Package 'Trading'

September 6, 2016

Type Package

Title Trades, Curves, Rating Tables, Add-on Tables, CSAs

Version 1.0

Date 2016-09-04

Author Tasos Grivas

Maintainer Tasos Grivas <info@openriskcalculator.com>

Description Contains trades from the five major assets classes and also functionality to use pricing curves, rating tables, CSAs and add-on tables. The implementation follows an object oriented logic whereby each trade inherits from more abstract classes while also the curves/tables are objects. There is a lot of functionality focusing on the counterparty credit risk calculations however the package can be used for trading applications in general.

Imports methods

Suggests SACCR, xVA

URL www.openriskcalculator.com

License GPL-3

LazyData TRUE

Collate 'Swap.R' 'Vol.R' 'Option.R' 'Trade.R' 'IRD.R' 'Bond.R' 'CSA.R' 'Commodity.R' 'Credit.R' 'Curve.R' 'Equity.R' 'FX.R' 'HashTable.R' 'LoadSupervisoryData.R' 'ParseTrades.R'

RoxygenNote 5.0.1

NeedsCompilation no

Repository CRAN

Date/Publication 2016-09-06 02:04:09

R topics documented:

`Bond-class` *Bond Class*

Description

Creates a Bond object with the relevant info needed to calculate the Exposure-at-Default (EAD)

Arguments

`Notional`	The notional amount of the trade
`MTM`	The mark-to-market valuation of the trade
`Currency`	The currency set that the trade belongs to
`Si`	The number of years that the trade will take to start (zero if already started)
`BuySell`	Takes the values of either 'Buy' or 'Sell'
`yield`	The yield of the Bond
`ISIN`	The ISIN of the Bond,
`payment_frequency`	the frequency that the bond pays coupon (Quarter, SA etc)
`maturity_date`	the maturity date of the bond
`coupon_type`	The coupon type of the bond (fixed, floating, flipper etc)
`credit_risk_weight`	The percentage weight of the exposure of the bond that should be attributed to the 'Credit' asset class
`Issuer`	The issuer of the bond

Value

An object of type Bond

Author(s)

Tasos Grivas <tasos@openriskcalculator.com>

Examples

```
tr1 = Bond(Notional=10000,MtM=30,Currency="EUR",Si=0,maturity_date="2026-04-04",
BuySell='Buy',payment_frequency="SA",credit_risk_weight=0.2,coupon_type="Fixed",
Issuer="FirmA",ISIN = "XS0943423")
```

BondFuture-class *Bond Future Class*

Description

Creates a Bond Future object with the relevant info needed to calculate the Exposure-at-Default (EAD)

Arguments

Notional	The notional amount of the trade
MTM	The mark-to-market valuation of the trade
Currency	The currency set that the trade belongs to
Si	The number of years that the trade will take to start (zero if already started)
Ei	The number of years that the trade will expire
BuySell	Takes the values of either 'Buy' or 'Sell'
yield	The yield of the Underlying Bond
isin	The ISIN of the Underlying Bond,
payment_frequency	the frequency that the bond pays coupon (Quarter, SA etc)
maturity_date	the maturity date of the bond
coupon_type	The coupon type of the bond (fixed, floating, flipper etc)
Issuer	The issuer of the bond

Value

An object of type Bond

Author(s)

Tasos Grivas <tasos@openriskcalculator.com>

Examples

```
tr1 = BondFuture(Notional=10000,MtM=30,Currency="EUR",Si=0,Ei=10,BuySell='Buy',
payment_frequency="SA",coupon_type="Fixed",Issuer="CountryA",ISIN = "XS0943423")
```

`CDOTranche-class` *CDO tranche Class*

Description

Creates a CDO tranche Object with the relevant info needed to calculate the Exposure-at-Default (EAD)

Arguments

`Notional`	The notional amount of the trade
`MTM`	The mark-to-market valuation of the trade
`Currency`	The currency set that the belongs
`Si`	The number of years after which the trade will start (zero if already started)
`Ei`	The number of years that the trade will expire
`BuySell`	Takes the values of either 'Buy' or 'Sell'
`attach_point`	The attachment point of the tranche
`detach_point`	The detachment point of the tranche

Value

An object of type CDOtrance

Examples

```
## a CDO trance object
tr3 = CDOTranche(Notional=10000,MtM=0,Currency="USD",Si=0,Ei=5,
BuySell='Buy',SubClass='IG',RefEntity='CDX.IG',attach_point=0.3,detach_point=0.5)
```

`Commodity-class` *Commodity Class*

Description

Creates a Commodity Object with the relevant info needed to calculate the Exposure-at-Default (EAD)

Arguments

`Notional`	The notional amount of the trade
`MTM`	The mark-to-market valuation of the trade
`Currency`	The currency set that the trade belongs to
`Si`	The number of years that the trade will take to start (zero if already started)
`BuySell`	Takes the values of either 'Buy' or 'Sell'
`commodity_type`	Takes the values of 'Oil/Gas','Silver','Electricity' etc.

Value

An object of type Commodity

Author(s)

Tasos Grivas <tasos@openriskcalculator.com>

References

Basel Committee: The standardised approach for measuring counterparty credit risk exposures http://www.bis.org/publ/bcbs279.htm

Examples

```
tr1 = Commodity(Notional=10000,MtM=-50,Si=0,
BuySell='Buy',SubClass='Energy',commodity_type='Oil/Gas')
```

CommodityForward-class

Commodity Forward Class

Description

Creates a Commodity Forward Object with the relevant info needed to calculate the Exposure-at-Default (EAD)

Arguments

Notional	The notional amount of the trade
MTM	The mark-to-market valuation of the trade
Currency	The currency set that the trade belongs to
Si	The number of years that the trade will take to start (zero if already started)
Ei	The number of years that the trade will expire
BuySell	Takes the values of either 'Buy' or 'Sell'
commodity_type	Takes the values of 'Oil/Gas','Silver','Electricity' etc.

Value

An object of type Commodity Forward

Author(s)

Tasos Grivas <tasos@openriskcalculator.com>

References

Basel Committee: The standardised approach for measuring counterparty credit risk exposures http://www.bis.org/publ/bcbs279.htm

Examples

```
## the Commodity Forward trade given in the Basel regulation Commodity example
tr1 = CommodityForward(Notional=10000,MtM=-50,Si=0,Ei=0.75,
BuySell='Buy',SubClass='Energy',commodity_type='Oil/Gas')
```

CommSwap-class *Commodity Swap Class*

Description

Creates a Commodity Swap Object with the relevant info needed to calculate the Exposure-at-Default (EAD)

Value

An object of type CommSwap

Author(s)

Tasos Grivas <tasos@openriskcalculator.com>

References

Basel Committee: The standardised approach for measuring counterparty credit risk exposures http://www.bis.org/publ/bcbs279.htm

CreditIndex-class *Credit Index Class*

Description

Creates a Credit Index Object with the relevant info needed to calculate the Exposure-at-Default (EAD)

Arguments

Notional	The notional amount of the trade
MTM	The mark-to-market valuation of the trade
Currency	The currency set that the belongs
Si	The number of years after which the trade will start (zero if already started)
Ei	The number of years that the trade will expire
BuySell	Takes the values of either 'Buy' or 'Sell'

Value

An object of type CreditIndex

Examples

```
## the CreditIndex trade given in the Basel regulation Credit example
tr3 = CreditIndex(Notional=10000,MtM=0,Currency="USD",Si=0,Ei=5,
BuySell='Buy',SubClass='IG',RefEntity='CDX.IG')
```

`CreditSingle-class` *Credit Single Class*

Description

Creates a Credit Single Object with the relevant info needed to calculate the Exposure-at-Default (EAD)

Arguments

`Notional`	The notional amount of the trade
`MTM`	The mark-to-market valuation of the trade
`Currency`	The currency set that the trade belongs to
`Si`	The number of years that the trade will take to start (zero if already started)
`Ei`	The number of years that the trade will expire
`BuySell`	Takes the values of either 'Buy' or 'Sell'

Value

An object of type CreditSingle

Author(s)

Tasos Grivas <tasos@openriskcalculator.com>

References

Basel Committee: The standardised approach for measuring counterparty credit risk exposures http://www.bis.org/publ/bcbs279.htm

Examples

```
## the CreditSingle trade given in the Basel regulation Credit example
tr1 = CreditSingle(Notional=10000,MtM=20,Currency="USD",Si=0,Ei=3,BuySell='Buy',
SubClass='AA',RefEntity='FirmA')
```

CSA-class *CSA Class*

Description

Creates a collateral agreement Object containing all the relevant data and methods regarding the maturity factor and the calculation of the exposures after applying the relevant threshold

Arguments

thres_cpty	The maximum exposure that the counterparty can generate before collateral will need to be posted
thres_PO	The maximum exposure that the processing organization can generate before collateral will need to be posted
MTA_cpty	The minimum transfer amount for the counterparty
MTA_PO	The minimum transfer amount for the processing organization
IM_cpty	The initial margin that is posted by the counterparty
IM_PO	The initial margin that is posted by the processing organization
mpor_days	The margin period of risk in days
remargin_freq	The frequency of re-margining the exposure in days
rounding	The rounding amount of the transfers

Value

An object of type CSA

Author(s)

Tasos Grivas <tasos@openriskcalculator.com>

References

Basel Committee: The standardised approach for measuring counterparty credit risk exposures http://www.bis.org/publ/bcbs279.htm

Examples

```
## the margin agreement given in the Basel regulation example
coll = CSA(thres_cpty = 0, MTA_cpty = 5, IM_cpty = 150, remargin_freq = 5)
```

Curve-class *Curve Class*

Description

Creates a Curve Object containing pairs of Tenors with relevant rates and the interpolation function. Also, methods for populating the object via a .csv file and the generation of the interpolation function via cubic splines are included.

Arguments

Tenors	The Tenors of the curve
Rates	The rates on the corresponding tenors
interp_function	(Optional) The interpolation function of the curve. Can be populated via the 'CalcInterpPoints' method

Value

An object of type Curve

Author(s)

Tasos Grivas <tasos@openriskcalculator.com>

Examples

```
## generating a curve either directly or through a csv -
## the spot_rates.csv file can be found on the extdata folder in the installation library ## path
funding_curve =  Curve(Tenors=c(1,2,3,4,5,6,10),Rates=c(4,17,43,47,76,90,110))
spot_rates = Curve()
spot_rates$PopulateViaCSV('spot_rates.csv')
time_points = seq(0,5,0.01)
spot_curve     = spot_rates$CalcInterpPoints(time_points)
```

Equity-class *Equity Class*

Description

Creates an Equity object

Arguments

Notional	The notional amount of the trade
MTM	The mark-to-market valuation of the trade
Currency	The currency set that the trade belongs to
Si	The number of years that the trade will take to start (zero if already started)
BuySell	Takes the values of either 'Buy' or 'Sell'
ISIN	the ISIN of the Equity
traded_price	the price that trade was done

Value

An object of type EquityIndexFuture

Author(s)

Tasos Grivas <tasos@openriskcalculator.com>

Examples

```
tr1 = Equity(Notional=10000,MtM=30,Currency="EUR",Si=0,BuySell='Buy',
traded_price = 10,ISIN = "XS04340432")
```

EquityIndexFuture-class

Equity Index Future Class

Description

Creates an Equity Index Future object with the relevant info needed to calculate the Exposure-at-Default (EAD)

Arguments

Notional	The notional amount of the trade
MTM	The mark-to-market valuation of the trade
Currency	The currency set that the trade belongs to
Si	The number of years that the trade will take to start (zero if already started)
Ei	The number of years that the trade will expire
BuySell	Takes the values of either 'Buy' or 'Sell'
traded_price	the price that trade was done

Value

An object of type EquityIndexFuture

Author(s)

Tasos Grivas <tasos@openriskcalculator.com>

Examples

```
tr1 = EquityIndexFuture(Notional=10000,MtM=30,Currency="EUR",Si=0,
Ei=10,BuySell='Buy',traded_price=10)
```

FXSwap-class *FX Swap Class*

Description

Creates an FX Swap object with the relevant info needed to calculate the Exposure-at-Default (EAD)

Arguments

Notional	The notional amount of the trade
MTM	The mark-to-market valuation of the trade
Currency	The currency set that the trade belongs to
Si	The number of years that the trade will take to start (zero if already started)
Ei	The number of years that the trade will expire
BuySell	Takes the values of either 'Buy' or 'Sell'
traded_price	the price that trade was done

Value

An object of type FXSwap

Author(s)

Tasos Grivas <tasos@openriskcalculator.com>

References

Basel Committee: The standardised approach for measuring counterparty credit risk exposures http://www.bis.org/publ/bcbs279.htm

Examples

```
tr1 = FXSwap(Notional=10000,MtM=30,ccyPair="EUR/USD",Si=0,Ei=10,BuySell='Buy')
```

HashTable-class *Hashtable Class*

Description

Creates a hashtable-like object so as to represent data with a key structure (for example addon tables, rating-based factors etc). Also, it includes methods for populating the object via a .csv file and finding a value based on a specific key on an interval of keys For examples of the format of the CSVs files, please view RatingsMapping.csv or AddonTable.csv on the extdata folder in the installation folder of the library

Arguments

keys	A vector of keys
values	A vector of values mapping to the keys
keys_type	The type of the keys
values_type	The type of the values

Value

An object of type HashTable

Author(s)

Tasos Grivas <tasos@openriskcalculator.com>

Examples

```
## loading a ratings' mapping matrix from the extdata folder
rating_table = HashTable('RatingsMapping.csv',"character","numeric")
reg_weight =rating_table$FindValue("AAA")
```

IRDSwap-class *IRD Swap Class*

Description

Creates an IRD Swap Object with the relevant info needed to calculate the Exposure-at-Default (EAD)

Arguments

Notional	The notional amount of the trade
MTM	The mark-to-market valuation of the trade
Currency	The currency set that the trade belongs to
Si	The number of years that the trade will take to start (zero if already started)
Ei	The number of years that the trade will expire
BuySell	Takes the values of either 'Buy' or 'Sell'

Value

An object of type IRDSwap

Examples

```
# the IRD Swap trade given in the Basel regulation IRD example
tr1 = IRDSwap(Notional=10000,MtM=30,Currency="USD",Si=0,Ei=10,BuySell='Buy')
```

IRDSwaption-class *IRD Swaption Class*

Description

Creates an IRD Swaption Object with the relevant info needed to calculate the Exposure-at-Default (EAD)

Arguments

Notional	The notional amount of the trade
MTM	The mark-to-market valuation of the trade
Currency	The currency set that the trade belongs to
Si	The number of years that the trade will take to start (zero if already started)
Ei	The number of years that the trade will expire
BuySell	Takes the values of either 'Buy' or 'Sell'

`OptionType` Takes the values of either 'Put' or 'Call'

`UnderlyingPrice`
The current price of the underlying

`StrikePrice` The strike price of the option

Value

An object of type IRDSwaption

Author(s)

Tasos Grivas <tasos@openriskcalculator.com>

References

Basel Committee: The standardised approach for measuring counterparty credit risk exposures http://www.bis.org/publ/bcbs279.htm

Examples

```
# the Swaption trade given in the Basel regulation IRD example
tr3 = IRDSwaption(Notional=5000,MtM=50,Currency="EUR",Si=1,Ei=11,BuySell='Sell',
OptionType='Put',UnderlyingPrice=0.06,StrikePrice=0.05)
```

IRDSwapVol-class *IRD Swap Volatility Class*

Description

Creates an IRD Swap Volatility-based Object with the relevant info needed to calculate the Exposure-at-Default (EAD)

Value

An object of type IRDSwapVol

Author(s)

Tasos Grivas <tasos@openriskcalculator.com>

Examples

```
tr3 = IRDSwapVol(Notional=5000,MtM=50,Currency="EUR",Si=1,Ei=11,BuySell='Sell',
reference  = "CDOR", vol_strike=0.2, annualization_factor=252)
```

LoadSupervisoryData *Supervisory Data Loading*

Description

Loads the supervisory data (factors, correlation and option volatility) for each Asset Class and SubClass

Usage

```
LoadSupervisoryData()
```

Value

A data frame with the required data

Author(s)

Tasos Grivas <tasos@openriskcalculator.com>

References

Basel Committee: The standardised approach for measuring counterparty credit risk exposures http://www.bis.org/publ/bcbs279.htm

ParseTrades *Parse trades through a .csv file.*

Description

Parse trades through a .csv file. In case no file name is given, an example file is automatically loaded containing trades corresponding to Basel's SA-CCR regulation (the example trades file can be found on the extdata folder in the installation library path)

Usage

```
ParseTrades(csvfilename)
```

Arguments

csvfilename	the name of csv file containing the trades

Value

A list of trades

Author(s)

Tasos Grivas <tasos@openriskcalculator.com>

Index