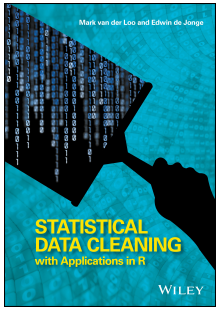

Imputation

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Try the code

`03valid/impute.R`

Imputing data

Need to specify

- Imputation method
- Variable(s) to impute
- Variables used as predictor

Simputation's goal

Easy to experiment, robust enough for production.

Simputation interface

```
impute_<model>(data, imputed_variables ~ predictors, ...)
```

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Imputing data with simputation

<model>	description
proxy	copy (transformation of) other variable(s)
median	(group-wise) median
rlm, lm, en	(robust) linear model, elasticnet regression
cart, rf	Classification And Regression Tree, RandomForest
em, mf	EM-alogithm (multivariate normal) missForest
knn	*k* nearest neighbours
shd, rhd	sequential, random, hot-deck
pmm	predictive mean matching
impute_model	use pre-trained model

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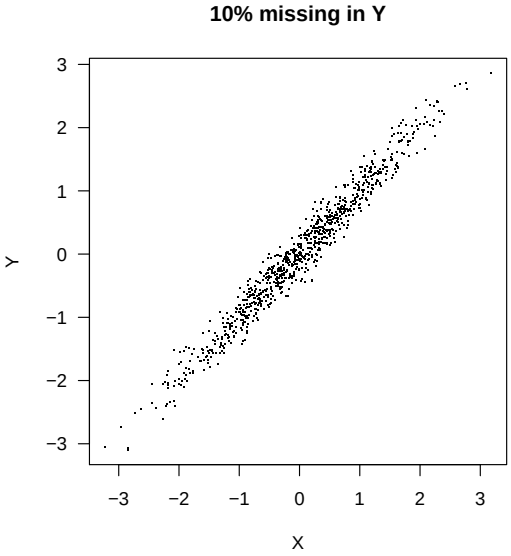
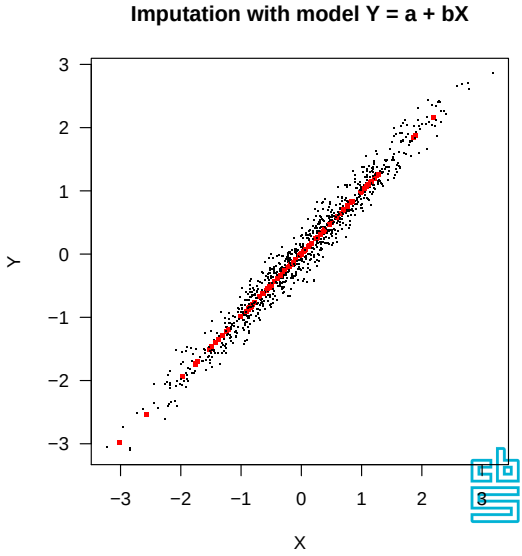
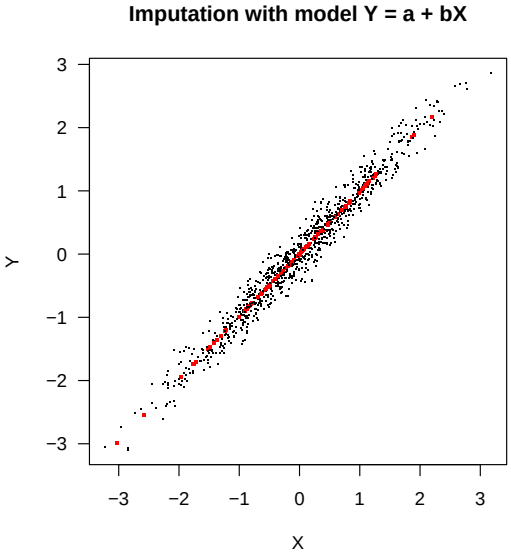
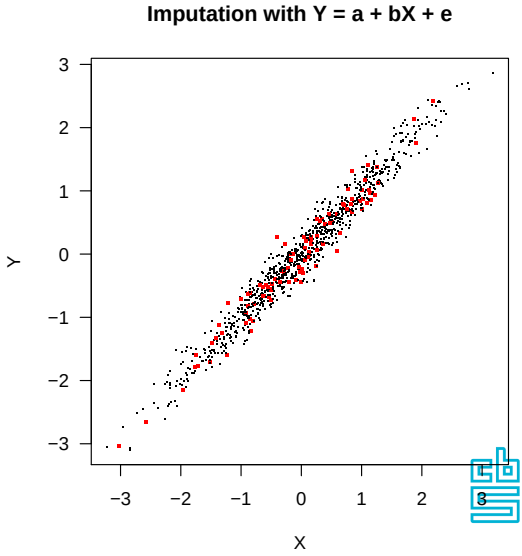
Imputation of the mean





Adding a random residual





Adding a random residual with `simputation`

Example

```
impute_rlm(companies, other.rev ~ turnover
         , add_residual = "normal")
```

Options

- "none"‘: (default)
- "normal"‘: from $N(0, \hat{\sigma})$
- "observed"‘: from observed residuals

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Chaining methods

Example

```
companies %>%
  impute_lm(turnover ~ staff + profit) %>%
  impute_lm(turnover ~ staff)
```

Assignment

1. Read `errors_located.csv` (`stringsAsFactors=FALSE`)
2. Make a separete data frame, selecting columns 11–14 (`staff`–`vat`)
3. Implement the following imputation sequence:
   - Impute `turnover` by copying the `vat` variable (`impute_proxy`)
   - Impute `staff` with a robust linear model based on `staff.costs`
   - Impute `staff` with a robust linear model based on `total.costs`
   - Impute `profit` as `total.rev - total.costs` (`impute_proxy`)
   - Impute everything else using `missForest` (formula: `. ~ .`)

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