

Package ‘ggsolvencyii’

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Title A 'ggplot2'-Plot of Composition of Solvency II SCR: SF and IM

Version 0.1.2

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Description An implementation of 'ggplot2'-methods to present the composition of Solvency II Solvency Capital Requirement (SCR) as a series of concentric circle-parts.

Solvency II (Solvency 2) is European insurance legislation, coming in force by the delegated acts of October 10, 2014.

<[https:](https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=OJ%3AL%3A2015%3A012%3ATOC)

[//eur-lex.europa.eu/legal-content/EN/TXT/?uri=OJ%3AL%3A2015%3A012%3ATOC](https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=OJ%3AL%3A2015%3A012%3ATOC)>.

Additional files, defining the structure of the Standard Formula (SF) method of the SCR-calculation are provided.

The structure files can be adopted for localization or for insurance companies who use Internal Models (IM).

Options are available for combining smaller components, horizontal and vertical scaling, rotation, and plotting only some circle-parts.

With outlines and connectors several SCR-compositions can be compared, for example in ORSA-scenarios (Own Risk and Solvency Assessment).

Depends R (>= 3.5.0)

License GPL-3

Encoding UTF-8

LazyData true

RoxygenNote 6.1.1

Imports dplyr, ggplot2, magrittr, tidyr

Suggests covr, ggmap, knitr, rmarkdown, testthat

VignetteBuilder knitr

URL <https://github.com/vanzanden/ggsolvencyii>

BugReports <https://github.com/vanzanden/ggsolvencyii/issues>

NeedsCompilation no

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Contents

geom_sii_riskconnection	3
geom_sii_riskoutline	4
geom_sii_risksurface	7
sii_debug_geom	10
sii_levelmax_sf16_993	11
sii_levelmax_sf16_995	12
sii_plotdetails_sf16	12
sii_structure_sf16_eng	13
sii_structure_sf16_nld	14
sii_x_edgecolors_sf16_eng	15
sii_x_edgecolors_sf16_nld	15
sii_x_fillcolors_sf16_eng	16
sii_x_fillcolors_sf16_nld	16
sii_z_ex1_data	17
sii_z_ex1_edgecolors	18
sii_z_ex1_fillcolors	18
sii_z_ex1_levelmax	19
sii_z_ex1_plotdetails	19
sii_z_ex1_plotdetails2	20
sii_z_ex1_structure	22
sii_z_ex2_data	22
sii_z_ex3_data	23
sii_z_ex3_plotdetails	24
sii_z_ex4_data	25
sii_z_ex4_levelmax	26
sii_z_ex4_structure	26
sii_z_ex6_data	27
sii_z_ex6_data2	28
sii_z_ex6_edgecolors	29
sii_z_ex6_fillcolors	29
sii_z_ex6_levelmax	30
sii_z_ex6_plotdetails	30
sii_z_ex6_structure	31
sii_z_ex7_data	32
sii_z_ex7_plotdetails	33
stat_sii_risksurface	34

Index

37

```
geom_sii_riskconnection
      geom_sii_riskconnection
```

Description

returns a 'ggplot2' object, based on geom_segment.; it plots a line between (x and y coordinates of) those datapoints which have a matching value in the columns 'id' and 'comparewithid'. values in 'id' must be unique. For values in 'comparewithid' is uniqueness not required, but a matching value in 'id' must be present.

Usage

```
geom_sii_riskconnection(data = NULL, mapping = NULL,
  stat = "sii_riskconnection", position = "identity", na.rm = FALSE,
  show.legend = NA, inherit.aes = TRUE, ...)
```

Arguments

data	the dataset in tidyverse format (column 'description' as a factor). see examples in sii_z_ex2_data or sii_z_ex3_data
mapping	required aes(hetics) : 'x' (i.e. time, longitude, integer), 'y' (i.e SCR ratio, latitude), 'id' and also 'comparewithid'
stat	default stat is statsii_riskconnection, combinations with other stat's are not tested
position	standard ggplot function
na.rm	standard ggplot function
show.legend	standard ggplot function
inherit.aes	standard ggplot function
...	ellipsis, a standard R parameter

Value

a 'ggplot2' object based on 'geom_polygon'

Examples

```
library(ggsolvencyii)
library(ggplot2)

sii_z_ex3_data[sii_z_ex3_data$description == "SCR", ]

ggplot() + geom_sii_riskconnection(data = sii_z_ex3_data, mapping = aes(
  comparewithid = comparewithid,
  x = time,
  y = ratio,
  id = id,
```

```

    ),
    color = "red",
    lwd = 0.7,
    arrow = arrow()
  )

```

geom_sii_riskoutline *geom_sii_riskoutline*

Description

returns a 'ggplot2' object, based on geom_path with the outlines concentric circle(part)s, defined by the values in a hierarchy of levels. This can be used instead of geom_sii_risksurface to plot the composition of the SCR. When optional aes(thetic) 'comparewithid' is passed to the geom_sii_riskoutline then the second SCR can be an overlay over another, for easy comparison.

Usage

```

geom_sii_riskoutline(data = NULL, mapping = NULL,
  stat = "sii_riskoutline",
  structure = ggsolvencyii::sii_structure_sf16_eng, squared = FALSE,
  levelmax = 99, aggregatesuffix = "_other", plotdetails = NULL,
  rotationdegrees = NULL, rotationdescription = NULL,
  maxscrvalue = NULL, scalingx = 1, scalingy = 1,
  position = "identity", na.rm = FALSE, show.legend = NA,
  inherit.aes = TRUE, ...)

```

Arguments

data	the dataset in tidyverse format (column 'description' as a factor). see examples in sii_z_ex2_data or sii_z_ex3_data
mapping	required aes(thetic) : 'x' (i.e. time, longitude, integer), 'y' (i.e SCR ratio, latitude), 'id', 'description', 'value'. Optional aes is 'comparewithid'
stat	default stat is statsii_riskoutline, combinations with other stat's are not tested
structure	(dataframe: default = sii_structure_sf16_eng) A representation of the buildup from individual risks to the SCR. columns are 1. description (chr), 2. level (chr), 3. childlevel (chr) . In the standard formula structure, SCR has level 1, with childlevel 2. This means it consists of all datalines with level == 2, ie. "BSCR", "operational" and "Adjustment-LACDT". lines in the dataset with a suffix "d" behind the levelnumber are diversification items. As of now these are not used in any calculation. the values in column "description" in the dataset need to match the description in this file. The package contains also a file sii_structure_sf16_nld with Dutch terms in description column.

squared	(optional, boolean, default = FALSE) when set to TRUE plot returns a square representation. Compared with a circle representation of the same data the height and width of the square are smaller than the radius of the circle. Segments which fall in the corner parts of the square are smaller than equally sized part which fall in the vertical or horizontal parts of the square.
levelmax	(integer or dataframe, default = 99) a positive integer or a dataframe with columns 'level' and 'levelmax'. The maximum amount of items in a certain level to be plotted. The smallest items are combined to one item. In the case level consisting of 7 items has a levelmax of 5 this results in 4 separate items and one grouped item. For a less detailed plot sii_levelmax_sf16_995 and sii_levelmax_sf16_993 are present in the package where the components of market, life, non-life, health are combined in 5 or 3 items.
aggregatesuffix	(string, default = "_other") When a certain level contains more items than specified by levelmax the smallest items are combined. The description is of the name of the one higher level (lower number) with a suffix
plotdetails	a table with columns 'levelordescription' and 'outline1' to 'outline4', indicating which outlines of which circle elements to plot. When no table is provided all segments are plotted. example 3 shows how to combine geom_sii_risksurface and geom_sii_riskoutline by using using table sii_z_ex3_plotdetails . geom_sii_risksurface uses another column in the same table.
rotationdegrees	(optional, integer, -360 to 360, default = NULL) when given, the fixed amount of degrees (positive is clockwise) of which each item is rotated (as in a compass, -90 is a quarter rotation anti-clockwise), additive to possible rotation to description
rotationdescription	(optional, string, default = NULL) default the orientation of the lower level (higher number) circles is based on the structure. When this parameter is not NULL then the circles are rotated in such a way that the indicated item lies in the "north-east" part of the circle.
maxscrvalue	(optional, double, default = NULL) the scale of the different plot elements is by default measured to the largest level 1 element (i.e. SCR) in the dataset, this can be overridden by this parameter for example when combining several plots
scalingx	(optional, positive value ,default = 1) for plots where units in x and y are different in magnitude distortion can occur. This parameter scales only in x-direction
scalingy	(optional, positive value ,default = 1) for plots where units in x and y are different in magnitude distortion can occur. This parameter scales only in y-direction
position	standard ggplot function
na.rm	standard ggplot function

show.legend	standard ggplot function
inherit.aes	standard ggplot function
...	ellipsis, a standard R parameter

Details

When describing an outline of a circle part 4 segments can be distinguished, radial line outwards, outer circle segment, radial line inwards, inner circle segment. Whether or not to plot these lines can be determined with an outline dataframe. by means of the column aes()value comparewithid in the data an overlay can be made to compare two SCR representations.

Value

a 'ggplot2' object [geom_sii_risksurface](#)

Examples

```
library(ggsolvencyii)
library(ggplot2)

## see details about id and comparewithid
# sii_z_ex3_data[sii_z_ex3_data$description == "SCR", ]

ggplot()+
  geom_sii_riskoutline(data = sii_z_ex3_data, mapping = aes(
    # comparewithid = comparewithid,
    x = time,
    y = ratio,
    value = value,
    id = id,
    description = description),
  color = "red",
  lwd = 0.7
)

##and with comparewithid in aes()

ggplot()+
  geom_sii_riskoutline(data = sii_z_ex3_data, mapping = aes(
    comparewithid = comparewithid,
    x = time,
    y = ratio,
    value = value,
    id = id,
    description = description),
  color = "red",
  lwd = 0.7
)
```

geom_sii_risksurface *geom_sii_risksurface*

Description

returns a 'ggplot2' object, based on geom_polygon, with filled, concentric circle(part)s, defined by the values in a hierarchy of levels.

Usage

```
geom_sii_risksurface(data = NULL, mapping = NULL,
  stat = "sii_risksurface",
  structure = ggsolvencyii::sii_structure_sf16_eng, squared = FALSE,
  levelmax = 99, aggregatesuffix = "_other", plotdetails = NULL,
  rotationdegrees = NULL, rotationdescription = NULL,
  maxscrvalue = NULL, scalingx = 1, scalingy = 1,
  position = "identity", na.rm = FALSE, show.legend = NA,
  inherit.aes = TRUE, ...)
```

Arguments

data	the dataset in tidyverse format (column 'description' as a factor). see examples in sii_z_ex2_data or sii_z_ex3_data
mapping	required aes(hetics) : x (i.e. time, longitude), y (i.e SCR ratio, latitude), id, description (), value
stat	default stat is statsii_risksurface, combinations with other stat's are not tested
structure	(dataframe: default = sii_structure_sf16_eng) A representation of the buildup from individual risks to the SCR. columns are 1. description (chr), 2. level (chr), 3. childlevel (chr) . In the standard formula structure, SCR has level 1, with childlevel 2. This means it consists of all datalines with level == 2, ie. "BSCR", "operational" and "Adjustment-LACDT". lines in the dataset with a suffix "d" behind the levelnumber are diversification items. As of now these are not used in any calculation. the values in column "description" in the dataset need to match the description in this file. The package contains also a file sii_structure_sf16_nld with Dutch terms in description column.
squared	(optional, boolean, default = FALSE) when set to TRUE plot returns a square representation. Compared with a circle representation of the same data the height and width of the square are smaller than the radius of the circle. Segments which fall in the corner parts of the square are smaller than equally sized part which fall in the vertical or horizontal parts of the square.

levelmax	(integer or dataframe, default = 99) a positive integer or a dataframe with columns 'level' and 'levelmax'. The maximum amount of items in a certain level to be plotted. The smallest items are combined to one item. In the case level consisting of 7 items has a levelmax of 5 this results in 4 separate items and one grouped item. For a less detailed plot sii_levelmax_sf16_995 and sii_levelmax_sf16_993 are present in the package where the components of market, life, non-life, health are combined in 5 or 3 items.
aggregatesuffix	(string, default = "_other") When a certain level contains more items than specified by levelmax the smallest items are combined. The description is of the name of the one higher level (lower number) with a suffix
plotdetails	(optional) a table with columns 'levelordescription' and 'surface', indicating which circle elements to plot. When no table is provided all segments are plotted. example 3 shows how to combine geom_sii_risksurface and geom_sii_riskoutline by using using table sii_z_ex3_plotdetails . geom_sii_riskoutline uses other columns in the same table
rotationdegrees	(optional, integer, -360 to 360, default = NULL) when given, the fixed amount of degrees (positive is clockwise) of which each item is rotated (as in a compass, -90 is a quarter rotation anti-clockwise), additive to possible rotation to description
rotationdescription	(optional, string, default = NULL) default the orientation of the lower level (higher number) circles is based on the structure. When this parameter is not NULL then the circles are rotated in such a way that the indicated item lies in the "north-east" part of the circle.
maxscrvalue	(optional, double, default = NULL) the scale of the different plot elements is by default measured to the largest level 1 element (i.e. SCR) in the dataset, this can be overridden by this parameter for example when combining several plots
scalingx	(optional, positive value ,default = 1) for plots where units in x and y are different in magnitude distortion can occur. This parameter scales only in x-direction
scalingy	(optional, positive value ,default = 1) for plots where units in x and y are different in magnitude distortion can occur. This parameter scales only in y-direction
position	standard ggplot function
na.rm	standard ggplot function
show.legend	standard ggplot function
inherit.aes	standard ggplot function
...	ellipsis, a standard R parameter

Value

a ggplot object


```

        color = description ## optional
    ),
    ## all parameters are shown here,
    ## the values behind the outcommented are the default values
    ## how and what
    ## structure = sii_structure_sf16_eng,
    ## plotdetails = NULL,
    ## grouping
    # levelmax = 99,
    # aggregatesuffix = "other",
    ## scaling
    # maxscrvalue = NULL,
    # scalingx = 1,
    # scalingy = 1,
    ## rotation and squared
    # rotationdegrees = NULL,
    # rotationdescription = NULL,
    # squared = FALSE,
    ## cosmetic
    lwd = 0.25,
    # alpha = 1
) +
theme_bw() +
scale_fill_manual(name = "risks", values = sii_z_ex1_fillcolors) +
scale_color_manual(name = "risks", values = sii_z_ex1_edgecolors)

```

sii_debug_geom

sii_debug_geom

Description

assists in finding level or description mismatches in a set parameter(tables)

Usage

```

sii_debug_geom(data_descriptionvector,
  structure = ggsolvencyii::sii_structure_sf16_eng,
  aggregatesuffix = "other", levelmax = NULL, plotdetails = NULL,
  fillcolors = NULL, edgecolors = NULL)

```

Arguments

data_descriptionvector	(no default) the vector 'description' from the data
structure	(no default) the structure dataframe
aggregatesuffix	(optional, default = "_other"):
levelmax	(optional, no default): the levelmax dataframe, when not filled the expanded structure assumes levelmax was set to 99 for all levels.

plotdetails	(optional, no default): the plotdetails dataframe
fillcolors	(optional, no default): fillcolor parameter (list with items "description" = "color" where color can be a name, #hexcode or other)
edgecolors	(optional, no default): edgecolor parameter (list with items "description" = "color" where color can be a name, #hexcode or other)

Value

prints two comparison tables and puts them in \$debug_description and \$debug_level

```
sii_levelmax_sf16_993  sii_levelmax_sf16_993
```

Description

maximum number of items in a level, 99 items for levels 1-3 (SCR, BSCR/OR/ADJ, Market/life/... risks) and 3 items for lower level risk (equity/longevity/...) in a standard formula structure.

Usage

```
sii_levelmax_sf16_993
```

Format

A data frame with columns:

level string with format '*level(numeric)*' [*<point>* '*sublevel(numeric)*'] [*'d'*] i.e. 1, 2.01, 3.1d where d indicates a diversification component

levelmax positive integer indicating the total number of components to be shown in a level, consisting of the x-1 largest components and the remaining components combined in one other

Source

made from excel-file in github.com/vanzanden :

Examples

```
installedtable <- sii_levelmax_sf16_993
installedtable
```

```
sii_levelmax_sf16_995  sii_levelmax_sf16_995
```

Description

maximum number of items in a level, 99 items for levels 1-3 (SCR, BSCR/OR/ADJ, Market/life/... risks) and 5 items for lower level risk (equity/longevity/...) in a standard formula structure.

Usage

```
sii_levelmax_sf16_995
```

Format

A data frame with columns:

level string with format '*level(numeric)*' [*<point>* '*sublevel(numeric)*'] [*'d'*] i.e. 1, 2.01, 3.1d where d indicates a diversification component

levelmax positive integer indicating the total number of components to be shown in a level, consisting of the x-1 largest components and the remaining components combined in one other

Source

made from excel-file in github.com/vanzanden, from there transferred to R environment with code in preparingtables.R.

Examples

```
installedtable <- sii_levelmax_sf16_995
installedtable
```

```
sii_plotdetails_sf16  sii_plotdetails_sf16
```

Description

A table for [geom_sii_risksurface](#) and [geom_sii_riskoutline](#) indicating which outlines of each item should be shown, specified per level and/or description. the latter overrule the former. when defining an item (or the squared = TRUE transformation) 4 lines can be distinguished, a radially line going outwards, a circle segment (clockwise), a radially line going inwards, a circle segment (counterclockwise). These are numbered as outline1 to outline4.

Usage

```
sii_plotdetails_sf16
```

Format

A data frame with columns:

levelordescription string with format '*level(numeric)*' [*<point>* '*sublevel(numeric)*'] [*'d'*] i.e. 1, 2.01, 3.1d where d indicates a diversification component **AND/OR** description(s) from the corresponding structure

surface boolean (logical): the surface

outline1 boolean (logical): the radial line

outline2 boolean (logical): the outer line

outline3 boolean (logical): the radial line

outline4 boolean (logical): the inner line

outline11 NOT YET IMPLEMENTED: boolean (logical): analogue to outline1, but but only for the first plotted component of that level. The components in each level are plotted clockwise

outline13 NOT YET IMPLEMENTED: boolean (logical): analogue to outline3, but but only for the last plotted component of that level.

Source

determined based on specification of EIOPA standard formula Solvency II structure made from excel-file in github.com/vanzanden, from there transfered to R environment with code in `preparingtables.R`.

Examples

```
installedtable <- sii_plotdetails_sf16
installedtable
```

```
sii_structure_sf16_eng
      sii_structure_sf16_eng
```

Description

a standard formula structure (as of 2016), with descriptions in English.

Usage

```
sii_structure_sf16_eng
```

Format

A data frame with columns:

description string: the name of the component

level string with format '*level(numeric)*' [*<point>* '*sublevel(numeric)*'] [*'d'*] i.e. 1, 2.01, 3.1d where d indicates a diversification component

childlevel string, same format as level, indicating the level of which the components combine into this level

Source

determined based on specification of EIOPA standard formula Solvency II structure.
made from excel-file in github.com/vanzanden, from there transfered to R environment with code in preparingtables.R.

Examples

```
installedtable <- sii_structure_sf16_eng
installedtable
```

```
sii_structure_sf16_nld
      sii_structure_sf16_nld
```

Description

a standard formula structure (as of 2016), with descriptions in Dutch.

Usage

```
sii_structure_sf16_nld
```

Format

A data frame with columns:

description string: the name of the component

level string with format `'level(numeric)' [<point> 'sublevel(numeric)'] ['d']` i.e. 1, 2.01, 3.1d where d indicates a diversification component

childlevel string, same format as level, indicating the level of which the components combine into this level

Source

determined based on specification of EIOPA standard formula Solvency II structure.
made from excel-file in github.com/vanzanden, from there transfered to R environment with code in preparingtables.R.

Examples

```
installedtable <- sii_structure_sf16_nld
installedtable
```

```
sii_x_edgcolors_sf16_eng  
      sii_x_edgcolors_sf16_eng
```

Description

a colorset, as named list, where each risk has the edgecolor of the "motherlevel", as defined in the `..fillcolors..` variable.

Usage

```
sii_x_edgcolors_sf16_eng
```

Format

A list with items in the form "*description*" = "#*colorcode*":

Source

made with `preparingtables.R` (not included in this package) which can be found on github.com/vanzanden/ggsolvencyii

Examples

```
installedtable <- sii_x_edgcolors_sf16_eng  
installedtable
```

```
sii_x_edgcolors_sf16_nld  
      sii_x_edgcolors_sf16_nld
```

Description

a colorset, as named list, where each risk has the edgecolor of the "motherlevel", as defined in the `..fillcolors..` variable.

Usage

```
sii_x_edgcolors_sf16_nld
```

Format

A list with items in the form "*description*" = "#*colorcode*":

Source

made with `preparingtables.R` (not included in this package) which can be found on github.com/vanzanden/ggsolvencyii

Examples

```
installedtable <- sii_x_edgecolors_sf16_nld
installedtable
```

```
sii_x_fillcolors_sf16_eng
      sii_x_fillcolors_sf16_eng
```

Description

a colorset, as named list, where each accumulationlevel and each type of risk has it's own color, where ".._other" has the same color as the "motherlevel", i.e. 'market_other' has the same color as 'market' while other 'm_..' risks have a different hue.

Usage

```
sii_x_fillcolors_sf16_eng
```

Format

A list with items in the form "*description*"= "#*colorcode*":

Source

made with preparingtables.R (not included in this package) which can be found on github.com/vanzanden/ggsolvencyii

Examples

```
installedtable <- sii_x_fillcolors_sf16_eng
installedtable
```

```
sii_x_fillcolors_sf16_nld
      sii_x_fillcolors_sf16_nld
```

Description

a colorset, as named list, where each accumulationlevel and each type of risk has it's own color, where ".._other" has the same color as the "motherlevel", i.e. 'market_other' has the same color as 'market' while other 'm_..' risks have a different hue.

Usage

```
sii_x_fillcolors_sf16_nld
```

Format

A list with items in the form "*description*"= "*#colorcode*":

Source

made with `preparingtables.R` (not included in this package) which can be found on github.com/vanzanden/ggsolvencyii

Examples

```
installedtable <- sii_x_fillcolors_sf16_nld
installedtable
```

sii_z_ex1_data	<i>sii_z_ex1_data</i>
----------------	-----------------------

Description

example dataset, in tidyverse format, for the showcase of a limited structure.

Usage

```
sii_z_ex1_data
```

Format

A data frame with columns:

time numerical: a representation of an x value:

The x aesthetic could also be a normal numbering, or a longitude

ratio numerical: solvency II ratio, a representation of an y value:

y aesthetic could also be a latitude

description character: component of the structure

id number: a grouping item

value numerical: positive for risks, negative for diversification effects

comparewithid numerical: a reference to the id of another datapoint #'

Source

loosely based on public SFCR report of a medium sized dutch life insurer made from excel-file in github.com/vanzanden, from there transfered to R environment with code in `preparingtables.R`.

Examples

```
installedtable <- sii_z_ex1_data
installedtable
```

```
sii_z_ex1_edgecolors    sii_z_ex1_edgecolors
```

Description

a colorset, as named list, where each risk has the edgecolor of the "motherlevel", as defined in the `..fillcolors..` variable.

Usage

```
sii_z_ex1_edgecolors
```

Format

A list with items in the form "*description*" = "#*colorcode*":

Source

made with `preparingtables.R` (not included in this package) which can be found on github.com/vanzanden/ggsolvencyii

Examples

```
installedtable <- sii_z_ex1_edgecolors
installedtable
```

```
sii_z_ex1_fillcolors    sii_z_ex1_fillcolors
```

Description

a colorset, as named list, where each accumulationlevel and each type of risk has it's own color, where "`.._other`" has the same color as the "motherlevel", i.e. '`market_other`' has the same color as '`market`' while other '`m_..`' risks have a different hue.

Usage

```
sii_z_ex1_fillcolors
```

Format

A list with items in the form "*description*" = "#*colorcode*":

Source

made with `preparingtables.R` (not included in this package) which can be found on github.com/vanzanden/ggsolvencyii

Examples

```
installedtable <- sii_z_ex1_fillcolors
installedtable
```

```
sii_z_ex1_levelmax      sii_z_ex1_levelmax
```

Description

maximum number of items in a level, 99 items for levels 1-3 (SCR, BSCR/OR/ADJ, Market/life/... risks) and 3 items for lower level risk (equity/longevity/...)

Usage

```
sii_z_ex1_levelmax
```

Format

A data frame with columns:

Source

made from excel-file in github.com/vanzanden, from there transfered to R environment with code in preparingtables.R.

Examples

```
installedtable <- sii_z_ex1_levelmax
installedtable
```

```
sii_z_ex1_plotdetails  sii_z_ex1_plotdetails #' A table for geom_sii_risksurface and
                        geom_sii_riskoutline indicating which outlines of each item
                        should be shown, specified per level and/or description. the latter
                        overrule the former:
                        when defining an item (or the squared = TRUE transformation) 4 lines
                        can be distinguished, a radiallyline going outwards, a circle segment
                        (clockwise), a radiallyline going inwards, a circle segment (counter-
                        clockwise). These are numbered as outline1 to outline4.
```

Description

sii_z_ex1_plotdetails #' A table for [geom_sii_risksurface](#) and [geom_sii_riskoutline](#) indicating which outlines of each item should be shown, specified per level and/or description. the latter overrule the former.

when defining an item (or the squared = TRUE transformation) 4 lines can be distinguished, a radiallyline going outwards, a circle segment (clockwise), a radiallyline going inwards, a circle segment (counterclockwise). These are numbered as outline1 to outline4.

Usage

```
sii_z_ex1_plotdetails
```

Format

A data frame with columns:

levelordescription string with format '*level(numeric)*' [*<point>* '*sublevel(numeric)*'] [*'d'*] i.e. 1, 2.01, 3.1d where d indicates a diversification component **AND/OR** description(s) from the corresponding structure

surface boolean (logical): the surface

outline1 boolean (logical): the radial line

outline2 boolean (logical): the outer line

outline3 boolean (logical): the radial line

outline4 boolean (logical): the inner line

outline11 NOT YET IMPLEMENTED: boolean (logical): analogue to outline1, but but only for the first plotted component of that level. The components in each level are plotted clockwise

outline13 NOT YET IMPLEMENTED: boolean (logical): analogue to outline3, but but only for the last plotted component of that level.

Source

determined based on specification of EIOPA standard formula Solvency II structure made from excel-file in github.com/vanzanden, from there transferred to R environment with code in `preparingtables.R`.

Examples

```
installedtable <- sii_z_ex1_plotdetails
installedtable
```

```
sii_z_ex1_plotdetails2
```

sii_z_ex1_plotdetails2 #' A table for `geom_sii_risksurface` and `geom_sii_riskoutline` indicating which outlines of each item should be shown, specified per level and/or description. the latter overrule the former.

when defining an item (or the squared = TRUE transformation) 4 lines can be distinguished, a radially line going outwards, a circle segment (clockwise), a radially line going inwards, a circle segment (counter-clockwise). These are numbered as outline1 to outline4.

Description

sii_z_ex1_plotdetails2 #' A table for `geom_sii_risksurface` and `geom_sii_riskoutline` indicating which outlines of each item should be shown, specified per level and/or description. the latter overrule the former.

when defining an item (or the squared = TRUE transformation) 4 lines can be distinguished, a radialline going outwards, a circle segment (clockwise), a radialline going inwards, a circle segment (counterclockwise). These are numbered as outline1 to outline4.

Usage

```
sii_z_ex1_plotdetails2
```

Format

A data frame with columns:

levelordescription string with format '*level(numeric)*' [*<point>* '*sublevel(numeric)*'] [*'d'*] i.e. 1, 2.01, 3.1d where d indicates a diversification component **AND/OR** description(s) from the corresponding structure

surface boolean (logical): the surface

outline1 boolean (logical): the radial line

outline2 boolean (logical): the outer line

outline3 boolean (logical): the radial line

outline4 boolean (logical): the inner line

outline11 NOT YET IMPLEMENTED: boolean (logical): analogue to outline1, but but only for the first plotted component of that level. The components in each level are plotted clockwise

outline13 NOT YET IMPLEMENTED: boolean (logical): analogue to outline3, but but only for the last plotted component of that level.

Source

determined based on specification of EIOPA standard formula Solvency II structure made from excel-file in github.com/vanzanden, from there transferred to R environment with code in `preparingtables.R`.

Examples

```
installedtable <- sii_z_ex1_plotdetails2
installedtable
```

`sii_z_ex1_structure` *sii_z_ex1_structure*

Description

a adapted (compact) structure, for a life-insurer with only market and life risk and their subrisks

Usage

```
sii_z_ex1_structure
```

Format

A data frame with columns:

description string: the name of the component, or a diversification

level string with format '*level(numeric)*' [*<point>* '*sublevel(numeric)*'] [*d*'] i.e. 1, 2.01, 3.1d where d indicates a diversification component

childlevel string of the same format as level, indicating the level of which the components make up this item

Source

determined based on specification of EIOPA standard formula Solvency II structure made from excel-file in github.com/vanzanden, from there transferred to R environment with code in `preparingtables.R`.

Examples

```
installedtable <- sii_z_ex1_structure
installedtable
```

`sii_z_ex2_data` *sii_z_ex2_data*

Description

example dataset, in tidyverse format, with only one instance of a limited filled sf structure.

Usage

```
sii_z_ex2_data
```

Format

A data frame with columns:

time numerical: a representation of an x value:

The x aesthetic could also be a normal numbering, or a longitude

ratio numerical: solvency II ratio, a representation of an y value:

y aesthetic could also be a latitude

description character: component of the structure

id number: a grouping item

value numerical: positive for risks, negative for diversification effects

Source

loosely based on public SFCR report of a medium sized dutch life insurer made from excel-file in github.com/vanzanden, from there transferred to R environment with code in `preparingtables.R`.

Examples

```
installedtable <- sii_z_ex2_data
installedtable
```

sii_z_ex3_data	<i>sii_z_ex3_data</i>
----------------	-----------------------

Description

example dataset, in tidyverse format, with all columns of the complete SF16 structure present in the data but with only a few risks filled with non-zero values,

Usage

```
sii_z_ex3_data
```

Format

A data frame with columns:

time numerical: a representation of an x value:

The x aesthetic could also be a normal numbering, or a longitude

ratio numerical: solvency II ratio, a representation of an y value:

y aesthetic could also be a latitude

description character: component of the structure

id number: a grouping item

value numerical: positive for risks, negative for diversification effects

comparewithid numerical: a reference to the id of another datapoint

Source

loosely based on public SFCR report of a medium sized dutch life insurer made from excel-file in github.com/vanzanden, from there transfered to R environment with code in `preparingtables.R`.

Examples

```
installedtable <- sii_z_ex3_data
installedtable
```

```
sii_z_ex3_plotdetails  sii_z_ex3_plotdetails #' A table for geom_sii_risksurface and
                        geom_sii_riskoutline indicating which outlines of each item
                        should be shown, specified per level and/or description. the latter
                        overrule the former.
                        when defining an item (or the squared = TRUE transformation) 4 lines
                        can be distinguished, a radiallyline going outwards, a circle segment
                        (clockwise), a radiallyline going inwards, a circle segment (counter-
                        clockwise). These are numbered as outline1 to outline4.
```

Description

`sii_z_ex3_plotdetails` #' A table for `geom_sii_risksurface` and `geom_sii_riskoutline` indicating which outlines of each item should be shown, specified per level and/or description. the latter overrule the former.

when defining an item (or the `squared = TRUE` transformation) 4 lines can be distinguished, a radialline going outwards, a circle segment (clockwise), a radialline going inwards, a circle segment (counterclockwise). These are numbered as `outline1` to `outline4`.

Usage

```
sii_z_ex3_plotdetails
```

Format

A data frame with columns:

levelordescription string with format `'level(numeric)' [<point> 'sublevel(numeric)'] ['d']` i.e. 1, 2.01, 3.1d where d indicates a diversification component **AND/OR** description(s) from the corresponding structure

surface boolean (logical): the surface

outline1 boolean (logical): the radial line

outline2 boolean (logical): the outer line

outline3 boolean (logical): the radial line

outline4 boolean (logical): the inner line

outline11 NOT YET IMPLEMENTED: boolean (logical): analogue to `outline1`, but but only for the first plotted component of that level. The components in each level are plotted clockwise

outline13 NOT YET IMPLEMENTED: boolean (logical): analogue to `outline3`, but but only for the last plotted component of that level.

Source

determined based on specification of EIOPA standard formula Solvency II structure made from excel-file in github.com/vanzanden, from there transferred to R environment with code in `preparingtables.R`.

Examples

```
installedtable <- sii_z_ex3_plotdetails
installedtable
```

sii_z_ex4_data	<i>sii_z_ex4_data</i>
----------------	-----------------------

Description

example dataset, in tidyverse format, with several instances of a filled sf structure,

Usage

```
sii_z_ex4_data
```

Format

A data frame with columns:

time numerical: a representation of an x value:

The x aesthetic could also be a normal numbering, or a longitude

ratio numerical: solvency II ratio, a representation of an y value:

y aesthetic could also be a latitude

description character: component of the structure

id number: a grouping item

value numerical: positive for risks, negative for diversification effects

comparewithid numerical: a reference to the id of another datapoint #'

Source

based on public SFCR 2017 reports of a medium sized dutch life insurer in Oosterhout made from excel-file in github.com/vanzanden, from there transferred to R environment with code in `preparingtables.R`.

Examples

```
installedtable <- sii_z_ex4_data
installedtable
```

sii_z_ex4_levelmax	<i>sii_z_ex4_levelmax</i>
--------------------	---------------------------

Description

maximum number of items in a level, 99 items for levels 1-3 (SCR, BSCR/OR/ADJ, Market/life/... risks) and 3 items for lower level risk (equity/longevity/...)

Usage

```
sii_z_ex4_levelmax
```

Format

A data frame with columns:

Source

made from excel-file in github.com/vanzanden, from there transfered to R environment with code in preparingtables.R.

Examples

```
installedtable <- sii_z_ex4_levelmax
installedtable
```

sii_z_ex4_structure	<i>sii_z_ex4_structure</i>
---------------------	----------------------------

Description

a adapted (compact) structure with no division of market, life, .. risks in subrisks (i.e. equity, longevity,...). Descriptions are in English

Usage

```
sii_z_ex4_structure
```

Format

A data frame with columns:

description string: the name of the component, or a diversification

level string with format '*level(numeric)*' [*<point>* '*sublevel(numeric)*'] [*d*'] i.e. 1, 2.01, 3.1d where d indicates a diversification component

childlevel string of the same format as level, indicating the level of which the components make up this item

Source

determined based on specification of EIOPA standard formula Solvency II structure made from excel-file in github.com/vanzanden, from there transferred to R environment with code in `preparingtables.R`.

Examples

```
installedtable <- sii_z_ex4_structure
installedtable
```

<code>sii_z_ex6_data</code>	<i>sii_z_ex6_data</i>
-----------------------------	-----------------------

Description

example dataset of a internal model of a large Dutch insurer (NN group). Values are fictious

Usage

```
sii_z_ex6_data
```

Format

A data frame with columns:

time numerical: a representation of an x value:
 The x aesthetic could also be a normal numbering, or a longitude

ratio numerical: solvency II ratio, a representation of an y value:
 y aesthetic could also be a latitude

description character: component of the structure

id number: a grouping item

value numerical: positive for risks, negative for diversification effects

comparewithid numerical: a reference to the id of another datapoint

Source

the structure is based on public SFCR 2017 report of NN group, with a possible wrong interpretation of diversification effects towards 'market basis and CPD risk'

#' See preview.tinyurl.com/ggsolvencyii-001, page 33 linking to www.nn-group.com/nn-group/file?uuid=e3e89829-e7bd-495a-9fed-4bc54a9349eb&owner=c5df72fd-8a65-4f75-956d-5e37307aa50c&contentid=2311

made from excel-file in github.com/vanzanden, from there transferred to R environment with code in `preparingtables.R` in the same directory.

Examples

```
installedtable <- sii_z_ex6_data
installedtable
```

sii_z_ex6_data2	sii_z_ex6_data2
-----------------	-----------------

Description

example dataset of a internal model of a large Dutch insurer (NN group). Values are fictious.
 To show 'counterparty default risk (CPD)' separate from the two components 'type 1' and 'type 2' the following assumption is made: The (fictious) diversification towards the higher level from CPD risk is transferred to a position between CPD and its two components. A similar approach is used to show 'business risk', 'life risk', 'morbidity risk' and 'non-life risk' and their (7,4,4 and 4) components

Usage

```
sii_z_ex6_data2
```

Format

A data frame with columns:

time numerical: a representation of an x value:

The x aesthetic could also be a normal numbering, or a longitude

ratio numerical: solvency II ratio, a representation of an y value:

y aesthetic could also be a latitude

description character: component of the structure

id number: a grouping item

value numerical: positive for risks, negative for diversification effects

comparewithid numerical: a reference to the id of another datapoint #'

Source

the structure is based on public SFCR 2017 report of NN group, with a possible wrong interpretation of diversification effects towards 'market basis and CPD risk'

#' See preview.tinyurl.com/ggsolvencyii-001, page 33 linking to www.nn-group.com/nn-group/file?uuid=e3e89829-e7bd-495a-9fed-4bc54a9349eb&owner=c5df72fd-8a65-4f75-956d-5e37307aa50c&contentid=2311 made from excel-file in github.com/vanzanden, from there transferred to R environment with code in `preparingtables.R` in the same directory.

Examples

```
installedtable <- sii_z_ex6_data2
installedtable
```

```
sii_z_ex6_edgecolors    sii_z_ex6_edgecolors
```

Description

a colorset, as named list, where each risk has the edgecolor of the "motherlevel", as defined in the `..fillcolors..` variable.

Usage

```
sii_z_ex6_edgecolors
```

Format

A list with items in the form "*description*" = "#*colorcode*":

Source

made with `preparingtables.R` (not included in this package) which can be found on github.com/vanzanden/ggsolvencyii

Examples

```
installedtable <- sii_z_ex6_edgecolors
installedtable
```

```
sii_z_ex6_fillcolors    sii_z_ex6_fillcolors
```

Description

a colorset, as named list, where each accumulation-level and each type of risk has it's own color, where "`.._other`" has the same color as the "motherlevel", i.e. '`market_other`' has the same color as '`market`' while other '`m_..`' risks have a different hue.

Usage

```
sii_z_ex6_fillcolors
```

Format

A list with items in the form "*description*" = "#*colorcode*":

Source

made with `preparingtables.R` (not included in this package) which can be found on github.com/vanzanden/ggsolvencyii

Examples

```
installedtable <- sii_z_ex6_fillcolors
installedtable
```

```
sii_z_ex6_levelmax      sii_z_ex6_levelmax
```

Description

maximum number of items in a level, 99 items for levels 1-3 (SCR, BSCR/OR/ADJ, Market/life/... risks) and 3 items for lower level risk (equity/longevity/...)

Usage

```
sii_z_ex6_levelmax
```

Format

A data frame with columns:

Source

made from excel-file in github.com/vanzanden, from there transfered to R environment with code in preparingtables.R.

Examples

```
installedtable <- sii_z_ex6_levelmax
installedtable
```

```
sii_z_ex6_plotdetails  sii_z_ex6_plotdetails #' A table for geom_sii_risksurface and
                        geom_sii_riskoutline indicating which outlines of each item
                        should be shown, specified per level and/or description. the latter
                        overrule the former:
                        when defining an item (or the squared = TRUE transformation) 4 lines
                        can be distinguished, a radiallyline going outwards, a circle segment
                        (clockwise), a radiallyline going inwards, a circle segment (counter-
                        clockwise). These are numbered as outline1 to outline4.
```

Description

sii_z_ex6_plotdetails #' A table for [geom_sii_risksurface](#) and [geom_sii_riskoutline](#) indicating which outlines of each item should be shown, specified per level and/or description. the latter overrule the former.

when defining an item (or the squared = TRUE transformation) 4 lines can be distinguished, a radiallyline going outwards, a circle segment (clockwise), a radiallyline going inwards, a circle segment (counterclockwise). These are numbered as outline1 to outline4.

Usage

```
sii_z_ex6_plotdetails
```

Format

A data frame with columns:

levelordescription string with format '*level(numeric)*' [*<point>* '*sublevel(numeric)*'] [*'d'*] i.e. 1, 2.01, 3.1d where d indicates a diversification component **AND/OR** description(s) from the corresponding structure

surface boolean (logical): the surface

outline1 boolean (logical): the radial line

outline2 boolean (logical): the outer line

outline3 boolean (logical): the radial line

outline4 boolean (logical): the inner line

outline11 NOT YET IMPLEMENTED: boolean (logical): analogue to outline1, but but only for the first plotted component of that level. The components in each level are plotted clockwise

outline13 NOT YET IMPLEMENTED: boolean (logical): analogue to outline3, but but only for the last plotted component of that level.

Source

determined based on specification of EIOPA standard formula Solvency II structure made from excel-file in github.com/vanzanden, from there transferred to R environment with code in `preparingtables.R`.

Examples

```
installedtable <- sii_z_ex6_plotdetails
installedtable
```

```
sii_z_ex6_structure    sii_z_ex6_structure
```

Description

a standard formula structure (as of 2016), with descriptions in English.

Usage

```
sii_z_ex6_structure
```

Format

A data frame with columns:

description string: the name of the component

level string with format *'level(numeric)' [<point> 'sublevel(numeric)'] ['d']* i.e. 1, 2.01, 3.1d where d indicates a diversification component

childlevel string, same format as level, indicating the level of which the components combine into this level

Source

determined based on specification of EIOPA standard formula Solvency II structure.

made from excel-file in github.com/vanzanden, from there transfered to R environment with code in `preparingtables.R`.

Examples

```
installedtable <- sii_z_ex6_structure
installedtable
```

sii_z_ex7_data	<i>sii_z_ex7_data</i>
----------------	-----------------------

Description

example dataset, in tidyverse format, with all columns of the complete SF16 structure present in the data but with only a few risks filled with non-zero values,

Usage

```
sii_z_ex7_data
```

Format

A data frame with columns:

tijd numerical: a representation of an x value:

The x aesthetic could also be a normal numbering, or a longitude

ratio numerical: solvency II ratio, a representation of an y value:

y aesthetic could also be a latitude

description character: component of the structure

id number: a grouping item

waarde numerical: positive for risks, negative for diversification effects

vergelijkmet numerical: a reference to the id of another datapoint #'

Source

loosely based on public SFCR report of a medium sized dutch life insurer made from excel-file in github.com/vanzanden, from there transferred to R environment with code in `preparingtables.R`.

Examples

```
installedtable <- sii_z_ex7_data
installedtable
```

```
sii_z_ex7_plotdetails
```

*sii_z_ex7_plotdetails #' A table for `geom_sii_risksurface` and `geom_sii_riskoutline` indicating which outlines of each item should be shown, specified per level and/or description. the latter overrule the former.
when defining an item (or the squared = TRUE transformation) 4 lines can be distinguished, a radially line going outwards, a circle segment (clockwise), a radially line going inwards, a circle segment (counterclockwise). These are numbered as outline1 to outline4.*

Description

`sii_z_ex7_plotdetails` #' A table for `geom_sii_risksurface` and `geom_sii_riskoutline` indicating which outlines of each item should be shown, specified per level and/or description. the latter overrule the former.

when defining an item (or the squared = TRUE transformation) 4 lines can be distinguished, a radially line going outwards, a circle segment (clockwise), a radially line going inwards, a circle segment (counterclockwise). These are numbered as outline1 to outline4.

Usage

```
sii_z_ex7_plotdetails
```

Format

A data frame with columns:

levelordescription string with format '*level(numeric)*' [*<point>* '*sublevel(numeric)*'] [*'d'*] i.e. 1, 2.01, 3.1d where d indicates a diversification component **AND/OR** description(s) from the corresponding structure

surface boolean (logical): the surface

outline1 boolean (logical): the radial line

outline2 boolean (logical): the outer line

outline3 boolean (logical): the radial line

outline4 boolean (logical): the inner line

outline11 NOT YET IMPLEMENTED: boolean (logical): analogue to outline1, but but only for the first plotted component of that level. The components in each level are plotted clockwise

outline13 NOT YET IMPLEMENTED: boolean (logical): analogue to outline3, but but only for the last plotted component of that level.

Source

determined based on specification of EIOPA standard formula Solvency II structure made from excel-file in github.com/vanzanden, from there transferred to R environment with code in `preparingtables.R`.

Examples

```
installedtable <- sii_z_ex7_plotdetails
installedtable
```

```
stat_sii_risksurface  stat_sii_risksurface
```

Description

returns a 'ggplot2' object with filled, concentric circle(part)s, defined by the values of a hierarchy of levels.

Usage

```
stat_sii_risksurface(mapping = NULL, data = NULL,
  geom = "sii_risksurface", position = "identity",
  show.legend = TRUE, inherit.aes = TRUE, na.rm = FALSE,
  levelmax = 99, structure = ggsolvencyii::sii_structure_sf16_eng,
  maxscrvalue = NULL, aggregatesuffix = "_other", scalingx = 1,
  scalingy = 1, rotationdegrees = NULL, rotationdescription = NULL,
  squared = FALSE, plotdetails = NULL, ...)
```

Arguments

mapping	required aes(hetics) : x (i.e. time, longitude), y (i.e SCR ratio, latitude), id, description (), value
data	the dataset in tidyverse format (column 'description' as a factor). see examples in sii_z_ex2_data or sii_z_ex3_data
geom	the default is geom_sii_risksurface
position	standard ggplot function
show.legend	standard ggplot function
inherit.aes	standard ggplot function
na.rm	standard ggplot function
levelmax	(integer or dataframe, default = 99) a positive integer or a dataframe with columns 'level' and 'levelmax'. The maximum amount of items in a certain level to be plotted. The smallest items are combined to one item. In the case level consisting of 7 items has a levelmax of 5 this results in 4 separate items and one grouped item. For a less detailed plot sii_levelmax_sf16_995 and sii_levelmax_sf16_993 are present in the package where the components of market, life, non-life, health are combined in 5 or 3 items.

structure	(dataframe: default = sii_structure_sf16_eng) A representation of the buildup from individual risks to the SCR. columns are 1. description (chr), 2. level (chr), 3. childlevel (chr) . In the standard formula structure, SCR has level 1, with childlevel 2. This means it consists of all datalines with level == 2, ie. "BSCR", "operational" and "Adjustment-LACDT". lines in the dataset with a suffix "d" behind the levelnumber are diversification items. As of now these are not used in any calculation. the values in column "description" in the dataset need to match the description in this file. The package contains also a file sii_structure_sf16_nld with Dutch terms in description column.
maxscrvalue	(optional, double, default = NULL) the scale of the different plot elements is by default measured to the largest level 1 element (i.e. SCR) in the dataset, this can be overridden by this parameter for example when combining several plots
aggregatesuffix	(string, default = "_other") When a certain level contains more items than specified by levelmax the smallest items are combined. The description is of the name of the one higher level (lower number) with a suffix
scalingx	(optional, positive value ,default = 1) for plots where units in x and y are different in magnitude distortion can occur. This parameter scales only in x-direction
scalingy	(optional, positive value ,default = 1) for plots where units in x and y are different in magnitude distortion can occur. This parameter scales only in y-direction
rotationdegrees	(optional, integer, -360 to 360, default = NULL) when given, the fixed amount of degrees (positive is clockwise) of which each item is rotated (as in a compass, -90 is a quarter rotation anti-clockwise), additive to possible rotation to description
rotationdescription	(optional, string, default = NULL) default the orientation of the lower level (higher number) circles is based on the structure. When this parameter is not NULL then the circles are rotated in such a way that the indicated item lies in the "north-east" part of the circle.
squared	(optional, boolean, default = FALSE) when set to TRUE plot returns a square representation. Compared with a circle representation of the same data the height and width of the square are smaller than the radius of the circle. Segments which fall in the corner parts of the square are smaller than equally sized part which fall in the vertical or horizontal parts of the square.
plotdetails	(optional) a table with columns 'levelordescription' and 'surface', indicating which circle elements to plot. When no table is provided all segments are plotted. example 3 shows how to combine <code>geom_sii_risksurface</code> and <code>geom_sii_riskoutline</code>

by using using table [sii_z_ex3_plotdetails](#). geom_sii_riskoutline uses other columns in the same table

... ellipsis, a standard R parameter

Value

a ggplot object

Index

* datasets

sii_levelmax_sf16_993, [11](#)
sii_levelmax_sf16_995, [12](#)
sii_plotdetails_sf16, [12](#)
sii_structure_sf16_eng, [13](#)
sii_structure_sf16_nld, [14](#)
sii_x_edgecolors_sf16_eng, [15](#)
sii_x_edgecolors_sf16_nld, [15](#)
sii_x_fillcolors_sf16_eng, [16](#)
sii_x_fillcolors_sf16_nld, [16](#)
sii_z_ex1_data, [17](#)
sii_z_ex1_edgecolors, [18](#)
sii_z_ex1_fillcolors, [18](#)
sii_z_ex1_levelmax, [19](#)
sii_z_ex1_plotdetails, [19](#)
sii_z_ex1_plotdetails2, [20](#)
sii_z_ex1_structure, [22](#)
sii_z_ex2_data, [22](#)
sii_z_ex3_data, [23](#)
sii_z_ex3_plotdetails, [24](#)
sii_z_ex4_data, [25](#)
sii_z_ex4_levelmax, [26](#)
sii_z_ex4_structure, [26](#)
sii_z_ex6_data, [27](#)
sii_z_ex6_data2, [28](#)
sii_z_ex6_edgecolors, [29](#)
sii_z_ex6_fillcolors, [29](#)
sii_z_ex6_levelmax, [30](#)
sii_z_ex6_plotdetails, [30](#)
sii_z_ex6_structure, [31](#)
sii_z_ex7_data, [32](#)
sii_z_ex7_plotdetails, [33](#)

geom_sii_riskconnection, [3](#)
geom_sii_riskoutline, [4](#), [12](#), [19–21](#), [24](#), [30](#),
[33](#)
geom_sii_risksurface, [6](#), [7](#), [12](#), [19–21](#), [24](#),
[30](#), [33](#)

sii_debug_geom, [10](#)

sii_levelmax_sf16_993, [5](#), [8](#), [11](#), [34](#)
sii_levelmax_sf16_995, [5](#), [8](#), [12](#), [34](#)
sii_plotdetails_sf16, [12](#)
sii_structure_sf16_eng, [4](#), [7](#), [13](#), [35](#)
sii_structure_sf16_nld, [4](#), [7](#), [14](#), [35](#)
sii_x_edgecolors_sf16_eng, [15](#)
sii_x_edgecolors_sf16_nld, [15](#)
sii_x_fillcolors_sf16_eng, [16](#)
sii_x_fillcolors_sf16_nld, [16](#)
sii_z_ex1_data, [17](#)
sii_z_ex1_edgecolors, [18](#)
sii_z_ex1_fillcolors, [18](#)
sii_z_ex1_levelmax, [19](#)
sii_z_ex1_plotdetails, [19](#)
sii_z_ex1_plotdetails2, [20](#)
sii_z_ex1_structure, [22](#)
sii_z_ex2_data, [3](#), [4](#), [7](#), [22](#), [34](#)
sii_z_ex3_data, [3](#), [4](#), [7](#), [23](#), [34](#)
sii_z_ex3_plotdetails, [5](#), [8](#), [24](#), [36](#)
sii_z_ex4_data, [25](#)
sii_z_ex4_levelmax, [26](#)
sii_z_ex4_structure, [26](#)
sii_z_ex6_data, [27](#)
sii_z_ex6_data2, [28](#)
sii_z_ex6_edgecolors, [29](#)
sii_z_ex6_fillcolors, [29](#)
sii_z_ex6_levelmax, [30](#)
sii_z_ex6_plotdetails, [30](#)
sii_z_ex6_structure, [31](#)
sii_z_ex7_data, [32](#)
sii_z_ex7_plotdetails, [33](#)
stat_sii_risksurface, [34](#)