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: -2.05170080 -0.7379284
## 2:  0.05987133 -2.9770885
## 3:  1.05203741  2.1437695
## 4: -0.81178372 -2.6964102
## 5:  0.64417241 -1.1619206
## 6: -0.02944772  1.9980108
```

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: -2.05170080 -0.7379284  7.948299  8.262072
## 2:  0.05987133 -2.9770885 10.059871  6.022911
## 3:  1.05203741  2.1437695 11.052037 11.143770
## 4: -0.81178372 -2.6964102  9.188216  6.303590
## 5:  0.64417241 -1.1619206 10.644172  7.838079
## 6: -0.02944772  1.9980108  9.970552 10.998011
```

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: -2.05170080 -0.7379284  7.948299  8.262072 0
## 2:  0.05987133 -2.9770885 10.059871  6.022911 0
## 3:  1.05203741  2.1437695 11.052037 11.143770 0
## 4: -0.81178372 -2.6964102  9.188216  6.303590 0
## 5:  0.64417241 -1.1619206 10.644172  7.838079 0
## 6: -0.02944772  1.9980108  9.970552 10.998011 1
```

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       10.146979        8.413263  0.1469793 -0.586737
## 2: 1        9.355516       11.578800 -0.6444844  2.578800
```

```
# 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      10.146979       8.413263  0.1469793 -0.586737
## 2:     1       9.355516      11.578800 -0.6444844  2.578800
```

4.2.7

```r
# E(w1,I=1)(11.578201) & E(w0,I=0)(10.146672) is observed in real world,
# E(w1,I=0)(8.412406) & E(w0,I=1)(9.355612) is not observed in real world,
```