisible()</code> as usual.

<code>ylab.abs</code>	character; label to be used for y-axis in absolute information panel
<code>ylab.rel</code>	character; label to be used for y-axis in relative information panel
<code>...</code>	further parameters for plot

Details

Absolute information is defined as the square of the length of an IC. The relative information is defined as the absolute information of one component with respect to the absolute information of the whole IC; confer Section 8.1 of Kohl (2005).

Any parameters of `plot.default` may be passed on to this particular plot method.

For main-, inner, and subtitles given as arguments `main`, `inner`, and `sub`, top and bottom margins are enlarged to 5 resp. 6 by default but may also be specified by `tmar` / `bmar` arguments. If `main` / `inner` / `sub` are logical then if the respective argument is FALSE nothing is done/plotted, but if it is TRUE, we use a default main title taking up the calling arguments in case of `main`, default inner titles taking up the class and (named) parameter slots of arguments in case of `inner`, and a "generated on <data>"-tag in case of `sub`. Of course, if `main` / `inner` / `sub` are character, this is used for the title; in case of `inner` it is then checked whether it has correct length. In all title arguments, the following patterns are substituted:

```
"%C" class of argument object
"%A" deparsed argument object
"%D" time/date-string when the plot was generated
```

If argument `...` contains argument `ylim`, this may either be as in `plot.default` (i.e. a vector of length 2) or a vector of length $2 * (\text{number of plotted dimensions} + e)$, where e is 1 or 0 depending on whether absolute information is plotted or not; in the case of longer length, if e is 1, the first two elements are the values for `ylim` in panel "Abs", while the last $2 * (\text{number of plotted dimensions})$ are the values for `ylim` for the plotted dimensions of the IC, one pair for each dimension.

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

References

Kohl, M. (2005) *Numerical Contributions to the Asymptotic Theory of Robustness*. Bayreuth: Dissertation.

See Also

[L2ParamFamily-class](#), [IC-class](#)

Examples

```
N <- NormLocationScaleFamily(mean=0, sd=1)
IC1 <- optIC(model = N, risk = asCov())
infoPlot(IC1)
## selection of subpanels for plotting
```

```

par(mfrow=c(1,2))
infoPlot(IC1, mfColRow = FALSE, to.draw.arg=c("Abs","sd"))
infoPlot(IC1, mfColRow = FALSE, to.draw.arg=c("Abs","mean"),
        panel.first= grid(), ylim = c(0,4), xlim = c(-6,6))
infoPlot(IC1, mfColRow = FALSE, to.draw.arg=c("Abs","mean"),
        panel.first= grid(), ylim = c(0,4,-3,3), xlim = c(-6,6))
par(mfrow=c(1,3))
infoPlot(IC1, mfColRow = FALSE, panel.first= grid(),
        ylim = c(0,4,0,.3,0,.8), xlim=c(-6,6))
par(mfrow=c(1,1))
data <- r(N)(20)
par(mfrow=c(1,3))
infoPlot(IC1, data=data, mfColRow = FALSE, panel.first= grid(),
        with.lab = TRUE, cex.pts=2,
        which.lbs = c(1:4,15:20), which.Order = 1:6,
        return.Order = TRUE)
infoPlot(IC1, data=data[1:10], mfColRow = FALSE, panel.first= grid(),
        with.lab = TRUE, cex.pts=0.7)
par(mfrow=c(1,1))

```

InfRobModel

Generating function for InfRobModel-class

Description

Generates an object of class "InfRobModel".

Usage

```
InfRobModel(center = L2ParamFamily(), neighbor = ContNeighborhood())
```

Arguments

center	object of class "ProbFamily"
neighbor	object of class "UncondNeighborhood"

Value

Object of class "FixRobModel"

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

References

Rieder, H. (1994) *Robust Asymptotic Statistics*. New York: Springer.
 Kohl, M. (2005) *Numerical Contributions to the Asymptotic Theory of Robustness*. Bayreuth: Dissertation.

See Also

[RobModel-class](#), [FixRobModel-class](#)

Examples

```
(M1 <- InfRobModel())

## The function is currently defined as
function(center = L2ParamFamily(), neighbor = ContNeighborhood()){
  new("InfRobModel", center = center, neighbor = neighbor)
}
```

InfRobModel-class *Robust model with infinitesimal (unconditional) neighborhood*

Description

Class of robust models with infinitesimal (unconditional) neighborhoods; i.e., the neighborhood is shrinking at a rate of \sqrt{n} .

Objects from the Class

Objects can be created by calls of the form `new("InfRobModel", ...)`. More frequently they are created via the generating function `InfRobModel`.

Slots

`center` Object of class "ProbFamily".
`neighbor` Object of class "UncondNeighborhood".

Extends

Class "RobModel", directly.

Methods

neighbor<- signature(object = "InfRobModel"): replacement function for slot neighbor<-
show signature(object = "InfRobModel")

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

References

Rieder, H. (1994) *Robust Asymptotic Statistics*. New York: Springer.
 Kohl, M. (2005) *Numerical Contributions to the Asymptotic Theory of Robustness*. Bayreuth: Dissertation.

See Also

[ProbFamily-class](#), [UncondNeighborhood-class](#), [InfRobModel](#)

Examples

```
new("InfRobModel")
```

kStepEstimate-class *kStepEstimate-class*.

Description

Class of asymptotically linear estimates.

Objects from the Class

Objects can be created by calls of the form `new("kStepEstimate", ...)`. More frequently they are created via the generating function `kStepEstimator`.

Slots

`name` Object of class "character": name of the estimator.

`estimate` Object of class "ANY": estimate.

`estimate.call` Object of class "call": call by which estimate was produced.

`samplesize` object of class "numeric" — the samplesize (only complete cases are counted) at which the estimate was evaluated.

`completecases`: object of class "logical" — complete cases at which the estimate was evaluated.

`asvar` object of class "OptionalNumericOrMatrix" which may contain the asymptotic (co)variance of the estimator.

`asbias` Optional object of class "numeric": asymptotic bias.

`pIC` Optional object of class InfluenceCurve: influence curve.

`nuis.idx` object of class "OptionalNumeric": indices of estimate belonging to the nuisance part.

`fixed` object of class "OptionalNumeric": the fixed and known part of the parameter.

`steps` Object of class "integer": number of steps.

`Infos` object of class "matrix" with two columns named `method` and `message`: additional informations.

`trafo` object of class "list": a list with components `fct` and `mat` (see below).

`untransformed.estimate`: Object of class "ANY": untransformed estimate.

`untransformed.asvar`: object of class "OptionalNumericOrMatrix" which may contain the asymptotic (co)variance of the untransformed estimator.

`pICList` Optional object of class "OptionalpICList": the list of (intermediate) (partial) influence curves used; only filled when called from `kStepEstimator` with argument `withPICList==TRUE`.

ICList Optional object of class "OptionalpICList": the list of (intermediate) (total) influence curves used; only filled when called from `kStepEstimator` with argument `withICList==TRUE`.

start The argument `start` — of class "StartClass" used in call to `kStepEstimator`.

startval Object of class `matrix`: the starting value with which the `k`-step Estimator was initialized (in p -space / transformed).

ustartval Object of class `matrix`: the starting value with which the `k`-step Estimator was initialized (in k -space / untransformed).

ksteps Object of class "OptionalMatrix": the intermediate estimates (in p -space) for the parameter; only filled when called from `kStepEstimator`.

uksteps Object of class "OptionalMatrix": the intermediate estimates (in k -space) for the parameter; only filled when called from `kStepEstimator`.

Extends

Class "ALEstimate", directly.
 Class "Estimate", by class "ALEstimate"

Methods

steps signature(object = "kStepEstimate"): accessor function for slot `steps`.

ksteps signature(object = "kStepEstimate"): accessor function for slot `ksteps`; has additional argument `diff`, defaulting to `FALSE`; if the latter is `TRUE`, the starting value from slot `startval` is prepended as first column; otherwise we return the corresponding increments in each step.

uksteps signature(object = "kStepEstimate"): accessor function for slot `uksteps`; has additional argument `diff`, defaulting to `FALSE`; if the latter is `TRUE`, the starting value from slot `ustartval` is prepended as first column; otherwise we return the corresponding increments in each step.

start signature(object = "kStepEstimate"): accessor function for slot `start`.

startval signature(object = "kStepEstimate"): accessor function for slot `startval`.

ustartval signature(object = "kStepEstimate"): accessor function for slot `ustartval`.

ICList signature(object = "kStepEstimate"): accessor function for slot `ICList`.

pICList signature(object = "kStepEstimate"): accessor function for slot `pICList`.

show signature(object = "kStepEstimate"): a show method;

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

See Also

[ALEstimate-class](#)

kStepEstimator *Function for the computation of k-step estimates*

Description

Function for the computation of k-step estimates.

Usage

```
kStepEstimator(x, IC, start = NULL, steps = 1L,
  useLast = getRobAStBaseOption("kStepUseLast"),
  withUpdateInKer = getRobAStBaseOption("withUpdateInKer"),
  IC.UpdateInKer = getRobAStBaseOption("IC.UpdateInKer"),
  withICList = getRobAStBaseOption("withICList"),
  withPICList = getRobAStBaseOption("withPICList"),
  na.rm = TRUE, startArgList = NULL, ...)
```

Arguments

x	sample
IC	object of class "IC"
start	initial estimate (for full parameter, i.e. in dimension k respective joint length of main and nuisance part of the parameter): either a numerical value, or an object of class "Estimate" or a function producing either a numerical value, or an object of class "Estimate" when evaluated at x, \dots ; if missing or NULL, we use slot startPar of the L2family L2Fam from within IC
steps	integer: number of steps
useLast	which parameter estimate (initial estimate or k-step estimate) shall be used to fill the slots pIC, asvar and asbias of the return value.
withUpdateInKer	if there is a non-trivial trafo in the model with matrix D , shall the parameter be updated on $\ker(D)$?
IC.UpdateInKer	if there is a non-trivial trafo in the model with matrix D , the IC to be used for this; if NULL the result of getboundedIC(L2Fam, D) is taken; this IC will then be projected onto $\ker(D)$.
na.rm	logical: if TRUE, the estimator is evaluated at complete.cases(x).
startArgList	a list of arguments to be given to argument start if the latter is a function; this list by default already starts with two unnamed items, the sample x , and the model eval(CallL2Fam(IC)).
withPICList	logical: shall slot pICList of return value be filled?
withICList	logical: shall slot ICList of return value be filled?
...	additional parameters

Details

Given an initial estimation `start`, a sample `x` and an influence curve `IC` the corresponding `k`-step estimator is computed.

The default value of argument `useLast` is set by the global option `kStepUseLast` which by default is set to `FALSE`. In case of general models `useLast` remains unchanged during the computations. However, if slot `CallL2Fam` of `IC` generates an object of class `"L2GroupParamFamily"` the value of `useLast` is changed to `TRUE`. Explicitly setting `useLast` to `TRUE` should be done with care as in this situation the influence curve is re-computed using the value of the one-step estimate which may take quite a long time depending on the model.

If `useLast` is set to `TRUE` and slot `modifyIC` of `IC` is filled with some function (which can be used to re-compute the `IC` for a different parameter), the computation of `asvar`, `asbias` and `IC` is based on the `k`-step estimate.

Value

Object of class `"kStepEstimate"`.

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>,
Peter Ruckdeschel <Peter.Ruckdeschel@itwm.fraunhofer.de>

References

- Rieder, H. (1994) *Robust Asymptotic Statistics*. New York: Springer.
Kohl, M. (2005) *Numerical Contributions to the Asymptotic Theory of Robustness*. Bayreuth: Dissertation.

See Also

[IC-class](#), [kStepEstimate-class](#)

Examples

```
if(require(ROptEst)){
## 1. generate a contaminated sample
ind <- rbinom(100, size=1, prob=0.05)
x <- rnorm(100, mean=0, sd=(1-ind) + ind*9)

## 2. Kolmogorov(-Smirnov) minimum distance estimator
(est0 <- MDEstimator(x=x, NormLocationScaleFamily()))

## 3. k-step estimation: radius known
N1 <- NormLocationScaleFamily(mean=estimate(est0)["mean"], sd=estimate(est0)["sd"])
N1.Rob <- InfRobModel(center = N1, neighbor = ContNeighborhood(radius = 0.5))
IC1 <- optIC(model = N1.Rob, risk = asMSE())
(est1 <- kStepEstimator(x, IC1, est0, steps = 3, withPIC = TRUE))
estimate(est1)
ksteps(est1)
```

```

pICList(est1)
start(est1)

## a transformed model
tfct <- function(x){
  nms0 <- c("mean", "sd")
  nms <- "comb"
  fval0 <- x[1]+2*x[2]
  names(fval0) <- nms
  mat0 <- matrix(c(1,2), nrow = 1, dimnames = list(nms,nms0))
  return(list(fval = fval0, mat = mat0))
}

N1.traf <- N1; trafo(N1.traf) <- tfct
N1R.traf <- N1.Rob; trafo(N1R.traf) <- tfct
IC1.traf <- optIC(model = N1R.traf, risk = asMSE())
(est0.traf <- MDEstimator(x, N1.traf))
(est1.traf <- kStepEstimator(x, IC1.traf, est0, steps = 3,
  withIC = TRUE, withPIC = TRUE, withUpdateInKer = FALSE))
(est1a.traf <- kStepEstimator(x, IC1.traf, est0, steps = 3,
  withIC = TRUE, withPIC = TRUE, withUpdateInKer = TRUE))
estimate(est1.traf)
ksteps(est1.traf)
pICList(est1.traf)
startval(est1.traf)

untransformed.estimate(est1.traf)
uksteps(est1.traf)
ICList(est1.traf)
ustartval(est1.traf)

estimate(est1a.traf)
ksteps(est1a.traf)
pICList(est1a.traf)
startval(est1a.traf)

untransformed.estimate(est1a.traf)
uksteps(est1a.traf)
ICList(est1a.traf)
ustartval(est1a.traf)
}

```

kStepEstimator.start-methods

Methods for function kStepEstimator.start in Package 'RobAStBase'

Description

kStepEstimator.start-methods; these are called from within kStepEstimator to produce a numeric value of for the starting estimator in the end.

Usage

```

kStepEstimator.start(start, ...)
## S4 method for signature 'numeric'
kStepEstimator.start(start, nrvalues, ...)
## S4 method for signature 'Estimate'
kStepEstimator.start(start, nrvalues, ...)
## S4 method for signature 'function'
kStepEstimator.start(start, x, nrvalues, na.rm, L2Fam, startList)

```

Arguments

start	the start slot of an object of class kStepEstimator
nrvalues	numeric; dimension k of the original model, i.e.; length of the untransformed parameter, or joint length of main and nuisance part of the parameter.
x	the data at which the starting estimator is to be evaluated.
na.rm	logical: if TRUE, the estimator is evaluated at <code>complete.cases(x)</code> .
startList	a list of arguments to be given to the call to <code>start</code> if this is a function;
L2Fam	the parametric family;
...	further arguments for <code>kStepEstimator.start</code> .

Value

a numeric vector with the corresponding value of the start estimator (in k space)

Methods

kStepEstimator.start signature(`start = "numeric"`): returns the unchanged argument `start` if it has the correct length; otherwise throws an error.

kStepEstimator.start signature(`start = "Estimate"`): returns slot `untransformed.estimate` of `start` if it is not NULL, and else slot `estimate` if the latter has dimension `nrvalues`.

kStepEstimator.start signature(`start = "function"`): returns `kStepEstimator.start(do.call(start, args=c(list(x,L2Fam),startList)))` where, if `na.rm == TRUE`, beforehand `x` has been modified to `x <- complete.cases(x)`.

Author(s)

Peter Ruckdeschel <Peter.Ruckdeschel@itwm.fraunhofer.de>

References

Rieder, H. (1994) *Robust Asymptotic Statistics*. New York: Springer.

See Also

[kStepEstimator](#), [ALEstimate-class](#)

`locMEstimator`*Generic function for the computation of location M estimates*

Description

Generic function for the computation of location M estimates.

Usage

```
locMEstimator(x, IC, ...)  
  
## S4 method for signature 'numeric,InfluenceCurve'  
locMEstimator(x, IC, eps = .Machine$double.eps^0.5, na.rm = TRUE)
```

Arguments

<code>x</code>	sample
<code>IC</code>	object of class "InfluenceCurve"
<code>...</code>	additional parameters
<code>eps</code>	the desired accuracy (convergence tolerance).
<code>na.rm</code>	logical: if TRUE, the estimator is evaluated at <code>complete.cases(x)</code> .

Details

Given some sample `x` and some influence curve `IC` an M estimate is computed by solving the corresponding M equation.

Value

Object of class "MEstimate"

Methods

`x = "numeric", IC = "InfluenceCurve"` univariate location.

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

References

Huber, P.J. (1964) Robust estimation of a location parameter. *Ann. Math. Stat.* **35**: 73–101.
Rieder, H. (1994) *Robust Asymptotic Statistics*. New York: Springer.
Kohl, M. (2005) *Numerical Contributions to the Asymptotic Theory of Robustness*. Bayreuth: Dissertation.

See Also

[InfluenceCurve-class](#), [MEstimate-class](#)

makeIC-methods	<i>Generic Function for making ICs consistent at a possibly different model</i>
----------------	---

Description

Generic function for providing centering and Fisher consistency of ICs.

Usage

```
makeIC(IC, L2Fam, ...)
## S4 method for signature 'IC,missing'
makeIC(IC)
## S4 method for signature 'IC,L2ParamFamily'
makeIC(IC, L2Fam)
## S4 method for signature 'list,L2ParamFamily'
makeIC(IC, L2Fam, forceIC = TRUE, name, Risks,
       Infos, modifyIC = NULL)
## S4 method for signature 'function,L2ParamFamily'
makeIC(IC, L2Fam, forceIC = TRUE, name,
       Risks, Infos, modifyIC = NULL)
```

Arguments

IC	object of class "IC" for signature IC="IC", respectively a list of functions in one argument for signature IC="list", respectively a function in one argument for signature IC="function".
L2Fam	L2-differentiable family of probability measures; may be missing.
forceIC	logical; shall centeredness and Fisher consistency be enforced applying an affine linear transformation?
name	Object of class "character"; the name of the IC
Risks	object of class "list": list of risks; cf. RiskType-class .
Infos	matrix of characters with two columns named method and message: additional informations.
modifyIC	Object of class "OptionalFunction": function of two arguments, which are an L2 parametric family and an optional influence curve. Returns an object of class "IC" at the parameter value of the L2 parametric family. This function is mainly used for internal computations!
...	additional parameters

Value

An IC of class "IC" at the model.

Methods

makeIC signature(IC = "IC", L2Fam = "missing"): creates an object of class "IC" at the parametric model of its own slot CallL2Fam; enforces IC conditions centeredness and Fisher consistency, applying an affine linear transformation.

makeIC signature(IC = "IC", L2Fam = "L2ParamFamily"): creates an object of class "IC" at the parametric model L2Fam; enforces IC conditions centeredness and Fisher consistency, applying an affine linear transformation.

makeIC signature(IC = "list", L2Fam = "L2ParamFamily"): creates an object of class "IC" out of a list of functions given by argument IC at the parametric model L2Fam; enforces IC conditions centeredness and Fisher consistency, applying an affine linear transformation.

makeIC signature(IC = "function", L2Fam = "L2ParamFamily"): creates an object of class "IC" out of a function given by argument IC at the parametric model L2Fam; enforces IC conditions centeredness and Fisher consistency, applying an affine linear transformation.

Author(s)

Peter Ruckdeschel <Peter.Ruckdeschel@itwm.fraunhofer.de>

References

Rieder, H. (1994) *Robust Asymptotic Statistics*. New York: Springer.

Kohl, M. (2005) *Numerical Contributions to the Asymptotic Theory of Robustness*. Bayreuth: Dissertation.

See Also

[L2ParamFamily-class](#), [IC-class](#)

Examples

```
## default IC
IC1 <- new("IC")

## L2-differentiable parametric family
B <- BinomFamily(13, 0.3)

## check IC properties
checkIC(IC1, B)

## make IC
IC2 <- makeIC(IC1, B)

## check IC properties
checkIC(IC2)

## slot modifyIC is filled in case of IC2
IC3 <- modifyIC(IC2)(BinomFamily(13, 0.2), IC2)
checkIC(IC3)
## identical to
```

```

checkIC(IC3, BinomFamily(13, 0.2))

IC4 <- makeIC(sin, B)
checkIC(IC4)

(IC5 <- makeIC(list(function(x)x^3), B, name="a try"))
plot(IC5)
checkIC(IC5)

N0 <- NormLocationScaleFamily()
IC6 <- makeIC(list(sin,cos),N0)
plot(IC6)
checkIC(IC6)

getRiskIC(IC6,risk=trAsCov())$trAsCov$value
getRiskIC(IC6,risk=asBias(),neighbor=ContNeighborhood())$asBias$value

```

masked-methods	<i>Masked Methods from Packages 'stats' and 'graphics' in Package 'RobAStBase'</i>
----------------	--

Description

masked methods from packages **stats** and **graphics**

Usage

```

clip(x1,...)
## S4 method for signature 'ANY'
clip(x1,x2,y1,y2)
start(x,...)
## S4 method for signature 'ANY'
start(x,...)

```

Arguments

`x, ...` see [start](#).
`x1,x2,y1,y2` see [clip](#).

Details

In order to make accessible the otherwise masked functions [start](#), [clip](#), we generate corresponding S4-methods.

Value

see [start](#), [clip](#)

Author(s)

Peter Ruckdeschel <Peter.Ruckdeschel@itwm.fraunhofer.de>

MEstimate-class *MEstimate-class.*

Description

Class of asymptotically linear estimates.

Objects from the Class

Objects can be created by calls of the form `new("MEstimate", ...)`. More frequently they are created via the generating function `locMEstimator`.

Slots

`name` Object of class "character": name of the estimator.

`estimate` Object of class "ANY": estimate.

`samplesize` Object of class "numeric": sample size.

`asvar` Optional object of class "matrix": asymptotic variance.

`asbias` Optional object of class "numeric": asymptotic bias.

`pIC` Optional object of class `InfluenceCurve`: influence curve.

`nuis.idx` object of class "OptionalNumeric": indices of estimate belonging to the nuisance part.

`Mroot` Object of class "numeric": value of the M equation at the estimate.

`Infos` object of class "matrix" with two columns named `method` and `message`: additional informations.

Extends

Class "ALEstimate", directly.

Class "Estimate", by class "ALEstimate".

Methods

Mroot `signature(object = "MEstimate")`: accessor function for slot `Mroot`.

show `signature(object = "MEstimate")`

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

See Also

[ALEstimate-class](#)

Examples

```
## prototype  
new("MEstimate")
```

Neighborhood-class *Neighborhood*

Description

Class of neighborhoods of families of probability measures.

Objects from the Class

A virtual Class: No objects may be created from it.

Slots

`type` Object of class "character": type of the neighborhood.

`radius` Object of class "numeric": neighborhood radius.

Methods

type signature(object = "Neighborhood"): accessor function for slot type.

radius signature(object = "Neighborhood"): accessor function for slot radius.

show signature(object = "Neighborhood")

radius<- signature(object = "Neighborhood"): replacement function for slot radius.

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

References

Rieder, H. (1994) *Robust Asymptotic Statistics*. New York: Springer.

Kohl, M. (2005) *Numerical Contributions to the Asymptotic Theory of Robustness*. Bayreuth: Dissertation.

See Also

[ProbFamily-class](#)

oneStepEstimator	<i>Function for the computation of one-step estimates</i>
------------------	---

Description

Function for the computation of one-step estimates.

Usage

```
oneStepEstimator(x, IC, start = NULL,
  useLast = getRobAStBaseOption("kStepUseLast"),
  withUpdateInKer = getRobAStBaseOption("withUpdateInKer"),
  IC.UpdateInKer = getRobAStBaseOption("IC.UpdateInKer"),
  na.rm = TRUE, startArgList = NULL, ...)
```

Arguments

x	sample
IC	object of class "InfluenceCurve"
start	initial estimate (for full parameter, i.e. in dimension k respective joint length of main and nuisance part of the parameter): either a numerical value, or an object of class "Estimate" or a function producing either a numerical value, or an object of class "Estimate" when evaluated at x, \dots ; if missing or NULL, we use slot startPar of the L2family L2Fam from within IC.
useLast	which parameter estimate (initial estimate or one-step estimate) shall be used to fill the slots pIC, asvar and asbias of the return value.
withUpdateInKer	if there is a non-trivial trafo in the model with matrix D , shall the parameter be updated on $\ker(D)$?
IC.UpdateInKer	if there is a non-trivial trafo in the model with matrix D , the IC to be used for this; if NULL the result of getboundedIC(L2Fam, D) is taken; this IC will then be projected onto $\ker(D)$.
na.rm	logical: if TRUE, the estimator is evaluated at complete.cases(x).
startArgList	a list of arguments to be given to argument start if the latter is a function; this list by default already starts with two unnamed items, the sample x, and the model eval(CallL2Fam(IC)); in case IC is not of class IC, the model argument L2Fam will be set to NULL.
...	additional arguments

Details

Given an initial estimation start, a sample x and an influence curve IC the corresponding one-step estimator is computed.

In case IC is an object of class "IC" the slots asvar and asbias of the return value are filled (based on the initial estimate).

The default value of argument `useLast` is set by the global option `kStepUseLast` which by default is set to `FALSE`. In case of general models `useLast` remains unchanged during the computations. However, if slot `CallL2Fam` of `IC` generates an object of class `"L2GroupParamFamily"` the value of `useLast` is changed to `TRUE`. Explicitly setting `useLast` to `TRUE` should be done with care as in this situation the influence curve is re-computed using the value of the one-step estimate which may take quite a long time depending on the model.

If `useLast` is set to `TRUE` and slot `modifyIC` of `IC` is filled with some function (which can be used to re-compute the `IC` for a different parameter), the computation of `asvar`, `asbias` and `IC` is based on the one-step estimate.

Value

Object of class `"kStepEstimate"`

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>,
Peter Ruckdeschel <Peter.Ruckdeschel@itwm.fraunhofer.de>

References

Rieder, H. (1994) *Robust Asymptotic Statistics*. New York: Springer.
Kohl, M. (2005) *Numerical Contributions to the Asymptotic Theory of Robustness*. Bayreuth: Dissertation.

See Also

[InfluenceCurve-class](#), [kStepEstimate-class](#)

optIC

Generic function for the computation of optimally robust ICs

Description

Generic function for the computation of optimally robust ICs.

Usage

```
optIC(model, risk, ...)

## S4 method for signature 'L2ParamFamily,asCov'
optIC(model, risk)
```

Arguments

<code>model</code>	probability model.
<code>risk</code>	object of class <code>"RiskType"</code> .
<code>...</code>	additional parameters.

Details

The classical optimal IC which is optimal in sense of the Cramer-Rao bound is computed.

Value

Some optimally robust IC is computed.

Methods

`model = "L2ParamFamily", risk = "asCov"` computes classical optimal influence curve for L2 differentiable parametric families.

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

References

Rieder, H. (1994) *Robust Asymptotic Statistics*. New York: Springer.

Kohl, M. (2005) *Numerical Contributions to the Asymptotic Theory of Robustness*. Bayreuth: Dissertation.

See Also

[InfluenceCurve-class](#), [RiskType-class](#)

Examples

```
B <- BinomFamily(size = 25, prob = 0.25)

## classical optimal IC
IC0 <- optIC(model = B, risk = asCov())
plot(IC0) # plot IC
checkIC(IC0, B)
```

OptionalInfluenceCurve-class

Some helper Classes in package 'RobASTBase'

Description

Some helper Classes in package 'RobASTBase': Classes `OptionalInfluenceCurve`, `OptionalpICList`, `StartClass`, `pICList`

Class Unions

OptionalInfluenceCurve is a class union of classes InfluenceCurve and NULL — it is the slot class of slot pIC in ALEstimate; OptionalpICList is a class union of classes pICList and NULL — it is the slot class of slot pICList in kStepEstimate; StartClass is a class union of classes function, numeric and Estimate — it is the slot class of slot start in kStepEstimate.

List Classes

pICList is a descendant of class list which requires its members —if any— to be of class pIC.

Methods

show signature(object = "OptionalpICList"): particular show-method.

show signature(object = "pICList"): particular show-method.

Author(s)

Peter Ruckdeschel <peter.ruckdeschel@itwm.fraunhofer.de>

References

Hampel et al. (1986) *Robust Statistics*. The Approach Based on Influence Functions. New York: Wiley.

Rieder, H. (1994) *Robust Asymptotic Statistics*. New York: Springer.

Kohl, M. (2005) *Numerical Contributions to the Asymptotic Theory of Robustness*. Bayreuth: Dissertation.

See Also

[InfluenceCurve](#), [RiskType-class](#)

outlyingPlotIC

Function outlyingPlotIC in Package 'RobAStBase'

Description

outlyingPlotIC produces an outlyingness plot based on distances applied to ICs

Usage

```
outlyingPlotIC(data, IC.x, IC.y = IC.x, dist.x = NormType(),
               dist.y, cutoff.y = cutoff.chisq(), cutoff.x = cutoff.sememp(), ...,
               cutoff.quantile.x = 0.95,
               cutoff.quantile.y = cutoff.quantile.x,
               id.n, lab.pts, adj, cex.idn,
               col.idn, lty.cutoff, lwd.cutoff, col.cutoff,
               main = gettext("Outlyingness by means of a distance-distance plot")
               )
```

Arguments

<code>data</code>	data coercable to <code>matrix</code> ; the data at which to produce the <code>ddPlot</code> .
<code>IC.x</code>	object of class <code>IC</code> the influence curve to produce the distances for the x axis.
<code>IC.y</code>	object of class <code>IC</code> the influence curve to produce the distances for the y axis.
<code>...</code>	further arguments to be passed to <code>plot.default</code> , <code>text</code> , and <code>abline</code>
<code>dist.x</code>	object of class <code>NormType</code> ; the distance for the x axis.
<code>dist.y</code>	object of class <code>NormType</code> ; the distance for the y axis.
<code>cutoff.x</code>	object of class <code>cutoff</code> ; the cutoff information for the x axis (the vertical line discriminating 'good' and 'bad' points).
<code>cutoff.y</code>	object of class <code>cutoff</code> ; the cutoff information for the y axis (the horizontal line discriminating 'good' and 'bad' points).
<code>cutoff.quantile.x</code>	numeric; the cutoff quantile for the x axis.
<code>cutoff.quantile.y</code>	numeric; the cutoff quantile for the y axis.
<code>id.n</code>	a set of indices (or a corresponding logical vector); to select a subset of the data in argument <code>data</code> .
<code>lab.pts</code>	a vector of labels for the (unsubsampled) data.
<code>adj</code>	the corresponding argument for <code>text</code> for labelling the outliers.
<code>cex.idn</code>	the corresponding <code>cex</code> argument for <code>text</code> for labelling the outliers.
<code>col.idn</code>	the corresponding <code>col</code> argument for <code>text</code> for labelling the outliers.
<code>lty.cutoff</code>	the corresponding <code>lty</code> argument for <code>abline</code> for drawing the cutoff lines.
<code>lwd.cutoff</code>	the corresponding <code>lwd</code> argument for <code>abline</code> for drawing the cutoff lines.
<code>col.cutoff</code>	the corresponding <code>col</code> argument for <code>abline</code> for drawing the cutoff lines.
<code>main</code>	the main title.

Details

calls a corresponding `ddPlot` method to produce the plot.

Value

a list with items

<code>id.x</code>	the indices of (possibly transformed) data (within subset <code>id.n</code>) beyond the x-cutoff
<code>id.y</code>	the indices of (possibly transformed) data (within subset <code>id.n</code>) beyond the y-cutoff
<code>id.xy</code>	the indices of (possibly transformed) data (within subset <code>id.n</code>) beyond the x-cutoff and the y-cutoff
<code>qtx</code>	the quantiles of the distances of the (possibly transformed) data in x direction
<code>qty</code>	the quantiles of the distances of the (possibly transformed) data in y direction
<code>cutoff.x.v</code>	the cutoff value in x direction
<code>cutoff.y.v</code>	the cutoff value in y direction

Author(s)

Peter Ruckdeschel <Peter.Ruckdeschel@itwm.fraunhofer.de>

Examples

```
if(require(ROptEst)){
  ## generates normal location and scale family with mean = -2 and sd = 3
  N0 <- NormLocationScaleFamily()
  N0.IC0 <- optIC(model = N0, risk = asCov())
  N0.Rob1 <- InfRobModel(center = N0, neighbor = ContNeighborhood(radius = 0.5))
  N0.IC1 <- optIC(model = N0.Rob1, risk = asMSE())
  xn <- c(rnorm(100),rcauchy(20)+20)
  outlyingPlotIC(xn, IC.x=N0.IC0)
  outlyingPlotIC(xn, IC.x=N0.IC1)
}
```

plot-methods

Methods for Function plot in Package 'RobAStBase'

Description

plot-methods

Usage

```
plot(x, y, ...)
## S4 method for signature 'IC,missing'
plot(x, ..., withSweave = getdistrOption("withSweave"),
      main = FALSE, inner = TRUE, sub = FALSE,
      col.inner = par("col.main"), cex.inner = 0.8,
      bmar = par("mar")[1], tmar = par("mar")[3],
      mfColRow = TRUE, to.draw.arg = NULL)
## S4 method for signature 'IC,numeric'
plot(x, y, ..., cex.pts = 1,
      col.pts = par("col"), pch.pts = 1, jitter.fac = 1,
      with.lab = FALSE, lab.pts = NULL, lab.font = NULL,
      which.lbs = NULL, which.Order = NULL, return.Order = FALSE)
```

Arguments

x	object of class "IC": IC to be plotted
y	missing or numeric (a dataset, e.g.)
withSweave	logical: if TRUE (for working with Sweave) no extra device is opened
main	logical: is a main title to be used? or just as argument main in plot.default .

inner	logical: do panels have their own titles? or character vector of / cast to length 'number of plotted dimensions'; if argument <code>to.draw.arg</code> is used, this refers to a vector of length <code>length(to.draw.arg)</code> , the actually plotted dimensions. For further information, see also description of argument <code>main</code> in <code>plot.default</code> .
sub	logical: is a sub-title to be used? or just as argument <code>sub</code> in <code>plot.default</code> .
tmar	top margin – useful for non-standard main title sizes
bmar	bottom margin – useful for non-standard sub title sizes
cex.inner	magnification to be used for inner titles relative to the current setting of <code>cex</code> ; as in <code>par</code>
col.inner	character or integer code; color for the inner title
mfColRow	shall default partition in panels be used — defaults to TRUE
to.draw.arg	Either NULL (default; everything is plotted) or a vector of either integers (the indices of the subplots to be drawn) or characters — the names of the subplots to be drawn: these names are to be chosen either among the row names of the <code>trafo</code> matrix <code>rownames(trafo(eval(x@CallL2Fam)@param))</code> or if the last expression is NULL a vector " <code>dim<dimnr></code> ", <code>dimnr</code> running through the number of rows of the <code>trafo</code> matrix.
cex.pts	size of the points of the second argument plotted
col.pts	color of the points of the second argument plotted
pch.pts	symbol of the points of the second argument plotted
with.lab	logical; shall labels be plotted to the observations?
lab.pts	character or NULL; labels to be plotted to the observations; if NULL observation indices;
lab.font	font to be used for labels
jitter.fac	jittering factor used in case of a <code>DiscreteDistribution</code> for plotting points of the second argument in a jittered fashion.
which.lbs	either an integer vector with the indices of the observations to be plotted into graph or NULL — then no observation is excluded
which.Order	we order the observations (descending) according to the norm given by <code>normtype(object)</code> ; then <code>which.Order</code> either is an integer vector with the indices of the <i>ordered</i> observations (remaining after a possible reduction by argument <code>which.lbs</code>) to be plotted into graph or NULL — then no (further) observation is excluded.
return.Order	logical; if TRUE, an order vector is returned; more specifically, the order of the (remaining) observations given by their original index is returned (remaining means: after a possible reduction by argument <code>which.lbs</code> , and ordering is according to the norm given by <code>normtype(object)</code>); otherwise we return <code>invisible()</code> as usual.
...	further parameters for <code>plot</code>

Details

Any parameters of `plot.default` may be passed on to this particular plot method.

We start describing the IC,missing-method: For main-, inner, and subtitles given as arguments `main`, `inner`, and `sub`, top and bottom margins are enlarged to 5 resp. 6 by default but may also be specified by `tmar` / `bmar` arguments. If `main` / `inner` / `sub` are logical then if the respective argument is `FALSE` nothing is done/plotted, but if it is `TRUE`, we use a default main title taking up the calling arguments in case of `main`, default inner titles taking up the class and (named) parameter slots of arguments in case of `inner`, and a "generated on <data>"-tag in case of `sub`. Of course, if `main` / `inner` / `sub` are character, this is used for the title; in case of `inner` it is then checked whether it has correct length. In all title arguments, the following patterns are substituted:

```
"%C" class of argument object
"%A" deparsed argument object
"%D" time/date-string when the plot was generated
```

If argument `...` contains argument `ylim`, this may either be as in `plot.default` (i.e. a vector of length 2) or a vector of length $2 \times (\text{number of plotted dimensions} + 2)$, where the first two elements are the values for `ylim` in panel "d", the first two are for `ylim` resp. `xlim` for panels "p" and "q", and the last $2 \times (\text{number of plotted dimensions})$ are the values for `ylim` for the plotted dimensions of the L2derivative, one pair for each dimension.

The IC,numeric-method calls the IC,missing-method but in addition plots the values of a dataset into the IC.

Examples

```
IC1 <- new("IC")
plot(IC1)
plot(IC1, main = TRUE, panel.first= grid(),
      col = "blue", cex.main = 2, cex.inner = 1)

### selection of subpanels for plotting
N <- NormLocationScaleFamily(mean=0, sd=1)
IC2 <- optIC(model = N, risk = asCov())
par(mfrow=c(1,1))
plot(IC2, main = TRUE, panel.first= grid(),
      col = "blue", cex.main = 2, cex.inner = 0.6,
      mfColRow = FALSE, to.draw.arg=c("sd"))

## xlim and ylim arguments
plot(IC2, main = TRUE, panel.first= grid(),
      ylim=c(-3,3), xlim=c(-2,3))
plot(IC2, main = TRUE, panel.first= grid(),
      ylim=c(-3,3,-1,3), xlim=c(-2,3))

data <- r(N)(30)
plot(IC2, data, panel.first= grid(),
      ylim = c(-3,3,-1,3), xlim=c(-2,3),
      cex.pts = 3, pch.pts = 1:2, col.pts="green",
      with.lab = TRUE, which.lbs = c(1:4,15:20),
      which.Order = 1:6, return.Order = TRUE)
```

Description

We generalize function `qqplot` from package `stats` to be applicable to distribution and probability model objects. In this context, `qqplot` produces a QQ plot of data (argument `x`) against a (model) distribution. For arguments `y` of class `RobModel`, points at a high “distance” to the model are plotted smaller. For arguments `y` of class `kStepEstimate`, points at with low weight in the [p]IC are plotted bigger and their color gets faded out slowly. Graphical parameters may be given as arguments to `qqplot`.

Usage

```
qqplot(x, y, ...)
## S4 method for signature 'ANY,RobModel'
qqplot(x, y,
       n = length(x), withIdLine = TRUE, withConf = TRUE,
       withConf.pw = withConf, withConf.sim = withConf,
       plot.it = TRUE, xlab = deparse(substitute(x)),
       ylab = deparse(substitute(y)), ..., distance = NormType(),
       n.adj = TRUE)
## S4 method for signature 'ANY,InfRobModel'
qqplot(x, y,
       n = length(x), withIdLine = TRUE, withConf = TRUE,
       withConf.pw = withConf, withConf.sim = withConf,
       plot.it = TRUE, xlab = deparse(substitute(x)),
       ylab = deparse(substitute(y)), ..., n.adj = TRUE)
## S4 method for signature 'ANY,kStepEstimate'
qqplot(x, y,
       n = length(x), withIdLine = TRUE, withConf = TRUE,
       withConf.pw = withConf, withConf.sim = withConf,
       plot.it = TRUE, xlab = deparse(substitute(x)),
       ylab = deparse(substitute(y)), ...,
       exp.cex2.lbl = -.15,
       exp.cex2.pch = -.35,
       exp.fadcol.lbl = 1.85,
       exp.fadcol.pch = 1.85,
       bg = "white")
```

Arguments

<code>x</code>	data to be checked for compatibility with distribution/model <code>y</code> .
<code>y</code>	object of class "RobModel", of class "InfRobModel" or of class "kStepEstimate".
<code>n</code>	numeric; number of quantiles at which to do the comparison.

<code>withIdLine</code>	logical; shall line $y = x$ be plotted in?
<code>withConf</code>	logical; shall confidence lines be plotted?
<code>withConf.pw</code>	logical; shall pointwise confidence lines be plotted?
<code>withConf.sim</code>	logical; shall simultaneous confidence lines be plotted?
<code>plot.it</code>	logical; shall be plotted at all (inherited from <code>qqplot</code>)?
<code>xlab</code>	x-label
<code>ylab</code>	y-label
<code>...</code>	further parameters for method <code>qqplot</code> with signature <code>ANY, ProbFamily</code> (see <code>qqplot</code>) or with function <code>plot</code>
<code>n.adj</code>	logical; shall sample size be adjusted for possible outliers according to radius of the corresponding neighborhood?
<code>distance</code>	a function mapping observations x to the positive reals; used to determine the size of the plotted points (the larger <code>distance(x)</code> , the smaller the points are plotted).
<code>exp.cex2.lbl</code>	for objects <code>kStepEstimate</code> based on a [p]IC of class <code>HampIC</code> : exponent for the weights of this [p]IC used to magnify the labels.
<code>exp.cex2.pch</code>	for objects <code>kStepEstimate</code> based on a [p]IC of class <code>HampIC</code> : exponent for the weights of this [p]IC used to magnify the symbols.
<code>exp.fadcol.lbl</code>	for objects <code>kStepEstimate</code> based on a [p]IC of class <code>HampIC</code> : exponent for the weights of this [p]IC used to find out-fading colors.
<code>exp.fadcol.pch</code>	for objects <code>kStepEstimate</code> based on a [p]IC of class <code>HampIC</code> : exponent for the weights of this [p]IC used to find out-fading colors.
<code>bg</code>	background color to fade against

Details

qqplot signature(`x = "ANY"`, `y = "RobModel"`): produces a QQ plot of a dataset x against the theoretical quantiles of distribution of robust model y .

qqplot signature(`x = "ANY"`, `y = "InfRobModel"`): produces a QQ plot of a dataset x against the theoretical quantiles of distribution of infinitesimally robust model y .

qqplot signature(`x = "ANY"`, `y = "kStepEstimate"`): produces a QQ plot of a dataset x against the theoretical quantiles of the model distribution of model at which the corresponding `kStepEstimate` y had been calibrated at. By default, if the [p]IC of the `kStepEstimate` is of class `HampIC`, i.e.; has a corresponding weight function, points (and, if `withLab==TRUE`, labels) are scaled and faded according to this weight function. Corresponding arguments `exp.cex2.pch` and `exp.fadcol.pch` control this scaling and fading, respectively (and analogously `exp.cex2.lbl` and `exp.fadcol.lbl` for the labels). The choice of these arguments has to be done on a case-by-case basis. Positive exponents induce fading, magnification with increasing weight, for negative exponents the same is true for decreasing weight; higher (absolute) values increase the speed of fading / magnification.

Value

As for function `qqplot` from package **stats**: a list with components

`x` The x coordinates of the points that were/would be plotted
`y` The corresponding quantiles of the second distribution, *including NAs*.

Author(s)

Peter Ruckdeschel <Peter.Ruckdeschel@itwm.fraunhofer.de>

References

Becker, R. A., Chambers, J. M. and Wilks, A. R. (1988) *The New S Language*. Wadsworth & Brooks/Cole.

See Also

`qqplot` from package **stats** – the standard QQ plot function, `qqplot` from package **distr** for comparisons of distributions, and `qqplot` from package **distrMod** (which is called intermediately by this method), as well as `qqbounds`, used by `qqplot` to produce confidence intervals.

Examples

```
qqplot(r(Norm(15,sqrt(30)))(40), Chisq(df=15))
RobM <- InfRobModel(center = NormLocationFamily(mean=13,sd=sqrt(28)),
                    neighbor = ContNeighborhood(radius = 0.4))
x <- r(Norm(15,sqrt(30)))(20)
qqplot(x, RobM)
qqplot(x, RobM, alpha.CI=0.9)
## further examples for ANY,kStepEstimator-method
## in example to roptest() in package ROptEst
```

RobAStBaseMASK

Masking of/by other functions in package "RobAStBase"

Description

Provides information on the (intended) masking of and (non-intended) masking by other other functions in package **RobAStBase**

Usage

```
RobAStBaseMASK(library = NULL)
```

Arguments

`library` a character vector with path names of R libraries, or NULL. The default value of NULL corresponds to all libraries currently known. If the default is used, the loaded packages are searched before the libraries

Value

no value is returned

Author(s)

Peter Ruckdeschel <Peter.Ruckdeschel@itwm.fraunhofer.de>

Examples

```
RobASTBaseMASK()
```

RobASTBaseOptions	<i>Function to change the global variables of the package ‘RobASTBase’</i>
-------------------	--

Description

With RobASTBaseOptions you can inspect and change the global variables of the package **RobAST-Base**.

Usage

```
RobASTBaseOptions(...)
getRobASTBaseOption(x)
```

Arguments

...	any options can be defined, using name = value or by passing a list of such tagged values.
x	a character string holding an option name.

Value

RobASTBaseOptions() returns a list of the global variables.
 RobASTBaseOptions(x) returns the global variable x.
 getRobASTBaseOption(x) returns the global variable x.
 RobASTBaseOptions(x=y) sets the value of the global variable x to y.

Global Options

kStepUseLast: The default value of argument kStepUseLast is FALSE. Explicitly setting kStepUseLast to TRUE should be done with care as in this situation the influence curve in case of oneStepEstimator and kStepEstimator is re-computed using the value of the one- resp. k-step estimate which may take quite a long time depending on the model.

withUpdateInKer: if there is a non-trivial trafo in the model with matrix D , shall the parameter be updated on $\ker(D)$? defaults to FALSE.

IC.UpdateInKer: if there is a non-trivial trafo in the model with matrix D , the IC to be used for this; if NULL the result of `getboundedIC(L2Fam,D)` is taken; this IC will then be projected onto $\ker(D)$; defaults to NULL.

all.verbose: argument `verbose` passed on by default to many calls of `optIC`, `radiusminimaxIC`, `getinfRobIC` etc.; well suited for testing purposes.

withPICList: logical: shall slot `pICList` of return value of `kStepEstimator` be filled?

withICList: logical: shall slot `ICList` of return value of `kStepEstimator` be filled?

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

See Also

[options](#), [getOption](#)

Examples

```
RobASTBaseOptions()
RobASTBaseOptions("kStepUseLast")
RobASTBaseOptions("kStepUseLast" = TRUE)
# or
RobASTBaseOptions(kStepUseLast = 1e-6)
getRobASTBaseOption("kStepUseLast")
```

RobASTControl-class *Control classes in package RobASTBase*

Description

Control classes in package **RobASTBase**.

Objects from the Class

This class is virtual; that is no objects may be created.

Slots

name Object of class "character": name of the control object.

Methods

name signature(object = "RobASTControl"): accessor function for slot name.

name<- signature(object = "RobASTControl", value = "character"): replacement function for slot name.

Author(s)

Peter Ruckdeschel <Peter.Ruckdeschel@itwm.fraunhofer.de>

References

Hampel et al. (1986) *Robust Statistics. The Approach Based on Influence Functions*. New York: Wiley.

Rieder, H. (1994) *Robust Asymptotic Statistics*. New York: Springer.

Kohl, M. (2005) *Numerical Contributions to the Asymptotic Theory of Robustness*. Bayreuth: Dissertation.

RobModel-class

Robust model

Description

Class of robust models. A robust model consists of family of probability measures center and a neighborhood neighbor about this family.

Objects from the Class

A virtual Class: No objects may be created from it.

Slots

center Object of class "ProbFamily"

neighbor Object of class "Neighborhood"

Methods

center signature(object = "RobModel"): accessor function for slot center.

center<- signature(object = "RobModel"): replacement function for slot center.

neighbor signature(object = "RobModel"): accessor function for slot neighbor.

neighbor<- signature(object = "RobModel"): replacement function for slot neighbor.

trafo signature(object = "RobModel", param = "missing"): accessor function for slot trafo of slot center.

trafo<- signature(object = "RobModel"): replacement function for slot trafo of slot center.

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

References

- Rieder, H. (1994) *Robust Asymptotic Statistics*. New York: Springer.
- Kohl, M. (2005) *Numerical Contributions to the Asymptotic Theory of Robustness*. Bayreuth: Dissertation.

See Also

[ProbFamily-class](#), [Neighborhood-class](#)

RobWeight-class	<i>Robust Weight classes</i>
-----------------	------------------------------

Description

Classes for robust weights.

Objects from the Class

Objects can be created by calls of the form `new("RobWeight", ...)`.

Slots

`name` Object of class "character".
`weight` Object of class "function" — the weight function.

Methods

name signature(object = "RobWeight"): accessor function for slot name.
name<- signature(object = "RobWeight"): replacement function for slot name.
weight signature(object = "RobWeight"): accessor function for slot weight.
weight<- signature(object = "RobWeight"): replacement function for slot weight.

Author(s)

Peter Ruckdeschel <Peter.Ruckdeschel@itwm.fraunhofer.de>

References

- Hampel et al. (1986) *Robust Statistics. The Approach Based on Influence Functions*. New York: Wiley.
- Rieder, H. (1994) *Robust Asymptotic Statistics*. New York: Springer.
- Kohl, M. (2005) *Numerical Contributions to the Asymptotic Theory of Robustness*. Bayreuth: Dissertation.

See Also

[InfluenceCurve-class](#), [IC](#)

Examples

```
## prototype
new("RobWeight")
```

TotalVarIC

Generating function for TotalVarIC-class

Description

Generates an object of class "TotalVarIC"; i.e., an influence curves η of the form

$$\eta = c \vee A\Lambda \wedge d$$

with lower clipping bound c , upper clipping bound d and standardizing matrix A . Λ stands for the L2 derivative of the corresponding L2 differentiable parametric family which can be created via `CallL2Fam`.

Usage

```
TotalVarIC(name, CallL2Fam = call("L2ParamFamily"),
            Curve = EuclRandVarList(RealRandVariable(Map = c(function(x) {x}),
                                                    Domain = Reals())),
            Risks, Infos, clipLo = -Inf, clipUp = Inf, stand = as.matrix(1),
            lowerCase = NULL, neighborRadius = 0, w = new("BdStWeight"),
            normtype = NormType(), biastype = symmetricBias(),
            modifyIC = NULL)
```

Arguments

name	object of class "character".
CallL2Fam	object of class "call": creates an object of the underlying L2-differentiable parametric family.
Curve	object of class "EuclRandVarList".
Risks	object of class "list": list of risks; cf. RiskType-class .
Infos	matrix of characters with two columns named method and message: additional informations.
clipLo	negative real: lower clipping bound.
clipUp	positive real: lower clipping bound.
stand	matrix: standardizing matrix
w	BdStWeight: weight object
lowerCase	optional constant for lower case solution.

neighborRadius	radius of the corresponding (unconditional) contamination neighborhood.
biastype	BiasType: type of the bias
normtype	NormType: type of the norm
modifyIC	object of class "OptionalFunction": function of two arguments, which are an L2 parametric family and an optional influence curve. Returns an object of class "IC". This function is mainly used for internal computations!

Value

Object of class "TotalVarIC"

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

References

- Rieder, H. (1994) *Robust Asymptotic Statistics*. New York: Springer.
 Kohl, M. (2005) *Numerical Contributions to the Asymptotic Theory of Robustness*. Bayreuth: Dissertation.

See Also

[IC-class](#), [ContIC](#)

Examples

```
IC1 <- TotalVarIC()
plot(IC1)
```

TotalVarIC-class *Influence curve of total variation type*

Description

Class of (partial) influence curves of total variation type. i.e., an influence curves η of the form

$$\eta = c \vee A\Lambda \wedge d$$

with lower clipping bound c , upper clipping bound d and standardizing matrix A . Λ stands for the L2 derivative of the corresponding L2 differentiable parametric family which can be created via `CallL2Fam`.

Objects from the Class

Objects can be created by calls of the form `new("TotalVarIC", ...)`. More frequently they are created via the generating function `TotalVarIC`, respectively via the method `generateIC`.

Slots

CallL2Fam object of class "call": creates an object of the underlying L2-differentiable parametric family.

name object of class "character".

Curve object of class "EuclRandVarList".

modifyIC Object of class "OptionalFunction": function of two arguments, which are an L2 parametric family and an optional influence curve. Returns an object of class "IC". This slot is mainly used for internal computations!

Risks object of class "list": list of risks; cf. [RiskType-class](#).

Infos object of class "matrix" with two columns named method and message: additional informations.

clipLo object of class "numeric": lower clipping bound.

clipUp object of class "numeric": upper clipping bound.

stand object of class "matrix": standardizing matrix.

weight object of class "BdStWeight": weight function

biastype object of class "BiasType": bias type (symmetric/onsided/asymmetric)

normtype object of class "NormType": norm type (Euclidean, information/self-standardized)

neighborRadius object of class "numeric": radius of the corresponding (unconditional) contamination neighborhood.

Extends

Class "HampIC", directly.

Class "IC", by class "HampIC".

Class "InfluenceCurve", by class "IC".

Methods

CallL2Fam<- signature(object = "TotalVarIC"): replacement function for slot CallL2Fam.

clipLo signature(object = "TotalVarIC"): accessor function for slot clipLo.

clipLo<- signature(object = "TotalVarIC"): replacement function for slot clipLo.

clipUp signature(object = "TotalVarIC"): accessor function for slot clipUp.

clipUp<- signature(object = "TotalVarIC"): replacement function for slot clipUp.

clip signature(x1 = "TotalVarIC"): returns clipUp-clipLo.

stand<- signature(object = "TotalVarIC"): replacement function for slot stand.

lowerCase<- signature(object = "TotalVarIC"): replacement function for slot lowerCase.

neighbor signature(object = "TotalVarIC"): generates an object of class "TotalVarNeighborhood" with radius given in slot neighborRadius.

generateIC signature(neighbor = "TotalVarNeighborhood", L2Fam = "L2ParamFamily"): generate an object of class "TotalVarIC". Rarely called directly.

show signature(object = "TotalVarIC")

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

References

Rieder, H. (1994) *Robust Asymptotic Statistics*. New York: Springer.

Kohl, M. (2005) *Numerical Contributions to the Asymptotic Theory of Robustness*. Bayreuth: Dissertation.

See Also

[IC-class](#), [ContIC](#), [HampIC-class](#)

Examples

```
IC1 <- new("TotalVarIC")
plot(IC1)
```

TotalVarNeighborhood *Generating function for TotalVarNeighborhood-class*

Description

Generates an object of class "TotalVarNeighborhood".

Usage

```
TotalVarNeighborhood(radius = 0)
```

Arguments

radius non-negative real: neighborhood radius.

Value

Object of class "ContNeighborhood"

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

References

Rieder, H. (1994) *Robust Asymptotic Statistics*. New York: Springer.

Kohl, M. (2005) *Numerical Contributions to the Asymptotic Theory of Robustness*. Bayreuth: Dissertation.

See Also

[TotalVarNeighborhood-class](#)

Examples

```
TotalVarNeighborhood()  
  
## The function is currently defined as  
function(radius = 0){  
  new("TotalVarNeighborhood", radius = radius)  
}
```

TotalVarNeighborhood-class

Total variation neighborhood

Description

Class of (unconditional) total variation neighborhoods.

Objects from the Class

Objects can be created by calls of the form `new("TotalVarNeighborhood", ...)`. More frequently they are created via the generating function `TotalVarNeighborhood`.

Slots

type Object of class "character": "(uncond.) total variation neighborhood".
radius Object of class "numeric": neighborhood radius.

Extends

Class "UncondNeighborhood", directly.
Class "Neighborhood", by class "UncondNeighborhood".

Methods

No methods defined with class "TotalVarNeighborhood" in the signature.

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

References

Rieder, H. (1994) *Robust Asymptotic Statistics*. New York: Springer.
Kohl, M. (2005) *Numerical Contributions to the Asymptotic Theory of Robustness*. Bayreuth: Dissertation.

See Also

[TotalVarNeighborhood](#), [UncondNeighborhood-class](#)

Examples

```
new("TotalVarNeighborhood")
```

UncondNeighborhood-class

Unconditional neighborhood

Description

Class of unconditional (errors-in-variables) neighborhoods.

Objects from the Class

A virtual Class: No objects may be created from it.

Slots

type Object of class "character": type of the neighborhood.

radius Object of class "numeric": neighborhood radius.

Extends

Class "Neighborhood", directly.

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

References

Rieder, H. (1994) *Robust Asymptotic Statistics*. New York: Springer.

Kohl, M. (2005) *Numerical Contributions to the Asymptotic Theory of Robustness*. Bayreuth: Dissertation.

See Also

[Neighborhood-class](#)

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