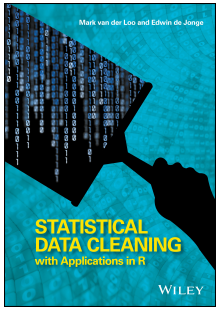

Adjusting numerical values

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Try the code

`03valid/adjusting.R`

Adjusting numerical values

Minimally adjust values so that they conform to rules after imputation.

Imputation

- Almost all imputation methods, do not take the data restrictions/rules into account.
- This means that valid data can be become invalid after missing values have been imputed.

Successive projection algorithm

Idea

Alter (imputed) values in a record $\boldsymbol{x}$ *as little as possible* to satisfy all restrictions.

As little as possible?

The minimal Eucledian distance between the original $\boldsymbol{x}$ and the adjusted record $\boldsymbol{x}^*$.

$$\boldsymbol{x}^* = \min_{\boldsymbol{x}} (\boldsymbol{x}^* - \boldsymbol{x})'(\boldsymbol{x}^* - \boldsymbol{x})$$

Successive Projection Algorithm (sketch)

Project $\boldsymbol{x}$ on each (in)equality restriction sequentially and iteratively until convergence.

Hildredth (1957) *Naval Research Logistics* **4** 79–85

Extension: weighted distance

$$\boldsymbol{x}^* = \min_{\boldsymbol{x}} (\boldsymbol{x}^* - \boldsymbol{x})' \boldsymbol{W} (\boldsymbol{x}^* - \boldsymbol{x})$$

Property

If $W_{ij} = \delta_{ij} x_j^{-1}$, then the ratios between altered variables are preserved to $\mathcal{O}(1)$.

Pannekoek & Zhang (2015) *Survey Methodology* **41** 127–144; SDCR §10.11

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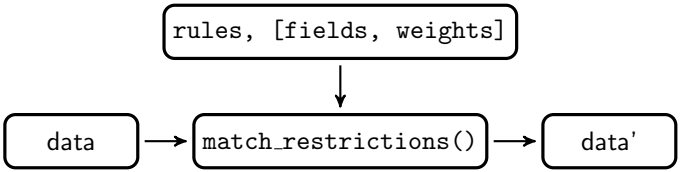
rules, [fields, weights]
data
match_restrictions()
data'

Assignments

- load “03valid/imputed.csv” into `imputed`
- use `confront` to find out how many values are invalid and make a plot of the object
- apply `rspa::match_restrictions` to the data
- use `confront` to find out how many values are invalid and make a plot of the object