

Package ‘distrMod’

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Title Object oriented implementation of probability models

Description Object oriented implementation of probability models based on packages ‘distr’ and ‘distrEx’

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Depends R(>= 2.6.0), methods, startupmsg, distr(>= 2.2), distrEx(>= 2.2), RandVar(>= 0.6.3), MASS, stats4

LazyLoad yes

License LGPL-3

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distrMod-package *distrMod – probability models*

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:      2.3
Date:         2010-12-03
Depends:      R(>= 2.6.0), methods, startupmsg, distr(>= 2.2), distrEx(>= 2.2), RandVar(>= 0.6.3), MASS, stats4
LazyLoad:    yes
License:      LGPL-3
URL:          http://distr.r-forge.r-project.org/
SVNRevision: 699

```

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"   [*]
|>|>|>"GammaFamily" [*]
|>|>|>"BetaFamily"  [*]
|>|>|>"L2GroupParamFamily"
additional slots:
LogDeriv(function)
|>|>|>|>"L2LocationScaleUnion" /VIRTUAL/
additional slots:
locscalename(character)
|>|>|>|>|>"L2LocationFamily"      [*]
|>|>|>|>|>"NormLocationFamily"    [*]
|>|>|>|>|>"GumbelLocationFamily"  [*]
|>|>|>|>|>"L2ScaleFamily"         [*]
|>|>|>|>|>"NormScaleFamily"       [*]
|>|>|>|>|>"ExpScaleFamily"        [*]
|>|>|>|>|>"LnormScaleFamily"      [*]
|>|>|>|>|>"L2LocationScaleFamily"  [*]
|>|>|>|>|>"NormLocationScaleFamily" [*]
|>|>|>|>|>"CauchyLocationScaleFamily" [*]

#####
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)

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Matthias Kohl <Matthias.Kohl@stamats.de>

Maintainer: Peter Ruckdeschel <Peter.Ruckdeschel@itwm.fraunhofer.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. <http://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. http://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")`

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	<i>Asymptotic covariance</i>
-------------	------------------------------

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

Convex asymptotic risk

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	<i>Asymptotic risk</i>
--------------	------------------------

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@itwm.fraunhofer.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@itwm.fraunhofer.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 *Semivariance Risk Type*

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@itwm.fraunhofer.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@itwm.fraunhofer.de>

References

- Rieder, H. (1994) *Robust Asymptotic Statistics*. New York: Springer.
- Ruckdeschel, P. (2005) Optimally One-Sided Bounded Influence Curves. *Mathematical Methods in Statistics* 14(1), 105-131.
- Kohl, M. (2005) *Numerical Contributions to the Asymptotic Theory of Robustness*. Bayreuth: Dissertation.

See Also

[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@itwm.fraunhofer.de>

References

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

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

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

See Also

[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)
```

Arguments

shape1	positive real: shape1 parameter
shape2	positive real: shape2 parameter
trafo	matrix: transformation of the parameter

Details

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

Value

Object of class "L2ParamFamily"

Author(s)

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

See Also

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

Examples

```
(B1 <- BetaFamily())
FisherInfo(B1)
checkL2deriv(B1)
```

BiasType-class

Bias Type

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@itwm.fraunhofer.de>

References

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

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

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

See Also

[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

<code>size</code>	number of trials
<code>prob</code>	probability of success
<code>trafo</code>	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)
```

CauchyLocationScaleFamily

Generating function for Cauchy location and scale families

Description

Generates an object of class "L2LocationScaleFamily" which represents a normal 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, ...)
```

Arguments

L2Fam	L2-differentiable family of probability measures
...	additional parameters

Details

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

Value

The maximum deviation is returned.

Author(s)

Matthias Kohl <Matthias.Kohl@stamats.de>

References

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

See Also

[L2ParamFamily-class](#)

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`).

completecases.estimate signature(object = "Confint"): accessor function for slot completecases.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@itwm.fraunhofer.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>
<code>parm</code>	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.
<code>level</code>	the confidence level required.
<code>method</code>	not yet used (only as missing; later to allow for various methods)
<code>...</code>	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@itwm.fraunhofer.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@itwm.fraunhofer.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@itwm.fraunhofer.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, ...)
```

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 <code>complete.cases(x)</code> .
...	further arguments to estimator.

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@itwm.fraunhofer.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)
```

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 .Machine\$double.eps.

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@itwm.fraunhofer.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 $1/\text{rate}$.

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]])  
checkL2deriv(E1)
```

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	<i>Finite-sample covariance</i>
-------------	---------------------------------

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`*Finite-sample Hampel risk*

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 *Finite-sample under-/overshoot probability*

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)
```

Arguments

scale	positive real: scale parameter
shape	positive real: shape parameter
trafo	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](#), [Gammad-class](#)

Examples

```
(G1 <- GammaFamily())
FisherInfo(G1)
checkL2deriv(G1)
```

GumbelLocationFamily *Generating function for Gumbel location families*

Description

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

Usage

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

Arguments

loc	location parameter
scale	scale parameter
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](#), [Gumbel-class](#)

Examples

```
(G1 <- GumbelLocationFamily())
plot(G1)
Map(L2deriv(G1)[[1]])
checkL2deriv(G1)
```

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

```
InfoNorm()

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

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@itwm.fraunhofer.de>

Examples

```

ma <- cbind(1,1,c(1,1,7))
D <- t(ma %*% c(0,1,-1))
isKerAinKerB(D,ma)
isKerAinKerB(ma,D)

```

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@itwm.fraunhofer.de>

References

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

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

See Also

[L2ParamFamily-class](#), [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.

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@itwm.fraunhofer.de>

References

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

See Also

[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 "Euc1RandVariable": 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@itwm.fraunhofer.de>

References

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

See Also

[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@itwm.fraunhofer.de>

References

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

See Also

[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@itwm.fraunhofer.de>

References

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

See Also

[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@itwm.fraunhofer.de>

References

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

See Also

[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)
```

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
L2derivSymm	object of class “FunSymmList”: symmetry of the maps contained in L2deriv
L2derivDistr	object of class “UnivarDistrList”: distribution of L2deriv
L2derivDistrSymm	object of class “DistrSymmList”: symmetry of the distributions contained in L2derivDistr
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 produce objects of class BinomialFamily, PoisFamily GammaFamily, BetaFamily.

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@itwm.fraunhofer.de>

References

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

See Also

[L2ParamFamily-class](#)

Examples

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

L2ParamFamily-class *L2 differentiable parametric family*

Description

Class of L2 differentiable parametric families.

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.

`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

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

`L2derivDistr` object of class "UnivarDistrList": list which includes the distribution of `L2deriv`.

`L2derivDistrSymm` object of class "DistrSymmList": symmetry of the distributions included in `L2derivDistr`.

`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.

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)` 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", "dimms")` where `dimms` 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.
- ...** 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".

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

Author(s)

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

References

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

See Also

[L2ParamFamily](#), [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@itwm.fraunhofer.de>

References

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

See Also

[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@itwm.fraunhofer.de>

References

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

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

See Also

[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

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 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@itwm.fraunhofer.de>

References

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

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

See Also

[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)
```

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, withthetaPar = FALSE,...)
## S4 method for signature 'numeric,ParamFamily'
mleCalc(x, PFam, startPar = NULL,
        penalty = 1e20, Infos = NULL, ...)
## 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>...</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

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

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`.

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.

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

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

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

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

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

criterion.fct signature(object = "MCEstimate"): accessor function for slot `criterion.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@itwm.fraunhofer.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)

MDEstimator(x, G)
(m <- MLEstimator(x, G))
m.mle <- as(m, "mle")
par(mfrow=c(1,2))
plot(profile(m))
```

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, ...)
```

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 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>asvar.fct</code>	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
<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.

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)

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Peter Ruckdeschel <Peter.Ruckdeschel@itwm.fraunhofer.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
MCEstimator(x = x, ParamFamily = G, criterion = TotalVarDist,
            crit.name = "Total variation distance")

## 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
distributions(DistrResolution = 1e-8)
MCEstimator(x = x, ParamFamily = G, criterion = HellingerDist,
            crit.name = "Hellinger Distance", startPar = c(1,2))
distributions(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, asvar.fct, na.rm = TRUE, ...)
```

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
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 MatrixorFunction – a transformation for the main parameter
penalty	(non-negative) numeric: penalizes non valid parameter-values
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.

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.

Value

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

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@itwm.fraunhofer.de>

References

Huber, P.J. (1981) *Robust Statistics*. New York: Wiley.
 Rieder, H. (1994) *Robust Asymptotic Statistics*. New York: Springer.

See Also

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

Examples

```
## (empirical) Data
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)

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

## von Mises minimum distance estimator with default mu
MDEstimator(x = x, ParamFamily = G, distance = CvMDist,
             asvar.fct = distrMod::.CvMMDCovariance)
### variance routine is still in testing phase so not yet
### exported to namespace
## von Mises minimum distance estimator with mu = N(0,1)
MDEstimator(x = x, ParamFamily = G, distance = CvMDist, mu = Norm())

## Total variation minimum distance estimator
## gamma distributions are discretized
MDEstimator(x = x, ParamFamily = G, distance = TotalVarDist)
## 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))
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)
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
<code>fun</code>	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.)
<code>startPar</code>	value of argument <code>StartPar</code> — starting parameter used.
<code>...</code>	further arguments to be passed to <code>optim / optimize</code>
<code>object</code>	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

`mleRes` a list of prescribed structure to be digested in functions `mceCalc` and `mleCalc` by the internal helper function `.process.mceCalcRes`.

`get.criterion.fct` a function; see details below;

`samplesize` numeric

Author(s)

Peter Ruckdeschel <Peter.Ruckdeschel@itwm.fraunhofer.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, na.rm = TRUE, ...)
```

Arguments

`x` (empirical) data

`ParamFamily` object of class "ParamFamily"

`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
na.rm	logical: if TRUE, the estimator is evaluated at <code>complete.cases(x)</code> .
...	further arguments to <code>criterion</code> or <code>optimize</code> or <code>optim</code> , respectively.

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@itwm.fraunhofer.de>

See Also

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

Examples

```
#####
## 1. Binomial data
#####
## (empirical) data
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
```

```

x <- rnorm(100)

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

#####
## 4. Gamma model
#####
## (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))

## 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
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 '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 L2ParamFamily — 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?
...	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)
NbinomMeanSizeFamily(size = 1, mean = 0.5, trafo)
```

Arguments

<code>size</code>	number of trials
<code>prob</code>	probability of success
<code>mean</code>	alternative parameter for negative binomial parameter
<code>trafo</code>	function in param or matrix: transformation of the parameter

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@itwm.fraunhofer.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@itwm.fraunhofer.de>

References

- Rieder, H. (1994) *Robust Asymptotic Statistics*. New York: Springer.
- Ruckdeschel, P. (2005) Optimally One-Sided Bounded Influence Curves. *Mathematical Methods in Statistics* 14(1), 105-131.
- Kohl, M. (2005) *Numerical Contributions to the Asymptotic Theory of Robustness*. Bayreuth: Dissertation.

See Also

[onesidedBias-class](#)

Examples

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

NonSymmetric

Generating function for NonSymmetric-class

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 *Class for Non-symmetric Functions*

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@itwm.fraunhofer.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

Generating function for normal scale families

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@itwm.fraunhofer.de>

References

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

See Also

[NormType-class](#)

Examples

```
NormType()
```

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@itwm.fraunhofer.de>

References

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

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

See Also

[BiasType-class](#)

Examples

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

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@itwm.fraunhofer.de>

References

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

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

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

See Also

[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@itwm.fraunhofer.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),
  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),
  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. Gumbel location family
theta <- 0
names(theta) <- "loc"
GL <- ParamFamily(name = "Gumbel location family",
  param = ParamFamParameter(name = "location parameter", main = theta),
  startPar = function(x,...) c(min(x),max(x)),
  distribution = Gumbel(loc = 0, scale = 1), ## scale known!
  modifyParam = function(theta){ Gumbel(loc = theta, scale = 1) },
  props = paste(c("The Gumbel location family is invariant under",
    "the group of transformations 'g(x) = x + loc'",
    "with location parameter 'loc'"), collapse = " "))
GL

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

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

## 9. Gamma family
theta <- c(1, 2)
names(theta) <- c("scale", "shape")
G <- ParamFamily(name = "Gamma family",
  param = ParamFamParameter(name = "scale and shape", main = theta),
  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.

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`.

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	<i>Generating function for ParamFamParameter-class</i>
-------------------	--------------------------------------------------------

Description

Generates an object of class "ParamFamParameter".

Usage

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

Arguments

name	(optional) character string: name of parameter
main	numeric vector: main parameter
nuisance	(optional) numeric vector: nuisance paramter
fixed	(optional) numeric vector: fixed part of the paramter
trafo	(optional) MatrixorFunction: transformation of the parameter

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"

Author(s)

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

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.
show signature(object = "ParamFamParameter")

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@itwm.fraunhofer.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@itwm.fraunhofer.de>

References

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

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

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

See Also

[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	<i>Family of probability measures</i>
------------------	---------------------------------------

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".

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@itwm.fraunhofer.de>

References

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

See Also

[QFNorm-class](#)

Examples

```
QFNorm()

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

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@itwm.fraunhofer.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. In this context, `qqplot` produces a QQ plot of data (argument `x`) against a (model) distribution. Graphical parameters may be given as arguments to `qqplot`.

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, xlab = deparse(substitute(x)),ylab = deparse(substitute(y)),
  ..., width = 10, height = 5.5, withSweave = getdistrOption("withSweave"),
  mfColRow = TRUE, n.CI = n, withLab = FALSE, lab.pts = NULL, which.lbs = NULL,
  which.Order = NULL, 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"),
  cex.pch = par("cex"), col.pch = par("col"),
  cex.lbl = par("cex"), col.lbl = par("col"), adj.lbl = NULL,
  jit.fac = 0, 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)
## 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)), ...)
```

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 <code>qqplot</code>)?
xlab	x-label
ylab	y-label
...	further parameters for method <code>qqplot</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
withLab	logical; shall observation labels be plotted in?
lab.pt	character or NULL; observation labels to be used
which.lbs	integer or NULL; which observations shall be labelled
which.Order	integer or NULL; which of the ordered (remaining) observations shall be labelled
order.traf	function or NULL; an optional trafo by which the observations are ordered (as <code>order(trafo(obs))</code>).
col.IdL	color for the identity line
lty.IdL	line type for the identity line
lwd.IdL	line width for the identity line
alpha.CI	confidence level
exact.pCI	logical; shall pointwise CIs be determined with exact Binomial distribution?
exact.sCI	logical; shall simultaneous CIs be determined with exact Kolmogorov distribution?
nosym.pCI	logical; shall we use (shortest) asymmetric CIs?
col.pCI	color for the pointwise CI
lty.pCI	line type for the pointwise CI
lwd.pCI	line width for the pointwise CI
pch.pCI	symbol for points (for discrete mass points) in pointwise CI
cex.pCI	magnification factor for points (for discrete mass points) in pointwise CI
col.sCI	color for the simultaneous CI
lty.sCI	line type for the simultaneous CI
lwd.sCI	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>cex.pch</code>	magnification factor for the plotted symbols
<code>col.pch</code>	color for the plotted symbols
<code>cex.lbl</code>	magnification factor for the plotted observation labels
<code>col.lbl</code>	color for the plotted observation labels
<code>adj.lbl</code>	adj parameter for the plotted observation labels
<code>jit.fac</code>	jittering factor used for discrete distributions
<code>check.NotInSupport</code>	logical; shall we check if all x-quantiles lie in support(y)?
<code>col.NotInSupport</code>	logical; if preceding check TRUE color of x-quantiles if not in support(y)
<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

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.

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> .

Author(s)

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

References

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

See Also

`qqplot` from package **stats** – the standard QQ plot function, `qqplot` from package **distr** for comparisons of distributions, and `qqbounds`, used by `qqplot` to produce confidence intervals.

Examples

```
qqplot(r(Norm(15,sqrt(30)))(40), Chisq(df=15))
qqplot(r(Norm(15,sqrt(30)))(40), NormLocationFamily())
```

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	<i>Generating function for SelfNorm-class</i>
----------	-----------------------------------------------

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

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

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@itwm.fraunhofer.de>

References

- Rieder, H. (1994) *Robust Asymptotic Statistics*. New York: Springer.
- Ruckdeschel, P. (2005) Optimally One-Sided Bounded Influence Curves. *Mathematical Methods in Statistics* 14(1), 105-131.
- Kohl, M. (2005) *Numerical Contributions to the Asymptotic Theory of Robustness*. Bayreuth: Dissertation.

See Also

[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@itwm.fraunhofer.de>

References

- Rieder, H. (1994) *Robust Asymptotic Statistics*. New York: Springer.
- Ruckdeschel, P. (2005) Optimally One-Sided Bounded Influence Curves. *Mathematical Methods in Statistics* 14(1), 105-131.
- Kohl, M. (2005) *Numerical Contributions to the Asymptotic Theory of Robustness*. Bayreuth: Dissertation.

See Also

[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 '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 <code>param</code> of class <code>ParamFamParameter</code> and return a list of length two with named components <code>fval</code> (the function value, see below) and <code>mat</code> (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 `list(fval, mat)` where `fval` is the function value $\tau(\theta)$ of the transformation, and `mat`, 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

Trace of asymptotic covariance

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 '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 'GammaFamily'
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.

`L2ScaleFamily` 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`)

`L2LocationFamily` checks if the parameter is finite by `is.finite`, if its length is 1

`L2LocationScaleFamily` checks if the scale parameter is finite by `is.finite`, if its length is 1 or 2 (e.g. if one features as nuisance parameter), and if it is strictly larger than 0 (upto argument `tol`)

`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`)

`GammaFamily` checks if both parameters are finite by `is.finite`, if their length is 1 or 2 (e.g. if one features as nuisance parameter), and if both are 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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