

Package ‘ESG’

November 29, 2020

Type Package

Title A Package for Asset Projection

Version 1.2

Date 2020-11-29

Author Jean-Charles Croix, Thierry Moudiki, Frédéric Planchet, Wassim Youssef

Maintainer Wassim Youssef <Wassim.G.Youssef@gmail.com>

Description Presents a ``Scenarios" class containing general parameters, risk parameters and projection results. Risk parameters are gathered together into a ParamsScenarios sub-object. The general process for using this package is to set all needed parameters in a Scenarios object, use the customPathsGeneration method to proceed to the projection, then use xxx_PriceDistribution() methods to get asset prices.

License GPL (>= 2)

Depends methods

Encoding latin1

Repository CRAN

Date/Publication 2020-11-29 18:10:02 UTC

NeedsCompilation no

R topics documented:

ESG-package	2
Asset_PriceDistribution	4
Bond_PriceDistribution	5
CBond_PriceDistribution	5
CDSPremium_PriceDistribution	6
ConvBond_PriceDistribution	6
customPathsGeneration	7
EuroCall_Stock_PriceDistribution	7
EuroCall_ZC_PriceDistribution	8

EuroPut_Stock_PriceDistribution	8
EuroPut_ZC_PriceDistribution	8
getDefaultSpreadPaths	9
getForwardRates	9
getLiquiditySpreadPaths	9
getParamsBaseScenarios	9
getrealEstatePaths	10
getRiskParamsScenarios	10
getRiskParamsScenariosdefSpr	10
getRiskParamsScenariosliqSpr	11
getRiskParamsScenariosRE	11
getRiskParamsScenariosrt	11
getRiskParamsScenariosS	12
getShortRatePaths	12
getstockPaths	12
getZCRates	13
MartingaleTest	13
ParamsScenarios	14
rAllRisksFactors	14
rAssetDistribution	15
rDefaultSpread	17
rLiquiditySpread	17
rRealEstate	18
rShortRate	18
rStock	19
Scenarios	20
setForwardRates	20
setParamsBaseScenarios	21
setRiskParamsScenarios	21
setRiskParamsScenariosdefSpr	22
setRiskParamsScenariosliqSpr	22
setRiskParamsScenariosRE	23
setRiskParamsScenariosrt	23
setRiskParamsScenariosS	23
setZCRates	24
ZC	24
ZCBond_PriceDistribution	25

Index**26**

ESG-package

*ESG - Economic Scenario Generator***Description**

Risk neutral Economic Scenario Generator.

Details

Package: ESG
 Type: Package
 Version: 1.2
 Date: 2020-11-29
 License: GNU
 Depends: methods

The package is build around the "Scenarios" object.

Use the dedicated methods to set all the needed parameters then use the customPathsGeneration() method to proceed to the asset projection.

Asset_PriceDistribution

Asset_PriceDistribution method

Description

Get a distribution for any asset price. This method is a wrapper for asset specific pricers.

Arguments

type	The name of the asset to price. It must be 'Zero-Coupon', 'Bond', 'CBond', 'EuroCall_UL', 'EuroPut_UL', 'EuroCall_ZC' or 'EuroPut_ZC'.
t	Date of pricing (has to be an integer)
T	Date of maturity for the option
nCoupons	Number of coupons
couponsRate	Rate of coupons
omega	Recoverables in case of default
s	Date of maturity for the underlying
Strike	Strike for options

Examples

```

objScenario <- new("Scenarios")
# Basic scenario's parameters setting
objScenario <- setParamsBaseScenarios(objScenario, horizon = 10, nScenarios = 1000)
# Risk factors parameters setting
objScenario <- setRiskParamsScenariosrt(objScenario, vol = .1, k = 2)
objScenario <- setRiskParamsScenariosS(objScenario, vol = .1, k = 2,
volStock = .2, stock0 = 100, rho=.5)
objScenario <- setRiskParamsScenariosliqSpr(objScenario, eta=.05, liquiditySpread0=.01)
objScenario <- setRiskParamsScenariosdefSpr(objScenario, volDefault=.2,
defaultSpread0=.01, alpha=.1, beta=1)
# Forward and ZC rates setting
  
```

```

data(ZC)
objScenario <- setForwardRates(objScenario, ZC, horizon=10)
objScenario <- setZCRates(objScenario, ZC, horizon=10)
# Projection
objScenario <- customPathsGeneration(objScenario, type="shortRate")
objScenario <- customPathsGeneration(objScenario, type="stock")
objScenario <- customPathsGeneration(objScenario, type="defaultSpread")
objScenario <- customPathsGeneration(objScenario, type="liquiditySpread")
Asset_PriceDistribution(objScenario,type='ConvBond',t=0,T=10,nCoupons=1,couponsRate=0.03)

```

Bond_PriceDistribution

Bond_PriceDistribution method

Description

Get a distribution for bond price.

Arguments

t	Date of pricing (has to be an integer)
T	Date of maturity
nCoupons	Number of coupons
couponsRate	Rate of coupons

CBond_PriceDistribution

CBond_PriceDistribution method

Description

Get a distribution for corporate bond price.

Arguments

t	Date of pricing (has to be an integer)
T	Date of maturity
nCoupons	Number of coupons
couponsRate	Rate of coupons
omega	Recoverables in case of default

CDSPremium_PriceDistribution
CDSPremium_PriceDistribution

Description

Proceed to the projection using the parameters that were previously set into the Scenarios objet.

Arguments

t	Date of pricing (has to be an integer)
T	Date of maturity for the option
omega	Recoverables in case of default

ConvBond_PriceDistribution
ConvBond_PriceDistribution method

Description

Proceed to the projection using the parameters that were previously set into the Scenarios objet.

Arguments

type	The name of the asset for which a projection has to be proceeded. Can be 'short-Rate', 'stock', 'realEstate', 'liquiditySpread' or 'defaultSpread'. If NULL, all assets will be projected.
t	Date of pricing (has to be an integer)
T	Date of maturity for the option
nCoupons	Number of coupons
couponsRate	Rate of coupons

customPathsGeneration *customPathsGeneration method*

Description

Proceed to the projection using the parameters that were previously set into the Scenarios objet.

Arguments

type The name of the asset for which a projection has to be proceeded. Can be 'shortRate', 'stock', 'realEstate', 'liquiditySpread' or 'defaultSpread'. If NULL, all assets will be projected.

Examples

```
objScenario <- new("Scenarios")
# Basic scenario's parameters setting
objScenario <- setParamsBaseScenarios(objScenario, horizon = 10, nScenarios = 1000)
# Risk factors parameters setting
objScenario <- setRiskParamsScenariosrt(objScenario, vol = .1, k = 2)
objScenario <- setRiskParamsScenariosS(objScenario, vol = .1, k = 2,
volStock = .2, stock0 = 100, rho=.5)
objScenario <- setRiskParamsScenariosliqSpr(objScenario, eta=.05, liquiditySpread0=.01)
objScenario <- setRiskParamsScenariosdefSpr(objScenario, volDefault=.2,
defaultSpread0=.01, alpha=.1, beta=1)
# Forward and ZC rates setting
data(ZC)
objScenario <- setForwardRates(objScenario, ZC, horizon=10)
objScenario <- setZCRates(objScenario, ZC, horizon=10)
# Projection
objScenario <- customPathsGeneration(objScenario, type="shortRate")
objScenario <- customPathsGeneration(objScenario, type="stock")
objScenario <- customPathsGeneration(objScenario, type="defaultSpread")
objScenario <- customPathsGeneration(objScenario, type="liquiditySpread")
```

EuroCall_Stock_PriceDistribution

EuroCall_Stock_PriceDistribution method

Description

Get a distribution for EuroCall UL price.

Arguments

t Date of pricing (has to be an integer)
T Date of maturity
Strike Strike of the option

EuroCall_ZC_PriceDistribution

EuroCall_ZC_PriceDistribution method

Description

Get a distribution for EuroCall ZC price.

Arguments

t	Date of pricing (has to be an integer)
T	Date of maturity
s	Date of maturity for the underlying
Strike	Strike of the option

EuroPut_Stock_PriceDistribution

EuroPut_Stock_PriceDistribution method

Description

Get a distribution for EuroPut UL price.

Arguments

t	Date of pricing (has to be an integer)
T	Date of maturity
Strike	Strike of the option

EuroPut_ZC_PriceDistribution

EuroPut_ZC_PriceDistribution method

Description

Get a distribution for EuroPut ZC price.

Arguments

t	Date of pricing (has to be an integer)
T	Date of maturity
s	Date of maturity for the underlying
Strike	Strike of the option

getdefaultSpreadPaths *getdefaultSpreadPaths method*

Description

Get default spread paths for a Scenarios object after projection.

getForwardRates *getForwardRates method*

Description

Get the forward rates for a Scenarios object.

Examples

```
scenarios1 <- new("Scenarios")
scenarios1 <- setParamsBaseScenarios(scenarios1, horizon=5, nScenarios=10)
scenarios1 <- scenarios1 <- setRiskParamsScenarios(scenarios1, vol=.1, k=2, volStock=.2,
volRealEstate=.15, volDefault=.2, alpha=.1, beta=1, eta=.05, rho=.5, stock0=100, realEstate0=50,
liquiditySpread0=.01, defaultSpread0=.01)
data(ZC)
scenarios1 <- setForwardRates(scenarios1, ZC, horizon=5)
getForwardRates(scenarios1)
```

getLiquiditySpreadPaths
getLiquiditySpreadPaths method

Description

Get liquidity spread paths for a Scenarios object after projection.

getParamsBaseScenarios
getParamsBaseScenarios method

Description

Get a list containing the horizon and number of scenarios for a Scenarios object.

Examples

```
scenarios1 <- new("Scenarios")
scenarios1 <- setParamsBaseScenarios(scenarios1, horizon=5, nScenarios=10)
getParamsBaseScenarios(scenarios1)
```

`getrealEstatePaths` *getrealEstatePaths method*

Description

Get real estate paths for a Scenarios object after projection.

`getRiskParamsScenarios`
getRiskParamsScenarios method

Description

Get a list containing all risk paramaters for a Scenarios object.

Examples

```
scenarios1 <- new("Scenarios")
scenarios1 <- setParamsBaseScenarios(scenarios1, horizon=5, nScenarios=10)
scenarios1 <- scenarios1 <- setRiskParamsScenarios(scenarios1, vol=.1, k=2,volStock=.2,
volRealEstate=.15, volDefault=.2, alpha=.1,beta=1, eta=.05,rho=.5, stock0=100,realEstate0=50,
liquiditySpread0=.01, defaultSpread0=.01)
getRiskParamsScenarios(scenarios1)
```

`getRiskParamsScenariosdefSpr`
getRiskParamsScenariosdefSpr method

Description

Get a list containing the risk paramaters related to default spread for a Scenarios object.

Examples

```
scenarios1 <- new("Scenarios")
scenarios1 <- setParamsBaseScenarios(scenarios1, horizon=5, nScenarios=10)
scenarios1 <- scenarios1 <- setRiskParamsScenarios(scenarios1, vol=.1, k=2,volStock=.2,
volRealEstate=.15, volDefault=.2, alpha=.1,beta=1, eta=.05,rho=.5, stock0=100,realEstate0=50,
liquiditySpread0=.01, defaultSpread0=.01)
getRiskParamsScenariosdefSpr(scenarios1)
```

```
getRiskParamsScenariosliqSpr
```

getRiskParamsScenariosliqSpr method

Description

Get a list containing the risk paramaters related to the spread for a Scenarios object.

Examples

```
scenarios1 <- new("Scenarios")
scenarios1 <- setParamsBaseScenarios(scenarios1, horizon=5, nScenarios=10)
scenarios1 <- scenarios1 <- setRiskParamsScenarios(scenarios1, vol=.1, k=2,volStock=.2,
volRealEstate=.15, volDefault=.2, alpha=.1,beta=1, eta=.05,rho=.5, stock0=100,realEstate0=50,
liquiditySpread0=.01, defaultSpread0=.01)
getRiskParamsScenariosliqSpr(scenarios1)
```

```
getRiskParamsScenariosRE
```

getRiskParamsScenariosRE method

Description

Get a list containing the risk paramaters related to Real Estate for a Scenarios object.

Examples

```
scenarios1 <- new("Scenarios")
scenarios1 <- setParamsBaseScenarios(scenarios1, horizon=5, nScenarios=10)
scenarios1 <- scenarios1 <- setRiskParamsScenarios(scenarios1, vol=.1, k=2,volStock=.2,
volRealEstate=.15, volDefault=.2, alpha=.1,beta=1, eta=.05,rho=.5, stock0=100,realEstate0=50,
liquiditySpread0=.01, defaultSpread0=.01)
getRiskParamsScenariosRE(scenarios1)
```

```
getRiskParamsScenariosrt
```

getRiskParamsScenariosrt method

Description

Get a list containing the risk paramaters related to short rates for a Scenarios object.

Examples

```

scenarios1 <- new("Scenarios")
scenarios1 <- setParamsBaseScenarios(scenarios1, horizon=5, nScenarios=10)
scenarios1 <- scenarios1 <- setRiskParamsScenarios(scenarios1, vol=.1, k=2,volStock=.2,
volRealEstate=.15, volDefault=.2, alpha=.1,beta=1, eta=.05,rho=.5, stock0=100,realEstate0=50,
liquiditySpread0=.01, defaultSpread0=.01)
getRiskParamsScenariosrt(scenarios1)

```

getRiskParamsScenariosS

getRiskParamsScenariosS method

Description

Get a list containing the risk paramaters related to UL for a Scenarios object.

Examples

```

scenarios1 <- new("Scenarios")
scenarios1 <- setParamsBaseScenarios(scenarios1, horizon=5, nScenarios=10)
scenarios1 <- scenarios1 <- setRiskParamsScenarios(scenarios1, vol=.1, k=2,volStock=.2,
volRealEstate=.15, volDefault=.2, alpha=.1,beta=1, eta=.05,rho=.5, stock0=100,realEstate0=50,
liquiditySpread0=.01, defaultSpread0=.01)
getRiskParamsScenariosS(scenarios1)

```

getShortRatePaths

getShortRatePaths method

Description

Get the short rate paths for a Scenarios object after projection.

getstockPaths

getstockPaths method

Description

Get the UL paths for a Scenarios object after projection.

getZCRates	<i>getZCRates method</i>
------------	--------------------------

Description

Get the ZC rates for a Scenarios object.

Examples

```
scenarios1 <- new("Scenarios")
scenarios1 <- setParamsBaseScenarios(scenarios1, horizon=5, nScenarios=10)
scenarios1 <- scenarios1 <- setRiskParamsScenarios(scenarios1, vol=.1, k=2,volStock=.2,
volRealEstate=.15, volDefault=.2, alpha=.1,beta=1, eta=.05,rho=.5, stock0=100,realEstate0=50,
liquiditySpread0=.01, defaultSpread0=.01)
data(ZC)
scenarios1 <- setZCRates(scenarios1, ZC, horizon=5)
getZCRates(scenarios1)
```

MartingaleTest	<i>MartingaleTest method</i>
----------------	------------------------------

Description

Test the martingale for the Scenarios object.

Examples

```
objScenario <- new("Scenarios")
# Basic scenario's parameters setting
objScenario <- setParamsBaseScenarios(objScenario, horizon = 10, nScenarios = 1000)
# Risk factors parameters setting
objScenario <- setRiskParamsScenariosrt(objScenario, vol = .1, k = 2)
objScenario <- setRiskParamsScenariosS(objScenario, vol = .1, k = 2,
volStock = .2, stock0 = 100, rho=.5)
objScenario <- setRiskParamsScenariosliqSpr(objScenario, eta=.05, liquiditySpread0=.01)
objScenario <- setRiskParamsScenariosdefSpr(objScenario, volDefault=.2,
defaultSpread0=.01, alpha=.1, beta=1)
# Forward and ZC rates setting
data(ZC)
objScenario <- setForwardRates(objScenario, ZC, horizon=10)
objScenario <- setZCRates(objScenario, ZC, horizon=10)
# Projection
objScenario <- customPathsGeneration(objScenario, type="shortRate")
objScenario <- customPathsGeneration(objScenario, type="stock")
objScenario <- customPathsGeneration(objScenario, type="defaultSpread")
objScenario <- customPathsGeneration(objScenario, type="liquiditySpread")
MartingaleTest(objScenario)
```

ParamsScenarios	<i>ParamsScenarios class</i>
-----------------	------------------------------

Description

This class is a container for all the risk related parameters. It is used as a parameter for the Scenarios class.

Details

horizon Horizon for the projection (in years)
nScenarios Number of scenarios
vol Volatility for rates in vasicek model
k k for rates in vasicek model
volStock Volatility for UL in Black & Scholes model
volRealEstate Volatility for real estate in Black & Scholes model
stock0 Stock initial value
realEstate0 Real estate initial value
volDefault Volatility for LMN model
alpha alpha for LMN model
beta beta for LMN model
eta eta for LMN model
liquiditySpread0 Initial liquidity for LMN model
defaultSpread0 Initial default spread for LMN model
rho Correlation between stock and short rates

rAllRisksFactors	<i>rAllRisksFactors</i>
------------------	-------------------------

Description

Direct generation for all risk factors. Object creation is managed internally.

Usage

```
rAllRisksFactors(horizon, nScenarios, ZC, vol, k,
    volStock, stock0, rho, volRealEstate, realEstate0, eta,
    liquiditySpread0, defaultSpread0, volDefault, alpha,
    beta)
```

Arguments

horizon	Horizon of projection
nScenarios	Number of scenarios
ZC	ZC rate input
vol	Volatility for short rates
k	k for rates in vasicek model
volStock	Volatility for stock
stock0	Initial value for stock
rho	Correlation between stock and short rates
volRealEstate	Volatility for real estate
realEstate0	Initial value for real estate
eta	eta Volatility for LMN model
liquiditySpread0	Initial value for liquidity spread
defaultSpread0	Initial value for default spread
volDefault	Volatility for default spread
alpha	alpha for LMN model
beta	beta Volatility for LMN model

Examples

```
data(ZC)
rAllRiskFactors(horizon=5, nScenarios=10, ZC, vol=.1, k=2, volStock=.2, stock0=100, rho=.5,
volRealEstate=.15, realEstate0=50, eta=.05, liquiditySpread0=.01, defaultSpread0=.01,
volDefault=.2, alpha=.1, beta=1)
```

rAssetDistribution *rAssetDistribution*

Description

Direct generation for all assets values. Object creation is managed internally.

Usage

```
rAssetDistribution(type, t, T, vol, k, ZC,
nScenarios = NULL, volStock = NULL, stock0 = NULL,
rho = NULL, volRealEstate = NULL, realEstate0 = NULL,
eta = NULL, liquiditySpread0 = NULL,
defaultSpread0 = NULL, volDefault = NULL, alpha = NULL,
beta = NULL, nCoupons = NULL, couponsRate = NULL,
omega = NULL, s = NULL, Strike = NULL)
```

Arguments

type	Type of asset. Can be : Zero-Coupon, Bond, CBond, ConvBond, EuroCall_S, EuroPut_Stock, EuroCall_ZC, EuroPut_ZC or CDS.
t	Date of pricing (has to be an integer)
T	Date of maturity for the option
vol	Volatility for short rates
k	k for rates in vasicek model
ZC	ZC rate input
nScenarios	Number of scenarios
volStock	Volatility for stock
stock0	Initial value for stock
rho	Correlation between stock and short rates
volRealEstate	Volatility for real estate
realEstate0	Initial value for real estate
eta	eta Volatility for LMN model
liquiditySpread0	Initial value for liquidity spread
defaultSpread0	Initial value for default spread
volDefault	Volatility for default spread
alpha	alpha for LMN model
beta	beta Volatility for LMN model
nCoupons	Number of coupons
couponsRate	Rate of coupons
omega	Recoverables in case of default
s	Date of maturity for the underlying
Strike	Strike for options

Examples

```

data(ZC)
rAssetDistribution(type="Zero-Coupon",t=2,T=3,vol=.1, k=2, ZC=ZC, nScenarios=100)
rAssetDistribution(type="Bond",t=3,T=35,nCoupons=20, couponsRate=0.3,vol=.1, k=2,
ZC=ZC, nScenarios=10)
rAssetDistribution(type="CBond",t=5,T=35,nCoupons=5, couponsRate=0.3, omega=5,vol=.1, k=2, ZC=ZC,
nScenarios=10,eta=.05, liquiditySpread0=.01, defaultSpread0=.01, volDefault=.2, alpha=.1, beta=1)
rAssetDistribution(type="EuroPut_Stock",5,25,Strike=98.5,vol=.1,k=2,ZC=ZC,volStock=.2,
stock0=100, rho=.5,nScenarios=10)
rAssetDistribution(type="EuroCall_ZC",4,4.5,s=5, Strike=.985,vol=.1, k=2, ZC=ZC,nScenarios=10)
rAssetDistribution(type="EuroPut_ZC",4,4.5,s=5, Strike=.9385,vol=.1, k=2, ZC=ZC,nScenarios=10)

```

rDefaultSpread	<i>rDefaultSpread</i>
----------------	-----------------------

Description

Direct default spread generation. Object creation is managed internally.

Usage

```
rDefaultSpread(horizon, nScenarios, defaultSpread0,
               volDefault, alpha, beta)
```

Arguments

horizon	Horizon of projection
nScenarios	Number of scenarios
defaultSpread0	Initial value for default spread
volDefault	Volatility
alpha	alpha for LMN model
beta	beta Volatility for LMN model

Examples

```
rDefaultSpread(horizon=5, nScenarios=8, defaultSpread0=.01, volDefault=.2, alpha=.1, beta=1)
```

rLiquiditySpread	<i>rLiquiditySpread</i>
------------------	-------------------------

Description

Direct liquidity spread generation. Object creation is managed internally.

Usage

```
rLiquiditySpread(horizon, nScenarios, eta,
                 liquiditySpread0)
```

Arguments

horizon	Horizon of projection
nScenarios	Number of scenarios
eta	eta Volatility for LMN model
liquiditySpread0	Initial value for liquidity spread

Examples

```
rLiquiditySpread(horizon=5, nScenarios=15, eta=.05, liquiditySpread0=.01)
```

rRealEstate

rRealEstate

Description

Direct real estate generation. Object creation is managed internally.

Usage

```
rRealEstate(horizon, nScenarios, ZC, vol, k,
            volRealEstate, realEstate0)
```

Arguments

horizon	Horizon of projection
nScenarios	Number of scenarios
ZC	ZC rate input
vol	Volatility for short rates
k	k for rates in vasicek model
volRealEstate	Volatility
realEstate0	Initial value for real estate

Examples

```
data(ZC)
rRealEstate(horizon=5, nScenarios=10, ZC=ZC, vol=.1, k=2, volRealEstate=.15, realEstate0=50)
```

rShortRate

rShortRate

Description

Direct short rate generation. Object creation is managed internally.

Usage

```
rShortRate(horizon, nScenarios, ZC, vol, k)
```

Arguments

horizon	Horizon of projection
nScenarios	Number of scenarios
ZC	ZC rate input
vol	Volatility for short rates
k	k for rates in vasicek model

Examples

```
data(ZC)
rShortRate(horizon=15, nScenarios=10, ZC=ZC, vol=.1, k=2)
```

rStock	<i>rStock</i>
--------	---------------

Description

Direct stock generation. Object creation is managed internally.

Usage

```
rStock(horizon, nScenarios, ZC, vol, k, volStock, stock0,
rho)
```

Arguments

horizon	Horizon of projection
nScenarios	Number of scenarios
ZC	ZC rate input
vol	Volatility for short rates
k	k for rates in vasicek model
volStock	Volatility
stock0	Initial value for stock
rho	Correlation between stock and short rates

Examples

```
data(ZC)
rStock(horizon=10, nScenarios=7, ZC=ZC, vol=.1, k=2, volStock=.2, stock0=100, rho=.5)
```

Scenarios	<i>Scenarios class</i>
-----------	------------------------

Description

This is the main class of the package. It has several method to read and write the parameters.

Details

ParamsScenarios A ParamsScenarios object containing the risk parameters

ForwardRates The forward rates

ZCRates Volatility for rates in vasicek model

shortRatePaths The short rate generated paths

stockPaths The stock generated paths

realEstatePaths The real estate generated paths

liquiditySpreadPaths The liquidity spread generated paths

liquiditySpreadPaths The liquidity spread generated paths

defaultSpreadPaths The default spread generated paths

setForwardRates	<i>setForwardRates method</i>
-----------------	-------------------------------

Description

Calculate and set the forward rates in a Scenarios object. Internaly, this method uses the ForwardExtraction() function.

Arguments

ZC	The Zero Coupon rates
horizon	Horizon for the calculation (in years)

Examples

```
scenarios1 <- new("Scenarios")
scenarios1 <- scenarios1 <- setRiskParamsScenarios(scenarios1, vol=.1, k=2,volStock=.2,
volRealEstate=.15, volDefault=.2, alpha=.1,beta=1, eta=.05,rho=.5, stock0=100,realEstate0=50,
liquiditySpread0=.01, defaultSpread0=.01)
data(ZC)
scenarios1 <- setForwardRates(scenarios1, ZC, horizon=5)
```

```
setParamsBaseScenarios
      setParamsBaseScenarios method
```

Description

Set the horizon and nScenarios parameters of the [\[ParamsScenarios\]](#) sub-object of a Scenarios object

Arguments

horizon	Horizon for the projection (in years)
nScenarios	Number of scenarios

Examples

```
scenarios1 <- new("Scenarios")
scenarios1 <- setParamsBaseScenarios(scenarios1, horizon=5, nScenarios=10)
```

```
setRiskParamsScenarios
      setRiskParamsScenarios method
```

Description

Set all the risk parameters of a Scenarios object (contained in a [\[ParamsScenarios\]](#) sub-object)

Arguments

vol	Volatility for rates in vasicek model
k	k for rates in vasicek model
volStock	Volatility for UL in Black & Scholes model
volRealEstate	Volatility for real estate in Black & Scholes model
volDefault	Volatility for LMN model
alpha	alpha for LMN model
beta	beta Volatility for LMN model
eta	eta Volatility for LMN model
rho	Correlation between stock and short rates
stock0	UL initial value
realEstate0	Real estate initial value
liquiditySpread0	Initial liquidity for LMN model
defaultSpread0	Initial default spread for LMN model

Examples

```

scenarios1 <- new("Scenarios")
scenarios1 <- setParamsBaseScenarios(scenarios1, horizon=5, nScenarios=10)
scenarios1 <- scenarios1 <- setRiskParamsScenarios(scenarios1, vol=.1, k=2, volStock=.2,
volRealEstate=.15, volDefault=.2, alpha=.1, beta=1, eta=.05, rho=.5, stock0=100, realEstate0=50,
liquiditySpread0=.01, defaultSpread0=.01)

```

setRiskParamsScenariosdefSpr

setRiskParamsScenariosdefSpr method

Description

Set risk parameters related to default spread in a Scenarios object (these parameters are contained in a [\[ParamsScenarios\]](#) sub-object)

Arguments

volDefault	Volatility for LMN model
defaultSpread0	Initial default spread for LMN model
alpha	alpha for LMN model
beta	beta Volatility for LMN model

setRiskParamsScenariosliqSpr

setRiskParamsScenariosliqSpr method

Description

Set risk parameters related to the spread in a Scenarios object (these parameters are contained in a [\[ParamsScenarios\]](#) sub-object)

Arguments

eta	eta Volatility for LMN model
liquiditySpread0	Initial liquidity for LMN model

`setRiskParamsScenariosRE`*setRiskParamsScenariosRE method*

Description

Set risk parameters related to real estates in a Scenarios object (these parameters are contained in a [\[ParamsScenarios\]](#) sub-object)

Arguments

<code>vol</code>	Volatility for rates in vasicek model
<code>k</code>	k for rates in vasicek model
<code>volRealEstate</code>	Volatility for real estate in Black & Scholes model
<code>realEstate0</code>	Real estate initial value

`setRiskParamsScenariosrt`*setRiskParamsScenariosrt method*

Description

Set risk parameters related to short rates in a Scenarios object (these parameters are contained in a [\[ParamsScenarios\]](#) sub-object)

Arguments

<code>vol</code>	Volatility for rates in vasicek model
<code>k</code>	k for rates in vasicek model

`setRiskParamsScenariosS`*setRiskParamsScenariosS method*

Description

Set risk parameters related to short rates in a Scenarios object (these parameters are contained in a [\[ParamsScenarios\]](#) sub-object)

Arguments

vol	Volatility for rates in vasicek model
k	k for rates in vasicek model
volStock	Volatility for UL in Black & Scholes model
stock0	UL initial value
rho	Correlation between stock and short rates

setZCRates	<i>setZCRates method</i>
------------	--------------------------

Description

Set the ZC rates in a Scenarios object. Internally, this method uses the ZCExtraction() function.

Arguments

ZC	The Zero Coupon rates
horizon	Horizon for the calculation (in years)

Examples

```
scenarios1 <- new("Scenarios")
scenarios1 <- setParamsBaseScenarios(scenarios1, horizon=5, nScenarios=10)
scenarios1 <- scenarios1 <- setRiskParamsScenarios(scenarios1, vol=.1, k=2, volStock=.2,
volRealEstate=.15, volDefault=.2, alpha=.1, beta=1, eta=.05, rho=.5, stock0=100, realEstate0=50,
liquiditySpread0=.01, defaultSpread0=.01)
data(ZC)
scenarios1 <- setZCRates(scenarios1, ZC, horizon=5)
```

ZC	<i>ZC data</i>
----	----------------

Description

ZC data for examples in the documentation

Usage

```
data(ZC)
```

Examples

```
data(ZC)
```

ZCBond_PriceDistribution

ZCBond_PriceDistribution method

Description

Get a distribution for ZC bond price.

Arguments

t	Date of pricing (has to be an integer)
T	Date of maturity

Index

- * **datasets**
 - ZC, [24](#)
- * **package**
 - ESG-package, [2](#)

- Asset_PriceDistribution, [4](#)
- Asset_PriceDistribution, Scenarios-method
(Asset_PriceDistribution), [4](#)

- Bond_PriceDistribution, [5](#)
- Bond_PriceDistribution, Scenarios-method
(Bond_PriceDistribution), [5](#)

- CBond_PriceDistribution, [5](#)
- CBond_PriceDistribution, Scenarios-method
(CBond_PriceDistribution), [5](#)
- CDSPremium_PriceDistribution, [6](#)
- CDSPremium_PriceDistribution, Scenarios-method
(CDSPremium_PriceDistribution),
[6](#)
- ConvBond_PriceDistribution, [6](#)
- ConvBond_PriceDistribution, Scenarios-method
(ConvBond_PriceDistribution), [6](#)
- customPathsGeneration, [7](#)
- customPathsGeneration, Scenarios-method
(customPathsGeneration), [7](#)

- ESG (ESG-package), [2](#)
- ESG-package, [2](#)
- EuroCall_Stock_PriceDistribution, [7](#)
- EuroCall_Stock_PriceDistribution, Scenarios-method
(EuroCall_Stock_PriceDistribution),
[7](#)
- EuroCall_ZC_PriceDistribution, [8](#)
- EuroCall_ZC_PriceDistribution, Scenarios-method
(EuroCall_ZC_PriceDistribution),
[8](#)
- EuroPut_Stock_PriceDistribution, [8](#)
- EuroPut_Stock_PriceDistribution, Scenarios-method
(EuroPut_Stock_PriceDistribution),
[8](#)
- EuroPut_ZC_PriceDistribution, [8](#)
- EuroPut_ZC_PriceDistribution, Scenarios-method
(EuroPut_ZC_PriceDistribution),
[8](#)

- getDefaultSpreadPaths, [9](#)
- getDefaultSpreadPaths, Scenarios-method
(getDefaultSpreadPaths), [9](#)
- getForwardRates, [9](#)
- getForwardRates, Scenarios-method
(getForwardRates), [9](#)
- getLiquiditySpreadPaths, [9](#)
- getLiquiditySpreadPaths, Scenarios-method
(getLiquiditySpreadPaths), [9](#)
- getParamsBaseScenarios, [9](#)
- getParamsBaseScenarios, Scenarios-method
(getParamsBaseScenarios), [9](#)
- getrealEstatePaths, [10](#)
- getrealEstatePaths, Scenarios-method
(getrealEstatePaths), [10](#)
- getRiskParamsScenarios, [10](#)
- getRiskParamsScenarios, Scenarios-method
(getRiskParamsScenarios), [10](#)
- getRiskParamsScenariosdefSpr, [10](#)
- getRiskParamsScenariosdefSpr, Scenarios-method
(getRiskParamsScenariosdefSpr),
[10](#)
- getRiskParamsScenariosliqSpr, [11](#)
- getRiskParamsScenariosliqSpr, Scenarios-method
(getRiskParamsScenariosliqSpr),
[11](#)
- getRiskParamsScenariosRE, [11](#)
- getRiskParamsScenariosRE, Scenarios-method
(getRiskParamsScenariosRE), [11](#)
- getRiskParamsScenariosrt, [11](#)
- getRiskParamsScenariosrt, Scenarios-method
(getRiskParamsScenariosrt), [11](#)
- getRiskParamsScenariosS, [12](#)
- getRiskParamsScenariosS, Scenarios-method
(getRiskParamsScenariosS), [12](#)

- getShortRatePaths, [12](#)
- getShortRatePaths, Scenarios-method
(getShortRatePaths), [12](#)
- getstockPaths, [12](#)
- getstockPaths, Scenarios-method
(getstockPaths), [12](#)
- getZCRates, [13](#)
- getZCRates, Scenarios-method
(getZCRates), [13](#)

- MartingaleTest, [13](#)
- MartingaleTest, Scenarios-method
(MartingaleTest), [13](#)

- ParamsScenarios, [14](#), [21–23](#)
- ParamsScenarios-class
(ParamsScenarios), [14](#)

- rAllRisksFactors, [14](#)
- rAssetDistribution, [15](#)
- rDefaultSpread, [17](#)
- rLiquiditySpread, [17](#)
- rRealEstate, [18](#)
- rShortRate, [18](#)
- rStock, [19](#)

- Scenarios, [20](#)
- Scenarios-class (Scenarios), [20](#)
- setForwardRates, [20](#)
- setForwardRates, Scenarios-method
(setForwardRates), [20](#)
- setParamsBaseScenarios, [21](#)
- setParamsBaseScenarios, Scenarios-method
(setParamsBaseScenarios), [21](#)
- setRiskParamsScenarios, [21](#)
- setRiskParamsScenarios, Scenarios-method
(setRiskParamsScenarios), [21](#)
- setRiskParamsScenariosdefSpr, [22](#)
- setRiskParamsScenariosdefSpr, Scenarios-method
(setRiskParamsScenariosdefSpr),
[22](#)
- setRiskParamsScenariosliqSpr, [22](#)
- setRiskParamsScenariosliqSpr, Scenarios-method
(setRiskParamsScenariosliqSpr),
[22](#)
- setRiskParamsScenariosRE, [23](#)
- setRiskParamsScenariosRE, Scenarios-method
(setRiskParamsScenariosRE), [23](#)
- setRiskParamsScenariosrt, [23](#)
- setRiskParamsScenariosrt, Scenarios-method
(setRiskParamsScenariosrt), [23](#)
- setRiskParamsScenariosS, [23](#)
- setRiskParamsScenariosS, Scenarios-method
(setRiskParamsScenariosS), [23](#)
- setZCRates, [24](#)
- setZCRates, Scenarios-method
(setZCRates), [24](#)

- ZC, [24](#)
- ZCBond_PriceDistribution, [25](#)
- ZCBond_PriceDistribution, Scenarios-method
(ZCBond_PriceDistribution), [25](#)