Análisis caso ABB

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This is an R Markdown document. Markdown is a simple formatting syntax for authoring HTML, PDF, and MS Word documents. For more details on using R Markdown see http://rmarkdown.rstudio.com.

When you click the **Knit** button a document will be generated that includes both content as well as the output of any embedded R code chunks within the document. You can embed an R code chunk like this:

```
require(ggplot2)
```

```
## Loading required package: ggplot2
```

```
require(dplyr)
```

```
## Loading required package: dplyr
##
## Attaching package: 'dplyr'
##
## The following object is masked from 'package:stats':
##
##     filter
##
## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union
```

```
#la opción file.chose() en la función read.table nos permite escoger un fichero de datos guardado en el
#leer el fichero de datos abb-R.txt, el cual contiene los datos de la elección de las empresas eléctric
abb<-read.table("abb-r.txt", header=T)
#la función head() nos permite visualizar las primer seis líneas de un objeto de datos.
#He traspuesto el resupado con la función t() con el objeto de facilitar la lectura. Así las líneas rep
t(head(abb))
```

```
##                 1     2     3              4         5     6
## id              "1"   "1"   "1"            "1"       "2"   "2"
## Alternatives    "ABB" "GE"  "Westinghouse" "Edison" "ABB" "GE"
## choice          "0"   "1"   "0"            "0"       "0"   "0"
## price           "6"   "6"   "6"            "5"       "3"   "3"
## energy_loss     "6"   "6"   "5"            "5"       "4"   "4"
## maintenance     "7"   "6"   "7"            "6"       "5"   "5"
## warranty        "6"   "7"   "5"            "7"       "4"   "4"
## spare_parts     "6"   "9"   "3"            "8"       "4"   "7"
## ease_install    "5"   "9"   "4"            "2"       "5"   "3"
## problem_solving "7"   "7"   "7"            "6"       "6"   "5"
## quality         "5"   "5"   "6"            "5"       "4"   "5"
## DA              "1"   "0"   "0"            "0"       "1"   "0"
## DB              "0"   "1"   "0"            "0"       "0"   "1"
```

```
## DC              "0"   "0"   "1"            "0"      "0"   "0"
## DD              "0"   "0"   "0"            "1"      "0"   "0"
## volume          "761" "761" "761"          "761"    "627" "627"
## district        "1"   "1"   "1"            "1"      "1"   "1"
```

```
#la funcion names() muestra los nombres de las variables

names(abb)
```

```
##  [1] "id"              "Alternatives"    "choice"
##  [4] "price"           "energy_loss"     "maintenance"
##  [7] "warranty"        "spare_parts"     "ease_install"
## [10] "problem_solving" "quality"         "DA"
## [13] "DB"              "DC"              "DD"
## [16] "volume"          "district"
```

```
#La función str() nos proporciona una descripción de la base de datos
str(abb)
```

```
## 'data.frame':    352 obs. of  17 variables:
##  $ id             : int  1 1 1 1 2 2 2 2 3 3 ...
##  $ Alternatives   : Factor w/ 4 levels "ABB","Edison",..: 1 3 4 2 1 3 4 2 1 3 ...
##  $ choice         : num  0 1 0 0 0 0 0 1 1 0 ...
##  $ price          : num  6 6 6 5 3 3 4 4 6 5 ...
##  $ energy_loss    : num  6 6 5 5 4 4 5 5 6 6 ...
##  $ maintenance    : num  7 6 7 6 5 5 5 6 7 7 ...
##  $ warranty       : num  6 7 5 7 4 4 5 5 7 7 ...
##  $ spare_parts    : num  6 9 3 8 4 7 5 4 6 5 ...
##  $ ease_install   : num  5 9 4 2 5 3 7 5 7 6 ...
##  $ problem_solving: num  7 7 7 6 6 5 6 5 7 8 ...
##  $ quality        : num  5 5 6 5 4 5 4 6 6 6 ...
##  $ DA             : num  1 0 0 0 1 0 0 0 1 0 ...
##  $ DB             : num  0 1 0 0 0 1 0 0 0 1 ...
##  $ DC             : num  0 0 1 0 0 0 1 0 0 0 ...
##  $ DD             : int  0 0 0 1 0 0 0 1 0 0 ...
##  $ volume         : int  761 761 761 761 627 627 627 627 643 643 ...
##  $ district       : int  1 1 1 1 1 1 1 1 2 2 ...
```

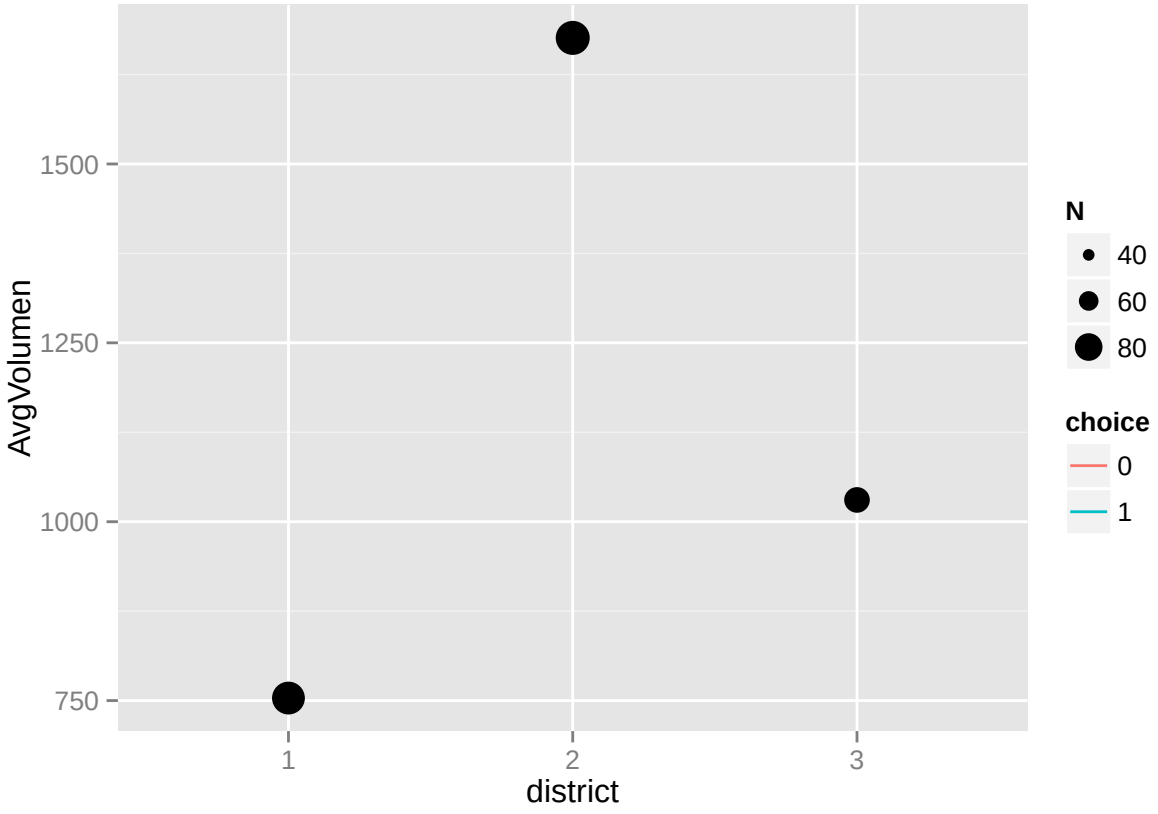
```
#cambiar la clase de las variables según sea apropiado.
#las variables choice y district deberían se factores.
abb$district <- as.factor(abb$district)
abb$choice <- as.factor(abb$choice)
#Ahora con la ayuda de la función select() del packete dplyr y del operador tubería (pipeline) %>% calc
A= select(abb, choice, volume, district, price) %>%
  group_by(district, choice) %>%
  summarize(AvgPrice = mean(price), AvgVolumen = mean(volume), N = length(price))
A
```

```
## Source: local data frame [6 x 5]
## Groups: district
##
##   district choice AvgPrice AvgVolumen  N
```

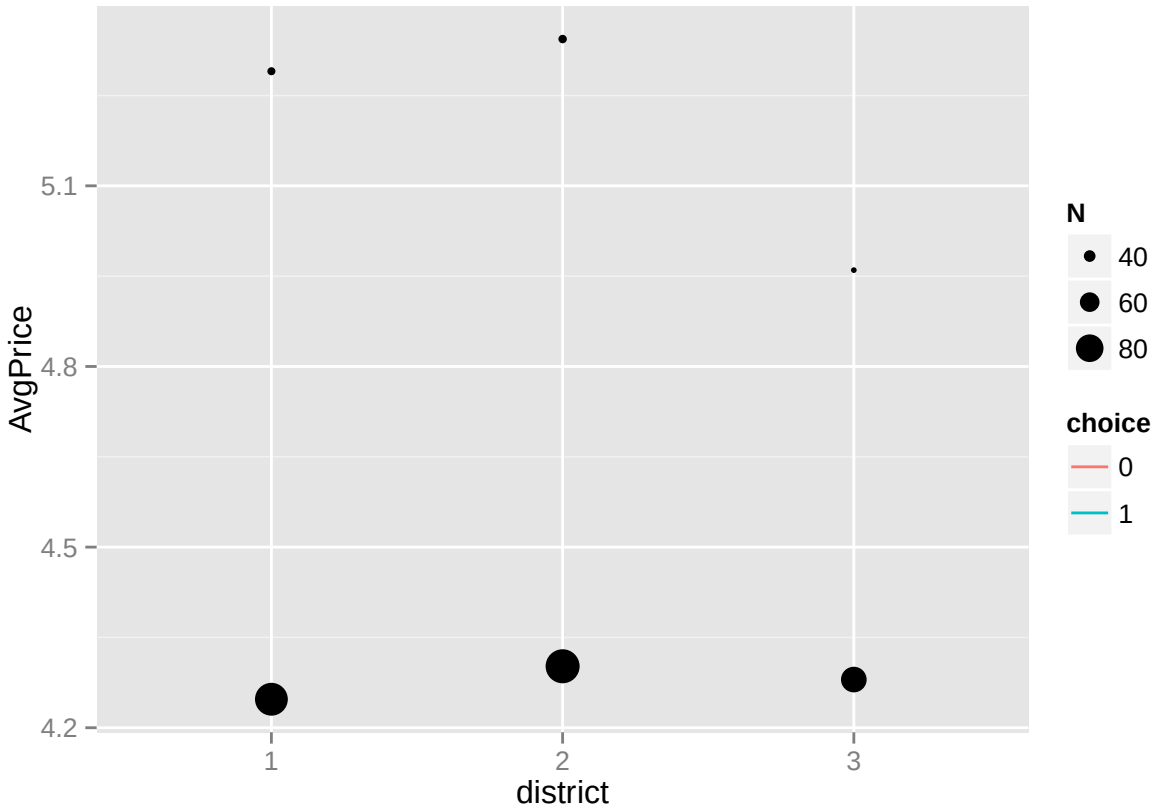
```
## 1        1      0 4.247312   753.5161 93
## 2        1      1 5.290323   753.5161 31
## 3        2      0 4.302083  1676.2188 96
## 4        2      1 5.343750  1676.2188 32
## 5        3      0 4.280000  1030.4400 75
## 6        3      1 4.960000  1030.4400 25
```

You can also embed plots, for example:

```
## geom_path: Each group consist of only one observation. Do you need to adjust the group aesthetic?
```




```
## geom_path: Each group consist of only one observation. Do you need to adjust the group aesthetic?
```



Note that the `echo = FALSE` parameter was added to the code chunk to prevent printing of the R code that generated the plot.

```
## Loading required package: splines

## Call:
## coxph(formula = Surv(rep(1, 352L), choice) ~ price + energy_loss +
##     maintenance + warranty + spare_parts + ease_install + problem_solving +
##     quality + DA + DB + DC + strata(id), data = abb, method = "exact")
##
##   n= 352, number of events= 88
##
##                    coef exp(coef) se(coef)      z Pr(>|z|)
## price            2.1806    8.8515   0.5866  3.717 0.000201 ***
## energy_loss      2.6556   14.2337   0.6737  3.942 8.09e-05 ***
## maintenance      0.5937    1.8107   0.4370  1.358 0.174313
## warranty         1.1407    3.1290   0.3310  3.446 0.000568 ***
## spare_parts     -0.1326    0.8758   0.2176 -0.610 0.542158
## ease_install     0.5200    1.6821   0.1729  3.008 0.002629 **
## problem_solving  2.0322    7.6307   0.5497  3.697 0.000218 ***
## quality          2.6394   14.0050   0.6877  3.838 0.000124 ***
## DA              -0.1238    0.8836   0.6785 -0.182 0.855241
## DB              -0.6712    0.5111   0.7194 -0.933 0.350814
## DC              -0.6872    0.5030   0.7150 -0.961 0.336499
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##                 exp(coef) exp(-coef) lower .95 upper .95
```

```
## price              8.8515    0.11298    2.8036    27.945
## energy_loss       14.2337    0.07026    3.8006    53.306
## maintenance        1.8107    0.55228    0.7688     4.264
## warranty           3.1290    0.31959    1.6355     5.986
## spare_parts        0.8758    1.14182    0.5718     1.342
## ease_install       1.6821    0.59451    1.1986     2.360
## problem_solving    7.6307    0.13105    2.5982    22.410
## quality           14.0050    0.07140    3.6381    53.913
## DA                 0.8836    1.13178    0.2337     3.341
## DB                 0.5111    1.95662    0.1248     2.093
## DC                 0.5030    1.98821    0.1238     2.043
##
## Rsquare= 0.411   (max possible= 0.5 )
## Likelihood ratio test= 186.4  on 11 df,   p=0
## Wald test            = 23.67  on 11 df,   p=0.01419
## Score (logrank) test = 103.3  on 11 df,   p=0
```

Ahora calculamos la utilidad de cada elección

```
u <- predict(abb.clogit)
head(u)
```

```
##          1          2          3          4          5          6
##  2.0458929  3.7277069  0.2033874 -5.9769871 -3.7209496 -5.0990503
```

Después obtenemos exp(u) y sumamos exp(u) para cada individuo

```
eu <- exp(u)
sumaeu <- by(eu, abb$id, sum)
head(sumaeu)
```

```
## abb$id
##          1          2          3          4          5          6
##   50.54779  516.23324  248.18063  164.16144 2069.30050  153.61078
```

Ahora calculamos la probabilidad de elección de cada marca. Para ello definimos una función que llamaremos prob()

```
prob<-function(suma, eutil, indiv){
#suma, eutil, inviv son los argumentos de la función
n<-0
#Crea un vector con tantos elementos como el producto entre
#lis individuos y las marcas
p<-1:indiv*4
#Para cada individuo
for (i in 1:indiv) {
#para cada marca
for (j in 1:4) {
#construye un índice
n<-n+1
#calcula la probabilidad de que el individuo i compre la #marca j
p[n]<-eutil[n]/suma[i]
```

```
}
}
#Devuelve el vector de probabilidades
return(p)
}
```

Y después la utilizamos con los datos calculados previamente

```
pchoice <- prob(sumaeu, eu, 88)
head(pchoice)
```

```
## [1] 1.530445e-01 8.226600e-01 2.424532e-02 5.017938e-05 4.689928e-05
## [6] 1.182128e-05
```

```
abb$pchoice <- pchoice
t(head(abb))
```

```
##                 1             2             3
## id              "1"           "1"           "1"
## Alternatives    "ABB"         "GE"          "Westinghouse"
## choice          "1"           "2"           "1"
## price           "6"           "6"           "6"
## energy_loss     "6"           "6"           "5"
## maintenance     "7"           "6"           "7"
## warranty        "6"           "7"           "5"
## spare_parts     "6"           "9"           "3"
## ease_install    "5"           "9"           "4"
## problem_solving "7"           "7"           "7"
## quality         "5"           "5"           "6"
## DA              "1"           "0"           "0"
## DB              "0"           "1"           "0"
## DC              "0"           "0"           "1"
## DD              "0"           "0"           "0"
## volume          "761"         "761"         "761"
## district        "1"           "1"           "1"
## pchoice         "1.530445e-01" "8.226600e-01" "2.424532e-02"
##                 4             5             6
## id              "1"           "2"           "2"
## Alternatives    "Edison"      "ABB"         "GE"
## choice          "1"           "1"           "1"
## price           "5"           "3"           "3"
## energy_loss     "5"           "4"           "4"
## maintenance     "6"           "5"           "5"
## warranty        "7"           "4"           "4"
## spare_parts     "8"           "4"           "7"
## ease_install    "2"           "5"           "3"
## problem_solving "6"           "6"           "5"
## quality         "5"           "4"           "5"
## DA              "0"           "1"           "0"
## DB              "0"           "0"           "1"
## DC              "0"           "0"           "0"
## DD              "1"           "0"           "0"
```

```
## volume          "761"          "627"          "627"
## district        "1"            "1"            "1"
## pchoice         "5.017938e-05" "4.689928e-05" "1.182128e-05"
```

Ahora creamos una función para clasificar a los clientes en función de su probabilidad de compra

```
msegment<-function(p, indiv){
# p es el vector de probabilidades
# in es el número de individuos
s<-1:indiv*4
j<-0
for (i in 1:indiv) {
#para cada individuo
j=j+4
#Leales
if (p[j-3]>0.8) {s[j-3]<-"L"; s[j-2]<-"L"; s[j-1]<-"L"; s[j]<-"L"}
#Competitivos
if (p[j-3]<=0.8 & p[j-3]>0.5) {s[j-3]<-"C"; s[j-2]<-"C"; s[j-1]<-"C"; s[j]<-"C"}
#Apropiables
if (p[j-3]<=0.5 & p[j-3]>0.15) {s[j-3]<-"A"; s[j-2]<-"A"; s[j-1]<-"A"; s[j]<-"A"}
#Perdidos
if (p[j-3]<=0.15) {s[j-3]<-"P"; s[j-2]<-"P"; s[j-1]<-"P"; s[j]<-"P"}
}
#Devuelve el resultado de la función
return(s)
}
```

Ahora utilizamos la nueva función para clasificar la base de datos

```
seg <- msegment(pchoice, 88)
abb$seg <- seg

abb.select.ord <- select(abb, volume, pchoice, seg) %>%
  arrange(-volume)
head(abb.select.ord)
```

```
##   volume      pchoice seg
## 1  14798 4.989266e-04   P
## 2  14798 6.259664e-08   P
## 3  14798 8.011871e-07   P
## 4  14798 9.995002e-01   P
## 5  12514 7.866831e-03   P
## 6  12514 3.195145e-04   P
```

primero seleccionamos las variables que queremos ordenar, después