# Package 'SACCR'

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**Type** Package

**Title** SA Counterparty Credit Risk under CRR2

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**Author** Tasos Grivas [aut, cre]

**Maintainer** Tasos Grivas <info@openriskcalculator.com>

**Description** Computes the Exposure-At-Default based on the standardized approach of CRR2 (SA-CCR). The simplified version of SA-CCR has been included, as well as the OEM methodology.

Multiple trade types of all the five major asset classes are being supported including the Other Exposure and, given the inheritance-based structure of the application, the addition of further trade types is straightforward. The application returns a list of trees per Counterparty and CSA after automatically separating the trades based on the Counterparty, the CSAs, the hedging sets, the netting sets and the risk factors. The basis and volatility transactions are also identified and treated in specific hedging sets whereby the corresponding penalty factors are applied. All the examples appearing on the regulatory papers (both for the margined and the unmargined workflow) have been implemented including the latest CRR2 developments.

**License** GPL-3

**Imports** methods, data.tree, jsonlite, Trading

**URL** https://openriskcalculator.com/

**Collate** 'CalcAddon.R' 'CalcEAD.R' 'CalcPFE.R' 'CalcRC.R' 'ExampleBasisVol.R' 'ExampleComm.R' 'ExampleCredit.R' 'ExampleFX.R' 'ExampleIRD.R' 'ExampleIRDCommMargined.R' 'ExampleIRDCredit.R' 'HandleBasisVol.R' 'LoadSupervisoryData.R' 'runExampleCalcs.R' 'CalculateFactorMult.R' 'CreateTradeGraph.R' 'GroupCommTrades.R' 'GroupCreditTrades.R' 'GroupEquityTrades.R' 'GroupFXTrades.R' 'GroupIRDTrades.R' 'GroupTrades.R' 'SACCRCalculator.R' 'SingleTradeAddon.R' 'onLoad.R' 'DetermineCCRMethodology.R' 'GroupOtherTrades.R' 'ExampleFXHedge.R'

**NeedsCompilation** no

**RoxygenNote** 7.3.2

**Repository** CRAN

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# Contents



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`CalcAddon` *Calculates the Addon amount*

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## Description

Calculates the amount of the addon for each heding/nettting set

## Usage

```
CalcAddon(trades_tree, MF, simplified = FALSE, OEM = FALSE)
```

## Arguments

| | |
|---|---|
| `trades_tree` | A tree structure with the input trades |
| `MF` | (Optional) The Maturity Factor based on the collateral agreement |
| `simplified` | (optional) When TRUE, the add-ons will be calculated as per the simplified SA-CCR |
| `OEM` | (optional) When TRUE, the add-ons will be calculated as per the Original Exposure Method |

## Value

The aggregate amount of the addon summed up for all the asset classes

## Author(s)

Tasos Grivas <tasos@openriskcalculator.com>

## References

Regulation (EU) 2019/876 of the European Parliament and of the Council of 20 May 2019 http://data.europa.eu/eli/reg/2019/8

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`CalcEAD` *Calculates the EAD*

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## Description

Calculates the Exposure at Default

## Usage

```
CalcEAD(RC, PFE)
```

## Arguments

| | |
|---|---|
| `RC` | the replacement cost |
| `PFE` | the projected future exposure |

## Value

The Exposure-at-Default

## Author(s)

Tasos Grivas <tasos@openriskcalculator.com>

## References

Regulation (EU) 2019/876 of the European Parliament and of the Council of 20 May 2019 http://data.europa.eu/eli/reg/2019/8

## Examples

```
#returns 1.4*(60+500) = 784
EAD <- CalcEAD(60,500)
```

## CalcPFE *Calculates the PFE*

### Description

Calculates the Projected Future Exposure (PFE) after applying the relevant multiplier. The purpose of this multiplier is to lessen the risk stemming from the addons in case of excess collateral

### Usage

```
CalcPFE(V_C, V = 0, Addon_Aggregate, simplified)
```

### Arguments

| | |
|---|---|
| V_C | the difference between the sum of the MtMs and the collateral |
| V | the sum of MVs of the trades |
| Addon_Aggregate | the aggregate amount of the Addon |
| simplified | (optional) When TRUE, the multiplier will be set to 1 as per the simplified & OEM approach |

### Value

The Projected Future Exposure (PFE)

### Author(s)

Tasos Grivas <info@openriskcalculator.com>

### References

Regulation (EU) 2019/876 of the European Parliament and of the Council of 20 May 2019 http://data.europa.eu/eli/reg/2019/8

## CalcRC *Calculates the RC*

### Description

Calculates the Replacement Cost(RC) and the sum of the MtMs for all the trades

### Usage

```
CalcRC(trades, csa, collaterals, simplified, ignore_margin = FALSE)
```

### Arguments

| | |
|---|---|
| trades | The full list of the Trade Objects |
| csa | (Optional) The CSA objects |
| collaterals | (Optional) The collaterals Objects |
| simplified | (optional) When TRUE, collaterals will be ignored as per the simplified & OEM approach |
| ignore_margin | (optional) if TRUE, the margin agreement workflow will be turned off |

### Value

The replacement Cost and the sum of the MtMs

### Author(s)

Tasos Grivas <tasos@openriskcalculator.com>

### References

Regulation (EU) 2019/876 of the European Parliament and of the Council of 20 May 2019 http://data.europa.eu/eli/reg/2019/8

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## CreateTradeGraph *Creates a tree-like structure of a list of trades*

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### Description

Creates a tree-like structure describing the various hedging sets / risk factors that that the input trades can be broken into

### Usage

```
CreateTradeGraph(trades)
```

### Arguments

| | |
|---|---|
| trades | The full list of the Trade Objects |

### Value

A tree structure based on hedging/netting sets and basis/volatility transactions

### Author(s)

Tasos Grivas <tasos@openriskcalculator.com>

`DetermineCCRMethodology` *Specifies the CCR methodology*

## Description

Determines the CCR methodology that the institution is eligible to utilize. The regulator allows the institutions to select less complicated methodologies when the derivatives trading business is negligible

## Usage

```
DetermineCCRMethodology(trades_filename, total_assets)
```

## Arguments

| | |
|---|---|
| `trades_filename` | the file holding the trades of the portfolio |
| `total_assets` | the total assets of the institution in mio EUR |

## Value

The CCR methodology that the institution is eligible to utilize

## Author(s)

Tasos Grivas <info@openriskcalculator.com>

## References

Regulation (EU) 2019/876 of the European Parliament and of the Council of 20 May 2019 http://data.europa.eu/eli/reg/2019/8

`ExampleBasisVol` *Basis+Volatility trades Example*

## Description

Calculates the Exposure at Default for a trade set containing basis and volatility transactions

## Usage

```
ExampleBasisVol(JSON = FALSE)
```

## Arguments

| | |
|---|---|
| `JSON` | (optional) if TRUE it returns a json string |

### Value

The exposure at default

### Author(s)

Tasos Grivas <tasos@openriskcalculator.com>

### References

Regulation (EU) 2019/876 of the European Parliament and of the Council of 20 May 2019 http://data.europa.eu/eli/reg/2019/8

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## ExampleComm *Commodities Example*

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### Description

Calculates the Exposure at Default for the Commodities example as given in the Basel III regulatory paper

### Usage

```
ExampleComm(JSON = FALSE)
```

### Arguments

| | |
|---|---|
| JSON | (optional) if TRUE it returns a json string |

### Value

The exposure at default (expected value based on the Basel paper is 5406)

### 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

## ExampleCredit *Credit Products Example*

### Description

Calculates the Exposure at Default for the Credit example as given in the Basel III regulatory paper

### Usage

```
ExampleCredit(JSON = FALSE)
```

### Arguments

| | |
|---|---|
| JSON | (optional) if TRUE it returns a json string |

### Value

The exposure at default (expected value based on the Basel paper is 381)

### 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

## ExampleFX *FX Example*

### Description

Calculates the Exposure at Default for the FX product type

### Usage

```
ExampleFX(JSON = FALSE)
```

### Arguments

| | |
|---|---|
| JSON | (optional) if TRUE it returns a json string |

### Value

The exposure at default

### 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

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`ExampleFXHedge` *FX Example*

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### Description

Calculates the Exposure at Default for the FX product type

### Usage

```
ExampleFXHedge(
  JSON = FALSE,
  rwa_fx_cpty = NULL,
  rwa_cds_cpty = NULL,
  EAD_cds = NULL,
  hedging_approach = NULL,
  protection_percentage = NULL
)
```

### Arguments

| | |
|---|---|
| `JSON` | (optional) if TRUE it returns a json string |
| `rwa_fx_cpty` | (optional) The risk weight of the original counterparty |
| `rwa_cds_cpty` | (optional) The risk weight of the hedging counterparty |
| `EAD_cds` | (optional) The EAD of the hedging CDS contract |
| `hedging_approach` | (optional) The hedging approach, can be 'Current', 'TechnicalAmendment' or 'CappedProtection' |
| `protection_percentage` | (optional) if the hedging_approach is 'CappedProtection' |

### Value

The exposure at default

### 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

Technical Amendment - Hedging of counterparty credit risk exposures https://www.bis.org/bcbs/publ/d600.htm

## Examples

```
tree_fx_hedge = ExampleFXHedge(rwa_fx_cpty = 0.2, rwa_cds_cpty = 0.2, EAD_cds = 14,
 hedging_approach = "CappedProtection", protection_percentage = 0.5)
```

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# ExampleIRD *IRDs Example*

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## Description

Calculates the Exposure at Default for the IRD example as given in the Basel III regulatory paper

## Usage

```
ExampleIRD(JSON = FALSE)
```

## Arguments

| | |
|---|---|
| JSON | (optional) if TRUE it returns a json string |

## Value

The exposure at default (expected value based on the Basel paper is 569)

## 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

ExampleIRDCommMargined *Margined IRDs+Commodity Example*

## Description

Calculates the Exposure at Default for the margined IRDs + Commodity example as given in the Basel III regulatory paper

## Usage

```
ExampleIRDCommMargined(JSON = FALSE)
```

## Arguments

| | |
|---|---|
| JSON | (optional) if TRUE it returns a json string |

## Value

The exposure at default (expected value based on the Basel paper is 1879)

## 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

ExampleIRDCredit *IRDs+Commodity Example*

## Description

Calculates the Exposure at Default for the IRDs + Commodity example as given in the Basel III regulatory paper

## Usage

```
ExampleIRDCredit(JSON = FALSE)
```

## Arguments

| | |
|---|---|
| JSON | (optional) if TRUE it returns a json string |

## Value

The exposure at default (expected value based on the Basel paper is 936)

## 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

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`HandleBasisVol` *Splits trades in being basis, volatility or 'normal' transactions*

---

## Description

Receives a list of trades and splits them according to being basis, volatility or 'normal' transactions

## Usage

```
HandleBasisVol(trades)
```

## Arguments

| | |
|---|---|
| `trades` | The full list of the Trade Objects |

## Value

A list depicting which trade IDs fall under each hedging set.

## Author(s)

Tasos Grivas <tasos@openriskcalculator.com>

## References

Regulation (EU) 2019/876 of the European Parliament and of the Council of 20 May 2019 http://data.europa.eu/eli/reg/2019/8

## 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

Regulation (EU) 2019/876 of the European Parliament and of the Council of 20 May 2019 http://data.europa.eu/eli/reg/2019/8

## SACCRCalculator *SA-CCR Calculator*

### Description

Returns a tree structure depicting the add-on calculations on different hedging/netting sets

### Usage

```
SACCRCalculator(
  trades_filename,
  csa_filename,
  coll_filename,
  JSON = FALSE,
  simplified = FALSE,
  OEM = FALSE,
  export_results = FALSE,
  ignore_margin = FALSE
)
```

### Arguments

| | |
|---|---|
| trades_filename | a .csv file containing the trades |
| csa_filename | a .csv file containing CSAs |
| coll_filename | a .csv file containing collaterals |
| JSON | (optional) if TRUE it returns a json string |
| simplified | (optional) if TRUE, the simplified SA-CCR is being calculated |
| OEM | (optional) if TRUE, the Original Exposure Method is being calculated |
| export_results | (optional) if TRUE, a csv with the exposure at the top level will be exported |
| ignore_margin | (optional) if TRUE, the margin agreement workflow will be turned off |

### Value

The relevant exposure trees

### Author(s)

Tasos Grivas <tasos@openriskcalculator.com>

### References

Regulation (EU) 2019/876 of the European Parliament and of the Council of 20 May 2019 http://data.europa.eu/eli/reg/2019/8

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## SingleTradeAddon *Calculates the addon information*

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### Description

Calculates the addon information (including Adj notional, superv delta etc) for each trade

### Usage

```
SingleTradeAddon(trade, MF)
```

### Arguments

| | |
|---|---|
| trade | A trade object |
| MF | (Optional) The Maturity Factor based on the collateral agreement |

### Value

A list of addon information

### Author(s)

Tasos Grivas <tasos@openriskcalculator.com>

## References

Regulation (EU) 2019/876 of the European Parliament and of the Council of 20 May 2019 http://data.europa.eu/eli/reg/2019/8

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