Data Handling: Import, Cleaning and Visualisation

Lecture 8:

Data Preparation

Prof. Dr. Ulrich Matter

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Updates

Recap: Data Import

Sources/formats in economics

- CSV (typical for rectangular/table-like data)
- Variants of CSV (tab-delimited, fix length etc.)
- XML and JSON (useful for complex/high-dimensional data sets)
- HTML (a markup language to define the structure and layout of webpages)
- Unstructured text

Sources/formats in economics

- Excel spreadsheets (`.xls`)
- Formats specific to statistical software packages (SPSS: `.sav`, STATA: `.dat`, etc.)
- Built-in R datasets
- Binary formats

A Template/Blueprint

```
#######################################################################
# Data Handling Course: Example Script for Data Gathering and Import
#
# Imports data from ...
# Input: links to data sources (data comes in ... format)
# Output: cleaned data as CSV
#
# U. Matter, St.Gallen, 2019
#######################################################################


# SET UP --------------
# load packages
library(tidyverse)

# set fix variables
INPUT_PATH <- "/rawdata"
OUTPUT_FILE <- "/final_data/datafile.csv"
```

Script sections

Finally we add sections with the actual code (in the case of a data import script, maybe one section per data source)

```
#######################################################################
# Project XY: Data Gathering and Import
#
# This script is the first part of the data pipeline of project XY.
# It imports data from ...
# Input: links to data sources (data comes in ... format)
# Output: cleaned data as CSV
#
# U. Matter, St.Gallen, 2019
#######################################################################


# SET UP --------------
# load packages
library(tidyverse)

# set fix variables
INPUT_PATH <- "/rawdata"
OUTPUT_FILE <- "/final_data/datafile.csv"
```

Parsing CSVs

Recognizing columns and rows is one thing…

```
swiss
```

```
## # A tibble: 47 x 7
##    District     Fertility Agriculture Examination Education Catholic Infant.Morta
##    <chr>            <dbl>       <dbl>       <dbl>     <dbl>    <dbl>            <
##  1 Courtelary        80.2        17            15        12     9.96
##  2 Delemont          83.1        45.1           6         9    84.8
##  3 Franches-Mnt      92.5        39.7           5         5    93.4
##  4 Moutier           85.8        36.5          12         7    33.8
##  5 Neuveville        76.9        43.5          17        15     5.16
##  6 Porrentruy        76.1        35.3           9         7    90.6
##  7 Broye             83.8        70.2          16         7    92.8
##  8 Glane             92.4        67.8          14         8    97.2
##  9 Gruyere           82.4        53.3          12         7    97.7
## 10 Sarine            82.9        45.2          16        13    91.4
## # … with 37 more rows
```

What else did `read_csv()` recognize?

Parsing CSVs

- Recall the introduction to data structures and data types in R
- How does R represent data in RAM
    - **Structure**: `data.frame`/`tibble`, etc.
    - **Types**: `character`, `numeric`, etc.
- Parsers in `read_csv()` guess the data **types**.

Parsing CSV-columns

```
library(readr)

read_csv('A,B
         12:00, 12:00
         14:30, midnight
         20:01, noon')
```

```
## # A tibble: 3 x 2
##   A      B
##   <time> <chr>
## 1 12:00  12:00
## 2 14:30  midnight
## 3 20:01  noon
```

Parsing CSV-columns: guess types

Under the hood `read_csv()` used the `guess_parser()`- function to determine which type the two vectors likely contain:

```
guess_parser(c("12:00", "midnight", "noon"))
```

```
## [1] "character"
```

```
guess_parser(c("12:00", "14:30", "20:01"))
```

```
## [1] "time"
```

Data Preparation/Munging/Wrangling

The dataset is imported, now what?

- In practice: still a long way to go.
- Parsable, but messy data: Inconsistencies, data types, missing observations, wide format.

The dataset is imported, now what?

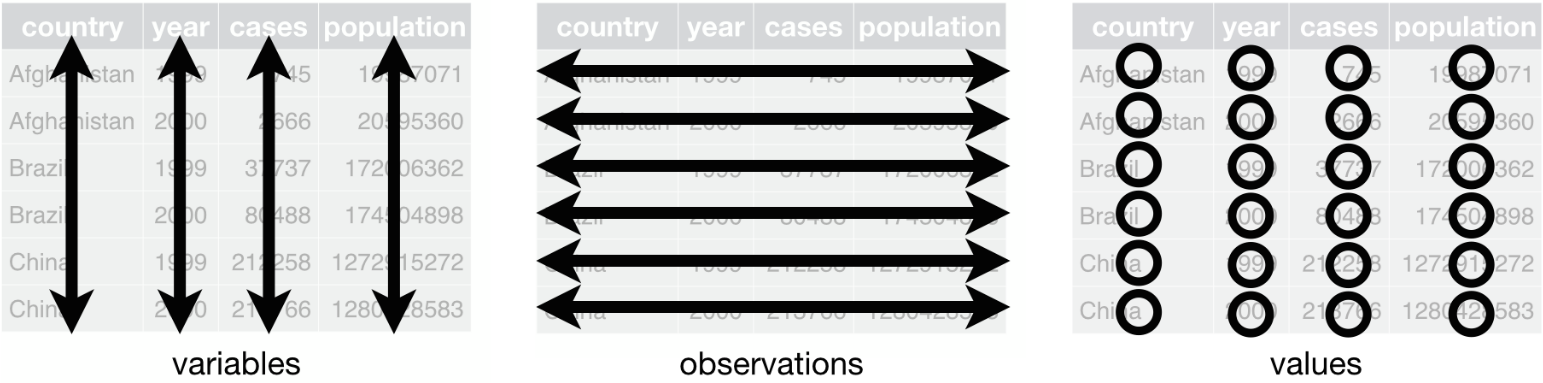
- In practice: still a long way to go.
- Parsable, but messy data: Inconsistencies, data types, missing observations, wide format.
- **Goal** of data preparation: Dataset is ready for analysis.
- **Key conditions**:
  1. Data values are consistent/clean within each variable.
  2. Variables are of proper data types.
  3. Dataset is in ‘tidy’ (in long format)!

Some vocabulary

Following Wickham (2014):

- **Dataset**: Collection of **values** (numbers and strings).
- Every value belongs to a **variable** and an **observation**.
- **Variable**: Contains all values that measure the same underlying attribute across units.
- **Observation**: Cointains all values measured on the same unit (e.g., a person).

Tidy data



Tidy data. Source: Wickham and Grolemund (2017), licensed under the Creative Commons Attribution-Share Alike 3.0 United States license.

Data preparation in R (`tidyverse`)

Q&A

References

Wickham, Hadley. 2014. “Tidy Data.” **Journal of Statistical Software, Articles** 59 (10): 1–23. https://doi.org/10.18637/jss.v059.i10.

Wickham, Hadley, and Garrett Grolemund. 2017. Sebastopol, CA: O’Reilly. http://r4ds.had.co.nz/.