(2019) R

2024-04-28

Contents

(2019) ( ) R . R :

```
install.packages("tidyverse")
install.packages("openxlsx")
install.packages("haven")
install.packages("wooldridge")
install.packages("fixest")
```

0.1 Usage

Each **bookdown** chapter is an .Rmd file, and each .Rmd file can contain one (and only one) chapter. A chapter *must* start with a first-level heading: `# A good chapter`, and can contain one (and only one) first-level heading.

Use second-level and higher headings within chapters like: `## A short section` or `### An even shorter section`.

The `index.Rmd` file is required, and is also your first book chapter. It will be the homepage when you render the book.

0.2 Render book

You can render the HTML version of this example book without changing anything:

1. Find the **Build** pane in the RStudio IDE, and
2. Click on **Build Book**, then select your output format, or select "All formats" if you'd like to use multiple formats from the same book source files.

Or build the book from the R console:

```
bookdown::render_book()
```

To render this example to PDF as a `bookdown::pdf_book`, you'll need to install XeLaTeX. You are recommended to install TinyTeX (which includes XeLaTeX): https://yihui.org/tinytex/.

0.3 Preview book

As you work, you may start a local server to live preview this HTML book. This preview will update as you edit the book when you save individual .Rmd files. You can start the server in a work session by using the RStudio add-in "Preview book", or from the R console:

```
bookdown::serve_book()
```

2

.

```
#
curl <- "https://www.yuhikaku.co.jp/static_files/05385_support02.zip"
#            ,
if(!dir.exists("downloads")){
    dir.create("downloads")
}
cdestfile <- "downloads/support02.zip"
download.file(curl, cdestfile)
#          ,
if(!dir.exists("data")){
    dir.create("data")
}
# WSL R        Linux
# Windows        .
if(.Platform$OS.type == "unix") {
    system(sprintf('unzip -n -Ocp932 %s -d %s', "downloads/support02.zip", "./data"))
} else {
    print("Windows         .")
}
```

.

```
library(tidyverse)
## -- Attaching core tidyverse packages ------------------------ tidyverse 2.0.0 --
## v dplyr     1.1.4     v readr     2.1.5
## v forcats   1.0.0     v stringr   1.5.1
## v ggplot2   3.5.0     v tibble    3.2.1
## v lubridate 1.9.3     v tidyr     1.3.1
## v purrr     1.0.2
## -- Conflicts ------------------------------------------ tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()
## i Use the conflicted package (<http://conflicted.r-lib.org/>) to force all conflicts to become
```

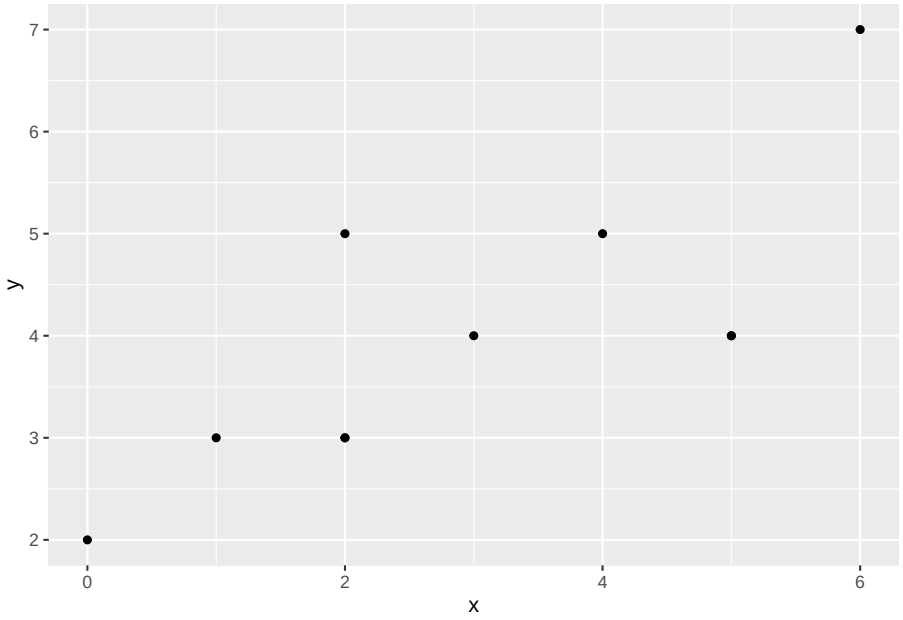
2-1 [ ]

R , Mode() .

```
data21 <- read.table("data/02_ 2 /02_practice_01.csv")

mean(data21$V1)
## [1] 10
var(data21$V1)
## [1] 18.10526
median(data21$V1)
## [1] 10

Mode <- function(x) {
    ux <- unique(x)
    tab <- tabulate(match(x, ux))
    ux[tab == max(tab)]
}

Mode(data21$V1)
## [1] 10
```

2-2 [ ]

```
data23 <- read.table("data/02_ 2 /02_practice_03.csv", sep=",")

x <- data23$V1
y <- data23$V2

data23 %>%
    ggplot(aes(x = x, y = y)) +
    geom_point()
```




```
cov(x, y)
## [1] 2.111111
cor(x, y)
## [1] 0.7680295
```

3

3 2 . 3 , 2-1 , 2-3 .

.

```
library(tidyverse)
```

3-1 [ ]

3-2 [ ]

2 2-1 t . $\alpha = 0.10$ 90% $[8.354811, 11.645189]$, 8 .
$\alpha = 0.01$ 99% $[7.277955, 12.722045]$ 8 , .

```
data32 <- read.table("data/02_ 2 /02_practice_01.csv")
x <- data32$V1

t.test(x, alternative = "two.sided", mu = 8, conf.level = 0.90)
##
##  One Sample t-test
##
## data:  x
## t = 2.102, df = 19, p-value = 0.04911
## alternative hypothesis: true mean is not equal to 8
## 90 percent confidence interval:
##   8.354811 11.645189
## sample estimates:
## mean of x
##        10

t.test(x, alternative = "two.sided", mu = 8, conf.level = 0.99)
##
##  One Sample t-test
##
## data:  x
```

```
## t = 2.102, df = 19, p-value = 0.04911
## alternative hypothesis: true mean is not equal to 8
## 99 percent confidence interval:
##   7.277955 12.722045
## sample estimates:
## mean of x
##        10
```

3-3 [ ]

3-4 [ ]

4

.

```
#
curl <- "https://www.yuhikaku.co.jp/static_files/05385_support04.zip"
#            ,
if(!dir.exists("downloads")){
    dir.create("downloads")
}
cdestfile <- "downloads/support04.zip"
download.file(curl, cdestfile)
#           ,
if(!dir.exists("data")){
    dir.create("data")
}
# WSL R         Linux
# Windows         .
if(.Platform$OS.type == "unix") {
    system(sprintf('unzip -n -Ocp932 %s -d %s', "downloads/support04.zip", "./data"))
} else {
    print("Windows          .")
}
```

.

```
library(tidyverse)
library(openxlsx) # Excel
```

4.1

p.128 $N = 22$ $N = 21$.

```
ch04_wage <- read.table("data/04_ 4 /ch04_wage.csv", header = TRUE, sep = ",")
ch04_wage_model <- lm(wage ~ productivity, data = ch04_wage) # robust  ?
summary(ch04_wage_model)
##
```

```
## Call:
## lm(formula = wage ~ productivity, data = ch04_wage)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -47.618 -17.612   4.186  21.946  37.052
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  276.12961   87.61057   3.152  0.00525 **
## productivity   0.54682    0.02442  22.395 4.04e-15 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 25.77 on 19 degrees of freedom
## Multiple R-squared:  0.9635, Adjusted R-squared:  0.9616
## F-statistic: 501.5 on 1 and 19 DF,  p-value: 4.037e-15
```

4-1:

: !

```
ch04_wage %>%
    ggplot(aes(x = productivity, y = wage)) +
    geom_point() +
    xlab("  ( )") +
    ylab("  ( )")
```

```
## Warning in grid.Call(C_textBounds, as.graphicsAnnot(x$label), x$x, x$y, :
## conversion failure on '  ( )' in 'mbcsToSbcs': dot substituted for <e5>
## Warning in grid.Call(C_textBounds, as.graphicsAnnot(x$label), x$x, x$y, :
## conversion failure on '  ( )' in 'mbcsToSbcs': dot substituted for <ae>
## Warning in grid.Call(C_textBounds, as.graphicsAnnot(x$label), x$x, x$y, :
## conversion failure on '  ( )' in 'mbcsToSbcs': dot substituted for <9f>
## Warning in grid.Call(C_textBounds, as.graphicsAnnot(x$label), x$x, x$y, :
## conversion failure on '  ( )' in 'mbcsToSbcs': dot substituted for <e8>
## Warning in grid.Call(C_textBounds, as.graphicsAnnot(x$label), x$x, x$y, :
## conversion failure on '  ( )' in 'mbcsToSbcs': dot substituted for <b3>
## Warning in grid.Call(C_textBounds, as.graphicsAnnot(x$label), x$x, x$y, :
## conversion failure on '  ( )' in 'mbcsToSbcs': dot substituted for <aa>
## Warning in grid.Call(C_textBounds, as.graphicsAnnot(x$label), x$x, x$y, :
## conversion failure on '  ( )' in 'mbcsToSbcs': dot substituted for <e8>
## Warning in grid.Call(C_textBounds, as.graphicsAnnot(x$label), x$x, x$y, :
## conversion failure on '  ( )' in 'mbcsToSbcs': dot substituted for <b3>
## Warning in grid.Call(C_textBounds, as.graphicsAnnot(x$label), x$x, x$y, :
## conversion failure on '  ( )' in 'mbcsToSbcs': dot substituted for <83>
```

```
## Warning in grid.Call(C_textBounds, as.graphicsAnnot(x$label), x$x, x$y, :
## conversion failure on '  ()' in 'mbcsToSbcs': dot substituted for <e9>
## Warning in grid.Call(C_textBounds, as.graphicsAnnot(x$label), x$x, x$y, :
## conversion failure on '  ()' in 'mbcsToSbcs': dot substituted for <87>
## Warning in grid.Call(C_textBounds, as.graphicsAnnot(x$label), x$x, x$y, :
## conversion failure on '  ()' in 'mbcsToSbcs': dot substituted for <91>
## Warning in grid.Call(C_textBounds, as.graphicsAnnot(x$label), x$x, x$y, :
## conversion failure on '  ()' in 'mbcsToSbcs': dot substituted for <e5>
## Warning in grid.Call(C_textBounds, as.graphicsAnnot(x$label), x$x, x$y, :
## conversion failure on '  ()' in 'mbcsToSbcs': dot substituted for <86>

## Warning in grid.Call(C_textBounds, as.graphicsAnnot(x$label), x$x, x$y, :
## conversion failure on '  ()' in 'mbcsToSbcs': dot substituted for <86>
## Warning in grid.Call(C_textBounds, as.graphicsAnnot(x$label), x$x, x$y, :
## conversion failure on '  ()' in 'mbcsToSbcs': dot substituted for
## <e5>
## Warning in grid.Call(C_textBounds, as.graphicsAnnot(x$label), x$x, x$y, :
## conversion failure on '  ()' in 'mbcsToSbcs': dot substituted for
## <8a>
## Warning in grid.Call(C_textBounds, as.graphicsAnnot(x$label), x$x, x$y, :
## conversion failure on '  ()' in 'mbcsToSbcs': dot substituted for
## <b4>
## Warning in grid.Call(C_textBounds, as.graphicsAnnot(x$label), x$x, x$y, :
## conversion failure on '  ()' in 'mbcsToSbcs': dot substituted for
## <e5>
## Warning in grid.Call(C_textBounds, as.graphicsAnnot(x$label), x$x, x$y, :
## conversion failure on '  ()' in 'mbcsToSbcs': dot substituted for
## <83>
## Warning in grid.Call(C_textBounds, as.graphicsAnnot(x$label), x$x, x$y, :
## conversion failure on '  ()' in 'mbcsToSbcs': dot substituted for
## <8d>
## Warning in grid.Call(C_textBounds, as.graphicsAnnot(x$label), x$x, x$y, :
## conversion failure on '  ()' in 'mbcsToSbcs': dot substituted for
## <e7>
## Warning in grid.Call(C_textBounds, as.graphicsAnnot(x$label), x$x, x$y, :
## conversion failure on '  ()' in 'mbcsToSbcs': dot substituted for
## <94>
## Warning in grid.Call(C_textBounds, as.graphicsAnnot(x$label), x$x, x$y, :
## conversion failure on '  ()' in 'mbcsToSbcs': dot substituted for
## <9f>
## Warning in grid.Call(C_textBounds, as.graphicsAnnot(x$label), x$x, x$y, :
## conversion failure on '  ()' in 'mbcsToSbcs': dot substituted for
## <e7>
## Warning in grid.Call(C_textBounds, as.graphicsAnnot(x$label), x$x, x$y, :
## conversion failure on '  ()' in 'mbcsToSbcs': dot substituted for
```

```
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## Warning in grid.Call(C_textBounds, as.graphicsAnnot(x$label), x$x, x$y, :
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## <a3>
## Warning in grid.Call(C_textBounds, as.graphicsAnnot(x$label), x$x, x$y, :
## conversion failure on '   ()' in 'mbcsToSbcs': dot substituted for
## <e6>
## Warning in grid.Call(C_textBounds, as.graphicsAnnot(x$label), x$x, x$y, :
## conversion failure on '   ()' in 'mbcsToSbcs': dot substituted for
## <80>
## Warning in grid.Call(C_textBounds, as.graphicsAnnot(x$label), x$x, x$y, :
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```

```
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## conversion failure on '  ()' in 'mbcsToSbcs': dot substituted for <e8>
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## Warning in grid.Call.graphics(C_text, as.graphicsAnnot(x$label), x$x, x$y, :
## conversion failure on '  ()' in 'mbcsToSbcs': dot substituted for <e9>
## Warning in grid.Call.graphics(C_text, as.graphicsAnnot(x$label), x$x, x$y, :
## conversion failure on '  ()' in 'mbcsToSbcs': dot substituted for <87>
## Warning in grid.Call.graphics(C_text, as.graphicsAnnot(x$label), x$x, x$y, :
## conversion failure on '  ()' in 'mbcsToSbcs': dot substituted for <91>
## Warning in grid.Call.graphics(C_text, as.graphicsAnnot(x$label), x$x, x$y, :
## conversion failure on '  ()' in 'mbcsToSbcs': dot substituted for <e5>
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## conversion failure on '  ()' in 'mbcsToSbcs': dot substituted for <86>

## Warning in grid.Call.graphics(C_text, as.graphicsAnnot(x$label), x$x, x$y, :
## conversion failure on '  ()' in 'mbcsToSbcs': dot substituted for <86>
```

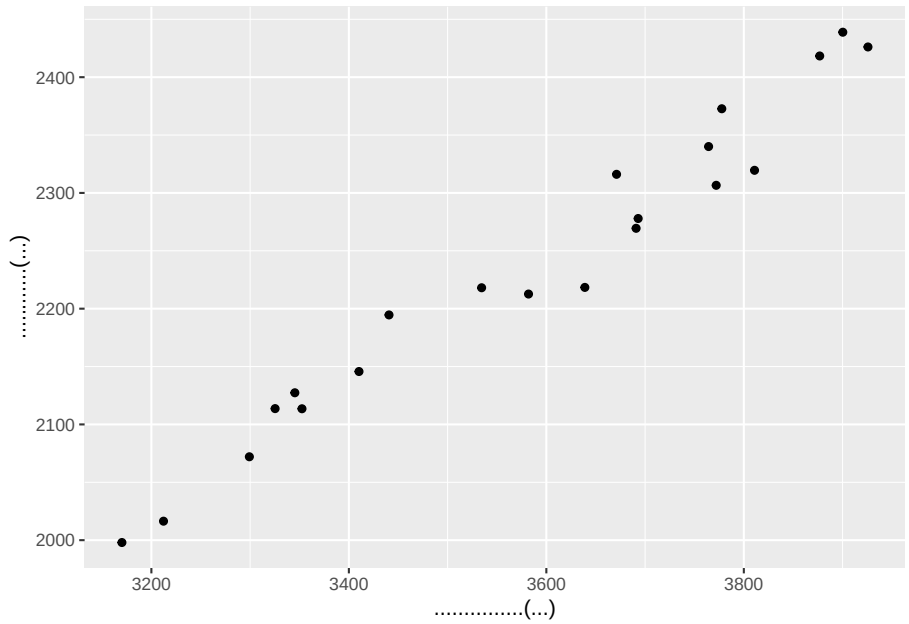

4-1 [ ]

4-2 [ ]

(1) , . Excel openxlsx::read.xlsx() . , .
$gdp2013\_ln = \beta_0 + \beta_1 pop2013\_ln$, $\hat{\beta}_0 = 7.623, \hat{\beta}_1 = 1.075$.

```
data42 <- read.xlsx("data/04_ 4 /data for chap 4 exercise 2.xlsx")
colnames(data42) <- c("pref", "pop2013", "gdp2013", "pop2013_ln", "gdp2013_ln")

model <- lm(gdp2013_ln ~ pop2013_ln, data = data42)
model
##
## Call:
## lm(formula = gdp2013_ln ~ pop2013_ln, data = data42)
##
## Coefficients:
## (Intercept)   pop2013_ln
##       7.623        1.075
```

(2) H_0: $\beta_1 = 1$, $t = \frac{\hat{\beta}_1 - \beta_1}{\mathrm{SE}(\hat{\beta}_1)} = 2.62773$. $n - 2 = 45$,
5% t $(\infty, -2.014103]$, $[2.014103, \infty)$.

```
beta1 <- model$coefficients[2]
sebeta1 <- summary(model)$coefficients[2, 2]
n <- dim(data42)[1]

t <- (beta1 - 1)/sebeta1
t
## pop2013_ln
##    2.62773
qt(0.975, n-2) # 2.014103
## [1] 2.014103
```

(3) confint() .

```
confint(model, '(Intercept)', level=0.90)
##                   5 %     95 %
## (Intercept) 7.257252 7.988132
```

(4) 1% , GDP $\beta_1 = 1.075\%$.

(5) $\mathrm{Var}(u) = \frac{\sum_{i=1}^{n} \hat{u}_i^2}{n-2} = 0.02245859$. ln( ) var() , 0.5964525 .

```
sum(model$residuals^2)/(n-2)
## [1] 0.02245859

var_pop2013_ln <- var(data42$pop2013_ln)
```

```
var_pop2013_ln
## [1] 0.5964525
```

4-3 [ ]

4-4 [ ]

4-5 [ ]

4-6 [ ]

4-7 [ ]

4-8 [ ]

4-9 [ ]

4-10 [ ]

5

.

```
#
curl <- "https://www.yuhikaku.co.jp/static_files/05385_support05.zip"
#             ,
if(!dir.exists("downloads")){
    dir.create("downloads")
}
cdestfile <- "downloads/support05.zip"
download.file(curl, cdestfile)
#           ,
if(!dir.exists("data")){
    dir.create("data")
}
# WSL R         Linux
# Windows         .
if(.Platform$OS.type == "unix") {
    system(sprintf('unzip -n -Ocp932 %s -d %s', "downloads/support05.zip", "./data"))
} else {
    print("Windows          .")
}
```

.

```
library(tidyverse)
```

6

.

```
#
curl <- "https://www.yuhikaku.co.jp/static_files/05385_support06.zip"
#             ,
if(!dir.exists("downloads")){
    dir.create("downloads")
}
cdestfile <- "downloads/support06.zip"
download.file(curl, cdestfile)
#          ,
if(!dir.exists("data")){
    dir.create("data")
}
# WSL R        Linux
# Windows        .
if(.Platform$OS.type == "unix") {
    system(sprintf('unzip -n -Ocp932 %s -d %s', "downloads/support06.zip", "./data"))
} else {
    print("Windows         .")
}
```

7

.

```
#
curl <- "https://www.yuhikaku.co.jp/static_files/05385_support07.zip"
#             ,
if(!dir.exists("downloads")){
    dir.create("downloads")
}
cdestfile <- "downloads/support07.zip"
download.file(curl, cdestfile)
#          ,
if(!dir.exists("data")){
    dir.create("data")
}
# WSL R        Linux
# Windows        .
if(.Platform$OS.type == "unix") {
    system(sprintf('unzip -n -Ocp932 %s -d %s', "downloads/support07.zip", "./data"))
} else {
    print("Windows         .")
}
```

8

.

```
#
curl <- "https://www.yuhikaku.co.jp/static_files/05385_support08.zip"
#            ,
if(!dir.exists("downloads")){
    dir.create("downloads")
}
cdestfile <- "downloads/support08.zip"
download.file(curl, cdestfile)
#           ,
if(!dir.exists("data")){
    dir.create("data")
}
# WSL R         Linux
# Windows         .
if(.Platform$OS.type == "unix") {
    system(sprintf('unzip -n -Ocp932 %s -d %s', "downloads/support08.zip", "./data"))
} else {
    print("Windows         .")
}
```

8-1 [ ]

8-2 [ ]

8-3 [ ]

8-4 [ ]

9

.

```
#
curl <- "https://www.yuhikaku.co.jp/static_files/05385_support09.zip"
#            ,
if(!dir.exists("downloads")){
    dir.create("downloads")
}
cdestfile <- "downloads/support09.zip"
download.file(curl, cdestfile)
#           ,
if(!dir.exists("data")){
    dir.create("data")
}
# WSL R         Linux
# Windows         .
if(.Platform$OS.type == "unix") {
    system(sprintf('unzip -n -Ocp932 %s -d %s', "downloads/support09.zip", "./data"))
} else {
    print("Windows         .")
}
```

9-1 [ ]

9-2 [ ]

9-3 [ ]

9-4 [ ]

9-5 [ ]

10

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```
#
curl <- "https://www.yuhikaku.co.jp/static_files/05385_support10.zip"
#             ,
if(!dir.exists("downloads")){
    dir.create("downloads")
}
cdestfile <- "downloads/support10.zip"
download.file(curl, cdestfile)
#          ,
if(!dir.exists("data")){
    dir.create("data")
}
# WSL R        Linux
# Windows        .
if(.Platform$OS.type == "unix") {
    system(sprintf('unzip -n -Ocp932 %s -d %s', "downloads/support10.zip", "./data"))
} else {
    print("Windows         .")
}
```

11

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```
#
curl <- "https://www.yuhikaku.co.jp/static_files/05385_support11.zip"
#             ,
if(!dir.exists("downloads")){
    dir.create("downloads")
}
cdestfile <- "downloads/support11.zip"
download.file(curl, cdestfile)
#          ,
if(!dir.exists("data")){
    dir.create("data")
}
# WSL R        Linux
# Windows        .
if(.Platform$OS.type == "unix") {
    system(sprintf('unzip -n -Ocp932 %s -d %s', "downloads/support11.zip", "./data"))
} else {
    print("Windows         .")
}
```

12 VAR

.

```
#
curl <- "https://www.yuhikaku.co.jp/static_files/05385_support12.zip"
#             ,
if(!dir.exists("downloads")){
    dir.create("downloads")
}
cdestfile <- "downloads/support12.zip"
download.file(curl, cdestfile)
#          ,
if(!dir.exists("data")){
    dir.create("data")
}
# WSL R        Linux
# Windows        .
if(.Platform$OS.type == "unix") {
    system(sprintf('unzip -n -Ocp932 %s -d %s', "downloads/support12.zip", "./data"))
} else {
    print("Windows         .")
}
```