

final_project.R

prbsh

2022-02-21

```
print("parth shah")
```

```
## [1] "parth shah"
```

```
pacman::p_load(rio, tidyverse, ggplot2, party, dplyr, plyr, webr, plotrix, vcd)
r=getOption("repos")
r["CRAN"]="https://cran.r-project.org/"
options(repos=r)
```

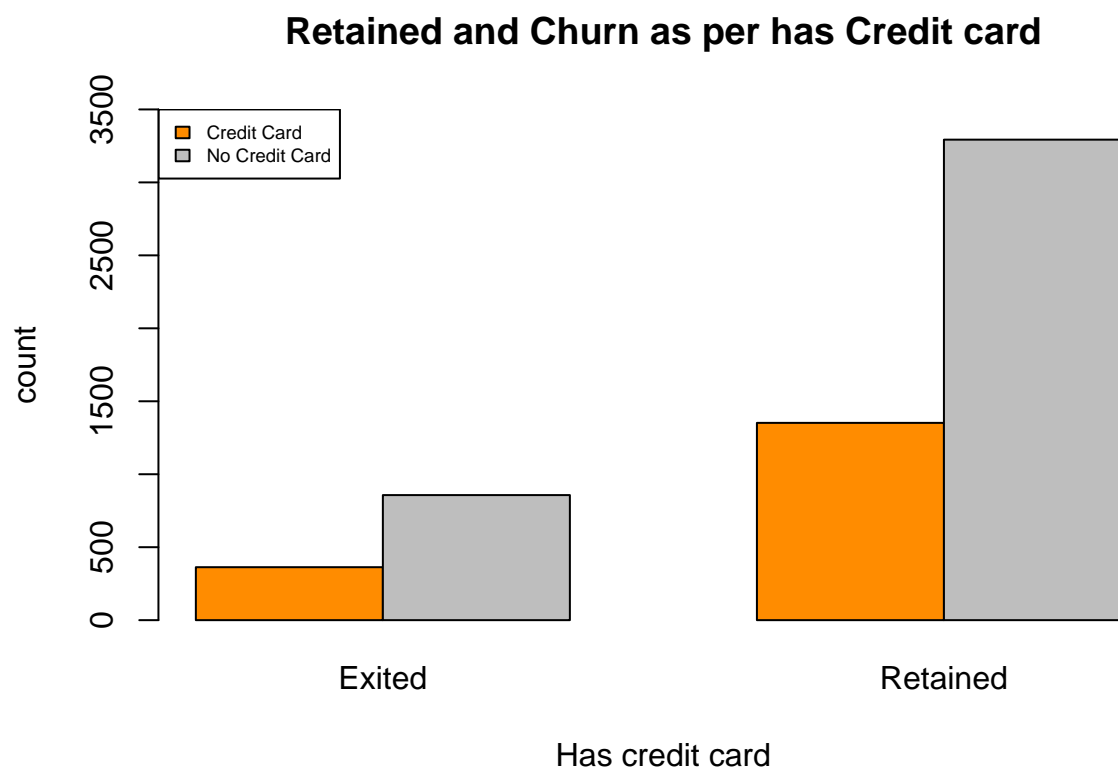
```
library(readxl)
creditscore <- read_excel("Churn_Modelling.xlsx")
View(creditscore)
```

```
#Retained and Churn as per has credit card
```

```
hascard <- table(creditscore$HasCrCard, creditscore$Exited)
hascard
```

```
##
##      Exited Retained
##  0      363      1352
##  1      857      3293
```

```
colorhascard <- c("darkorange", "gray")
barplot(hascard,
        col = colorhascard,
        beside = TRUE,
        main = "Retained and Churn as per has Credit card",
        xlab = "Has credit card",
        ylab = "count",
        ylim = c(0,3500)
        )
legend("topleft", c("Credit Card", "No Credit Card"), cex = 0.6, fill = colorhascard)
```



```
#Retained and Churn as per active member
```

```
activemember <- table(creditscore$IsActiveMember, creditscore$Exited)
activemember
```

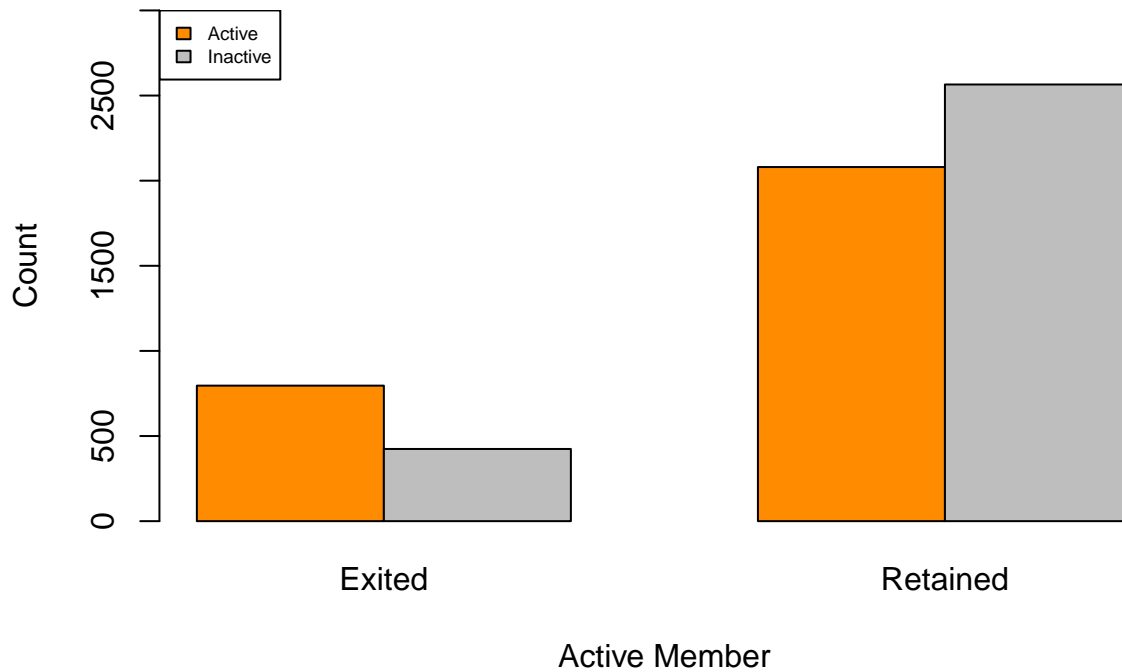
```
##
##      Exited Retained
##  0      796      2080
##  1      424      2565
```

```
coloractivemember <- c("darkorange", "gray")
```

```
barplot(activemember,
        col = coloractivemember,
        beside = TRUE,
        main = "Retained and Churn as per active member",
        xlab = "Active Member",
        ylab = "Count",
        ylim = c(0,3000)
)
```

```
legend("topleft", c("Active", "Inactive"), cex = 0.6, fill = coloractivemember)
```

Retained and Churn as per active member



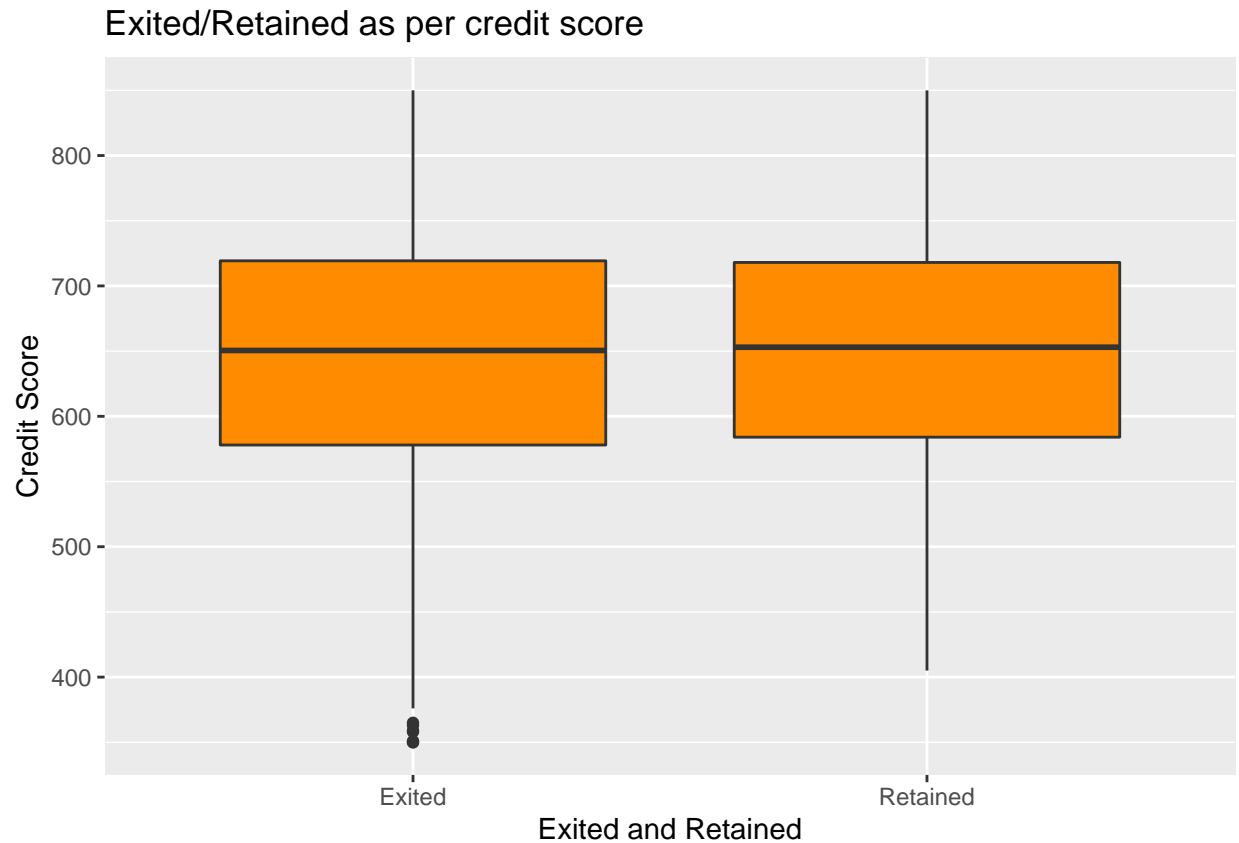
```
#boxplot
```

```
#Exited/Retained as per credit score
```

```
ggplot(creditscore, aes(x=creditscore$Exited, y=creditscore$CreditScore)) +  
  geom_boxplot(fill="darkorange") +  
  xlab("Exited and Retained")+ ylab("Credit Score")+  
  labs(title = 'Exited/Retained as per credit score')
```

```
## Warning: Use of 'creditscore$Exited' is discouraged. Use 'Exited' instead.
```

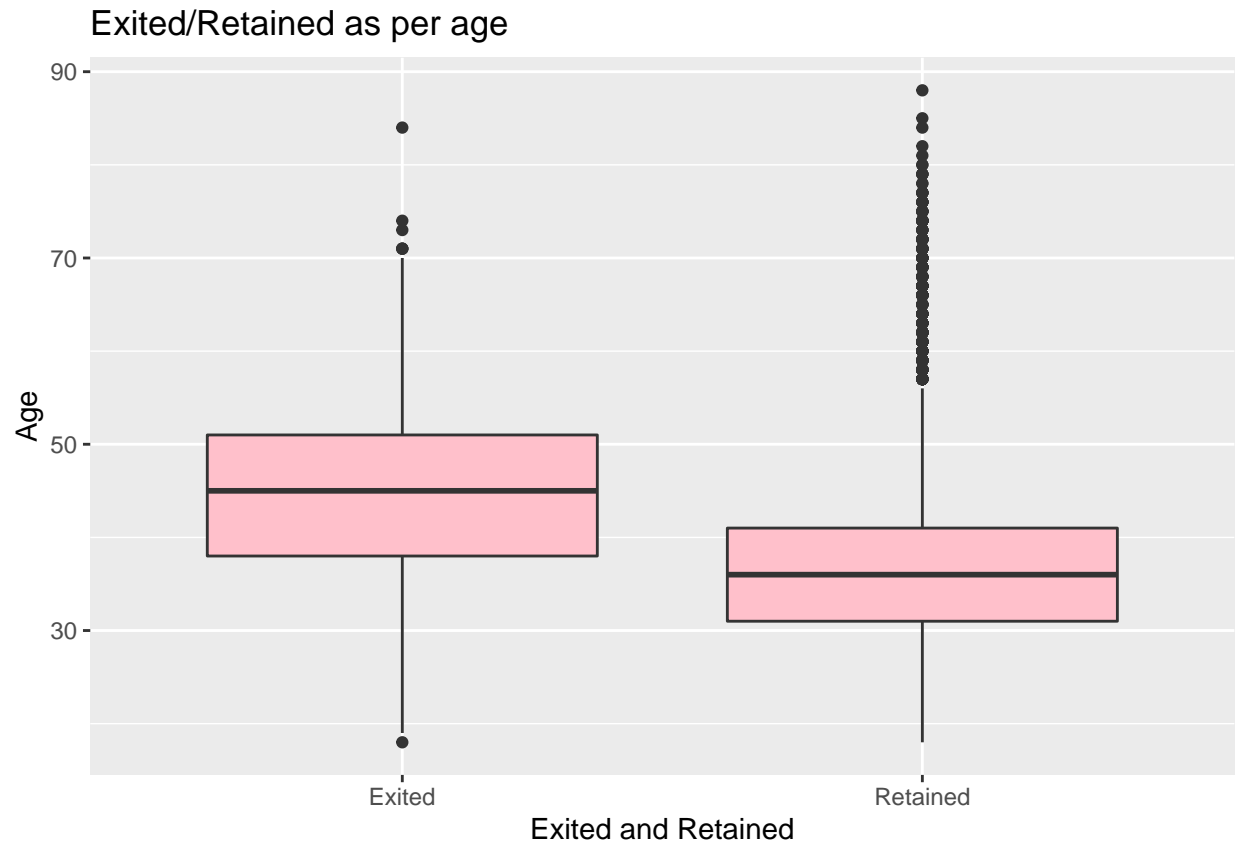
```
## Warning: Use of 'creditscore$CreditScore' is discouraged. Use 'CreditScore'  
## instead.
```



```
#exited/Retained as per age  
ggplot(creditscore, aes(x=creditscore$Exited, y=creditscore$Age)) +  
  geom_boxplot(fill="pink") +  
  xlab("Exited and Retained")+ ylab("Age")+  
  labs(title = 'Exited/Retained as per age')
```

```
## Warning: Use of 'creditscore$Exited' is discouraged. Use 'Exited' instead.
```

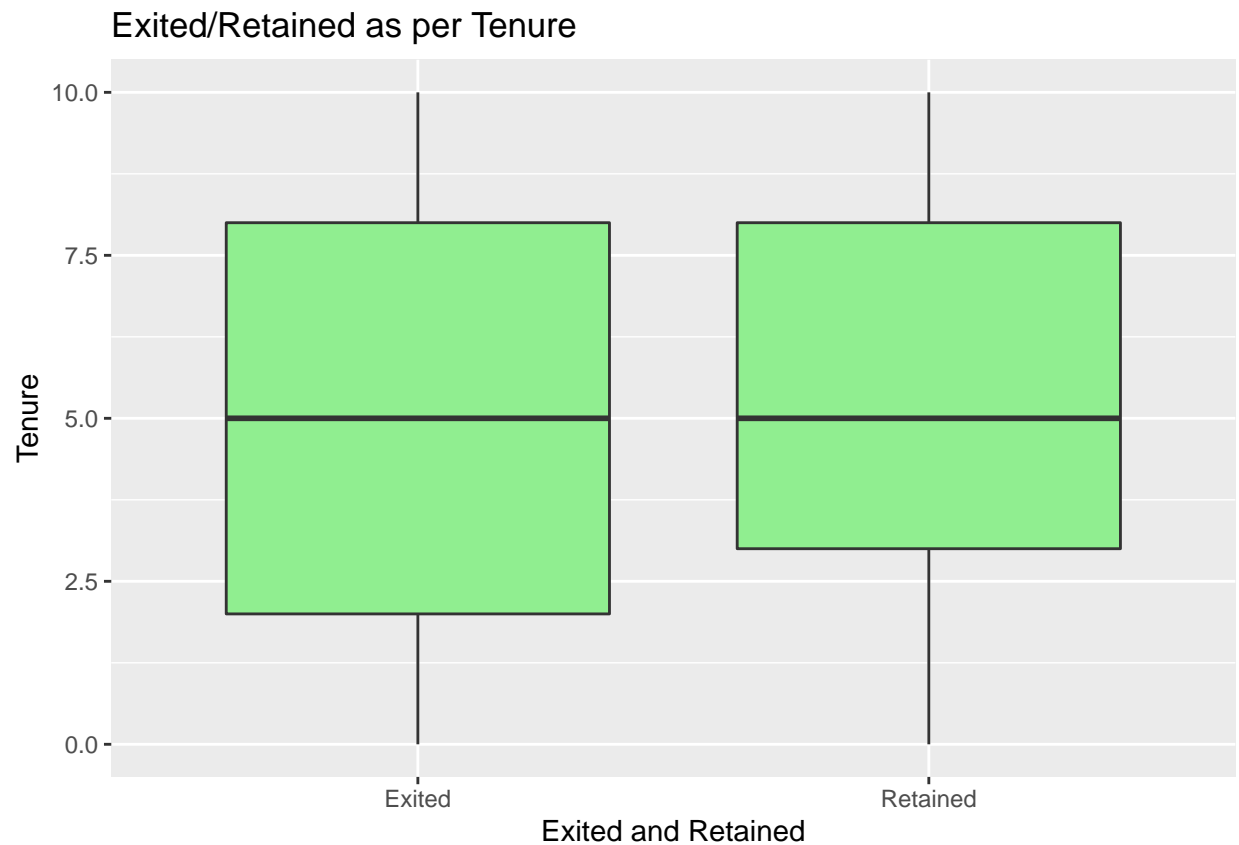
```
## Warning: Use of 'creditscore$Age' is discouraged. Use 'Age' instead.
```



```
#exited/Retained as per Tenure  
ggplot(creditscore, aes(x=creditscore$Exited, y=creditscore$Tenure)) +  
  geom_boxplot(fill="lightgreen") +  
  xlab("Exited and Retained")+ ylab("Tenure")+  
  labs(title = 'Exited/Retained as per Tenure')
```

```
## Warning: Use of 'creditscore$Exited' is discouraged. Use 'Exited' instead.
```

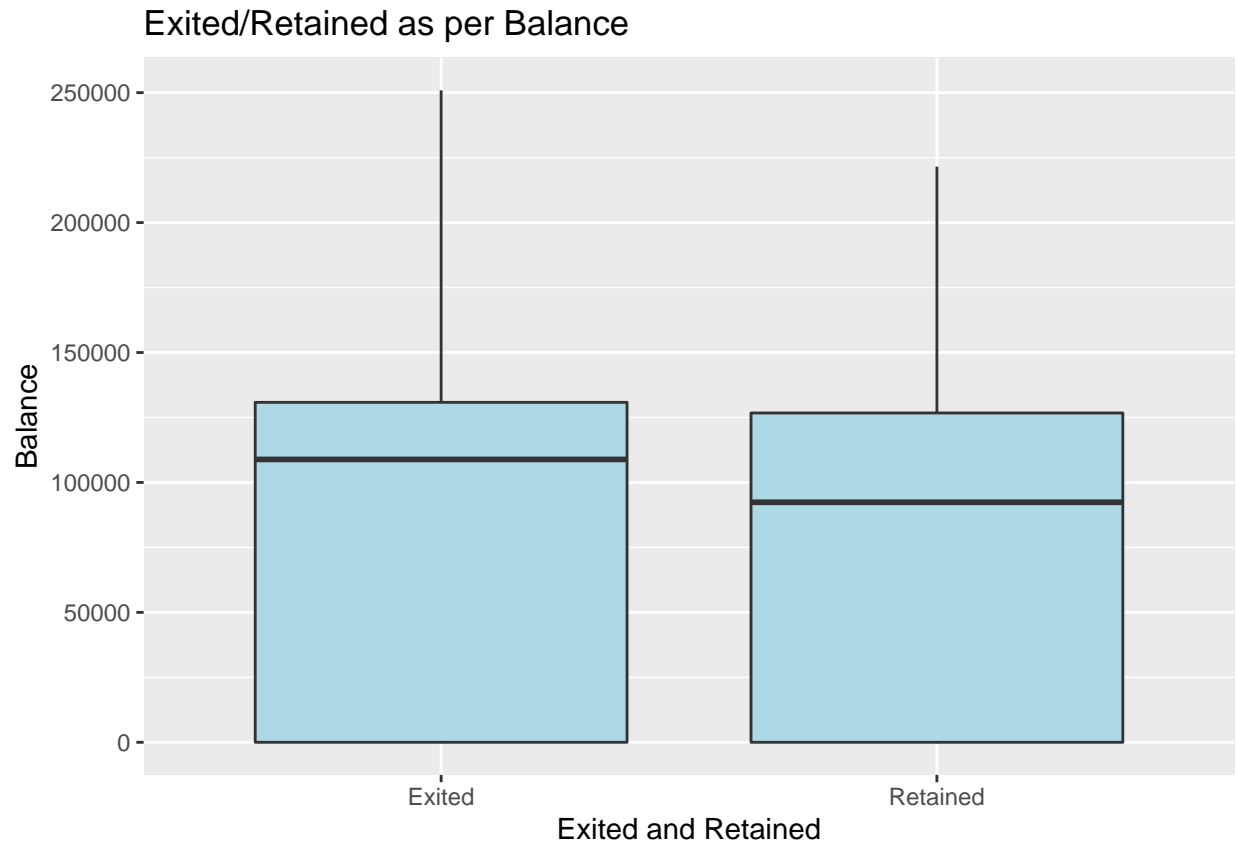
```
## Warning: Use of 'creditscore$Tenure' is discouraged. Use 'Tenure' instead.
```



```
#exited/Retained as per Balance
ggplot(creditscore, aes(x=creditscore$Exited, y=creditscore$Balance)) +
  geom_boxplot(fill="lightBlue") +
  xlab("Exited and Retained")+ ylab("Balance")+
  labs(title = 'Exited/Retained as per Balance')
```

```
## Warning: Use of 'creditscore$Exited' is discouraged. Use 'Exited' instead.
```

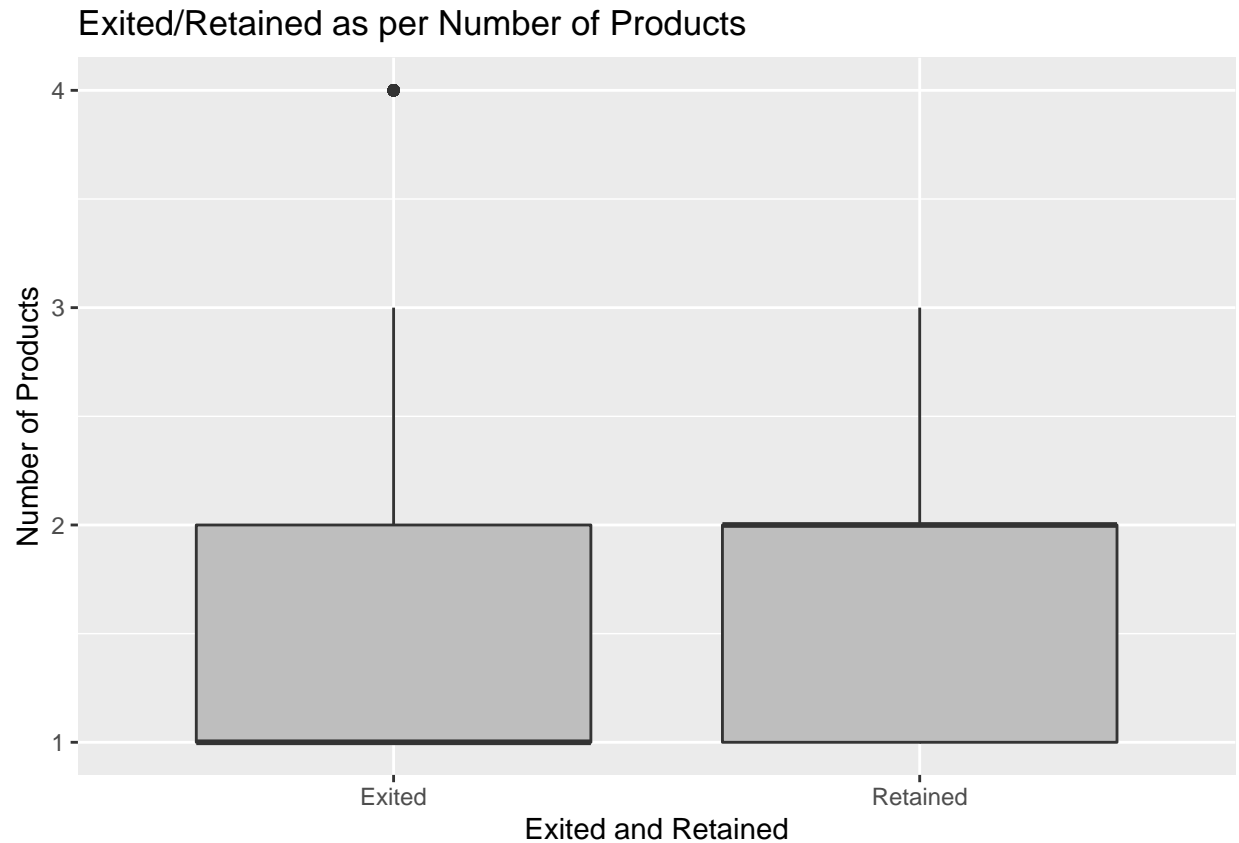
```
## Warning: Use of 'creditscore$Balance' is discouraged. Use 'Balance' instead.
```



```
#exited/Retained as per Number of Products
ggplot(creditscore, aes(x=creditscore$Exited, y=creditscore$NumOfProducts)) +
  geom_boxplot(fill="gray") +
  xlab("Exited and Retained")+ ylab("Number of Products")+
  labs(title = 'Exited/Retained as per Number of Products')
```

```
## Warning: Use of 'creditscore$Exited' is discouraged. Use 'Exited' instead.
```

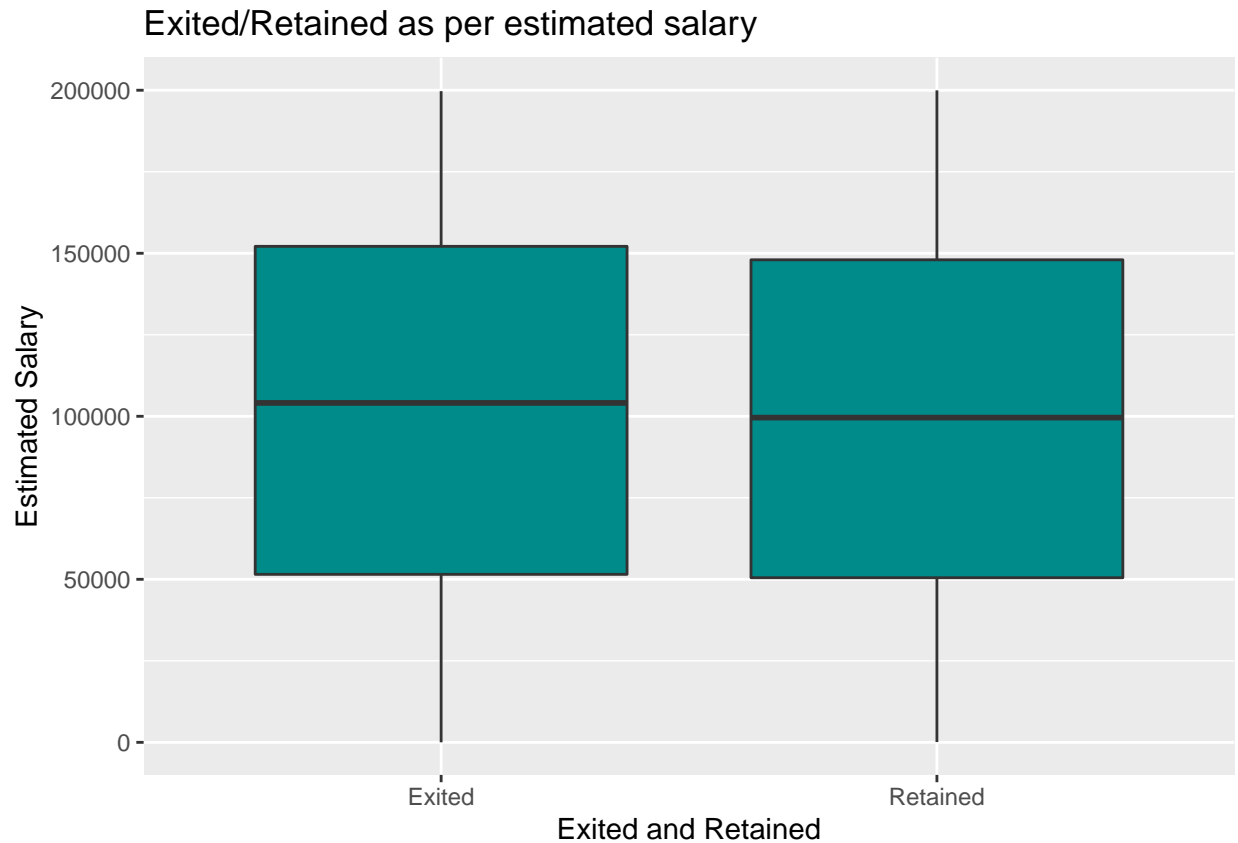
```
## Warning: Use of 'creditscore$NumOfProducts' is discouraged. Use 'NumOfProducts'
## instead.
```



```
#Exited/Retained as per estimated salary  
ggplot(creditscore, aes(x=creditscore$Exited, y=creditscore$EstimatedSalary)) +  
  geom_boxplot(fill="cyan4") +  
  xlab("Exited and Retained")+ ylab("Estimated Salary")+  
  labs(title = 'Exited/Retained as per estimated salary')
```

```
## Warning: Use of 'creditscore$Exited' is discouraged. Use 'Exited' instead.
```

```
## Warning: Use of 'creditscore$EstimatedSalary' is discouraged. Use  
## 'EstimatedSalary' instead.
```

```
#Exited/Retained as per estimated balance-salary ratio
balancesalaryratio <- table(creditscore$Balance/creditscore$EstimatedSalary)
balancesalaryratio
```

```
##
##          0 0.0794655359291127  0.141614116265352  0.180996484390334
##          2116                    1                    1                    1
## 0.187514249768973  0.192581777861048  0.200992637403045  0.205378741330938
##          1                    1                    1                    1
## 0.217974606258167  0.222565663736751  0.225548951552621  0.237492696781588
##          1                    1                    1                    1
## 0.252347121099174  0.259500447763078  0.260797569390351  0.26816361500235
##          1                    1                    1                    1
## 0.271091880712748  0.276491692312842  0.279961170831162  0.284768792852333
##          1                    1                    1                    1
## 0.292128672827648  0.292295568357648  0.295163969049209  0.307074172325508
##          1                    1                    1                    1
## 0.308605902148602  0.308713284114732  0.313676043479873  0.316284639605492
##          1                    1                    1                    1
## 0.318782014441703  0.322074384224005  0.324176413616763  0.324221210054704
##          1                    1                    1                    1
## 0.325586030577128  0.338592837091361  0.339032684738129  0.340380633158953
##          1                    1                    1                    1
## 0.340839985555955  0.345918141431957  0.349069913823815  0.35275626843442
##          1                    1                    1                    1
```

##	0.352809754992475	0.353535780416244	0.35398209517745	0.358133165288343
##	1	1	1	1
##	0.359789166800868	0.362844902453994	0.366974822408153	0.367086890022624
##	1	1	1	1
##	0.372254268072724	0.372627805960837	0.373140376402031	0.376945678333842
##	1	1	1	1
##	0.379439182264274	0.390743949251517	0.391787788017175	0.391814060516679
##	1	1	1	1
##	0.391938564581756	0.394998695321779	0.395057471600015	0.39600017755012
##	1	1	1	1
##	0.396770455260247	0.397721206532364	0.398127036430796	0.402002872213666
##	1	1	1	1
##	0.402205873473383	0.403382765512986	0.403570273273736	0.404963975097936
##	1	1	1	1
##	0.405078770247035	0.407192233067245	0.407869856181121	0.408563251302914
##	1	1	1	1
##	0.409157049396307	0.410438843927175	0.410571197279033	0.411882662182532
##	1	1	1	1
##	0.412249713830752	0.413264944106637	0.414252966188848	0.415539638379858
##	1	1	1	1
##	0.415869307523544	0.416355923816373	0.419231505885959	0.419481588226126
##	1	1	1	1
##	0.419779236692357	0.421157739589232	0.421418236076823	0.424052625333354
##	1	1	1	1
##	0.424914180275151	0.424964998712707	0.425785843212378	0.426839406000645
##	1	1	1	1
##	0.427228793789092	0.428068029914722	0.433133704435296	0.433451052070835
##	1	1	1	1
##	0.433459032087715	0.434545385670926	0.437156394865756	0.437550515509157
##	1	1	1	1
##	0.437592394203415	0.438497885766422	0.438762448455969	0.439451174773703
##	1	1	1	1
##	0.440703140975146	0.441570163041906	0.442457270012213	0.442532524590665
##	1	1	1	1
##	0.443413012311727	0.443946891824741	0.446875002390224	0.447273164533559
##	1	1	1	1
##	0.448235879067089	0.45038487293378	0.450668214237667	0.451018650969428
##	1	1	1	1
##	0.451078011751124	0.454148147729142	0.456624551706464	0.457335461526418
##	1	1	1	1
##	0.45782564037613	0.459100617740071	0.460420390598668	0.460447818584127
##	1	1	1	1
##	0.461757211804454	0.463347854104025	0.463809237177136	0.464153091124772
##	1	1	1	1
##	0.464312467376361	0.464317712589945	0.465006467072024	0.466095692201301
##	1	1	1	1
##	0.466210116353322	0.466406845125792	0.466580318673823	0.466692486370689
##	1	1	1	1
##	0.466715296660698	0.468018683701783	0.468987978789378	0.469277522484051
##	1	1	1	1
##	0.470723785264178	0.471382952827403	0.471475535363172	0.471861252146304
##	1	1	1	1
##	0.473056276750107	0.473077092695141	0.4732326695516	0.474930451615193
##	1	1	1	1

##	0.475039357912249	0.478077574840138	0.478931970620039	0.478994840008629
##	1	1	1	1
##	0.47952226376971	0.479971837463992	0.480091421999422	0.480551133676776
##	1	1	1	1
##	0.481100016230571	0.48181423132218	0.481819956307807	0.482625284862523
##	1	1	1	1
##	0.483703191338941	0.484905825703036	0.485658517390729	0.485978606811761
##	1	1	1	1
##	0.487868250422517	0.488338179733739	0.490468881731123	0.491975108444843
##	1	1	1	1
##	0.492134552720595	0.493251012623147	0.49348894646456	0.493582395185337
##	1	1	1	1
##	0.49466374513444	0.495298169558857	0.496433561190666	0.496756684549306
##	1	1	1	1
##	0.497105510804363	0.497131321458932	0.497428410964901	0.498203223571164
##	1	1	1	1
##	0.498573509497079	0.499222719832661	0.499539050810179	0.502459582994254
##	1	1	1	1
##	0.503191961668806	0.503197053351784	0.504307084400657	0.504383403354748
##	1	1	1	1
##	0.50439868649674	0.50479035705992	0.504975492792191	0.505431587983445
##	1	1	1	1
##	0.505708262908883	0.505712579914394	0.505912982399997	0.506091090228819
##	1	1	1	1
##	0.506291540836719	0.506439627828535	0.506983913093572	0.507888192512996
##	1	1	1	1
##	0.509022665780835	0.509632034147861	0.511118621572947	0.511561334648437
##	1	1	1	1
##	0.512319133735054	0.512581613797974	0.513975448504399	0.514003942209472
##	1	1	1	1
##	0.514066066639766	0.514476625776441	0.514860532381035	0.515177450635708
##	1	1	1	1
##	0.515398755269539	0.517490596410369	0.517507405968816	0.517711885455202
##	1	1	1	1
##	0.519988739170422	0.520213517043445	0.520587805348458	0.521474647316467
##	1	1	1	1
##	0.522101006954461	0.522420662923973	0.524185180259539	0.524329314030794
##	1	1	1	1
##	0.5255226827638	0.525744018169551	0.525785017954369	0.525788248159807
##	1	1	1	1
##	0.526031044806886	0.526464422585354	0.526972562049856	0.527086627084547
##	1	1	1	1
##	0.527154508150421	0.52855884646107	0.528886790749138	0.530601294393137
##	1	1	1	1
##	0.530834352415323	0.530905847825347	0.531834663681885	0.532022842547019
##	1	1	1	1
##	0.534619734494417	0.534908808431726	0.535207096666646	0.535338508893426
##	1	1	1	1
##	0.536444476966629	0.536964654392758	0.538051306493263	0.538610571959688
##	1	1	1	1
##	0.539834369581153	0.540595650197366	0.540670259964475	0.540700237402256
##	1	1	1	1
##	0.540913386636127	0.540961508561716	0.542638254226797	0.543381526684465
##	1	1	1	1

##	0.543411611912541	0.543749383547084	0.544316087260086	0.544678318969546
##	1	1	1	1
##	0.545595734820062	0.547154045692238	0.547902426181071	0.548979908683947
##	1	1	1	1
##	0.549260946491203	0.550428132557683	0.550781174989169	0.553164124590202
##	1	1	1	1
##	0.553530439394576	0.553613332755076	0.553672999842882	0.553818130236108
##	1	1	1	1
##	0.553831619247592	0.553915346875959	0.554774820310396	0.555616962258413
##	1	1	1	1
##	0.55698011329172	0.557416459886686	0.557797165019944	0.558121178914292
##	1	1	1	1
##	0.55885792540516	0.559090377391058	0.559756146802826	0.56041428033551
##	1	1	1	1
##	0.560623181933273	0.561872441158582	0.561930889555777	0.561967861210762
##	1	1	1	1
##	0.56201777359104	0.562719147466844	0.562770109500469	0.563017105185987
##	1	1	1	1
##	0.563814692481334	0.564346270876644	0.564370607281055	0.564405618003968
##	1	1	1	1
##	0.564492895982217	0.564537383465385	0.564886658220019	0.565542937447331
##	1	1	1	1
##	0.566146395143356	0.566299663555041	0.567133202696463	0.567353985308396
##	1	1	1	1
##	0.567409000049234	0.568328357982515	0.568420850591257	0.569343107564021
##	1	1	1	1
##	0.570263032683148	0.570328900320544	0.570368869335834	0.570646967704856
##	1	1	1	1
##	0.570724205858759	0.571032586321273	0.571384374138702	0.571435947195642
##	1	1	1	1
##	0.571718886190912	0.571838253480787	0.571884595618642	0.572927719983274
##	1	1	1	1
##	0.572985579654544	0.57304911081237	0.57309721280559	0.573710870927304
##	1	1	1	1
##	0.573946164817561	0.575069114829209	0.576460072356174	0.57680341933048
##	1	1	1	1
##	0.577844331666721	0.578024642909149	0.578031706843091	0.578923474289449
##	1	1	1	1
##	0.579081957484615	0.580079017409466	0.580199010632477	0.580417263700982
##	1	1	1	1
##	0.580528841437815	0.581074691490675	0.581791159751758	0.582940608611629
##	1	1	1	1
##	0.583790808580843	0.58519251812037	0.585215100039821	0.585301241687181
##	1	1	1	1
##	0.585383642475858	0.586433234683781	0.586501003705924	0.58660779693673
##	1	1	1	1
##	0.586779278651687	0.586982974639538	0.58751824454875	0.587893266096319
##	1	1	1	1
##	0.587960093392796	0.587966634108676	0.588050377474574	0.58863165854277
##	1	1	1	1
##	0.588875370004767	0.589096510615498	0.589151325657289	0.589203477589272
##	1	1	1	1
##	0.589472106655957	0.589506471906289	0.589578298327364	0.589953133342236
##	1	1	1	1

##	0.590835991907833	0.591078652626824	0.591812138634892	0.591945425006475
##	1	1	1	1
##	0.592491335535283	0.593068215400085	0.593303655304591	0.593488565390619
##	1	1	1	1
##	0.593797144107095	0.59466805770625	0.59546892024637	0.59563680203321
##	1	1	1	1
##	0.596165910119305	0.596356542154575	0.596555870201153	0.596999059423602
##	1	1	1	1
##	0.598373887243382	0.598461375759121	0.598787609540644	0.598991047173524
##	1	1	1	1
##	0.59948359989708	0.599492252333949	0.60060885127567	0.601505157000927
##	1	1	1	1
##	0.601947420359604	0.601991810780364	0.602004600572606	0.602225768690693
##	1	1	1	1
##	0.602368630409517	0.602654939534012	0.602659393584995	0.603247380142596
##	1	1	1	1
##	0.604147514934322	0.604573801488257	0.604652244676968	0.605242215045678
##	1	1	1	1
##	0.605297893007253	0.605327155908859	0.605947597703955	0.606689926693183
##	1	1	1	1
##	0.606791671979394	0.607085282352002	0.607183064879121	0.60756918724147
##	1	1	1	1
##	0.607696405666794	0.608056682064917	0.608270926241769	0.608716745569229
##	1	1	1	1
##	0.608744488989411	0.608808395017588	0.609885763740374	0.609941249530995
##	1	1	1	1
##	0.610395427343541	0.610992758181608	0.611057326156269	0.611124556604995
##	1	1	1	1
##	0.611253323680508	0.611952714848262	0.612431597179407	0.612662423483566
##	1	1	1	1
##	0.613320342704631	0.613336483287149	0.613471001408957	0.61428434246411
##	1	1	1	1
##	0.614678423295599	0.615194777819276	0.615211686885514	0.615390026389202
##	1	1	1	1
##	0.615460799904977	0.615601614365728	0.615907976153565	0.616851257208428
##	1	1	1	1
##	0.617137669576962	0.61790581006507	0.618343462929079	0.61936343282829
##	1	1	1	1
##	0.619766059894206	0.620716885866459	0.622124448381081	0.622482892757534
##	1	1	1	1
##	0.624314647435065	0.624977927455904	0.625268078256898	0.625310523936655
##	1	1	1	1
##	0.625717755428384	0.62631797262953	0.626433816755581	0.627897374008171
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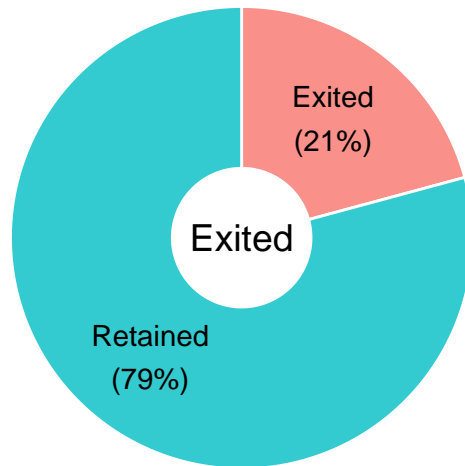
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##	24.2183793946613	24.2855809235093	25.4073095238748	25.7185348818024
##	1	1	1	1
##	25.8913063245674	25.9119003864263	26.0124488246591	26.0402933591582
##	1	1	1	1
##	27.0550282039306	27.3657365195549	27.7515570486834	28.534228676449
##	1	1	1	1
##	28.5396909168652	28.551563932277	28.8412537704182	28.8775168652764
##	1	1	1	1
##	29.8968176390891	30.2905274868265	30.707140727884	31.4256322484954
##	1	1	1	1
##	33.4599296687026	33.825412832472	34.5394723652435	34.968201838011
##	1	1	1	1
##	35.4542341695806	35.4846252586405	35.4930386304432	38.3148832643858
##	1	1	1	1
##	39.7912804307116	39.829109349398	40.0951735504928	40.1566272954663
##	1	1	1	1
##	40.6669220586877	41.1877267398644	41.2113844471248	42.2974500388279
##	1	1	1	1
##	43.9284716947411	44.2775379075772	44.7497198046243	46.4749642346209
##	1	1	1	1
##	47.5772404679164	48.6870411985019	50.6301229583953	51.0275182630461
##	1	1	1	1
##	51.4149384378607	54.6335327573147	54.9709648287813	56.7908214490063
##	1	1	1	1

```
## 58.1328760726169 59.7478209735381 59.8687643758317 61.4430758313058
## 1 1 1 1
## 61.8438156312625 64.3111977759659 64.9734817832594 65.0196253383679
## 1 1 1 1
## 68.4210448587779 71.2572458386557 73.4655136892863 73.7062531307397
## 1 1 1 1
## 74.9797623456189 80.0899355270219 86.6558238205879 92.8605177180196
## 1 1 1 1
## 94.6690531384879 97.2859282215543 99.1322451456311 99.4018566447392
## 1 1 1 1
## 103.720946335834 144.243181652447 145.39860367423 145.585462654473
## 1 1 1 1
## 146.890041773346 148.026173199704 159.593705134055 203.003440213761
## 1 1 1 1
## 222.741644207165 226.94259933442 233.665128254955 243.464493379726
## 1 1 1 1
## 291.14223132787 321.358768741481 349.521987302697 353.229624838292
## 1 1 1 1
## 437.980841615564 10614.6554404145
## 1 1
```

```
#Overall Retained-Exited ratio
PieDonut(creditscore, aes(Exited)) +
  labs(title = 'Overall Retained-Exited ratio') +
  theme(plot.title = element_text(hjust = 0.5, size = 20),
        axis.title = element_blank(),
        axis.text = element_blank(),
        axis.ticks = element_blank(),
        panel.grid=element_blank(),
        panel.border = element_blank())
```

```
## Warning: 'guides(<scale> = FALSE)' is deprecated. Please use 'guides(<scale> =
## "none")' instead.
```

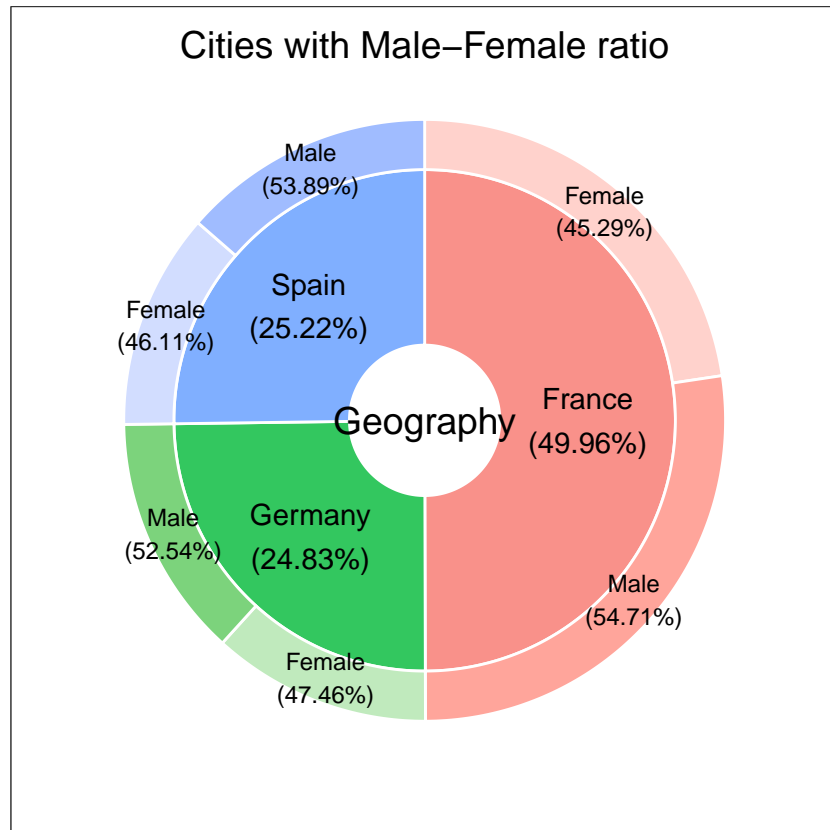
Overall Retained–Exited ratio



```
#Cities with Male-Female ratio  
PieDonut(creditscore, aes(Geography, Gender), title = "Cities with Male-Female ratio")
```

```
## Warning: 'guides(<scale> = FALSE)' is deprecated. Please use 'guides(<scale> =  
## "none")' instead.
```

```
## Warning: 'guides(<scale> = FALSE)' is deprecated. Please use 'guides(<scale> =  
## "none")' instead.
```

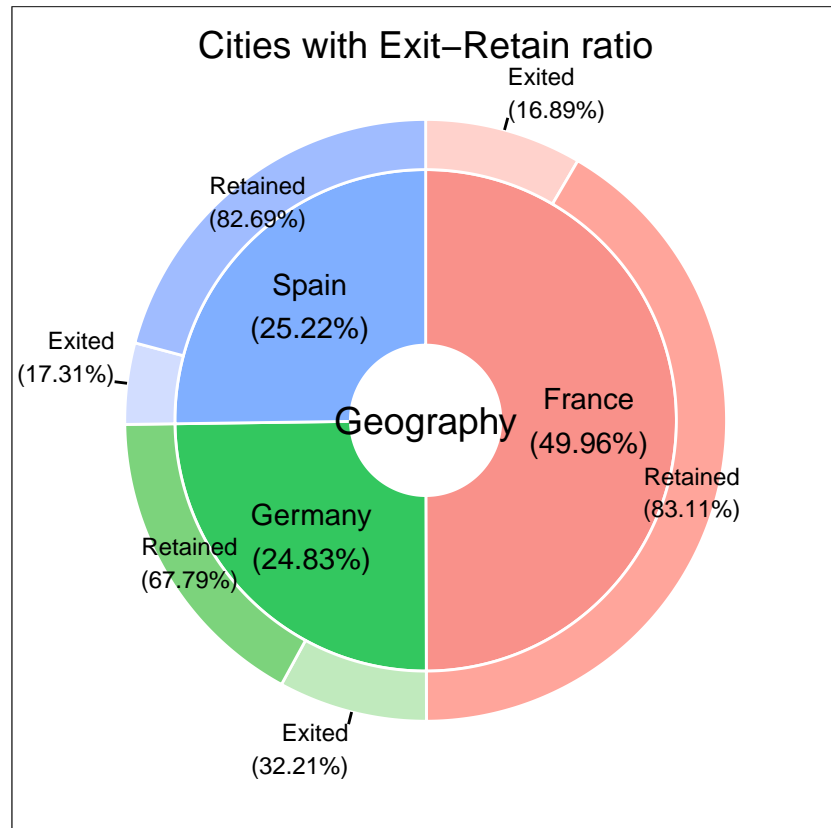


```
#Cities with Exit-Retain ratio
```

```
PieDonut(creditscore, aes(Geography, Exited), title = "Cities with Exit-Retain ratio")
```

```
## Warning: 'guides(<scale> = FALSE)' is deprecated. Please use 'guides(<scale> =  
## "none")' instead.
```

```
## Warning: 'guides(<scale> = FALSE)' is deprecated. Please use 'guides(<scale> =  
## "none")' instead.
```



```
#Male-Female with Exit-Retain ratio
```

```
PieDonut(creditscore, aes(Gender, Exited), title = "Male-Female with Exit-Retain ratio")
```

```
## Warning: 'guides(<scale> = FALSE)' is deprecated. Please use 'guides(<scale> =  
## "none")' instead.
```

```
## Warning: 'guides(<scale> = FALSE)' is deprecated. Please use 'guides(<scale> =  
## "none")' instead.
```

Male–Female with Exit–Retain ratio

