Package: NetSimR (via r-universe)

September 3, 2024

Type Package

Title Actuarial Functions for Non-Life Insurance Modelling

Version 0.1.5

Author Yiannis Parizas [aut, cre]

Maintainer Yiannis Parizas <yiannis.parizas@gmail.com>

Description Assists actuaries and other insurance modellers in pricing, reserving and capital modelling for non-life insurance and reinsurance modelling. Provides functions that help model excess levels, capping and pure Incurred but not reported claims (pure IBNR). Includes capped mean, exposure curves and increased limit factor curves (ILFs) for LogNormal, Gamma, Pareto, Sliced LogNormal-Pareto and Sliced Gamma-Pareto distributions. Includes mean, probability density function (pdf), cumulative probability function (cdf) and inverse cumulative probability function for Sliced LogNormal-Pareto and Sliced Gamma-Pareto distributions. Includes calculating pure IBNR exposure with LogNormal and Gamma distribution for reporting delay. Includes three shiny tools, one to simulate insurance claims applying reinsurance structures, fit generalised linear models and fit claims frequency or severity distributions. Methods used in the package refer to Free for All by Yiannis Parizas (2023) <https://www.theactuary.com/2023/03/02/free-all>; Escaping the triangle by Yiannis Parizas (2019) <https://www.theactuary.com/features/2019/06/2019/06/05/escaping-triangle>; Take to excess by Yiannis Parizas (2019) <https://www.theactuary.com/features/2019/03/2019/03/06/taken-excess>.

License GPL-3

Encoding UTF-8

Imports rmarkdown, shiny, shinybusy, future.apply, scales, future, methods, DBI, RMySQL, RODBC, RPostgreSQL, RSQLite, plotly, shinyjs, MASS, fitdistrplus, shinyWidgets, Pareto

Suggests knitr, crch, testthat

VignetteBuilder knitr

RoxygenNote 7.2.3

NeedsCompilation no

Date/Publication 2023-12-02 08:10:02 UTC

Repository https://netsimanalytics.r-universe.dev

RemoteUrl https://github.com/cran/NetSimR

RemoteRef HEAD

RemoteSha 691cb2bf16c4b27501674c3d8212260cd3c7eafa

Contents

`apply_deductible_limit` *Apply a deductible and limit to claims*

Description

Apply a deductible and limit to claims

Usage

```
apply_deductible_limit(
  gross_claims_data,
  reinsurance_structure,
  deductible,
  limit
)
```

Arguments

`gross_claims_data`	A vector of Claims.
`reinsurance_structure`	The chosen reinsurance structure. Options are: 'No Reinsurance Structure', 'Unlimited Layer', 'Limited Layer', 'Exclude Layer'.
`deductible`	The deductible of the reinsurance structure.
`limit`	The limit of the reinsurance structure.

Value

The ceded claims for the structure, with the chosen deductible and limit.

Examples

```
apply_deductible_limit(c(100, 50, 20), 'Limited Layer', 40, 20)
apply_deductible_limit(c(100, 50, 20), 'Limited Layer', 10, 30)
```

`apply_severity_cap` *Apply severity cap function*

Description

Apply severity cap function

Usage

```
apply_severity_cap(claims, severity_cap_boolean, severity_cap_amount)
```

Arguments

`claims`	A vector of Claims.
`severity_cap_boolean`	A variable that if true, the function will cap the claims, otherwise will just return them.
`severity_cap_amount`	The claim cap value.

Value

If `severity_cap_boolean` is true, then will return the minimum of `severity_cap_amount` or `claims` otherwise will return `claims`. The operation is vectorised.

`distributionClass-class`
The class of the distribution objects

Description

The class of the distribution objects

distribution_fitting_tool_Server

Server function for the Distribution Fitting tool application

Description

Server function for the Distribution Fitting tool application

Usage

```
distribution_fitting_tool_Server(input, output, session)
```

Arguments

input	Input for the server function.
output	Output for the server function.
session	Session for the server function.

Value

Returns server rendering for the shiny application.

distribution_fitting_tool_UI

UI file for the Shiny glm fitting tool

Description

UI file for the Shiny glm fitting tool

Usage

```
distribution_fitting_tool_UI
```

Format

An object of class `shiny.tag.list` (inherits from `list`) of length 4.

Value

Returns the UI code for the shiny application.

`dSlicedGammaPareto` *The probability density function (pdf) of a Sliced Gamma Pareto severity distribution*

Description

The probability density function (pdf) of a Sliced Gamma Pareto severity distribution

Usage

```
dSlicedGammaPareto(x, GShape, GRate, SlicePoint, PShape)
```

Arguments

`x`	A positive real number - the claim amount where the probability density function (pdf) will be evaluated.
`GShape`	A positive real number - the shape parameter of the attritional Claim Severity's Gamma distribution.
`GRate`	A positive real number - the rate parameter of the attritional Claim Severity's Gamma distribution.
`SlicePoint`	A positive real number - the slice point and the scale parameter of the tail Claim Severity's Pareto distribution.
`PShape`	A positive real number - the shape parameter of the tail Claim Severity's Pareto distribution.

Value

The value of the probability density function (pdf) at `x` with an attritional claim Gamma distribution with parameters `GShape` and `GRate` and a large claim Pareto distribution with parameters `SlicePoint` and `PShape`.

Examples

```
dSlicedGammaPareto(3000,1,0.0005,1000,1.2)
dSlicedGammaPareto(1000,1.1,0.0006,2000,1.6)
dSlicedGammaPareto(2000,1.2,0.0004,3000,1.4)
```

`dSlicedLNormPareto` *The probability density function (pdf) of a Sliced LogNormal Pareto severity distribution*

Description

The probability density function (pdf) of a Sliced LogNormal Pareto severity distribution

Usage

```
dSlicedLNormPareto(x, mu, sigma, SlicePoint, shape)
```

Arguments

`x`	A positive real number - the claim amount where the probability density function (pdf) will be evaluated.
`mu`	A real number - the first parameter of the attritional Claim Severity's LogNormal distribution.
`sigma`	A positive real number - the second parameter of the attritional Claim Severity's LogNormal distribution.
`SlicePoint`	A positive real number - the slice point and the scale parameter of the Claim Severity's Pareto distribution.
`shape`	A positive real number - the shape parameter of the Claim Severity's Pareto distribution.

Value

The value of the probability density function (pdf) at `x` with an attritional claim LogNormal distribution with parameters `mu` and `sigma` and a large claim Pareto distribution with parameters `SlicePoint` and `shape`.

Examples

```
dSlicedLNormPareto(1200,6,1.5,1000,1.2)
dSlicedLNormPareto(4000,7,1.6,3000,1.4)
```

erf *Error function*

Description

Error function

Usage

```
erf(x)
```

Arguments

x	A real number.

Value

The value of the error function at x.

Examples

```
erf(0.1)
erf(0.5)
```

ExposureCurveGamma *Exposure Curve from a Gamma severity distribution*

Description

Exposure Curve from a Gamma severity distribution

Usage

```
ExposureCurveGamma(x, shape, rate)
```

Arguments

x	A positive real number - the claim amount where the exposure curve will be evaluated.
shape	A positive real number - the shape parameter of the Claim Severity's Gamma distribution.
rate	A positive real number - the rate parameter of the Claim Severity's Gamma distribution.

Value

The value of the Exposure curve at `x` with Claim Severity from a Gamma distribution with parameters `shape` and `rate`.

Examples

```
ExposureCurveGamma(700,1,0.0005)
ExposureCurveGamma(1000,1.5,0.0006)
```

ExposureCurveLNorm *Exposure Curve from LogNormal a severity distribution*

Description

Exposure Curve from LogNormal a severity distribution

Usage

```
ExposureCurveLNorm(x, mu, sigma)
```

Arguments

`x`	A positive real number - the claim amount where the exposure curve will be evaluated.
`mu`	A real number - the first parameter of the Claim Severity's LogNormal distribution.
`sigma`	A positive real number - the second parameter of the Claim Severity's LogNormal distribution.

Value

The value of the Exposure curve at `x` with Claim Severity from a LogNormal distribution with parameters `mu` and `sigma`.

Examples

```
ExposureCurveLNorm(2000,6,1.5)
ExposureCurveLNorm(1000,5,1.6)
```

ExposureCurvePareto *Exposure Curve from a Pareto severity distribution*

Description

Exposure Curve from a Pareto severity distribution

Usage

```
ExposureCurvePareto(x, scale, shape)
```

Arguments

x	A positive real number - the claim amount where the exposure curve will be evaluated.
scale	A positive real number - the scale parameter of the Claim Severity's Pareto distribution.
shape	A positive real number - the shape parameter of the Claim Severity's Pareto distribution.

Value

The value of the Exposure curve at x with Claim Severity from a Pareto distribution with parameters scale and shape.

Examples

```
ExposureCurvePareto(700,500,1.2)
ExposureCurvePareto(20000,200,1.1)
```

ExposureCurveSlicedGammaPareto *Exposure Curve from a Sliced Gamma Pareto severity distribution*

Description

Exposure Curve from a Sliced Gamma Pareto severity distribution

Usage

```
ExposureCurveSlicedGammaPareto(x, GShape, GRate, SlicePoint, PShape)
```

Arguments

x	A positive real number - the claim amount where the exposure curve will be evaluated.
GShape	A positive real number - the shape parameter of the Claim Severity's Gamma distribution.
GRate	A positive real number - the rate parameter of the Claim Severity's Gamma distribution.
SlicePoint	A positive real number - the slice point and the scale parameter of the Claim Severity's Pareto distribution.
PShape	A positive real number - the shape parameter of the Claim Severity's Pareto distribution.

Value

The value of the Exposure curve at x with an attritional claim Gamma distribution with parameters GShape and GRate and a large claim Pareto distribution with parameters SlicePoint and PShape.

Examples

```
ExposureCurveSlicedGammaPareto(3000,1,0.0005,1000,1.2)
ExposureCurveSlicedGammaPareto(1000,1.1,0.0006,2000,1.6)
ExposureCurveSlicedGammaPareto(2000,1.2,0.0004,3000,1.4)
```

ExposureCurveSlicedLNormPareto

Exposure Curve from a Sliced LogNormal Pareto severity distribution

---

Description

Exposure Curve from a Sliced LogNormal Pareto severity distribution

Usage

```
ExposureCurveSlicedLNormPareto(x, mu, sigma, SlicePoint, shape)
```

Arguments

x	A positive real number - the claim amount where the exposure curve will be evaluated.
mu	A real number - the first parameter of the attritional Claim Severity's LogNormal distribution.
sigma	A positive real number - the second parameter of the attritional Claim Severity's LogNormal distribution.
SlicePoint	A positive real number - the slice point and the scale parameter of the tail Claim Severity's Pareto distribution.
shape	A positive real number - the shape parameter of the tail Claim Severity's Pareto distribution.

Value

The value of the Exposure curve at `x` with an attritional claim LogNormal distribution with parameters `mu` and `sigma` and a large claim Pareto distribution with parameters `SlicePoint` and `shape`.

Examples

```
ExposureCurveSlicedLNormPareto(1200,6,1.5,1000,1.2)
ExposureCurveSlicedLNormPareto(4000,7,1.6,3000,1.4)
```

`freq_dist_options` *A vector with the frequency distribution objects*

Description

A vector with the frequency distribution objects

Usage

```
freq_dist_options
```

Format

An object of class `list` of length 4.

Value

The frequency distribution objects.

`freq_dist_parameter_placeholders` *A data frame with the frequency distribution parameter placeholders*

Description

A data frame with the frequency distribution parameter placeholders

Usage

```
freq_dist_parameter_placeholders
```

Format

An object of class `data.frame` with 2 rows and 2 columns.

Value

The frequency distribution parameter placeholders.

GammaCappedMean *Gamma capped mean*

Description

Gamma capped mean

Usage

```
GammaCappedMean(cap, shape, rate)
```

Arguments

cap	A positive real number - the claim severity cap.
shape	A positive real number - the shape parameter of the Claim Severity's Gamma distribution.
rate	A positive real number - the rate parameter of the Claim Severity's Gamma distribution.

Value

The mean of the claim severity capped at cap with a Gamma distribution with parameters shape and rate.

Examples

```
GammaCappedMean(700,1,0.0005)
GammaCappedMean(1000,1.5,0.0006)
```

GLMFittingToolServer *Server function for the GLM Fitting tool application*

Description

Server function for the GLM Fitting tool application

Usage

```
GLMFittingToolServer(input, output, session)
```

Arguments

input	Input for the server function.
output	Output for the server function.
session	Session for the server function.

Value

Returns server rendering for the shiny application.

`GLMFittingToolUI` *UI file for the Shiny glm fitting tool*

Description

UI file for the Shiny glm fitting tool

Usage

```
GLMFittingToolUI
```

Format

An object of class `shiny.tag.list` (inherits from `list`) of length 4.

Value

Returns the UI code for the shiny application.

`IGamma` *Lower incomplete gamma function*

Description

Lower incomplete gamma function

Usage

```
IGamma(a, x)
```

Arguments

`a`	A positive real number.
`x`	A positive real number.

Value

The value of the lower incomplete gamma function at `x` with shape parameter `a`.

Examples

```
IGamma(1,1)
IGamma(0.1,2)
```

ILFGamma — *Increased Limit Factor Curve from a Gamma severity distribution*

Description

Increased Limit Factor Curve from a Gamma severity distribution

Usage

```
ILFGamma(xLow, xHigh, shape, rate)
```

Arguments

xLow	A positive real number - the claim amount where the Increased Limit Factor Curve will be evaluated from.
xHigh	A positive real number - the claim amount where the Increased Limit Factor Curve will be evaluated to.
shape	A positive real number - the shape parameter of the Claim Severity's Gamma distribution.
rate	A positive real number - the rate parameter of the Claim Severity's Gamma distribution.

Value

The value of the Increased Limit Factor curve from xLow to xHigh with Claim Severity from a Gamma distribution with parameters shape and rate.

Examples

```
ILFGamma(1000,700,1,0.0005)
ILFGamma(1200,1000,1.5,0.0006)
```

ILFLNorm — *Increased Limit Factor Curve from a LogNormal severity distribution*

Description

Increased Limit Factor Curve from a LogNormal severity distribution

Usage

```
ILFLNorm(xLow, xHigh, mu, sigma)
```

Arguments

xLow	A positive real number - the claim amount where the Increased Limit Factor Curve will be evaluated from.
xHigh	A positive real number - the claim amount where the Increased Limit Factor Curve will be evaluated to.
mu	A real number - the first parameter of the Claim Severity's LogNormal distribution.
sigma	A positive real number - the second parameter of the Claim Severity's LogNormal distribution.

Value

The value of the Increased Limit Factor curve from xLow to xHigh with Claim Severity from a LogNormal distribution with parameters mu and sigma.

Examples

```
ILFLNorm(1000,2000,6,1.5)
ILFLNorm(1000,1500,5,1.6)
```

ILFPareto *Increased Limit Factor Curve from a Pareto severity distribution*

Description

Increased Limit Factor Curve from a Pareto severity distribution

Usage

```
ILFPareto(xLow, xHigh, scale, shape)
```

Arguments

xLow	A positive real number - the claim amount where the Increased Limit Factor Curve will be evaluated from.
xHigh	A positive real number - the claim amount where the Increased Limit Factor Curve will be evaluated to.
scale	A positive real number - the scale parameter of the Claim Severity's Pareto distribution.
shape	A positive real number - the shape parameter of the Claim Severity's Pareto distribution.

Value

The value of the Increased Limit Factor curve from xLow to xHigh with Claim Severity from a Pareto distribution with parameters scale and shape.

Examples

```
ILFPareto(700,1200,500,1.2)
ILFPareto(1200,20000,200,1.1)
```

`ILFSlicedGammaPareto` *Increased Limit Factor Curve from a Sliced Gamma Pareto severity distribution*

Description

Increased Limit Factor Curve from a Sliced Gamma Pareto severity distribution

Usage

```
ILFSlicedGammaPareto(xLow, xHigh, GShape, GRate, SlicePoint, PShape)
```

Arguments

`xLow`	A positive real number - the claim amount where the Limit Factor Curve will be evaluated from.
`xHigh`	A positive real number - the claim amount where the Limit Factor Curve will be evaluated to.
`GShape`	A positive real number - the shape parameter of the attritional Claim Severity's Gamma distribution.
`GRate`	A positive real number - the rate parameter of the attritional Claim Severity's Gamma distribution.
`SlicePoint`	A positive real number - the slice point and the scale parameter of the tail Claim Severity's Pareto distribution.
`PShape`	A positive real number - the shape parameter of the tail Claim Severity's Pareto distribution.

Value

The value of the Increased Limit Factor curve from `xLow` to `xHigh` with an attritional claim Gamma distribution with parameters `GShape` and `GRate` and a large claim Pareto distribution with parameters `SlicePoint` and `PShape`.

Examples

```
ILFSlicedGammaPareto(2000,3000,1,0.0005,1000,1.2)
ILFSlicedGammaPareto(800,1000,1.1,0.0006,2000,1.6)
ILFSlicedGammaPareto(1200,2000,1.2,0.0004,3000,1.4)
```

`ILFSlicedLNormPareto` *Increased Limit Factor Curve from a Sliced LogNormal Pareto severity distribution*

Description

Increased Limit Factor Curve from a Sliced LogNormal Pareto severity distribution

Usage

```
ILFSlicedLNormPareto(xLow, xHigh, mu, sigma, SlicePoint, shape)
```

Arguments

`xLow`	A positive real number - the claim amount where the Limit Factor Curve will be evaluated from.
`xHigh`	A positive real number - the claim amount where the Limit Factor Curve will be evaluated to.
`mu`	A real number - the first parameter of the attritional Claim Severity's LogNormal distribution.
`sigma`	A positive real number - the second parameter of the attritional Claim Severity's LogNormal distribution.
`SlicePoint`	A positive real number - the slice point and the scale parameter of the tail Claim Severity's Pareto distribution.
`shape`	A positive real number - the shape parameter of the tail Claim Severity's Pareto distribution.

Value

The value of the Increased Limit Factor curve from `xLow` to `xHigh` with an attritional claim LogNormal distribution with parameters `mu` and `sigma` and a large claim Pareto distribution with parameters `SlicePoint` and `shape`.

Examples

```
ILFSlicedLNormPareto(800,1200,6,1.5,1000,1.2)
ILFSlicedLNormPareto(2000,4000,7,1.6,3000,1.4)
```

LNormCappedMean *Lognormal capped mean*

Description

Lognormal capped mean

Usage

```
LNormCappedMean(cap, mu, sigma)
```

Arguments

cap	A positive real number - the claim severity cap.
mu	A real number - the first parameter of the Claim Severity's LogNormal distribution.
sigma	A positive real number - the second parameter of the Claim Severity's LogNormal distribution.

Value

The mean of the claim severity capped at cap with a LogNormal distribution with parameters mu and sigma.

Examples

```
LNormCappedMean(2000,6,1.5)
LNormCappedMean(1000,5,1.6)
```

max_number_of_pareto_slices *Parameter to set the maximum number of pareto slices*

Description

Parameter to set the maximum number of pareto slices

Usage

```
max_number_of_pareto_slices
```

Format

An object of class numeric of length 1.

Value

The the maximum number of Pareto Slices.

NetSimR *NetSimR: A non-life insurance package for computating various statistics.*

Description

The NetSimR package provides three categories of functions:

1. Capped means, Exposure and ILF curve from various severity distributions
2. Pure IBNR and UPR earned periods
3. Sliced distributions

NetSimR mean functions

SlicedGammaParetoMean SlicedLNormParetoMean

NetSimR capped mean functions

GammaCappedMean LNormCappedMean ParetoCappedMean SlicedGammaParetoCappedMean SlicedLNormParetoCappedMe

NetSimR exposure curve functions

ExposureCurveGamma ExposureCurveLNorm ExposureCurvePareto ExposureCurveSlicedGammaPareto ExposureCurveSlicedLNormPareto

NetSimR ILF curve functions

ILFGamma ILFLNorm ILFPareto ILFSlicedGammaPareto ILFSlicedLNormPareto

NetSimR pure IBNR functions

PureIBNRGamma PureIBNRLNorm

NetSimR Sliced distribution functions

dSlicedGammaPareto dSlicedLNormPareto pSlicedGammaPareto pSlicedLNormPareto qSlicedGammaPareto qSlicedLNormPareto

ParetoCappedMean *Pareto capped mean*

Description

Pareto capped mean

Usage

```
ParetoCappedMean(cap, scale, shape)
```

Arguments

cap	A positive real number - the claim severity cap.
scale	A positive real number - the scale parameter of the Claim Severity's Pareto distribution.
shape	A positive real number - the shape parameter of the Claim Severity's Pareto distribution.

Value

The mean of the claim severity capped at cap with a Pareto distribution with parameters scale and shape.

Examples

```
ParetoCappedMean(600,200,1.2)
ParetoCappedMean(800,100,1)
ParetoCappedMean(1000,500,0.8)
```

ParetoCappedMeanCalc *Pareto capped mean intermediary calculation*

Description

Pareto capped mean intermediary calculation

Usage

```
ParetoCappedMeanCalc(cap, scale, shape)
```

Arguments

cap	A positive real number - the claim severity cap.
scale	A positive real number - the scale parameter of the Claim Severity's Pareto distribution.
shape	A positive real number - the shape parameter of the Claim Severity's Pareto distribution.

Value

An interim calculation for the mean of the claim severity capped at cap with a Pareto distribution with parameters scale and shape.

Examples

```
ParetoCappedMeanCalc(800,100,1.1)
ParetoCappedMeanCalc(1000,500,0.9)
```

---

pSlicedGammaPareto *The cumulative density function (cdf) of a Sliced Gamma-Pareto severity distribution*

Description

The cumulative density function (cdf) of a Sliced Gamma-Pareto severity distribution

Usage

```
pSlicedGammaPareto(x, GShape, GRate, SlicePoint, PShape)
```

Arguments

x	A positive real number - the claim amount where the cumulative density function (cdf) will be evaluated.
GShape	A positive real number - the shape parameter of the attritional Claim Severity's Gamma distribution.
GRate	A positive real number - the rate parameter of the attritional Claim Severity's Gamma distribution.
SlicePoint	A positive real number - the slice point and the scale parameter of the tail Claim Severity's Pareto distribution.
PShape	A positive real number - the shape parameter of the tail Claim Severity's Pareto distribution.

Value

The value of the cumulative density function (cdf) at x with an attritional claim Gamma distribution with parameters GShape and GRate and a large claim Pareto distribution with parameters SlicePoint and PShape.

Examples

```
pSlicedGammaPareto(3000,1,0.0005,1000,1.2)
pSlicedGammaPareto(1000,1.1,0.0006,2000,1.6)
pSlicedGammaPareto(2000,1.2,0.0004,3000,1.4)
```

---

pSlicedLNormPareto *The cumulative density function (cdf) of a Sliced LogNormal Pareto severity distribution*

Description

The cumulative density function (cdf) of a Sliced LogNormal Pareto severity distribution

Usage

```
pSlicedLNormPareto(x, mu, sigma, SlicePoint, shape)
```

Arguments

x	A positive real number - the claim amount where the cumulative density function (cdf) will be evaluated.
mu	A real number - the first parameter of the attritional Claim Severity's LogNormal distribution.
sigma	A positive real number - the second parameter of the attritional Claim Severity's LogNormal distribution.
SlicePoint	A positive real number - the slice point and the scale parameter of the tail Claim Severity's Pareto distribution.
shape	A positive real number - the shape parameter of the tail Claim Severity's Pareto distribution.

Value

The value of the cumulative density function (cdf) at x with an attritional claim LogNormal distribution with parameters mu and sigma and a large claim Pareto distribution with parameters SlicePoint and shape.

Examples

```
pSlicedLNormPareto(1200,6,1.5,1000,1.2)
pSlicedLNormPareto(4000,7,1.6,3000,1.4)
```

PureIBNRGamma *Pure IBNR exposure from a Gamma reporting delay distribution*

Description

Pure IBNR exposure from a Gamma reporting delay distribution

Usage

```
PureIBNRGamma(IncDate, ExpDate, ValDate, shape, rate)
```

Arguments

IncDate	A date - the inception date of the period.
ExpDate	A date - the expiry date of the period. Must be greater than inception date.
ValDate	A date - the valuation date.
shape	A positive real number - the shape parameter of the reporing delay's Gamma distribution.
rate	A positive real number - the rate parameter of the reporing delay's Gamma distribution.

Value

Unearned and Pure IBNR exposure in days and as a percentage of the period's duration, where the reporting delay has a Gamma distribution with parameters shape and rate.

Examples

```
Dates = data.frame(
    inceptionDate = c("01/01/2006", "01/07/2006", "01/01/2007")
    ,expiryDate = c("31/12/2006", "30/06/2007", "31/12/2007")
)

Dates$inceptionDate<-as.POSIXct(Dates$inceptionDate, format="%d/%m/%Y")

Dates$expiryDate<-as.POSIXct(Dates$expiryDate, format="%d/%m/%Y")

ValuationDate<-as.POSIXct("30/10/2007", format="%d/%m/%Y")

PureIBNRGamma(Dates$inceptionDate,Dates$expiryDate,ValuationDate,7,0.15)
```

PureIBNRLNorm *Pure IBNR exposure from a LogNormal reporting delay distribution*

Description

Pure IBNR exposure from a LogNormal reporting delay distribution

Usage

```
PureIBNRLNorm(IncDate, ExpDate, ValDate, mu, sigma)
```

Arguments

IncDate	A date - the inception date of the period.
ExpDate	A date - the expiry date of the period. Must be greater than inception date.
ValDate	A date - the valuation date.
mu	A real number - the first parameter of the reporing delay's LogNormal distribution.
sigma	A positive real number - the second parameter of the reporing delay's LogNormal distribution.

Value

Unearned and Pure IBNR exposure in days and as a percentage of the period's duration, where the reporting delay has a LogNormal distribution with parameters mu and sigma.

Examples

```
Dates = data.frame(
    inceptionDate = c("01/01/2006", "01/07/2006", "01/01/2007")
    ,expiryDate = c("31/12/2006", "30/06/2007", "31/12/2007")
)

Dates$inceptionDate<-as.POSIXct(Dates$inceptionDate, format="%d/%m/%Y")

Dates$expiryDate<-as.POSIXct(Dates$expiryDate, format="%d/%m/%Y")

ValuationDate<-as.POSIXct("30/10/2007", format="%d/%m/%Y")

PureIBNRLNorm(Dates$inceptionDate,Dates$expiryDate,ValuationDate,4,1.5)
```

qSlicedGammaPareto *The inverse cumulative density function of a Sliced Gamma Pareto severity distribution*

Description

The inverse cumulative density function of a Sliced Gamma Pareto severity distribution

Usage

```
qSlicedGammaPareto(q, GShape, GRate, SlicePoint, PShape)
```

Arguments

q	A real number between 0 and 1 - the probability where the inverse cumulative density function will be evaluated.
GShape	A positive real number - the shape parameter of the attritional Claim Severity's Gamma distribution.
GRate	A positive real number - the rate parameter of the attritional Claim Severity's Gamma distribution.
SlicePoint	A positive real number - the slice point and the scale parameter of the tail Claim Severity's Pareto distribution.
PShape	A positive real number - the shape parameter of the tail Claim Severity's Pareto distribution.

Value

The value of the inverse cumulative density function at q with an attritional claim Gamma distribution with parameters GShape and GRate and a large claim Pareto distribution with parameters SlicePoint and PShape.

Examples

```
qSlicedGammaPareto(0.5,1,0.0005,1000,1.2)
qSlicedGammaPareto(0.2,1.1,0.0006,2000,1.6)
qSlicedGammaPareto(0.8,1.2,0.0004,3000,1.4)
```

`qSlicedLNormPareto` *The inverse cumulative density function of a Sliced LogNormal Pareto severity distribution*

Description

The inverse cumulative density function of a Sliced LogNormal Pareto severity distribution

Usage

```
qSlicedLNormPareto(q, mu, sigma, SlicePoint, shape)
```

Arguments

`q`	A real number between 0 and 1 - the probability where the inverse cumulative density function will be evaluated.
`mu`	A real number - the first parameter of the attritional Claim Severity's LogNormal distribution.
`sigma`	A positive real number - the second parameter of the attritional Claim Severity's LogNormal distribution.
`SlicePoint`	A positive real number - the slice point and the scale parameter of the tail Claim Severity's Pareto distribution.
`shape`	A positive real number - the shape parameter of the tail Claim Severity's Pareto distribution.

Value

The value of the inverse cumulative density function at `q` with an attritional claim LogNormal distribution with parameters `mu` and `sigma` and a large claim Pareto distribution with parameters `SlicePoint` and `shape`.

Examples

```
qSlicedLNormPareto(0.5,6,1.5,1000,1.2)
qSlicedLNormPareto(0.7,7,1.6,3000,1.4)
```

reinsurance_structures_options *A vector with the reinsurance structure options*

Description

A vector with the reinsurance structure options

Usage

```
reinsurance_structures_options
```

Format

An object of class `character` of length 4.

Value

The reinsurance structure options

rpareto *Random Pareto generator*

Description

Random Pareto generator

Usage

```
rpareto(n, alpha, x_m)
```

Arguments

`n`	Number of values to generate.
`alpha`	A positive real number. Alpha parameter of the Pareto distribution.
`x_m`	A positive real number. The minimum value for the Pareto distribution.

Value

A vector of `n` random Pareto variables with parameters `alpha` and `x_m`.

`run_shiny_distribution_fitting_tool` *A function to run the glm fitting tool application*

Description

A function to run the glm fitting tool application

Usage

```
run_shiny_distribution_fitting_tool()
```

Value

Opens the glm fitting tool application

`run_shiny_glm_fitting_tool` *A function to run the glm fitting tool application*

Description

A function to run the glm fitting tool application

Usage

```
run_shiny_glm_fitting_tool()
```

Value

Opens the glm fitting tool application

`run_shiny_simulator` *A function to run the shiny simulator application*

Description

A function to run the shiny simulator application

Usage

```
run_shiny_simulator()
```

Value

Opens the shiny simulator application

sev_dist_options *A vector with the severity distribution objects*

Description

A vector with the severity distribution objects

Usage

```
sev_dist_options
```

Format

An object of class `list` of length 6.

Value

The severity distribution objects.

sev_dist_parameter_placeholders *A data frame with the severity distribution parameter placeholders*

Description

A data frame with the severity distribution parameter placeholders

Usage

```
sev_dist_parameter_placeholders
```

Format

An object of class `data.frame` with 2 rows and 2 columns.

Value

The severity distribution parameter placeholders.

shiny_simulator_server *Server function for the Shiny Simulator application*

Description

Server function for the Shiny Simulator application

Usage

```
shiny_simulator_server(input, output, session)
```

Arguments

input	Input for the server function.
output	Output for the server function.
session	Session for the server function.

Value

Returns server rendering for the shiny application.

shiny_simulator_ui *UI file for the Shiny GLM Fitting Tool*

Description

UI file for the Shiny GLM Fitting Tool

Usage

```
shiny_simulator_ui
```

Format

An object of class `shiny.tag.list` (inherits from `list`) of length 4.

Value

Returns the UI code for the shiny application.

simulate_function	*A function to simulate frequency - severity of insurance claims. The function applies severity cap, reinsurance structure for each and every loss claim, reinsurance structure for each and aggregate claims. The function allows for piecewise pareto slices.*

Description

A function to simulate frequency - severity of insurance claims. The function applies severity cap, reinsurance structure for each and every loss claim, reinsurance structure for each and aggregate claims. The function allows for piecewise pareto slices.

Usage

```
simulate_function(
  numOfSimulations,
  freq_params,
  sev_params,
  seedSetBinary,
  seedValue,
  freqDistr,
  sevDistr,
  paretoSlice,
  pareto_slice_times,
  slice_pareto_alphas,
  slice_pareto_x_ms,
  sevCapBinary,
  sev_cap_amount,
  reinsuranceStructureEEL,
  reinsurance_structure_eel_dedctible_amount,
  reinsurance_structure_eel_limit_amount,
  reinsuranceStructureAL,
  reinsurance_structure_al_dedctible_amount,
  reinsurance_structure_al_limit_amount,
  reinsuranceStructureLimitedReinstatements,
  reinsuranceStructureReinstatementLimit,
  multiprocessing
)
```

Arguments

numOfSimulations	The number of simulations to run.
freq_params	A vector of the frequency distribution parameters.
sev_params	A vector of the severity distribution parameters.
seedSetBinary	True if there is a fixed seed, otherwise false.

`seedValue` The seed value.

`freqDistr` The frequency distribution. Options are as per the freq_dist_options.

`sevDistr` The severity distribution. Options are as per the sev_dist_options.

`paretoSlice` True if there is Pareto slicing.

`pareto_slice_times`
The number of Pareto slices.

`slice_pareto_alphas`
A vector of Pareto slices' aphla parameters.

`slice_pareto_x_ms`
A vector of Pareto slices' x_m parameters.

`sevCapBinary` True if there is a severity cap.

`sev_cap_amount` The severity cap amount.

`reinsuranceStructureEEL`
The chosen reinsurance structure for each and every loss claim.

`reinsurance_structure_eel_dedctible_amount`
The deductible for each and every loss reinsurance structure.

`reinsurance_structure_eel_limit_amount`
The limit for each and every loss reinsurance structure.

`reinsuranceStructureAL`
The chosen reinsurance structure for aggregate claims.

`reinsurance_structure_al_dedctible_amount`
The deductible for aggregate reinsurance structure.

`reinsurance_structure_al_limit_amount`
The limit for aggregate reinsurance structure.

`reinsuranceStructureLimitedReinstatements`
True if there is a limit in reinstatements, otherwise false.

`reinsuranceStructureReinstatementLimit`
The reinstatement limit.

`multiprocessing`
True if multiprocessing is used, otherwise false.

Value

A data frame with claims counts, ceded claims and the number of reinstatements used.

`SlicedGammaParetoCappedMean`
Sliced Gamma Pareto capped mean

Description

Sliced Gamma Pareto capped mean

Usage

```
SlicedGammaParetoCappedMean(cap, GShape, GRate, SlicePoint, PShape)
```

Arguments

cap	A positive real number - the claim severity cap.
GShape	A positive real number - the shape parameter of the attritional Claim Severity's Gamma distribution.
GRate	A positive real number - the rate parameter of the attritional Claim Severity's Gamma distribution.
SlicePoint	A positive real number - the slice point and the scale parameter of the tail Claim Severity's Pareto distribution.
PShape	A positive real number - the shape parameter of the tail Claim Severity's Pareto distribution.

Value

The mean of the claim severity capped at cap with an attritional claim Gamma distribution with parameters GShape and GRate and a large claim Pareto distribution with parameters SlicePoint and PShape.

Examples

```
SlicedGammaParetoCappedMean(3000,1,0.0005,1000,1.2)
SlicedGammaParetoCappedMean(1000,1.1,0.0006,2000,1.6)
SlicedGammaParetoCappedMean(2000,1.2,0.0004,3000,1.4)
```

SlicedGammaParetoMean *Sliced Gamma Pareto mean*

Description

Sliced Gamma Pareto mean

Usage

```
SlicedGammaParetoMean(GShape, GRate, SlicePoint, PShape)
```

Arguments

GShape	A positive real number - the shape parameter of the attritional Claim Severity's Gamma distribution.
GRate	A positive real number - the rate parameter of the attritional Claim Severity's Gamma distribution.
SlicePoint	A positive real number - the slice point and the scale parameter of the tail Claim Severity's Pareto distribution.
PShape	A positive real number - the Shape parameter of the tail Claim Severity's Pareto distribution.

Value

The mean of the claim severity with an attritional claim Gamma distribution with parameters GShape and GRate and a large claim Pareto distribution with parameters SlicePoint and PShape.

Examples

```
SlicedGammaParetoMean(1,0.0005,1000,1.2)
SlicedGammaParetoMean(1.1,0.0006,2000,1.6)
SlicedGammaParetoMean(1.2,0.0004,3000,1.4)
```

SlicedLNormParetoCappedMean

Sliced LogNormal Pareto capped mean

Description

Sliced LogNormal Pareto capped mean

Usage

```
SlicedLNormParetoCappedMean(cap, mu, sigma, SlicePoint, shape)
```

Arguments

cap	A positive real number - the claim severity cap.
mu	A real number - the first parameter of the attritional Claim Severity's LogNormal distribution.
sigma	A positive real number - the second parameter of the attritional Claim Severity's LogNormal distribution.
SlicePoint	A positive real number - the slice point and the scale parameter of the tail Claim Severity's Pareto distribution.
shape	A positive real number - the shape parameter of the tail Claim Severity's Pareto distribution.

Value

The mean of the claim severity capped at cap with an attritional claim LogNormal distribution with parameters mu and sigma and a large claim Pareto distribution with parameters SlicePoint and shape.

Examples

```
SlicedLNormParetoCappedMean(1200,6,1.5,1000,1.2)
SlicedLNormParetoCappedMean(2500,6.5,1.4,2000,1.6)
SlicedLNormParetoCappedMean(4000,7,1.6,3000,1.4)
```

SlicedLNormParetoMean *Sliced LogNormal Pareto mean*

Description

Sliced LogNormal Pareto mean

Usage

```
SlicedLNormParetoMean(mu, sigma, SlicePoint, shape)
```

Arguments

mu	A real number - the first parameter of the attritional Claim Severity's LogNormal distribution.
sigma	A positive real number - the second parameter of the attritional Claim Severity's LogNormal distribution.
SlicePoint	A positive real number - the slice point and the scale parameter of the tail Claim Severity's Pareto distribution.
shape	A positive real number - the shape parameter of the tail Claim Severity's Pareto distribution.

Value

The mean of the claim severity with an attritional claim LogNormal distribution with parameters mu and sigma and a large claim Pareto distribution with parameters SlicePoint and shape.

Examples

```
SlicedLNormParetoMean(6,1.5,1000,1.2)
SlicedLNormParetoMean(6.5,1.4,2000,1.6)
SlicedLNormParetoMean(7,1.6,3000,1.4)
```

Index