

Package: sdcLog (via r-universe)

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Title Tools for Statistical Disclosure Control in Research Data Centers

Version 0.5.0

Description Tools for researchers to explicitly show that their results comply to rules for statistical disclosure control imposed by research data centers. These tools help in checking descriptive statistics and models and in calculating extreme values that are not individual data. Also included is a simple function to create log files. The methods used here are described in the ``Guidelines for the checking of output based on microdata research" by Bond, Brandt, and de Wolf (2015) <https://ec.europa.eu/eurostat/cros/system/files/dwb_standalone-document_output-checking-guidelines.pdf>.

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URL <https://github.com/matthiasgomolka/sdcLog>

BugReports <https://github.com/matthiasgomolka/sdcLog/issues>

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common_arguments	<i>arguments</i>
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Description

arguments

Arguments

data	data.frame from which the descriptive statistics are calculated.
id_var	character The name of the id variable. Defaults to <code>getOption("sdc.id_var")</code> so that you can provide <code>options(sdc.id_var = "my_id_var")</code> at the top of your script.
val_var	character vector of value variables on which descriptive statistics are computed.
by	character vector of grouping variables.
zero_as_NA	logical If TRUE, zeros in 'val_var' are treated as NA.
fill_id_var	logical Only for very specific use cases. For example: <ul style="list-style-type: none"> • <code>id_var</code> contains NA values which represent missing values in the sense that there actually exist values identifying the entity but are unknown (or deleted for privacy reasons). • <code>id_var</code> contains NA values which result from the fact that an observation features more than one confidential identifier and not all of these identifiers are present in each observation. Examples for such identifiers are the role of a broker in a security transaction or the role of a collateral giver in a credit relationship.

If TRUE, NA values within `id_var` will internally be filled with `<filled_[i]>`, assuming that all NA values of `id_var` can be treated as different small entities for statistical disclosure control purposes. Thus, set TRUE only if this is a reasonable assumption.

Defaults to FALSE.

<code>model</code>	The estimated model object. Can be a model type like <code>lm</code> , <code>glm</code> and various others (anything which can be handled by <code>broom::augment()</code>).
<code>min_obs</code>	integer The minimum number of observations used to calculate the minimum and maximum. Defaults to <code>getOption("sdc.n_ids", 5L)</code> . <i>This is not the number of distinct entities.</i>
<code>max_obs</code>	integer The maximum number of observations used to calculate the minimum and maximum. Defaults to <code>nrow(data)</code> . <i>This is not the number of distinct entities.</i>

```
print.sdc_distinct_ids
```

Print methods for SDC objects

Description

These methods print SDC objects. Tables containing information are only printed when relevant.

Usage

```
## S3 method for class 'sdc_distinct_ids'
print(x, ...)

## S3 method for class 'sdc_dominance'
print(x, ...)

## S3 method for class 'sdc_options'
print(x, ...)

## S3 method for class 'sdc_settings'
print(x, ...)

## S3 method for class 'sdc_descriptives'
print(x, ...)

## S3 method for class 'sdc_model'
print(x, ...)

## S3 method for class 'sdc_min_max'
print(x, ...)
```

Arguments

x	The object to be printed
...	Ignored.

sdc_descriptives *Disclosure control for descriptive statistics*

Description

Checks the number of distinct entities and the (n, k) dominance rule for your descriptive statistics.

That means that `sdc_descriptives()` checks if there are at least 5 distinct entities and if the largest 2 entities account for 85% or more of `val_var`. The parameters can be changed using options. For details see `vignette("options", package = "sdcLog")`.

Usage

```
sdc_descriptives(
  data,
  id_var = getOption("sdc.id_var"),
  val_var = NULL,
  by = NULL,
  zero_as_NA = NULL,
  fill_id_var = FALSE
)
```

Arguments

data	data.frame from which the descriptive statistics are calculated.
id_var	character The name of the id variable. Defaults to <code>getOption("sdc.id_var")</code> so that you can provide <code>options(sdc.id_var = "my_id_var")</code> at the top of your script.
val_var	character vector of value variables on which descriptive statistics are computed.
by	character vector of grouping variables.
zero_as_NA	logical If TRUE, zeros in 'val_var' are treated as NA.
fill_id_var	logical Only for very specific use cases. For example: <ul style="list-style-type: none"> • <code>id_var</code> contains NA values which represent missing values in the sense that there actually exist values identifying the entity but are unknown (or deleted for privacy reasons). • <code>id_var</code> contains NA values which result from the fact that an observation features more than one confidential identifier and not all of these identifiers are present in each observation. Examples for such identifiers are the role of a broker in a security transaction or the role of a collateral giver in a credit relationship.

If TRUE, NA values within `id_var` will internally be filled with `<filled_[i]>`, assuming that all NA values of `id_var` can be treated as different small entities for statistical disclosure control purposes. Thus, set TRUE only if this is a reasonable assumption.

Defaults to FALSE.

Details

The general form of the (n, k) dominance rule can be formulated as:

$$\sum_{i=1}^n x_i > \frac{k}{100} \sum_{i=1}^N x_i$$

where $x_1 \geq x_2 \geq \dots \geq x_N$. n denotes the number of largest contributions to be considered, x_n the n -th largest contribution, k the maximal percentage these n contributions may account for, and N is the total number of observations.

If the statement above is true, the (n, k) dominance rule is violated.

Value

A [list](#) of class `sdc_descriptives` with detailed information about options, settings, and compliance with the criteria distinct entities and dominance.

Examples

```
sdc_descriptives(
  data = sdc_descriptives_DT,
  id_var = "id",
  val_var = "val_1"
)
```

```
sdc_descriptives(
  data = sdc_descriptives_DT,
  id_var = "id",
  val_var = "val_1",
  by = "sector"
)
```

```
sdc_descriptives(
  data = sdc_descriptives_DT,
  id_var = "id",
  val_var = "val_1",
  by = c("sector", "year")
)
```

```
sdc_descriptives(
  data = sdc_descriptives_DT,
  id_var = "id",
  val_var = "val_2",
  by = c("sector", "year")
)
```

```
)  
  
sdc_descriptives(  
  data = sdc_descriptives_DT,  
  id_var = "id",  
  val_var = "val_2",  
  by = c("sector", "year"),  
  zero_as_NA = FALSE  
)
```

sdc_descriptives_DT *Example data for sdc_descriptives()*

Description

Utilized in the vignette.

Usage

```
data("sdc_descriptives_DT")
```

Format

A data.table with 20 rows and 5 columns.

Details

The data.table contains the following columns:

- id [factor](#) random identifier
- sector [factor](#) economic sector
- year [integer](#) time variable
- val_1, val_2 [numeric](#) value variables

sdc_log

Create Stata-like log files from R Scripts

Description

This function creates Stata-like log files from R Scripts. It can handle several files (in a [character vector](#)) at once.

Usage

```
sdc_log(r_script, destination, replace = FALSE, append = FALSE, local = FALSE)
```

Arguments

r_script	character Path of the R script to be run with logging.
destination	One of: <ul style="list-style-type: none"> • character Path of the log file to be used. • file connection to which the log should be written. This is especially useful, when you have nested calls to <code>sdc_log()</code> and want to write everything into the same log file. Then, create a single file connection and provide this connection to all calls to <code>sdc_log()</code> (and close it afterwards).
replace	logical Indicates whether to replace an existing log file.
append	logical Indicates whether to append an existing log file.
local	One of: <ul style="list-style-type: none"> • logical Indicates whether to evaluate within the global environment (FALSE) or the calling environment (TRUE). • environment A specific evaluation environment. Determines the evaluation environment. Useful whenever <code>sdc_log()</code> is called from within a function, or for nested <code>sdc_log()</code> calls. By default (FALSE) evaluation occurs in the global environment. See also source.

Value

character vector holding the path(s) of the written log file(s).

sdc_min_max

Calculate RDC rule-compliant extreme values

Description

Checks if calculation of extreme values comply to RDC rules. If so, function returns average min and max values according to RDC rules.

Usage

```
sdc_min_max(
  data,
  id_var = getOption("sdc.id_var"),
  val_var,
  by = NULL,
  max_obs = nrow(data),
  fill_id_var = FALSE
)
```

Arguments

<code>data</code>	data.frame from which the descriptive statistics are calculated.
<code>id_var</code>	character The name of the id variable. Defaults to <code>getOption("sdc.id_var")</code> so that you can provide <code>options(sdc.id_var = "my_id_var")</code> at the top of your script.
<code>val_var</code>	character vector of value variables on which descriptive statistics are computed.
<code>by</code>	character vector of grouping variables.
<code>max_obs</code>	integer The maximum number of observations used to calculate the minimum and maximum. Defaults to <code>nrow(data)</code> . <i>This is not the number of distinct entities.</i>
<code>fill_id_var</code>	logical Only for very specific use cases. For example:

- `id_var` contains NA values which represent missing values in the sense that there actually exist values identifying the entity but are unknown (or deleted for privacy reasons).
- `id_var` contains NA values which result from the fact that an observation features more than one confidential identifier and not all of these identifiers are present in each observation. Examples for such identifiers are the role of a broker in a security transaction or the role of a collateral giver in a credit relationship.

If TRUE, NA values within `id_var` will internally be filled with `<filled_[i]>`, assuming that all NA values of `id_var` can be treated as different small entities for statistical disclosure control purposes. Thus, set TRUE only if this is a reasonable assumption.

Defaults to FALSE.

Value

A list [list](#) of class `sdc_min_max` with detailed information about options, settings and the calculated extreme values (if possible).

Examples

```
sdc_min_max(sdc_min_max_DT, id_var = "id", val_var = "val_1")
sdc_min_max(sdc_min_max_DT, id_var = "id", val_var = "val_2")
sdc_min_max(sdc_min_max_DT, id_var = "id", val_var = "val_3", max_obs = 10)
sdc_min_max(sdc_min_max_DT, id_var = "id", val_var = "val_1", by = "year")
sdc_min_max(
  sdc_min_max_DT, id_var = "id", val_var = "val_1", by = c("sector", "year")
)
```

sdc_min_max_DT	<i>Example data for sdc_min_max()</i>
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Description

Utilized in the vignette

Usage

```
data("sdc_min_max_DT")
```

Format

A data.table with 20 rows and 6 columns.

Details

The data.table contains the following columns:

- id **factor** random identifier
- sector **factor** economic sector
- year **integer** time variable
- val_1 - val_3 **numeric** value variables

sdc_model	<i>Disclosure control for models</i>
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Description

Checks if your model complies to RDC rules. Checks for overall number of entities and number of entities for each level of dummy variables.

Usage

```
sdc_model(data, model, id_var = getOption("sdc.id_var"), fill_id_var = FALSE)
```

Arguments

data	data.frame which was used to build the model.
model	The estimated model object. Can be a model type like lm , glm and various others (anything which can be handled by broom::augment()).
id_var	character The name of the id variable. Defaults to <code>getOption("sdc.id_var")</code> so that you can provide <code>options(sdc.id_var = "my_id_var")</code> at the top of your script.

`fill_id_var` **logical** Only for very specific use cases. For example:

- `id_var` contains NA values which represent missing values in the sense that there actually exist values identifying the entity but are unknown (or deleted for privacy reasons).
- `id_var` contains NA values which result from the fact that an observation features more than one confidential identifier and not all of these identifiers are present in each observation. Examples for such identifiers are the role of a broker in a security transaction or the role of a collateral giver in a credit relationship.

If TRUE, NA values within `id_var` will internally be filled with `<filled_[i]>`, assuming that all NA values of `id_var` can be treated as different small entities for statistical disclosure control purposes. Thus, set TRUE only if this is a reasonable assumption.

Defaults to FALSE.

Value

A [list](#) of class `sdc_model` with detailed information about options, settings, and compliance with the distinct entities criterion.

Examples

```
# Check simple models
model_1 <- lm(y ~ x_1 + x_2, data = sdc_model_DT)
sdc_model(data = sdc_model_DT, model = model_1, id_var = "id")

model_2 <- lm(y ~ x_1 + x_2 + x_3, data = sdc_model_DT)
sdc_model(data = sdc_model_DT, model = model_2, id_var = "id")

model_3 <- lm(y ~ x_1 + x_2 + dummy_3, data = sdc_model_DT)
sdc_model(data = sdc_model_DT, model = model_3, id_var = "id")
```

sdc_model_DT

Example data for sdc_model()

Description

Utilized in the vignette

Usage

```
data("sdc_model_DT")
```

Format

A `data.table` with 80 rows and 9 columns.

Details

The data.table contains the following columns:

- id **factor** random identifier
- y - x_4 **numeric** value variables
- dummy_1 - dummy_3 **factor** dummy variables

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