HelloWorld.rmd

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the document is by R11323019 .

1.1

```
print("HelloWorld")
```

```
## [1] "HelloWorld"
```

1.3

```
add_two_number <- function(intA,intB ) {
    return(intA + intB)
}
add_two_number(2,3)
```

```
## [1] 5
```

4.2.1: set value

```
mu0 <- 10
mu1 <- 9
var0 <- 1
var1 <- 2
var01 <- 0.6
c <- 1
```

4.2.2: create eplison and store in data.table

```
library('dplyr')
```

```
## Warning:   'dplyr'   R   4.2.2
```

```
##
##    'dplyr'

##       'package:stats':
##
##     filter, lag

##       'package:base':
##
##     intersect, setdiff, setequal, union
```

```
library('data.table')
```

```
## Warning:   'data.table'   R   4.2.2
```

```
##
##    'data.table'

##       'package:dplyr':
##
##     between, first, last
```

```
simulation <- data.table(
  eplison0 = rnorm(10^7, 0, var0),
  eplison1 = rnorm(10^7, 0, var1)
)
```

```
head(simulation)
```

```
##       eplison0   eplison1
## 1: -0.93057476  0.5200274
## 2:  0.04014091  0.0700869
## 3:  0.27587839 -0.4887278
## 4:  0.15288237  1.0671124
## 5: -0.27734037 -0.2902790
## 6: -0.36161716 -0.2527342
```

4.2.3: create W0 and W1

```
# W0 = u0 + eplison0
# w1 = u1 + eplison1

simulation[, w0:= mu0+eplison0]
simulation[, w1:= mu1+eplison1]
```

```
head(simulation)
```

```
##       eplison0   eplison1        w0        w1
## 1: -0.93057476  0.5200274  9.069425  9.520027
## 2:  0.04014091  0.0700869 10.040141  9.070087
## 3:  0.27587839 -0.4887278 10.275878  8.511272
## 4:  0.15288237  1.0671124 10.152882 10.067112
## 5: -0.27734037 -0.2902790  9.722660  8.709721
## 6: -0.36161716 -0.2527342  9.638383  8.747266
```

4.2.4: create I

```
# Migrate(I=1) if w1>(w0+c)

simulation[w1-w0-c>0, I:= 1]
simulation[w1-w0-c<=0, I:= 0]
```

```
head(simulation)
```

```
##       eplison0   eplison1        w0        w1 I
## 1: -0.93057476  0.5200274  9.069425  9.520027 0
## 2:  0.04014091  0.0700869 10.040141  9.070087 0
## 3:  0.27587839 -0.4887278 10.275878  8.511272 0
## 4:  0.15288237  1.0671124 10.152882 10.067112 0
## 5: -0.27734037 -0.2902790  9.722660  8.709721 0
## 6: -0.36161716 -0.2527342  9.638383  8.747266 0
```

4.2.5: create conditional mean by data

```
conditionmean_bydata<- simulation[,
                                  .(condi_w0_bydata = mean(w0), #condi_w0_bydata is E(w0|I) cal by data
                                    condi_w1_bydata = mean(w1), #condi_w1_bydata is E(w1|I) cal by data
                                    Q0_bydata = mean(eplison0), #Q0_bydata is E(eplison0|I) cal by data
                                    Q1_bydata = mean(eplison1)),#Q1_bydata is E(eplison1|I) cal by data
                                  by = I]
```

```
conditionmean_bydata
```

```
##    I condi_w0_bydata condi_w1_bydata  Q0_bydata  Q1_bydata
## 1: 0       10.147104        8.412763  0.1471044 -0.5872368
## 2: 1        9.355277       11.578328 -0.6447230  2.5783283
```

```
# The first row(I=1) is what we want to know.
```

4.2.6: create conditional mean by RHS

```r
# get z by data
simulation[, v := eplison1-eplison0]
val_v <- simulation[, var(v)]
z <- (mu0-mu1+c)/val_v

# where we know E(w1|I) = mu1 + var1*E((eplison1/var1)|(v/var_v > z))
# and E(w0|I) = mu0 + var0*E((eplison0/var0)|(v/var_v > z))
simulation[v/var(v) > z, condi:= 1]
simulation[v/var(v) <= z, condi:= 0]
```

```r
E1 <- simulation[,mu1+ var1*mean(eplison1/var1), by = condi]

conditionmean_bydRHD<- simulation[,
# condi_w0_byRHS is E(w0|I) cal by E(w0|I) = mu0 + var0*E((eplison0/var0)|(v/var_v > z))
                           .(condi_w0_byRHS = mu0+ var0*mean(eplison0/var0),
# condi_w1_byRHS is E(w1|I) cal by E(w1|I) = mu1 + var1*E((eplison1/var1)|(v/var_v > z))
                             condi_w1_byRHS = mu1+ var1*mean(eplison1/var1)),
                             by = condi]

# Q0_byRHS is E(eplison0|I) cal by calculation(E(w0|I)-mu0)
conditionmean_bydRHD[,Q0_byRHS := (condi_w0_byRHS - mu0)]
# Q1_byRHS is E(eplison1|I) cal by calculation(E(w1|I)-mu1)
conditionmean_bydRHD[,Q1_byRHS := (condi_w1_byRHS - mu1)]
```

```r
conditionmean_bydRHD
```

```
##    condi condi_w0_byRHS condi_w1_byRHS   Q0_byRHS   Q1_byRHS
## 1:     0      10.147104       8.412763  0.1471044 -0.5872368
## 2:     1       9.355277      11.578328 -0.6447230  2.5783283
```

4.2.7

```r
# E(w1,I=1) & E(w0,I=0) is observed in real world,
# E(w1,I=0) & E(w0,I=1) is not observed in real world,
```