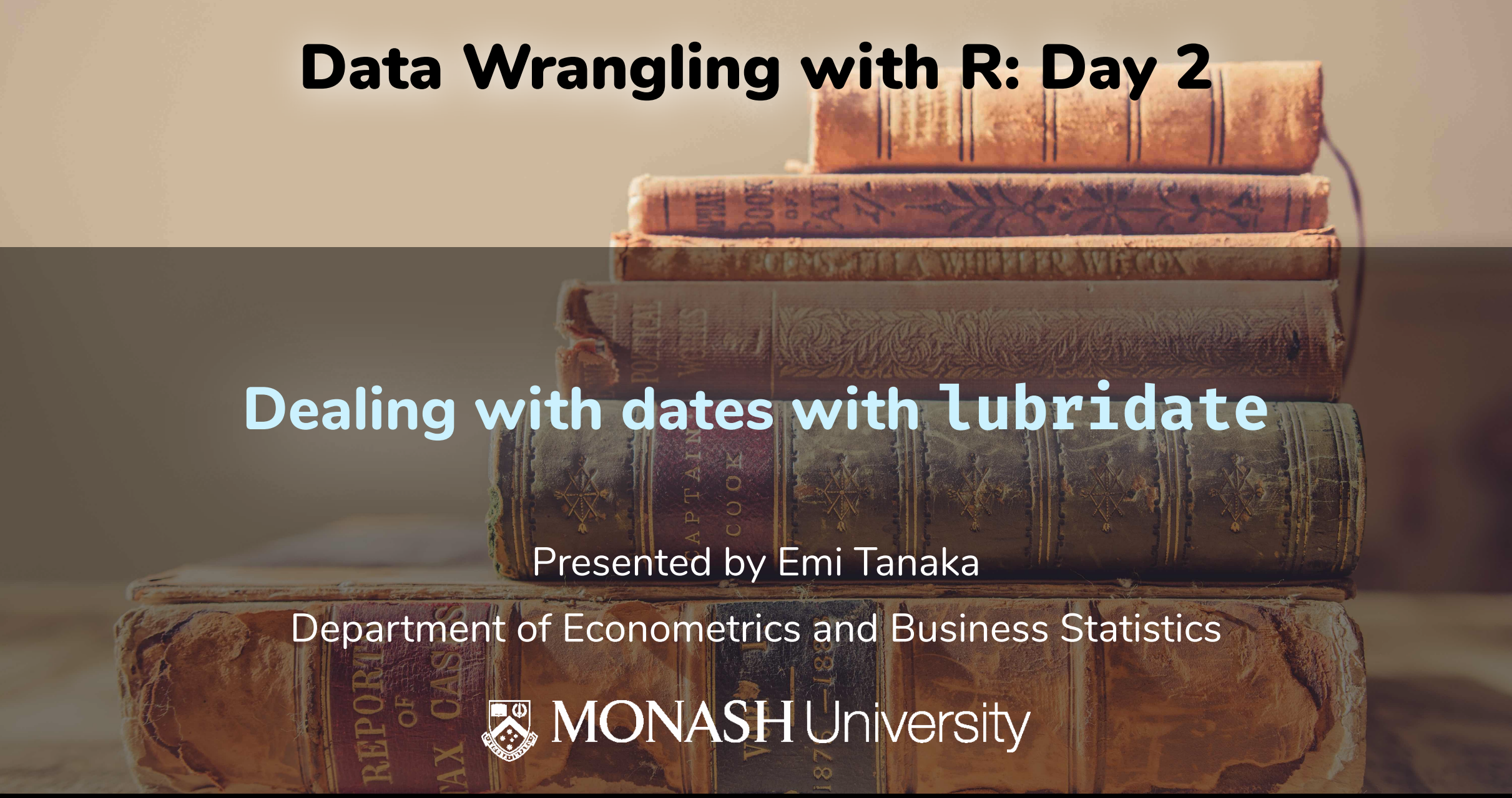
Data Wrangling with R: Day 2



Dealing with dates with `lubridate`

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Date in R Base R Part 1

- Dealing with dates alone is relatively straightforward compared to date and time
- Dealing with date *and* time is ... tricky so let's start with dates

```
Sys.Date() # System Date, gets the date when the command is run

## [1] "2020-12-02"
```

- Dates in R have class **`Date`** 📅 even though it looks like `character` 🔢

```
class(Sys.Date())

## [1] "Date"
```

- It's actually a numerical value under the hood, what is this number? 🤔

```
unclass(Sys.Date())

## [1] 18598
```

Date in R Base R Part 2

- ℹ **1st January 1970** is a special reference point
- Let's have a look at the numerical value under the hood of `Date` objects

```
unclass(as.Date("1970/01/02"))

## [1] 1

unclass(as.Date("1969/12/31"))

## [1] -1
```

- Yup, the number under the hood is the number of days after (if positive) or before (if negative) 1st January 1970
- And yes, you can use `as.Date` to convert objects to `Date` 📅

Date in R Base R Part 3

- Dates do no have to be in the format of "YYYY/MM/DD" (in fact, there are many format in the wild)
- If it has a different format, then you can use the conversion specification with a "%" symbol followed by a single letter note quite regex, but like it

```
as.Date("Xmas is 25 December 2020", format = "Xmas is %d %B %Y")

## [1] "2020-12-25"
```

- You can find some widely used conversion specification in documentation at `?strptime` but some *depends on your operating system*
- Below are some common ones:
  - %b abbreviated month
  - %B full month
  - %e day of the month (01, 02, ..., 31)
  - %y year without century (00-99)

System locale

- "aralık" is December in Turkey

```
as.Date("Xmas is 25 aralık 2020", format = "Xmas is %d %B %Y")

## [1] NA
```

- Let's temorary set our system locale to Turkey

```
Sys.setlocale("LC_TIME", "tr_TR.UTF-8") # temporary set to Turkey locale

as.Date("Xmas is 25 aralık 2020", format = "Xmas is %d %B %Y")

## [1] "2020-12-25"
```

(And set it back to English again) "UTF-8" might only for Unix and Linux systems

```
Sys.setlocale("LC_TIME", "en_AU.UTF-8")
```

Date and Time in R Base R Part 1

- two main date-time classes in R: **`POSIXct`** and **`POSIXlt`** avoid using `POSIXlt` if possible
- POSIX stands for Portable Operating System Interface
- `ct` stands for calendar time

```
as.POSIXct("2020-12-02 13:00", format = "%Y-%m-%e %H:%M")

## [1] "2020-12-02 13:00:00 AEDT"

unclass(as.POSIXct("2020-12-02 13:00", format = "%Y-%m-%e %H:%M"))

## [1] 1606874400
## attr(,"tzone")
## [1] ""
```

- ℹ **1970/01/01 00:00:00 UTC** is a special reference point called ***Unix epoch*** and the above number is the number of seconds after Unix epoch

Date and Time in R Base R Part 2

- `POSIXlt` seems like it's the same as `POSIXlt`

```
as.POSIXlt("2020-12-02 13:00", format = "%Y-%m-%e %H:%M")

## [1] "2020-12-02 13:00:00 AEDT"
```

- But under the hood, it's a list of time attributes

```
unclass(as.POSIXlt("2020-12-02 13:00", format = "%Y-%m-%e %H:%M"))

## $sec
## [1] 0
##
## $min
## [1] 0
##
## $hour
## [1] 13
```

- `lubridate` is a package in Tidyverse but not part of the core pacakges
- This means that you need to `library(lubridate)` explicitly if you need to use it

Time zone

```
melb <- as.POSIXct("2020-12-02 13:00", format = "%Y-%m-%e %H:%M",
                   tz = "Australia/Melbourne")

perth <- as.POSIXct("2020-12-02 13:00", format = "%Y-%m-%e %H:%M",
                   tz = "Australia/Perth")

melb - perth

## Time difference of -3 hours
```

- You can find the names of the time zones using **`OlsonNames()`**
- If you want to know which time zone your system is using:

```
Sys.timezone()

## [1] "Australia/Melbourne"
```

Working with `lubridate`

Date in R `lubridate`

- Remember, `lubridate` isn't part of core `tidyverse` so you have to load it up explicitly

```
library(lubridate)
```

- To convert string to a `Date`, you can use `ymd` and friends. E.g.

```
ymd("2012 Dec 30th")

## [1] "2012-12-30"

mdy("01/30 99")

## [1] "1999-01-30"

dmy("1st January 2015")

## [1] "2015-01-01"
```

You might have guessed it but:
`y` = year, `m` = month, and `d` = day.

The order determines the expected order of its appearance in the string

Date and time in R `lubridate`

- To convert string to `POSIXct`, you can use `ymd_hms` and friends

```
ymd_hms("20140101 201001", tz = "Australia/Melbourne")

## [1] "2014-01-01 20:10:01 AEDT"

mdy_h("09/09/2010 4PM")

## [1] "2010-09-09 16:00:00 UTC"

ydm_hm("Today is not 2009 9th Sep 4:30PM")

## [1] "2009-09-09 16:30:00 UTC"

ydm_hms("19 9 July | 4:30:03.34343")

## [1] "2019-07-09 04:30:03 UTC"
```

`h` = hour, `m` = minute, and `s` = second.

It's remarkably clever!

The time has to be after date though.

Conversion to date and time `lubridate`

Making `Date` from individual date components:

```
make_date(year = 2018,
          month = 8,
          day = 3)

## [1] "2018-08-03"
```

Making `POSIXct` from individual components:

```
make_datetime(year = 2018,
              month = 8,
              day = 3,
              hour = 10,
              min = 3,
              sec = 30)

## [1] "2018-08-03 10:03:30 UTC"
```

Extracting date or time components `lubridate`

```
t1 <- ymd_hms("20101010 13:30:30")

month(t1, label = TRUE)

## [1] Oct
## 12 Levels: Jan < Feb < Mar < Apr < May < Jun < Jul < Aug < Sep < ... < Dec
```

```
year(t1)

## [1] 2010

month(t1)

## [1] 10

day(t1)

## [1] 10
```

```
hour(t1)

## [1] 13

minute(t1)

## [1] 30

second(t1)

## [1] 30
```

```
yday(t1)

## [1] 283

mday(t1)

## [1] 10

wday(t1)

## [1] 1
```

Date and time modifiers

```
month(t1) <- 3
t1
```

```
## [1] "2010-03-10 13:30:30 UTC"
```

```
mday(t1) <- 20
t1
```

```
## [1] "2010-03-20 13:30:30 UTC"
```

```
with_tz(t1, "Australia/Perth")
```

```
## [1] "2010-03-20 21:30:30 AWST"
```

Durations `lubridate`

- `Duration` is a special class in `lubridate`
- Some convenient constructors for `Duration` are:

```
dyears(1)

## [1] "31557600s (~1 years)"

dweeks(10)

## [1] "6048000s (~10 weeks)"

ddays(4)

## [1] "345600s (~4 days)"

dhours(3)

## [1] "10800s (~3 hours)"
```

Maths with Durations `lubridate`

```
ddays(4) + dweeks(1)
```

```
## [1] "950400s (~1.57 weeks)"
```

```
ymd("2013-01-01") + ddays(5)
```

```
## [1] "2013-01-06"
```

```
ymd_hms("2020-10-1 2:00:00", tz = "Australia/Melbourne") + ddays(1)
```

```
## [1] "2020-10-02 02:00:00 AEST"
```

- What happened below?

```
ymd_hms("2020-10-4 1:00:00", tz = "Australia/Melbourne") + dhours(1)
```

```
## [1] "2020-10-04 03:00:00 AEDT"
```

- Day light saving started at Sun 4th Oct 2020 2AM in Melbourne

Period `lubridate`

- `Period` is a special class in `lubridate`
- Constructors for `Period` are like for `Duration` but without the prefix "d":

```
years(1)
```

```
## [1] "1y 0m 0d 0H 0M 0S"
```

```
weeks(10)
```

```
## [1] "70d 0H 0M 0S"
```

```
days(4)
```

```
## [1] "4d 0H 0M 0S"
```

```
hours(3)
```

```
## [1] "3H 0M 0S"
```

Maths with Period `lubridate`

```
days(4) + weeks(1)
```

```
## [1] "11d 0H 0M 0S"
```

```
ymd("2013-01-01") + days(5)
```

```
## [1] "2013-01-06"
```

```
ymd_hms("2020-10-1 2:00:00", tz = "Australia/Melbourne") + days(1)
```

```
## [1] "2020-10-02 02:00:00 AEST"
```

```
ymd_hms("2020-10-4 1:00:00", tz = "Australia/Melbourne") + hours(1)
```

```
## [1] NA
```

```
ymd_hms("2020-10-4 1:00:00", tz = "Australia/Melbourne") + hours(2)
```

```
## [1] "2020-10-04 03:00:00 AEDT"
```

</> If you installed the `dwexercise` package, run below in your R console

```
learnr::run_tutorial("day2-exercise-03", package = "dwexercise")
```

🔗 If the above doesn't work for you, go here.

? Questions or issues, let us know!

15:00

Session Information

```
devtools::session_info()
```

```
## ─ Session info ─────────────────────────────────────────────────────────────
##  setting  value
##  version  R version 4.0.1 (2020-06-06)
##  os       macOS Catalina 10.15.7
##  system   x86_64, darwin17.0
##  ui       X11
##  language (EN)
##  collate  en_AU.UTF-8
##  ctype    en_AU.UTF-8
##  tz       Australia/Melbourne
##  date     2020-12-02
##
## ─ Packages ─────────────────────────────────────────────────────────────────
##  package     * version    date       lib source
##  anicon        0.1.0      2020-06-21 [1] Github (emitanaka/anicon@0b756df)
##  assertthat    0.2.1      2019-03-21 [2] CRAN (R 4.0.0)
```