

Python R

gg_hatano

2020-08-23

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Chapter 1

Python pandas R
 GitHub

Chapter 2

(1-1)

1-1

2.1

IPSS

```
library(readr)
library(dplyr)
url = 'http://www.ipss.go.jp/p-toukei/JMD/00/STATS/Births.txt'
dat = read.table(url, skip=2, header = TRUE)
dat %>% head
```

```
##   Year  Female    Male   Total
## 1 1947 1301806 1376986 2678792
## 2 1948 1303060 1378564 2681624
## 3 1949 1316630 1380008 2696638
## 4 1950 1134396 1203111 2337507
## 5 1951 1043048 1094641 2137689
## 6 1952  977101 1028061 2005162
```

Female Male

```
library(tidyr)
library(magrittr)
dat %>%
```

```

pivot_longer(cols = c("Male", "Female"), names_to = "Sex", values_to = "Life")
mutate(Sex = if_else(Sex == "Female", "F", "M")) -> dat
dat

```

```

## # A tibble: 140 x 4
##   Year   Total Sex   Life
##   <int>   <int> <chr>   <int>
## 1 1947 2678792 M    1376986
## 2 1947 2678792 F    1301806
## 3 1948 2681624 M    1378564
## 4 1948 2681624 F    1303060
## 5 1949 2696638 M    1380008
## 6 1949 2696638 F    1316630
## 7 1950 2337507 M    1203111
## 8 1950 2337507 F    1134396
## 9 1951 2137689 M    1094641
## 10 1951 2137689 F    1043048
## # ... with 130 more rows

```

```

dat %<>%
  arrange(Sex, Year)
dat %<>%
  mutate(ratio = Life / sum(Life)) %>%
  mutate(cum_sum = cumsum(ratio))

dat %>% head

```

```

## # A tibble: 6 x 6
##   Year   Total Sex   Life  ratio cum_sum
##   <int>   <int> <chr>   <int>   <dbl>   <dbl>
## 1 1947 2678792 F    1301806 0.0121  0.0121
## 2 1948 2681624 F    1303060 0.0122  0.0243
## 3 1949 2696638 F    1316630 0.0123  0.0366
## 4 1950 2337507 F    1134396 0.0106  0.0472
## 5 1951 2137689 F    1043048 0.00973 0.0569
## 6 1952 2005162 F     977101 0.00912 0.0660

```

```

dat %>%
  select(-Total) %>%
  write.csv("./data/ipss_birth.csv", row.names=FALSE, quote = FALSE)

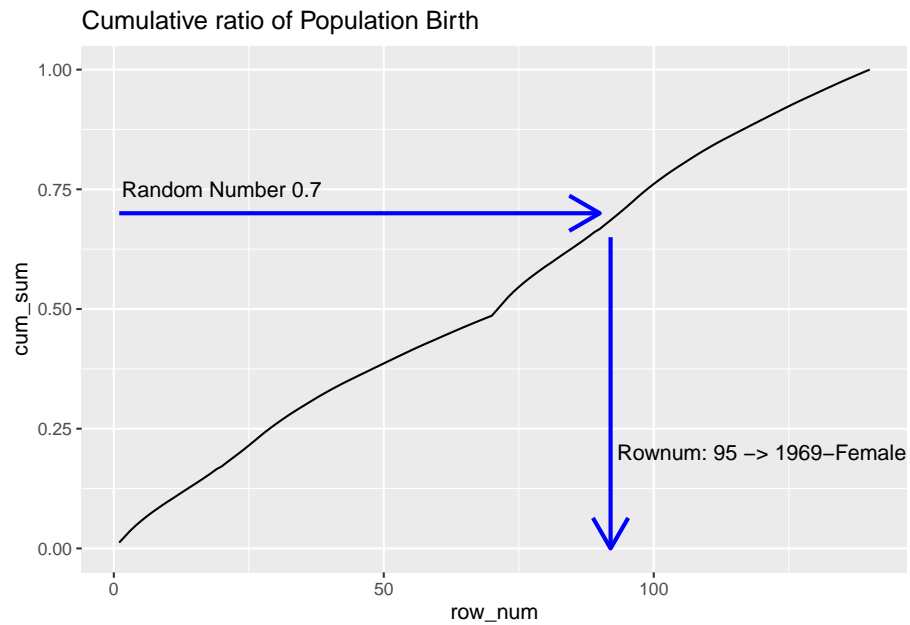
```

(y :0-1) (,)


```
library(ggplot2)
dat = read_csv("./data/ipss_birth.csv")
```

```
## Parsed with column specification:
## cols(
##   Year = col_double(),
##   Sex = col_character(),
##   Life = col_double(),
##   ratio = col_double(),
##   cum_sum = col_double()
## )
```

```
dat %>%
  mutate(x_axis = paste(Year, Sex, sep=" ")) %>%
  mutate(row_num = 1:nrow(.)) %>%
  ggplot() +
  geom_line(aes(x = row_num, y = cum_sum), stat = "identity") +
  annotate("segment", x=1, xend=90, y=0.7, yend=0.7, colour="blue",
    size=1, arrow=arrow()) +
  annotate("segment", x=92, xend=92, y=0.65, yend=0.0, colour="blue",
    size=1, arrow=arrow()) +
  annotate("text", x=20, y=0.75, parse=TRUE, label="'Random Number 0.7'") +
  annotate("text", x=120, y=0.2, parse=TRUE, label="'Rownum: 95 -> 1969-Female'") +
  ggtitle("Cumulative ratio of Population Birth")
```



2.2

```
url_death_rate = "http://www.ipss.go.jp/p-toukei/JMD/00/STATS/Mx_1x1.txt"
dat = read.table(url_death_rate, skip=2, header = TRUE)
dat %>% str
```

```
## 'data.frame': 7770 obs. of 5 variables:
## $ Year : int 1947 1947 1947 1947 1947 1947 1947 1947 1947 1947 ...
## $ Age : chr "0" "1" "2" "3" ...
## $ Female: chr "0.087401" "0.033723" "0.016994" "0.011412" ...
## $ Male : chr "0.099181" "0.034697" "0.016804" "0.011461" ...
## $ Total : chr "0.093432" "0.034220" "0.016897" "0.011437" ...
```

```
Year X 1 ( )
```

```
2016
```

```
dat %<>%
  filter(Year == 2016) %>%
```

```
select(-Year) %>%
select(-Total)
```

Age char

```
dat$Age %>% table
```

```
## .
##    0     1    10   100   101   102   103   104   105   106   107   108   109   11    110+   12
##    1     1     1     1     1     1     1     1     1     1     1     1     1     1     1
##   13    14    15    16    17    18    19     2    20    21    22    23    24    25    26    27
##    1     1     1     1     1     1     1     1     1     1     1     1     1     1     1
##   28    29     3    30    31    32    33    34    35    36    37    38    39     4    40    41
##    1     1     1     1     1     1     1     1     1     1     1     1     1     1     1
##   42    43    44    45    46    47    48    49     5    50    51    52    53    54    55    56
##    1     1     1     1     1     1     1     1     1     1     1     1     1     1     1
##   57    58    59     6    60    61    62    63    64    65    66    67    68    69     7    70
##    1     1     1     1     1     1     1     1     1     1     1     1     1     1     1
##   71    72    73    74    75    76    77    78    79     8    80    81    82    83    84    85
##    1     1     1     1     1     1     1     1     1     1     1     1     1     1     1
##   86    87    88    89     9    90    91    92    93    94    95    96    97    98    99
##    1     1     1     1     1     1     1     1     1     1     1     1     1     1
```

```
110+      111
```

```
dat %<>%
  mutate(Age = if_else(Age == "110+", "111", Age)) %>%
  mutate(Age = as.integer(Age))
```

```
dat %<>%
  mutate(Anb = Age) %>%
  select(-Age)
```

```
dat %>% head
```

```
##      Female      Male Anb
## 1 0.002028 0.001995   0
## 2 0.000313 0.000340   1
## 3 0.000174 0.000178   2
## 4 0.000098 0.000133   3
## 5 0.000087 0.000095   4
## 6 0.000084 0.000101   5
```

Anb Alb Anb Alb

x Anb q_x Alb $\frac{q_x + q_{x+1}}{2}$

```
dat %<>%
  mutate(Female = as.numeric(Female)) %>%
  mutate(Male = as.numeric(Male)) %>%
  mutate(lead_Female = lead(Female)) %>%
  mutate(lead_Male = lead(Male)) %>%
  mutate(F = (Female + lead_Female)/2) %>%
  mutate(M = (Male + lead_Male)/2) %>%
  mutate(Alb = Anb) %>%
  select(Alb,F,M)

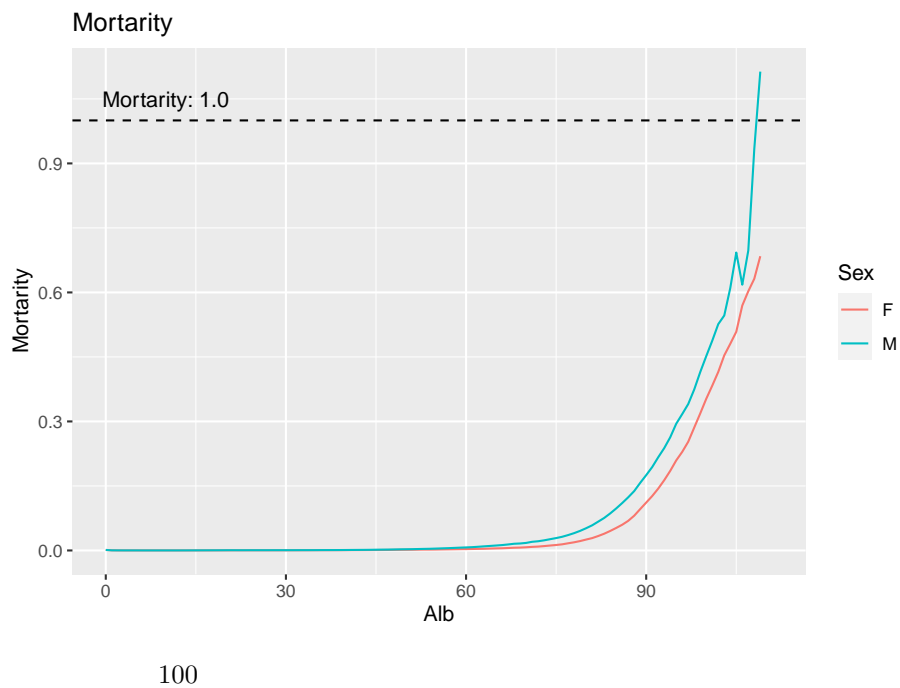
dat %>% head
```

```
##   Alb      F      M
## 1  0 0.0011705 0.0011675
## 2  1 0.0002435 0.0002590
## 3  2 0.0001360 0.0001555
## 4  3 0.0000925 0.0001140
## 5  4 0.0000855 0.0000980
## 6  5 0.0000815 0.0001060
```

1

```
dat %>%
  pivot_longer(cols=c("F","M"), names_to = "Sex", values_to = "Mortality") %>%
  ggplot(aes(x = Alb, y = Mortality, group = Sex, color = Sex)) +
  geom_line() +
  geom_hline(yintercept = 1.0, linetype = "dashed") +
  annotate("text", x = 10, y = 1.05, label = 'Mortality: 1.0') +
  ggtitle("Mortality")
```

```
## Warning: Removed 2 row(s) containing missing values (geom_path).
```



$$y = 1 - (1 - x)^{12} \quad x = 1 - (1 - y)^{0.0833}$$

```
dat %<>%
  filter(Alb < 100)

dat %<>%
  mutate(F = 1 - (1-F)**(1/12)) %>%
  mutate(M = 1 - (1-M)**(1/12))

dat %>% write.csv("./data/ipss_mortality.csv", quote=F, row.names = F)
dat %>% head
```

```
##   Alb          F          M
## 1    0 9.759403e-05 9.734377e-05
## 2    1 2.029393e-05 2.158590e-05
## 3    2 1.133404e-05 1.295926e-05
## 4    3 7.708660e-06 9.500496e-06
## 5    4 7.125279e-06 8.167034e-06
## 6    5 6.791920e-06 8.833763e-06
```

2.3

•
•
•

2.4

... - -

Chapter 3

(1-2)

3.1