Package 'ROptEst'

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Version 0.9

Date 2013-09-11

Title Optimally robust estimation

Description Optimally robust estimation in general smoothly parameterized models using S4 classes and methods.

Depends R(>= 2.14.0), methods, distr(>= 2.5.2), distrEx(>= 2.4),distrMod(>= 2.5.2), RandVar(>= 0.9.2), RobAStBase(>= 0.9)

Suggests RobLox, MASS

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LazyLoad yes

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ROptEst-package *Optimally robust estimation*

Description

Optimally robust estimation in general smoothly parameterized models using S4 classes and methods.

Details

Package:	ROptEst
Version:	0.9
Date:	2013-09-11
Depends:	R(>= 2.7.0), methods, distr(>= 2.0), distrEx(>= 2.0), distrMod(>= 2.0), RandVar(>= 0.6.4), RobAStBase
LazyLoad:	yes
License:	LGPL-3
URL:	http://robast.r-forge.r-project.org/
SVNRevision:	694

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.

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References

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

See Also

distr-package, distrEx-package, distrMod-package, RandVar-package, RobAStBase-package

Examples

```
library(ROptEst)

## Example: Rutherford-Geiger (1910); cf. Feller~(1968), Section VI.7 (a)
x <- c(rep(0, 57), rep(1, 203), rep(2, 383), rep(3, 525), rep(4, 532),
       rep(5, 408), rep(6, 273), rep(7, 139), rep(8, 45), rep(9, 27),
       rep(10, 10), rep(11, 4), rep(12, 0), rep(13, 1), rep(14, 1))

## ML-estimate from package distrMod
MLest <- MLEstimator(x, PoisFamily())
MLest
## confidence interval based on CLT
confint(MLest)

## compute optimally (w.r.t to MSE) robust estimator (unknown contamination)
robEst <- roptest(x, PoisFamily(), eps.upper = 0.1, steps = 3)
estimate(robEst)
## check influence curve
pIC(robEst)
checkIC(pIC(robEst))
## plot influence curve
plot(pIC(robEst))
## confidence interval based on LAN - neglecting bias
confint(robEst)
## confidence interval based on LAN - including bias
confint(robEst, method = symmetricBias())
```

`asAnscombe` *Generating function for asAnscombe-class*

Description

Generates an object of class `"asAnscombe"`.

Usage

```
asAnscombe(eff = .95, biastype = symmetricBias(), normtype = NormType())
```

Arguments

`eff`	value in (0,1]: ARE in the ideal model
`biastype`	a bias type of class `BiasType`
`normtype`	a norm type of class `NormType`

Value

Object of class `asAnscombe`

Author(s)

Peter Ruckdeschel <peter.ruckdeschel@fraunhofer.itwm.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

asAnscombe-class

Examples

```
asAnscombe()

## The function is currently defined as
function(eff = .95, biastype = symmetricBias(), normtype = NormType()){
    new("asAnscombe", eff = eff, biastype = biastype, normtype = normtype) }
```

---

asAnscombe-class *Asymptotic Anscombe risk*

Description

Class of asymptotic Anscombe risk which is the ARE (asymptotic relative efficiency) in the ideal model obtained by an optimal bias robust IC .

Objects from the Class

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

Slots

`type` Object of class `"character"`: "optimal bias robust IC (OBRI) for given ARE (asymptotic relative efficiency)".

`eff` Object of class `"numeric"`: given ARE (asymptotic relative efficiency) to be attained in the ideal model.

`biastype` Object of class `"BiasType"`: symmetric, one-sided or asymmetric

Extends

Class "asRiskwithBias", directly.
Class "asRisk", by class "asRiskwithBias". Class "RiskType", by class "asRisk".

Methods

eff signature(object = "asAnscombe"): accessor function for slot eff.

show signature(object = "asAnscombe")

Author(s)

Peter Ruckdeschel <peter.ruckdeschel@fraunhofer.itwm.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

asRisk-class, asAnscombe

Examples

```
new("asAnscombe")
```

---

asL1 *Generating function for asMSE-class*

Description

Generates an object of class "asMSE".

Usage

```
asL1(biastype = symmetricBias(), normtype = NormType())
```

Arguments

biastype	a bias type of class BiasType
normtype	a norm type of class NormType

Value

Object of class "asMSE"

Author(s)

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

References

Ruckdeschel, P. and Rieder, H. (2004) Optimal Influence Curves for General Loss Functions. Statistics & Decisions *22*, 201-223.

See Also

asL1-class, asMSE, asL4

Examples

```
asL1()

## The function is currently defined as
function(biastype = symmetricBias(), normtype = NormType()){
         new("asL1", biastype = biastype, normtype = normtype) }
```

---

asL1-class *Asymptotic mean absolute error*

Description

Class of asymptotic mean absolute error.

Objects from the Class

Objects can be created by calls of the form new("asL1", ...). More frequently they are created via the generating function asL1.

Slots

type Object of class "character": "asymptotic mean square error".

biastype Object of class "BiasType": symmetric, one-sided or asymmetric

normtype Object of class "NormType": norm in which a multivariate parameter is considered

Extends

Class "asGRisk", directly.
Class "asRiskwithBias", by class "asGRisk".
Class "asRisk", by class "asRiskwithBias".
Class "RiskType", by class "asGRisk".

Methods

No methods defined with class "asL1" in the signature.

Author(s)

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

References

Ruckdeschel, P. and Rieder, H. (2004) Optimal Influence Curves for General Loss Functions. Statistics & Decisions *22*, 201-223.

See Also

asGRisk-class, asMSE, asMSE-class, asL4-class, asL1

Examples

```
new("asMSE")
```

---

asL4 *Generating function for asL4-class*

Description

Generates an object of class "asL4".

Usage

```
asL4(biastype = symmetricBias(), normtype = NormType())
```

Arguments

biastype	a bias type of class BiasType
normtype	a norm type of class NormType

Value

Object of class "asL4"

Author(s)

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

References

Ruckdeschel, P. and Rieder, H. (2004) Optimal Influence Curves for General Loss Functions. Statistics & Decisions *22*, 201-223.

See Also

asL4-class, asMSE, asL1

Examples

```
asL4()

## The function is currently defined as
function(biastype = symmetricBias(), normtype = NormType()){
         new("asL4", biastype = biastype, normtype = normtype) }
```

---

asL4-class *Asymptotic mean power 4 error*

Description

Class of asymptotic mean power 4 error.

Objects from the Class

Objects can be created by calls of the form `new("asL4", ...)`. More frequently they are created via the generating function `asL4`.

Slots

`type` Object of class `"character"`: "asymptotic mean square error".

`biastype` Object of class `"BiasType"`: symmetric, one-sided or asymmetric

`normtype` Object of class `"NormType"`: norm in which a multivariate parameter is considered

Extends

Class `"asGRisk"`, directly.
Class `"asRiskwithBias"`, by class `"asGRisk"`.
Class `"asRisk"`, by class `"asRiskwithBias"`.
Class `"RiskType"`, by class `"asGRisk"`.

Methods

No methods defined with class "asL4" in the signature.

Author(s)

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

References

Ruckdeschel, P. and Rieder, H. (2004) Optimal Influence Curves for General Loss Functions. Statistics & Decisions *22*, 201-223.

See Also

asGRisk-class, asMSE, asMSE-class, asL1-class, asL4

Examples

```
new("asMSE")
```

---

cniperCont *Functions for Computation and Plot of Cniper Contamination and Cniper Points.*

Description

These functions and their methods can be used to determine cniper contamination as well as cniper points. That is, under which (Dirac) contamination is the risk of one procedure larger than the risk of some other procedure.

Usage

```
cniperCont(IC1, IC2, data = NULL, ...,
               neighbor, risk, lower = getdistrOption("DistrResolution"),
               upper = 1-getdistrOption("DistrResolution"), n = 101,
               scaleX = FALSE, scaleX.fct, scaleX.inv,
               scaleY = FALSE, scaleY.fct = pnorm, scaleY.inv=qnorm,
               scaleN = 9, x.ticks = NULL, y.ticks = NULL,
               cex.pts = 1, col.pts = par("col"),
               pch.pts = 19, jitter.fac = 1, with.lab = FALSE,
               lab.pts = NULL, lab.font = NULL, alpha.trsp = NA,
               which.lbs = NULL, which.Order  = NULL,
               return.Order = FALSE)


cniperPoint(L2Fam, neighbor, risk, lower, upper)

cniperPointPlot(L2Fam, data=NULL, ..., neighbor, risk= asMSE(),
                lower=getdistrOption("DistrResolution"),
                upper=1-getdistrOption("DistrResolution"), n = 101,
                withMaxRisk = TRUE,
                scaleX = FALSE, scaleX.fct, scaleX.inv,
                scaleY = FALSE, scaleY.fct = pnorm, scaleY.inv=qnorm,
                scaleN = 9, x.ticks = NULL, y.ticks = NULL,
                cex.pts = 1, col.pts = par("col"),
                pch.pts = 19, jitter.fac = 1, with.lab = FALSE,
                lab.pts = NULL, lab.font = NULL, alpha.trsp = NA,
                which.lbs = NULL, which.Order  = NULL,
                return.Order = FALSE)
```

Arguments

IC1	object of class IC
IC2	object of class IC
L2Fam	object of class L2ParamFamily
neighbor	object of class Neighborhood
risk	object of class RiskType
...	additional parameters (in particular to be passed on to plot).
data	data to be plotted in
lower, upper	the lower and upper end points of the contamination interval (in prob-scale).
n	number of points between lower and upper
withMaxRisk	logical; if TRUE, for risk comparison uses the maximal risk of the classically optimal IC ψ in all situations with contamination in Dirac points 'no larger' than the respective evaluation point and the optimally-robust IC η at its least favorable contamination situation ('over all real Dirac contamination points'). This is the default and was the behavior prior to package version 0.9). If FALSE it uses exactly the situation with Dirac contamination in the evaluation point for both ICs ψ and η which amounts to calling cniperCont with IC1=psi, IC2=eta.
scaleX	logical; shall X-axis be rescaled (by default according to the cdf of the underlying distribution)?
scaleY	logical; shall Y-axis be rescaled (by default according to a probit scale)?
scaleX.fct	an isotone, vectorized function mapping the domain of the IC(s) to [0,1]; if scaleX is TRUE and scaleX.fct is missing, the cdf of the underlying observation distribution.
scaleX.inv	the inverse function to scale.fct, i.e., an isotone, vectorized function mapping [0,1] to the domain of the IC(s) such that for any x in the domain, scaleX.inv(scaleX.fct(x))==x; if scaleX is TRUE and scaleX.inv is missing, the quantile function of the underlying observation distribution.
scaleY.fct	an isotone, vectorized function mapping for each coordinate the range of the respective coordinate of the IC(s) to [0,1]; defaulting to the cdf of $\mathcal{N}(0,1)$.
scaleY.inv	an isotone, vectorized function mapping for each coordinate the range [0,1] into the range of the respective coordinate of the IC(s); defaulting to the quantile function of $\mathcal{N}(0,1)$.
scaleN	integer; defaults to 9; on rescaled axes, number of x and y ticks if drawn automatically;
x.ticks	numeric; defaults to NULL; (then ticks are chosen automatically); if non-NULL, user-given x-ticks (on original scale);
y.ticks	numeric; defaults to NULL; (then ticks are chosen automatically); if non-NULL, user-given y-ticks (on original scale);
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
alpha.trsp	alpha transparency to be added ex post to colors col.pch and col.lbl; if one-dim and NA all colors are left unchanged. Otherwise, with usual recycling rules alpha.trsp gets shorted/prolongated to length the data-symbols to be plotted. Coordinates of this vector alpha.trsp with NA are left unchanged, while for the remaining ones, the alpha channel in rgb space is set to the respective coordinate value of alpha.trsp. The non-NA entries must be integers in [0,255] (0 invisible, 255 opaque).
jitter.fac	jittering factor used in case of a DiscreteDistribution 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 normtype(object); then which.Order either is an integer vector with the indices of the *ordered* observations (remaining after a possible reduction by argument which.lbs) 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 which.lbs, and ordering is according to the norm given by normtype(object)); otherwise we return invisible() as usual.

Details

In case of cniperCont the difference between the risks of two ICs is plotted.

The function cniperPoint can be used to determine cniper points. That is, points such that the optimally robust estimator has smaller minimax risk than the classical optimal estimator under contamination with Dirac measures at the cniper points.

As such points might be difficult to find, we provide the function cniperPointPlot which can be used to obtain a plot of the risk difference; in this function the usual arguments for plot can be used. For arguments col, lwd, vectors can be used; then the first coordinate is taken for the curve, the second one for the balancing line. For argument lty, a list can be used; its first component is then taken for the curve, the second one for the balancing line.

For more details about cniper contamination and cniper points we refer to Section~3.5 of Kohl et al. (2008) as well as Ruckdeschel (2004) and the Introduction of Kohl (2005).

Value

invisible() resp. cniper point is returned.

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

References

Kohl, M. and Ruckdeschel, H. and Rieder, H. (2008). Infinitesimally Robust Estimation in General Smoothly Parametrized Models. Unpublished Manuscript.

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

Ruckdeschel, P. (2004). Higher Order Asymptotics for the MSE of M-Estimators on Shrinking Neighborhoods. Unpublished Manuscript.

Examples

```
## cniper contamination
P <- PoisFamily(lambda = 4)
RobP1 <- InfRobModel(center = P, neighbor = ContNeighborhood(radius = 0.1))
IC1 <- optIC(model=RobP1, risk=asMSE())
RobP2 <- InfRobModel(center = P, neighbor = ContNeighborhood(radius = 1))
IC2 <- optIC(model=RobP2, risk=asMSE())
cniperCont(IC1 = IC1, IC2 = IC2,
           neighbor = ContNeighborhood(radius = 0.5),
           risk = asMSE(),
           lower = 0, upper = 8, n = 101)

## cniper point plot
cniperPointPlot(P, neighbor = ContNeighborhood(radius = 0.5),
                risk = asMSE(), lower = 0, upper = 10)

## Don't run to reduce check time on CRAN
## Not run:
## cniper point
cniperPoint(P, neighbor = ContNeighborhood(radius = 0.5),
            risk = asMSE(), lower = 0, upper = 4)
cniperPoint(P, neighbor = ContNeighborhood(radius = 0.5),
            risk = asMSE(), lower = 4, upper = 8)

## End(Not run)
```

`CniperPointPlot` *Wrapper function for cniperPointPlot - Computation and Plot of Cniper Contamination and Cniper Points*

Description

The wrapper `CniperPointPlot` (capital C!) takes most of arguments to the `cniperPointPlot` (lower case c!) function by default and gives a user possibility to run the function with low number of arguments.

Usage

```
CniperPointPlot(fam, ...,
  lower = getdistrOption("DistrResolution"),
  upper = 1 - getdistrOption("DistrResolution"),
  with.legend = TRUE, rescale = FALSE, withCall = TRUE)
```

Arguments

fam	object of class L2ParamFamily
...	additional parameters (in particular to be passed on to plot)
lower	the lower end point of the contamination interval
upper	the upper end point of the contamination interval
with.legend	the flag for showing the legend of the plot
rescale	the flag for rescaling the axes for better view of the plot
withCall	the flag for the call output

Value

invisible(NULL)

Details

Calls cniperPointPlot with suitably chosen defaults; if withCall == TRUE, the call to cniperPointPlot is returned.

Examples

```
L2fam <- GammaFamily()
CniperPointPlot(fam=L2fam, main = "Gamma", lower = 0, upper = 5, withCall = FALSE)
```

---

comparePlot-methods *Compare - Plots*

Description

Plots 2-4 influence curves to the same model.

Details

S4-Method comparePlot for signature IC,IC has been enhanced compared to its original definition in **RobAStBase** so that if argument MBRB is NA, it is filled automatically by a call to optIC which computes the MBR-IC on the fly. To this end, there is an additional argument n.MBR defaulting to 10000 to determine the number of evaluation points.

Examples

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

## Don't run to reduce check time on CRAN
## Not run:
IC1 <- optIC(model = N0, risk = asCov())
IC2 <- optIC(model = N0.Rob1, risk = asMSE())

comparePlot(IC1,IC2, withMBR=TRUE)

## End(Not run)
```

---

get.asGRisk.fct-methods

Methods for Function get.asGRisk.fct in Package 'ROptEst'

Description

get.asGRisk.fct-methods to produce a function in r,s,b for computing a particular asGRisk

Usage

```
get.asGRisk.fct(Risk)
## S4 method for signature 'asMSE'
get.asGRisk.fct(Risk)
## S4 method for signature 'asL1'
get.asGRisk.fct(Risk)
## S4 method for signature 'asL4'
get.asGRisk.fct(Risk)
```

Arguments

Risk	a risk of class "asGRisk"

Details

get.asGRisk.fct is used internally in functions getAsRisk and getReq.

Value

get.asGRisk.fct

a function with arguments r (radius), s (square root of (trace of) variance), b bias to compute the respective risk of an IC with this bias and variance at the respective radius.

Methods

get.asGRisk.fct `signature(Risk = "asMSE")`: method for asymptotic mean squared error.

get.asGRisk.fct `signature(Risk = "asL1")`: method for asymptotic mean absolute error.

get.asGRisk.fct `signature(Risk = "asL4")`: method for asymptotic mean power 4 error.

Author(s)

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

---

getAsRisk *Generic Function for Computation of Asymptotic Risks*

Description

Generic function for the computation of asymptotic risks. This function is rarely called directly. It is used by other functions.

Usage

```
getAsRisk(risk, L2deriv, neighbor, biastype, ...)

## S4 method for signature 'asMSE,UnivariateDistribution,Neighborhood,ANY'
getAsRisk(risk,
    L2deriv, neighbor, biastype, normtype = NULL, clip = NULL, cent = NULL,
    stand, trafo, ...)

## S4 method for signature 'asL1,UnivariateDistribution,Neighborhood,ANY'
getAsRisk(risk,
    L2deriv, neighbor, biastype, normtype = NULL, clip = NULL, cent = NULL,
    stand, trafo, ...)

## S4 method for signature 'asL4,UnivariateDistribution,Neighborhood,ANY'
getAsRisk(risk,
    L2deriv, neighbor, biastype, normtype = NULL, clip = NULL, cent = NULL,
    stand, trafo, ...)

## S4 method for signature 'asMSE,EuclRandVariable,Neighborhood,ANY'
getAsRisk(risk,
    L2deriv, neighbor, biastype, normtype = NULL, clip = NULL, cent = NULL,
    stand, trafo, ...)

## S4 method for signature 'asBias,UnivariateDistribution,ContNeighborhood,ANY'
getAsRisk(risk,
    L2deriv, neighbor, biastype, normtype = NULL, clip = NULL, cent = NULL,
    stand = NULL, trafo, ...)
```

```
## S4 method for signature
## 'asBias,UnivariateDistribution,ContNeighborhood,onesidedBias'
getAsRisk(
    risk, L2deriv, neighbor, biastype, normtype = NULL, clip = NULL, cent = NULL,
     stand = NULL, trafo, ...)

## S4 method for signature
## 'asBias,UnivariateDistribution,ContNeighborhood,asymmetricBias'
getAsRisk(
    risk, L2deriv, neighbor, biastype, normtype = NULL, clip = NULL, cent = NULL,
     stand = NULL, trafo, ...)

## S4 method for signature
## 'asBias,UnivariateDistribution,TotalVarNeighborhood,ANY'
getAsRisk(
    risk, L2deriv, neighbor, biastype, normtype = NULL, clip = NULL, cent = NULL,
     stand = NULL, trafo, ...)

## S4 method for signature 'asBias,RealRandVariable,ContNeighborhood,ANY'
getAsRisk(
    risk,L2deriv, neighbor, biastype, normtype = NULL, clip = NULL, cent = NULL,
     stand = NULL, Distr, DistrSymm, L2derivSymm,
     L2derivDistrSymm, Finfo, trafo, z.start, A.start, maxiter, tol,
     warn, verbose = NULL, ...)
## S4 method for signature 'asBias,RealRandVariable,TotalVarNeighborhood,ANY'
getAsRisk(
     risk, L2deriv, neighbor, biastype, normtype = NULL,
     clip = NULL, cent = NULL, stand = NULL, Distr, DistrSymm, L2derivSymm,
     L2derivDistrSymm, Finfo, trafo, z.start, A.start, maxiter, tol,
     warn, verbose = NULL, ...)

## S4 method for signature 'asCov,UnivariateDistribution,ContNeighborhood,ANY'
getAsRisk(
     risk, L2deriv, neighbor, biastype, normtype = NULL, clip, cent, stand,
     trafo = NULL, ...)

## S4 method for signature
## 'asCov,UnivariateDistribution,TotalVarNeighborhood,ANY'
getAsRisk(
     risk, L2deriv, neighbor, biastype, normtype = NULL, clip, cent, stand,
     trafo = NULL, ...)

## S4 method for signature 'asCov,RealRandVariable,ContNeighborhood,ANY'
getAsRisk(risk,
     L2deriv, neighbor, biastype, normtype = NULL, clip = NULL, cent, stand,
     Distr, trafo = NULL, V.comp =  matrix(TRUE, ncol = nrow(stand),
     nrow = nrow(stand)), w, ...)
```

```
## S4 method for signature
## 'trAsCov,UnivariateDistribution,UncondNeighborhood,ANY'
getAsRisk(
    risk, L2deriv, neighbor, biastype, normtype = NULL, clip, cent, stand,
    trafo = NULL, ...)

## S4 method for signature 'trAsCov,RealRandVariable,ContNeighborhood,ANY'
getAsRisk(risk,
    L2deriv, neighbor, biastype, normtype, clip, cent, stand, Distr,
    trafo = NULL,  V.comp =  matrix(TRUE, ncol = nrow(stand),
    nrow = nrow(stand)), w, ...)

## S4 method for signature
## 'asAnscombe,UnivariateDistribution,UncondNeighborhood,ANY'
getAsRisk(
    risk, L2deriv, neighbor, biastype, normtype = NULL, clip, cent, stand,
    trafo = NULL, FI, ...)

## S4 method for signature 'asAnscombe,RealRandVariable,ContNeighborhood,ANY'
getAsRisk(risk,
   L2deriv, neighbor, biastype, normtype, clip, cent, stand, Distr, trafo = NULL,
    V.comp =  matrix(TRUE, ncol = nrow(stand), nrow = nrow(stand)),
    FI, w, ...)


## S4 method for signature
## 'asUnOvShoot,UnivariateDistribution,UncondNeighborhood,ANY'
getAsRisk(
    risk, L2deriv, neighbor, biastype, normtype = NULL, clip, cent, stand,
    trafo, ...)

## S4 method for signature
## 'asSemivar,UnivariateDistribution,Neighborhood,onesidedBias'
getAsRisk(
    risk, L2deriv, neighbor, biastype, normtype = NULL, clip, cent, stand,
    trafo, ...)
```

Arguments

risk	object of class "asRisk".
L2deriv	L2-derivative of some L2-differentiable family of probability distributions.
neighbor	object of class "Neighborhood".
biastype	object of class "ANY".
...	additional parameters; often used to enable flexible calls.
clip	optimal clipping bound.
cent	optimal centering constant.
stand	standardizing matrix.

Finfo	matrix: the Fisher Information of the parameter.
trafo	matrix: transformation of the parameter.
Distr	object of class "Distribution".
DistrSymm	object of class "DistributionSymmetry".
L2derivSymm	object of class "FunSymmList".
L2derivDistrSymm	object of class "DistrSymmList".
z.start	initial value for the centering constant.
A.start	initial value for the standardizing matrix.
maxiter	the maximum number of iterations
tol	the desired accuracy (convergence tolerance).
warn	logical: print warnings.
normtype	object of class "NormType".
V.comp	matrix: indication which components of the standardizing matrix have to be computed.
w	object of class RobWeight; current weight
FI	trace of the respective Fisher Information
verbose	logical: if TRUE some diagnostics are printed out.

Details

This function is rarely called directly. It is used by other functions/methods.

Value

The asymptotic risk is computed.

Methods

risk = "asMSE", L2deriv = "UnivariateDistribution", neighbor = "Neighborhood", biastype = "ANY":
computes asymptotic mean square error in methods for function getInfRobIC.

risk = "asL1", L2deriv = "UnivariateDistribution", neighbor = "Neighborhood", biastype = "ANY":
computes asymptotic mean absolute error in methods for function getInfRobIC.

risk = "asL4", L2deriv = "UnivariateDistribution", neighbor = "Neighborhood", biastype = "ANY":
computes asymptotic mean power 4 error in methods for function getInfRobIC.

risk = "asMSE", L2deriv = "EuclRandVariable", neighbor = "Neighborhood", biastype = "ANY":
computes asymptotic mean square error in methods for function getInfRobIC.

risk = "asBias", L2deriv = "UnivariateDistribution", neighbor = "ContNeighborhood", biastype = "ANY":
computes standardized asymptotic bias in methods for function getInfRobIC.

risk = "asBias", L2deriv = "UnivariateDistribution", neighbor = "ContNeighborhood", biastype = "onesidedBias":
computes standardized asymptotic bias in methods for function getInfRobIC.

risk = "asBias", L2deriv = "UnivariateDistribution", neighbor = "ContNeighborhood", biastype = "asymmetricBias
computes standardized asymptotic bias in methods for function getInfRobIC.

risk = "asBias", L2deriv = "UnivariateDistribution", neighbor = "TotalVarNeighborhood", biastype = "ANY":
computes standardized asymptotic bias in methods for function `getInfRobIC`.

risk = "asBias", L2deriv = "RealRandVariable", neighbor = "ContNeighborhood", biastype = "ANY":
computes standardized asymptotic bias in methods for function `getInfRobIC`.

risk = "asCov", L2deriv = "UnivariateDistribution", neighbor = "ContNeighborhood", biastype = "ANY":
computes asymptotic covariance in methods for function `getInfRobIC`.

risk = "asCov", L2deriv = "UnivariateDistribution", neighbor = "TotalVarNeighborhood", biastype = "ANY":
computes asymptotic covariance in methods for function `getInfRobIC`.

risk = "asCov", L2deriv = "RealRandVariable", neighbor = "ContNeighborhood", biastype = "ANY":
computes asymptotic covariance in methods for function `getInfRobIC`.

risk = "trAsCov", L2deriv = "UnivariateDistribution", neighbor = "UncondNeighborhood", biastype = "ANY":
computes trace of asymptotic covariance in methods for function `getInfRobIC`.

risk = "trAsCov", L2deriv = "RealRandVariable", neighbor = "ContNeighborhood", biastype = "ANY":
computes trace of asymptotic covariance in methods for function `getInfRobIC`.

risk = "asAnscombe", L2deriv = "UnivariateDistribution", neighbor = "UncondNeighborhood", biastype = "ANY":
computes the ARE in the ideal model in methods for function `getInfRobIC`.

risk = "asAnscombe", L2deriv = "RealRandVariable", neighbor = "ContNeighborhood", biastype = "ANY":
computes the ARE in the ideal model in methods for function `getInfRobIC`.

risk = "asUnOvShoot", L2deriv = "UnivariateDistribution", neighbor = "UncondNeighborhood", biastype = "ANY"
computes asymptotic under-/overshoot risk in methods for function `getInfRobIC`.

risk = "asSemivar", L2deriv = "UnivariateDistribution", neighbor = "Neighborhood", biastype = "onesidedBias":
computes asymptotic semivariance in methods for function `getInfRobIC`.

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

References

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

Ruckdeschel, P. and Rieder, H. (2004) Optimal Influence Curves for General Loss Functions. Statistics & Decisions *22*, 201-223.

Ruckdeschel, P. (2005) Optimally One-Sided Bounded Influence Curves. Mathematical Methods in Statistics *14*(1), 105-131.

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

See Also

asRisk-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 'HampIC,UncondNeighborhood'
getBiasIC(IC, neighbor, L2Fam, ...)
```

Arguments

IC	object of class "InfluenceCurve"
neighbor	object of class "Neighborhood".
L2Fam	object of class "L2ParamFamily".
...	additional parameters

Details

This function is rarely called directly. It is used by other functions/methods.

Value

The bias of the IC is computed.

Methods

IC = "HampIC", neighbor = "UncondNeighborhood" reads off the as. bias from the risks-slot of the IC.

IC = "TotalVarIC", neighbor = "UncondNeighborhood" reads off the as. bias from the risks-slot of the IC, resp. if this is NULL from the corresponding Lagrange Multipliers.

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`

`getFiRisk` *Generic Function for Computation of Finite-Sample Risks*

Description

Generic function for the computation of finite-sample risks. This function is rarely called directly. It is used by other functions.

Usage

```
getFiRisk(risk, Distr, neighbor, ...)

## S4 method for signature 'fiUnOvShoot,Norm,ContNeighborhood'
getFiRisk(risk, Distr,
          neighbor, clip, stand, sampleSize, Algo, cont)

## S4 method for signature 'fiUnOvShoot,Norm,TotalVarNeighborhood'
getFiRisk(risk, Distr,
          neighbor, clip, stand, sampleSize, Algo, cont)
```

Arguments

`risk`	object of class "RiskType".
`Distr`	object of class "Distribution".
`neighbor`	object of class "Neighborhood".
`...`	additional parameters.
`clip`	positive real: clipping bound
`stand`	standardizing constant/matrix.
`sampleSize`	integer: sample size.
`Algo`	"A" or "B".
`cont`	"left" or "right".

Details

The computation of the finite-sample under-/overshoot risk is based on FFT. For more details we refer to Section 11.3 of Kohl (2005).

Value

The finite-sample risk is computed.

Methods

risk = "fiUnOvShoot", Distr = "Norm", neighbor = "ContNeighborhood" computes finite-sample under-/overshoot risk in methods for function `getFixRobIC`.

risk = "fiUnOvShoot", Distr = "Norm", neighbor = "TotalVarNeighborhood" computes finite-sample under-/overshoot risk in methods for function `getFixRobIC`.

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

References

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

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

`fiRisk-class`

`getFixClip` *Generic Function for the Computation of the Optimal Clipping Bound*

Description

Generic function for the computation of the optimal clipping bound in case of robust models with fixed neighborhoods. This function is rarely called directly. It is used to compute optimally robust ICs.

Usage

```
getFixClip(clip, Distr, risk, neighbor,  ...)

## S4 method for signature 'numeric,Norm,fiUnOvShoot,ContNeighborhood'
getFixClip(clip, Distr, risk, neighbor)

## S4 method for signature 'numeric,Norm,fiUnOvShoot,TotalVarNeighborhood'
getFixClip(clip, Distr, risk, neighbor)
```

Arguments

clip	positive real: clipping bound
Distr	object of class "Distribution".
risk	object of class "RiskType".
neighbor	object of class "Neighborhood".
...	additional parameters.

Value

The optimal clipping bound is computed.

Methods

clip = "numeric", Distr = "Norm", risk = "fiUnOvShoot", neighbor = "ContNeighborhood"
optimal clipping bound for finite-sample under-/overshoot risk.

clip = "numeric", Distr = "Norm", risk = "fiUnOvShoot", neighbor = "TotalVarNeighborhood"
optimal clipping bound for finite-sample under-/overshoot risk.

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

References

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

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

See Also

ContIC-class, TotalVarIC-class

getFixRobIC *Generic Function for the Computation of Optimally Robust ICs*

Description

Generic function for the computation of optimally robust ICs in case of robust models with fixed neighborhoods. This function is rarely called directly.

Usage

```
getFixRobIC(Distr, risk, neighbor, ...)

## S4 method for signature 'Norm,fiUnOvShoot,UncondNeighborhood'
getFixRobIC(Distr, risk, neighbor,
          sampleSize, upper, lower, maxiter, tol, warn, Algo, cont)
```

Arguments

Distr	object of class "Distribution".
risk	object of class "RiskType".
neighbor	object of class "Neighborhood".
...	additional parameters.
sampleSize	integer: sample size.
upper	upper bound for the optimal clipping bound.
lower	lower bound for the optimal clipping bound.
maxiter	the maximum number of iterations.
tol	the desired accuracy (convergence tolerance).
warn	logical: print warnings.
Algo	"A" or "B".
cont	"left" or "right".

Details

Computation of the optimally robust IC in sense of Huber (1968) which is also treated in Kohl (2005). The Algorithm used to compute the exact finite sample risk is introduced and explained in Kohl (2005). It is based on FFT.

Value

The optimally robust IC is computed.

Methods

Distr = "Norm", risk = "fiUnOvShoot", neighbor = "UncondNeighborhood" computes the optimally robust influence curve for one-dimensional normal location and finite-sample under-/overshoot risk.

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.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.

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

See Also

FixRobModel-class

---

getIneffDiff *Generic Function for the Computation of Inefficiency Differences*

Description

Generic function for the computation of inefficiency differencies. This function is rarely called directly. It is used to compute the radius minimax IC and the least favorable radius.

Usage

```
getIneffDiff(radius, L2Fam, neighbor, risk, ...)

## S4 method for signature 'numeric,L2ParamFamily,UncondNeighborhood,asMSE'
getIneffDiff(
          radius, L2Fam, neighbor, risk, loRad, upRad, loRisk, upRisk,
          z.start = NULL, A.start = NULL, upper.b = NULL, lower.b = NULL,
         OptOrIter = "iterate", MaxIter, eps, warn, loNorm = NULL, upNorm = NULL,
          verbose = NULL, ..., withRetIneff = FALSE)
```

Arguments

radius	neighborhood radius.
L2Fam	L2-differentiable family of probability measures.
neighbor	object of class "Neighborhood".
risk	object of class "RiskType".
loRad	the lower end point of the interval to be searched.
upRad	the upper end point of the interval to be searched.
loRisk	the risk at the lower end point of the interval.
upRisk	the risk at the upper end point of the interval.

z.start	initial value for the centering constant.
A.start	initial value for the standardizing matrix.
upper.b	upper bound for the optimal clipping bound.
lower.b	lower bound for the optimal clipping bound.
OptOrIter	character; which method to be used for determining Lagrange multipliers A and a: if (partially) matched to "optimize", getLagrangeMultByOptim is used; otherwise: by default, or if matched to "iterate" or to "doubleiterate", getLagrangeMultByIter is used. More specifically, when using getLagrangeMultByIter, and if argument risk is of class "asGRisk", by default and if matched to "iterate" we use only one (inner) iteration, if matched to "doubleiterate" we use up to Maxiter (inner) iterations.
MaxIter	the maximum number of iterations
eps	the desired accuracy (convergence tolerance).
warn	logical: print warnings.
loNorm	object of class "NormType"; used in selfstandardization to evaluate the bias of the current IC in the norm of the lower bound
upNorm	object of class "NormType"; used in selfstandardization to evaluate the bias of the current IC in the norm of the upper bound
verbose	logical: if TRUE, some messages are printed
...	further arguments to be passed on to getInfRobIC
withRetIneff	logical: if TRUE, getIneffDiff returns the vector of lower and upper inefficiency (components named "lo" and "up"), otherwise (default) the difference. The latter was used in radiusMinimaxIC up to version 0.8 for a call to uniroot directly. In order to speed up things (i.e., not to call the expensive getInfRobIC once again at the zero, up to version 0.8 we had some awkward assign-sys.frame construction to modify the caller writing the upper inefficiency already computed to the caller environment; having capsulated this into try from version 0.9 on, this became even more awkward, so from version 0.9 onwards, we instead use the TRUE-alternative when calling it from radiusMinimaxIC.

Value

The inefficieny difference between the left and the right margin of a given radius interval is computed.

Methods

radius = "numeric", L2Fam = "L2ParamFamily", neighbor = "UncondNeighborhood", risk = "asMSE": computes difference of asymptotic MSE–inefficiency for the boundaries of a given radius interval.

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

References

Rieder, H., Kohl, M. and Ruckdeschel, P. (2008) The Costs of not Knowing the Radius. Statistical Methods and Applications, *17*(1) 13-40.

Rieder, H., Kohl, M. and Ruckdeschel, P. (2001) The Costs of not Knowing the Radius. Submitted. Appeared as discussion paper Nr. 81. SFB 373 (Quantification and Simulation of Economic Processes), Humboldt University, Berlin; also available under www.uni-bayreuth.de/departments/math/org/mathe7/RIEDER/pubs/RR.pdf

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

See Also

radiusMinimaxIC, leastFavorableRadius

`getInfCent` *Generic Function for the Computation of the Optimal Centering Constant/Lower Clipping Bound*

Description

Generic function for the computation of the optimal centering constant (contamination neighborhoods) respectively, of the optimal lower clipping bound (total variation neighborhood). This function is rarely called directly. It is used to compute optimally robust ICs.

Usage

```
getInfCent(L2deriv, neighbor, biastype, ...)

## S4 method for signature 'UnivariateDistribution,ContNeighborhood,BiasType'
getInfCent(L2deriv,
     neighbor, biastype, clip, cent, tol.z, symm, trafo)

## S4 method for signature
## 'UnivariateDistribution,TotalVarNeighborhood,BiasType'
getInfCent(L2deriv,
     neighbor, biastype, clip, cent, tol.z, symm, trafo)

## S4 method for signature 'RealRandVariable,ContNeighborhood,BiasType'
getInfCent(L2deriv,
     neighbor, biastype, Distr, z.comp, w, tol.z = .Machine$double.eps^.5)

## S4 method for signature 'RealRandVariable,TotalVarNeighborhood,BiasType'
getInfCent(L2deriv,
     neighbor, biastype, Distr, z.comp, w, tol.z = .Machine$double.eps^.5)

## S4 method for signature
```

```
## 'UnivariateDistribution,ContNeighborhood,onesidedBias'
getInfCent(L2deriv,
     neighbor, biastype, clip, cent, tol.z, symm, trafo)

## S4 method for signature
## 'UnivariateDistribution,ContNeighborhood,asymmetricBias'
getInfCent(L2deriv,
     neighbor, biastype, clip, cent, tol.z, symm, trafo)
```

Arguments

L2deriv	L2-derivative of some L2-differentiable family of probability measures.
neighbor	object of class "Neighborhood".
biastype	object of class "BiasType"
...	additional parameters.
clip	optimal clipping bound.
cent	optimal centering constant.
tol.z	the desired accuracy (convergence tolerance).
symm	logical: indicating symmetry of L2deriv.
trafo	matrix: transformation of the parameter.
Distr	object of class Distribution.
z.comp	logical vector: indication which components of the centering constant have to be computed.
w	object of class RobWeight; current weight

Value

The optimal centering constant is computed.

Methods

L2deriv = "UnivariateDistribution", neighbor = "ContNeighborhood", biastype = "BiasType"
computation of optimal centering constant for symmetric bias.

L2deriv = "UnivariateDistribution", neighbor = "TotalVarNeighborhood", biastype = "BiasType"
computation of optimal lower clipping bound for symmetric bias.

L2deriv = "RealRandVariable", neighbor = "TotalVarNeighborhood", biastype = "BiasType"
computation of optimal centering constant for symmetric bias.

L2deriv = "RealRandVariable", neighbor = "ContNeighborhood", biastype = "BiasType" computation of optimal centering constant for symmetric bias.

L2deriv = "UnivariateDistribution", neighbor = "ContNeighborhood", biastype = "onesidedBias"
computation of optimal centering constant for onesided bias.

L2deriv = "UnivariateDistribution", neighbor = "ContNeighborhood", biastype = "asymmetricBias"
computation of optimal centering constant for asymmetric bias.

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.

Ruckdeschel, P. (2005) Optimally One-Sided Bounded Influence Curves. Mathematical Methods in Statistics *14*(1), 105-131.

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

See Also

ContIC-class, TotalVarIC-class

---

getInfClip *Generic Function for the Computation of the Optimal Clipping Bound*

Description

Generic function for the computation of the optimal clipping bound in case of infinitesimal robust models. This function is rarely called directly. It is used to compute optimally robust ICs.

Usage

```
getInfClip(clip, L2deriv, risk, neighbor, ...)

## S4 method for signature
## 'numeric,UnivariateDistribution,asMSE,ContNeighborhood'
getInfClip(
     clip, L2deriv, risk, neighbor, biastype, cent, symm, trafo)

## S4 method for signature
## 'numeric,UnivariateDistribution,asMSE,TotalVarNeighborhood'
getInfClip(
     clip, L2deriv, risk, neighbor, biastype, cent, symm, trafo)

## S4 method for signature
## 'numeric,UnivariateDistribution,asL1,ContNeighborhood'
getInfClip(
     clip, L2deriv, risk, neighbor, biastype, cent, symm, trafo)

## S4 method for signature
## 'numeric,UnivariateDistribution,asL1,TotalVarNeighborhood'
getInfClip(
     clip, L2deriv, risk, neighbor, biastype, cent, symm, trafo)
```

```
## S4 method for signature
## 'numeric,UnivariateDistribution,asL4,ContNeighborhood'
getInfClip(
     clip, L2deriv, risk, neighbor, biastype, cent, symm, trafo)

## S4 method for signature
## 'numeric,UnivariateDistribution,asL4,TotalVarNeighborhood'
getInfClip(
     clip, L2deriv, risk, neighbor, biastype, cent, symm, trafo)

## S4 method for signature 'numeric,EuclRandVariable,asMSE,UncondNeighborhood'
getInfClip(
     clip, L2deriv, risk, neighbor, biastype, Distr, stand, cent, trafo)

## S4 method for signature
## 'numeric,UnivariateDistribution,asUnOvShoot,UncondNeighborhood'
getInfClip(
     clip, L2deriv, risk, neighbor, biastype, cent, symm, trafo)

## S4 method for signature
## 'numeric,UnivariateDistribution,asSemivar,ContNeighborhood'
getInfClip(
     clip, L2deriv, risk, neighbor, biastype, cent, symm, trafo)
```

Arguments

clip	positive real: clipping bound
L2deriv	L2-derivative of some L2-differentiable family of probability measures.
risk	object of class "RiskType".
neighbor	object of class "Neighborhood".
...	additional parameters.
biastype	object of class "BiasType"
cent	optimal centering constant.
stand	standardizing matrix.
Distr	object of class "Distribution".
symm	logical: indicating symmetry of L2deriv.
trafo	matrix: transformation of the parameter.

Value

The optimal clipping bound is computed.

Methods

clip = "numeric", L2deriv = "UnivariateDistribution", risk = "asMSE", neighbor = "ContNeighborhood"
optimal clipping bound for asymtotic mean square error.

clip = "numeric", L2deriv = "UnivariateDistribution", risk = "asMSE", neighbor = "TotalVarNeighborhood"
optimal clipping bound for asymtotic mean square error.

clip = "numeric", L2deriv = "EuclRandVariable", risk = "asMSE", neighbor = "UncondNeighborhood"
optimal clipping bound for asymtotic mean square error.

clip = "numeric", L2deriv = "UnivariateDistribution", risk = "asL1", neighbor = "ContNeighborhood"
optimal clipping bound for asymtotic mean absolute error.

clip = "numeric", L2deriv = "UnivariateDistribution", risk = "asL1", neighbor = "TotalVarNeighborhood"
optimal clipping bound for asymtotic mean absolute error.

clip = "numeric", L2deriv = "UnivariateDistribution", risk = "asL4", neighbor = "ContNeighborhood"
optimal clipping bound for asymtotic mean power 4 error.

clip = "numeric", L2deriv = "UnivariateDistribution", risk = "asL4", neighbor = "TotalVarNeighborhood"
optimal clipping bound for asymtotic mean power 4 error.

clip = "numeric", L2deriv = "UnivariateDistribution", risk = "asUnOvShoot", neighbor = "UncondNeighborhood"
optimal clipping bound for asymtotic under-/overshoot risk.

clip = "numeric", L2deriv = "UnivariateDistribution", risk = "asSemivar", neighbor = "ContNeighborhood"
optimal clipping bound for asymtotic semivariance.

Author(s)

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

References

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

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

Ruckdeschel, P. and Rieder, H. (2004) Optimal Influence Curves for General Loss Functions. Statistics & Decisions *22*, 201-223.

Ruckdeschel, P. (2005) Optimally One-Sided Bounded Influence Curves. Mathematical Methods in Statistics *14*(1), 105-131.

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

See Also

ContIC-class, TotalVarIC-class

getInfGamma *Generic Function for the Computation of the Optimal Clipping Bound*

Description

Generic function for the computation of the optimal clipping bound. This function is rarely called directly. It is called by `getInfClip` to compute optimally robust ICs.

Usage

```
getInfGamma(L2deriv, risk, neighbor, biastype, ...)

## S4 method for signature
## 'UnivariateDistribution,asGRisk,ContNeighborhood,BiasType'
getInfGamma(L2deriv,
     risk, neighbor, biastype, cent, clip)

## S4 method for signature
## 'UnivariateDistribution,asGRisk,TotalVarNeighborhood,BiasType'
getInfGamma(L2deriv,
     risk, neighbor, biastype, cent, clip)

## S4 method for signature 'RealRandVariable,asMSE,ContNeighborhood,BiasType'
getInfGamma(L2deriv,
     risk, neighbor, biastype, Distr, stand, cent, clip, power = 1L)

## S4 method for signature
## 'RealRandVariable,asMSE,TotalVarNeighborhood,BiasType'
getInfGamma(L2deriv,
     risk, neighbor, biastype, Distr, stand, cent, clip, power = 1L)

## S4 method for signature
## 'UnivariateDistribution,asUnOvShoot,ContNeighborhood,BiasType'
getInfGamma(L2deriv,
     risk, neighbor, biastype, cent, clip)

## S4 method for signature
## 'UnivariateDistribution,asMSE,ContNeighborhood,onesidedBias'
getInfGamma(L2deriv,
     risk, neighbor, biastype, cent, clip)

## S4 method for signature
## 'UnivariateDistribution,asMSE,ContNeighborhood,asymmetricBias'
getInfGamma(L2deriv,
    risk, neighbor, biastype, cent, clip)
```

Arguments

L2deriv	L2-derivative of some L2-differentiable family of probability measures.
risk	object of class "RiskType".
neighbor	object of class "Neighborhood".
biastype	object of class "BiasType"
...	additional parameters
cent	optimal centering constant.
clip	optimal clipping bound.
stand	standardizing matrix.
Distr	object of class "Distribution".
power	exponent for the integrand; by default 1, but may also be 2, for optimization in getLagrangeMultByOptim.

Details

The function is used in case of asymptotic G-risks; confer Ruckdeschel and Rieder (2004).

Methods

L2deriv = "UnivariateDistribution", risk = "asGRisk", neighbor = "ContNeighborhood", biastype = "BiasType"
used by getInfClip for symmetric bias.

L2deriv = "UnivariateDistribution", risk = "asGRisk", neighbor = "TotalVarNeighborhood", biastype = "BiasType"
used by getInfClip for symmetric bias.

L2deriv = "RealRandVariable", risk = "asMSE", neighbor = "ContNeighborhood", biastype = "BiasType"
used by getInfClip for symmetric bias.

L2deriv = "RealRandVariable", risk = "asMSE", neighbor = "TotalVarNeighborhood", biastype = "BiasType"
used by getInfClip for symmetric bias.

L2deriv = "UnivariateDistribution", risk = "asUnOvShoot", neighbor = "ContNeighborhood", biastype = "BiasTyp
used by getInfClip for symmetric bias.

L2deriv = "UnivariateDistribution", risk = "asMSE", neighbor = "ContNeighborhood", biastype = "onesidedBias"
used by getInfClip for onesided bias.

L2deriv = "UnivariateDistribution", risk = "asMSE", neighbor = "ContNeighborhood", biastype = "asymmetricBia
used by getInfClip for asymmetric bias.

Author(s)

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

References

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

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

Ruckdeschel, P. and Rieder, H. (2004) Optimal Influence Curves for General Loss Functions. Statistics & Decisions *22*, 201-223.

Ruckdeschel, P. (2005) Optimally One-Sided Bounded Influence Curves. Mathematical Methods in Statistics *14*(1), 105-131.

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

See Also

asGRisk-class, asMSE-class, asUnOvShoot-class, ContIC-class, TotalVarIC-class

---

getInfLM *Functions to determine Lagrange multipliers*

Description

Functions to determine Lagrange multipliers A and a in a Hampel problem or in a(n) (inner) loop in a MSE problem; can be done either by optimization or by fixed point iteration. These functions are rarely called directly.

Usage

```
getLagrangeMultByIter(b, L2deriv, risk, trafo,
                      neighbor, biastype, normtype, Distr,
                      a.start, z.start, A.start, w.start, std, z.comp,
                      A.comp, maxiter, tol, verbose = NULL,
                      warnit = TRUE)
getLagrangeMultByOptim(b, L2deriv, risk, FI, trafo,
                      neighbor, biastype, normtype, Distr,
                      a.start, z.start, A.start, w.start,  std, z.comp,
                      A.comp, maxiter, tol, verbose = NULL, ...)
```

Arguments

b	numeric; ($> b_{\min}$; clipping bound for which the Lagrange multipliers are searched
L2deriv	L2-derivative of some L2-differentiable family of probability measures.
risk	object of class "RiskType".
FI	matrix: Fisher information.
trafo	matrix: transformation of the parameter.
neighbor	object of class "Neighborhood".
biastype	object of class "BiasType" — the bias type with we work.
normtype	object of class "NormType" — the norm type with we work.
Distr	object of class "Distribution".
a.start	initial value for the centering constant (in p-space).
z.start	initial value for the centering constant (in k-space).

A.start	initial value for the standardizing matrix.
w.start	initial value for the weight function.
std	matrix of (or which may coerced to) class PosSemDefSymmMatrix for use of different (standardizing) norm.
z.comp	logical vector: indication which components of the centering constant have to be computed.
A.comp	matrix: indication which components of the standardizing matrix have to be computed.
maxiter	the maximum number of iterations.
tol	the desired accuracy (convergence tolerance).
verbose	logical: if TRUE, some messages are printed.
warnit	logical: if TRUE warning is issued if maximal number of iterations is reached.
...	additional parameters for optim.

Value

a list with items

A	Lagrange multiplier A (standardizing matrix)
a	Lagrange multiplier a (centering in p-space)
z	Lagrange multiplier z (centering in k-space)
w	weight function involving Lagrange multipliers
biastype	(possibly modified) bias type biastype from argument
normtype	(possibly modified) norm type normtype from argument
normtype.old	(possibly modified) norm type normtype before last (internal) update
risk	(possibly [norm-]modified) risk risk from argument
std	(possibly modified) argument std
iter	number of iterations needed
prec	precision achieved
b	used clippng height b
call	call with which either getLagrangeMultByIter or getLagrangeMultByOptim was called

Author(s)

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

References

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

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

Ruckdeschel, P. and Rieder, H. (2004) Optimal Influence Curves for General Loss Functions. Statistics & Decisions **22**: 201-223.

Ruckdeschel, P. (2005) Optimally One-Sided Bounded Influence Curves. Mathematical Methods in Statistics *14*(1), 105-131.

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

See Also

InfRobModel-class

`getInfRad` *Generic Function for the Computation of the Optimal Radius for Given Clipping Bound*

Description

The usual robust optimality problem for given asGRisk searches the optimal clipping height b of a Hampel-type IC to given radius of the neighborhood. Instead, again for given asGRisk and for given Hampel-Type IC with given clipping height b we may determine the radius of the neighborhood for which it is optimal in the sense of the first sentence. This radius is determined by `getInfRad`. This function is rarely called directly. It is used withing `getRadius`.

Usage

```
getInfRad(clip, L2deriv, risk, neighbor, ...)

## S4 method for signature
## 'numeric,UnivariateDistribution,asMSE,ContNeighborhood'
getInfRad(
          clip, L2deriv, risk, neighbor, biastype, cent, symm, trafo)

## S4 method for signature
## 'numeric,UnivariateDistribution,asMSE,TotalVarNeighborhood'
getInfRad(
          clip, L2deriv, risk, neighbor, biastype, cent, symm, trafo)

## S4 method for signature
## 'numeric,UnivariateDistribution,asL1,ContNeighborhood'
getInfRad(
          clip, L2deriv, risk, neighbor, biastype, cent, symm, trafo)
```

```
## S4 method for signature
## 'numeric,UnivariateDistribution,asL1,TotalVarNeighborhood'
getInfRad(
          clip, L2deriv, risk, neighbor, biastype, cent, symm, trafo)

## S4 method for signature
## 'numeric,UnivariateDistribution,asL4,ContNeighborhood'
getInfRad(
          clip, L2deriv, risk, neighbor, biastype, cent, symm, trafo)

## S4 method for signature
## 'numeric,UnivariateDistribution,asL4,TotalVarNeighborhood'
getInfRad(
          clip, L2deriv, risk, neighbor, biastype, cent, symm, trafo)

## S4 method for signature 'numeric,EuclRandVariable,asMSE,UncondNeighborhood'
getInfRad(
          clip, L2deriv, risk, neighbor, biastype, Distr, stand, cent, trafo)

## S4 method for signature
## 'numeric,UnivariateDistribution,asUnOvShoot,UncondNeighborhood'
getInfRad(
          clip, L2deriv, risk, neighbor, biastype, cent, symm, trafo)

## S4 method for signature
## 'numeric,UnivariateDistribution,asSemivar,ContNeighborhood'
getInfRad(
          clip, L2deriv, risk, neighbor, biastype, cent, symm, trafo)
```

Arguments

clip	positive real: clipping bound
L2deriv	L2-derivative of some L2-differentiable family of probability measures.
risk	object of class "RiskType".
neighbor	object of class "Neighborhood".
...	additional parameters.
biastype	object of class "BiasType"
cent	optimal centering constant.
stand	standardizing matrix.
Distr	object of class "Distribution".
symm	logical: indicating symmetry of L2deriv.
trafo	matrix: transformation of the parameter.

Value

The optimal clipping bound is computed.

Methods

clip = "numeric", L2deriv = "UnivariateDistribution", risk = "asMSE", neighbor = "ContNeighborhood"
optimal clipping bound for asymtotic mean square error.

clip = "numeric", L2deriv = "UnivariateDistribution", risk = "asMSE", neighbor = "TotalVarNeighborhood"
optimal clipping bound for asymtotic mean square error.

clip = "numeric", L2deriv = "EuclRandVariable", risk = "asMSE", neighbor = "UncondNeighborhood"
optimal clipping bound for asymtotic mean square error.

clip = "numeric", L2deriv = "UnivariateDistribution", risk = "asL1", neighbor = "ContNeighborhood"
optimal clipping bound for asymtotic mean absolute error.

clip = "numeric", L2deriv = "UnivariateDistribution", risk = "asL1", neighbor = "TotalVarNeighborhood"
optimal clipping bound for asymtotic mean absolute error.

clip = "numeric", L2deriv = "UnivariateDistribution", risk = "asL4", neighbor = "ContNeighborhood"
optimal clipping bound for asymtotic mean power 4 error.

clip = "numeric", L2deriv = "UnivariateDistribution", risk = "asL4", neighbor = "TotalVarNeighborhood"
optimal clipping bound for asymtotic mean power 4 error.

clip = "numeric", L2deriv = "UnivariateDistribution", risk = "asUnOvShoot", neighbor = "UncondNeighborhood"
optimal clipping bound for asymtotic under-/overshoot risk.

clip = "numeric", L2deriv = "UnivariateDistribution", risk = "asSemivar", neighbor = "ContNeighborhood"
optimal clipping bound for asymtotic semivariance.

Author(s)

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References

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

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

Ruckdeschel, P. and Rieder, H. (2004) Optimal Influence Curves for General Loss Functions. Statistics & Decisions *22*, 201-223.

Ruckdeschel, P. (2005) Optimally One-Sided Bounded Influence Curves. Mathematical Methods in Statistics *14*(1), 105-131.

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

See Also

ContIC-class, TotalVarIC-class

getInfRobIC *Generic Function for the Computation of Optimally Robust ICs*

Description

Generic function for the computation of optimally robust ICs in case of infinitesimal robust models. This function is rarely called directly.

Usage

```
getInfRobIC(L2deriv, risk, neighbor, ...)

## S4 method for signature 'UnivariateDistribution,asCov,ContNeighborhood'
getInfRobIC(L2deriv,
                      risk, neighbor, Finfo, trafo, verbose = NULL)

## S4 method for signature 'UnivariateDistribution,asCov,TotalVarNeighborhood'
getInfRobIC(L2deriv,
                      risk, neighbor, Finfo, trafo, verbose = NULL)

## S4 method for signature 'RealRandVariable,asCov,UncondNeighborhood'
getInfRobIC(L2deriv, risk,
                    neighbor, Distr, Finfo, trafo, QuadForm = diag(nrow(trafo)),
                      verbose = NULL)

## S4 method for signature 'UnivariateDistribution,asBias,UncondNeighborhood'
getInfRobIC(L2deriv,
                      risk, neighbor, symm, trafo, maxiter, tol, warn, Finfo,
                      verbose = NULL, ...)

## S4 method for signature 'RealRandVariable,asBias,UncondNeighborhood'
getInfRobIC(L2deriv, risk,
                      neighbor, Distr, DistrSymm, L2derivSymm,
                      L2derivDistrSymm, z.start, A.start, Finfo, trafo,
                      maxiter, tol, warn, verbose = NULL, ...)

## S4 method for signature 'UnivariateDistribution,asHampel,UncondNeighborhood'
getInfRobIC(L2deriv,
                      risk, neighbor, symm, Finfo, trafo, upper = NULL,
                      lower=NULL, maxiter, tol, warn, noLow = FALSE,
                      verbose = NULL, checkBounds = TRUE, ...)

## S4 method for signature 'RealRandVariable,asHampel,UncondNeighborhood'
getInfRobIC(L2deriv, risk,
                      neighbor, Distr, DistrSymm, L2derivSymm,
                      L2derivDistrSymm, Finfo, trafo, onesetLM = FALSE,
                      z.start, A.start, upper = NULL, lower=NULL,
```

```
                        OptOrIter = "iterate", maxiter, tol, warn,
                        verbose = NULL, checkBounds = TRUE, ...,
                        .withEvalAsVar = TRUE)

## S4 method for signature
## 'UnivariateDistribution,asAnscombe,UncondNeighborhood'
getInfRobIC(
                      L2deriv, risk, neighbor, symm, Finfo, trafo, upper = NULL,
                        lower=NULL, maxiter, tol, warn, noLow = FALSE,
                        verbose = NULL, checkBounds = TRUE, ...)

## S4 method for signature 'RealRandVariable,asAnscombe,UncondNeighborhood'
getInfRobIC(L2deriv,
                        risk, neighbor, Distr, DistrSymm, L2derivSymm,
                        L2derivDistrSymm, Finfo, trafo, onesetLM = FALSE,
                        z.start, A.start, upper = NULL, lower=NULL,
                        OptOrIter = "iterate", maxiter, tol, warn,
                        verbose = NULL, checkBounds = TRUE, ...)

## S4 method for signature 'UnivariateDistribution,asGRisk,UncondNeighborhood'
getInfRobIC(L2deriv,
                        risk, neighbor, symm, Finfo, trafo, upper = NULL,
                        lower = NULL, maxiter, tol, warn, noLow = FALSE,
                        verbose = NULL, ...)

## S4 method for signature 'RealRandVariable,asGRisk,UncondNeighborhood'
getInfRobIC(L2deriv, risk,
                        neighbor,  Distr, DistrSymm, L2derivSymm,
                      L2derivDistrSymm, Finfo, trafo, onesetLM = FALSE, z.start,
                      A.start, upper = NULL, lower = NULL, OptOrIter = "iterate",
                        maxiter, tol, warn, verbose = NULL, withPICcheck = TRUE,
                        ..., .withEvalAsVar = TRUE)

## S4 method for signature
## 'UnivariateDistribution,asUnOvShoot,UncondNeighborhood'
getInfRobIC(
                        L2deriv, risk, neighbor, symm, Finfo, trafo,
                        upper, lower, maxiter, tol, warn, ...)
```

Arguments

L2deriv	L2-derivative of some L2-differentiable family of probability measures.
risk	object of class "RiskType".
neighbor	object of class "Neighborhood".
...	additional parameters (mainly for optim).
Distr	object of class "Distribution".
symm	logical: indicating symmetry of L2deriv.

DistrSymm	object of class "DistributionSymmetry".
L2derivSymm	object of class "FunSymmList".
L2derivDistrSymm	object of class "DistrSymmList".
Finfo	Fisher information matrix.
z.start	initial value for the centering constant.
A.start	initial value for the standardizing matrix.
trafo	matrix: transformation of the parameter.
upper	upper bound for the optimal clipping bound.
lower	lower bound for the optimal clipping bound.
OptOrIter	character; which method to be used for determining Lagrange multipliers A and a: if (partially) matched to "optimize", getLagrangeMultByOptim is used; otherwise: by default, or if matched to "iterate" or to "doubleiterate", getLagrangeMultByIter is used. More specifically, when using getLagrangeMultByIter, and if argument risk is of class "asGRisk", by default and if matched to "iterate" we use only one (inner) iteration, if matched to "doubleiterate" we use up to Maxiter (inner) iterations.
maxiter	the maximum number of iterations.
tol	the desired accuracy (convergence tolerance).
warn	logical: print warnings.
noLow	logical: is lower case to be computed?
onesetLM	logical: use one set of Lagrange multipliers?
QuadForm	matrix of (or which may coerced to) class PosSemDefSymmMatrix for use of different (standardizing) norm
verbose	logical: if TRUE, some messages are printed
checkBounds	logical: if TRUE, minimal and maximal clipping bound are computed to check if a valid bound was specified.
withPICcheck	logical: at the end of the algorithm, shall we check how accurately this is a pIC; this will only be done if withPICcheck && verbose.
.withEvalAsVar	logical (of length 1): if TRUE, risks based on covariances are to be evaluated (default), otherwise just a call is returned.

Value

The optimally robust IC is computed.

Methods

L2deriv = "UnivariateDistribution", risk = "asCov", neighbor = "ContNeighborhood" computes the classical optimal influence curve for L2 differentiable parametric families with unknown one-dimensional parameter.

L2deriv = "UnivariateDistribution", risk = "asCov", neighbor = "TotalVarNeighborhood" computes the classical optimal influence curve for L2 differentiable parametric families with unknown one-dimensional parameter.

L2deriv = "RealRandVariable", risk = "asCov", neighbor = "UncondNeighborhood" computes the classical optimal influence curve for L2 differentiable parametric families with unknown k-dimensional parameter ($k > 1$) where the underlying distribution is univariate; for total variation neighborhoods only is implemented for the case where there is a $1 \times k$ transformation `trafo` matrix.

L2deriv = "UnivariateDistribution", risk = "asBias", neighbor = "UncondNeighborhood" computes the bias optimal influence curve for L2 differentiable parametric families with unknown one-dimensional parameter.

L2deriv = "RealRandVariable", risk = "asBias", neighbor = "UncondNeighborhood" computes the bias optimal influence curve for L2 differentiable parametric families with unknown k-dimensional parameter ($k > 1$) where the underlying distribution is univariate.

L2deriv = "UnivariateDistribution", risk = "asHampel", neighbor = "UncondNeighborhood" computes the optimally robust influence curve for L2 differentiable parametric families with unknown one-dimensional parameter.

L2deriv = "RealRandVariable", risk = "asHampel", neighbor = "UncondNeighborhood" computes the optimally robust influence curve for L2 differentiable parametric families with unknown k-dimensional parameter ($k > 1$) where the underlying distribution is univariate; for total variation neighborhoods only is implemented for the case where there is a $1 \times k$ transformation `trafo` matrix.

L2deriv = "UnivariateDistribution", risk = "asAnscombe", neighbor = "UncondNeighborhood" computes the optimally bias-robust influence curve to given ARE in the ideal model for L2 differentiable parametric families with unknown one-dimensional parameter.

L2deriv = "RealRandVariable", risk = "asAnscombe", neighbor = "UncondNeighborhood" computes the optimally bias-robust influence curve to given ARE in the ideal modelfor L2 differentiable parametric families with unknown k-dimensional parameter ($k > 1$) where the underlying distribution is univariate; for total variation neighborhoods only is implemented for the case where there is a $1 \times k$ transformation `trafo` matrix.

L2deriv = "UnivariateDistribution", risk = "asGRisk", neighbor = "UncondNeighborhood" computes the optimally robust influence curve for L2 differentiable parametric families with unknown one-dimensional parameter.

L2deriv = "RealRandVariable", risk = "asGRisk", neighbor = "UncondNeighborhood" computes the optimally robust influence curve for L2 differentiable parametric families with unknown k-dimensional parameter ($k > 1$) where the underlying distribution is univariate; for total variation neighborhoods only is implemented for the case where there is a $1 \times k$ transformation `trafo` matrix.

L2deriv = "UnivariateDistribution", risk = "asUnOvShoot", neighbor = "UncondNeighborhood" computes the optimally robust influence curve for one-dimensional L2 differentiable parametric families and asymptotic under-/overshoot risk.

Author(s)

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

References

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

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

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Ruckdeschel, P. (2005) Optimally One-Sided Bounded Influence Curves. Mathematical Methods in Statistics *14*(1), 105-131.

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

See Also

InfRobModel-class

`getInfStand` *Generic Function for the Computation of the Standardizing Matrix*

Description

Generic function for the computation of the standardizing matrix which takes care of the Fisher consistency of the corresponding IC. This function is rarely called directly. It is used to compute optimally robust ICs.

Usage

```
getInfStand(L2deriv, neighbor, biastype, ...)

## S4 method for signature 'UnivariateDistribution,ContNeighborhood,BiasType'
getInfStand(L2deriv,
     neighbor, biastype, clip, cent, trafo)

## S4 method for signature
## 'UnivariateDistribution,TotalVarNeighborhood,BiasType'
getInfStand(L2deriv,
     neighbor, biastype, clip, cent, trafo)

## S4 method for signature 'RealRandVariable,UncondNeighborhood,BiasType'
getInfStand(L2deriv,
     neighbor, biastype, Distr, A.comp, cent, trafo, w)

## S4 method for signature 'UnivariateDistribution,ContNeighborhood,BiasType'
getInfStand(L2deriv,
     neighbor, biastype, clip, cent, trafo)

## S4 method for signature 'UnivariateDistribution,ContNeighborhood,BiasType'
getInfStand(L2deriv,
     neighbor, biastype, clip, cent, trafo)
```

Arguments

L2deriv	L2-derivative of some L2-differentiable family of probability measures.
neighbor	object of class "Neighborhood"
biastype	object of class "BiasType"
...	additional parameters
clip	optimal clipping bound.
cent	optimal centering constant.
Distr	object of class "Distribution".
trafo	matrix: transformation of the parameter.
A.comp	matrix: indication which components of the standardizing matrix have to be computed.
w	object of class RobWeight; current weight

Value

The standardizing matrix is computed.

Methods

L2deriv = "UnivariateDistribution", neighbor = "ContNeighborhood", biastype = "BiasType"
computes standardizing matrix for symmetric bias.

L2deriv = "UnivariateDistribution", neighbor = "TotalVarNeighborhood", biastype = "BiasType"
computes standardizing matrix for symmetric bias.

L2deriv = "RealRandVariable", neighbor = "UncondNeighborhood", biastype = "BiasType"
computes standardizing matrix for symmetric bias.

L2deriv = "UnivariateDistribution", neighbor = "ContNeighborhood", biastype = "onesidedBias"
computes standardizing matrix for onesided bias.

L2deriv = "UnivariateDistribution", neighbor = "ContNeighborhood", biastype = "asymmetricBias"
computes standardizing matrix for asymmetric bias.

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.

Ruckdeschel, P. (2005) Optimally One-Sided Bounded Influence Curves. Mathematical Methods in Statistics *14*(1), 105-131.

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

See Also

ContIC-class, TotalVarIC-class

getInfV *Generic Function for the Computation of the asymptotic Variance of a Hampel type IC*

Description

Generic function for the computation of the optimal clipping bound in case of infinitesimal robust models. This function is rarely called directly. It is used to compute optimally robust ICs.

Usage

```
getInfV(L2deriv, neighbor, biastype, ...)
## S4 method for signature 'UnivariateDistribution,ContNeighborhood,BiasType'
getInfV(L2deriv,
         neighbor, biastype, clip, cent, stand)
## S4 method for signature
## 'UnivariateDistribution,TotalVarNeighborhood,BiasType'
getInfV(L2deriv,
         neighbor, biastype, clip, cent, stand)
## S4 method for signature 'RealRandVariable,ContNeighborhood,BiasType'
getInfV(L2deriv,
         neighbor, biastype, Distr, V.comp, cent, stand,
         w)
## S4 method for signature 'RealRandVariable,TotalVarNeighborhood,BiasType'
getInfV(L2deriv,
         neighbor, biastype, Distr, V.comp, cent, stand,
         w)
## S4 method for signature
## 'UnivariateDistribution,ContNeighborhood,onesidedBias'
getInfV(L2deriv,
         neighbor, biastype, clip, cent, stand)
## S4 method for signature
## 'UnivariateDistribution,ContNeighborhood,asymmetricBias'
getInfV(L2deriv,
         neighbor, biastype, clip, cent, stand)
```

Arguments

L2deriv	L2-derivative of some L2-differentiable family of probability measures.
neighbor	object of class "Neighborhood".
biastype	object of class "BiasType"
...	additional parameters.
clip	positive real: clipping bound
cent	optimal centering constant.
stand	standardizing matrix.

Distr	standardizing matrix.
V.comp	matrix: indication which components of the standardizing matrix have to be computed.
w	object of class RobWeight; current weight

Value

The asymptotic variance of an ALE to IC of Hampel type is computed.

Author(s)

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

References

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

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

Ruckdeschel, P. (2005) Optimally One-Sided Bounded Influence Curves. Mathematical Methods in Statistics *14*(1), 105-131.

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

See Also

ContIC-class, TotalVarIC-class

---

getL1normL2deriv *Calculation of L1 norm of L2derivative*

Description

Methods to calculate the L1 norm of the L2derivative in a smooth parametric model.

Usage

```
getL1normL2deriv(L2deriv, ...)
## S4 method for signature 'UnivariateDistribution'
getL1normL2deriv(L2deriv,
     cent, ...)

## S4 method for signature 'RealRandVariable'
getL1normL2deriv(L2deriv,
     cent, stand, Distr, normtype, ...)
```

Arguments

L2deriv	L2derivative of the model
cent	centering Lagrange Multiplier
stand	standardizing Lagrange Multiplier
Distr	distribution of the L2derivative
normtype	object of class NormType; the norm under which we work
...	further arguments (not used at the moment)

Value

L1 norm of the L2derivative

Author(s)

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

Examples

```
##
```

---

getL2normL2deriv *Calculation of L2 norm of L2derivative*

Description

Function to calculate the L2 norm of the L2derivative in a smooth parametric model.

Usage

```
getL2normL2deriv(aFinfo, cent, ...)
```

Arguments

aFinfo	trace of the Fisher information
cent	centering
...	further arguments (not used at the moment)

Value

L2 norm of the L2derivative

Author(s)

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

Examples

```
##
```

getMaxIneff *getMaxIneff – computation of the maximal inefficiency of an IC*

Description

computes the maximal inefficiency of an IC for the radius range [0,Inf).

Usage

```
getMaxIneff(IC, neighbor, biastype = symmetricBias(),
                          normtype = NormType(), z.start = NULL,
                          A.start = NULL, maxiter = 50,
                          tol = .Machine$double.eps^0.4,
                          warn = TRUE, verbose = NULL)
```

Arguments

IC	some IC of class IC
neighbor	object of class Neighborhood; the neighborhood at which to compute the bias.
biastype	a bias type of class BiasType
normtype	a norm type of class NormType
z.start	initial value for the centering constant.
A.start	initial value for the standardizing matrix.
maxiter	the maximum number of iterations.
tol	the desired accuracy (convergence tolerance).
warn	logical: print warnings.
verbose	logical: if TRUE, some messages are printed

Value

The maximal inefficiency, i.e.; a number in [1,Inf).

Author(s)

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

Rieder, H., Kohl, M. and Ruckdeschel, P. (2008) The Costs of not Knowing the Radius. Statistical Methods and Applications *17*(1) 13-40.

Rieder, H., Kohl, M. and Ruckdeschel, P. (2001) The Costs of not Knowing the Radius. Submitted. Appeared as discussion paper Nr. 81. SFB 373 (Quantification and Simulation of Economic Processes), Humboldt University, Berlin; also available under www.uni-bayreuth.de/departments/math/org/mathe7/RIEDER/pubs/RR.pdf

Examples

```
N0 <- NormLocationFamily(mean=2, sd=3)
## L_2 family + infinitesimal neighborhood
neighbor <- ContNeighborhood(radius = 0.5)
N0.Rob1 <- InfRobModel(center = N0, neighbor = neighbor)
## OBRE solution (ARE 95%)
N0.ICA <- optIC(model = N0.Rob1, risk = asAnscombe(.95))
## OMSE solution radius 0.5
N0.ICM <- optIC(model=N0.Rob1, risk=asMSE())
## RMX solution
N0.ICR <- radiusMinimaxIC(L2Fam=N0, neighbor=neighbor,risk=asMSE())

getMaxIneff(N0.ICA,neighbor)
getMaxIneff(N0.ICM,neighbor)
getMaxIneff(N0.ICR,neighbor)

## Don't run to reduce check time on CRAN
## Not run:
N0ls <- NormLocationScaleFamily()
ICsc <- makeIC(list(sin,cos),N0ls)
getMaxIneff(ICsc,neighbor)

## End(Not run)
```

---

getModifyIC *Generic Function for the Computation of Functions for Slot modifyIC*

Description

These function is used by internal computations and is rarely called directly.

Usage

```
getModifyIC(L2FamIC, neighbor, risk,...)
## S4 method for signature 'L2ParamFamily,Neighborhood,asRisk'
getModifyIC(L2FamIC,
          neighbor, risk, ...)
## S4 method for signature 'L2LocationFamily,UncondNeighborhood,asGRisk'
getModifyIC(L2FamIC,
          neighbor, risk, ...)
## S4 method for signature 'L2LocationFamily,UncondNeighborhood,fiUnOvShoot'
getModifyIC(L2FamIC,
          neighbor, risk, ...)
```

```
## S4 method for signature 'L2ScaleFamily,UncondNeighborhood,asGRisk'
getModifyIC(L2FamIC,
          neighbor, risk, ...)
## S4 method for signature 'L2LocationScaleFamily,UncondNeighborhood,asGRisk'
getModifyIC(L2FamIC,
          neighbor, risk, ...)

scaleUpdateIC(neighbor,...)
## S4 method for signature 'UncondNeighborhood'
scaleUpdateIC(neighbor, sdneu, sdalt, IC)
## S4 method for signature 'ContNeighborhood'
scaleUpdateIC(neighbor, sdneu, sdalt, IC)
## S4 method for signature 'TotalVarNeighborhood'
scaleUpdateIC(neighbor, sdneu, sdalt, IC)
```

Arguments

L2FamIC	object of class L2ParamFamily.
neighbor	object of class "Neighborhood".
risk	object of class "RiskType"
...	further arguments to be passed over to optIC.
sdneu	positive numeric of length one; the new scale.
sdalt	positive numeric of length one; the new scale.
IC	a Hampel-IC to be updated.

Details

This function is used for internal computations. By setting RobAStBaseOption("all.verbose" = TRUE) somewhere globally, the generated function modifyIC will generate calls to optIC with argument verbose=TRUE.

Value

getmodifyIC Function for slot modifyIC of ICs

scaleUpdateIC a list to be digested in corresponding methods of getmodifyIC by generateIC

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

optIC, IC-class

---

getRadius *Computation of the Optimal Radius for Given Clipping Bound*

Description

The usual robust optimality problem for given asGRisk searches the optimal clipping height b of a Hampel-type IC to given radius of the neighborhood. Instead, again for given asGRisk and for given Hampel-Type IC with given clipping height b we may determine the radius of the neighborhood for which it is optimal in the sense of the first sentence.

Usage

```
getRadius(IC, risk, neighbor, L2Fam)
```

Arguments

IC	an IC of class "HampIC".
risk	object of class "RiskType".
neighbor	object of class "Neighborhood".
L2Fam	object of class "L2FamParameter". Can be missing; in this case it is constructed from slot CallL2Fam of IC.

Value

The optimal radius is computed.

Author(s)

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

References

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

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

Ruckdeschel, P. and Rieder, H. (2004) Optimal Influence Curves for General Loss Functions. Statistics & Decisions *22*, 201-223.

Ruckdeschel, P. (2005) Optimally One-Sided Bounded Influence Curves. Mathematical Methods in Statistics *14*(1), 105-131.

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

See Also

ContIC-class, TotalVarIC-class

Examples

```
N <- NormLocationFamily(mean=0, sd=1)
nb <- ContNeighborhood(); ri <- asMSE()
radIC <- radiusMinimaxIC(L2Fam=N, neighbor=nb, risk=ri, loRad=0.1, upRad=0.5)
getRadius(radIC, L2Fam=N, neighbor=nb, risk=ri)

## taken from script NormalScaleModel.R in folder scripts
N0 <- NormScaleFamily(mean=0, sd=1)
(N0.IC7 <- radiusMinimaxIC(L2Fam=N0, neighbor=nb, risk=ri, loRad=0, upRad=Inf))
##
getRadius(N0.IC7, risk=asMSE(), neighbor=nb, L2Fam=N0)
getRadius(N0.IC7, risk=asL4(), neighbor=nb, L2Fam=N0)
```

---

getReq — *getReq – computation of the radius interval where IC1 is better than IC2.*

Description

(tries to) compute a radius interval where IC1 is better than IC2, respectively the number of (worst-case) outliers interval where IC1 is better than IC2.

Usage

```
getReq(Risk,neighbor,IC1,IC2,n=1,upper=15)
```

Arguments

Risk	an object of class "asGRisk" – the risk at which IC1 is better than IC2.
neighbor	object of class "Neighborhood"; the neighborhood at which to compute the bias.
IC1	some IC of class "IC"
IC2	some IC of class "IC"
n	the sample size; by default set to 1; then the radius interval refers to starting radii in the shrinking neighborhood setting of Rieder[94]. Otherwise the radius interval is scaled down accordingly.
upper	the upper bound of the radius interval in which to search

Value

The radius interval (given by its endpoints) where IC1 is better than IC2 according to the risk. In case IC2 is better than IC1 as to both variance and bias, the return value is NA.

Author(s)

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

Examples

```
N0 <- NormLocationFamily(mean=2, sd=3)
## L_2 family + infinitesimal neighborhood
neighbor <- ContNeighborhood(radius = 0.5)
N0.Rob1 <- InfRobModel(center = N0, neighbor = neighbor)
## OBRE solution (ARE 95%)
N0.ICA <- optIC(model = N0.Rob1, risk = asAnscombe(.95))
## MSE solution
N0.ICM <- optIC(model=N0.Rob1, risk=asMSE())

getReq(asMSE(),neighbor,N0.ICA,N0.ICM,n=1)
getReq(asMSE(),neighbor,N0.ICA,N0.ICM,n=30)

## Don't run to reduce check time on CRAN
## Not run:
## RMX solution
N0.ICR <- radiusMinimaxIC(L2Fam=N0, neighbor=neighbor,risk=asMSE())

getReq(asL1(),neighbor,N0.ICA,N0.ICM,n=30)
getReq(asL4(),neighbor,N0.ICA,N0.ICM,n=30)
getReq(asMSE(),neighbor,N0.ICA,N0.ICR,n=30)
getReq(asL1(),neighbor,N0.ICA,N0.ICR,n=30)
getReq(asL4(),neighbor,N0.ICA,N0.ICR,n=30)
getReq(asMSE(),neighbor,N0.ICM,N0.ICR,n=30)


### when to use MAD and when Qn
##  for Qn, see C. Croux, P. Rousseeuw (1993). Alternatives to the Median
##      Absolute Deviation, JASA 88(424):1273-1283
L2M <- NormScaleFamily()
IC.mad <- makeIC(function(x)sign(abs(x)-qnorm(.75)),L2M)
d.qn <- (2^.5*qnorm(5/8))^-1
IC.qn <- makeIC(function(x) d.qn*(1/4 - pnorm(x+1/d.qn) + pnorm(x-1/d.qn)), L2M)
getReq(asMSE(), neighbor, IC.mad, IC.qn)
getReq(asMSE(), neighbor, IC.mad, IC.qn, radOrOutl = "Outlier", n = 30)
# => MAD is better once r > 0.5144 (i.e. for more than 2 outliers for n = 30)

## End(Not run)
```

getRiskFctBV-methods *Methods for Function getRiskFctBV in Package 'ROptEst'*

Description

getRiskFctBV for a given object of S4 class asGRisk returns a function in bias and variance to compute the asymptotic risk.

Methods

getRiskFctBV signature(risk = "asL1", biastype = "ANY"): returns a function with arguments bias and variance to compute the asymptotic absolute (L1) error for a given ALE at a situation where it has bias bias (including the radius!) and variance variance.

getRiskFctBV signature(risk = "asL4", biastype = "ANY"): returns a function with arguments bias and variance to compute the asymptotic L4 error for a given ALE at a situation where it has bias bias (including the radius!) and variance variance.

Examples

```
myrisk <- asMSE()
getRiskFctBV(myrisk)
```

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 'HampIC,asCov,missing,missing'
getRiskIC(IC, risk)

## S4 method for signature 'HampIC,asCov,missing,L2ParamFamily'
getRiskIC(IC, risk, L2Fam)
## S4 method for signature 'TotalVarIC,asCov,missing,L2ParamFamily'
getRiskIC(IC, risk, L2Fam)
```

Arguments

IC	object of class "InfluenceCurve"
risk	object of class "RiskType".
neighbor	object of class "Neighborhood"; missing in the methods described here.
...	additional parameters
L2Fam	object of class "L2ParamFamily".

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 = "HampIC", risk = "asCov", neighbor = "missing", L2Fam = "missing" asymptotic covariance of IC read off from corresp. Risks slot.

IC = "HampIC", risk = "asCov", neighbor = "missing", L2Fam = "L2ParamFamily" asymptotic covariance of IC under L2Fam read off from corresp. Risks slot.

IC = "TotalVarIC", risk = "asCov", neighbor = "missing", L2Fam = "L2ParamFamily" asymptotic covariance of IC read off from corresp. Risks slot, resp. if this is NULL calculates it via getInfV.

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 Risk of M-estimators on Neighborhoods.

See Also

getRiskIC, InfRobModel-class

Examples

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

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

---

getStartIC-methods *Methods for Function getStartIC in Package 'ROptEst'*

Description

getStartIC computes the optimally-robust IC to be used as argument ICstart in kStepEstimator.

Usage

```
getStartIC(model, risk, ...)
## S4 method for signature 'ANY,ANY'
getStartIC(model, risk, ...)
## S4 method for signature 'L2ParamFamily,asGRisk'
getStartIC(model, risk, ...,
                     withEvalAsVar = TRUE,..debug=FALSE)
## S4 method for signature 'L2ParamFamily,asBias'
getStartIC(model, risk, ..., ..debug=FALSE)
## S4 method for signature 'L2ParamFamily,asCov'
getStartIC(model, risk, ..., ..debug=FALSE)
## S4 method for signature 'L2ParamFamily,trAsCov'
getStartIC(model, risk, ..., ..debug=FALSE)
```

Arguments

model	normtype of class NormType
risk	normtype of class NormType
...	further arguments to be passed to specific methods.
withEvalAsVar	logical (of length 1): if TRUE, risks based on covariances are to be evaluated (default), otherwise just a call is returned.
..debug	logical; if TRUE information for debugging is issued.

Details

getStartIC is used internally in functions robest and roptest to compute the optimally robust influence function according to the arguments given to them.

Value

An IC of type HampIC.

Methods

getStartIC signature(model = "ANY", risk = "ANY"): issue that this is not yet implemented.

getStartIC signature(model = "L2ParamFamily", risk = "asGRisk"): depending on the values of argument eps (to be passed on through the ... argument) computes the optimally robust influence function on the fly via calls to optIC or radiusMinimaxIC.

getStartIC signature(model = "L2ParamFamily", risk = "asBias"): computes the most-bias-robust influence function on the fly via calls to optIC.

getStartIC signature(model = "L2ParamFamily", risk = "asCov"): computes the classically optimal influence function on the fly via calls to optIC.

getStartIC signature(model = "L2ParamFamily", risk = "trAsCov"): computes the classically optimal influence function on the fly via calls to optIC.

Author(s)

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

See Also

robest,optIC, radiusMinimaxIC

---

inputGenerators *Input generating functions for function 'robest'*

Description

Generating functions to generate structured input for function robest.

Usage

```
genkStepCtrl(useLast = getRobAStBaseOption("kStepUseLast"),
                     withUpdateInKer = getRobAStBaseOption("withUpdateInKer"),
                     IC.UpdateInKer = getRobAStBaseOption("IC.UpdateInKer"),
                     withICList = getRobAStBaseOption("withICList"),
                     withPICList = getRobAStBaseOption("withPICList"),
                     scalename = "scale", withLogScale = TRUE,
                     withEvalAsVar = NULL)
genstartCtrl(initial.est = NULL, initial.est.ArgList = NULL,
                         startPar = NULL, distance = CvMDist, withMDE = NULL)
gennbCtrl(neighbor = ContNeighborhood(), eps, eps.lower, eps.upper)
```

Arguments

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 $\ker(D)$.
withICList	logical: shall slot ICList of return value be filled?
withPICList	logical: shall slot pICList of return value be filled?
scalename	character: name of the respective scale component.
withLogScale	logical; shall a scale component (if existing and found with name scalename) be computed on log-scale and backtransformed afterwards? This avoids crossing 0.
withEvalAsVar	logical or NULL: if TRUE (default), tells R to evaluate the asymptotic variance or if FALSE just to produces a call to do so. If withEvalAsVar is NULL (default), the content of slot .withEvalAsVar in the L2 family is used instead to take this decision.
initial.est	initial estimate for unknown parameter. If missing minimum distance estimator is computed.
initial.est.ArgList	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 L2Fam.
startPar	initial information used by optimize resp. optim; i.e; if (total) parameter is of length 1, startPar is a search interval, else it is an initial parameter value; if NULL slot startPar of ParamFamily is used to produce it; in the multivariate case, startPar may also be of class Estimate, in which case slot untransformed.estimate is used.
distance	distance function
withMDE	logical or NULL: Shall a minimum distance estimator be used as starting estimator in roptest() / robest()—in addition to the function given in argument startPar of the current function or, if the argument is NULL, in slot startPar of the L2 family? If NULL (default) the content of slot .withMDE in the L2 family is used instead to take this decision.
neighbor	object of class "UncondNeighborhood"
eps	positive real (0 < eps <= 0.5): amount of gross errors. See details below.
eps.lower	positive real (0 <= eps.lower <= eps.upper): lower bound for the amount of gross errors. See details below.
eps.upper	positive real (eps.lower <= eps.upper <= 0.5): upper bound for the amount of gross errors. See details below.

Details

All these functions bundle their respective input to (reusable) lists which can be used as arguments in function robest. For details, see this function.

Author(s)

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

See Also

roblox, L2ParamFamily-class UncondNeighborhood-class, RiskType-class

Examples

```
genkStepCtrl()
genstartCtrl()
gennbCtrl()
```

---

leastFavorableRadius *Generic Function for the Computation of Least Favorable Radii*

Description

Generic function for the computation of least favorable radii.

Usage

```
leastFavorableRadius(L2Fam, neighbor, risk, ...)

## S4 method for signature 'L2ParamFamily,UncondNeighborhood,asGRisk'
leastFavorableRadius(
          L2Fam, neighbor, risk, rho, upRad = 1,
            z.start = NULL, A.start = NULL, upper = 100,
            OptOrIter = "iterate", maxiter = 100,
            tol = .Machine$double.eps^0.4, warn = FALSE, verbose = NULL)
```

Arguments

L2Fam	L2-differentiable family of probability measures.
neighbor	object of class "Neighborhood".
risk	object of class "RiskType".
...	additional parameters
upRad	the upper end point of the radius interval to be searched.
rho	The considered radius interval is: $[r\rho, r/\rho]$ with $\rho \in (0,1)$.
z.start	initial value for the centering constant.

A.start	initial value for the standardizing matrix.
upper	upper bound for the optimal clipping bound.
OptOrIter	character; which method to be used for determining Lagrange multipliers A and a: if (partially) matched to "optimize", getLagrangeMultByOptim is used; otherwise: by default, or if matched to "iterate" or to "doubleiterate", getLagrangeMultByIter is used. More specifically, when using getLagrangeMultByIter, and if argument risk is of class "asGRisk", by default and if matched to "iterate" we use only one (inner) iteration, if matched to "doubleiterate" we use up to Maxiter (inner) iterations.
maxiter	the maximum number of iterations
tol	the desired accuracy (convergence tolerance).
warn	logical: print warnings.
verbose	logical: if TRUE, some messages are printed

Value

The least favorable radius and the corresponding inefficiency are computed.

Methods

L2Fam = "L2ParamFamily", neighbor = "UncondNeighborhood", risk = "asGRisk" computation of the least favorable radius.

Author(s)

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

References

Rieder, H., Kohl, M. and Ruckdeschel, P. (2008) The Costs of not Knowing the Radius. Statistical Methods and Applications *17*(1) 13-40.

Rieder, H., Kohl, M. and Ruckdeschel, P. (2001) The Costs of not Knowing the Radius. Submitted. Appeared as discussion paper Nr. 81. SFB 373 (Quantification and Simulation of Economic Processes), Humboldt University, Berlin; also available under www.uni-bayreuth.de/departments/math/org/mathe7/RIEDER/pubs/RR.pdf

Ruckdeschel, P. (2005) Optimally One-Sided Bounded Influence Curves. Mathematical Methods in Statistics *14*(1), 105-131.

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

See Also

radiusMinimaxIC

Examples

```
N <- NormLocationFamily(mean=0, sd=1)
leastFavorableRadius(L2Fam=N, neighbor=ContNeighborhood(),
                     risk=asMSE(), rho=0.5)
```

---

lowerCaseRadius *Computation of the lower case radius*

Description

The lower case radius is computed; confer Subsection 2.1.2 in Kohl (2005) and formula (4.5) in Ruckdeschel (2005).

Usage

```
lowerCaseRadius(L2Fam, neighbor, risk, biastype, ...)
```

Arguments

L2Fam	L2 differentiable parametric family
neighbor	object of class "Neighborhood"
risk	object of class "RiskType"
biastype	object of class "BiasType"
...	additional parameters

Value

lower case radius

Methods

L2Fam = "L2ParamFamily", neighbor = "ContNeighborhood", risk = "asMSE", biastype = "BiasType"
lower case radius for risk "asMSE" in case of "ContNeighborhood" for symmetric bias.

L2Fam = "L2ParamFamily", neighbor = "TotalVarNeighborhood", risk = "asMSE", biastype = "BiasType"
lower case radius for risk "asMSE" in case of "TotalVarNeighborhood"; (argument biastype is just for signature reasons).

L2Fam = "L2ParamFamily", neighbor = "ContNeighborhood", risk = "asMSE", biastype = "onesidedBias"
lower case radius for risk "asMSE" in case of "ContNeighborhood" for onesided bias.

L2Fam = "L2ParamFamily", neighbor = "ContNeighborhood", risk = "asMSE", biastype = "asymmetricBias"
lower case radius for risk "asMSE" in case of "ContNeighborhood" for asymmetric bias.

L2Fam = "UnivariateDistribution", neighbor = "ContNeighborhood", risk = "asMSE", biastype = "onesidedBias"
used only internally; trick to be able to call lower case radius from within minmax bias solver

Author(s)

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

References

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

Ruckdeschel, P. (2005) Optimally One-Sided Bounded Influence Curves. Mathematical Methods in Statistics *14*(1), 105-131.

See Also

L2ParamFamily-class, Neighborhood-class

Examples

```
lowerCaseRadius(BinomFamily(size = 10), ContNeighborhood(), asMSE())
lowerCaseRadius(BinomFamily(size = 10), TotalVarNeighborhood(), asMSE())
```

---

minmaxBias *Generic Function for the Computation of Bias-Optimally Robust ICs*

Description

Generic function for the computation of bias-optimally robust ICs in case of infinitesimal robust models. This function is rarely called directly.

Usage

```
minmaxBias(L2deriv, neighbor, biastype, ...)

## S4 method for signature 'UnivariateDistribution,ContNeighborhood,BiasType'
minmaxBias(L2deriv,
     neighbor, biastype, symm, trafo, maxiter, tol, warn, Finfo)

## S4 method for signature
## 'UnivariateDistribution,ContNeighborhood,asymmetricBias'
minmaxBias(
     L2deriv, neighbor, biastype, symm, trafo, maxiter, tol, warn, Finfo)

## S4 method for signature
## 'UnivariateDistribution,ContNeighborhood,onesidedBias'
minmaxBias(
     L2deriv, neighbor, biastype, symm, trafo, maxiter, tol, warn, Finfo)

## S4 method for signature
## 'UnivariateDistribution,TotalVarNeighborhood,BiasType'
minmaxBias(
     L2deriv, neighbor, biastype, symm, trafo, maxiter, tol, warn, Finfo)

## S4 method for signature 'RealRandVariable,ContNeighborhood,BiasType'
```

```
minmaxBias(L2deriv,
     neighbor, biastype, normtype, Distr, z.start, A.start,  z.comp, A.comp,
     Finfo, trafo, maxiter, tol, verbose = NULL)

## S4 method for signature 'RealRandVariable,TotalVarNeighborhood,BiasType'
minmaxBias(L2deriv,
     neighbor, biastype, normtype, Distr, z.start, A.start,  z.comp, A.comp,
     Finfo, trafo, maxiter, tol, verbose = NULL)
```

Arguments

L2deriv	L2-derivative of some L2-differentiable family of probability measures.
neighbor	object of class "Neighborhood".
biastype	object of class "BiasType".
normtype	object of class "NormType".
...	additional parameters.
Distr	object of class "Distribution".
symm	logical: indicating symmetry of L2deriv.
z.start	initial value for the centering constant.
A.start	initial value for the standardizing matrix.
z.comp	logical indicator which indices need to be computed and which are 0 due to symmetry.
A.comp	matrix of logical indicator which indices need to be computed and which are 0 due to symmetry.
trafo	matrix: transformation of the parameter.
maxiter	the maximum number of iterations.
tol	the desired accuracy (convergence tolerance).
warn	logical: print warnings.
Finfo	Fisher information matrix.
verbose	logical: if TRUE, some messages are printed

Value

The bias-optimally robust IC is computed.

Methods

L2deriv = "UnivariateDistribution", neighbor = "ContNeighborhood", biastype = "BiasType"
computes the bias optimal influence curve for symmetric bias for L2 differentiable parametric families with unknown one-dimensional parameter.

L2deriv = "UnivariateDistribution", neighbor = "ContNeighborhood", biastype = "asymmetricBias"
computes the bias optimal influence curve for asymmetric bias for L2 differentiable parametric families with unknown one-dimensional parameter.

L2deriv = "UnivariateDistribution", neighbor = "TotalVarNeighborhood", biastype = "BiasType" computes the bias optimal influence curve for symmetric bias for L2 differentiable parametric families with unknown one-dimensional parameter.

L2deriv = "RealRandVariable", neighbor = "ContNeighborhood", biastype = "BiasType" computes the bias optimal influence curve for symmetric bias for L2 differentiable parametric families with unknown k-dimensional parameter ($k > 1$) where the underlying distribution is univariate.

L2deriv = "RealRandVariable", neighbor = "TotalNeighborhood", biastype = "BiasType" computes the bias optimal influence curve for symmetric bias for L2 differentiable parametric families in a setting where we are interested in a $p = 1$ dimensional aspect of an unknown k-dimensional parameter ($k > 1$) where the underlying distribution is univariate.

Author(s)

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

References

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

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

Ruckdeschel, P. (2005) Optimally One-Sided Bounded Influence Curves. Mathematical Methods in Statistics *14*(1), 105-131.

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

See Also

InfRobModel-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 'InfRobModel,asRisk'
optIC(model, risk, z.start = NULL, A.start = NULL,
                                    upper = 1e4, lower = 1e-4,
                                    OptOrIter = "iterate", maxiter = 50,
                                   tol = .Machine$double.eps^0.4, warn = TRUE,
                                    noLow = FALSE, verbose = NULL, ...,
```

```
                                        .withEvalAsVar = TRUE,
                                        returnNAifProblem = FALSE)

## S4 method for signature 'InfRobModel,asUnOvShoot'
optIC(model, risk, upper = 1e4,
                                             lower = 1e-4, maxiter = 50,
                                       tol = .Machine$double.eps^0.4, warn = TRUE)

## S4 method for signature 'FixRobModel,fiUnOvShoot'
optIC(model, risk, sampleSize, upper = 1e4, lower = 1e-4,
                                      maxiter = 50, tol = .Machine$double.eps^0.4,
                                          warn = TRUE, Algo = "A", cont = "left",
                                            verbose = NULL)
```

Arguments

model	probability model.
risk	object of class "RiskType".
...	additional parameters.
z.start	initial value for the centering constant.
A.start	initial value for the standardizing matrix.
upper	upper bound for the optimal clipping bound.
lower	lower bound for the optimal clipping bound.
maxiter	the maximum number of iterations.
tol	the desired accuracy (convergence tolerance).
warn	logical: print warnings.
sampleSize	integer: sample size.
Algo	"A" or "B".
cont	"left" or "right".
noLow	logical: is lower case to be computed?
OptOrIter	character; which method to be used for determining Lagrange multipliers A and a: if (partially) matched to "optimize", getLagrangeMultByOptim is used; otherwise: by default, or if matched to "iterate" or to "doubleiterate", getLagrangeMultByIter is used. More specifically, when using getLagrangeMultByIter, and if argument risk is of class "asGRisk", by default and if matched to "iterate" we use only one (inner) iteration, if matched to "doubleiterate" we use up to Maxiter (inner) iterations.
verbose	logical: if TRUE, some messages are printed.
.withEvalAsVar	logical (of length 1): if TRUE, risks based on covariances are to be evaluated (default), otherwise just a call is returned.
returnNAifProblem	logical (of length 1): if TRUE (not the default), in case of convergence problems in the algorithm, returns NA.

Details

In case of the finite-sample risk `"fiUnOvShoot"` one can choose between two algorithms for the computation of this risk where the least favorable contamination is assumed to be left or right of some bound. For more details we refer to Section 11.3 of Kohl (2005).

Value

Some optimally robust IC is computed.

Methods

model = "InfRobModel", risk = "asRisk" computes optimally robust influence curve for robust models with infinitesimal neighborhoods and various asymptotic risks.

model = "InfRobModel", risk = "asUnOvShoot" computes optimally robust influence curve for robust models with infinitesimal neighborhoods and asymptotic under-/overshoot risk.

model = "FixRobModel", risk = "fiUnOvShoot" computes optimally robust influence curve for robust models with fixed neighborhoods and finite-sample under-/overshoot risk.

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

References

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

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Kohl, M. and Ruckdeschel, P., and Rieder, H. (2010): Infinitesimally Robust Estimation in General Smoothly Parametrized Models. *Stat. Methods Appl.*, **19**, 333–354.

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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)
```

---

optRisk *Generic function for the computation of the minimal risk*

Description

Generic function for the computation of the optimal (i.e., minimal) risk for a probability model.

Usage

```
optRisk(model, risk, ...)

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

## S4 method for signature 'InfRobModel,asRisk'
optRisk(model, risk, z.start = NULL,
                  A.start = NULL, upper = 1e4, maxiter = 50,
                  tol = .Machine$double.eps^0.4, warn = TRUE, noLow = FALSE)

## S4 method for signature 'FixRobModel,fiUnOvShoot'
optRisk(model, risk, sampleSize,
                  upper = 1e4, maxiter = 50, tol = .Machine$double.eps^0.4,
                  warn = TRUE, Algo = "A", cont = "left")
```

Arguments

model	probability model
risk	object of class RiskType
...	additional parameters
z.start	initial value for the centering constant.
A.start	initial value for the standardizing matrix.
upper	upper bound for the optimal clipping bound.
maxiter	the maximum number of iterations
tol	the desired accuracy (convergence tolerance).
warn	logical: print warnings.
sampleSize	integer: sample size.

Algo	"A" or "B".
cont	"left" or "right".
noLow	logical: is lower case to be computed?

Details

In case of the finite-sample risk "fiUnOvShoot" one can choose between two algorithms for the computation of this risk where the least favorable contamination is assumed to be left or right of some bound. For more details we refer to Section 11.3 of Kohl (2005).

Value

The minimal risk is computed.

Methods

model = "L2ParamFamily", risk = "asCov" asymptotic covariance of L2 differentiable parameteric family.

model = "InfRobModel", risk = "asRisk" asymptotic risk of a infinitesimal robust model.

model = "FixRobModel", risk = "fiUnOvShoot" finite-sample under-/overshoot risk of a robust model with fixed neighborhood.

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

References

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

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

See Also

RiskType-class

Examples

```
optRisk(model = NormLocationScaleFamily(), risk = asCov())
```

plot-methods *Methods for Function plot in Package 'ROptEst'*

Description

plot-methods

Details

S4-Method `plot` for for signature `IC,missing` has been enhanced compared to its original definition in **RobAStBase** so that if argument `MBRB` is `NA`, it is filled automatically by a call to `optIC` which computes the MBR-IC on the fly. To this end, there is an additional argument `n.MBR` defaulting to 10000 to determine the number of evaluation points. points.

Examples

```
N <- NormLocationScaleFamily(mean=0, sd=1)
IC <- optIC(model = N, risk = asCov())
## Don't run to reduce check time on CRAN
## Not run:
plot(IC, main = TRUE, panel.first= grid(),
     col = "blue", cex.main = 2, cex.inner = 0.6,
     withMBR=TRUE)

## End(Not run)
```

radiusMinimaxIC *Generic function for the computation of the radius minimax IC*

Description

Generic function for the computation of the radius minimax IC.

Usage

```
radiusMinimaxIC(L2Fam, neighbor, risk, ...)

## S4 method for signature 'L2ParamFamily,UncondNeighborhood,asGRisk'
radiusMinimaxIC(
       L2Fam, neighbor, risk, loRad = 0, upRad = Inf, z.start = NULL, A.start = NULL,
         upper = NULL, lower = NULL, OptOrIter = "iterate",
         maxiter = 50, tol = .Machine$double.eps^0.4,
         warn = FALSE, verbose = NULL, loRad0 = 1e-3, ...,
         returnNAifProblem = FALSE, loRad.s = NULL, upRad.s = NULL)
```

Arguments

L2Fam	L2-differentiable family of probability measures.
neighbor	object of class "Neighborhood".
risk	object of class "RiskType".
loRad	the lower end point of the interval to be searched in the inner optimization (for the least favorable situation to the user-guessed radius).
upRad	the upper end point of the interval to be searched in the inner optimization (for the least favorable situation to the user-guessed radius).
z.start	initial value for the centering constant.
A.start	initial value for the standardizing matrix.
upper	upper bound for the optimal clipping bound.
lower	lower bound for the optimal clipping bound.
OptOrIter	character; which method to be used for determining Lagrange multipliers A and a: if (partially) matched to "optimize", getLagrangeMultByOptim is used; otherwise: by default, or if matched to "iterate" or to "doubleiterate", getLagrangeMultByIter is used. More specifically, when using getLagrangeMultByIter, and if argument risk is of class "asGRisk", by default and if matched to "iterate" we use only one (inner) iteration, if matched to "doubleiterate" we use up to Maxiter (inner) iterations.
maxiter	the maximum number of iterations
tol	the desired accuracy (convergence tolerance).
warn	logical: print warnings.
verbose	logical: if TRUE, some messages are printed
loRad0	for numerical reasons: the effective lower bound for the zero search; internally set to max(loRad,loRad0).
...	further arguments to be passed on to getInfRobIC
returnNAifProblem	logical (of length 1): if TRUE (not the default), in case of convergence problems in the algorithm, returns NA.
loRad.s	the lower end point of the interval to be searched in the outer optimization (for the user-guessed radius); if NULL (default) set to loRad in the algorithm.
upRad.s	the upper end point of the interval to be searched in the outer optimization (for the user-guessed radius); if NULL (default) set to upRad in the algorithm.

Details

In case the neighborhood radius is unknown, Rieder et al. (2001, 2008) and Kohl (2005) show that there is nevertheless a way to compute an optimally robust IC - the so-called radius-minimax IC - which is optimal for some radius interval.

Value

The radius minimax IC is computed.

Methods

L2Fam = "L2ParamFamily", neighbor = "UncondNeighborhood", risk = "asGRisk": computation of the radius minimax IC for an L2 differentiable parametric family.

Author(s)

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

References

Rieder, H., Kohl, M. and Ruckdeschel, P. (2008) The Costs of not Knowing the Radius. Statistical Methods and Applications, *17*(1) 13-40.

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

See Also

radiusMinimaxIC

Examples

```
N <- NormLocationFamily(mean=0, sd=1)
radIC <- radiusMinimaxIC(L2Fam=N, neighbor=ContNeighborhood(),
                         risk=asMSE(), loRad=0.1, upRad=0.5)
checkIC(radIC)
```

---

robest *Optimally robust estimation*

Description

Function to compute optimally robust estimates for L2-differentiable parametric families via k-step construction.

Usage

```
robest(x, L2Fam,  fsCor = 1, risk = asMSE(), steps = 1L,
        verbose = NULL, OptOrIter = "iterate", nbCtrl = gennbCtrl(),
        startCtrl = genstartCtrl(), kStepCtrl = genkStepCtrl(),
        na.rm = TRUE, ..., debug = FALSE, withTimings = FALSE)
```

Arguments

x	sample
L2Fam	object of class "L2ParamFamily"
fsCor	positive real: factor used to correct the neighborhood radius; see details.
risk	object of class "RiskType"
steps	positive integer: number of steps used for k-steps construction
verbose	logical: if TRUE, some messages are printed
OptOrIter	character; which method to be used for determining Lagrange multipliers A and a: if (partially) matched to "optimize", getLagrangeMultByOptim is used; otherwise: by default, or if matched to "iterate" or to "doubleiterate", getLagrangeMultByIter is used. More specifically, when using getLagrangeMultByIter, and if argument risk is of class "asGRisk", by default and if matched to "iterate" we use only one (inner) iteration, if matched to "doubleiterate" we use up to Maxiter (inner) iterations.
nbCtrl	a list specifying input concerning the used neighborhood; to be generated by a respective call to gennbCtrl.
startCtrl	a list specifying input concerning the used starting estimator; to be generated by a respective call to genstartCtrl.
kStepCtrl	a list specifying input concerning the used variant of a kstepEstimator; to be generated by a respective call to genkStepCtrl.
na.rm	logical: if TRUE, the estimator is evaluated at complete.cases(x).
...	further arguments
debug	logical: if TRUE, only the respective calls within the function are generated for debugging purposes.
withTimings	logical: if TRUE, separate (and aggregate) timings for the three steps evaluating the starting value, finding the starting influence curve, and evaluating the k-step estimator is issued.

Details

A new, more structured interface to the former function roptest. For details, see this function.

Value

Object of class "kStepEstimate". In addition, it has an attribute "timings" where computation time is stored.

Author(s)

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

See Also

roblox, L2ParamFamily-class UncondNeighborhood-class, RiskType-class

Examples

```
## Don't run to reduce check time on CRAN
## Not run:
############################
## 1. Binomial data
############################
## generate a sample of contaminated data
ind <- rbinom(100, size=1, prob=0.05)
x <- rbinom(100, size=25, prob=(1-ind)*0.25 + ind*0.9)

## Family
BF <- BinomFamily(size = 25)
## ML-estimate
MLest <- MLEstimator(x, BF)
estimate(MLest)
confint(MLest)

## compute optimally robust estimator (known contamination)
nb <- gennbCtrl(eps=0.05)
robest1 <- robest(x, BF, nbCtrl = nb, steps = 3)
estimate(robest1)

confint(robest1, method = symmetricBias())
## neglecting bias
confint(robest1)
plot(pIC(robest1))
tmp <- qqplot(x, robest1, cex.pch=1.5, exp.cex2.pch = -.25,
              exp.fadcol.pch = .55, jit.fac=.9)

## compute optimally robust estimator (unknown contamination)
nb2 <- gennbCtrl(eps.lower = 0, eps.upper = 0.2)
robest2 <- robest(x, BF, nbCtrl = nb2, steps = 3)
estimate(robest2)
confint(robest2, method = symmetricBias())
plot(pIC(robest2))

## total variation neighborhoods (known deviation)
nb3 <- gennbCtrl(eps = 0.025, neighbor = TotalVarNeighborhood())
robest3 <- robest(x, BF, nbCtrl = nb3, steps = 3)
estimate(robest3)
confint(robest3, method = symmetricBias())
plot(pIC(robest3))

## total variation neighborhoods (unknown deviation)
nb4 <- gennbCtrl(eps.lower = 0, eps.upper = 0.1,
                 neighbor = TotalVarNeighborhood())
robest3 <- robest(x, BF, nbCtrl = nb4, steps = 3)
robest4 <- robest(x, BinomFamily(size = 25), nbCtrl = nb4, steps = 3)
estimate(robest4)
confint(robest4, method = symmetricBias())
plot(pIC(robest4))
```

```
############################
## 2. Poisson data
############################
## Example: Rutherford-Geiger (1910); cf. Feller~(1968), Section VI.7 (a)
x <- c(rep(0, 57), rep(1, 203), rep(2, 383), rep(3, 525), rep(4, 532),
       rep(5, 408), rep(6, 273), rep(7, 139), rep(8, 45), rep(9, 27),
       rep(10, 10), rep(11, 4), rep(12, 0), rep(13, 1), rep(14, 1))

## Family
PF <- PoisFamily()

## ML-estimate
MLest <- MLEstimator(x, PF)
estimate(MLest)
confint(MLest)

## compute optimally robust estimator (unknown contamination)
nb1 <- gennbCtrl(eps.upper = 0.1)
robest <- robest(x, PF, nbCtrl = nb1, steps = 3)
estimate(robest)

confint(robest, symmetricBias())
plot(pIC(robest))
tmp <- qqplot(x, robest, cex.pch=1.5, exp.cex2.pch = -.25,
              exp.fadcol.pch = .55, jit.fac=.9)

## total variation neighborhoods (unknown deviation)
nb2 <- gennbCtrl(eps.upper = 0.05, neighbor = TotalVarNeighborhood())
robest1 <- robest(x, PF, nbCtrl = nb2, steps = 3)
estimate(robest1)
confint(robest1, symmetricBias())
plot(pIC(robest1))

## End(Not run)

############################
## 3. Normal (Gaussian) location and scale
############################
## 24 determinations of copper in wholemeal flour
library(MASS)
data(chem)
plot(chem, main = "copper in wholemeal flour", pch = 20)

## Family
NF <- NormLocationScaleFamily()
## ML-estimate
MLest <- MLEstimator(chem, NF)
estimate(MLest)
confint(MLest)

## Don't run to reduce check time on CRAN
## Not run:
```

```
## compute optimally robust estimator (known contamination)
## takes some time -> you can use package RobLox for normal
## location and scale which is optimized for speed
nb1 <- gennbCtrl(eps = 0.05)
robEst <- robest(chem, NF, nbCtrl = nb1, steps = 3)
estimate.call(robEst)
attr(robEst,"timings")
estimate(robest)

confint(robest, symmetricBias())
plot(pIC(robest))
## plot of relative and absolute information; cf. Kohl (2005)
infoPlot(pIC(robest))

tmp <- qqplot(chem, robest, cex.pch=1.5, exp.cex2.pch = -.25,
              exp.fadcol.pch = .55, withLab = TRUE, which.Order=1:4,
              exp.cex2.lbl = .12,exp.fadcol.lbl = .45,
              nosym.pCI = TRUE, adj.lbl=c(1.7,.2),
              exact.pCI = FALSE, log ="xy")

## finite-sample correction
if(require(RobLox)){
    n <- length(chem)
    r <- 0.05*sqrt(n)
    r.fi <- finiteSampleCorrection(n = n, r = r)
    fsCor0 <- r.fi/r
    nb1 <- gennbCtrl(eps = 0.05)
    robest <- robest(chem, NF, nbCtrl = nb1, fsCor = fsCor0, steps = 3)
    estimate(robest)
}

## compute optimally robust estimator (unknown contamination)
## takes some time -> use package RobLox!
nb2 <- gennbCtrl(eps.lower = 0.05, eps.upper = 0.1)
robest1 <- robest(chem, NF, nbCtrl = nb2, steps = 3)
estimate(robest1)
confint(robest1, symmetricBias())
plot(pIC(robest1))
## plot of relative and absolute information; cf. Kohl (2005)
infoPlot(pIC(robest1))

## End(Not run)
```

`roptest` *Optimally robust estimation*

Description

Function to compute optimally robust estimates for L2-differentiable parametric families via k-step construction.

Usage

```
roptest(x, L2Fam, eps, eps.lower, eps.upper, fsCor = 1, initial.est,
        neighbor = ContNeighborhood(), risk = asMSE(), steps = 1L,
        distance = CvMDist, startPar = NULL, verbose = NULL,
        OptOrIter = "iterate",
        useLast = getRobAStBaseOption("kStepUseLast"),
        withUpdateInKer = getRobAStBaseOption("withUpdateInKer"),
        IC.UpdateInKer = getRobAStBaseOption("IC.UpdateInKer"),
        withICList = getRobAStBaseOption("withICList"),
        withPICList = getRobAStBaseOption("withPICList"),
        na.rm = TRUE, initial.est.ArgList, ...,
        withLogScale = TRUE, ..withCheck = FALSE, withTimings = FALSE,
        withMDE = NULL, withEvalAsVar = NULL)
roptest.old(x, L2Fam, eps, eps.lower, eps.upper, fsCor = 1, initial.est,
        neighbor = ContNeighborhood(), risk = asMSE(), steps = 1L,
        distance = CvMDist, startPar = NULL, verbose = NULL,
        OptOrIter = "iterate",
        useLast = getRobAStBaseOption("kStepUseLast"),
        withUpdateInKer = getRobAStBaseOption("withUpdateInKer"),
        IC.UpdateInKer = getRobAStBaseOption("IC.UpdateInKer"),
        withICList = getRobAStBaseOption("withICList"),
        withPICList = getRobAStBaseOption("withPICList"),
        na.rm = TRUE, initial.est.ArgList, ...,
        withLogScale = TRUE)
```

Arguments

x	sample
L2Fam	object of class "L2ParamFamily"
eps	positive real (0 < eps <= 0.5): amount of gross errors. See details below.
eps.lower	positive real (0 <= eps.lower <= eps.upper): lower bound for the amount of gross errors. See details below.
eps.upper	positive real (eps.lower <= eps.upper <= 0.5): upper bound for the amount of gross errors. See details below.
fsCor	positive real: factor used to correct the neighborhood radius; see details.
initial.est	initial estimate for unknown parameter. If missing minimum distance estimator is computed.
neighbor	object of class "UncondNeighborhood"
risk	object of class "RiskType"
steps	positive integer: number of steps used for k-steps construction
distance	distance function
startPar	initial information used by optimize resp. optim; i.e; if (total) parameter is of length 1, startPar is a search interval, else it is an initial parameter value; if NULL slot startPar of ParamFamily is used to produce it; in the multivariate case, startPar may also be of class Estimate, in which case slot untransformed.estimate is used.

verbose	logical: if TRUE, some messages are printed
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.
OptOrIter	character; which method to be used for determining Lagrange multipliers A and a: if (partially) matched to "optimize", getLagrangeMultByOptim is used; otherwise: by default, or if matched to "iterate" or to "doubleiterate", getLagrangeMultByIter is used. More specifically, when using getLagrangeMultByIter, and if argument risk is of class "asGRisk", by default and if matched to "iterate" we use only one (inner) iteration, if matched to "doubleiterate" we use up to Maxiter (inner) iterations.
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 $\ker(D)$.
withPICList	logical: shall slot pICList of return value be filled?
withICList	logical: shall slot ICList of return value be filled?
na.rm	logical: if TRUE, the estimator is evaluated at complete.cases(x).
initial.est.ArgList	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 L2Fam.
...	further arguments
withLogScale	logical; shall a scale component (if existing and found with name scalename) be computed on log-scale and backtransformed afterwards? This avoids crossing 0.
..withCheck	logical: if TRUE, debugging info is issued.
withTimings	logical: if TRUE, separate (and aggregate) timings for the three steps evaluating the starting value, finding the starting influence curve, and evaluating the k-step estimator is issued.
withMDE	logical or NULL: Shall a minimum distance estimator be used as starting estimator—in addition to the function given in slot startPar of the L2 family? If NULL (default), the content of slot .withMDE in the L2 family is used instead to take this decision.
withEvalAsVar	logical or NULL: if TRUE (default), tells R to evaluate the asymptotic variance or if FALSE just to produces a call to do so. If withEvalAsVar is NULL (default), the content of slot .withEvalAsVar in the L2 family is used instead to take this decision.

Details

Computes the optimally robust estimator for a given L2 differentiable parametric family. The computation uses a k-step construction with an appropriate initial estimate; cf. also kStepEstimator.

Valid candidates are e.g. Kolmogorov(-Smirnov) or von Mises minimum distance estimators (default); cf. Rieder (1994) and Kohl (2005).

Before package version 0.9, this computation was done with the code of function `roptest.old` (with the same formals). From package version 0.9 on, this function uses the modularized function `robest` internally.

If the amount of gross errors (contamination) is known, it can be specified by `eps`. The radius of the corresponding infinitesimal contamination neighborhood is obtained by multiplying `eps` by the square root of the sample size.

If the amount of gross errors (contamination) is unknown, try to find a rough estimate for the amount of gross errors, such that it lies between `eps.lower` and `eps.upper`.

In case `eps.lower` is specified and `eps.upper` is missing, `eps.upper` is set to 0.5. In case `eps.upper` is specified and `eps.lower` is missing, `eps.lower` is set to 0.

If neither `eps` nor `eps.lower` and/or `eps.upper` is specified, `eps.lower` and `eps.upper` are set to 0 and 0.5, respectively.

If `eps` is missing, the radius-minimax estimator in sense of Rieder et al. (2001, 2008), respectively Section 2.2 of Kohl (2005) is returned.

Finite-sample and higher order results suggest that the asymptotically optimal procedure is to liberal. Using `fsCor` the radius can be modified - as a rule enlarged - to obtain a more conservative estimate. In case of normal location and scale there is function `finiteSampleCorrection` which returns a finite-sample corrected (enlarged) radius based on the results of large Monte-Carlo studies.

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` the computation of `asvar`, `asbias` and `IC` is based on the k-step estimate.

Value

Object of class `"kStepEstimate"`. In addition, it has an attribute `"timings"` where computation time is stored.

Author(s)

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

References

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

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See Also

roblox, L2ParamFamily-class UncondNeighborhood-class, RiskType-class

Examples

```
## Don't run to reduce check time on CRAN
## Not run:
############################
## 1. Binomial data
############################
## generate a sample of contaminated data
ind <- rbinom(100, size=1, prob=0.05)
x <- rbinom(100, size=25, prob=(1-ind)*0.25 + ind*0.9)

## ML-estimate
MLest <- MLEstimator(x, BinomFamily(size = 25))
estimate(MLest)
confint(MLest)

## compute optimally robust estimator (known contamination)
robest1 <- roptest(x, BinomFamily(size = 25), eps = 0.05, steps = 3)
robest1.0 <- roptest.old(x, BinomFamily(size = 25), eps = 0.05, steps = 3)
identical(robest1,robest1.0)
estimate(robest1)
confint(robest1, method = symmetricBias())
## neglecting bias
confint(robest1)
plot(pIC(robest1))
tmp <- qqplot(x, robest1, cex.pch=1.5, exp.cex2.pch = -.25,
             exp.fadcol.pch = .55, jit.fac=.9)

## compute optimally robust estimator (unknown contamination)
robest2 <- roptest(x, BinomFamily(size = 25), eps.lower = 0, eps.upper = 0.2, steps = 3)
estimate(robest2)
confint(robest2, method = symmetricBias())
plot(pIC(robest2))

## total variation neighborhoods (known deviation)
robest3 <- roptest(x, BinomFamily(size = 25), eps = 0.025,
                   neighbor = TotalVarNeighborhood(), steps = 3)
estimate(robest3)
confint(robest3, method = symmetricBias())
```

```
plot(pIC(robest3))

## total variation neighborhoods (unknown deviation)
robest4 <- roptest(x, BinomFamily(size = 25), eps.lower = 0, eps.upper = 0.1,
                   neighbor = TotalVarNeighborhood(), steps = 3)
estimate(robest4)
confint(robest4, method = symmetricBias())
plot(pIC(robest4))

############################
## 2. Poisson data
############################
## Example: Rutherford-Geiger (1910); cf. Feller~(1968), Section VI.7 (a)
x <- c(rep(0, 57), rep(1, 203), rep(2, 383), rep(3, 525), rep(4, 532),
       rep(5, 408), rep(6, 273), rep(7, 139), rep(8, 45), rep(9, 27),
       rep(10, 10), rep(11, 4), rep(12, 0), rep(13, 1), rep(14, 1))

## ML-estimate
MLest <- MLEstimator(x, PoisFamily())
estimate(MLest)
confint(MLest)

## compute optimally robust estimator (unknown contamination)
robest <- roptest(x, PoisFamily(), eps.upper = 0.1, steps = 3)
estimate(robest)
confint(robest, symmetricBias())

plot(pIC(robest))
tmp <- qqplot(x, robest, cex.pch=1.5, exp.cex2.pch = -.25,
              exp.fadcol.pch = .55, jit.fac=.9)

## total variation neighborhoods (unknown deviation)
robest1 <- roptest(x, PoisFamily(), eps.upper = 0.05,
                   neighbor = TotalVarNeighborhood(), steps = 3)
estimate(robest1)
confint(robest1, symmetricBias())
plot(pIC(robest1))

## End(Not run)

############################
## 3. Normal (Gaussian) location and scale
############################
## 24 determinations of copper in wholemeal flour
library(MASS)
data(chem)
plot(chem, main = "copper in wholemeal flour", pch = 20)

## ML-estimate
MLest <- MLEstimator(chem, NormLocationScaleFamily())
estimate(MLest)
confint(MLest)
```

```
## Don't run to reduce check time on CRAN
## Not run:
## compute optimally robust estimator (known contamination)
## takes some time -> you can use package RobLox for normal
## location and scale which is optimized for speed
robest <- roptest(chem, NormLocationScaleFamily(), eps = 0.05, steps = 3)
estimate(robest)
confint(robest, symmetricBias())
plot(pIC(robest))
## plot of relative and absolute information; cf. Kohl (2005)
infoPlot(pIC(robest))

tmp <- qqplot(chem, robest, cex.pch=1.5, exp.cex2.pch = -.25,
              exp.fadcol.pch = .55, withLab = TRUE, which.Order=1:4,
              exp.cex2.lbl = .12,exp.fadcol.lbl = .45,
              nosym.pCI = TRUE, adj.lbl=c(1.7,.2),
              exact.pCI = FALSE, log ="xy")

## finite-sample correction
if(require(RobLox)){
    n <- length(chem)
    r <- 0.05*sqrt(n)
    r.fi <- finiteSampleCorrection(n = n, r = r)
    fsCor <- r.fi/r
    robest <- roptest(chem, NormLocationScaleFamily(), eps = 0.05,
                      fsCor = fsCor, steps = 3)
    estimate(robest)
}

## compute optimally robust estimator (unknown contamination)
## takes some time -> use package RobLox!
robest1 <- roptest(chem, NormLocationScaleFamily(), eps.lower = 0.05,
                   eps.upper = 0.1, steps = 3)
estimate(robest1)
confint(robest1, symmetricBias())
plot(pIC(robest1))
## plot of relative and absolute information; cf. Kohl (2005)
infoPlot(pIC(robest1))

## End(Not run)
```

`updateNorm-methods` *Methods for Function updateNorm in Package 'ROptEst'*

Description

updateNorm-methods to update norm in IC-Algo

Usage

```
updateNorm(normtype, ...)
## S4 method for signature 'SelfNorm'
updateNorm(normtype, L2, neighbor, biastype, Distr, V.comp,
                                cent, stand,  w)
```

Arguments

normtype	normtype of class NormType
...	further arguments to be passed to specific methods.
L2	L2derivative
neighbor	object of class "Neighborhood".
biastype	object of class "BiasType"
cent	optimal centering constant.
stand	standardizing matrix.
Distr	standardizing matrix.
V.comp	matrix: indication which components of the standardizing matrix have to be computed.
w	object of class RobWeight; current weight

Details

updateNorm is used internally in the opt-IC-algorithm to be able to work with a norm that depends on the current covariance (SelfNorm)

Value

updateNorm	an updated object of class NormType.

Methods

updateNorm signature(normtype = "SelfNorm"): udates the norm in the self-standardized case; just used internally in the opt-IC-Algorithm.

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See Also

NormType-class

Index