

Package ‘distrMod’

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Version 2.8.4

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Title Object Oriented Implementation of Probability Models

Description Implements S4 classes for probability models based on packages 'distr' and 'distrEx'.

Depends R(>= 3.4), distr(>= 2.8.0), distrEx(>= 2.8.0), RandVar(>= 1.2.0), MASS, stats4, methods

Imports startupmsg, sfsmisc, graphics, stats, grDevices

Suggests ismev, evd,

Enhances RobExtremes

ByteCompile yes

License LGPL-3

Encoding latin1

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Author Matthias Kohl [aut, cph],
Peter Ruckdeschel [cre, cph],
R Core Team [ctb, cph] (for source file 'format.perc')

Maintainer Peter Ruckdeschel <peter.ruckdeschel@uni-oldenburg.de>

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| | |
|------------------|--|
| distrMod-package | <i>distrMod – Object Oriented Implementation of Probability Models</i> |
|------------------|--|

Description

Based on the packages **distr** and **distrEx** package **distrMod** provides a flexible framework which allows computation of estimators like maximum likelihood or minimum distance estimators for probability models.

Details

| | |
|------------------|--|
| Package: | distrMod |
| Version: | 2.8.4 |
| Date: | 2020-03-06 |
| Depends: | R(>= 3.4), distr(>= 2.8.0), distrEx(>= 2.8.0), RandVar(>= 1.2.0), MASS, stats4,methods |
| Imports: | startupmsg, sfsmisc, graphics, stats, grDevices |
| Suggests: | ismev, evd, |
| Enhances: | RobExtremes |
| ByteCompile: | yes |
| License: | LGPL-3 |
| URL: | http://distr.r-forge.r-project.org/ |
| VCS/SVNRevision: | 1356 |

Classes

```

[*]: there is a generating function with the same name
#####
ProbFamily classes
#####
slots: [<name>(<class>)]
name(character), distribution(Distribution),
distrSym(DistributionSymmetry), props(character)
"ProbFamily"
|>"ParamFamily"      [*]
additional slots:
param(ParamFamParameter), modifyParam(function),
startPar(function), makeOKPar(function), fam.call(call)
|>|>"L2ParamFamily" [*]
additional slots:
L2deriv(EuclRandVarList), L2deriv.fct(function),
L2derivSymm(FunSymmList), L2derivDistr(DistrList),
L2derivDistrSymm(DistrSymmList), FisherInfo(PosSemDefSymmMatrix),
FisherInfo.fct(function)
|>|>|>"BinomFamily"  [*]
|>|>|>"PoisFamily"   [*]
|>|>|>"BetaFamily"   [*]
|>|>|>"NbinomFamily" [*]
|>|>|>"NbinomwithSizeFamily" [*]
|>|>|>"NbinomMeanSizeFamily" [*]
|>|>|>"L2GroupParamFamily"
additional slots:
LogDeriv(function)
|>|>|>|>"L2ScaleShapeUnion" /VIRTUAL/
|>|>|>|>"GammaFamily"  [*]
|>|>|>|>"L2LocationScaleUnion" /VIRTUAL/
additional slots:
locscalename(character)
|>|>|>|>"L2LocationFamily"      [*]
|>|>|>|>"NormLocationFamily"   [*]
|>|>|>|>"L2ScaleFamily"        [*]
|>|>|>|>"NormScaleFamily"      [*]
|>|>|>|>"ExpScaleFamily"       [*]
|>|>|>|>"LnormScaleFamily"     [*]
|>|>|>|>"L2LocationScaleFamily" [*]
|>|>|>|>"NormLocationScaleFamily" [*]
|>|>|>|>"CauchyLocationScaleFamily" [*]
|>|>|>|>"LogisticLocationScaleFamily" [*]
and a (virtual) class union "L2ScaleUnion" between
  "L2LocationScaleUnion" and "L2ScaleShapeUnion"
#####
ParamFamParameter
#####

```

```

"ParamFamParameter" [*] is subclass of class "Parameter" of package "distr".
Additional slots:
main(numeric), nuisance(OptionalNumeric), fixed(OptionalNumeric),
trafo(MatrixorFunction)
#####
Class unions
#####
"MatrixorFunction" = union("matrix", "OptionalFunction")
"PrintDetails" = union("Estimate", "Confint",
                        "PosSemDefSymmMatrix",
                        "ParamFamParameter", "ParamFamily")
#####
Symmetry classes (other classes moved to package "distr")
#####
slots:
type(character), SymmCenter(ANY)
"Symmetry" (from package "distr")
|>"FunctionSymmetry"
|>|>"NonSymmetric" [*]
|>|>"EvenSymmetric" [*]
|>|>"OddSymmetric" [*]
list thereof
"FunSymmList" [*]
#####
Matrix classes (moved to package "distr")
#####
slots:
none
"PosSemDefSymmMatrix" [*] is subclass of class "matrix" of package "base".
|>"PosDefSymmMatrix" [*]
#####
Norm Classes
#####
slots:
name(character), fct(function)
"NormType" [*]
|>"QFNorm" [*]
Additional slots:
QuadForm(PosSemDefSymmMatrix)
|>|>"InfoNorm" [*]
|>|>"SelfNorm" [*]
#####
Bias Classes
#####
slots:
name(character)
"BiasType"
|>"symmetricBias" [*]

```

```

|>"onesidedBias"
Additional slots:
sign(numeric)
|>"asymmetricBias" [*]
Additional slots:
nu(numeric)
#####
Risk Classes
#####
slots:
type(character)
"RiskType"
|>"asRisk"
|>|>"asCov" [*]
|>|>"trAsCov" [*]
|>"fiRisk"
|>|>"fiCov" [*]
|>|>"trfiCov" [*]
|>|>"fiHampel" [*]
Additional slots:
bound(numeric)
|>|>"fiMSE" [*]
|>|>"fiBias" [*]
|>|>"fiUnOvShoot" [*]
Additional slots:
width(numeric)
Risk with Bias:
"asRiskwithBias"
slots: biastype(BiasType), normtype(NormType),
|>"asHampel" [*]
Additional slots:
bound(numeric)
|>"asBias" [*]
|>"asGRisk"
|>|>"asMSE" [*]
|>|>"asUnOvShoot" [*]
Additional slots:
width(numeric)
|>|>"asSemivar" [*]
#####
Estimate Classes
#####
slots:
name(character), estimate(ANY),
samplesize(numeric), asvar(OptionalMatrix),
Infos(matrix), nuis.idx(OptionalNumeric)
fixed.estimate(OptionalNumeric),
estimate.call(call), trafo(list[of function, matrix]),

```

```

untransformed.estimate(ANY),
untransformed.asvar(OptionalMatrix)
criterion.fct(function), method(character),
"Estimate"
|>"MCEstimate",
Additional slots:
criterion(numeric)
#####
Confidence interval class
#####
slots:
type(character), confint(array),
estimate.call(call), name.estimate(character),
trafo.estimate(list[of function, matrix]),
nuisance.estimate(OptionalNumeric)
"Confint"

```

Methods

besides accessor and replacement functions, we have methods solve, sqrt for matrices checkL2deriv, existsPIC for class L2ParamFamily LogDeriv for class L2GroupParamFamily validParameter for classes ParamFamily, L2ScaleFamily, L2LocationFamily, and L2LocationScaleFamily modifyModel for the pairs of classes L2ParamFamily and ParamFamParameter, L2LocationFamily and ParamFamParameter, L2ScaleFamily and ParamFamParameter, L2LocationScaleFamily and ParamFamParameter, GammaFamily and ParamFamParameter, and ExpScaleFamily and ParamFamParameter mceCalc for the pair of classes numeric and ParamFamily mleCalc for the pairs of classes numeric and ParamFamily, numeric and BinomFamily, numeric and PoisFamily, numeric and NormLocationFamily, numeric and NormScaleFamily, and numeric and NormLocationScaleFamily coerce from class MCEstimate to class mle confint for class Estimate profile for class MCEstimate

Functions

```

Management of global options:
"distrModOptions", "distrModoptions", "getdistrModOption",
check for ker of matrix: "isKerAinKerB"
particular norms: "EuclideanNorm", "QuadFormNorm"
onesided bias: "positiveBias", "negativeBias",
Estimators:
"Estimator", "MCEstimator", "MLEstimator", "MDEstimator"
special location/scale models:
"L2LocationUnknownScaleFamily", "L2ScaleUnknownLocationFamily"
some special normal models:
"NormScaleUnknownLocationFamily", "NormLocationUnknownScaleFamily",

```

Start-up-Banner

You may suppress the start-up banner/message completely by setting options("StartupBanner"="off") somewhere before loading this package by library or require in your R-code / R-session. If option "StartupBanner" is not defined (default) or setting options("StartupBanner"=NULL)

or options("StartupBanner"="complete") the complete start-up banner is displayed. For any other value of option "StartupBanner" (i.e., not in c(NULL, "off", "complete")) only the version information is displayed. The same can be achieved by wrapping the library or require call into either suppressStartupMessages() or onlytypeStartupMessages(. , atypes="version"). As for general packageStartupMessage's, you may also suppress all the start-up banner by wrapping the library or require call into suppressPackageStartupMessages() from **startupmsg**-version 0.5 on.

Demos

Demos are available — see demo(package="distrMod").

Scripts

Example scripts are available — see folder 'scripts' in the package folder to package **distrMod** in your library.

Package versions

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

Note

Some functions of packages **stats**, **base** have intentionally been masked, but completely retain their functionality — see distrModMASK(). If any of the packages **stats4**, **fBasics** is to be used together with **distrMod**, the latter must be attached *after* any of the first mentioned. Otherwise confint() defined as *method* in **distrMod** may get masked.

To re-mask, you may use confint <-distrMod::confint. See also distrModMASK()

Author(s)

Peter Ruckdeschel <peter.ruckdeschel@uni-oldenburg.de>,
Matthias Kohl <Matthias.Kohl@stamats.de>

Maintainer: Peter Ruckdeschel <peter.ruckdeschel@uni-oldenburg.de>

References

M. Kohl and P. Ruckdeschel (2010): R Package distrMod: S4 Classes and Methods for Probability Models. Journal of Statistical Software, 35(10), 1-27. <https://www.jstatsoft.org/v35/i10/> (see also vignette("distrMod")) P. Ruckdeschel, M. Kohl, T. Stabla, F. Camphausen (2006): S4 Classes for Distributions, *R News*, 6(2), 2-6. https://CRAN.R-project.org/doc/Rnews/Rnews_2006-2.pdf A vignette for packages **distr**, **distrSim**, **distrTEst**, and **distrEx** is included into the mere documentation package **distrDoc** and may be called by require("distrDoc");vignette("distr")

`.checkEstClassForParamFamily-methods`

Methods for Function .checkEstClassForParamFamily in Package 'distrMod'

Description

`.checkEstClassForParamFamily-methods`

Usage

```
.checkEstClassForParamFamily(PFam, estimator)
## S4 method for signature 'ANY,ANY'
.checkEstClassForParamFamily(PFam, estimator)
```

Arguments

PFam a parametric family.
estimator an estimator.

Details

The respective methods can be used to cast an estimator to a model-specific subclass with particular methods.

Value

The (default) ANY, ANY-method returns the estimator unchanged.

Author(s)

Peter Ruckdeschel <peter.ruckdeschel@uni-oldenburg.de>

`addAlphTrsp2col` *"addAlphTrsp2col"*

Description

Adds alpha transparency to a given color.

Usage

```
addAlphTrsp2col(col, alpha=255)
```

Arguments

col any valid color
alpha tranparancy; an integer value in [0,255]

Value

a color in rgb coordinates

Author(s)

Peter Ruckdeschel <peter.ruckdeschel@uni-oldenburg.de>

Examples

```
## IGNORE_RDIFF_BEGIN
addAlphTrsp2col(rgb(1,0.3,0.03), 25)
## gives "#FF4C0819" on 32bit and "#FF4D0819" on 64bit
## IGNORE_RDIFF_END
addAlphTrsp2col("darkblue", 25)
addAlphTrsp2col("#AAAAAAA", 25)
palette(rainbow(6))
addAlphTrsp2col(2, 25)
```

asBias

Generating function for asBias-class

Description

Generates an object of class "asBias".

Usage

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

Arguments

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

Value

Object of class "asBias"

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

[asBias-class](#)

Examples

```
asBias()

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

asBias-class

Standardized Asymptotic Bias

Description

Class of standardized asymptotic bias; i.e., the neighborhood radius is omitted respectively, set to 1.

Objects from the Class

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

Slots

`type` Object of class "character": "asymptotic bias".

`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 "asRiskwithBias", directly.

Class "asRisk", by class "asRiskwithBias"

Class "RiskType", by class "asRisk".

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

[asRisk-class](#), [asBias](#)

Examples

```
new("asBias")
```

asCov

Generating function for asCov-class

Description

Generates an object of class "asCov".

Usage

```
asCov()
```

Value

Object of class "asCov"

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

[asCov-class](#)

Examples

```
asCov()
```

```
## The function is currently defined as  
function(){ new("asCov") }
```

asCov-class

Asymptotic covariance

Description

Class of asymptotic covariance.

Objects from the Class

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

Slots

type Object of class "character": "asymptotic covariance".

Extends

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

Methods

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

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

References

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

See Also

[asRisk-class](#), [asCov](#)

Examples

```
new("asCov")
```

| | |
|---------------|-------------------------------|
| asGRisk-class | <i>Convex asymptotic risk</i> |
|---------------|-------------------------------|

Description

Class of special convex asymptotic risks.

Objects from the Class

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

Slots

type Object of class "character".

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 "asRisk", directly.

Class "RiskType", by class "asRisk".

Methods

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

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

References

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

See Also

[asRisk-class](#)

`asHampel`*Generating function for asHampel-class*

Description

Generates an object of class "asHampel".

Usage

```
asHampel(bound = Inf, biastype = symmetricBias(), normtype = NormType())
```

Arguments

| | |
|-----------------------|--|
| <code>bound</code> | positive real: bias bound |
| <code>biastype</code> | a bias type of class <code>BiasType</code> |
| <code>normtype</code> | a norm type of class <code>NormType</code> |

Value

Object of class `asHampel`

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

References

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

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

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

See Also

[asHampel-class](#)

Examples

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

| | |
|----------------|-------------------------------|
| asHampel-class | <i>Asymptotic Hampel risk</i> |
|----------------|-------------------------------|

Description

Class of asymptotic Hampel risk which is the trace of the asymptotic covariance subject to a given bias bound (bound on gross error sensitivity).

Objects from the Class

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

Slots

`type` Object of class "character": "trace of asymptotic covariance for given bias bound".

`bound` Object of class "numeric": given positive bias bound.

`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

bound signature(object = "asHampel"): accessor function for slot bound.

show signature(object = "asHampel")

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

References

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

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

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

See Also

[asRisk-class](#), [asHampel](#)

Examples

```
new("asHampel")
```

asMSE

Generating function for asMSE-class

Description

Generates an object of class "asMSE".

Usage

```
asMSE(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)

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

[asMSE-class](#)

Examples

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

`asMSE-class`*Asymptotic mean square error*

Description

Class of asymptotic mean square error.

Objects from the Class

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

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 "asMSE" in the signature.

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

References

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

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

See Also

[asGRisk-class](#), [asMSE](#)

Examples

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

asRisk-class

Asymptotic risk

Description

Class of asymptotic risks.

Objects from the Class

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

Slots

type Object of class "character".

Extends

Class "RiskType", directly.

Methods

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

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* (submitted).

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

See Also

[RiskType-class](#)

asRiskwithBias-class *Asymptotic risk*

Description

Class of asymptotic risks.

Objects from the Class

A “virtual” Class (although it does not contain "VIRTUAL"): No objects may be created from it.

Slots

type Object of class "character".
biastype Object of class "BiasType".
normtype Object of class "NormType".

Extends

Class "RiskType", directly.

Methods

biastype signature(object = "asRiskwithBias"): accessor function for slot biastype.
biastype<- signature(object = "asRiskwithBias", value = "BiasType"): replacement function for slot biastype.
normtype signature(object = "asRiskwithBias"): accessor function for slot normtype.
normtype<- signature(object = "asRiskwithBias", value = "NormType"): replacement function for slot normtype.
norm signature(object = "asRiskwithBias"): accessor function for slot fct of slot norm.

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>, Peter Ruckdeschel <peter.ruckdeschel@uni-oldenburg.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](#)

`asSemivar`*Generating function for asSemivar-class*

Description

Generates an object of class "asSemivar".

Usage

```
asSemivar(sign = 1)
```

Arguments

`sign` positive (=1) or negative Bias (=-1)

Value

Object of class "asSemivar"

Author(s)

Peter Ruckdeschel <peter.ruckdeschel@uni-oldenburg.de>

References

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

See Also[onesidedBias-class](#)**Examples**

```
asSemivar()
```

| | |
|-----------------|-------------------------------|
| asSemivar-class | <i>Semivariance Risk Type</i> |
|-----------------|-------------------------------|

Description

Class for semi-variance risk.

Objects from the Class

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

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

Methods

sign `signature(object = "asSemivar")`: accessor function for slot `sign`.

sign<- `signature(object = "asSemivar", value = "numeric")`: replacement function for slot `sign`.

Extends

Class "asGRisk", directly.

Class "asRiskwithBias", by class "asGRisk".

Class "asRisk", by class "asRiskwithBias".

Class "RiskType", by class "asGRisk".

Author(s)

Peter Ruckdeschel <peter.ruckdeschel@uni-oldenburg.de>

References

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](#)

Examples

```
asSemivar()
```

```
asUnOvShoot
```

```
Generating function for asUnOvShoot-class
```

Description

Generates an object of class "asUnOvShoot".

Usage

```
asUnOvShoot(width = 1.960, biastype = symmetricBias())
```

Arguments

| | |
|----------|---|
| width | positive real: half the width of given confidence interval. |
| biastype | a bias type of class BiasType |

Value

Object of class "asUnOvShoot"

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

References

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

[asUnOvShoot-class](#)

Examples

```
asUnOvShoot()
```

```
## The function is currently defined as  
function(width = 1.960, biastype = symmetricBias()){  
  new("asUnOvShoot", width = width, biastype = biastype) }
```

asUnOvShoot-class *Asymptotic under-/overshoot probability*

Description

Class of asymptotic under-/overshoot probability.

Objects from the Class

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

Slots

`type` Object of class "character": "asymptotic under-/overshoot probability".

`width` Object of class "numeric": half the width of given confidence interval.

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

Extends

Class "asGRisk", directly.

Class "asRiskwithBias", by class "asGRisk".

Class "asRisk", by class "asRiskwithBias".

Class "RiskType", by class "asGRisk".

Methods

width signature(object = "asUnOvShoot"): accessor function for slot width.

show signature(object = "asUnOvShoot")

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

References

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

[asGRisk-class](#)

Examples

```
new("asUnOvShoot")
```

`asymmetricBias`*Generating function for asymmetricBias-class*

Description

Generates an object of class "asymmetricBias".

Usage

```
asymmetricBias(name = "asymmetric Bias", nu = c(1,1) )
```

Arguments

| | |
|------|--|
| name | name of the bias type |
| nu | weights for negative and positive bias, respectively |

Value

Object of class "asymmetricBias"

Author(s)

Peter Ruckdeschel <peter.ruckdeschel@uni-oldenburg.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

[asymmetricBias-class](#)

Examples

```
asymmetricBias()  
  
## The function is currently defined as  
function(){ new("asymmetricBias", name = "asymmetric Bias", nu = c(1,1)) }
```

asymmetricBias-class *asymmetric Bias Type*

Description

Class of asymmetric bias types.

Objects from the Class

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

Slots

name Object of class "character".

nu Object of class "numeric"; to be in $(0,1] \times (0,1]$ with maximum 1; weights for negative and positive bias, respectively

Methods

nu signature(object = "asymmetricBias"): accessor function for slot nu.

nu<- signature(object = "asymmetricBias", value = "numeric"): replacement function for slot nu.

Extends

Class "BiasType", directly.

Author(s)

Peter Ruckdeschel <peter.ruckdeschel@uni-oldenburg.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

[BiasType-class](#)

Examples

```
asymmetricBias()  
## The function is currently defined as  
function(){ new("asymmetricBias", name = "asymmetric Bias", nu = c(1,1)) }  
  
aB <- asymmetricBias()  
nu(aB)  
try(nu(aB) <- -2) ## error  
nu(aB) <- c(0.3,1)
```

BetaFamily

Generating function for Beta families

Description

Generates an object of class "L2ParamFamily" which represents a Beta family.

Usage

```
BetaFamily(shape1 = 1, shape2 = 1, trafo, withL2derivDistr = TRUE)
```

Arguments

| | |
|------------------|---|
| shape1 | positive real: shape1 parameter |
| shape2 | positive real: shape2 parameter |
| trafo | matrix: transformation of the parameter |
| withL2derivDistr | logical: shall the distribution of the L2 derivative be computed? Defaults to TRUE; setting it to FALSE speeds up computations. |

Details

The slots of the corresponding L2 differentiable parameteric family are filled.

Value

Object of class "L2ParamFamily"

Author(s)

Peter Ruckdeschel <peter.ruckdeschel@uni-oldenburg.de>

See Also

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

Examples

```
(B1 <- BetaFamily())
FisherInfo(B1)
## IGNORE_RDIFF_BEGIN
checkL2deriv(B1)
## IGNORE_RDIFF_END
```

| | |
|----------------|------------------|
| BiasType-class | <i>Bias Type</i> |
|----------------|------------------|

Description

Class of bias types.

Objects from the Class

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

Slots

name Object of class "character".

Methods

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

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

Author(s)

Peter Ruckdeschel <peter.ruckdeschel@uni-oldenburg.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

[RiskType-class](#)

Examples

```
aB <- positiveBias()
name(aB)
```

BinomFamily*Generating function for Binomial families*

Description

Generates an object of class "L2ParamFamily" which represents a Binomial family where the probability of success is the parameter of interest.

Usage

```
BinomFamily(size = 1, prob = 0.5, trafo)
```

Arguments

| | |
|-------|--|
| size | number of trials |
| prob | probability of success |
| trafo | function in param or matrix: transformation of the parameter |

Details

The slots of the corresponding L2 differentiable parameteric family are filled.

Value

Object of class "L2ParamFamily"

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

References

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

See Also

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

Examples

```
(B1 <- BinomFamily(size = 25, prob = 0.25))  
plot(B1)  
FisherInfo(B1)  
checkL2deriv(B1)
```

CauchyLocationFamily *Generating function for Cauchy location families*

Description

Generates an object of class "L2LocationFamily" which represents a Cauchy location family.

Usage

```
CauchyLocationFamily(loc = 0, scale = 1, trafo)
```

Arguments

| | |
|-------|--|
| loc | location |
| scale | scale |
| trafo | function in param or matrix: transformation of the parameter |

Details

The slots of the corresponding L2 differentiable parameteric family are filled.

Value

Object of class "L2LocationScaleFamily"

Author(s)

Peter Ruckdeschel <Peter.Ruckdeschel@uni-oldenburg.de>

References

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

See Also

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

Examples

```
(C1 <- CauchyLocationFamily())  
plot(C1)  
FisherInfo(C1)  
### need smaller integration range:  
checkL2deriv(C1)
```

CauchyLocationScaleFamily

Generating function for Cauchy location and scale families

Description

Generates an object of class "L2LocationScaleFamily" which represents a Cauchy location and scale family.

Usage

```
CauchyLocationScaleFamily(loc = 0, scale = 1, trafo)
```

Arguments

| | |
|-------|--|
| loc | location |
| scale | scale |
| trafo | function in param or matrix: transformation of the parameter |

Details

The slots of the corresponding L2 differentiable parameteric family are filled.

Value

Object of class "L2LocationScaleFamily"

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

References

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

See Also

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

Examples

```
(C1 <- CauchyLocationScaleFamily())
plot(C1)
FisherInfo(C1)
### need smaller integration range:
distrExoptions("ElowerTruncQuantile"=1e-4,"EupperTruncQuantile"=1e-4)
checkL2deriv(C1)
distrExoptions("ElowerTruncQuantile"=1e-7,"EupperTruncQuantile"=1e-7)
```

| | |
|--------------|---|
| checkL2deriv | <i>Generic function for checking L2-derivatives</i> |
|--------------|---|

Description

Generic function for checking the L2-derivative of an L2-differentiable family of probability measures.

Usage

```
checkL2deriv(L2Fam, ...)  
## S3 method for class 'relMatrix'  
print(x, ...)
```

Arguments

| | |
|-------|---|
| L2Fam | L2-differentiable family of probability measures |
| x | argument to be printed |
| ... | additional parameters (ignored/for compatibility with S3 generic in case <code>print.relMatrix</code>) |

Details

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

Value

A list with items `maximum.deviation`, `cent`, `consist`, and `condition` is invisibly returned, where `maximum.deviation` comprises the maximal absolute value of all entries in `cent` and `consist`, `cent` shows the expectation of `L2deriv(L2Fam)` (which should be 0), `consist` shows the difference between the Fisher information and `cov(L2deriv(L2Fam))` (which should be 0), and `condition` is the condition number of the Fisher information.

Note

The return value gives the non-rounded values (which will be machine dependent), whereas on argument `out==TRUE` (the default) we only issue the values up to 5 digits which should be independent of the machine. For the output of relative differences, we adjust accuracy to the size of the maximal (absolute) value of the Fisher information. In case of the consistency condition, at positions where the denominator is 0, we print a "."; this is done through helper S3 method `print.relMatrix`.

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

References

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

See Also

[L2ParamFamily-class](#)

Examples

```
F1 <- new("L2ParamFamily")
checkL2deriv(F1)
```

Confint-class

Confint-class

Description

Return value S4 classes for method “confint”.

Objects from the Class

Objects could in principle be created by calls of the form `new("Confint", ...)`. The preferred form is to have them created via a call to `confint`.

Slots

- `type` Object of class "character": type of the confidence interval (asymptotic, bootstrap,...). Can be of length >2. Then in printing, the first element is printed in the gap '[...]' in 'an [...] confidence interval', while the other elements are printed below.
- `confint` Object of class "array": the confidence interval(s).
- `call.estimate` Object of class "call": the estimate(s) for which the confidence intervals are produced.
- `name.estimate` Object of class "character": the name of the estimate(s) for which the confidence intervals are produced.
- `samplesize.estimate`: Object of class "numeric": the sample size of the estimate(s) for which the confidence intervals are (only complete cases) produced.
- `completeness.estimate`: Object of class "logical": complete cases at which the estimate was evaluated.
- `trafo.estimate` Object of class "matrix": the trafo/derivative matrix of the estimate(s) for which the confidence intervals are produced.
- `nuisance.estimate` Object of class "OptionalNumeric": the nuisance parameter (if any) at which the confidence intervals are produced.
- `fixed.estimate` Object of class "OptionalNumeric": the fixed part of the parameter (if any) at which the confidence intervals are produced.

Methods

- type** signature(object = "Confint"): accessor function for slot type.
- confint** signature(object = "Confint", method = "missing"): accessor function for slot type.
- call.estimate** signature(object = "Confint"): accessor function for slot call.estimate.
- name.estimate** signature(object = "Confint"): accessor function for slot name.estimate.
- trafo.estimate** signature(object = "Confint"): accessor function for slot trafo.estimate.
- samplesize.estimate** signature(object = "Confint"): (with additional argument `onlycompleteness` defaulting to TRUE returns the sample size; in case there are any incomplete cases and argument `onlycompleteness` is FALSE, the number of these is added to slot `samplesize`.)
- completeness.estimate** signature(object = "Confint"): accessor function for slot `completeness.estimate`.
- nuisance.estimate** signature(object = "Confint"): accessor function for slot `nuisance.estimate`.
- fixed.estimate** signature(object = "Confint"): accessor function for slot `fixed.estimate`.
- show** signature(object = "Confint"): shows a detailed view of the object; slots `nuisance.estimate` and `fixed.estimate` are only shown if non-null, and slot `trafo.estimate` only if different from a unit matrix.
- print** signature(object = "Confint"): just as `show`, but with additional arguments `digits`.

Details for methods 'show', 'print'

Detailedness of output by methods `show`, `print` is controlled by the global option `show.details` to be set by [distrModoptions](#).

As method `show` is used when inspecting an object by typing the object's name into the console, `show` comes without extra arguments and hence detailedness must be controlled by global options.

Method `print` may be called with a (partially matched) argument `show.details`, and then the global option is temporarily set to this value.

More specifically, when `show.detail` is matched to "minimal" you will be shown only the type of the confidence interval(s) and its/their values. When `show.detail` is matched to "medium", you will in addition see the type of the estimator(s) for which it is produced, the corresponding call of the estimator, its sample size, and, if present, the value of the corresponding nuisance parameter. Finally, when `show.detail` is matched to "maximal", additionally you will be shown the fixed part of the parameter (if present) and the transformation of the estimator (if non-trivial, i.e. the identity) in form of its function code respectively of its derivative matrix.

Note

The pretty-printing code for methods `show` and `print` has been borrowed from `confint.default` in package **stats**.

Author(s)

Peter Ruckdeschel <peter.ruckdeschel@uni-oldenburg.de>

See Also

[Estimator](#), [confint](#), [Estimate-class](#), [trafo-methods](#)

Examples

```
## some transformation
mtrafo <- function(x){
  nms0 <- c("scale","shape")
  nms <- c("shape","rate")
  fval0 <- c(x[2], 1/x[1])
  names(fval0) <- nms
  mat0 <- matrix( c(0, -1/x[1]^2, 1, 0), nrow = 2, ncol = 2,
                 dimnames = list(nms,nms0))
  list(fval = fval0, mat = mat0)}

x <- rgamma(50, scale = 0.5, shape = 3)

## parametric family of probability measures
G <- GammaFamily(scale = 1, shape = 2, trafo = mtrafo)
## MLE
res <- MLEstimator(x = x, ParamFamily = G)
ci <- confint(res)
print(ci, digits = 4, show.details="maximal")
print(ci, digits = 4, show.details="medium")
print(ci, digits = 4, show.details="minimal")
```

confint-methods

Methods for function confint in Package 'distrMod'

Description

Methods for function `confint` in package **distrMod**; by default uses `confint` and its corresponding S3-methods, but also computes (asymptotic) confidence intervals for objects of class `Estimate`. Computes confidence intervals for one or more parameters in a fitted model.

Usage

```
confint(object, method, ...)
## S4 method for signature 'ANY,missing'
confint(object, method, parm, level = 0.95, ...)
## S4 method for signature 'Estimate,missing'
confint(object, method, level = 0.95)
## S4 method for signature 'mle,missing'
confint(object, method, parm, level = 0.95, ...)
## S4 method for signature 'profile.mle,missing'
confint(object, method, parm, level = 0.95, ...)
```

Arguments

| | |
|---------------------|---|
| <code>object</code> | in default / signature ANY case: a fitted model object, in signature <code>Estimate</code> case, an object of class <code>Estimate</code> |
|---------------------|---|

| | |
|--------|--|
| parm | only used in default / signature ANY case: a specification of which parameters are to be given confidence intervals, either a vector of numbers or a vector of names. If missing, all parameters are considered. |
| level | the confidence level required. |
| method | not yet used (only as missing; later to allow for various methods |
| ... | additional argument(s) for methods. |

Details

confint is a generic function. Its behavior differs according to its arguments.

signature ANY,missing: the default method; uses the S3 generic of package **stats**, see [confint](#).

signature Estimate,missing: will return a corresponding confidence interval assuming asymptotic normality, and hence needs suitably filled slot `asvar` in argument object. Besides the actual bounds, organized in an array just as in the S3 generic, the return value also captures the name of the estimator for which it is produced, as well as the corresponding call producing the estimator, and the corresponding `trafo` and nuisance slots/parts.

Value

signature ANY,missing:

A matrix (or vector) with columns giving lower and upper confidence limits for each parameter. These will be labelled as $(1-\text{level})/2$ and $1 - (1-\text{level})/2$ in % (by default 2.5% and 97.5%).

signature Estimate,missing:

An object of class `Confint`

See Also

[confint](#), [confint.glm](#) and [confint.nls](#) in package **MASS**, [Confint-class](#).

Examples

```
## for signature ANY examples confer stats::confint
## (empirical) Data
x <- rgamma(50, scale = 0.5, shape = 3)

## parametric family of probability measures
G <- GammaFamily(scale = 1, shape = 2)

## Maximum likelihood estimator
res <- MLEstimator(x = x, ParamFamily = G)
confint(res)

### for comparison:
require(MASS)
(res1 <- fitdistr(x, "gamma"))
## add a convenient (albeit wrong)
## S3-method for vcov:
## --- wrong as in general cov-matrix
```

```

## will not be diagonal
## but for conf-interval this does
## not matter...
vcov.fitdistr <- function(object, ...){
  v<-diag(object$sd^2)
  rownames(v) <- colnames(v) <- names(object$estimate)
  v}

## explicitly transforming to
## MASS parametrization:
mtrafo <- function(x){
  nms0 <- names(c(main(param(G)),nuisance(param(G))))
  nms <- c("shape","rate")
  fval0 <- c(x[2], 1/x[1])
  names(fval0) <- nms
  mat0 <- matrix( c(0, -1/x[1]^2, 1, 0), nrow = 2, ncol = 2,
                 dimnames = list(nms,nms0))
  list(fval = fval0, mat = mat0)}

G2 <- G
trafo(G2) <- mtrafo
res2 <- MLEstimator(x = x, ParamFamily = G2)

old<-getdistrModOption("show.details")
distrModoptions("show.details" = "minimal")
res
res1
res2
confint(res)
confint(res1)
confint(res2)
confint(res,level=0.99)
distrModoptions("show.details" = old)

```

distrModMASK

Masking of/by other functions in package "distrMod"

Description

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

Usage

```
distrModMASK(library = NULL)
```

Arguments

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

Value

no value is returned

Author(s)

Peter Ruckdeschel <peter.ruckdeschel@uni-oldenburg.de>

Examples

```
distrModMASK()
```

distrModOptions *Function to change the global variables of the package 'distrMod'*

Description

With `distrModOptions` you can inspect and change the global variables of the package **distrMod**.

Usage

```
distrModOptions(...)
getdistrModOption(x)
distrModoptions(...)
```

Arguments

... any options can be defined, using name = value or by passing a list of such tagged values.

x a character string holding an option name.

Details

Invoking `distrModoptions()` with no arguments returns a list with the current values of the options. To access the value of a single option, one should use `getdistrModOption("show.details")`, e.g., rather than `distrModoptions("show.details")` which is a *list* of length one.

Value

`distrModoptions()` returns a list of the global options of **distrMod**.
`distrModoptions("show.details")` returns the global option `show.details` as a list of length 1.
`distrModoptions("show.details" = "minimal")` sets the value of the global option `show.details` to "minimal". `getdistrModOption("show.details")` the current value set for option `show.details`.

distrModoptions

For compatibility with spelling in package **distr**, `distrModoptions` is just a synonym to `distrModOptions`.

Currently available options

show.details degree of detailedness for method `show` for objects of classes of the **distrXXX** family of packages. Possible values are

"maximal" all information is shown

"minimal" only the most important information is shown

"medium" somewhere in the middle; see actual `show`-methods for details.

The default value is "maximal".

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>,
Peter Ruckdeschel <peter.ruckdeschel@uni-oldenburg.de>

See Also

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

Examples

```
distrModoptions()  
distrModoptions("show.details")  
distrModoptions("show.details" = "maximal")  
distrModoptions("show.details" = "minimal")  
# or  
getDistrModOption("show.details")
```

Estimate-class

Estimate-class.

Description

Class of estimates.

Objects from the Class

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

Slots

name Object of class "character": name of the estimator.
estimate Object of class "ANY": estimate.
estimate.call Object of class "call": call by which estimate was produced.
Infos object of class "matrix" with two columns named method and message: additional informations.
asvar object of class "OptionalNumericOrMatrix" which may contain the asymptotic (co)variance of the estimator.
samplesize object of class "numeric" — the samplesize (only complete cases are counted) at which the estimate was evaluated.
completecases object of class "logical" — complete cases at which the estimate was evaluated.
nuis.idx object of class "OptionalNumeric": indices of estimate belonging to the nuisance part.
fixed object of class "OptionalNumeric": the fixed and known part of the parameter.
trafo object of class "list": a list with components fct and mat (see below).
untransformed.estimate Object of class "ANY": untransformed estimate.
untransformed.asvar object of class "OptionalNumericOrMatrix" which may contain the asymptotic (co)variance of the untransformed estimator.

Methods

name signature(object = "Estimate"): accessor function for slot name.
name<- signature(object = "Estimate"): replacement function for slot name.
estimate signature(object = "Estimate"): accessor function for slot estimate.
untransformed.estimate signature(object = "Estimate"): accessor function for slot untransformed.estimate.
estimate.call signature(object = "Estimate"): accessor function for slot estimate.call.
samplesize signature(object = "Estimate"): (with additional argument onlycompletecases defaulting to TRUE returns the sample size; in case there are any incomplete cases and argument onlycompletecases is FALSE, the number of these is added to slot samplesize).
completecases signature(object = "Estimate"): accessor function for slot completecases.
asvar signature(object = "Estimate"): accessor function for slot asvar.
asvar<- signature(object = "Estimate"): replacement function for slot asvar.
untransformed.asvar signature(object = "Estimate"): accessor function for slot untransformed.asvar.
nuisance signature(object = "Estimate"): accessor function for nuisance part of slot estimate.
main signature(object = "Estimate"): accessor function for main part of slot estimate.
fixed signature(object = "Estimate"): accessor function for slot fixed.
Infos signature(object = "Estimate"): accessor function for slot Infos.
Infos<- signature(object = "Estimate"): replacement function for slot Infos.
addInfo<- signature(object = "Estimate"): function to add an information to slot Infos.
show signature(object = "Estimate")
print signature(object = "Estimate"): just as show, but with additional arguments digits.

Details for methods 'show', 'print'

Detailedness of output by methods `show`, `print` is controlled by the global option `show.details` to be set by `distrModoptions`.

As method `show` is used when inspecting an object by typing the object's name into the console, `show` comes without extra arguments and hence detailedness must be controlled by global options.

Method `print` may be called with a (partially matched) argument `show.details`, and then the global option is temporarily set to this value.

More specifically, when `show.detail` is matched to "minimal" you will be shown only the name/type of the estimator, the value of its main part, and, if present, the corresponding standard errors, as well as, also if present, the value of the nuisance part. When `show.detail` is matched to "medium", you will in addition see the class of the estimator, its call and its sample-size and, if present, the fixed part of the parameter and the asymptotic covariance matrix. Also the information gathered in the `Infos` slot is shown. Finally, when `show.detail` is matched to "maximal", and if, in addition, you estimate non-trivial (i.e. not the identity) transformation of the parameter of the parametric family, you will also be shown this transformation in form of its function and its derivative matrix at the estimated parameter value, as well as the estimator (with standard errors, if present) and (again, if present) the corresponding asymptotic covariance of the untransformed, total (i.e. main and nuisance part) parameter.

`trafo` realizes partial influence curves; i.e.; we are only interested in some possibly lower dimensional smooth (not necessarily linear or even coordinate-wise) aspect/transformation τ of the parameter θ .

To be coherent with the corresponding *nuisance* implementation, we make the following convention:

The full parameter θ is split up coordinate-wise in a main parameter θ' and a nuisance parameter θ'' (which is unknown, too, hence has to be estimated, but only is of secondary interest) and a fixed, known part θ''' .

Without loss of generality, we restrict ourselves to the case that transformation τ only acts on the main parameter θ' — if we want to transform the whole parameter, we only have to assume that both nuisance parameter θ'' and fixed, known part of the parameter θ''' have length 0.

To the implementation:

Slot `trafo` can either contain a (constant) matrix D_θ or a function

$$\tau: \Theta' \rightarrow \tilde{\Theta}, \quad \theta \mapsto \tau(\theta)$$

mapping main parameter θ' to some range $\tilde{\Theta}$.

If *slot value* `trafo` is a function, besides $\tau(\theta)$, it will also return the corresponding derivative matrix $\frac{\partial}{\partial \theta} \tau(\theta)$. More specifically, the return value of this function `theta` is a list with entries `fval`, the function value $\tau(\theta)$, and `mat`, the derivative matrix.

In case `trafo` is a matrix D , we interpret it as such a derivative matrix $\frac{\partial}{\partial \theta} \tau(\theta)$, and, correspondingly, $\tau(\theta)$ as the linear mapping $\tau(\theta) = D\theta$.

Note

The pretty-printing code for methods `show` and `print` has been borrowed from `print.fittedistr` in package **MASS** by B.D. Ripley.

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>
 Peter Ruckdeschel <peter.ruckdeschel@uni-oldenburg.de>

See Also

[Estimator](#)

Examples

```
x <- rnorm(100)
Estimator(x, estimator = mean, name = "mean")

x1 <- x; x1[sample(1:100,10)] <- NA
myEst1 <- Estimator(x1, estimator = mean, name = "mean")
samplesize(myEst1)
samplesize(myEst1, onlycomplete = FALSE)
```

| | |
|-----------|--------------------------------------|
| Estimator | <i>Function to compute estimates</i> |
|-----------|--------------------------------------|

Description

The function Estimator provides a general way to compute estimates.

Usage

```
Estimator(x, estimator, name, Infos, asvar = NULL, nuis.idx,
          trafo = NULL, fixed = NULL, asvar.fct, na.rm = TRUE, ...,
          ParamFamily = NULL, .withEvalAsVar = TRUE)
```

Arguments

| | |
|-----------|---|
| x | (empirical) data |
| estimator | function: estimator to be evaluated on x. |
| name | optional name for estimator. |
| Infos | character: optional informations about estimator |
| asvar | optionally the asymptotic (co)variance of the estimator |
| nuis.idx | optionally the indices of the estimate belonging to nuisance parameter |
| fixed | optionally (numeric) the fixed part of the parameter |
| trafo | an object of class <code>MatrixorFunction</code> – a transformation for the main parameter |
| asvar.fct | optionally: a function to determine the corresponding asymptotic variance; if given, <code>asvar.fct</code> takes arguments <code>L2Fam</code> (the parametric model as object of class <code>L2ParamFamily</code>) and <code>param</code> (the parameter value as object of class <code>ParamFamParameter</code>); arguments are called by name; <code>asvar.fct</code> may also process further arguments passed through the <code>...</code> argument. |

na.rm logical: if TRUE, the estimator is evaluated at complete.cases(x).
 ... further arguments to estimator.
 ParamFamily an optional object of class ParamFamily. Passed on to asvar.fct to compute asymptotic variances.
 .withEvalAsVar logical: shall slot asVar be evaluated (if asvar.fct is given) or just the call be returned?

Details

The argument criterion has to be a function with arguments the empirical data as well as an object of class "Distribution" and possibly ...

Value

An object of S4-class "Estimate".

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>,
 Peter Ruckdeschel <peter.ruckdeschel@uni-oldenburg.de>

See Also

[Estimate-class](#)

Examples

```
x <- rnorm(100)
Estimator(x, estimator = mean, name = "mean")

X <- matrix(rnorm(1000), nrow = 10)
Estimator(X, estimator = rowMeans, name = "mean")
```

EvenSymmetric

Generating function for EvenSymmetric-class

Description

Generates an object of class "EvenSymmetric".

Usage

```
EvenSymmetric(SymmCenter = 0)
```

Arguments

SymmCenter numeric: center of symmetry

Value

Object of class "EvenSymmetric"

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

See Also

[EvenSymmetric-class](#), [FunctionSymmetry-class](#)

Examples

```
EvenSymmetric()

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

EvenSymmetric-class *Class for Even Functions*

Description

Class for even functions.

Objects from the Class

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

Slots

type Object of class "character": contains "even function"
SymmCenter Object of class "numeric": center of symmetry

Extends

Class "FunctionSymmetry", directly.
Class "Symmetry", by class "FunctionSymmetry".

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

See Also

[EvenSymmetric](#), [FunctionSymmetry-class](#)

Examples

```
new("EvenSymmetric")
```

existsPIC-methods *Methods for Function existsPIC in Package 'distrMod'*

Description

existsPIC-methods to check whether in a given L2 differentiable model at parameter value theta there exist (partial) influence curves to Trafo D_θ .

Usage

```
existsPIC(object, ...)
## S4 method for signature 'L2ParamFamily'
existsPIC(object, warning = TRUE, tol = .Machine$double.eps^.5)
```

Arguments

| | |
|---------|--|
| object | L2ParamFamily |
| ... | further arguments used by specific methods. |
| warning | logical: should a warning be issued if there exist no (partial) influence curves? |
| tol | the tolerance the linear algebraic operations. Default is <code>.Machine\$double.eps^.5</code> . |

Details

To check the existence of (partial) influence curves and, simultaneously, for bounded (partial) influence curves, by Lemma 1.1.3 in Kohl(2005) [resp. the fact that $\ker I = \ker J$ for $J = E(\Lambda', 1)'(\Lambda', 1)w$ and $w = \min(1, b/|(\Lambda', 1)|]$, it suffices to check that $\ker I$ is a subset of $\ker D_\theta$. This is done by a call to `isKerAinKerB`.

Author(s)

Peter Ruckdeschel <peter.ruckdeschel@uni-oldenburg.de>

References

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

See Also

[isKerAinKerB](#)

| | |
|----------------|---|
| ExpScaleFamily | <i>Generating function for exponential scale families</i> |
|----------------|---|

Description

Generates an object of class "L2ScaleFamily" which represents an exponential scale family.

Usage

```
ExpScaleFamily(scale = 1, trafo)
```

Arguments

| | |
|-------|---|
| scale | scale (= 1/rate) |
| trafo | function in param or matrix: optional transformation of the parameter |

Details

The slots of the corresponding L2 differentiable parameteric family are filled. The scale parameter corresponds to 1/rate.

Value

Object of class "L2ScaleFamily"

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

References

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

See Also

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

Examples

```
(E1 <- ExpScaleFamily())
plot(E1)
Map(L2deriv(E1)[[1]])
## IGNORE_RDIFF_BEGIN
checkL2deriv(E1)
## IGNORE_RDIFF_END
```

`fiBias`*Generating function for fiBias-class*

Description

Generates an object of class "fiBias".

Usage

```
fiBias()
```

Value

Object of class "fiBias"

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

References

Ruckdeschel, P. and Kohl, M. (2005) How to approximate the finite sample risk of M-estimators.

See Also

[fiBias-class](#)

Examples

```
fiBias()  
  
## The function is currently defined as  
function(){ new("fiBias") }
```

`fiBias-class`*Finite-sample Bias*

Description

Class of finite-sample bias.

Objects from the Class

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

Slots

type Object of class "character": "finite-sample bias".

Extends

Class "fiRisk", directly.

Class "RiskType", by class "fiRisk".

Methods

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

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

References

Ruckdeschel, P. and Kohl, M. (2005) How to approximate the finite sample risk of M-estimators.

See Also

[fiRisk-class](#), [fiBias](#)

Examples

```
new("fiBias")
```

fiCov

Generating function for fiCov-class

Description

Generates an object of class "fiCov".

Usage

```
asCov()
```

Value

Object of class "fiCov"

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

References

Ruckdeschel, P. and Kohl, M. (2005) How to approximate the finite sample risk of M-estimators.

See Also

[fiCov-class](#)

Examples

```
fiCov()  
  
## The function is currently defined as  
function(){ new("fiCov") }
```

fiCov-class

Finite-sample covariance

Description

Class of finite-sample covariance.

Objects from the Class

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

Slots

type Object of class "character": "finite-sample covariance".

Extends

Class "fiRisk", directly.
Class "RiskType", by class "fiRisk".

Methods

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

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

References

Ruckdeschel, P. and Kohl, M. (2005) How to approximate the finite sample risk of M-estimators.

See Also

[fiRisk-class](#), [fiCov](#)

Examples

```
new("fiCov")
```

fiHampel

Generating function for fiHampel-class

Description

Generates an object of class "fiHampel".

Usage

```
fiHampel(bound = Inf)
```

Arguments

bound positive real: bias bound

Value

Object of class fiHampel

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

References

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

Ruckdeschel, P. and Kohl, M. (2005) How to approximate the finite sample risk of M-estimators.

See Also

[fiHampel-class](#)

Examples

```
fiHampel()
```

```
## The function is currently defined as  
function(bound = Inf){ new("fiHampel", bound = bound) }
```

| | |
|----------------|----------------------------------|
| fiHempel-class | <i>Finite-sample Hampel risk</i> |
|----------------|----------------------------------|

Description

Class of finite-sample Hampel risk which is the trace of the finite-sample covariance subject to a given bias bound (bound on gross error sensitivity).

Objects from the Class

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

Slots

`type` Object of class "character": "trace of finite-sample covariance for given bias bound".
`bound` Object of class "numeric": given positive bias bound.

Extends

Class "fiRisk", directly.
Class "RiskType", by class "fiRisk".

Methods

bound signature(object = "fiHempel"): accessor function for slot bound.
show signature(object = "fiHempel")

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

References

Hampel et al. (1986) *Robust Statistics*. The Approach Based on Influence Functions. New York: Wiley.
Ruckdeschel, P. and Kohl, M. (2005) How to approximate the finite sample risk of M-estimators.

See Also

[fiRisk-class](#), [fiHempel](#)

Examples

```
new("fiHempel")
```

fiMSE

Generating function for fiMSE-class

Description

Generates an object of class "fiMSE".

Usage

```
fiMSE()
```

Value

Object of class "fiMSE"

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

References

Ruckdeschel, P. and Kohl, M. (2005) How to approximate the finite sample risk of M-estimators.

See Also

[fiMSE-class](#)

Examples

```
fiMSE()  
  
## The function is currently defined as  
function(){ new("fiMSE") }
```

fiMSE-class

Finite-sample mean square error

Description

Class of asymptotic mean square error.

Objects from the Class

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

Slots

type Object of class "character": "finite-sample mean square error".

Extends

Class "fiRisk", directly.

Class "RiskType", by class "fiRisk".

Methods

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

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

References

Ruckdeschel, P. and Kohl, M. (2005) How to approximate the finite sample risk of M-estimators.

See Also

[fiRisk-class](#), [fiMSE](#)

Examples

```
new("fiMSE")
```

fiRisk-class

Finite-sample risk

Description

Class of finite-sample risks.

Objects from the Class

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

Slots

type Object of class "character".

Extends

Class "RiskType", directly.

Methods

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

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

References

Ruckdeschel, P. and Kohl, M. (2005) How to approximate the finite sample risk of M-estimators.

See Also

[RiskType-class](#)

fiUnOvShoot

Generating function for fiUnOvShoot-class

Description

Generates an object of class "fiUnOvShoot".

Usage

```
fiUnOvShoot(width = 1.960)
```

Arguments

width positive real: half the width of given confidence interval.

Value

Object of class "fiUnOvShoot"

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. (1989) A finite-sample minimax regression estimator. *Statistics* **20**(2): 211–221.

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

Ruckdeschel, P. and Kohl, M. (2005) How to approximate the finite sample risk of M-estimators.

See Also

[fiUnOvShoot-class](#)

Examples

```
fiUnOvShoot()
```

```
## The function is currently defined as  
function(width = 1.960){ new("fiUnOvShoot", width = width) }
```

| | |
|-------------------|---|
| fiUnOvShoot-class | <i>Finite-sample under-/overshoot probability</i> |
|-------------------|---|

Description

Class of finite-sample under-/overshoot probability.

Objects from the Class

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

Slots

`type` Object of class "character": "finite-sample under-/overshoot probability".

`width` Object of class "numeric": half the width of given confidence interval.

Extends

Class "fiRisk", directly.

Class "RiskType", by class "fiRisk".

Methods

width signature(object = "fiUnOvShoot"): accessor function for slot width.

show signature(object = "fiUnOvShoot")

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. (1989) A finite-sample minimax regression estimator. *Statistics* **20**(2): 211–221.
- 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](#)

Examples

```
new("fiUnOvShoot")
```

FunctionSymmetry-class

Class of Symmetries for Functions

Description

Class of symmetries for functions.

Objects from the Class

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

Slots

type Object of class "character": describes type of symmetry.

SymmCenter Object of class "OptionalNumeric": center of symmetry.

Extends

Class "Symmetry", directly.

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

See Also

[Symmetry-class](#), [OptionalNumeric-class](#)

FunSymmList*Generating function for FunSymmList-class*

Description

Generates an object of class "FunSymmList".

Usage

```
FunSymmList(...)
```

Arguments

... Objects of class "FunctionSymmetry" which shall form the list of symmetry types.

Value

Object of class "FunSymmList"

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

See Also

[FunSymmList-class](#)

Examples

```
FunSymmList(NonSymmetric(), EvenSymmetric(SymmCenter = 1),
            OddSymmetric(SymmCenter = 2))

## The function is currently defined as
function (...){
  new("FunSymmList", list(...))
}
```

FunSymmList-class *List of Symmetries for a List of Functions*

Description

Create a list of symmetries for a list of functions

Objects from the Class

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

Slots

.Data Object of class "list". A list of objects of class "FunctionSymmetry".

Extends

Class "list", from data part.
Class "vector", by class "list".

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

See Also

[FunctionSymmetry-class](#)

Examples

```
new("FunSymmList", list(NonSymmetric(), EvenSymmetric(SymmCenter = 1),  
                        OddSymmetric(SymmCenter = 2)))
```

GammaFamily *Generating function for Gamma families*

Description

Generates an object of class "L2ParamFamily" which represents a Gamma family.

Usage

```
GammaFamily(scale = 1, shape = 1, trafo, withL2derivDistr = TRUE)
```

Arguments

scale positive real: scale parameter
 shape positive real: shape parameter
 trafo matrix: transformation of the parameter
 withL2derivDistr logical: shall the distribution of the L2 derivative be computed? Defaults to TRUE; setting it to FALSE speeds up computations.

Details

The slots of the corresponding L2 differentiable parameteric family are filled.

Value

Object of class "L2ParamFamily"

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

References

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

See Also

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

Examples

```

(G1 <- GammaFamily())
FisherInfo(G1)
## IGNORE_RDIFF_BEGIN
checkL2deriv(G1)
## IGNORE_RDIFF_END

```

InfoNorm

Generating function for InfoNorm-class

Description

Generates an object of class "InfoNorm" — used for information-standardized influence curves.

Usage

```
InfoNorm()
```

Value

Object of class "InfoNorm"

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

[InfoNorm-class](#)

Examples

```
## IGNORE_RDIFF_BEGIN
InfoNorm()

## The function is currently defined as
function(){ new("InfoNorm") }
## IGNORE_RDIFF_END
```

isKerAinKerB

isKerAinKerB

Description

For two matrices A and B checks whether the null space of A is a subspace of the null space of B, in other words, if $Ax = 0$ entails $Bx=0$.

Usage

```
isKerAinKerB(A, B, tol = .Machine$double.eps)
```

Arguments

| | |
|-----|---|
| A | a matrix; if A is a vector, A is coerced to a matrix by <code>as.matrix</code> . |
| B | a matrix; if B is a vector, B is coerced to a matrix by <code>as.matrix</code> . |
| tol | the tolerance for detecting linear dependencies in the columns of a and up to which the two projectors are seen as equal (see below). |

Details

via calls to `svd`, the projectors π_A and π_B onto the respective orthogonal complements of $\ker(A)$ and $\ker(B)$ are calculated and then is checked whether $\pi_B \pi_A = \pi_B$.

Value

logical

Author(s)

Peter Ruckdeschel <peter.ruckdeschel@uni-oldenburg.de>

Examples

```
ma <- cbind(1,1,c(1,1,7))
D <- t(ma %*% c(0,1,-1))
## IGNORE_RDIFF_BEGIN
## note that results may vary according to BLAS
isKerAinKerB(D,ma)
isKerAinKerB(ma,D)
## IGNORE_RDIFF_END
```

L2GroupParamFamily-class

L2 differentiable parametric group family

Description

Class of L2 differentiable parametric group families.

Objects from the Class

Objects can be created by calls of the form `new("L2GroupParamFamily", ...)`. More frequently, this class is just used as an intermediate class to classes of specific group models like [L2LocationFamily-class](#), [L2ScaleFamily-class](#), and [L2LocationScaleFamily-class](#).

Slots

`name` [inherited from class "ProbFamily"] object of class "character": name of the family.

`distribution` [inherited from class "ProbFamily"] object of class "Distribution": member of the family.

`distrSymm` [inherited from class "ProbFamily"] object of class "DistributionSymmetry": symmetry of distribution.

`param` [inherited from class "ParamFamily"] object of class "ParamFamParameter": parameter of the family.

`fam.call` [inherited from class "ParamFamily"] object of class "call": call by which parametric family was produced.

`makeOKPar` [inherited from class "ParamFamily"] object of class "function": has argument `param` — the (total) parameter, returns valid parameter; used if `optim` resp. `optimize`— try to use "illegal" parameter values; then `makeOKPar` makes a valid parameter value out of the illegal one.

`startPar` [inherited from class "ParamFamily"] object of class "function": has argument `x` — the data, returns starting parameter for `optim` resp. `optimize`— a starting estimator in case parameter is multivariate or a search interval in case parameter is univariate.

`modifyParam` [inherited from class "ParamFamily"] object of class "function": mapping from the parameter space (represented by "param") to the distribution space (represented by "distribution").

`props` [inherited from class "ProbFamily"] object of class "character": properties of the family.

`L2deriv` [inherited from class "L2ParamFamily"] object of class "EuclRandVariable": L2 derivative of the family.

`L2deriv.fct` [inherited from class "L2ParamFamily"] object of class "function": mapping from the parameter space (argument `param` of class "ParamFamParameter") to a mapping from observation `x` to the value of the L2derivative; `L2deriv.fct` is then used from observation `x` to value of the L2derivative; `L2deriv.fct` is used by `modifyModel` to move the L2deriv according to a change in the parameter

`L2derivSymm` [inherited from class "L2ParamFamily"] object of class "FunSymmList": symmetry of the maps included in `L2deriv`.

`L2derivDistr` [inherited from class "L2ParamFamily"] object of class "UnivarDistrList": list which includes the distribution of `L2deriv`.

`L2derivDistrSymm` [inherited from class "L2ParamFamily"] object of class "DistrSymmList": symmetry of the distributions included in `L2derivDistr`.

`FisherInfo.fct` [inherited from class "L2ParamFamily"] object of class "function": mapping from the parameter space (argument `param` of class "ParamFamParameter") to the set of positive semidefinite matrices; `FisherInfo.fct` is used by `modifyModel` to move the Fisher information according to a change in the parameter

`FisherInfo` [inherited from class "L2ParamFamily"] object of class "PosDefSymmMatrix": Fisher information of the family.

`LogDeriv` object of class "function": has argument `x`; the negative logarithmic derivative of the density of the model distribution at the "standard" parameter value.

Extends

Class "L2ParamFamily", directly.
 Class "ParamFamily", by class "L2ParamFamily".
 Class "ProbFamily", by class "ParamFamily".

Methods

LogDeriv signature(object = "L2GroupParamFamily"): accessor function for slot `LogDeriv`.
LogDeriv<- signature(object = "L2GroupParamFamily"): replacement function for slot `LogDeriv`.

Author(s)

Peter Ruckdeschel <peter.ruckdeschel@uni-oldenburg.de>

References

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

See Also

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

Examples

```
F1 <- new("L2GroupParamFamily")
plot(F1)
```

L2LocationFamily *Generating function for L2LocationFamily-class*

Description

Generates an object of class "L2LocationFamily".

Usage

```
L2LocationFamily(loc = 0, name, centraldistribution = Norm(),
                 locname = "loc", modParam, LogDeriv,
                 L2derivDistr.0, FisherInfo.0, distrSymm, L2derivSymm,
                 L2derivDistrSymm, trafo, .returnClsName = NULL)
```

Arguments

| | |
|---------------------|---|
| loc | numeric: location parameter of the model. |
| name | character: name of the parametric family. |
| centraldistribution | object of class "AbscontDistribution"; we assume from the beginning, that centraldistribution is symmetric about its median. |
| modParam | optional function: mapping from the parameter space (represented by "param") to the distribution space (represented by "distribution"). |
| locname | a character vector of length 1 containing the name of the location parameter |
| LogDeriv | function with argument x: the negative logarithmic derivative of the density of the central distribution; if missing, it is determined numerically using numeric differentiation. |
| L2derivDistr.0 | object of class "UnivariateDistribution": distribution of the L2derivative at the central distribution |
| FisherInfo.0 | object of class "PosSemDefSymmMatrix": Fisher information of the model at the "standard" parameter value |

| | |
|------------------|--|
| distrSymm | object of class "DistributionSymmetry": symmetry of distribution. |
| L2derivSymm | object of class "FunSymmList": symmetry of the maps contained in L2deriv |
| L2derivDistrSymm | object of class "DistrSymmList": symmetry of the distributions contained in L2derivDistr |
| trafo | matrix or function in param: transformation of the parameter |
| .returnClsName | the class name of the return value; by default this argument is NULL whereupon the return class will be L2LocationScaleFamily; but, internally, this generating function is also used to produce objects of class Classes NormLocationFamily and GumbelLocationFamily (the latter in package RobExtremes). |

Details

If name is missing, the default "L2 location family" is used. The function modParam is optional. If it is missing, it is constructed from centraldistribution using the location structure of the model. Slot param is filled accordingly with the argument trafo passed to L2LocationFamily. In case L2derivDistr.0 is missing, L2derivDistr is computed via imageDistr, else L2derivDistr is assigned L2derivDistr.0, coerced to "UnivariateDistributionList". In case FisherInfo.0 is missing, Fisher information is computed from L2deriv using E. If distrSymm is missing, it is set to symmetry about loc. If L2derivSymm is missing, it is set to no symmetry, and if L2derivDistrSymm is missing, it is set to no symmetry, too.

Value

Object of class "L2LocationFamily"

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>,
Peter Ruckdeschel <peter.ruckdeschel@uni-oldenburg.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

[L2LocationFamily-class](#)

Examples

```
F1 <- L2LocationFamily()
plot(F1)
```

L2LocationFamily-class

L2 differentiable parametric group family

Description

Class of L2 differentiable parametric group families.

Objects from the Class

Objects can be created by calls of the form `new("L2LocationFamily", ...)`. More frequently they are created via the generating function `L2LocationFamily`.

Slots

`name` [inherited from class "ProbFamily"] object of class "character": name of the family.

`distribution` [inherited from class "ProbFamily"] object of class "Distribution": member of the family.

`distrSymm` [inherited from class "ProbFamily"] object of class "DistributionSymmetry": symmetry of distribution.

`param` [inherited from class "ParamFamily"] object of class "ParamFamParameter": parameter of the family.

`fam.call` [inherited from class "ParamFamily"] object of class "call": call by which parametric family was produced.

`makeOKPar` [inherited from class "ParamFamily"] object of class "function": has argument `param` — the (total) parameter, returns valid parameter; used if `optim` resp. `optimize`— try to use "illegal" parameter values; then `makeOKPar` makes a valid parameter value out of the illegal one.

`startPar` [inherited from class "ParamFamily"] object of class "function": has argument `x` — the data, returns starting parameter for `optim` resp. `optimize`— a starting estimator in case parameter is multivariate or a search interval in case parameter is univariate.

`modifyParam` [inherited from class "ParamFamily"] object of class "function": mapping from the parameter space (represented by "param") to the distribution space (represented by "distribution").

`props` [inherited from class "ProbFamily"] object of class "character": properties of the family.

`L2deriv` [inherited from class "L2ParamFamily"] object of class "EuclRandVariable": L2 derivative of the family.

`L2deriv.fct` [inherited from class "L2ParamFamily"] object of class "function": mapping from the parameter space (argument `param` of class "ParamFamParameter") to a mapping from observation `x` to the value of the L2derivative; `L2deriv.fct` is then used from observation `x` to value of the L2derivative; `L2deriv.fct` is used by `modifyModel` to move the `L2deriv` according to a change in the parameter

`L2derivSymm` [inherited from class "L2ParamFamily"] object of class "FunSymmList": symmetry of the maps included in `L2deriv`.

L2derivDistr [inherited from class "L2ParamFamily"] object of class "UnivarDistrList": list which includes the distribution of L2deriv.

L2derivDistrSymm [inherited from class "L2ParamFamily"] object of class "DistrSymmList": symmetry of the distributions included in L2derivDistr.

FisherInfo.fct [inherited from class "L2ParamFamily"] object of class "function": mapping from the parameter space (argument param of class "ParamFamParameter") to the set of positive semidefinite matrices; FisherInfo.fct is used by modifyModel to move the Fisher information according to a change in the parameter

FisherInfo [inherited from class "L2ParamFamily"] object of class "PosDefSymmMatrix": Fisher information of the family.

LogDeriv [inherited from class "L2GroupParamFamily"] object of class "function": has argument x; the negative logarithmic derivative of the density of the model distribution at the "standard" parameter value.

locscalename [inherited from class "L2LocationScaleUnion"] object of class "character": names of location and scale parameter

Extends

Class "L2LocationScaleUnion", directly.

Class "L2GroupParamFamily", by class "L2LocationScaleUnion".

Class "L2ParamFamily", by class "L2GroupParamFamily".

Class "ParamFamily", by class "L2ParamFamily".

Class "ProbFamily", by class "ParamFamily".

Methods

modifyModel signature(model = "L2LocationFamily", param = "ParamFamParameter"): moves the L2-location family model to parameter param

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>,
Peter Ruckdeschel <peter.ruckdeschel@uni-oldenburg.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

[L2LocationFamily](#), [ParamFamily-class](#)

Examples

```
F1 <- new("L2LocationFamily")
plot(F1)
```

L2LocationScaleFamily *Generating function for L2LocationScaleFamily-class*

Description

Generates an object of class "L2LocationScaleFamily".

Usage

```
L2LocationScaleFamily(loc = 0, scale = 1, name, centraldistribution = Norm(),
  locscalename = c("loc", "scale"), modParam, LogDeriv,
  L2derivDistr.0, FisherInfo.0, distrSymm, L2derivSymm,
  L2derivDistrSymm, trafo, .returnClsName = NULL)
```

Arguments

| | |
|---------------------|---|
| loc | numeric: location parameter of the model. |
| scale | positive number: scale of the model. |
| name | character: name of the parametric family. |
| centraldistribution | object of class "AbscontDistribution": central distribution; we assume by default, that centraldistribution is symmetric about 0 |
| modParam | optional function: mapping from the parameter space (represented by "param") to the distribution space (represented by "distribution"). |
| locscalename | a character vector of length 2 containing the names of the location and scale parameter; either unnamed, then order must be c(loc, scale), or named, then names must be "loc" and "scale" |
| LogDeriv | function with argument x: the negative logarithmic derivative of the density of the central distribution; if missing, it is determined numerically using numeric differentiation. |
| L2derivDistr.0 | list of length 2 of objects of class "UnivariateDistribution": (marginal) distributions of the coordinates of the L2derivative at the central distribution |
| FisherInfo.0 | object of class "PosSemDefSymmMatrix": Fisher information of the model at the "standard" parameter value |
| distrSymm | object of class "DistributionSymmetry": symmetry of distribution. |
| L2derivSymm | object of class "FunSymmList": symmetry of the maps contained in L2deriv |
| L2derivDistrSymm | object of class "DistrSymmList": symmetry of the distributions contained in L2derivDistr |
| trafo | matrix or function in param: transformation of the parameter |
| .returnClsName | the class name of the return value; by default this argument is NULL whereupon the return class will be L2LocationScaleFamily; but, internally, this generating function is also used to produce objects of class NormalLocationScaleFamily, CauchyLocationScaleFamily. |

Details

If name is missing, the default “L2 location and scale family” is used. The function modParam is optional. If it is missing, it is constructed from centraldistribution using the location and scale structure of the model. Slot param is filled accordingly with the argument trafo passed to L2LocationScaleFamily. In case L2derivDistr.0 is missing, L2derivDistr is computed via imageDistr, else L2derivDistr is assigned L2derivDistr.0, coerced to “UnivariateDistributionList”. In case FisherInfo.0 is missing, Fisher information is computed from L2deriv using E. If distrSymm is missing, it is set to symmetry about loc. If L2derivSymm is missing, its location and scale components are set to no symmetry, respectively. If L2derivDistrSymm is missing, its location and scale components are set to no symmetry, respectively.

Value

Object of class “L2LocationScaleFamily”

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>,
Peter Ruckdeschel <peter.ruckdeschel@uni-oldenburg.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

[L2LocationScaleFamily-class](#)

Examples

```
F1 <- L2LocationScaleFamily()
plot(F1)
```

L2LocationScaleFamily-class

L2 differentiable parametric group family

Description

Class of L2 differentiable parametric group families.

Objects from the Class

Objects can be created by calls of the form `new("L2LocationScaleFamily", ...)`. More frequently they are created via the generating function `L2LocationScaleFamily`.

Slots

- name [inherited from class "ProbFamily"] object of class "character": name of the family.
- distribution [inherited from class "ProbFamily"] object of class "Distribution": member of the family.
- distrSymm [inherited from class "ProbFamily"] object of class "DistributionSymmetry": symmetry of distribution.
- param [inherited from class "ParamFamily"] object of class "ParamFamParameter": parameter of the family.
- fam.call [inherited from class "ParamFamily"] object of class "call": call by which parametric family was produced.
- makeOKPar [inherited from class "ParamFamily"] object of class "function": has argument param — the (total) parameter, returns valid parameter; used if optim resp. optimize— try to use "illegal" parameter values; then makeOKPar makes a valid parameter value out of the illegal one.
- startPar [inherited from class "ParamFamily"] object of class "function": has argument x — the data, returns starting parameter for optim resp. optimize— a starting estimator in case parameter is multivariate or a search interval in case parameter is univariate.
- modifyParam [inherited from class "ParamFamily"] object of class "function": mapping from the parameter space (represented by "param") to the distribution space (represented by "distribution").
- props [inherited from class "ProbFamily"] object of class "character": properties of the family.
- L2deriv [inherited from class "L2ParamFamily"] object of class "EuclRandVariable": L2 derivative of the family.
- L2deriv.fct [inherited from class "L2ParamFamily"] object of class "function": mapping from the parameter space (argument param of class "ParamFamParameter") to a mapping from observation x to the value of the L2derivative; L2deriv.fct is then used from observation x to value of the L2derivative; L2deriv.fct is used by modifyModel to move the L2deriv according to a change in the parameter
- L2derivSymm [inherited from class "L2ParamFamily"] object of class "FunSymmList": symmetry of the maps included in L2deriv.
- L2derivDistr [inherited from class "L2ParamFamily"] object of class "UnivarDistrList": list which includes the distribution of L2deriv.
- L2derivDistrSymm [inherited from class "L2ParamFamily"] object of class "DistrSymmList": symmetry of the distributions included in L2derivDistr.
- FisherInfo.fct [inherited from class "L2ParamFamily"] object of class "function": mapping from the parameter space (argument param of class "ParamFamParameter") to the set of positive semidefinite matrices; FisherInfo.fct is used by modifyModel to move the Fisher information according to a change in the parameter
- FisherInfo [inherited from class "L2ParamFamily"] object of class "PosDefSymmMatrix": Fisher information of the family.
- LogDeriv [inherited from class "L2GroupParamFamily"] object of class "function": has argument x; the negative logarithmic derivative of the density of the model distribution at the "standard" parameter value.
- locscalename [inherited from class "L2LocationScaleUnion"] object of class "character": names of location and scale parameter

Extends

Class "L2LocationScaleUnion", directly.
 Class "L2GroupParamFamily", by class "L2LocationScaleUnion".
 Class "L2ParamFamily", by class "L2GroupParamFamily".
 Class "ParamFamily", by class "L2ParamFamily".
 Class "ProbFamily", by class "ParamFamily".

Methods

modifyModel signature(model = "L2LocationScaleFamily", param = "ParamFamParameter"):
 moves the L2-location and scale family model to parameter param

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>,
 Peter Ruckdeschel <peter.ruckdeschel@uni-oldenburg.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

[L2LocationScaleFamily](#), [ParamFamily-class](#)

Examples

```
F1 <- new("L2LocationScaleFamily")
plot(F1)
```

L2LocationUnknownScaleFamily

Generating function for L2LocationScaleFamily-class in nuisance situation

Description

Generates an object of class "L2LocationScaleFamily" in the situation where location is main, scale nuisance parameter.

Usage

```
L2LocationUnknownScaleFamily(loc = 0, scale = 1, name, centraldistribution = Norm(),
  locscalename = c("loc", "scale"), modParam, LogDeriv,
  L2derivDistr.0, FisherInfo.0, distrSymm, L2derivSymm,
  L2derivDistrSymm, trafo, .returnClsName = NULL)
```

Arguments

| | |
|---------------------|--|
| loc | numeric: location parameter of the model. |
| scale | positive number: scale of the model. |
| name | character: name of the parametric family. |
| centraldistribution | object of class "AbscontDistribution": central distribution; we assume by default, that centraldistribution is symmetric about 0 |
| modParam | optional function: mapping from the parameter space (represented by "param") to the distribution space (represented by "distribution"). |
| locscalename | a character vector of length 2 containing the names of the location and scale parameter; either unnamed, then order must be c(loc, scale), or named, then names must be "loc" and "scale" |
| LogDeriv | function with argument x: the negative logarithmic derivative of the density of the central distribution; if missing, it is determined numerically using numeric differentiation. |
| L2derivDistr.0 | list of length 2 of objects of class "UnivariateDistribution": (marginal) distributions of the coordinates of the L2derivative at the central distribution |
| FisherInfo.0 | object of class "PosSemDefSymmMatrix": Fisher information of the model at the "standard" parameter value |
| distrSymm | object of class "DistributionSymmetry": symmetry of distribution. |
| L2derivSymm | object of class "FunSymmList": symmetry of the maps contained in L2deriv |
| L2derivDistrSymm | object of class "DistrSymmList": symmetry of the distributions contained in L2derivDistr |
| trafo | matrix or function in param: transformation of the parameter |
| .returnClsName | the class name of the return value; by default this argument is NULL whereupon the return class will be L2LocationScaleFamily; but, internally, this generating function is also used to produce objects of class NormalLocationScaleFamily. |

Details

If name is missing, the default "L2 location family with unknown scale (as nuisance)" is used. The function modParam is optional. If it is missing, it is constructed from centraldistribution using the location and scale structure of the model. Slot param is filled accordingly with the argument trafo passed to L2LocationUnknownScaleFamily. In case L2derivDistr.0 is missing, L2derivDistr is computed via imageDistr, else L2derivDistr is assigned L2derivDistr.0, coerced to "UnivariateDistributionList". In case FisherInfo.0 is missing, Fisher information is computed from L2deriv using E. If distrSymm is missing, it is set to symmetry about loc. If L2derivSymm is missing, its location and scale components are set to no symmetry, respectively. If L2derivDistrSymm is missing, its location and scale components are set to no symmetry, respectively.

Value

Object of class "L2LocationScaleFamily"

Author(s)

Peter Ruckdeschel <peter.ruckdeschel@uni-oldenburg.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

[L2LocationScaleFamily-class](#)

Examples

```
F1 <- L2LocationUnknownScaleFamily()
plot(F1)
```

L2ParamFamily

Generating function for L2ParamFamily-class

Description

Generates an object of class "L2ParamFamily".

Usage

```
L2ParamFamily(name, distribution = Norm(), distrSymm,
  main = main(param), nuisance = nuisance(param),
  fixed = fixed(param), trafo = trafo(param),
  param = ParamFamParameter(name = paste("Parameter of", name),
    main = main, nuisance = nuisance,
    fixed = fixed, trafo = trafo),
  props = character(0),
  startPar = NULL, makeOKPar = NULL,
  modifyParam = function(theta){ Norm(mean=theta) },
  L2deriv.fct = function(param) {force(theta <- param@main)
    return(function(x) {x-theta})},
  L2derivSymm, L2derivDistr, L2derivDistrSymm,
  FisherInfo.fct, FisherInfo = FisherInfo.fct(param),
  .returnClsName = NULL, .withMDE = TRUE)
```

Arguments

| | |
|------------------|---|
| name | character string: name of the family |
| distribution | object of class "Distribution": member of the family |
| distrSymm | object of class "DistributionSymmetry": symmetry of distribution. |
| main | numeric vector: main parameter |
| nuisance | numeric vector: nuisance parameter |
| fixed | numeric vector: fixed part of the parameter |
| trafo | function in param or matrix: transformation of the parameter |
| param | object of class "ParamFamParameter": parameter of the family |
| startPar | startPar is a function in the observations x returning initial information for MCEstimator used by optimize resp. optim; i.e. if (total) parameter is of length 1, startPar returns a search interval, else it returns an initial parameter value. |
| makeOKPar | makeOKPar is a function in the (total) parameter param; used if optim resp. optimize— try to use "illegal" parameter values; then makeOKPar makes a valid parameter value out of the illegal one; if NULL slot makeOKPar of ParamFamily is used to produce it. |
| modifyParam | function: mapping from the parameter space (represented by "param") to the distribution space (represented by "distribution"). |
| props | character vector: properties of the family |
| L2deriv.fct | function: mapping from the parameter space (argument param of class "ParamFamParameter") to a mapping from observation x to the value of the L2derivative; L2deriv.fct is used by modifyModel to move the L2deriv according to a change in the parameter, and to fill slot L2deriv. More specifically, let us call the parts main and nuisance of the parameter the <i>unknown</i> parameter. If this unknown parameter is one-dimensional, the return value of L2deriv.fct must be a function in argument x , which is vectorized, (i.e., callable for a vector-valued x), and has a one-dimensional, numeric return value. In case the dimension of the unknown parameter is larger than one, the return value must be a list of functions, each of which satisfies the conditions formulated for the case of a one-dimensional parameter of interest. The order of the components of this list is the same as the order of the parameter coordinates in main, followed by the ones in nuisance. |
| L2derivSymm | object of class "FunSymmList": symmetry of the maps contained in L2deriv; a list of symmetry properties of the same length as the return value of L2deriv.fct . |
| L2derivDistr | object of class "UnivarDistrList": distribution of L2deriv; the length of this list of univariate distributions must be of the same length as the return value of L2deriv.fct . |
| L2derivDistrSymm | object of class "DistrSymmList": symmetry of the distributions contained in L2derivDistr; the length of this list of symmetry properties must be of the same length as the return value of L2deriv.fct . |
| FisherInfo.fct | function: mapping from the parameter space (argument param of class "ParamFamParameter") to the set of positive semidefinite matrices; FisherInfo.fct is used by modifyModel to move the Fisher information according to a change in the parameter |

| | |
|----------------|--|
| FisherInfo | object of class "PosSemDefSymmMatrix": Fisher information of the family |
| .returnClsName | the class name of the return value; by default this argument is NULL whereupon the return class will be L2ParamFamily; but, internally, this generating function is also used to e.g. produce objects of class BinomialFamily, PoisFamily, GammaFamily, BetaFamily. |
| .withMDE | logical of length 1: Tells R how to use the function from slot startPar in case of a kStepEstimator—use it as is or to compute the starting point for a minimum distance estimator which in turn then serves as starting point for roptest / robest (from package ROptEst). If TRUE (default) the latter alternative is used. Ignored if ROptEst is not used. |

Details

If name is missing, the default “L2 differentiable parametric family of probability measures” is used. In case distrSymm is missing it is set to NoSymmetry(). If param is missing, the parameter is created via main, nuisance and trafo as described in [ParamFamParameter](#). In case L2derivSymm is missing, it is filled with an object of class FunSymmList with entries NonSymmetric(). In case L2derivDistr is missing, it is computed via imageDistr. If L2derivDistrSymm is missing, it is set to an object of class DistrSymmList with entries NoSymmetry(). In case FisherInfo is missing, it is computed from L2deriv using E.

Value

Object of class "L2ParamFamily"

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>,
Peter Ruckdeschel <peter.ruckdeschel@uni-oldenburg.de>

References

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

See Also

[L2ParamFamily-class](#)

Examples

```
F1 <- L2ParamFamily()
plot(F1)
```

L2ParamFamily-class *L2 differentiable parametric family*

Description

Class of L2 differentiable parametric families.

Details

In the E-methods, diagnostics on the involved integrations are available if argument `diagnostic` is TRUE. Then there is attribute `diagnostic` attached to the return value, which may be inspected and accessed through `showDiagnostic` and `getDiagnostic`.

Objects from the Class

Objects can be created by calls of the form `new("L2ParamFamily", ...)`. More frequently they are created via the generating function `L2ParamFamily`.

Slots

`name` [inherited from class "ProbFamily"] object of class "character": name of the family.

`distribution` [inherited from class "ProbFamily"] object of class "Distribution": member of the family.

`distrSymm` [inherited from class "ProbFamily"] object of class "DistributionSymmetry": symmetry of distribution.

`param` [inherited from class "ParamFamily"] object of class "ParamFamParameter": parameter of the family.

`fam.call` [inherited from class "ParamFamily"] object of class "call": call by which parametric family was produced.

`makeOKPar` [inherited from class "ParamFamily"] object of class "function": has argument `param` — the (total) parameter, returns valid parameter; used if `optim resp. optimize`— try to use "illegal" parameter values; then `makeOKPar` makes a valid parameter value out of the illegal one.

`startPar` [inherited from class "ParamFamily"] object of class "function": has argument `x` — the data, returns starting parameter for `optim resp. optimize`— a starting estimator in case parameter is multivariate or a search interval in case parameter is univariate.

`modifyParam` [inherited from class "ParamFamily"] object of class "function": mapping from the parameter space (represented by "param") to the distribution space (represented by "distribution").

`props` [inherited from class "ProbFamily"] object of class "character": properties of the family.

`L2deriv` object of class "EuclRandVariable": L2 derivative of the family. Its map slot must contain a list of functions. Each function in this list must have just one argument `x`, which is vectorized, (i.e., callable for a vector-valued `x`), and has a one-dimensional, numeric return value.

L2deriv.fct object of class "function": mapping from the parameter space (argument param of class "ParamFamParameter") to a mapping from observation x to the value of the L2derivative; L2deriv.fct is then used from observation x to value of the L2derivative; L2deriv.fct is used by modifyModel to move the L2deriv according to a change in the parameter. More specifically, let us call the parts main and nuisance of the parameter the *unknown* parameter. If this unknown parameter is one-dimensional, the return value of L2deriv.fct must be a function in argument x, which is vectorized, (i.e., callable for a vector-valued x), and has a one-dimensional, numeric return value. In case the dimension of the unknown parameter is larger than one, the return value must be a list of functions, each of which satisfies the conditions formulated for the case of a one-dimensional parameter of interest. The order of the components of this list is the same as the order of the parameter coordinates in main, followed by the ones in nuisance.

L2derivSymm object of class "FunSymmList": symmetry of the maps contained in L2deriv; a list of symmetry properties of the same length as the return value of L2deriv.fct .

L2derivDistr object of class "OptionalDistrListOrCall" (i.e., NULL or an object of class "DistrList" or the respective call to generate the latter object): if non-null and non-call, a list which includes the distribution of L2deriv; the length of this list of univariate distributions must be of the same length as the return value of L2deriv.fct .

L2derivDistrSymm object of class "DistrSymmList": symmetry of the distributions contained in L2derivDistr; the length of this list of symmetry properties must be of the same length as the return value of L2deriv.fct .

FisherInfo.fct object of class "function": mapping from the parameter space (argument param of class "ParamFamParameter") to the set of positive semidefinite matrices; FisherInfo.fct is used by modifyModel to move the Fisher information according to a change in the parameter

FisherInfo object of class "PosDefSymmMatrix": Fisher information of the family.

.withEvalL2derivDistr logical of length one: if TRUE slot L2derivDistr gets evaluated, otherwise it is only kept as call.

Extends

Class "ParamFamily", directly.
Class "ProbFamily", by class "ParamFamily".

Methods

L2deriv signature(object = "L2ParamFamily"): accessor function for L2deriv.

L2deriv signature(object = "L2ParamFamily", param = "ParamFamParameter"): returns the L2derivative at param, i.e. evaluates slot function L2deriv.fct at param.

L2derivSymm signature(object = "L2ParamFamily"): accessor function for L2derivSymm.

L2derivDistr signature(object = "L2ParamFamily"): accessor function for L2derivDistr.

L2derivDistrSymm signature(object = "L2ParamFamily"): accessor function for L2derivDistrSymm.

FisherInfo signature(object = "L2ParamFamily"): accessor function for FisherInfo.

FisherInfo signature(object = "L2ParamFamily", param = "ParamFamParameter"): returns the Fisher Information at param, i.e. evaluates slot function FisherInfo.fct at param.

- checkL2deriv** signature(object = "L2ParamFamily"): check centering of L2deriv and compute precision of Fisher information.
- E** signature(object = "L2ParamFamily", fun = "EuclRandVariable", cond = "missing"): expectation of fun under the distribution of object.
- E** signature(object = "L2ParamFamily", fun = "EuclRandMatrix", cond = "missing"): expectation of fun under the distribution of object.
- E** signature(object = "L2ParamFamily", fun = "EuclRandVarList", cond = "missing"): expectation of fun under the distribution of object.
- plot** signature(x = "L2ParamFamily"): plot of distribution and L2deriv. More precisely, this method has arguments `plot(x, withSweave = getdistrOption("withSweave"), main = FALSE, inner = TRUE, sub = FALSE, col.inner = par("col.main"), cex.inner = 0.8, bmar = par("mar")[1], tmar = par("mar")[3], ..., mfColRow = TRUE, to.draw.arg = NULL, withSubst = TRUE)` where
- x** object of class "L2ParamFamily"
 - withSweave** logical: if TRUE (for working with Sweave) no extra device is opened and height/width are not set
 - main** logical: is a main title to be used? or just as argument main in `plot.default`.
 - inner** logical: do panels have their own titles? or character vector of / cast to length 'number of plotted panels' with the corresponding panel titles. For further information, see also `plot` and the description of argument main in `plot.default`.
 - sub** logical: is a sub-title to be used? or just as argument sub in `plot.default`.
 - tmar** top margin – useful for non-standard main title sizes
 - bmar** bottom margin – useful for non-standard sub title sizes
 - cex.inner** magnification to be used for inner titles relative to the current setting of cex; as in `par`; can be a vector of length 2; in this case the first component is for the distribution panels, the second for the L2-derivative-panels.
 - col.inner** character or integer code; color for the inner title
 - mfColRow** shall default partition in panels be used — defaults to TRUE
 - to.draw.arg** Either NULL (default; everything is plotted) or a vector of either integers (the indices of the subplots to be drawn) or characters — the names of the subplots to be drawn: these names are to be chosen among `c("d", "p", "q", dimnms)` where `dimnms` is either the row names of the trafo matrix `rownames(trafo(x@param))` or if the last expression is NULL a vector `"dim<dimnr>"`, `dimnr` running through the number of rows of the trafo matrix.
 - withSubst** logical; if TRUE (default) pattern substitution for titles and labels is used; otherwise no substitution is used.
 - ... additional arguments for `plot` — see `plot`, `plot.default`, `plot.stepfun`

If ... contains argument `ylim`, this may either be as in `plot.default` (i.e. a vector of length 2) or a vector of length 4, where the first two elements are the values for `ylim` in panels "d.c" and "d.d", and the last two elements are the values for `ylim` resp. `xlim` in panels "p", "p.c", "p.d" and "q", "q.c", "q.d". In all title and axis label arguments, if `withSubst` is TRUE, the following patterns are substituted:

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

In addition, argument `...` may contain arguments `panel.first`, `panel.last`, i.e., hook expressions to be evaluated at the very beginning and at the very end of each panel (within the then valid coordinates). To be able to use these hooks for each panel individually, they may also be lists of expressions (of the same length as the number of panels and run through in the same order as the panels).

The return value of the plot methods is an S3 object of class `c("plotInfo", "DiagnInfo")`, i.e., a list containing the information needed to produce the respective plot, which at a later stage could be used by different graphic engines (like, e.g. `ggplot`) to produce the plot in a different framework. A more detailed description will follow in a subsequent version.

modifyModel `signature(model = "L2ParamFamily", param = "ParamFamParameter")`: moves the L2-parametric Family model to parameter `param`

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>
Peter Ruckdeschel <peter.ruckdeschel@uni-oldenburg.de>

References

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

See Also

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

Examples

```
F1 <- new("L2ParamFamily")
plot(F1)

## selection of subpanels for plotting
F2 <- L2LocationScaleFamily()
layout(matrix(c(1,2,3,3), nrow=2, byrow=TRUE))
plot(F2, mfColRow = FALSE,
      to.draw.arg=c("p", "q", "loc"))
plot(F2, mfColRow = FALSE, inner=list("empirical cdf", "pseudo-inverse",
                                       "L2-deriv, loc.part"), to.draw.arg=c("p", "q", "loc"))
```

L2ScaleFamily

*Generating function for L2ScaleFamily-class***Description**

Generates an object of class "L2ScaleFamily".

Usage

```
L2ScaleFamily(scale = 1, loc = 0, name, centraldistribution = Norm(),
              locscalename = c("loc", "scale"), modParam, LogDeriv,
              L2derivDistr.0, FisherInfo.0, distrSymm, L2derivSymm,
              L2derivDistrSymm, trafo, .returnClsName = NULL)
```

Arguments

| | |
|---------------------|--|
| scale | positive number: scale parameter of the model |
| loc | numeric: location parameter of the model |
| name | character: name of the parametric family. |
| centraldistribution | object of class "AbscontDistribution": central distribution; we assume from the beginning, that centraldistribution is symmetric about 0 |
| locscalename | a character vector of length 1 or 2 containing the names of the scale resp. of location and scale parameter; if length is 2, locscalename is either unnamed, then order must be c(scale, loc), or named, then names must be "loc" and "scale". |
| modParam | optional function: mapping from the parameter space (represented by "param") to the distribution space (represented by "distribution"). |
| LogDeriv | function with argument x: the negative logarithmic derivative of the density of the central distribution; if missing, it is determined numerically using numeric differentiation. |
| L2derivDistr.0 | object of class "UnivariateDistribution": distribution of the L2derivative at the central distribution |
| FisherInfo.0 | object of class "PosSemDefSymmMatrix": Fisher information of the model at the "standard" parameter value |
| distrSymm | object of class "DistributionSymmetry": symmetry of distribution. |
| L2derivSymm | object of class "FunSymmList": symmetry of the maps contained in L2deriv |
| L2derivDistrSymm | object of class "DistrSymmList": symmetry of the distributions contained in L2derivDistr |
| trafo | matrix or function in param: transformation of the parameter |
| .returnClsName | the class name of the return value; by default this argument is NULL whereupon the return class will be L2ScaleFamily; but, internally, this generating function is also used to produce objects of class NormScaleFamily, ExpScaleFamily, and LnormScaleFamily. |

Details

If name is missing, the default “L2 scale family” is used. The function modParam is optional. If it is missing, it is constructed from centraldistribution using the scale structure of the model. Slot param is filled accordingly with the argument trafo passed to L2ScaleFamily. In case L2derivDistr.0 is missing, L2derivDistr is computed via imageDistr, else L2derivDistr is assigned L2derivDistr.0, coerced to “UnivariateDistributionList”. In case FisherInfo.0 is missing, Fisher information is computed from L2deriv using E. If distrSymm is missing, it is set to symmetry about loc. If L2derivSymm is missing, it is set to no symmetry, and if L2derivDistrSymm is missing, it is set to no symmetry.

Value

Object of class “L2ScaleFamily”

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>,
Peter Ruckdeschel <peter.ruckdeschel@uni-oldenburg.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

[L2ScaleFamily-class](#)

Examples

```
F1 <- L2ScaleFamily()  
plot(F1)
```

L2ScaleFamily-class *L2 differentiable parametric group family*

Description

Class of L2 differentiable parametric group families.

Objects from the Class

Objects can be created by calls of the form new(“L2ScaleFamily”, ...). More frequently they are created via the generating function L2ScaleFamily.

Slots

- name [inherited from class "ProbFamily"] object of class "character": name of the family.
- distribution [inherited from class "ProbFamily"] object of class "Distribution": member of the family.
- distrSymm [inherited from class "ProbFamily"] object of class "DistributionSymmetry": symmetry of distribution.
- param [inherited from class "ParamFamily"] object of class "ParamFamParameter": parameter of the family.
- fam.call [inherited from class "ParamFamily"] object of class "call": call by which parametric family was produced.
- makeOKPar [inherited from class "ParamFamily"] object of class "function": has argument param — the (total) parameter, returns valid parameter; used if optim resp. optimize— try to use "illegal" parameter values; then makeOKPar makes a valid parameter value out of the illegal one.
- startPar [inherited from class "ParamFamily"] object of class "function": has argument x — the data, returns starting parameter for optim resp. optimize— a starting estimator in case parameter is multivariate or a search interval in case parameter is univariate.
- modifyParam [inherited from class "ParamFamily"] object of class "function": mapping from the parameter space (represented by "param") to the distribution space (represented by "distribution").
- props [inherited from class "ProbFamily"] object of class "character": properties of the family.
- L2deriv [inherited from class "L2ParamFamily"] object of class "EuclRandVariable": L2 derivative of the family.
- L2deriv.fct [inherited from class "L2ParamFamily"] object of class "function": mapping from the parameter space (argument param of class "ParamFamParameter") to a mapping from observation x to the value of the L2derivative; L2deriv.fct is then used from observation x to value of the L2derivative; L2deriv.fct is used by modifyModel to move the L2deriv according to a change in the parameter
- L2derivSymm [inherited from class "L2ParamFamily"] object of class "FunSymmList": symmetry of the maps included in L2deriv.
- L2derivDistr [inherited from class "L2ParamFamily"] object of class "UnivarDistrList": list which includes the distribution of L2deriv.
- L2derivDistrSymm [inherited from class "L2ParamFamily"] object of class "DistrSymmList": symmetry of the distributions included in L2derivDistr.
- FisherInfo.fct [inherited from class "L2ParamFamily"] object of class "function": mapping from the parameter space (argument param of class "ParamFamParameter") to the set of positive semidefinite matrices; FisherInfo.fct is used by modifyModel to move the Fisher information according to a change in the parameter
- FisherInfo [inherited from class "L2ParamFamily"] object of class "PosDefSymmMatrix": Fisher information of the family.
- LogDeriv [inherited from class "L2GroupParamFamily"] object of class "function": has argument x; the negative logarithmic derivative of the density of the model distribution at the "standard" parameter value.
- locscalename [inherited from class "L2LocationScaleUnion"] object of class "character": names of location and scale parameter

Extends

Class "L2LocationScaleUnion", directly.
 Class "L2GroupParamFamily", by class "L2LocationScaleUnion".
 Class "L2ParamFamily", by class "L2GroupParamFamily".
 Class "ParamFamily", by class "L2ParamFamily".
 Class "ProbFamily", by class "ParamFamily".

Methods

modifyModel signature(model = "L2ScaleFamily", param = "ParamFamParameter"): moves the L2-scale family model to parameter param

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>,
 Peter Ruckdeschel <peter.ruckdeschel@uni-oldenburg.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

[L2ScaleFamily](#), [ParamFamily-class](#)

Examples

```
F1 <- new("L2ScaleFamily")
plot(F1)
```

L2ScaleUnknownLocationFamily

Generating function for L2LocationScaleFamily-class in nuisance situation

Description

Generates an object of class "L2LocationScaleFamily" in the situation where scale is main, location nuisance parameter.

Usage

```
L2ScaleUnknownLocationFamily(loc = 0, scale = 1, name, centraldistribution = Norm(),
  locscalename = c("loc", "scale"), modParam, LogDeriv,
  L2derivDistr.0, FisherInfo.0, distrSymm, L2derivSymm,
  L2derivDistrSymm, trafo, .returnClsName = NULL)
```

Arguments

| | |
|----------------------------------|---|
| <code>loc</code> | numeric: location parameter of the model. |
| <code>scale</code> | positive number: scale of the model. |
| <code>name</code> | character: name of the parametric family. |
| <code>centraldistribution</code> | object of class "AbscontDistribution": central distribution; we assume by default, that <code>centraldistribution</code> is symmetric about 0 |
| <code>modParam</code> | optional function: mapping from the parameter space (represented by "param") to the distribution space (represented by "distribution"). |
| <code>locscalename</code> | a character vector of length 2 containing the names of the location and scale parameter; either unnamed, then order must be <code>c(loc, scale)</code> , or named, then names must be "loc" and "scale" |
| <code>LogDeriv</code> | function with argument <code>x</code> : the negative logarithmic derivative of the density of the central distribution; if missing, it is determined numerically using numeric differentiation. |
| <code>L2derivDistr.0</code> | list of length 2 of objects of class "UnivariateDistribution": (marginal) distributions of the coordinates of the L2derivative at the central distribution |
| <code>FisherInfo.0</code> | object of class "PosSemDefSymmMatrix": Fisher information of the model at the "standard" parameter value |
| <code>distrSymm</code> | object of class "DistributionSymmetry": symmetry of distribution. |
| <code>L2derivSymm</code> | object of class "FunSymmList": symmetry of the maps contained in <code>L2deriv</code> |
| <code>L2derivDistrSymm</code> | object of class "DistrSymmList": symmetry of the distributions contained in <code>L2derivDistr</code> |
| <code>trafo</code> | matrix or function in <code>param</code> : transformation of the parameter |
| <code>.returnClsName</code> | the class name of the return value; by default this argument is NULL whereupon the return class will be <code>L2LocationScaleFamily</code> ; but, internally, this generating function is also used to produce objects of class <code>NormalLocationScaleFamily</code> , <code>CauchyLocationScaleFamily</code> . |

Details

If `name` is missing, the default "L2 scale family with unknown location (as nuisance)" is used. The function `modParam` is optional. If it is missing, it is constructed from `centraldistribution` using the location and scale structure of the model. Slot `param` is filled accordingly with the argument `trafo` passed to `L2ScaleUnknownLocationFamily`. In case `L2derivDistr.0` is missing, `L2derivDistr` is computed via `imageDistr`, else `L2derivDistr` is assigned `L2derivDistr.0`, coerced to "UnivariateDistributionList". In case `FisherInfo.0` is missing, Fisher information is computed from `L2deriv` using `E`. If `distrSymm` is missing, it is set to symmetry about `loc`. If `L2derivSymm` is missing, its location and scale components are set to no symmetry, respectively. If `L2derivDistrSymm` is missing, its location and scale components are set to no symmetry, respectively.

Value

Object of class "L2LocationScaleFamily"

Author(s)

Peter Ruckdeschel <peter.ruckdeschel@uni-oldenburg.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

[L2LocationScaleFamily-class](#)

Examples

```
F1 <- L2ScaleUnknownLocationFamily()
plot(F1)
```

LnormScaleFamily *Generating function for lognormal scale families*

Description

Generates an object of class "L2ScaleFamily" which represents a lognormal scale family.

Usage

```
LnormScaleFamily(meanlog = 0, sdlog = 1, trafo)
```

Arguments

| | |
|---------|---|
| meanlog | mean of the distribution on the log scale |
| sdlog | standard deviation of the distribution on the log scale |
| trafo | matrix: transformation of the parameter |

Details

The slots of the corresponding L2 differentiable parameteric family are filled.

Value

Object of class "L2ScaleFamily"

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

References

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

See Also

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

Examples

```
(L1 <- LnormScaleFamily())
plot(L1)
Map(L2deriv(L1)[[1]])
checkL2deriv(L1)
```

LogisticLocationScaleFamily

Generating function for Logistic location and scale families

Description

Generates an object of class "L2LocationScaleFamily" which represents a normal location and scale family.

Usage

```
LogisticLocationScaleFamily(location = 0, scale = 1, trafo)
LOGISTINT2
```

Arguments

| | |
|----------|--|
| location | location |
| scale | scale |
| trafo | function in param or matrix: transformation of the parameter |

Details

The slots of the corresponding L2 differentiable parameteric family are filled. LOGISTINT2 is a constant used for the scale part of the Fisher information. More precisely LOGISTINT2 equals to $\int_{-\infty}^{\infty} (\tanh(x/2) x - 1)^2 d\logis(x) dx$.

Value

Object of class "L2LocationScaleFamily"

Author(s)

Peter Ruckdeschel <Peter.Ruckdeschel@uni-oldenburg.de>

References

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

See Also

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

Examples

```
(L1 <- LogisticLocationScaleFamily())
plot(L1)
FisherInfo(L1)
### need smaller integration range:
distrExoptions("ElowerTruncQuantile"=1e-4,"EupperTruncQuantile"=1e-4)
checkL2deriv(L1)
distrExoptions("ElowerTruncQuantile"=1e-7,"EupperTruncQuantile"=1e-7)
##
set.seed(123)
x <- rlogis(100,location=1,scale=2)
CvMMEstimator(x, L1)
```

mceCalc-methods

Methods for functions mceCalc and mleCalc in Package 'distrMod'

Description

Methods for functions `mceCalc` and `mleCalc` in package **distrMod**;

Usage

```
mceCalc(x, PFam, ...)
mleCalc(x, PFam, ...)
## S4 method for signature 'numeric,ParamFamily'
mceCalc(x, PFam, criterion,
        startPar = NULL, penalty = 1e20, crit.name,
        Infos = NULL, validity.check = TRUE,
        withthetaPar = FALSE,...)
## S4 method for signature 'numeric,ParamFamily'
mleCalc(x, PFam, startPar = NULL,
        penalty = 1e20, dropZeroDensity = TRUE, Infos = NULL,
        validity.check = TRUE, ...)
## S4 method for signature 'numeric,BinomFamily'
mleCalc(x, PFam, ...)
## S4 method for signature 'numeric,PoisFamily'
mleCalc(x, PFam, ...)
## S4 method for signature 'numeric,NormLocationFamily'
mleCalc(x, PFam, ...)
```

```
## S4 method for signature 'numeric, NormScaleFamily'
mleCalc(x, PFam, ...)
## S4 method for signature 'numeric, NormLocationScaleFamily'
mleCalc(x, PFam, ...)
```

Arguments

| | |
|------------------------------|---|
| <code>x</code> | numeric; data at which to evaluate the estimator |
| <code>PFam</code> | an object of class <code>ParamFamily</code> ; the parametric family at which to evaluate the estimator |
| <code>criterion</code> | a function measuring the “goodness of fit” |
| <code>startPar</code> | in case <code>optim</code> is used: a starting value for the parameter fit; in case <code>optimize</code> is used: a vector containing a search interval for the (one-dim) parameter |
| <code>penalty</code> | numeric; penalizes non-permitted parameter values |
| <code>crit.name</code> | character; the name of the criterion; may be missing |
| <code>withthetaPar</code> | logical; shall Parameter theta be transmitted? |
| <code>Infos</code> | matrix; info slot to be filled in object of class <code>MCEstimate</code> ; may be missing |
| <code>validity.check</code> | logical: shall return parameter value be checked for validity? |
| <code>dropZeroDensity</code> | logical of length 1; shall observations with density zero be dropped? Optimizers like <code>optim</code> require finite values, so get problems when negative loglikelihood is evaluated. |
| <code>...</code> | additional argument(s) for <code>optim</code> / <code>optimize</code> |

Details

`mceCalc` is used internally by function `MCEstimator` to allow for method dispatch according to argument `PFam`; similarly, and for the same purpose `mleCalc` is used internally by function `MLEstimator`. This way we / or any other developer can write particular methods for special cases where we may avoid using numerical optimization without interfering with existing code. For programming one’s own `mleCalc` / `mceCalc` methods, there is the helper function `meRes` to produce consistent return values.

Value

a list with components

| | |
|------------------------|---|
| <code>estimate</code> | — the estimate as a named vector of numeric |
| <code>criterion</code> | — the criterion value (i.e.; a numeric of length 1); e.g. the neg. log likelihood |
| <code>est.name</code> | — the name of the estimator |
| <code>param</code> | — estimate coerced to class <code>ParamFamParameter</code> |
| <code>crit.fct</code> | — a function with the named components of theta as arguments returning the criterion value; used for profiling / coercing to class <code>mle</code> |
| <code>method</code> | — a character reporting how the estimate was obtained, i.e., by <code>optim</code> , by <code>optimize</code> or by explicit calculations |

| | |
|------------|---|
| crit.name | character; the name of the criterion; may be "" |
| Infos | matrix; info slot to be filled in object of class MCEstimate; may be NULL |
| samplesize | numeric; sample size of x |

| | |
|------------------|--------------------------|
| MCEstimate-class | <i>MCEstimate-class.</i> |
|------------------|--------------------------|

Description

Class of minimum criterion estimates.

Objects from the Class

Objects can be created by calls of the form `new("MCEstimate", ...)`. More frequently they are created via the generating functions `MCEstimator`, `MDEstimator` or `MLEstimator`. More specifically, `MDEstimator`, `CvMMEstimator`, and `MLEstimator` return objects of classes `MDEstimate`, `CvMMEstimate`, and `MLEstimate` respectively, which each are immediate subclasses of `MCEstimate` (without further slots, for internal use in method dispatch).

Slots

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

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

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

`criterion` Object of class "numeric": minimum value of the considered criterion.

`criterion.fct` Object of class "function": the considered criterion function; used for compatibility with class "mle" from package **stats4**; should be a function returning the criterion; i.e. a numeric of length 1 and should have as arguments all named components of argument `untransformed.estimate`

`method` Object of class "character": the method by which the estimate was calculated, i.e.; "optim", "optimize", or "explicit calculation"; used for compatibility with class "mle" from package **stats4**, could be any character value.

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

`optimwarn` object of class "character" warnings issued during optimization.

`optimReturn` object of class "ANY" the return value of the optimizer (or NULL if, e.g., closed form solutions are used).

`startPar` — object of class "ANY"; filled either with NULL (no starting value used) or with "numeric" — the value of the starting parameter.

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

`samplesize` object of class "numeric" — the samplesize at which the estimate was evaluated.

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

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

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

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

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

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

`startPar` object of class "ANY"; usually filled with argument `startPar` of generating function `MCEstimator`, `MLEstimator`, `MDEstimator`.

Extends

Class "Estimate", directly.

Methods

crit signature(object = "MCEstimate"): accessor function for slot `crit`.

crit<- signature(object = "MCEstimate"): replacement function for slot `crit`.

optimwarn signature(object = "MCEstimate"): accessor function for slot `optimwarn`.

optimReturn signature(object = "MCEstimate"): accessor function for slot `optimReturn`.

startPar signature(object = "MCEstimate"): accessor function for slot `startPar`.

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

show signature(object = "Estimate")

coerce signature(from = "MCEstimate", to = "mle"): create a "mle" object from a "MCEstimate" object

profile signature(fitted = "MCEstimate"): coerces `fitted` to class "mle" and then calls the corresponding `profile`-method from package **stats4**; for details we confer to the corresponding man page.

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>,
Peter Ruckdeschel <peter.ruckdeschel@uni-oldenburg.de>

See Also

[Estimate-class](#), [MCEstimator](#), [MDEstimator](#), [MLEstimator](#)

Examples

```
## (empirical) Data
x <- rgamma(50, scale = 0.5, shape = 3)

## parametric family of probability measures
G <- GammaFamily(scale = 1, shape = 2)
```

```

MCEstimator(x, G)
(m <- MCEstimator(x, G))
m.mle <- as(m, "mle")
par(mfrow=c(1,2))
profileM <- profile(m)
## plot-profile throws an error

```

MCEstimator

Function to compute minimum criterion estimates

Description

The function `MCEstimator` provides a general way to compute estimates for a given parametric family of probability measures which can be obtained by minimizing a certain criterion. For instance, the negative log-Likelihood in case of the maximum likelihood estimator or some distance between distributions like in case of minimum distance estimators.

Usage

```

MCEstimator(x, ParamFamily, criterion, crit.name,
            startPar = NULL, Infos, trafo = NULL,
            penalty = 1e20, validity.check = TRUE, asvar.fct, na.rm = TRUE,
            ..., .withEvalAsVar = TRUE, nmsffx = "",
            .with.checkEstClassForParamFamily = TRUE)

```

Arguments

| | |
|-----------------------------|---|
| <code>x</code> | (empirical) data |
| <code>ParamFamily</code> | object of class "ParamFamily" |
| <code>criterion</code> | function: criterion to minimize; see Details section. |
| <code>crit.name</code> | optional name for criterion. |
| <code>startPar</code> | initial information used by <code>optimize</code> resp. <code>optim</code> ; i.e. if (total) parameter is of length 1, <code>startPar</code> is a search interval, else it is an initial parameter value; if <code>NULL</code> slot <code>startPar</code> of <code>ParamFamily</code> is used to produce it; in the multivariate case, <code>startPar</code> may also be of class <code>Estimate</code> , in which case slot <code>untransformed.estimate</code> is used. |
| <code>Infos</code> | character: optional informations about estimator |
| <code>trafo</code> | an object of class <code>MatrixorFunction</code> – a transformation for the main parameter |
| <code>penalty</code> | (non-negative) numeric: penalizes non valid parameter-values |
| <code>validity.check</code> | logical: shall return parameter value be checked for validity? Defaults to <code>yes</code> (<code>TRUE</code>) |

`asvar.fct` optionally: a function to determine the corresponding asymptotic variance; if given, `asvar.fct` takes arguments `L2Fam`((the parametric model as object of class `L2ParamFamily`)) and `param` (the parameter value as object of class `ParamFamParameter`); arguments are called by name; `asvar.fct` may also process further arguments passed through the `...` argument
`na.rm` logical: if TRUE, the estimator is evaluated at `complete.cases(x)`.
`...` further arguments to `criterion` or `optimize` or `optim`, respectively.
`.withEvalAsVar` logical: shall slot `asVar` be evaluated (if `asvar.fct` is given) or just the call be returned?
`nmsffx` character: a potential suffix to be appended to the estimator name.
`.with.checkEstClassForParamFamily`
 logical: Should a the end of the function `.checkEstClassForParamFamily`; defaults to TRUE; can be switched off for computational time or because this is already checked in a calling wrapper function.

Details

The argument `criterion` has to be a function with arguments the empirical data as well as an object of class "Distribution" and possibly `...`. Uses `mceCalc` for method dispatch.

Value

An object of S4-class "MCEstimate" which inherits from class "Estimate".

Note

The criterion function may be called together with a parameter `thetaPar` which is the current parameter value under consideration, i.e.; the value under which the model distribution is considered. Hence, if desired, particular criterion functions could make use of this information, by, say computing the criterion differently for different parameter values.

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>,
 Peter Ruckdeschel <peter.ruckdeschel@uni-oldenburg.de>

See Also

[ParamFamily-class](#), [ParamFamily](#), [MCEstimate-class](#)

Examples

```
## (empirical) Data
x <- rgamma(50, scale = 0.5, shape = 3)

## parametric family of probability measures
G <- GammaFamily(scale = 1, shape = 2)

## Maximum Likelihood estimator
```

```

## Note: you can directly use function MLEstimator!
negLoglikelihood <- function(x, Distribution){
  res <- -sum(log(Distribution@d(x)))
  names(res) <- "Negative Log-Likelihood"
  return(res)
}
MCEstimator(x = x, ParamFamily = G, criterion = negLoglikelihood)

## Kolmogorov(-Smirnov) minimum distance estimator
## Note: you can also use function MDEstimator!
MCEstimator(x = x, ParamFamily = G, criterion = KolmogorovDist,
  crit.name = "Kolmogorov distance")

## Total variation minimum distance estimator
## Note: you can also use function MDEstimator!
## discretize Gamma distribution

## IGNORE_RDIFF_BEGIN
MCEstimator(x = x, ParamFamily = G, criterion = TotalVarDist,
  crit.name = "Total variation distance")
## IGNORE_RDIFF_END

## or smooth empirical distribution (takes some time!)
#MCEstimator(x = x, ParamFamily = G, criterion = TotalVarDist,
#  asis.smooth.discretize = "smooth", crit.name = "Total variation distance")

## Hellinger minimum distance estimator
## Note: you can also use function MDEstimator!
## discretize Gamma distribution
distrOptions(DistrResolution = 1e-8)
MCEstimator(x = x, ParamFamily = G, criterion = HellingerDist,
  crit.name = "Hellinger Distance", startPar = c(1,2))
distrOptions(DistrResolution = 1e-6)

## or smooth empirical distribution (takes some time!)
#MCEstimator(x = x, ParamFamily = G, criterion = HellingerDist,
#  asis.smooth.discretize = "smooth", crit.name = "Hellinger distance")

```

MDEstimator

Function to compute minimum distance estimates

Description

The function MDEstimator provides a general way to compute minimum distance estimates.

Usage

```

MDEstimator(x, ParamFamily, distance = KolmogorovDist, dist.name,
  paramDepDist = FALSE, startPar = NULL, Infos, trafo = NULL,
  penalty = 1e20, validity.check = TRUE, asvar.fct, na.rm = TRUE,

```

```

..., .withEvalAsVar = TRUE, nmsffx = "",
.with.checkEstClassForParamFamily = TRUE)
CvMMEstimator(x, ParamFamily, muDatOrMod = c("Mod", "Dat", "Other"),
mu = NULL, paramDepDist = FALSE, startPar = NULL, Infos,
trafo = NULL, penalty = 1e20, validity.check = TRUE,
asvar.fct = .CvMMDCovariance, na.rm = TRUE, ...,
.withEvalAsVar = TRUE, nmsffx = "",
.with.checkEstClassForParamFamily = TRUE)
KolmogorovMDEstimator(x, ParamFamily, paramDepDist = FALSE, startPar = NULL, Infos,
trafo = NULL, penalty = 1e20, validity.check = TRUE, asvar.fct,
na.rm = TRUE, ..., .withEvalAsVar = TRUE, nmsffx = "",
.with.checkEstClassForParamFamily = TRUE)
TotalVarMDEstimator(x, ParamFamily, paramDepDist = FALSE, startPar = NULL, Infos,
trafo = NULL, penalty = 1e20, validity.check = TRUE, asvar.fct,
na.rm = TRUE, ..., .withEvalAsVar = TRUE, nmsffx = "",
.with.checkEstClassForParamFamily = TRUE)
HellingerMDEstimator(x, ParamFamily, paramDepDist = FALSE, startPar = NULL, Infos,
trafo = NULL, penalty = 1e20, validity.check = TRUE, asvar.fct,
na.rm = TRUE, ..., .withEvalAsVar = TRUE, nmsffx = "",
.with.checkEstClassForParamFamily = TRUE)
CvMDist2(e1, e2, ... )

```

Arguments

| | |
|--------------|--|
| x | (empirical) data |
| ParamFamily | object of class "ParamFamily" |
| distance | (generic) function: to compute distance between (empirical) data and objects of class "Distribution". |
| dist.name | optional name of distance |
| muDatOrMod | a character string specifying whether as integration measure <i>mu</i> in Cramer-von-Mises distance, the empirical cdf (corresponding to argument value "Dat") or the current model distribution (corresponding to argument value "Mod") or a given integration (probability) measure / distribution <i>mu</i> (corresponding to argument value "Other") is to be used; must be one of "Dat" (default) or "Mod" or "Other". You can specify just the initial letter; the default is "Mod". |
| mu | optional integration (probability) measure for CvM MDE. defaults to NULL and is ignored in options muDatOrMod in "Dat" and "Mod"; in case "Other", it must be of class UnivariateDistribution. |
| paramDepDist | logical; will computation of distance be parameter dependent (see also note below)? if TRUE, distance function must be able to digest a parameter thetaPar; otherwise this parameter will be eliminated if present in ...-argument. |
| 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. |

| | |
|-----------------------------------|--|
| Infos | character: optional informations about estimator |
| trafo | an object of class <code>MatrixorFunction</code> – a transformation for the main parameter |
| penalty | (non-negative) numeric: penalizes non valid parameter-values |
| validity.check | logical: shall return parameter value be checked for validity? Defaults to yes (TRUE) |
| asvar.fct | optionally: a function to determine the corresponding asymptotic variance; if given, <code>asvar.fct</code> takes arguments <code>L2Fam</code> ((the parametric model as object of class <code>L2ParamFamily</code>)) and <code>param</code> (the parameter value as object of class <code>ParamFamParameter</code>); arguments are called by name; <code>asvar.fct</code> may also process further arguments passed through the <code>...</code> argument |
| na.rm | logical: if TRUE, the estimator is evaluated at <code>complete.cases(x)</code> . |
| ... | for the estimators: further arguments to <code>criterion</code> or <code>optimize</code> or <code>optim</code> , respectively; for <code>CvMDist2</code> , these can be used e.g. by <code>E()</code> . |
| .withEvalAsVar | logical: shall slot <code>asVar</code> be evaluated (if <code>asvar.fct</code> is given) or just the call be returned? |
| nmsffx | character: a potential suffix to be appended to the estimator name. |
| e1 | object of class "Distribution" or class "numeric" |
| e2 | object of class "Distribution" |
| .with.checkEstClassForParamFamily | logical: Should a the end of the function <code>.checkEstClassForParamFamily</code> ; defaults to TRUE; can be switched off for computational time or because this is already checked in a calling wrapper function. |

Details

The argument `distance` has to be a (generic) function with arguments the empirical data as well as an object of class "Distribution" and possibly `...`; e.g. `KolmogorovDist` (default), `TotalVarDist` or `HellingerDist`. Uses `mceCalc` for method dispatch.

The functions `CvMMEstimator`, `KolmogorovMDEstimator`, `TotalVarMDEstimator`, and `HellingerMDEstimator` are aliases where the distance is fixed. More specifically, `CvMMEstimator` uses Cramer-von-Mises distance, see `CvMDist` with integration measure `mu` either equal to the empirical cdf or to the current best fitting model distribution; the alternative is selected by argument `muDatOrMod`. As it is asymptotically linear, asymptotic variances are available. In case of alternative "Dat", this variance is computed by means of helper function `.CvMMDCovarianceWithMux`, case of alternative "Mod" we use helper function `.CvMMDCovariance`. In both case one may use these helper function to get hand on the respective influence function. For covariances computed by `.CvMMDCovariance`, diagnostics on the involved integrations are available if argument `diagnostic` is TRUE. Then there is attribute `diagnostic` attached to the return value, which may be inspected and accessed through `showDiagnostic` and `getDiagnostic`.

`KolmogorovMDEstimator` uses Kolmogorov distance, see `KolmogorovDist`, `TotalVarMDEstimator`, uses total variation distance, see `TotalVarDist` and `HellingerMDEstimator` uses Hellinger distance, see `HellingerDist`.

Function `CvMDist2` calls `CvMDist` and computes the Cramer-von-Mises distance between distributions `e1` and `e2` with integration measure `mu` equal to `e2`; it is used in alternative "Mod" in `CvMMEstimator`.

Value

The estimators return an object of S4-class "MCEstimate" which inherits from class "Estimate". CvMDist2 returns the respective distance.

Theoretical Background

It should be noted that CvMMEstimator results in an asymptotically linear (hence asymptotically normal) estimator with an influence function which is always bounded; HellingerMDEstimator adapts, for growing sample size, the MLE estimator, hence is asymptotically efficient, while for finite sample size is bias robust. KolmogorovMDEstimator is square-root-n consistent but, due to the faceted level sets of the distance fails to be asymptotically normal. In the terminology of Donoho/Liu, TotalVarMDEstimator and HellingerMDEstimator rely on strong distances, while CvMMEstimator and KolmogorovMDEstimator use weak distances, so the latter ensure protection against larger classes of contamination (simply because the distribution balls based on the respective distances contain more elements).

Note

The distance function may be called together with a parameter thetaPar which is the current parameter value under consideration, i.e.; the value under which the model distribution is considered. Hence, if desired, particular distance functions could make use of this information, by, say computing the distance differently for different parameter values.

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>
Peter Ruckdeschel <peter.ruckdeschel@uni-oldenburg.de>

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See Also

[ParamFamily-class](#), [ParamFamily](#), [MCEstimator](#), [MCEstimate-class](#), [fitdistr](#)

Examples

```

## (empirical) Data
set.seed(123)
x <- rgamma(50, scale = 0.5, shape = 3)

## parametric family of probability measures
G <- GammaFamily(scale = 1, shape = 2)

## Kolmogorov(-Smirnov) minimum distance estimator
MDEstimator(x = x, ParamFamily = G, distance = KolmogorovDist)
## or
KolmogorovMDEstimator(x = x, ParamFamily = G)

## von Mises minimum distance estimator with default mu = Mod
MDEstimator(x = x, ParamFamily = G, distance = CvMDist)

## von Mises minimum distance estimator with default mu = Mod
MDEstimator(x = x, ParamFamily = G, distance = CvMDist,
             asvar.fct = .CvMMDCovarianceWithMux)
## or
CvMMDEstimator(x = x, ParamFamily = G)
## or
CvMMDEstimator(x = x, ParamFamily = G, muDatOrMod="Mod")

## or with data based integration measure:
CvMMDEstimator(x = x, ParamFamily = G, muDatOrMod="Dat")

## von Mises minimum distance estimator with mu = N(0,1)
MDEstimator(x = x, ParamFamily = G, distance = CvMDist, mu = Norm())
## or, with asy Var
MDEstimator(x = x, ParamFamily = G, distance = CvMDist, mu = Norm(),
             asvar.fct = function(L2Fam, param, ...){
               .CvMMDCovariance(L2Fam=L2Fam, param=param, mu=Norm(), N = 400)
             } )
## synonymous to
CvMMDEstimator(x = x, ParamFamily = G, muDatOrMod="Other", mu = Norm())

## Total variation minimum distance estimator
## gamma distributions are discretized
MDEstimator(x = x, ParamFamily = G, distance = TotalVarDist)
## or
TotalVarMDEstimator(x = x, ParamFamily = G)
## or smoothing of empirical distribution (takes some time!)
#MDEstimator(x = x, ParamFamily = G, distance = TotalVarDist, asis.smooth.discretize = "smooth")

## Hellinger minimum distance estimator
## gamma distributions are discretized
distributions(DistrResolution = 1e-10)
MDEstimator(x = x, ParamFamily = G, distance = HellingerDist, startPar = c(1,2))
## or
HellingerMDEstimator(x = x, ParamFamily = G, startPar = c(1,2))

```

```

distributions(DistrResolution = 1e-6) # default
## or smoothing of empirical distribution (takes some time!)
MDEstimator(x = x, ParamFamily = G, distance = HellingerDist, asis.smooth.discretize = "smooth")

```

meRes

helper functions for mceCalc and mleCalc

Description

helper functions to produce consistent lists to be digested in functions `mceCalc` and `mleCalc`

Usage

```

meRes(x, estimate, criterion.value, param, crit.fct, method = "explicit solution",
      crit.name = "Maximum Likelihood", Infos, warns = "", startPar = NULL,
      optReturn = NULL)
get.criterion.fct(theta, Data, ParamFam, criterion.ff, fun, ...)
## S4 method for signature 'numeric'
samplesize(object)

```

Arguments

| | |
|------------------------------|---|
| <code>x</code> | numeric; the data at which to evaluate the estimate |
| <code>estimate</code> | numeric; the estimate |
| <code>criterion.value</code> | numeric; the value of the criterion |
| <code>param</code> | object of class <code>ParamFamParameter</code> ; the parameter value |
| <code>crit.fct</code> | a function to fill slot <code>minuslogl</code> when an object of class <code>MCEstimate</code> is coerced to class <code>mle</code> (from package stats4); to this end function <code>get.criterion.fct</code> (also see details below) is helpful (at least if the dimension of the estimator is larger than 1). |
| <code>method</code> | character; describes how the estimate was obtained |
| <code>crit.name</code> | character; name of the criterion |
| <code>Infos</code> | optional matrix of characters in two columns; information to be attached to the estimate |
| <code>warns</code> | collected warnings in optimization |
| <code>samplesize</code> | numeric; the sample size at which the estimator was evaluated |
| <code>theta</code> | the parameter value as named numeric vector |
| <code>Data</code> | numeric; the data at which to evaluate the MCE |
| <code>ParamFam</code> | an object of class <code>ParamFamily</code> ; the parametric family at which to evaluate the MCE |
| <code>criterion.ff</code> | the criterion function used in the MCE |

| | |
|-----------|---|
| fun | wrapper to the criterion function used in the MCE (with certain checking whether parameter value is permitted and possibly penalizing if not; see code to , for example.) |
| startPar | value of argument StartPar — starting parameter used. |
| optReturn | object of class "ANY" the return value of the optimizer (or NULL if, e.g., closed form solutions are used). |
| ... | further arguments to be passed to optim / optimize |
| object | numeric; the data at which to evaluate the estimate |

Details

get.criterion.fct produces a function criterion.fct to fill slot minuslogl when an object of class MCEstimate is coerced to class mle (from package **stats4**); this way we may use profiling methods introduced there also for objects of our classes. More specifically, we produce a function where all coordinates/components of theta appear as separate named arguments, which then calls fun with these separate arguments again stacked to one (named) vector argument;

samplesize determines the samplesize of argument object,i.e.; if object has an attribute dim, it returns dim(object)[2], else length(object).

Value

| | |
|-------------------|--|
| meRes | a list of prescribed structure to be digested in functions <code>mceCalc</code> and <code>mleCalc</code> by the internal helper function <code>.process.meCalcRes</code> . |
| get.criterion.fct | a function; see details below; |
| samplesize | numeric |

Author(s)

Peter Ruckdeschel <peter.ruckdeschel@uni-oldenburg.de>

MLEstimator

Function to compute maximum likelihood estimates

Description

The function MLEstimator provides a general way to compute maximum likelihood estimates for a given parametric family of probability measures. This is done by calling the function MCEstimator which minimizes the negative log-Likelihood.

Usage

```
MLEstimator(x, ParamFamily, startPar = NULL,
            Infos, trafo = NULL, penalty = 1e20,
            validity.check = TRUE, na.rm = TRUE, ...,
            .withEvalAsVar = TRUE, dropZeroDensity = TRUE, nmsffx = "",
            .with.checkEstClassForParamFamily = TRUE)
```

Arguments

| | |
|--|--|
| <code>x</code> | (empirical) data |
| <code>ParamFamily</code> | object of class "ParamFamily" |
| <code>startPar</code> | initial information used by <code>optimize</code> resp. <code>optim</code> ; i.e; if (total) parameter is of length 1, <code>startPar</code> is a search interval, else it is an initial parameter value; if NULL slot <code>startPar</code> of <code>ParamFamily</code> is used to produce it; in the multivariate case, <code>startPar</code> may also be of class <code>Estimate</code> , in which case slot <code>untransformed.estimate</code> is used. |
| <code>Infos</code> | character: optional informations about estimator |
| <code>trafo</code> | an object of class <code>MatrixorFunction</code> – a transformation for the main parameter |
| <code>penalty</code> | (non-negative) numeric: penalizes non valid parameter-values |
| <code>validity.check</code> | logical: shall return parameter value be checked for validity? Defaults to yes (TRUE) |
| <code>na.rm</code> | logical: if TRUE, the estimator is evaluated at <code>complete.cases(x)</code> . |
| <code>...</code> | further arguments to <code>criterion</code> or <code>optimize</code> or <code>optim</code> , respectively. |
| <code>.withEvalAsVar</code> | logical: shall slot <code>asVar</code> be evaluated (if <code>asvar.fct</code> is given) or just the call be returned? |
| <code>dropZeroDensity</code> | logical of length 1; shall observations with density zero be dropped? Optimizers like <code>optim</code> require finite values, so get problems when negative loglikelihood is evaluated. |
| <code>nmsffx</code> | character: a potential suffix to be appended to the estimator name. |
| <code>.with.checkEstClassForParamFamily</code> | logical: Should a the end of the function <code>.checkEstClassForParamFamily</code> ; defaults to TRUE; can be switched off for computational time or because this is already checked in a calling wrapper function. |

Details

The function uses [mleCalc](#) for method dispatch; this method by default calls [mceCalc](#) using the negative log-likelihood as criterion which should be minimized.

Value

An object of S4-class "MCEstimate" which inherits from class "Estimate".

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>,
Peter Ruckdeschel <peter.ruckdeschel@uni-oldenburg.de>

See Also

[ParamFamily-class](#), [ParamFamily](#), [MCEstimator](#), [MCEstimate-class](#), [fitdistr](#), [mle](#)

Examples

```
#####
## 1. Binomial data
#####
## (empirical) data
# seed for reproducibility:
set.seed(20200306)
x <- rbinom(100, size=25, prob=.25)

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

#####
## 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
MLEstimator(x, PoisFamily())

#####
## 3. Normal (Gaussian) location and scale
#####
## (empirical) data
# seed for reproducibility:
set.seed(20200306)
x <- rnorm(100)

## ML-estimate
MLEstimator(x, NormLocationScaleFamily())
## compare:
c(mean(x),sd(x))

#####
## 4. Gamma model
#####
## (empirical) data
# seed for reproducibility:
set.seed(20200306)
x <- rgamma(50, scale = 0.5, shape = 3)

## parametric family of probability measures
G <- GammaFamily(scale = 1, shape = 2)

## Maximum likelihood estimator
(res <- MLEstimator(x = x, ParamFamily = G))
```

```

## Asymptotic (CLT-based) confidence interval
confint(res)

## some profiling
par(mfrow=c(1,2))
plot(profile(res))
par(mfrow=c(1,1))

## implementation of ML-estimator of package MASS
require(MASS)
(res1 <- fitdistr(x, "gamma"))

## comparison
## shape
estimate(res)[2]
## rate
1/estimate(res)[1]

## minor differences due to the fact that by default, fitdistr uses
## BFGS, while we use Nelder-Mead instead

## log-likelihood
res1$loglik
## negative log-likelihood
criterion(res)

## explicitly transforming to
## MASS parametrization:
mtrafo <- function(x){
  nms0 <- names(c(main(param(G)),nuisance(param(G))))
  nms <- c("shape","rate")
  fval0 <- c(x[2], 1/x[1])
  names(fval0) <- nms
  mat0 <- matrix( c(0, -1/x[1]^2, 1, 0), nrow = 2, ncol = 2,
                 dimnames = list(nms,nms0))
  list(fval = fval0, mat = mat0)}

G2 <- G
trafo(G2) <- mtrafo
res2 <- MLEstimator(x = x, ParamFamily = G2)

old <- getdistrModOption("show.details")
distrModoptions("show.details" = "minimal")
res1
res2

## some profiling
par(mfrow=c(1,2))
plot(profile(res2))
par(mfrow=c(1,1))

```

```
#####
## 5. Cauchy Location Scale model
#####
(C <- CauchyLocationScaleFamily())
loc.true <- 1
scl.true <- 2

## (empirical) data
# seed for reproducibility:
set.seed(20200306)
x <- rcauchy(50, location = loc.true, scale = scl.true)

## Maximum likelihood estimator
(res <- MLEstimator(x = x, ParamFamily = C))
## Asymptotic (CLT-based) confidence interval
confint(res)
```

modifyModel-methods *Methods for function modifyModel in Package 'distrMod'*

Description

Methods for function `modifyModel` in package **distrMod**; `modifyModel` moves a model from one parameter value to another.

Usage

```
modifyModel(model, param, ...)
## S4 method for signature 'ParamFamily,ParamFamParameter'
modifyModel(model,param,
             .withCall = TRUE, ...)
## S4 method for signature 'L2ParamFamily,ParamFamParameter'
modifyModel(model,param,
             .withCall = TRUE, .withL2derivDistr = TRUE, ...)
## S4 method for signature 'L2LocationFamily,ParamFamParameter'
modifyModel(model,param, ...)
## S4 method for signature 'L2ScaleFamily,ParamFamParameter'
modifyModel(model,param, ...)
## S4 method for signature 'L2LocationScaleFamily,ParamFamParameter'
modifyModel(model,
             param, ...)
## S4 method for signature 'GammaFamily,ParamFamParameter'
modifyModel(model,param, ...)
## S4 method for signature 'ExpScaleFamily,ParamFamParameter'
modifyModel(model,param, ...)
```

Arguments

| | |
|-------------------|---|
| model | an object of class ParamFamily — the model to move. |
| param | an object of class ParamFamParameter — the parameter to move to. |
| .withCall | logical: shall slot fam.call be updated? |
| .withL2derivDistr | logical: shall slot L2derivDistr be updated or just the call to do the updated be stored? |
| ... | additional argument(s) for methods; not used so far |

Details

modifyModel is merely used internally for moving the model along modified parameter values during a model fit.

It generally simply copies the original model and only modifies the affected slots, i.e. distribution, the distribution of the observations, param, the parameter, L2deriv, the L2-derivative at the parameter, L2FisherInfo, the Fisher information at the parameter, the symmetry slots distrSymm, L2derivSymm, and L2derivDistrSymm, and, finally, L2derivDistr the (marginal) distribution(s) of the L2derivative. By default, also slot fam.call is updated.

In case model is of class L2LocationFamily, L2ScaleFamily, or L2LocationScaleFamily, symmetry slots are updated to be centered about the median of the (central) distribution (assuming the latter is symmetric about the median); as an intermediate step, these methods call the general modifyModel-method for signature L2ParamFamily; in this call, however, slot fam.call is not updated (this is the reason for argument .withCall); this is then done in the individual parts of the corresponding method.

Value

a corresponding instance of the model in argument model with moved parameters.

NbinomFamily

Generating function for Nbinomial families

Description

Generates an object of class "L2ParamFamily" which represents a Nbinomial family where the probability of success is the parameter of interest.

Usage

```
NbinomFamily(size = 1, prob = 0.5, trafo)
NbinomwithSizeFamily(size = 1, prob = 0.5, trafo, withL2derivDistr = TRUE)
NbinomMeanSizeFamily(size = 1, mean = 0.5, trafo, withL2derivDistr = TRUE )
```


Arguments

| | |
|------------------|---|
| size | number of trials |
| prob | probability of success |
| mean | alternative parameter for negative binomial parameter |
| trafo | function in param or matrix: transformation of the parameter |
| withL2derivDistr | logical: shall the distribution of the L2 derivative be computed? Defaults to TRUE; setting it to FALSE speeds up computations. |

Details

The slots of the corresponding L2 differentiable parameteric family are filled. NbinomFamily assumes size to be known; while for NbinomwithSizeFamily it is a second (unknown) parameter; for NbinomMeanSizeFamily is like NbinomwithSizeFamily but uses the size, mean parametrization instead of the size, prob one.

Value

Object of class "L2ParamFamily"

Author(s)

Peter Ruckdeschel <peter.ruckdeschel@uni-oldenburg.de>

References

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

Kohl, M. and Ruckdeschel, P. (2010). R Package distrMod: S4 Classes and Methods for Probability Models. To appear in Journal of Statistical Software.

See Also

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

Examples

```
(N1 <- NbinomFamily(size = 25, prob = 0.25))
plot(N1)
FisherInfo(N1)
checkL2deriv(N1)
(N1.w <- NbinomwithSizeFamily(size = 25, prob = 0.25))
plot(N1.w)
FisherInfo(N1.w)
checkL2deriv(N1.w)
(N2.w <- NbinomMeanSizeFamily(size = 25, mean = 75))
plot(N2.w)
FisherInfo(N2.w)
checkL2deriv(N2.w)
```

`negativeBias`*Generating function for onesidedBias-class*

Description

Generates an object of class "onesidedBias".

Usage

```
negativeBias(name = "negative Bias")
```

Arguments

name name of the bias type

Value

Object of class "onesidedBias"

Author(s)

Peter Ruckdeschel <peter.ruckdeschel@uni-oldenburg.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

[onesidedBias-class](#)

Examples

```
negativeBias()  
  
## The function is currently defined as  
function(){ new("onesidedBias", name = "negative Bias", sign = -1) }
```

| | |
|--------------|---|
| NonSymmetric | <i>Generating function for NonSymmetric-class</i> |
|--------------|---|

Description

Generates an object of class "NonSymmetric".

Usage

```
NonSymmetric()
```

Value

Object of class "NonSymmetric"

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

See Also

[NonSymmetric-class](#), [FunctionSymmetry-class](#)

Examples

```
NonSymmetric()

## The function is currently defined as
function(){ new("NonSymmetric") }
```

| | |
|--------------------|--|
| NonSymmetric-class | <i>Class for Non-symmetric Functions</i> |
|--------------------|--|

Description

Class for non-symmetric functions.

Objects from the Class

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

Slots

type Object of class "character": contains "non-symmetric function"
SymmCenter Object of class "NULL"

Extends

Class "FunctionSymmetry", directly.
Class "Symmetry", by class "FunctionSymmetry".

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

See Also

[NonSymmetric](#)

Examples

```
new("NonSymmetric")
```

norm

Norm functions

Description

Functions to determine certain norms.

Usage

```
EuclideanNorm(x)  
QuadFormNorm(x,A)
```

Arguments

| | |
|---|---|
| x | vector or matrix; norm is determined columnwise |
| A | pos. semidefinite Matrix |

Value

the columnwise evaluated norms

Author(s)

Peter Ruckdeschel <peter.ruckdeschel@uni-oldenburg.de>

See Also

[onesidedBias-class](#)

Examples

```
mm <- matrix(rnorm(20),2,10)  
EuclideanNorm(mm)  
QuadFormNorm(mm, A = PosSemDefSymmMatrix(matrix(c(3,1,1,1),2,2)))
```

NormLocationFamily *Generating function for normal location families*

Description

Generates an object of class "L2LocationFamily" which represents a normal location family.

Usage

```
NormLocationFamily(mean = 0, sd = 1, trafo)
```

Arguments

| | |
|-------|--|
| mean | mean |
| sd | standard deviation |
| trafo | function in param or matrix: transformation of the parameter |

Details

The slots of the corresponding L2 differentiable parameteric family are filled.

Value

Object of class "L2LocationFamily"

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

References

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

See Also

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

Examples

```
(N1 <- NormLocationFamily())  
plot(N1)  
L2derivDistr(N1)
```

`NormLocationScaleFamily`*Generating function for normal location and scale families*

Description

Generates an object of class "L2LocationScaleFamily" which represents a normal location and scale family.

Usage

```
NormLocationScaleFamily(mean = 0, sd = 1, trafo)
```

Arguments

| | |
|-------|--|
| mean | mean |
| sd | standard deviation |
| trafo | function in param or matrix: transformation of the parameter |

Details

The slots of the corresponding L2 differentiable parameteric family are filled.

Value

Object of class "L2LocationScaleFamily"

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

References

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

See Also

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

Examples

```
(N1 <- NormLocationScaleFamily())  
plot(N1)  
FisherInfo(N1)  
checkL2deriv(N1)
```

NormLocationUnknownScaleFamily

Generating function for normal location families with unknown scale as nuisance

Description

Generates an object of class "L2LocationScaleFamily" which represents a normal location family with unknown scale as nuisance.

Usage

```
NormLocationUnknownScaleFamily(mean = 0, sd = 1, trafo)
```

Arguments

| | |
|-------|--|
| mean | mean |
| sd | standard deviation |
| trafo | function in param or matrix: transformation of the parameter |

Details

The slots of the corresponding L2 differentiable parameteric family are filled.

Value

Object of class "L2LocationScaleFamily"

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

References

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

See Also

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

Examples

```
(N1 <- NormLocationUnknownScaleFamily())  
plot(N1)  
FisherInfo(N1)  
checkL2deriv(N1)
```

| | |
|-----------------|--|
| NormScaleFamily | <i>Generating function for normal scale families</i> |
|-----------------|--|

Description

Generates an object of class "L2ScaleFamily" which represents a normal scale family.

Usage

```
NormScaleFamily(sd = 1, mean = 0, trafo)
```

Arguments

| | |
|-------|--|
| sd | standard deviation |
| mean | mean |
| trafo | function in param or matrix: transformation of the parameter |

Details

The slots of the corresponding L2 differentiable parameteric family are filled.

Value

Object of class "L2ScaleFamily"

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

References

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

See Also

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

Examples

```
(N1 <- NormScaleFamily())  
plot(N1)  
FisherInfo(N1)  
checkL2deriv(N1)
```

NormScaleUnknownLocationFamily

Generating function for normal scale families with unknown location as nuisance

Description

Generates an object of class "L2LocationScaleFamily" which represents a normal scale family with unknown location as nuisance.

Usage

```
NormScaleUnknownLocationFamily(sd = 1, mean = 0, trafo)
```

Arguments

| | |
|-------|--|
| mean | mean |
| sd | standard deviation |
| trafo | function in param or matrix: transformation of the parameter |

Details

The slots of the corresponding L2 differentiable parameteric family are filled.

Value

Object of class "L2LocationScaleFamily"

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

References

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

See Also

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

Examples

```
(N1 <- NormScaleUnknownLocationFamily())  
plot(N1)  
FisherInfo(N1)  
checkL2deriv(N1)
```

NormType

Generating function for NormType-class

Description

Generates an object of class "NormType".

Usage

```
NormType(name = "EuclideanNorm", fct = EuclideanNorm)
```

Arguments

| | |
|------|------------------------|
| name | slot name of the class |
| fct | slot fct of the class |

Value

Object of class "NormType"

Author(s)

Peter Ruckdeschel <peter.ruckdeschel@uni-oldenburg.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

[NormType-class](#)

Examples

```
## IGNORE_RDIFF_BEGIN
NormType()
## IGNORE_RDIFF_END
```

| | |
|----------------|------------------|
| NormType-class | <i>Norm Type</i> |
|----------------|------------------|

Description

Class of norm types.

Objects from the Class

Could be generated by `new("NormType")`; more frequently one will use the generating function [NormType](#)

Slots

`name` Object of class "character".

`fct` Object of class "function" — the norm to be evaluated.

Methods

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

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

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

fct<- signature(object = "NormType", value = "function"): replacement function for slot fct.

Author(s)

Peter Ruckdeschel <peter.ruckdeschel@uni-oldenburg.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

[BiasType-class](#)

Examples

```
## IGNORE_RDIFF_BEGIN
EuclNorm <- NormType("EuclideanNorm", EuclideanNorm)
fct(EuclNorm)
name(EuclNorm)
## IGNORE_RDIFF_END
```

OddSymmetric

Generating function for OddSymmetric-class

Description

Generates an object of class "OddSymmetric".

Usage

```
OddSymmetric(SymmCenter = 0)
```

Arguments

SymmCenter numeric: center of symmetry

Value

Object of class "OddSymmetric"

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

See Also

[OddSymmetric-class](#), [FunctionSymmetry-class](#)

Examples

```
OddSymmetric()

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

OddSymmetric-class*Class for Odd Functions*

Description

Class for odd functions.

Objects from the Class

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

Slots

type Object of class "character": contains "odd function"
 SymmCenter Object of class "numeric": center of symmetry

Extends

Class "FunctionSymmetry", directly.
 Class "Symmetry", by class "FunctionSymmetry".

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

See Also

[OddSymmetric](#), [FunctionSymmetry-class](#)

Examples

```
new("OddSymmetric")
```

onesidedBias-class *onesided Bias Type*

Description

Class of onesided bias types.

Objects from the Class

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

Slots

name Object of class "character".
 sign Object of class "numeric"; to be in $\{-1,1\}$ — whether bias is to be positive or negative

Methods

sign signature(object = "onesidedBias"): accessor function for slot sign.
sign<- signature(object = "onesidedBias", value = "numeric"): replacement function for slot sign.

Extends

Class "BiasType", directly.

Author(s)

Peter Ruckdeschel <peter.ruckdeschel@uni-oldenburg.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

[BiasType-class](#)

Examples

```
positiveBias()
## The function is currently defined as
function(){ new("onesidedBias", name = "positive Bias", sign = 1) }

negativeBias()
## The function is currently defined as
function(){ new("onesidedBias", name = "negative Bias", sign = -1) }

pB <- positiveBias()
sign(pB)
try(sign(pB) <- -2) ## error
sign(pB) <- -1
```

ParamFamily

Generating function for ParamFamily-class

Description

Generates an object of class "ParamFamily".

Usage

```
ParamFamily(name, distribution = Norm(), distrSymm, modifyParam,
            main = main(param), nuisance = nuisance(param),
            fixed = fixed(param), trafo = trafo(param),
            param = ParamFamParameter(name = paste("Parameter of",
                                                    name), main = main, nuisance = nuisance,
                                       fixed = fixed, trafo = trafo),
            props = character(0),
            startPar = NULL, makeOKPar = NULL)
```

Arguments

| | |
|--------------|--|
| name | character string: name of family |
| distribution | object of class "Distribution": member of the family |
| distrSymm | object of class "DistributionSymmetry": symmetry of distribution. |
| startPar | startPar is a function in the observations \times returning initial information for MCEstimator used by optimize resp. optim; i.e; if (total) parameter is of length 1, startPar returns a search interval, else it returns an initial parameter value. |
| makeOKPar | makeOKPar is a function in the (total) parameter param; used if optim resp. optimize— try to use "illegal" parameter values; then makeOKPar makes a valid parameter value out of the illegal one; if NULL slot makeOKPar of ParamFamily is used to produce it. |
| main | numeric vector: main parameter |
| nuisance | numeric vector: nuisance parameter |
| fixed | numeric vector: fixed part of the parameter |
| trafo | function in param or matrix: transformation of the parameter |
| param | object of class "ParamFamParameter": parameter of the family |
| modifyParam | function: mapping from the parameter space (represented by "param") to the distribution space (represented by "distribution"). |
| props | character vector: properties of the family |

Details

If name is missing, the default "'parametric family of probability measures'" is used. In case distrSymm is missing it is set to NoSymmetry(). If param is missing, the parameter is created via main, nuisance and trafo as described in [ParamFamParameter](#). One has to specify a function which represents a mapping from the parameter space to the corresponding distribution space; e.g., in case of normal location a simple version of such a function would be `function(theta){ Norm(mean = theta) }`.

Value

Object of class "ParamFamily"

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>,
Peter Ruckdeschel <peter.ruckdeschel@uni-oldenburg.de>

See Also

[ParamFamily-class](#)

Examples

```

## "default" (normal location)
F1 <- ParamFamily(modifyParam = function(theta){ Norm(mean = theta) })
plot(F1)

#####
## Some examples:
#####
## 1. Normal location family
theta <- 0
names(theta) <- "mean"
NL <- ParamFamily(name = "Normal location family",
  param = ParamFamParameter(name = "location parameter", main = theta),
  distribution = Norm(mean = 0, sd = 1), ## sd known!
  startPar = function(x,...) c(min(x),max(x)),
  distrSymm <- SphericalSymmetry(SymmCenter = 0),
  modifyParam = function(theta){ Norm(mean = theta, sd = 1) },
  props = paste(c("The normal location family is invariant under",
    "the group of transformations 'g(x) = x + mean'",
    "with location parameter 'mean'"), collapse = " "))

NL

## 2. Normal scale family
theta <- 1
names(theta) <- "sd"
NS <- ParamFamily(name = "Normal scale family",
  param = ParamFamParameter(name = "scale parameter", main = theta,
  .returnClsName = "ParamWithScaleFamParameter"),
  distribution = Norm(mean = 0, sd = 1), ## mean known!
  startPar = function(x,...) c(0,-min(x)+max(x)),
  distrSymm <- SphericalSymmetry(SymmCenter = 0),
  modifyParam = function(theta){ Norm(mean = 0, sd = theta) },
  props = paste(c("The normal scale family is invariant under",
    "the group of transformations 'g(y) = sd*y'",
    "with scale parameter 'sd'"), collapse = " "))

NS

## 3. Normal location and scale family
theta <- c(0, 1)
names(theta) <- c("mean", "sd")
NLS <- ParamFamily(name = "Normal location and scale family",
  param = ParamFamParameter(name = "location and scale parameter",
  main = theta,
  .returnClsName = "ParamWithScaleFamParameter"),
  distribution = Norm(mean = 0, sd = 1),
  startPar = function(x,...) c(median(x),mad(x)),
  makeOKPar = function(param) {param[2]<-abs(param[2]); return(param)},
  distrSymm <- SphericalSymmetry(SymmCenter = 0),
  modifyParam = function(theta){
    Norm(mean = theta[1], sd = theta[2])
  },

```



```

        props = paste(c("The normal location and scale family is",
            "invariant under the group of transformations",
            "'g(x) = sd*x + mean' with location parameter",
            "'mean' and scale parameter 'sd'"),
            collapse = " ")
NLS

## 4. Binomial family
theta <- 0.3
names(theta) <- "prob"
B <- ParamFamily(name = "Binomial family",
    param = ParamFamParameter(name = "probability of success",
        main = theta),
    startPar = function(x,...) c(0,1),
    distribution = Binom(size = 15, prob = 0.3), ## size known!
    modifyParam = function(theta){ Binom(size = 15, prob = theta) },
    props = paste(c("The Binomial family is symmetric with respect",
        "to prob = 0.5; i.e.",
        "d(Binom(size, prob))(k)=d(Binom(size,1-prob))(size-k)"),
        collapse = " "))
B

## 5. Poisson family
theta <- 7
names(theta) <- "lambda"
P <- ParamFamily(name = "Poisson family",
    param = ParamFamParameter(name = "positive mean", main = theta),
    startPar = function(x,...) c(0,max(x)),
    distribution = Pois(lambda = 7),
    modifyParam = function(theta){ Pois(lambda = theta) })
P

## 6. Exponential scale family
theta <- 2
names(theta) <- "scale"
ES <- ParamFamily(name = "Exponential scale family",
    param = ParamFamParameter(name = "scale parameter", main = theta,
        .returnClsName = "ParamWithScaleFamParameter"),
    startPar = function(x,...) c(0,max(x)-min(x)),
    distribution = Exp(rate = 1/2),
    modifyParam = function(theta){ Exp(rate = 1/theta) },
    props = paste(c("The Exponential scale family is invariant under",
        "the group of transformations 'g(y) = scale*y'",
        "with scale parameter 'scale = 1/rate'"),
        collapse = " "))
ES

## 7. Lognormal scale family
theta <- 2
names(theta) <- "scale"
LS <- ParamFamily(name = "Lognormal scale family",
    param = ParamFamParameter(name = "scale parameter", main = theta,

```

```

        .returnClsName = "ParamWithScaleFamParameter"),
startPar = function(x,...) c(0,max(x)-min(x)),
distribution = Lnorm(meanlog = log(2), sdlog = 2),## sdlog known!
modifyParam = function(theta){
  Lnorm(meanlog = log(theta), sdlog = 2)
},
props = paste(c("The Lognormal scale family is invariant under",
  "the group of transformations 'g(y) = scale*y'",
  "with scale parameter 'scale = exp(meanlog)'",
  collapse = " "))
LS

## 8. Gamma family
theta <- c(1, 2)
names(theta) <- c("scale", "shape")
G <- ParamFamily(name = "Gamma family",
  param = ParamFamParameter(name = "scale and shape", main = theta,
    withPosRestr = TRUE,
    .returnClsName = "ParamWithScaleAndShapeFamParameter"),
  startPar = function(x,...) {E <- mean(x); V <- var(X); c(V/E,E^2/V)},
  makeOKPar = function(param) abs(param),
  distribution = Gammad(scale = 1, shape = 2),
  modifyParam = function(theta){
    Gammad(scale = theta[1], shape = theta[2])
  },
  props = paste(c("The Gamma family is scale invariant via the",
    "parametrization '(nu,shape)=(log(scale),shape)'",
    collapse = " "))
G

```

ParamFamily-class *Parametric family of probability measures.*

Description

Class of parametric families of probability measures.

Objects from the Class

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

Slots

`name` [inherited from class "ProbFamily"] object of class "character": name of the family.
`distribution` [inherited from class "ProbFamily"] object of class "Distribution": member of the family.
`distrSymm` [inherited from class "ProbFamily"] object of class "DistributionSymmetry": symmetry of distribution.

`param` object of class "ParamFamParameter": parameter of the family.

`fam.call` object of class "call": call by which parametric family was produced.

`makeOKPar` object of class "function": has argument `param` — the (total) parameter, returns valid parameter; used if `optim` resp. `optimize`— try to use “illegal” parameter values; then `makeOKPar` makes a valid parameter value out of the illegal one.

`startPar` object of class "function": has argument `x` — the data, returns starting parameter for `optim` resp. `optimize`— a starting estimator in case parameter is multivariate or a search interval in case parameter is univariate.

`modifyParam` object of class "function": mapping from the parameter space (represented by "param") to the distribution space (represented by "distribution").

`props` [inherited from class "ProbFamily"] object of class "character": properties of the family.

`.withMDE` object of class "logical" (of length 1): Tells R how to use the function from slot `startPar` in case of a `kStepEstimator` — use it as is or to compute the starting point for a minimum distance estimator which in turn then serves as starting point for `roptest` / `robtest` (from package **R`OptEst`**). If TRUE (default) the latter alternative is used. Ignored if **R`OptEst`** is not used.

`.withEvalAsVar` object of class "logical" (of length 1): Tells R whether in determining `kStepEstimators` one evaluates the asymptotic variance or just produces a call to do so.

Extends

Class "ProbFamily", directly.

Methods

main signature(object = "ParamFamily"): wrapped accessor function for slot `main` of slot `param`.

nuisance signature(object = "ParamFamily"): wrapped accessor function for slot `nuisance` of slot `param`.

fixed signature(object = "ParamFamily"): wrapped accessor function for slot `fixed` of slot `param`.

trafo signature(object = "ParamFamily", param = "missing"): wrapped accessor function for slot `trafo` of slot `param`.

param signature(object = "ParamFamily"): accessor function for slot `param`.

modifyParam signature(object = "ParamFamily"): accessor function for slot `modifyParam`.

fam.call signature(object = "ParamFamily"): accessor function for slot `fam.call`.

plot signature(x = "ParamFamily"): plot of slot `distribution`.
The return value of the plot method is an S3 object of class `c("plotInfo", "DiagnInfo")`, i.e., a list containing the information needed to produce the respective plot, which at a later stage could be used by different graphic engines (like, e.g. `ggplot`) to produce the plot in a different framework. A more detailed description will follow in a subsequent version.

show signature(object = "ParamFamily")

Details for methods 'show', 'print'

Detailedness of output by methods `show`, `print` is controlled by the global option `show.details` to be set by [distrModoptions](#).

As method `show` is used when inspecting an object by typing the object's name into the console, `show` comes without extra arguments and hence detailedness must be controlled by global options.

Method `print` may be called with a (partially matched) argument `show.details`, and then the global option is temporarily set to this value.

For class `ParamFamily`, this becomes relevant for slot `param`. For details therefore confer to [ParamFamParameter-class](#).

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

See Also

[Distribution-class](#)

Examples

```
F1 <- new("ParamFamily") # prototype
plot(F1)
```

ParamFamParameter *Generating function for ParamFamParameter-class*

Description

Generates an object of class "ParamFamParameter".

Usage

```
ParamFamParameter(name, main = numeric(0), nuisance, fixed, trafo,
  ..., .returnClsName = NULL)
```

Arguments

| | |
|-----------------------------|--|
| <code>name</code> | (optional) character string: name of parameter |
| <code>main</code> | numeric vector: main parameter |
| <code>nuisance</code> | (optional) numeric vector: nuisance parameter |
| <code>fixed</code> | (optional) numeric vector: fixed part of the parameter |
| <code>trafo</code> | (optional) <code>MatrixorFunction</code> : transformation of the parameter |
| <code>...</code> | (optional) additional arguments for further return classes, e.g. <code>\withPosRestr</code> (only use case so far) for class <code>ParamWithShapeFamParameter</code> |
| <code>.returnClsName</code> | character or <code>NULL</code> ; if non-null, the generated object will be of class <code>.returnClsName</code> , which must be a subclass of <code>ParamFamParameter</code> . |

Details

If name is missing, the default “parameter of a parametric family of probability measures” is used. If nuisance is missing, the nuisance parameter is set to NULL. The number of columns of trafo have to be equal and the number of rows have to be not larger than the sum of the lengths of main and nuisance. If trafo is missing, no transformation to the parameter is applied; i.e., trafo is set to an identity matrix.

Value

Object of class "ParamFamParameter" (or, if non-null, of class .returnClsName)

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>
Peter Ruckdeschel <peter.ruckdeschel@uni-oldenburg.de>

See Also

[ParamFamParameter-class](#)

Examples

```
ParamFamParameter(main = 0, nuisance = 1, fixed = 2,
                  trafo = function(x) list(fval = sin(x),
                                          mat = matrix(cos(x),1,1))
                  )
```

ParamFamParameter-class

Parameter of a parametric family of probability measures

Description

Class of the parameter of parametric families of probability measures.

Objects from the Class

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

Slots

main Object of class "numeric": main parameter.
 nuisance Object of class "OptionalNumeric": optional nuisance parameter.
 fixed Object of class "OptionalNumeric": optional fixed part of the parameter.
 trafo Object of class "MatrixorFunction": transformation of the parameter.

name Object of class "character": name of the parameter.
 withPosRestr (for ParamWithShapeFamParameter and ParamWithScaleAndShapeFamParameter):
 Object of class "logical": Is shape restricted to be positive?

Extends

Class "Parameter", directly.
 Class "OptionalParameter", by class "Parameter".

Methods

main signature(object = "ParamFamParameter"): accessor function for slot main.
main<- signature(object = "ParamFamParameter"): replacement function for slot main.
nuisance signature(object = "ParamFamParameter"): accessor function for slot nuisance.
nuisance<- signature(object = "ParamFamParameter"): replacement function for slot nuisance.
fixed signature(object = "ParamFamParameter"): accessor function for slot fixed.
fixed<- signature(object = "ParamFamParameter"): replacement function for slot fixed.
trafo signature(object = "ParamFamParameter"): accessor function for slot trafo.
trafo<- signature(object = "ParamFamParameter"): replacement function for slot trafo.
length signature(x = "ParamFamParameter"): sum of the lengths of main and nuisance.
dimension signature(x = "ParamFamParameter"): length of main.
withPosRestr signature(object = "ParamWithShapeFamParameter"): accessor function for slot trafo.
withPosRestr<- signature(object = "ParamWithShapeFamParameter"): replacement function for slot trafo.
show signature(object = "ParamFamParameter")
show signature(object = "ParamWithShapeFamParameter")
show signature(object = "ParamWithScaleAndShapeFamParameter")

Details for methods 'show', 'print'

Detailedness of output by methods show, print is controlled by the global option show.details to be set by [distrModoptions](#).

As method show is used when inspecting an object by typing the object's name into the console, show comes without extra arguments and hence detailedness must be controlled by global options.

Method print may be called with a (partially matched) argument show.details, and then the global option is temporarily set to this value.

More specifically, when show.detail is matched to "minimal" only class and name as well as main and nuisance part of the parameter are shown. When show.detail is matched to "medium", and if you estimate non-trivial (i.e. not the identity) transformation of the parameter of the parametric family, you will in addition be shown the derivative matrix, if the transformation is given in form of this matrix, while, if the transformation is in function form, you will only be told this. Finally, when show.detail is matched to "maximal", and you have a non-trivial transformation in function form, you will also be shown the code to this function.

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>,
Peter Ruckdeschel <peter.ruckdeschel@uni-oldenburg.de>

See Also

[Parameter-class](#)

Examples

```
new("ParamFamParameter")
```

PoisFamily

Generating function for Poisson families

Description

Generates an object of class "L2ParamFamily" which represents a Poisson family.

Usage

```
PoisFamily(lambda = 1, trafo)
```

Arguments

| | |
|--------|--|
| lambda | positive mean |
| trafo | function in param or matrix: transformation of the parameter |

Details

The slots of the corresponding L2 differentiable parameteric family are filled.

Value

Object of class "L2ParamFamily"

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

References

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

See Also

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

Examples

```
(P1 <- PoisFamily(lambda = 4.5))
plot(P1)
FisherInfo(P1)
checkL2deriv(P1)
```

positiveBias

Generating function for onesidedBias-class

Description

Generates an object of class "onesidedBias".

Usage

```
positiveBias(name = "positive Bias")
```

Arguments

name name of the bias type

Value

Object of class "onesidedBias"

Author(s)

Peter Ruckdeschel <peter.ruckdeschel@uni-oldenburg.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

[onesidedBias-class](#)

Examples

```
positiveBias()

## The function is currently defined as
function(){ new("onesidedBias", name = "positive Bias", sign = 1) }
```


Description

Methods for print to the S4 classes in package **distrMod**;

Usage

```
## S4 method for signature 'ShowDetails'
print(x, digits = getOption("digits"),
      show.details = c("maximal", "minimal", "medium"))
```

Arguments

| | |
|---------------------------|---|
| <code>x</code> | object of class ShowDetails, a class union of classes OptionalNumeric, OptionalMatrix, MatrixorFunction, Estimate, MCEstimate. |
| <code>digits</code> | unchanged w.r.t. default method of package base: a non-null value for 'digits' specifies the minimum number of significant digits to be printed in values. The default, 'NULL', uses 'getOption(digits)'. (For the interpretation for complex numbers see 'signif'.) Non-integer values will be rounded down, and only values greater than or equal to 1 and no greater than 22 are accepted. |
| <code>show.details</code> | a character, controlling the degree of detailedness of the output; currently the following values are permitted: "maximal", "minimal", "medium"; for the meaning for the actual class, confer to the corresponding class help file. |

Details

This method provides sort of a "show with extra arguments", in form of a common print method for the mentioned S4 classes. Essentially this print method just temporarily sets the global options according to the optional arguments `digits` and `show.details`, calls `show` and then re-sets the options to their global settings.

Examples

```
## set options to maximal detailedness
show.old <- getdistrModOption("show.details")
distrModoptions("show.details" = "maximal")
## define a model
NS <- NormLocationScaleFamily(mean=2, sd=3)
## generate data out of this situation
x <- r(distribution(NS))(30)

## want to estimate mu/sigma, sigma^2
## -> new trafo slot:
trafo(NS) <- function(param){
  mu <- param["mean"]
  sd <- param["sd"]
```

```

    fval <- c(mu/sd, sd^2)
    nfval <- c("mu/sig", "sig^2")
    names(fval) <- nfval
    mat <- matrix(c(1/sd,0,-mu/sd^2,2*sd),2,2)
    dimnames(mat) <- list(nfval,c("mean","sd"))
    return(list(fval=fval, mat=mat))
  }
  print(param(NS))
  print(param(NS), show.details = "minimal")
  print(param(NS), show.details = "medium")
  ## Maximum likelihood estimator
  res <- MLEstimator(x = x, ParamFamily = NS)
  print(res) #equivalent to 'show(res)' or 'res'
  print(res, digits = 4)
  print(res, show.details = "minimal")
  print(res, show.details = "medium")
  distrModoptions("show.details" = show.old)

```

ProbFamily-class *Family of probability measures*

Description

Class of families of probability measures.

Objects from the Class

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

Slots

name Object of class "character": name of the family.

distribution Object of class "Distribution": member of the family.

distrSymm Object of class "DistributionSymmetry": symmetry of distribution.

props Object of class "character": properties of the family.

Methods

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

name<- signature(object = "ProbFamily"): replacement function for slot name.

distribution signature(object = "ProbFamily"): accessor function for slot distribution.

distrSymm signature(object = "ProbFamily"): accessor function for slot distrSymm.

props signature(object = "ProbFamily"): accessor function for slot props.

props<- signature(object = "ProbFamily"): replacement function for slot props.

addProp<- signature(object = "ProbFamily"): add a property to slot props.

r signature(object = "ProbFamily"): wrapped accessor to slot r of slot "Distribution".

d signature(object = "ProbFamily"): wrapped accessor to slot d of slot "Distribution".
p signature(object = "ProbFamily"): wrapped accessor to slot p of slot "Distribution".
q signature(object = "ProbFamily"): wrapped accessor to slot q of slot "Distribution".
q.l signature(object = "ProbFamily"): wrapped accessor to slot q of slot "Distribution" – for compatibility with RStudio or Jupyter IRKernel / synonymous to q.

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

See Also

[Distribution-class](#)

QFNorm

Generating function for QFNorm-class

Description

Generates an object of class "QFNorm".

Usage

```
QFNorm(name = "norm based on quadratic form",  
       QuadForm = PosSemDefSymmMatrix(matrix(1)))
```

Arguments

| | |
|----------|----------------------------|
| name | slot name of the class |
| QuadForm | slot QuadForm of the class |

Value

Object of class "QFNorm"

Author(s)

Peter Ruckdeschel <peter.ruckdeschel@uni-oldenburg.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

[QFNorm-class](#)

Examples

```
## IGNORE_RDIFF_BEGIN
QFNorm()

## The function is currently defined as
function(){ new("QFNorm") }
## IGNORE_RDIFF_END
```

QFNorm-class

Norm classes for norms based on quadratic forms

Description

Classes for norms based on quadratic forms

Objects from the Class

could be created by a call to `new`, but normally one would use the generating functions `QFNorm`, `InfoNorm`, and `SelfNorm`

Slots

`name` Object of class "character".
`fct` Object of class "function".
`QuadForm` Object of class "PosSemDefSymmMatrix".

Extends

"QFNorm" extends class "NormType", directly, and "InfoNorm" and "SelfNorm" each extend class "QFNorm", directly (and do not have extra slots).

Methods

QuadForm signature(object = "QFNorm"): accessor function for slot QuadForm.
QuadForm<- signature(object = "QFNorm"): replacement function for slot QuadForm.

Author(s)

Peter Ruckdeschel <peter.ruckdeschel@uni-oldenburg.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.
Kohl, M. (2005) *Numerical Contributions to the Asymptotic Theory of Robustness*. Bayreuth: Dissertation.

See Also[NormType-class](#)

qqplot

*Methods for Function qqplot in Package 'distrMod'***Description**

We generalize function `qqplot` from package `stats` to be applicable to distribution and probability model objects, as well as to estimate objects. In this context, `qqplot` produces a QQ plot of data (argument `x`) against a (model) distribution. If the second argument is of class `'Estimate'`, `qqplot` looks at the `estimate.call`-slot and checks whether it can use an argument `ParamFamily` to conclude on the model distribution. Graphical parameters may be given as arguments to `qqplot`. In all title and label arguments, if `withSubst` is `TRUE`, the following patterns are substituted:

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

Usage

```
qqplot(x, y, ...)
## S4 method for signature 'ANY,UnivariateDistribution'
qqplot(x,y,
  n = length(x), withIdLine = TRUE,
  withConf = TRUE, withConf.pw = withConf, withConf.sim = withConf,
  plot.it = TRUE, datax = FALSE, xlab = deparse(substitute(x)),
  ylab = deparse(substitute(y)),
  ..., width = 10, height = 5.5, withSweave = getdistrOption("withSweave"),
  mfColRow = TRUE, n.CI = n, with.lab = FALSE, lab.pts = NULL, which.lbs = NULL,
  which.Order = NULL, which.nonlbs = NULL, attr.pre = FALSE, order.traf = NULL,
  col.IdL = "red", lty.IdL = 2, lwd.IdL = 2, alpha.CI = .95,
  exact.pCI = (n<100), exact.sCI = (n<100), nosym.pCI = FALSE,
  col.pCI = "orange", lty.pCI = 3, lwd.pCI = 2, pch.pCI = par("pch"),
  cex.pCI = par("cex"),
  col.sCI = "tomato2", lty.sCI = 4, lwd.sCI = 2, pch.sCI = par("pch"),
  cex.sCI = par("cex"), added.points.CI = TRUE,
  cex.pch = par("cex"), col.pch = par("col"),
  cex.pts = 1, col.pts = par("col"), pch.pts = 19,
  cex.npts = 1, col.npts = grey(.5), pch.npts = 20,
  cex.lbs = par("cex"), col.lbs = par("col"), adj.lbs = par("adj"),
  alpha.trsp = NA, jit.fac = 0, jit.tol = .Machine$double.eps,
  check.NotInSupport = TRUE, col.NotInSupport = "red",
  with.legend = TRUE, legend.bg = "white",
  legend.pos = "topleft", legend.cex = 0.8,
  legend.pref = "", legend.postf = "", legend.alpha = alpha.CI,
```

```

    debug = FALSE, withSubst = TRUE)
## S4 method for signature 'ANY,ProbFamily'
qqplot(x, y,
       n = length(x), withIdLine = TRUE, withConf = TRUE,
       withConf.pw = withConf, withConf.sim = withConf,
       plot.it = TRUE, xlab = deparse(substitute(x)),
       ylab = deparse(substitute(y)), ...)
## S4 method for signature 'ANY,Estimate'
qqplot(x, y,
       n = length(x), withIdLine = TRUE, withConf = TRUE,
       withConf.pw = withConf, withConf.sim = withConf,
       plot.it = TRUE, xlab = deparse(substitute(x)),
       ylab = deparse(substitute(y)), ...)

```

Arguments

| | |
|---------------------------|--|
| <code>x</code> | data to be checked for compatibility with distribution/model <code>y</code> . |
| <code>y</code> | object of class "UnivariateDistribution" or of class "ProbFamily". |
| <code>n</code> | numeric; assumed sample size (by default length of <code>x</code>). |
| <code>withIdLine</code> | logical; shall line $y = x$ be plotted in? |
| <code>withConf</code> | logical; shall confidence lines be plotted? |
| <code>withConf.pw</code> | logical; shall pointwise confidence lines be plotted? |
| <code>withConf.sim</code> | logical; shall simultaneous confidence lines be plotted? |
| <code>plot.it</code> | logical; shall be plotted at all (inherited from <code>qqplot</code>)? |
| <code>datax</code> | logical; shall data be plotted on x-axis? |
| <code>xlab</code> | x-label |
| <code>ylab</code> | y-label |
| <code>...</code> | further parameters for method <code>qqplot</code> with signature <code>ANY, UnivariateDistribution</code> or with function <code>plot</code> |
| <code>width</code> | width (in inches) of the graphics device opened |
| <code>height</code> | height (in inches) of the graphics device opened |
| <code>withSweave</code> | logical: if TRUE (for working with Sweave) no extra device is opened and height/width are not set |
| <code>mfColRow</code> | shall default partition in panels be used — defaults to TRUE |
| <code>n.CI</code> | numeric; number of points to be used for confidence interval |
| <code>with.lab</code> | logical; shall observation labels be plotted in? |
| <code>lab.pts</code> | character or NULL; observation labels to be used |
| <code>attr.pre</code> | logical; do graphical attributes for plotted data refer to indices prior (TRUE) or posterior to selection via arguments <code>which.lbs</code> , <code>which.Order</code> , <code>which.nonlbs</code> (FALSE)? |
| <code>which.lbs</code> | integer or NULL; which observations shall be labelled |
| <code>which.Order</code> | integer or NULL; which of the ordered (remaining) observations shall be labelled |

| | |
|------------------------------|--|
| <code>which.nonlbs</code> | indices of the observations which should be plotted but not labelled; either an integer vector with the indices of the observations to be plotted into graph or NULL — then all non-labelled observations are plotted. |
| <code>order.traf</code> | function or NULL; an optional trafo by which the observations are ordered (as <code>order(trafo(obs))</code>). |
| <code>col.IdL</code> | color for the identity line |
| <code>lty.IdL</code> | line type for the identity line |
| <code>lwd.IdL</code> | line width for the identity line |
| <code>alpha.CI</code> | confidence level |
| <code>exact.pCI</code> | logical; shall pointwise CIs be determined with exact Binomial distribution? |
| <code>exact.sCI</code> | logical; shall simultaneous CIs be determined with exact Kolmogorov distribution? |
| <code>nosym.pCI</code> | logical; shall we use (shortest) asymmetric CIs? |
| <code>col.pCI</code> | color for the pointwise CI |
| <code>lty.pCI</code> | line type for the pointwise CI |
| <code>lwd.pCI</code> | line width for the pointwise CI |
| <code>pch.pCI</code> | symbol for points (for discrete mass points) in pointwise CI |
| <code>cex.pCI</code> | magnification factor for points (for discrete mass points) in pointwise CI |
| <code>col.sCI</code> | color for the simultaneous CI |
| <code>lty.sCI</code> | line type for the simultaneous CI |
| <code>lwd.sCI</code> | line width for the simultaneous CI |
| <code>pch.sCI</code> | symbol for points (for discrete mass points) in simultaneous CI |
| <code>cex.sCI</code> | magnification factor for points (for discrete mass points) in simultaneous CI |
| <code>added.points.CI</code> | logical; should CIs be plotted through additional points (and not only through data points)? |
| <code>cex.pch</code> | magnification factor for the plotted symbols (for backward compatibility); it is ignored once <code>col.pts</code> is specified. |
| <code>col.pch</code> | color for the plotted symbols (for backward compatibility); it is ignored once <code>col.pts</code> is specified. |
| <code>cex.pts</code> | size of the points of the second argument plotted, can be a vector; if argument <code>attr.pre</code> is TRUE, it is recycled to the length of all observations and determines the sizes of all plotted symbols, i.e., the selection is done within this argument; in this case argument <code>col.npts</code> is ignored. If <code>attr.pre</code> is FALSE, <code>cex.pts</code> is recycled to the number of the observations selected for labelling and refers to the index ordering after the selection. Then argument <code>cex.npts</code> determines the sizes of the shown but non-labelled observations as given in argument <code>which.nonlbs</code> . |
| <code>col.pts</code> | color of the points of the second argument plotted, can be a vector as in <code>cex.pts</code> (with <code>col.npts</code> as counterpart). |
| <code>pch.pts</code> | symbol of the points of the second argument plotted, can be a vector as in <code>cex.pts</code> (with <code>pch.npts</code> as counterpart). |

| | |
|---------------------------------|---|
| <code>col.npts</code> | color of the non-labelled points of the data argument plotted; (may be a vector). |
| <code>pch.npts</code> | symbol of the non-labelled points of the data argument plotted (may be a vector). |
| <code>cex.npts</code> | size of the non-labelled points of the data argument plotted (may be a vector). |
| <code>cex.lbs</code> | magnification factor for the plotted observation labels |
| <code>col.lbs</code> | color for the plotted observation labels |
| <code>adj.lbs</code> | adj parameter for the plotted observation labels |
| <code>alpha.trsp</code> | alpha transparency to be added ex post to colors <code>col.pch</code> and <code>col.lbs</code> ; if one-dim and NA all colors are left unchanged. Otherwise, with usual recycling rules <code>alpha.trsp</code> gets shorted/prolongated to length the data-symbols to be plotted. Coordinates of this vector <code>alpha.trsp</code> with NA are left unchanged, while for the remaining ones, the alpha channel in rgb space is set to the respective coordinate value of <code>alpha.trsp</code> . The non-NA entries must be integers in $[0,255]$ (0 invisible, 255 opaque). |
| <code>jit.fac</code> | jittering factor used for discrete distributions. |
| <code>jit.tol</code> | threshold for jittering: if distance between points is smaller than <code>jit.tol</code> , points are considered replicates. |
| <code>check.NotInSupport</code> | logical; shall we check if all x-quantiles lie in <code>support(y)</code> ? |
| <code>col.NotInSupport</code> | logical; if preceding check TRUE color of x-quantiles if not in <code>support(y)</code> |
| <code>with.legend</code> | logical; shall a legend be plotted? |
| <code>legend.bg</code> | background color for the legend |
| <code>legend.pos</code> | position for the legend |
| <code>legend.cex</code> | magnification factor for the legend |
| <code>legend.pref</code> | character to be prepended to legend text |
| <code>legend.postf</code> | character to be appended to legend text |
| <code>legend.alpha</code> | nominal coverage probability |
| <code>debug</code> | logical; if TRUE additional output to debug confidence bounds. |
| <code>withSubst</code> | logical; if TRUE (default) pattern substitution for titles and axis labels is used; otherwise no substitution is used. |

Details

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

qqplot `signature(x = "ANY", y = "ProbFamily")`: produces a QQ plot of a dataset `x` against the theoretical quantiles of the model distribution of model `y`. Passed through the `...` argument, all arguments valid for `signature(x = "ANY", y = "UnivariateDistribution")` are also valid for this signature.

qqplot signature($x = \text{"ANY"}, y = \text{"Estimate"}$): produces a QQ plot of a dataset x against the theoretical quantiles of the model distribution of the model that can be reconstructed from the estimator y ; more specifically, it tries to get hand at the argument 'ParamFamily' of the estimator's call; if this is available, internally this model is shifted to the estimated parameter by a call to `modifyModel`, and then this shifted model is used in a call to the ($x = \text{"ANY"}, y = \text{"UnivariateDistribution"}$)-method. Passed through the `...` argument, all arguments valid for signature($x = \text{"ANY"}, y = \text{"UnivariateDistribution"}$) are also valid for this signature.

Value

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

| | |
|-------------------|---|
| <code>x</code> | The x coordinates of the points that were/would be plotted |
| <code>y</code> | The corresponding quantiles of the second distribution, <i>including NAs</i> . |
| <code>crit</code> | A matrix with the lower and upper confidence bounds (computed by <code>qqbounds</code>). |
| <code>err</code> | logical vector of length 2. |

(elements `crit` and `err` are taken from the return value(s) of `qqbounds`).

Author(s)

Peter Ruckdeschel <peter.ruckdeschel@uni-oldenburg.de>

References

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

See Also

`qqplot` from package **stats** – the standard QQ plot function, `qqplot` from package **distr** for comparisons of distributions, and `qqbounds`, used by `qqplot` to produce confidence intervals.

Examples

```
set.seed(123)
x <- rnorm(40, mean=15, sd=30)
qqplot(x, Chisq(df=15))
NF <- NormLocationScaleFamily(mean=15, sd=30)
qqplot(x, NF, with.lab=TRUE, which.order=1:5, cex.lbs=1.3)
mLE <- MLEstimator(x, NF)
qqplot(x, mLE)
```

returnlevelplot

*Methods for Function returnlevelplot in Package 'distrMod'***Description**

We generalize the return level plot (which is one of the diagnostical plots provided package **ismev**, e.g., in function `gev.diag`), see also Coles' book below, to be applicable to distribution and probability model objects. In this context, `returnlevelplot` produces a rescaled QQ plot of data (argument `x`) against a (model) distribution. Graphical parameters may be given as arguments to `returnlevelplot`. In all title and label arguments, if `withSubst` is `TRUE`, the following patterns are substituted:

"%C" class of argument `x`

"%A" deparsed argument `x`

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

Usage

```
returnlevelplot(x, y, ...)
## S4 method for signature 'ANY,UnivariateDistribution'
returnlevelplot(x,y,
  n = length(x), withIdLine = TRUE,
  withConf = TRUE, withConf.pw = withConf, withConf.sim = withConf,
  plot.it = TRUE, datax = FALSE, MaxOrPOT = c("Max", "POT"), npy = 365,
  threshold = if(is(y,"GPareto")) NA else 0,
  xlab = deparse(substitute(x)),
  ylab = deparse(substitute(y)),
  main = "",
  ..., width = 10, height = 5.5, withSweave = getdistrOption("withSweave"),
  mfColRow = TRUE, n.CI = n, with.lab = FALSE, lab.pts = NULL, which.lbs = NULL,
  which.Order = NULL, which.nonlbs = NULL, attr.pre = FALSE, order.traf = NULL,
  col.IdL = "red", lty.IdL = 2, lwd.IdL = 2, alpha.CI = .95,
  exact.pCI = (n<100), exact.sCI = (n<100), nosym.pCI = FALSE,
  col.pCI = "orange", lty.pCI = 3, lwd.pCI = 2, pch.pCI = par("pch"),
  cex.pCI = par("cex"),
  col.sCI = "tomato2", lty.sCI = 4, lwd.sCI = 2, pch.sCI = par("pch"),
  cex.sCI = par("cex"), added.points.CI = TRUE,
  cex.pch = par("cex"), col.pch = par("col"),
  cex.pts = 1, col.pts = par("col"), pch.pts = 19,
  cex.npts = 1, col.npts = grey(.5), pch.npts = 20,
  cex.lbs = par("cex"), col.lbs = par("col"), adj.lbs = par("adj"),
  alpha.trsp = NA, jit.fac = 0, jit.tol = .Machine$double.eps,
  check.NotInSupport = TRUE, col.NotInSupport = "red",
  with.legend = TRUE, legend.bg = "white",
  legend.pos = "topleft", legend.cex = 0.8,
  legend.pref = "", legend.postf = "", legend.alpha = alpha.CI,
```

```

    debug = FALSE, withSubst = TRUE)
## S4 method for signature 'ANY,ProbFamily'
returnlevelplot(x, y,
  n = length(x), withIdLine = TRUE, withConf = TRUE,
  withConf.pw = withConf, withConf.sim = withConf,
  plot.it = TRUE, xlab = deparse(substitute(x)),
  ylab = deparse(substitute(y)), ...)
## S4 method for signature 'ANY,Estimate'
returnlevelplot(x, y,
  n = length(x), withIdLine = TRUE, withConf = TRUE,
  withConf.pw = withConf, withConf.sim = withConf,
  plot.it = TRUE, xlab = deparse(substitute(x)),
  ylab = deparse(substitute(y)), ...)

```

Arguments

| | |
|--------------|---|
| x | data to be checked for compatibility with distribution/model y. |
| y | object of class "UnivariateDistribution" or of class "ProbFamily". |
| n | numeric; assumed sample size (by default length of x). |
| withIdLine | logical; shall line $y = x$ be plotted in? |
| withConf | logical; shall confidence lines be plotted? |
| withConf.pw | logical; shall pointwise confidence lines be plotted? |
| withConf.sim | logical; shall simultaneous confidence lines be plotted? |
| plot.it | logical; shall be plotted at all (inherited from returnlevelplot)? |
| datax | logical; shall data be plotted on x-axis? |
| MaxOrPOT | a character string specifying whether it is used for block maxima ("Max") or for points over threshold ("POT"); must be one of "Max" (default) or "POT". You can specify just the initial letter. |
| npv | number of observations per year/block. |
| threshold | numerical; in case of <code>MaxOrPot=="POT"</code> , this captures the (removed) threshold. If it is NA, it is reconstructed from the distribution y. |
| main | Main title |
| xlab | x-label |
| ylab | y-label |
| ... | further parameters for method <code>returnlevelplot</code> with signature <code>ANY, UnivariateDistribution</code> or with function <code>plot</code> |
| width | width (in inches) of the graphics device opened |
| height | height (in inches) of the graphics device opened |
| withSweave | logical: if TRUE (for working with Sweave) no extra device is opened and height/width are not set |
| mfColRow | shall default partition in panels be used — defaults to TRUE |
| n.CI | numeric; number of points to be used for confidence interval |

| | |
|------------------------------|--|
| <code>with.lab</code> | logical; shall observation labels be plotted in? |
| <code>lab.pts</code> | character or NULL; observation labels to be used |
| <code>attr.pre</code> | logical; do graphical attributes for plotted data refer to indices prior (TRUE) or posterior to selection via arguments <code>which.lbs</code> , <code>which.Order</code> , <code>which.nonlbs</code> (FALSE)? |
| <code>which.lbs</code> | integer or NULL; which observations shall be labelled |
| <code>which.nonlbs</code> | indices of the observations which should be plotted but not labelled; either an integer vector with the indices of the observations to be plotted into graph or NULL — then all non-labelled observations are plotted. |
| <code>which.Order</code> | integer or NULL; which of the ordered (remaining) observations shall be labelled |
| <code>order.traf</code> | function or NULL; an optional trafo by which the observations are ordered (as <code>order(trafo(obs))</code>). |
| <code>col.IdL</code> | color for the identity line |
| <code>lty.IdL</code> | line type for the identity line |
| <code>lwd.IdL</code> | line width for the identity line |
| <code>alpha.CI</code> | confidence level |
| <code>exact.pCI</code> | logical; shall pointwise CIs be determined with exact Binomial distribution? |
| <code>exact.sCI</code> | logical; shall simultaneous CIs be determined with exact Kolmogorov distribution? |
| <code>nosym.pCI</code> | logical; shall we use (shortest) asymmetric CIs? |
| <code>col.pCI</code> | color for the pointwise CI |
| <code>lty.pCI</code> | line type for the pointwise CI |
| <code>lwd.pCI</code> | line width for the pointwise CI |
| <code>pch.pCI</code> | symbol for points (for discrete mass points) in pointwise CI |
| <code>cex.pCI</code> | magnification factor for points (for discrete mass points) in pointwise CI |
| <code>col.sCI</code> | color for the simultaneous CI |
| <code>lty.sCI</code> | line type for the simultaneous CI |
| <code>lwd.sCI</code> | line width for the simultaneous CI |
| <code>pch.sCI</code> | symbol for points (for discrete mass points) in simultaneous CI |
| <code>cex.sCI</code> | magnification factor for points (for discrete mass points) in simultaneous CI |
| <code>added.points.CI</code> | logical; should CIs be plotted through additional points (and not only through data points)? |
| <code>cex.pch</code> | magnification factor for the plotted symbols (for backward compatibility); it is ignored once <code>col.pts</code> is specified. |
| <code>col.pch</code> | color for the plotted symbols (for backward compatibility); it is ignored once <code>col.pts</code> is specified. |

| | |
|---------------------------------|---|
| <code>cex.pts</code> | size of the points of the second argument plotted, can be a vector; if argument <code>attr.pre</code> is TRUE, it is recycled to the length of all observations and determines the sizes of all plotted symbols, i.e., the selection is done within this argument; in this case argument <code>col.npts</code> is ignored. If <code>attr.pre</code> is FALSE, <code>cex.pts</code> is recycled to the number of the observations selected for labelling and refers to the index ordering after the selection. Then argument <code>cex.pts</code> determines the sizes of the shown but non-labelled observations as given in argument <code>which.nonlbs</code> . |
| <code>col.pts</code> | color of the points of the second argument plotted, can be a vector as in <code>cex.pts</code> (with <code>col.npts</code> as counterpart). |
| <code>pch.pts</code> | symbol of the points of the second argument plotted, can be a vector as in <code>cex.pts</code> (with <code>pch.npts</code> as counterpart). |
| <code>col.npts</code> | color of the non-labelled points of the data argument plotted; (may be a vector). |
| <code>pch.npts</code> | symbol of the non-labelled points of the data argument plotted (may be a vector). |
| <code>cex.npts</code> | size of the non-labelled points of the data argument plotted (may be a vector). |
| <code>cex.lbs</code> | magnification factor for the plotted observation labels |
| <code>col.lbs</code> | color for the plotted observation labels |
| <code>adj.lbs</code> | adj parameter for the plotted observation labels |
| <code>alpha.trsp</code> | alpha transparency to be added ex post to colors <code>col.pch</code> and <code>col.lbs</code> ; if one-dim and NA all colors are left unchanged. Otherwise, with usual recycling rules <code>alpha.trsp</code> gets shorted/prolongated to length the data-symbols to be plotted. Coordinates of this vector <code>alpha.trsp</code> with NA are left unchanged, while for the remaining ones, the alpha channel in rgb space is set to the respective coordinate value of <code>alpha.trsp</code> . The non-NA entries must be integers in $[0,255]$ (0 invisible, 255 opaque). |
| <code>jit.fac</code> | jittering factor used for discrete distributions. |
| <code>jit.tol</code> | threshold for jittering: if distance between points is smaller than <code>jit.tol</code> , points are considered replicates. |
| <code>check.NotInSupport</code> | logical; shall we check if all x-quantiles lie in <code>support(y)</code> ? |
| <code>col.NotInSupport</code> | logical; if preceding check TRUE color of x-quantiles if not in <code>support(y)</code> |
| <code>with.legend</code> | logical; shall a legend be plotted? |
| <code>legend.bg</code> | background color for the legend |
| <code>legend.pos</code> | position for the legend |
| <code>legend.cex</code> | magnification factor for the legend |
| <code>legend.pref</code> | character to be prepended to legend text |
| <code>legend.postf</code> | character to be appended to legend text |
| <code>legend.alpha</code> | nominal coverage probability |
| <code>debug</code> | logical; if TRUE additional output to debug confidence bounds. |
| <code>withSubst</code> | logical; if TRUE (default) pattern substitution for titles and axis labels is used; otherwise no substitution is used. |

Details

returnlevelplot signature($x = \text{"ANY"}, y = \text{"UnivariateDistribution"}$): produces a return level plot of a dataset x against the theoretical quantiles of distribution y .

returnlevelplot signature($x = \text{"ANY"}, y = \text{"ProbFamily"}$): produces a return level plot of a dataset x against the theoretical quantiles of the model distribution of model y . Passed through the \dots argument, all arguments valid for signature($x = \text{"ANY"}, y = \text{"UnivariateDistribution"}$) are also valid for this signature.

returnlevelplot signature($x = \text{"ANY"}, y = \text{"Estimate"}$): produces a return level plot of a dataset x against the theoretical quantiles of the model distribution of the model that can be reconstructed from the estimator y ; more specifically, it tries to get hand at the argument 'ParamFamily' of the estimator's call; if this is available, internally this model is shifted to the estimated parameter by a call to `modifyModel`, and then this shifted model is used in a call to the ($x = \text{"ANY"}, y = \text{"UnivariateDistribution"}$)-method. Passed through the \dots argument, all arguments valid for signature($x = \text{"ANY"}, y = \text{"UnivariateDistribution"}$) are also valid for this signature.

Value

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

| | |
|-------------------|---|
| <code>x</code> | The x coordinates of the points that were/would be plotted |
| <code>y</code> | The corresponding quantiles of the second distribution, <i>including NAs</i> . |
| <code>crit</code> | A matrix with the lower and upper confidence bounds (computed by <code>qqbounds</code>). |
| <code>err</code> | logical vector of length 2. |

(elements `crit` and `err` are taken from the return value(s) of `qqbounds`).

Note

The confidence bands given in our version of the return level plot differ from the ones given in package **ismev**. We use non-parametric bands, hence also allow for non-parametric deviances from the model, whereas in in package **ismev** they are based on profiling, hence only check for variability within the parametric class.

Author(s)

Peter Ruckdeschel <peter.ruckdeschel@uni-oldenburg.de>

References

ismev: An Introduction to Statistical Modeling of Extreme Values. R package version 1.39. <https://CRAN.R-project.org/package=ismev>; original S functions written by Janet E. Heffernan with R port and R documentation provided by Alec G. Stephenson. (2012).

Coles, S. (2001). *An introduction to statistical modeling of extreme values*. London: Springer.

See Also

[qqplot](#) from package **stats** – the standard QQ plot function, [qqplot](#) from package **distr** for comparisons of distributions, [qqplot](#) from this package and [qqbounds](#), used by [returnlevelplot](#) to produce confidence intervals.

Examples

```
set.seed(20190331)
returnlevelplot(r(Norm(15,sqrt(30)))(40), Chisq(df=15))
### more could be seen after installing RobExtremes and ismev
#

## IGNORE_RDIFF_BEGIN
## at R CMD check --as-cran, it does not find package cluster
## when trying to attach package rrcov
## so remove this from testing
if(require(RobExtremes) && require(ismev)){

  data(portpirie)
  gevfit <- gev.fit(portpirie[,2]) ## taken from example from ismev::gev.fit
  GEVF <- GEVFamily(scale=gevfit$mle[2],shape=gevfit$mle[3],loc=gevfit$mle[1])
  erg <- returnlevelplot(portpirie[,2], GEVF)
  print(names(erg))
  print(names(erg$plotArgs))
  print(names(erg$IdLineArgs))
  returnlevelplot(portpirie[,2], GEVF, datax=TRUE)

  data(rain)
  gpdfit <- gpd.fit(rain,10) ## taken from example from ismev::gpd.fit
  GPDF <- GParetoFamily(scale=gpdfit$mle[1],shape=gpdfit$mle[2],loc=10)
  returnlevelplot(rain, GPDF, MaxOrPOT="POT", xlim=c(1e-1,1e3))
}

## IGNORE_RDIFF_END
```

| | |
|----------------|-------------|
| RiskType-class | <i>Risk</i> |
|----------------|-------------|

Description

Class of risks; e.g., estimator risks.

Objects from the Class

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

Slots

type Object of class "character": type of risk.

Methods

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

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

SelfNorm

Generating function for SelfNorm-class

Description

Generates an object of class "SelfNorm" — used for self-standardized influence curves.

Usage

```
SelfNorm()
```

Value

Object of class "SelfNorm"

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

[SelfNorm-class](#)

Examples

```
## IGNORE_RDIFF_BEGIN
SelfNorm()

## The function is currently defined as
function(){ new("SelfNorm") }
## IGNORE_RDIFF_END
```

`symmetricBias`*Generating function for symmetricBias-class*

Description

Generates an object of class "symmetricBias".

Usage

```
symmetricBias(name = "symmetric Bias")
```

Arguments

name name of the bias type

Value

Object of class "symmetricBias"

Author(s)

Peter Ruckdeschel <peter.ruckdeschel@uni-oldenburg.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

[symmetricBias-class](#)

Examples

```
symmetricBias()  
  
## The function is currently defined as  
function(){ new("symmetricBias", name = "symmetric Bias") }
```

symmetricBias-class *symmetric Bias Type*

Description

Class of symmetric bias types.

Objects from the Class

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

Slots

name Object of class "character".

Methods

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

Extends

Class "BiasType", directly.

Author(s)

Peter Ruckdeschel <peter.ruckdeschel@uni-oldenburg.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

[BiasType-class](#)

Examples

```
symmetricBias()  
## The function is currently defined as  
function(){ new("symmetricBias", name = "symmetric Bias") }
```

trafo-methods

*Methods for function trafo in Package 'distrMod'***Description**

Methods for function trafo in package **distrMod**; there are accessor (trafo) and replacement (trafo<-) versions.

Usage

```
trafo(object, param, ...)
## S4 method for signature 'Estimate,missing'
trafo(object,param)
## S4 method for signature 'ParamFamParameter,missing'
trafo(object,param)
## S4 method for signature 'ParamWithScaleAndShapeFamParameter,missing'
trafo(object,param)
## S4 method for signature 'ParamFamily,missing'
trafo(object,param)
## S4 method for signature 'ParamFamily,ParamFamParameter'
trafo(object,param)
## S4 method for signature 'Estimate,ParamFamParameter'
trafo(object,param)
trafo.fct(object)
trafo(object) <- value
```

Arguments

| | |
|--------|---|
| object | an object of either class Estimate, ParamFamParameter, ParamFamily |
| param | an object of class ParamFamParameter; the parameter value at which to evaluate the transformation |
| value | a matrix or a function; if it is a matrix, dimensions must be consistent to the parametric setting; if it is function, it should take one argument param of class ParamFamParameter and return a list of length two with named components fval (the function value, see below) and mat (a matrix — with the same dimensions consistency conditions as above). |
| ... | additional argument(s) for methods; not used so far. |

Details

trafo is a slot of class ParamFamParameter, which in turn is a slot of class ParamFamily. It also sort of arises in class Estimate, i.e., all slots can be identified by the information contained in an instance thereof.

trafo realizes partial influence curves; i.e.; we are only interested in some possibly lower dimensional smooth (not necessarily linear or even coordinate-wise) aspect/transformation τ of the parameter θ .

To be coherent with the corresponding *nuisance* implementation, we make the following convention:

The full parameter θ is split up coordinate-wise in a main parameter θ' and a nuisance parameter θ'' (which is unknown, too, hence has to be estimated, but only is of secondary interest) and a fixed, known part θ''' .

Without loss of generality, we restrict ourselves to the case that transformation τ only acts on the main parameter θ' — if we want to transform the whole parameter, we only have to assume that both nuisance parameter θ'' and fixed, known part of the parameter θ''' have length 0.

To the implementation:

Slot *trafo* can either contain a (constant) matrix D_θ or a function

$$\tau: \Theta' \rightarrow \tilde{\Theta}, \quad \theta \mapsto \tau(\theta)$$

mapping main parameter θ' to some range $\tilde{\Theta}$.

If *slot value* *trafo* is a function, besides $\tau(\theta)$, it will also return the corresponding derivative matrix $\frac{\partial}{\partial \theta} \tau(\theta)$. More specifically, the return value of this function *theta* is a list with entries *fval*, the function value $\tau(\theta)$, and *mat*, the derivative matrix.

In case *trafo* is a matrix D , we interpret it as such a derivative matrix $\frac{\partial}{\partial \theta} \tau(\theta)$, and, correspondingly, $\tau(\theta)$ as the linear mapping $\tau(\theta) = D\theta$.

According to the signature, *method* *trafo* will return different return value types. For signature

Estimate,missing: it will return a list with entries *fct*, the function τ , and *mat*, the matrix $\frac{\partial}{\partial \theta} \tau(\theta)$. function τ will then return the list `list(fval, mat)` mentioned above.

Estimate,ParamFamParameter: as signature *Estimate,missing*.

ParamFamParameter,missing: it will just return the corresponding matrix.

ParamFamily,missing: is just wrapper to signature *ParamFamParameter,missing*.

ParamFamily,ParamFamParameter: as signature *Estimate,missing*.

Value

The return value depends on the signature. For *trafo.fct*, we return the corresponding function $\tau()$ (see below). For *trafo*, we have:

signature *Estimate,missing*:

a list of length two with components *fct* and *mat* (see below)

signature *Estimate,ParamFamParameter*:

a list of length two with components *fct* and *mat* (see below)

signature *ParamFamParameter,missing*:

a matrix (see below)

signature *ParamFamily,missing*:

a matrix (see below)

signature *ParamFamily,ParamFamParameter*:

a list of length two with components *fct* and *mat* (see below)

Examples

```
## Gaussian location and scale
NS <- NormLocationScaleFamily(mean=2, sd=3)
## generate data out of this situation
x <- r(distribution(NS))(30)

## want to estimate mu/sigma, sigma^2
## -> new trafo slot:
trafo(NS) <- function(param){
  mu <- param["mean"]
  sd <- param["sd"]
  fval <- c(mu/sd, sd^2)
  nfval <- c("mu/sig", "sig^2")
  names(fval) <- nfval
  mat <- matrix(c(1/sd,0,-mu/sd^2,2*sd),2,2)
  dimnames(mat) <- list(nfval,c("mean","sd"))
  return(list(fval=fval, mat=mat))
}

## Maximum likelihood estimator
(res <- MLEstimator(x = x, ParamFamily = NS))
## confidence interval
confint(res)
```

trafoEst

Function trafoEst in Package 'distrMod'

Description

trafoEst takes a τ like function (compare [trafo-methods](#)) and transforms an existing estimator by means of this transformation.

Usage

```
trafoEst(fct, estimator)
```

Arguments

| | |
|-----------|---|
| fct | a τ like function, i.e., a function in the main part θ of the parameter returning a list <code>list(fval,mat)</code> where <code>fval</code> is the function value $\tau(\theta)$ of the transformation, and <code>mat</code> , its derivative matrix at θ . |
| estimator | an object of class Estimator. |

Details

The disadvantage of this proceeding is that the transformation is not accounted for in determining the estimate (e.g. in a corresponding optimality); it simply transforms an existing estimator, without reapplying it to data. This becomes important in optimally robust estimation.

Value

exactly the argument estimator, but with modified slots estimate, asvar, and trafo.

Examples

```
## Gaussian location and scale
NS <- NormLocationScaleFamily(mean=2, sd=3)
## generate data out of this situation
x <- r(distribution(NS))(30)

## want to estimate mu/sigma, sigma^2
## -> without new trafo slot:
mtrafo <- function(param){
  mu <- param["mean"]
  sd <- param["sd"]
  fval <- c(mu/sd, sd^2)
  nfval <- c("mu/sig", "sig^2")
  names(fval) <- nfval
  mat <- matrix(c(1/sd,0,-mu/sd^2,2*sd),2,2)
  dimnames(mat) <- list(nfval,c("mean","sd"))
  return(list(fval=fval, mat=mat))
}

## Maximum likelihood estimator in the original problem
res0 <- MLEstimator(x = x, ParamFamily = NS)
## transformation
res <- trafoEst(mtrafo, res0)
## confidence interval
confint(res)
```

trAsCov

Generating function for trAsCov-class

Description

Generates an object of class "trAsCov".

Usage

```
trAsCov()
```

Value

Object of class "trAsCov"

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

[trAsCov-class](#)

Examples

```
trAsCov()  
  
## The function is currently defined as  
function(){ new("trAsCov") }
```

| | |
|---------------|---------------------------------------|
| trAsCov-class | <i>Trace of asymptotic covariance</i> |
|---------------|---------------------------------------|

Description

Class of trace of asymptotic covariance.

Objects from the Class

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

Slots

type Object of class "character": "trace of asymptotic covariance".

Extends

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

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

[asRisk-class](#), [trAsCov](#)

Examples

```
new("trAsCov")
```

trFiCov

Generating function for trFiCov-class

Description

Generates an object of class "trFiCov".

Usage

```
trFiCov()
```

Value

Object of class "trFiCov"

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

References

Ruckdeschel, P. and Kohl, M. (2005) How to approximate the finite sample risk of M-estimators.

See Also

[trFiCov-class](#)

Examples

```
trFiCov()
```

```
## The function is currently defined as  
function(){ new("trFiCov") }
```

| | |
|---------------|--|
| trFiCov-class | <i>Trace of finite-sample covariance</i> |
|---------------|--|

Description

Class of trace of finite-sample covariance.

Objects from the Class

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

Slots

type Object of class "character": "trace of finite-sample covariance".

Extends

Class "fiRisk", directly.
Class "RiskType", by class "fiRisk".

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

References

Ruckdeschel, P. and Kohl, M. (2005) How to approximate the finite sample risk of M-estimators.

See Also

[fiRisk-class](#), [trFiCov](#)

Examples

```
new("trFiCov")
```

 validParameter-methods

Methods for function validParameter in Package 'distrMod'

Description

Methods for function `validParameter` in package **distrMod** to check whether a new parameter (e.g. "proposed" by an optimization) is valid.

Usage

```
validParameter(object, ...)
## S4 method for signature 'ParamFamily'
validParameter(object, param)
## S4 method for signature 'L2ScaleUnion'
validParameter(object, param, tol=.Machine$double.eps)
## S4 method for signature 'L2ScaleFamily'
validParameter(object, param, tol=.Machine$double.eps)
## S4 method for signature 'L2LocationFamily'
validParameter(object, param)
## S4 method for signature 'L2LocationScaleFamily'
validParameter(object, param, tol=.Machine$double.eps)
## S4 method for signature 'BinomFamily'
validParameter(object, param, tol=.Machine$double.eps)
## S4 method for signature 'PoisFamily'
validParameter(object, param, tol=.Machine$double.eps)
## S4 method for signature 'L2ScaleShapeUnion'
validParameter(object, param, tol=.Machine$double.eps)
```

Arguments

| | |
|---------------------|--|
| <code>object</code> | an object of class <code>ParamFamily</code> |
| <code>param</code> | either a numeric vector or an object of class <code>ParamFamParameter</code> |
| <code>tol</code> | accuracy upto which the conditions have to be fulfilled |
| <code>...</code> | additional argument(s) for methods. |

Details

method for signature

`ParamFamily` checks if all parameters are finite by `is.finite` if their length is between 1 and the joint length of main and nuisance parameter of `object`, and finally, if a call to `modifyParam(object)` with argument `param` would throw an error.

`L2ScaleUnion` checks if the parameter is finite by `is.finite`, and if it is strictly larger than 0 (upto argument `tol`).

`L2ScaleFamily` checks if the parameter length is 1, and otherwise uses `L2ScaleUnion`-method.

- L2LocationFamily checks if the parameter is finite by `is.finite`, if its length is 1
- L2LocationScaleFamily checks if the parameter length is 1 or 2 (e.g. if one features as nuisance parameter), and also uses L2ScaleUnion-method.
- BinomFamily checks if the parameter is finite by `is.finite`, if its length is 1, and if it is strictly larger than 0 and strictly smaller than 1 (upto argument `tol`)
- PoisFamily checks if the parameter is finite by `is.finite`, if its length is 1, and if it is strictly larger than 0 (upto argument `tol`)
- L2ScaleShapeUnion uses L2ScaleUnion-method, checks if parameter length is 1 or 2 (e.g. if one features as nuisance parameter), and if shape is strictly larger than 0 (upto argument `tol`)

Value

logical of length 1 — valid or not

Examples

```
NS <- NormLocationScaleFamily()
validParameter(NS, c(scale=0.1, loc=2))
validParameter(NS, c(scale=-0.1, loc=2))
validParameter(NS, c(scale=0, loc=2))
validParameter(NS, c(mean=2, sd=2))
```

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