INFS_SP5_2023
DATA VISUALISATION
Assessable Exercise 2

Enna H

Contents

```
# read the data
# customer count
ccount <- read.csv("ccount.csv",header=T)
head(ccount)
```

```
##      X STORE   DATE  GROCERY    DAIRY FROZEN BOTTLE MVPCLUB GROCCOUP     MEAT
## 1  264     0 930216     1.00     0.00   0.00    0.0       0     0.00     0.00
## 2  265     0 930423 45603.00 11896.00 8592.00    0.0       0     0.00 13806.00
```

```
## 3  266     0 930607 11452.00 2781.00 2127.00    0.0        0      0.00 3717.00
## 4  902     1 900111 24325.63 5698.45 3677.99   12.8        0  -321.71 6839.53
## 5 1155     2 880101 17245.41    0.00    0.00    0.0        0      0.00 3926.10
## 6 1156     2 880102 34917.48    0.00    0.00    0.0        0      0.00 7730.39
##   MEATFROZ MEATCOUP    FISH FISHCOUP PROMO PROMCOUP  PRODUCE    BULK SALADBAR
## 1     0.00        0    0.00        0  0.00     0.00     0.00    0.00     0.00
## 2     0.00        0  710.00        0  0.00     0.00 11153.00 1403.00   869.00
## 3     0.00        0    0.00        0  0.00     0.00  1955.00  160.00     0.00
## 4   670.17        0  587.26        0 94.12   -25.99  4938.27  657.97   261.65
## 5     0.00        0   24.85        0  0.00     0.00  2870.23  247.54     0.00
## 6     0.00        0  836.53        0  0.00     0.00  5683.90  301.50     0.00
##   PRODCOUP BULKCOUP SALCOUP FLORAL FLORCOUP     DELI DELISELF DELIEXPR CONVFOOD
## 1        0        0       0   0.00      0.0     0.00     0.00      0.0     0.00
## 2        0        0       0 584.00      0.0  5398.00  2598.00      0.0     0.00
## 3        0        0       0 123.00      0.0  1406.00   757.00      0.0     0.00
## 4       -1        0       0 211.94     -0.5  2089.67  2245.41     42.5   128.69
## 5        0        0       0 172.96      0.0 27119.26     0.00      0.0     0.00
## 6        0        0       0 139.96      0.0  4905.48     0.00      0.0     0.00
##   CHEESE DELICOUP  BAKERY PHARMACY PHARCOUP       GM JEWELRY COSMETIC    HABA
## 1   0.00        0    0.00     0.00     0.00     0.00       0     0.00    0.00
## 2   0.00        0 1893.00  1423.00     0.00 15254.00       0     0.00    0.00
## 3   0.00        0  921.00     0.00     0.00  2179.00       0     0.00    0.00
## 4  72.89       -2 1031.34  2379.78   -71.31  3727.24       0   274.54 1998.24
## 5   0.00        0 1144.70     0.00     0.00  1884.91       0     0.00    0.00
## 6   0.00        0 2152.96     0.00     0.00  4253.57       0     0.00    0.00
##   GMCOUP CAMERA PHOTOFIN  VIDEO VIDEOREN VIDCOUP    BEER   WINE SPIRITS MISCSCP
## 1      0   0.00     0.00   0.00        0       0    0.00   0.00    0.00     0.0
## 2      0   0.00     0.00 253.00      542       0    0.00   0.00    0.00     0.0
## 3      0   0.00     0.00   0.00        0       0 1003.00   0.00    0.00     0.0
## 4    -20  30.21   205.82  63.83      120      -5  679.14 162.48  332.25   -35.3
## 5      0   0.00     0.00   0.00        0       0    0.00   0.00    0.00     0.0
## 6      0   0.00     0.00   0.00        0       0    0.00   0.00    0.00     0.0
##   MANCOUP CUSTCOUN FTGCHIN FTGCCOUP FTGITAL FTGICOUP DAIRCOUP FROZCOUP HABACOUP
## 1    0.00        1       0        0       0        0        0        0        0
## 2    0.00     4192       0        0       0        0        0        0        0
## 3    0.00     1652       0        0       0        0        0        0        0
## 4  704.84     2888       0        0       0        0        0        0        0
## 5    0.00     1505       0        0       0        0        0        0        0
## 6    0.00     2325       0        0       0        0        0        0        0
##   PHOTCOUP COSMCOUP SSDELICP BAKCOUP LIQCOUP WEEK
## 1        0        0        0       0       0  179
## 2        0        0        0       0       0  189
## 3        0        0        0       0       0  195
## 4        0        0        0       0       0   18
## 5        0        0        0       0       0  -88
## 6        0        0        0       0       0  -88
```

```r
ccount <- na.omit(ccount)

# demographics
demo <- read.csv("demo.csv",header=T)
head(demo)
```

```
##    MMID         NAME         CITY  ZIP   LAT   LONG WEEKVOL STORE SCLUSTER
```

```
## 1    NA                                 NA    NA    NA     NA     NA
## 2 16892 DOMINICKS    2 RIVER FOREST 60305 419081 878131    350     2         C
## 3 16893 DOMINICKS    4   PARK RIDGE 60068 420392 878425    300     4         A
## 4 16894 DOMINICKS    5      PALATINE 60067 421203 880431    550     5         D
## 5 16895 DOMINICKS    8      OAK LAWN 60453 417331 877436    600     8         C
## 6 16896 DOMINICKS    9 MORTON GROVE 60053 420411 877994    450     9         A
##   ZONE       AGE9      AGE60      ETHNIC       EDUC      NOCAR   INCOME INCSIGMA
## 1   NA         NA         NA          NA         NA         NA       NA       NA
## 2    1 0.11750858 0.2328647 0.11427995 0.24893493 0.12460290 10.55321 26296.90
## 3    2 0.09508951 0.2620299 0.06216127 0.22078941 0.05556729 10.64697 24885.18
## 4    2 0.14143348 0.1173680 0.05387528 0.32122573 0.02556950 10.92237 26779.61
## 5    5 0.12315542 0.2523940 0.03524333 0.09517327 0.07511272 10.59701 24653.87
## 6    2 0.10350310 0.2691190 0.03261883 0.22217232 0.04012794 10.78715 26599.04
##   GINI HSIZEAVG    HSIZE1    HSIZE2   HSIZE34  HSIZE567    HH3PLUS    HH4PLUS
## 1   NA       NA        NA        NA        NA        NA         NA         NA
## 2   NA 2.531062 0.2820332 0.3129192 0.3010942 0.10395341 0.4050477 0.2419696
## 3   NA 2.480347 0.2694421 0.3387574 0.3036771 0.08812341 0.3918005 0.2206255
## 4   NA 2.656439 0.2188517 0.3350767 0.3429800 0.10309158 0.4460716 0.2708043
## 5   NA 2.769603 0.2108215 0.3144177 0.3430111 0.13174970 0.4747608 0.2886836
## 6   NA 2.616894 0.2115441 0.3586798 0.3329456 0.09683047 0.4297761 0.2503635
##     HHSINGLE    HHLARGE   WORKWOM  SINHOUSE     DENSITY     HVAL150     HVAL200
## 1         NA         NA        NA        NA          NA          NA          NA
## 2 0.2820332 0.10395341 0.3035853 0.5550623 0.000456044 0.46388706 0.300393959
## 3 0.2694421 0.08812341 0.3621216 0.4463370 0.000571522 0.52223634 0.224057603
## 4 0.2188517 0.10309158 0.4105680 0.5762844 0.001119283 0.53588335 0.296345389
## 5 0.2108215 0.13174970 0.2830747 0.7572110 0.000390502 0.05422716 0.009109024
## 6 0.2115441 0.09683047 0.3589945 0.7299458 0.000703361 0.50574713 0.186484344
##     HVALMEAN    SINGLE    RETIRED      UNEMP      WRKCH5    WRKCH17    NWRKCH5
## 1         NA        NA         NA         NA          NA         NA         NA
## 2 176.21307 0.2976210 0.20062013 0.1817649 0.02963185 0.08275965 0.05297815
## 3 172.76790 0.2597452 0.17012859 0.1546983 0.03747535 0.10830196 0.05325444
## 4 184.57584 0.2645853 0.09664275 0.1779053 0.05859928 0.14519116 0.10848492
## 5  97.50142 0.2503721 0.20845197 0.1738848 0.03780510 0.11479170 0.06781061
## 6 168.27685 0.2300052 0.16828087 0.1420500 0.03585163 0.13062895 0.05495596
##    NWRKCH17     WRKCH    NWRKCH     WRKWCH    WRKWNCH    TELEPHN  MORTGAGE
## 1        NA        NA        NA         NA         NA         NA        NA
## 2 0.06644717 0.1123915 0.1194253 0.02926397 0.2864322 0.9855277 0.5491446
## 3 0.05415098 0.1457773 0.1074054 0.03707646 0.3044172 0.9915487 0.6986655
## 4 0.08779000 0.2037904 0.1962749 0.05762639 0.2728149 0.9922129 0.8518060
## 5 0.08157460 0.1525968 0.1493852 0.03732222 0.2367062 0.9930716 0.6477187
## 6 0.06810569 0.1664806 0.1230617 0.03542101 0.2896188 0.9947659 0.6628248
##      NWHITE    POVERTY    SHPCONS   SHPHURR   SHPAVID   SHPKSTR   SHPUNFT
## 1        NA         NA         NA        NA        NA        NA        NA
## 2 0.13822560 0.06195940 0.09106954 0.1210731 0.1812566 0.2322626 0.2843276
## 3 0.15166694 0.03759240 0.05535601 0.1183182 0.1628988 0.3169237 0.3124868
## 4 0.09117020 0.02510460 0.03254300 0.1906090 0.1680614 0.3301953 0.2633659
## 5 0.04599686 0.05135254 0.07622085 0.1351738 0.2174439 0.2161241 0.3027937
## 6 0.12998191 0.02806048 0.04332655 0.1586217 0.1536784 0.2364059 0.3604245
##      SHPBIRD  SHOPINDX   SHPINDX      GROUP1      GROUP2      GROUP3     GROUP4
## 1        NA        NA        NA          NA          NA          NA         NA
## 2 0.09001059 0.7300902 0.7300902 0.015389877 0.007181943 0.003761970 0.07301642
## 3 0.03401648 0.7266935 0.7266935 0.018589744 0.015170940 0.009615385 0.07307692
## 4 0.01522548 0.8352603 0.8352603 0.012572415 0.014791076 0.023049427 0.03919635
## 5 0.05224373 0.9016030 0.9016030 0.004313280 0.003178207 0.006696935 0.04914869
```

```
## 6 0.04754289 0.9171669 0.9171669 0.005543071 0.004644195 0.005692884 0.02831461
##         GROUP5     GROUP6     GROUP7     GROUP8     GROUP9    GROUP10    GROUP11
## 1           NA         NA         NA         NA         NA         NA         NA
## 2 0.09900821 0.1822845 0.05300958 0.05728454 0.2169973 0.15697674 0.04993160
## 3 0.11901709 0.2314103 0.03717949 0.06260684 0.2523504 0.09700855 0.03440171
## 4 0.07789967 0.3697769 0.01984469 0.04289412 0.2991495 0.04585234 0.01713300
## 5 0.11986379 0.2215664 0.04597049 0.06379115 0.2306470 0.15198638 0.04245176
## 6 0.07880150 0.2483895 0.02726592 0.05438202 0.3075655 0.10696629 0.05303371
##        GROUP12     SELAS1     SELAS2     SELAS3     SELAS4     SELAS5     SELAS6
## 1           NA         NA         NA         NA         NA         NA         NA
## 2 0.08515732 -1.856981 -1.373362 -1.509196 -1.430677 -1.705485 -1.534515
## 3 0.04957265 -1.891339 -1.224370 -1.875820 -1.875213 -1.875046 -1.688983
## 4 0.03784050 -2.071768 -1.021152 -1.569490 -1.504040 -1.631615 -1.266781
## 5 0.06038593 -1.803690 -1.162454 -2.039063 -2.154739 -2.134114 -1.069171
## 6 0.07940075 -1.678820 -1.163497 -1.777963 -1.722960 -1.809696 -1.325145
##         SELAS7     SELAS8     SELAS9    SELAS10    SELAS11    SELAS12    SELAS13
## 1           NA         NA         NA         NA         NA         NA         NA
## 2 -1.973243 -2.262341 -2.374266 -2.521031 -1.758233 -1.975818 -2.873225
## 3 -2.384172 -2.876327 -2.500316 -2.854116 -1.994033 -2.623174 -3.189566
## 4 -2.020712 -2.435155 -2.429923 -2.851684 -1.488839 -2.011953 -2.962026
## 5 -2.465376 -2.969798 -2.260139 -2.832196 -2.446596 -2.851022 -4.002387
## 6 -2.277693 -2.715847 -2.377512 -2.899755 -1.891981 -2.500281 -3.003231
##        SELAS14    SELAS15    SELAS16    SELAS17    SELAS18    SELAS19    SELAS20
## 1           NA         NA         NA         NA         NA         NA         NA
## 2 -1.083980 -2.415199 -3.609420 -1.551756 -2.154489 -1.203595 -2.780585
## 3 -1.332268 -2.543600 -4.029156 -1.932818 -2.636986 -1.261210 -2.460703
## 4 -1.029548 -2.386336 -3.569475 -1.703157 -2.049508 -1.249499 -2.574532
## 5 -1.481758 -2.602565 -4.194761 -2.373623 -2.839541 -1.164147 -2.530308
## 6 -1.131993 -1.702005 -4.173260 -1.742769 -2.183509 -1.248396 -2.464115
##        SELAS21    SELAS22     SELAS23    SELAS24    SEELAS1    SEELAS2    SEELAS3
## 1           NA         NA          NA         NA         NA         NA         NA
## 2 -1.176011 -0.7789004 -14.023059 -1.972626 0.04609577 0.04867132 0.04134085
## 3 -1.618733 -0.7669906  -1.544184 -1.994621 0.04667355 0.04600846 0.03710938
## 4 -1.314122 -0.7381921          NA -1.650603 0.04685187 0.04750394 0.04214705
## 5 -1.357998 -0.7817164  -2.449163 -2.016553 0.04372313 0.04603888 0.03677532
## 6 -1.085033 -0.7535565  -1.028969 -1.854648 0.04594523 0.04791337 0.03893287
##        SEELAS4    SEELAS5    SEELAS6    SEELAS7    SEELAS8    SEELAS9   SEELAS10
## 1           NA         NA         NA         NA         NA         NA         NA
## 2 0.05867142 0.09632491 0.08056414 0.07666972 0.08428978 0.04218708 0.06061534
## 3 0.05689763 0.09175825 0.08360286 0.08168923 0.08303710 0.04118425 0.06016966
## 4 0.05534390 0.09495190 0.08326407 0.08721526 0.08525697 0.03971104 0.06207115
## 5 0.05319666 0.09243632 0.06773426 0.08812882 0.08711132 0.04394201 0.05968469
## 6 0.06309824 0.09405849 0.07480442 0.08658819 0.08932187 0.04260716 0.06109514
##       SEELAS11   SEELAS12   SEELAS13   SEELAS14   SEELAS15   SEELAS16   SEELAS17
## 1           NA         NA         NA         NA         NA         NA         NA
## 2 0.09297869 0.06714518 0.05222730 0.05365839 0.06063472 0.04236044 0.04326563
## 3 0.10407357 0.06669679 0.05453834 0.05258531 0.05921006 0.04551734 0.04285546
## 4 0.11046914 0.06773406 0.05508357 0.05583948 0.06087175 0.04473752 0.04234011
## 5 0.11237543 0.07386350 0.05499707 0.04940938 0.05572323 0.05110535 0.04195292
## 6 0.11175206 0.07136980 0.05640542 0.05691006 0.05618144 0.04841895 0.04374715
##       SEELAS18   SEELAS19   SEELAS20   SEELAS21   SEELAS22  SEELAS23   SEELAS24
## 1           NA         NA         NA         NA         NA        NA         NA
## 2 0.08849878 0.03836553 0.06755864 0.06771325 0.02153658 2.7400502 0.09721065
## 3 0.07285956 0.03950031 0.06150636 0.10942223 0.01893505 0.1742115 0.11963333
```

```
## 4 0.08376773 0.03836881 0.06245907 0.10304508 0.01995546          NA 0.09705996
## 5 0.06929156 0.04056825 0.06123208 0.08645687 0.01858762 0.1437575 0.08863131
## 6 0.08388646 0.03866219 0.06159430 0.06452600 0.02030690 0.1673200 0.10008217
##   SELASALL STORENO URBAN  CUBDIST   CUBVOL CUBID OMNIDIST   OMNIVOL OMNIID
## 1       NA      NA     0       NA       NA 16501       NA        NA  61757
## 2 -2.091598       2     1 3.784829 1.7142857 16502 2.110122 1.1428571  78239
## 3 -2.382328       4     0 8.412411 1.2500000 16505 2.373200 1.0000000  71862
## 4 -2.110633       5     0 3.801998 0.6818182 16505 4.701267 0.8636364  76899
## 5 -2.633555       8     1 2.636333 1.5000000 16503 6.337501 0.3333333  70985
## 6 -2.243695       9     0 9.510009 1.3333333 16502 1.103279 0.6666667  71862
##      DDIST1    DDIST2   DDIST3   DDIST4   DDIST5   DDIST6   DDIST7   DDIST8
## 1       NA        NA       NA       NA       NA       NA       NA       NA
## 2 0.3323486 1.8562828 2.203283 2.417813 2.826671 2.839541 3.112675 3.628377
## 3 0.1148886 0.8251002 1.128794 1.662004 1.791566 2.014863 2.036048 2.752762
## 4 0.3118192 0.7314000 1.319936 2.441294 3.198418 3.418662 3.521435 4.001730
## 5 2.2268264 2.4054685 2.757371 3.406818 3.730438 4.098806 4.439074 4.468468
## 6 1.3599199 1.4440224 1.907676 2.138158 2.252595 2.735970 2.751439 2.755334
##     DDIST9   DDIST10     DCVOL1     DCVOL2     DCVOL3    DCVOL4    DCVOL5
## 1       NA        NA         NA         NA         NA        NA        NA
## 2 3.709681  3.767400 0.02857143 0.08571429 0.02857143 0.5714286 0.7142857
## 3 2.951548  3.826749 1.16666667 0.50000000 0.50000000 1.0000000 0.8333333
## 4 4.584915  5.057119 0.31818182 0.59090909 0.68181818 0.6363636 0.9090909
## 5 4.701078  5.055358 0.20833333 0.20833333 1.20833333 0.8333333 0.5833333
## 6 2.838994  3.009404 0.55555556 0.11111111 0.33333333 0.3333333 0.7777778
##       DCVOL6     DCVOL7    DCVOL8     DCVOL9    DCVOL10 DCID1 DCID2 DCID3 DCID4
## 1         NA         NA        NA         NA         NA 16137 16138 16141 16142
## 2 0.08571429 0.11428571 0.5000000 0.71428571 0.08571429 17963 17520 17251 17149
## 3 0.66666667 0.16666667 0.2500000 0.91666667 0.50000000 16793 16265 16825 16854
## 4 0.07272727 0.45454545 0.3636364 0.45454545 0.86363636 16393 16803 16788 77221
## 5 0.01666667 0.03333333 0.1250000 0.08333333 0.16666667 17111 16769 16700 16882
## 6 0.66666667 0.72222222 0.1666667 0.33333333 1.05555556 16831 17013 16825 16265
##   DCID5 DCID6 DCID7 DCID8 DCID9 DCID10 TTIME1 TTIME2 TTIME3 TTIME4 TTIME5
## 1 16143 16144 16145 16146 16147  16151     NA     NA     NA     NA     NA
## 2 73574 17990 17252 16742 16738  17254   5.49   7.29   7.46   8.30   8.52
## 3 16831 16137 17013 17232 16828  16805   4.75   6.54   7.38   7.73   8.43
## 4 16747 17025 77789 16745 16703  16804   4.20   5.32   6.62   9.78   9.90
## 5 16867 17005 17997 17103 17144  17270   7.11   7.63   7.82   7.82   8.40
## 6 16793 16854 70624 17232 16805  16712   6.64   6.95   7.42   7.63   7.71
##   TTIME6 TTIME7 TTIME8 TTIME9 TTIME10     TCVOL1    TCVOL2     TCVOL3    TCVOL4
## 1     NA     NA     NA     NA      NA         NA        NA         NA        NA
## 2   8.96   9.17   9.28   9.81    9.83 0.02857143        NA 0.08571429 1.7142857
## 3   8.49   9.17   9.25  10.29   10.81 1.16666667 0.5000000 0.50000000 1.0000000
## 4  10.36  11.26  11.58  11.81   11.87 0.31818182 0.5909091 0.68181818 0.6363636
## 5   8.53   8.70   9.41   9.50    9.63 1.50000000 0.2083333 0.20833333 0.8333333
## 6   8.26   8.43   8.52   8.61    8.97         NA        NA 0.55555556 0.1111111
##      TCVOL5     TCVOL6    TCVOL7    TCVOL8    TCVOL9    TCVOL10 TCID1 TCID2
## 1        NA         NA        NA        NA        NA         NA    NA    NA
## 2 0.7142857 0.02857143 0.5714286 0.5000000 0.7142857 0.08571429 17963 78239
## 3        NA 0.83333333 0.1666667 0.6666667        NA         NA 16793 16265
## 4 0.9090909 0.07272727        NA        NA 0.4545455 0.36363636 16393 16803
## 5        NA 0.58333333 1.2083333        NA 0.2916667 0.01666667 16503 17111
## 6        NA 0.77777778        NA 0.3333333 0.3333333 0.33333333 71862 16976
##   TCID3 TCID4 TCID5 TCID6 TCID7 TCID8 TCID9 TCID10  LSELAS1  LSELAS2  LSELAS3
## 1    NA    NA    NA    NA    NA    NA    NA     NA       NA       NA       NA
```

```
## 2 17520 16502 16738 17251 17149 16742 73574   17990 0.218548  0.013695 -0.051732
## 3 16825 16854 16896 16831 17013 16137 71862   16976 0.183219  0.214221 -0.325575
## 4 16788 77221 16747 17025 70874 16945 77789   16745 0.023781  0.398436 -0.123517
## 5 16769 16882 16953 16867 16700 16909 16362   17005 0.277445  0.449581 -0.484792
## 6 16831 17013 16899 16793 16893 16825 16805   16265 0.401609  0.233045 -0.245018
##     LSELAS4    LSELAS5   LSELAS6   LSELAS7   LSELAS8   LSELAS9  LSELAS10  LSELAS11
## 1       NA         NA        NA        NA        NA        NA        NA        NA
## 2 -0.160706 -0.689229  0.253402  0.086214  0.589751  0.318732  0.397246 -0.208447
## 3 -0.544397 -0.842997  0.131295 -0.302916  0.034401  0.285984  0.050152 -0.559545
## 4 -0.170516 -0.631603  0.509680  0.058434  0.396905  0.268126  0.071349  0.051063
## 5 -0.773472 -1.082956  0.871307 -0.425693 -0.066246  0.549753 -0.069569 -0.990855
## 6 -0.441348 -0.767057  0.486932 -0.207217  0.171427  0.412821  0.016662 -0.284956
##    LSELAS12  LSELAS13  LSELAS14  LSELAS15  LSELAS16  LSELAS17  LSELAS18
## 1       NA        NA        NA        NA        NA        NA        NA
## 2 -0.065948 -0.505076 -0.038756 -0.188406  0.016053 -0.204141 -0.364074
## 3 -0.645474 -1.034803 -0.268762 -0.246835 -0.281457 -0.546431 -0.831328
## 4 -0.139830 -0.606369  0.039228 -0.160580 -0.045339 -0.336489 -0.207174
## 5 -0.832119 -1.466201 -0.366040 -0.119211 -0.415750 -0.969865 -1.072058
## 6 -0.480224 -0.841587 -0.084738  0.516104 -0.576560 -0.253530 -0.352921
##    LSELAS19  LSELAS20  LSELAS21  LSELAS22   PERCENT     LIFT1     RATIO1
## 1       NA        NA        NA        NA        NA        NA        NA
## 2 0.139676 -0.016265  0.029944 -0.044818 1.2269379 0.9341763 0.05855654
## 3 0.082049  0.093079 -0.524090  0.015021        NA        NA        NA
## 4 0.090348  0.068191 -0.088917 -0.000800 0.9371925 1.4176228 0.07607739
## 5 0.163480  0.032799 -0.262969  0.019392 1.4748230 1.7557441 0.08981743
## 6 0.085252  0.090984  0.096852  0.009128 0.8358393 0.6453325 0.03909917
##     LIFT2     RATIO2    LIFT3     RATIO3    LIFT4     RATIO4 LIFT5 RATIO5
## 1      NA        NA       NA        NA       NA        NA    NA    NA
## 2      NA        NA 2.334865 0.1863499 1.436536 0.3371462    NA    NA
## 3      NA        NA       NA        NA       NA        NA    NA    NA
## 4 0.190694 0.04968258 2.798968 0.2144163 2.284296 0.4362096    NA    NA
## 5 1.944441 0.39127350 4.297798 0.3178809 2.641813 0.5028069    NA    NA
## 6 1.403913 0.30150400 1.927739 0.1418635 1.345884 0.2552949    NA    NA
##     LIFT6     RATIO6    LIFT7     RATIO7    LIFT8     RATIO8    LIFT9     RATIO9
## 1      NA        NA       NA        NA       NA        NA       NA        NA
## 2 2.574568 0.3344870 1.399786 0.2680973 1.400954 0.2478310 2.584231 0.3355305
## 3      NA        NA       NA        NA       NA        NA       NA        NA
## 4 2.931573 0.4310136 2.138400 0.4476524 1.920707 0.3147148 2.302486 0.2573382
## 5 4.688981 0.6606708 3.073091 0.6105314 2.758318 0.4315755 4.143856 0.4228342
## 6 2.007542 0.2741230 1.100827 0.2470095 1.387061 0.1932623 1.663609 0.1821946
##     LIFT10    RATIO10    LIFT11    RATIO11    LIFT12    RATIO12    LIFT13    RATIO13
## 1      NA        NA       NA        NA       NA        NA       NA        NA
## 2 0.3520967 0.04784466 3.741379 0.3141380 4.290322 0.3829084 1.675245 0.2933568
## 3      NA        NA       NA        NA       NA        NA       NA        NA
## 4 1.5647551 0.18132862 5.303446 0.4823268 8.526348 0.5692004 1.757013 0.2395202
## 5 2.4962674 0.31033294 7.976048 0.6783006 6.734166 0.4773786 3.675987 0.4876965
## 6 0.8527996 0.10193162 3.833903 0.3399243 4.739798 0.3078425 1.391338 0.1890616
##     LIFT14    RATIO14    LIFT15    RATIO15    LIFT16    RATIO16    LIFT17    RATIO17
## 1      NA        NA       NA        NA       NA        NA       NA        NA
## 2 3.712679 0.4414698 1.054609 0.1523169 2.423238 0.6367241 3.267101 0.6026356
## 3      NA        NA       NA        NA       NA        NA       NA        NA
## 4 2.370570 0.3707610 1.328489 0.1583010 1.708510 0.4376476 2.751282 0.5565180
## 5 4.597902 0.6514814 2.122250 0.2307887 2.695513 0.6894798 3.797759 0.7805405
## 6 2.193128 0.2915930 1.129604 0.1296760 1.346405 0.3620715 3.132148 0.5672906
```

```
##     LIFT18  RATIO18  LIFT19  RATIO19  LIFT20   RATIO20  LIFT21  RATIO21
## 1       NA       NA       NA       NA      NA        NA      NA        NA
## 2 2.923142 0.4558928 1.518924 0.3214898 1.0158085 0.08862533 2.751867 0.4751312
## 3       NA       NA       NA       NA      NA        NA      NA        NA
## 4 3.258170 0.5830778 2.682781 0.6370777 2.1740190 0.21335094 2.375763 0.3834679
## 5 4.587036 0.7916357 2.914740 0.6470971 1.2231807 0.11069612 5.133033 0.6325261
## 6 2.065950 0.3680376 1.365667 0.3358555 0.9012095 0.08896751 1.356177 0.2362235
##     LIFT22  RATIO22  LIFT23  RATIO23   UELAS1    UTELS1    UNETA1
## 1       NA       NA       NA       NA       NA        NA        NA
## 2 2.189501 0.1829519 3.705236 0.6138965 -1.461915 -1.849233 -1.412733
## 3       NA       NA       NA       NA       NA        NA        NA
## 4 2.597935 0.1911246 2.830232 0.6255733 -1.408057 -1.942297 -1.646370
## 5 2.826268 0.2281423 4.453825 0.9273054 -1.815892 -1.963792 -2.064376
## 6 2.187447 0.1486050 2.524155 0.4362547 -1.743350 -2.194845 -1.834487
##      WELAS1    WTELS1    WNETA1     UELAS2     UTELS2     UNETA2     WELAS2
## 1        NA        NA        NA        NA        NA        NA        NA
## 2 -1.221925 -1.312398 -1.311296 -11.694116 -11.694116 -11.694116 -11.694116
## 3        NA        NA        NA        NA        NA        NA        NA
## 4 -14.535796 -14.535824 -14.535798 -5.836127 -7.336628 -6.675913 -8.587104
## 5 -1.373659 -1.398001 -1.554000 -5.277306 -5.491707 -6.322489 -4.934895
## 6 -1.304567 -1.478760 -1.396463 -4.864680 -4.984393 -5.762275 -4.999513
##      WTELS2    WNETA2    UELAS3    UTELS3    UNETA3    WELAS3    WTELS3
## 1        NA        NA        NA        NA        NA        NA        NA
## 2 -11.694116 -11.694116 -3.065641 -3.479599 -3.942809 -2.222934 -2.424667
## 3        NA        NA        NA        NA        NA        NA        NA
## 4 -8.595580 -8.502479 -1.911306 -2.201627 -2.330391 -1.430801 -1.591114
## 5 -5.012104 -5.751170 -2.294206 -2.525535 -2.721695 -1.893059 -1.979854
## 6 -5.052999 -5.908660 -2.756348 -2.940061 -3.244996 -2.136059 -2.191522
##      WNETA3    UELAS4    UTELS4    UNETA4    WELAS4    WTELS4    WNETA4
## 1        NA        NA        NA        NA        NA        NA        NA
## 2 -2.675623 -1.696606 -1.959101 -2.344955 -1.768080 -1.849050 -2.301099
## 3        NA        NA        NA        NA        NA        NA        NA
## 4 -1.653482 -2.370281 -3.504604 -4.349718 -1.982695 -2.019580 -2.629028
## 5 -2.302817 -1.662490 -2.339535 -2.125483 -1.893921 -1.954046 -2.390214
## 6 -2.608547 -1.597473 -2.681772 -2.132743 46.419558 -2.373637 23.208520
##      UELAS5    UTELS5     UNETA5     WELAS5     WTELS5     WNETA5    UELAS6
## 1        NA        NA         NA         NA         NA         NA        NA
## 2 -1.0362222 -1.510746 -16.554679 -0.9088469 -1.1745405 -20.237057 -3.311418
## 3        NA        NA         NA         NA         NA         NA        NA
## 4 -1.2784392 -1.632153  -6.410297 -1.1897011 -1.3604212  -4.483955 -3.110704
## 5 -1.2181366 -1.322580  -8.163741 -0.8245403 -0.8422004  -9.189305 -3.172361
## 6 -0.8653559 -1.668280 -19.953247 -1.0482615 -1.3744977 -23.990647 -3.222093
##      UTELS6    UNETA6    WELAS6     WTELS6    WNETA6    UELAS7    UTELS7
## 1        NA        NA        NA         NA        NA        NA        NA
## 2 -3.599363 -4.021181 -3.243506 -3.285718 -3.652570 -2.104926 -2.300171
## 3        NA        NA        NA         NA        NA        NA        NA
## 4 -3.384633 -4.166335 -11.364074 -11.364075 -6.967854 -2.232569 -2.275863
## 5 -3.412003 -5.952976 -2.938399 -2.964999 -3.465985 -1.923470 -2.019700
## 6 -3.574882 -4.046712 -2.832281 -2.909105 -3.412164 -2.201518 -2.340621
##      UNETA7    WELAS7    WTELS7    WNETA7    UELAS8    UTELS8    UNETA8
## 1        NA        NA        NA        NA        NA        NA        NA
## 2 -2.443897 -1.994340 -2.004196 -2.209750 -1.880624 -2.012071 -2.816474
## 3        NA        NA        NA        NA        NA        NA        NA
## 4 -2.709499 -1.625794 -1.628830 -2.001179 -1.389703 -1.565598 -2.261307
```

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## 5 -2.302861 -2.094195 -2.108723 -2.401814 -1.517461 -1.613921 -2.451556
## 6 -2.539506 -2.005779 -2.052905 -2.394115 -1.616143 -1.797759 -2.330806
##        WELAS8    WTELS8    WNETA8    UELAS9    UTELS9    UNETA9    WELAS9
## 1         NA        NA        NA        NA        NA        NA        NA
## 2 -1.4738434 -1.5092290 -2.311890 -2.930605 -3.239092 -3.792275 -2.097772
## 3         NA        NA        NA        NA        NA        NA        NA
## 4 -0.7809370 -0.8938505 -1.363069 -3.285953 -3.961915 -4.963558 -1.690441
## 5 -0.7629456 -0.8202384 -1.289880 -2.342605 -3.030746 -3.275359 -1.620535
## 6 -0.9940056 -1.1426502 -1.536792 -3.031583 -3.772143 -3.959286 -1.874947
##        WTELS9    WNETA9   UELAS10   UTELS10   UNETA10   WELAS10   WTELS10
## 1         NA        NA        NA        NA        NA        NA        NA
## 2 -2.204007 -2.707618 -1.899609 -2.535477 -2.981219  2.472859 -2.118646
## 3         NA        NA        NA        NA        NA        NA        NA
## 4 -1.786081 -2.514964 -1.053076 -1.512390 -1.285160 -1.015708 -1.104385
## 5 -1.848406 -2.446244 -1.736643 -1.988724 -2.751938 -1.459104 -1.521467
## 6 -2.072709 -2.425673 -1.425104 -1.949029 -2.124857 -1.658179 -1.846107
##       WNETA10   UELAS11   UTELS11   UNETA11   WELAS11   WTELS11   WNETA11
## 1         NA        NA        NA        NA        NA        NA        NA
## 2  2.472859 -2.937827 -3.019744 -3.321280 -2.963489 -2.972839 -3.274794
## 3         NA        NA        NA        NA        NA        NA        NA
## 4 -1.400097 -3.444232 -3.552108 -3.705168 -3.463202 -3.481389 -3.621178
## 5 -2.045530 -3.583311 -3.757494 -3.925578 -3.627357 -3.712838 -3.820825
## 6 -2.574823 -3.353350 -3.519432 -3.599172 -3.501032 -3.541557 -3.664445
##       UELAS12   UTELS12   UNETA12   WELAS12   WTELS12   WNETA12   UELAS13
## 1         NA        NA        NA        NA        NA        NA        NA
## 2 -2.524870 -2.713981 -2.743338 -2.410273 -2.537375 -2.497374 -2.911866
## 3         NA        NA        NA        NA        NA        NA        NA
## 4 -2.765779 -2.871784 -3.075349 -2.544697 -2.656628 -2.761539 -4.267189
## 5 -2.624668 -2.833919 -2.831295 -2.133690 -2.529968 -2.265853 -3.420325
## 6 -3.147343 -3.242682 -3.536003 -3.065579 -3.118065 -3.430098 -3.282295
##       UTELS13   UNETA13   WELAS13   WTELS13   WNETA13   UELAS14   UTELS14
## 1         NA        NA        NA        NA        NA        NA        NA
## 2 -3.358862 -4.137065 -1.497646 -1.652962 -2.097344 -4.362597 -4.706281
## 3         NA        NA        NA        NA        NA        NA        NA
## 4 -4.973228 -5.128095 -1.405408 -1.588759 -1.835347 -4.632370 -5.676050
## 5 -4.141415 -4.925319 -1.811837 -2.269602 -2.629205 -5.052928 -5.980889
## 6 -4.101157 -4.975558 -1.375270 -1.517995 -1.884147 -4.367127 -5.416699
##       UNETA14   WELAS14   WTELS14   WNETA14   UELAS15   UTELS15   UNETA15
## 1         NA        NA        NA        NA        NA        NA        NA
## 2 -4.646660 -3.481910 -3.616637 -3.830678 -2.9811272 -3.117113 -3.989746
## 3         NA        NA        NA        NA        NA        NA        NA
## 4 -6.345849 -2.895967 -3.159753 -3.506386 -0.7238628 -2.085721 -1.448913
## 5 -6.971515 -3.824508 -4.101739 -4.821568 -1.6220542 -2.426473 -2.518838
## 6 -5.041030 -3.540794 -3.789781 -4.080399 -1.6987254 -2.518025 -2.815376
##       WELAS15   WTELS15   WNETA15   UELAS16   UTELS16      UNETA16   WELAS16
## 1         NA        NA        NA        NA        NA           NA        NA
## 2 -2.460761 -2.500540 -3.358164 -3.135551 -3.515092 -4.933879e+00 -3.099360
## 3         NA        NA        NA        NA        NA           NA        NA
## 4 -1.189027 -1.795257 -2.300130 -2.535600 -3.082270  2.878970e+10  7.335485
## 5 -2.019985 -2.370353 -3.015427 -3.300971 -3.705750 -6.198060e+00 -3.201617
## 6 -2.007735 -2.357953 -2.694768 -3.475774 -4.038785 -5.036723e+00 -3.540928
##       WTELS16       WNETA16   UELAS17   UTELS17   UNETA17   WELAS17   WTELS17
## 1         NA            NA        NA        NA        NA        NA        NA
## 2 -3.291899 -4.038132e+00 -2.424875 -2.445902 -2.608465 -2.273952 -2.274458
```

```
## 3         NA           NA        NA        NA        NA        NA        NA
## 4 -3.073443  8.590000e+13 -2.608634 -2.664109 -2.731085 -2.203450 -2.213478
## 5 -3.424312 -5.106037e+00 -2.795574 -2.910018 -2.990030 -2.413968 -2.497950
## 6 -3.741638 -4.526877e+00 -3.445888 -3.470685 -3.576533 -2.928736 -2.931583
##      WNETA17    UELAS18   UTELS18   UNETA18   WELAS18   WTELS18   WNETA18
## 1         NA         NA        NA        NA        NA        NA        NA
## 2 -2.331464  -3.476496 -3.526243 -3.588935 -3.087209 -3.097905 -3.130219
## 3         NA         NA        NA        NA        NA        NA        NA
## 4 -2.284649  -4.082328 -4.131074 -4.321989 -3.667694 -3.683352 -3.713431
## 5 -2.553606  -4.275382 -4.303549 -4.570624 -3.730317 -3.743220 -3.888331
## 6 -2.991489  -3.789791 -3.887088 -3.789058 -3.591238 -3.645655 -3.627660
##      UELAS19   UTELS19   UNETA19   WELAS19   WTELS19   WNETA19   UELAS20
## 1         NA        NA        NA        NA        NA        NA        NA
## 2 -2.234861 -2.529698 -2.702202 -2.207946 -2.255168 -2.606798 -1.039648
## 3         NA        NA        NA        NA        NA        NA        NA
## 4 -2.202925 -2.372631 -2.885801 -2.104746 -2.136734 -2.697674 -1.336693
## 5 -2.400041 -2.521509 -3.139408 -2.328117 -2.349933 -3.022966 -1.219188
## 6 -2.551745 -2.694425 -3.276258 -2.521208 -2.544914 -3.089462 -1.426954
##      UTELS20   UNETA20   WELAS20   WTELS20   WNETA20   UELAS21   UTELS21
## 1         NA        NA        NA        NA        NA        NA        NA
## 2 -1.300814 -1.202759 -1.000294 -1.078172 -1.145777 -2.467527 -3.001386
## 3         NA        NA        NA        NA        NA        NA        NA
## 4 -1.700806 -1.553815 -1.528892 -1.681729 -5.262222 -2.561010 -2.914409
## 5 -1.716023 -1.500921 22.407199 -1.191768 22.407199 -2.966910 -3.552122
## 6 -1.622078 -1.583470 -1.130194 -1.158398 -1.346781 -2.766444 -3.088871
##      UNETA21   WELAS21   WTELS21   WNETA21   UELAS22   UTELS22   UNETA22
## 1         NA        NA        NA        NA        NA        NA        NA
## 2 -2.898182 -2.543933 -2.607185 -3.087065 -2.771832 -2.836462 -3.203028
## 3         NA        NA        NA        NA        NA        NA        NA
## 4 -2.920175 -2.577842 -2.638241 -2.892121 -2.299843 -2.474487 -2.596967
## 5 -3.853060 -1.986901 -2.082670 -2.515710 -2.459412 -2.576269 -2.603538
## 6 -3.403445 -2.398437 -2.451914 -3.004825 -2.618570 -2.723040 -2.936094
##       WELAS22    WTELS22   WNETA22   UELAS23   UTELS23   UNETA23   WELAS23
## 1          NA         NA        NA        NA        NA        NA        NA
## 2   -2.130044  -2.152824 -2.260666 -2.553935 -3.093395 -2.709560 -2.563716
## 3          NA         NA        NA        NA        NA        NA        NA
## 4   -2.007636  -2.046466 -2.167058 -2.230326 -3.200370 -5.243920 -1.667185
## 5   -1.828212  -1.840071 -2.002614 -3.286972 -4.208538 -3.390066 -3.341220
## 6 -72.778667 -72.779272 -7.908484 -3.475987 -4.037364 -3.820515 -2.772333
##      WTELS23   WNETA23      NELAS1      NELAS2     NELAS3    NELAS4     NELAS5
## 1         NA        NA          NA          NA         NA        NA         NA
## 2 -2.989541 -2.586230  0.22019073 -0.20752148 -0.2952429 -1.346680 -0.7407575
## 3         NA        NA          NA          NA         NA        NA         NA
## 4 -2.606488 -2.121506 -0.22715762  0.06657446 -0.4546478 -1.319084 -0.5492236
## 5 -3.946506 -3.507987 -0.12395565 -0.42661184 -1.2166099 -1.986622 -1.3354955
## 6 -3.371210 -3.036846  0.04877609 -0.21688818 -0.4723322 -1.571876 -0.9643359
##      NELAS6     NELAS7      NELAS8     NELAS9    NELAS10    NELAS11    NELAS12
## 1        NA         NA          NA         NA         NA         NA         NA
## 2 -1.270718 -0.4669120  0.04051425 -0.7066955 -1.454597  0.1178855 -0.1215068
## 3        NA         NA          NA         NA         NA         NA         NA
## 4 -1.648280 -0.4736931 -0.28311938 -0.8177943 -1.499246  1.0336213 -0.3295682
## 5 -1.805891 -1.0492124 -0.98009168 -0.7536416 -1.856692 -0.3562631 -1.2619645
## 6 -1.475205 -0.6827592 -0.66983338 -0.7590043 -1.634541  0.6108307 -0.5672538
##      NELAS13    NELAS14    NELAS15    NELAS16     NELAS17    NELAS18    NEELAS1
```

```
## 1        NA        NA        NA        NA          NA        NA        NA
## 2 -2.848163 -0.5629646 -1.409878 -2.301364 -0.30952389 -0.4470375 0.1078285
## 3        NA        NA        NA        NA          NA        NA        NA
## 4 -2.942317 -0.5959334 -1.514486 -2.262482 -0.47355682 -0.3999070 0.1070178
## 5 -3.537732 -0.9665982 -2.089080 -2.376268 -1.15755138 -1.0271597 0.1094141
## 6 -3.045745 -0.7253331 -1.121652 -2.712378 -0.08114365 -0.5647115 0.1080981
##       NEELAS2    NEELAS3    NEELAS4   NEELAS5    NEELAS6   NEELAS7    NEELAS8
## 1          NA         NA         NA        NA         NA        NA         NA
## 2 0.08013213 0.05956918 0.08285528 0.1251665 0.07286859 0.0964827 0.08641107
## 3          NA         NA         NA        NA         NA        NA         NA
## 4 0.07501934 0.05873598 0.08138509 0.1233766 0.07184384 0.1060529 0.08652168
## 5 0.07344617 0.05896592 0.08120030 0.1211438 0.07179243 0.1039091 0.08864870
## 6 0.07530745 0.05933220 0.08561059 0.1215351 0.07099719 0.1067211 0.09491510
##      NEELAS9   NEELAS10  NEELAS11   NEELAS12   NEELAS13   NEELAS14  NEELAS15
## 1         NA         NA        NA         NA         NA         NA        NA
## 2 0.1449521 0.08751505 0.2289427 0.06588195 0.07183692 0.09706709 0.1174002
## 3         NA         NA        NA         NA         NA         NA        NA
## 4 0.1386538 0.09056390 0.2372675 0.06670879 0.07173720 0.09727189 0.1205063
## 5 0.1366943 0.08692660 0.2321184 0.06975906 0.06782203 0.10127444 0.1171894
## 6 0.1372374 0.08910600 0.2362395 0.06828493 0.07249779 0.09919005 0.1177263
##      NEELAS16   NEELAS17   NEELAS18    MELAS1     MELAS2     MELAS3    MELAS4
## 1          NA         NA         NA        NA         NA         NA        NA
## 2 0.10199525 0.1040674 0.11761423 -0.5722264 -0.8977455 -0.2229499 -1.074654
## 3          NA         NA         NA        NA         NA         NA        NA
## 4 0.09784107 0.1025626 0.12123875 -0.9238979 -0.5641226 -0.4382915 -1.085123
## 5 0.10553377 0.1011941 0.09151182 -0.7459529 -1.0200857 -1.0807981 -1.710242
## 6 0.09817859 0.1039657 0.12910442 -0.6431054 -0.9456581 -0.5239063 -1.214274
##       MELAS5     MELAS6      MELAS7     MELAS8     MELAS9    MELAS10   MELAS11
## 1         NA         NA          NA         NA         NA         NA        NA
## 2 -1.1659405 -0.9247925 -0.11149156 -0.5501612 -0.3961090 -1.150471 1.704400
## 3         NA         NA          NA         NA         NA         NA        NA
## 4 -0.9685821 -1.0938469  0.01256354 -0.7683471 -0.4495106 -1.371739 1.990591
## 5 -1.7956141 -1.1785621 -0.55427544 -1.0853129 -0.3039254 -1.621291 1.245430
## 6 -1.3995214 -0.9986511 -0.28470999 -0.9707039 -0.3186622 -1.492798 1.675960
##       MELAS12   MELAS13    MELAS14    MELAS15   MELAS16    MELAS17    MELAS18
## 1          NA        NA         NA         NA        NA         NA         NA
## 2 -0.5338255 -1.919018 -0.7379336 -0.9787131 -1.211325 -0.9924729 -0.6054320
## 3          NA        NA         NA         NA        NA         NA         NA
## 4 -0.5758192 -2.163830 -0.6580242 -1.1506687 -1.225305 -1.1955747 -0.4677629
## 5 -1.4995819 -2.622630 -1.1211092 -1.6970328 -1.259673 -1.7634225 -0.9475810
## 6 -0.6576173 -2.247073 -0.8857232 -0.8178248 -1.720948 -0.9949134 -0.7464607
##       MEELAS1    MEELAS2    MEELAS3    MEELAS4    MEELAS5    MEELAS6    MEELAS7
## 1          NA         NA         NA         NA         NA         NA         NA
## 2 0.05509315 0.04127767 0.03787961 0.05133036 0.07371413 0.03236984 0.06369925
## 3          NA         NA         NA         NA         NA         NA         NA
## 4 0.05414802 0.03899859 0.03705334 0.05137414 0.07259177 0.03200592 0.07247132
## 5 0.05513154 0.03807133 0.03672585 0.05094773 0.07113361 0.03189997 0.07248401
## 6 0.05396831 0.03921308 0.03766222 0.05378930 0.07241787 0.03131990 0.07309525
##       MEELAS8    MEELAS9   MEELAS10   MEELAS11   MEELAS12   MEELAS13   MEELAS14
## 1          NA         NA         NA         NA         NA         NA         NA
## 2 0.05815198 0.05212349 0.06268843 0.08460932 0.04615819 0.05315920 0.05390557
## 3          NA         NA         NA         NA         NA         NA         NA
## 4 0.05344815 0.04947803 0.06453025 0.09382700 0.04599948 0.05355360 0.05347473
## 5 0.05710728 0.04961284 0.06210887 0.09195903 0.04911960 0.05155966 0.05543061
```

```
## 6 0.06169539 0.04923536 0.06408232 0.09255073 0.04722880 0.05362473 0.05470002
##      MEELAS15   MEELAS16   MEELAS17   MEELAS18  I DOMVOL COMPCUB COMPNEAR COMPBY
## 1          NA         NA         NA         NA 11    NA       0        0       0
## 2  0.07147198 0.06033716 0.05782048 0.06058962  5   350       1        0       1
## 3          NA         NA         NA         NA  8   300       0        1       1
## 4  0.07434233 0.06062785 0.05715523 0.06468321  5   550       0        0       0
## 5  0.07144105 0.06365792 0.05594943 0.05273351  3   600       0        0       0
## 6  0.07208917 0.06084677 0.05875453 0.06416269  6   450       0        0       0
##    COMPFAR DRTIME1 DRTIME2  DRTIME3 DRTIME4 DRTIME5     DRVOL1     DRVOL2
## 1        0      NA      NA       NA      NA      NA         NA         NA
## 2        0    5.49   6.390 6.746667   7.135   7.412 0.02857143 0.01428571
## 3        0    4.75   5.645 6.223333   6.600   6.966 1.16666667 0.83333333
## 4        0    4.20   4.760 5.380000   6.480   7.164 0.31818182 0.45454545
## 5        0    7.11   7.370 7.520000   7.595   7.756 1.50000000 0.85416667
## 6        0    6.64   6.795 7.003333   7.160   7.270         NA         NA
##        DRVOL3    DRVOL4    DRVOL5    DRWVOL1   DRWVOL2   DRWVOL3   DRWVOL4
## 1          NA        NA        NA         NA        NA        NA        NA
## 2  0.03809524 0.4571429 0.5085714 0.02857143        NA        NA        NA
## 3  0.72222222 0.7916667 0.6333333 1.16666667 0.7804842 0.6696126 0.7663510
## 4  0.53030303 0.5568182 0.6272727 0.31818182 0.4705882 0.5572265 0.5870861
## 5  0.63888889 0.6875000 0.5500000 1.50000000 0.8313829 0.6154144 0.6715081
## 6  0.18518519 0.1666667 0.1333333         NA        NA        NA        NA
##      DRWVOL5 SSTRDIST   SSTRVOL   CPDIST1   CPDIST2   CPDIST3   CPDIST4  CPDIST5
## 1         NA       NA        NA        NA        NA        NA        NA       NA
## 2         NA 2.110122 1.1428571 0.3323486 1.0943157 1.4639713 1.7024318 1.927280
## 3         NA 2.373200 1.0000000 0.1148886 0.4699944 0.6895943 0.9326966 1.104470
## 4  0.6760824 3.801998 0.6818182 0.3118192 0.5216096 0.7877185 1.2011124 1.600573
## 5         NA 2.636333 1.5000000 2.2268264 2.3161475 2.4632220 2.6991209 2.905384
## 6         NA 1.103279 0.6666667 1.3599199 1.4019712 1.5705396 1.7124441 1.820474
##        CPVOL1     CPVOL2     CPVOL3    CPVOL4    CPVOL5    CPWVOL1    CPWVOL2
## 1          NA         NA         NA        NA        NA         NA         NA
## 2  0.02857143 0.05714286 0.04761905 0.1785714 0.2857143 0.02857143 0.07703702
## 3  1.16666667 0.83333333 0.72222222 0.7916667 0.8000000 1.16666667 0.58148227
## 4  0.31818182 0.45454545 0.53030303 0.5568182 0.6272727 0.31818182 0.50939064
## 5  0.20833333 0.20833333 0.54166667 0.6145833 0.6083333 0.20833333 0.20833333
## 6  0.55555556 0.33333333 0.33333333 0.3333333 0.4222222 0.55555556 0.32666791
##      CPWVOL3   CPWVOL4   CPWVOL5 FARTHEST   DTDIST    DTVOL     DTWVOL DTCOMP
## 1         NA        NA        NA       10       NA       NA         NA     10
## 2  0.05272338 0.2368912 0.3769266        4 1.702432 0.7142857 0.10489197     4
## 3  0.53702294 0.7432715 0.7724895        7 1.367609 4.8333333 0.50487837     7
## 4  0.60569973 0.6212810 0.7363068        4 1.201112 2.2272727 0.46358542     4
## 5  0.58147214 0.6609466 0.6410159        2 2.316147 0.4166667 0.08994822     2
## 6  0.32936666 0.3306049 0.4412683        5 1.820474 2.1111111 0.23192978     5
##    PRICLOW PRICMED PRICHIGH
## 1        0       1        0
## 2        0       0        1
## 3        0       1        0
## 4        0       1        0
## 5        0       1        0
## 6        0       1        0
```

```r
demo <- na.omit(demo)
```

This next set of data files are the result of aggregating the data to massage the original data into providing

more information. This might provide inspiration.

Beer_agg.csv is the result of aggregating across the beer data.

```r
beern <- read.csv("Beer_agg.csv",header=T,strip.white=TRUE)
head(beern)
```

```
##   STORE WEEK N.Obs Sum Mean Median Minimum Maximum     Date Price_Tier
## 1     2   91     1   0    0      0       0       0  6/06/91       High
## 2     2   92     1   0    0      0       0       0 13/06/91       High
## 3     2   93     1   0    0      0       0       0 20/06/91       High
## 4     2   94     1   0    0      0       0       0 27/06/91       High
## 5     2   95     1  39   39     39      39      39  4/07/91       High
## 6     2   96     1   0    0      0       0       0 11/07/91       High
##   Public_holiday
## 1             No
## 2             No
## 3             No
## 4             No
## 5            Yes
## 6             No
```

```r
beern <- na.omit(beern)
```

```r
# STORE_ZONE_SUM_PT.csv is the result of aggregating across the data to capture
# store information across zones and price tiers.  This data needed some extra cleaning,
# hence the extra lines of code below
SZSP <- read.csv("STORE_ZONE_SUM_PT.csv",header=T,strip.white=TRUE)
head(SZSP)
```

```
##   X STORE ZONE Sum Price_Tier
## 1 0     2    1   0       High
## 2 1     2    1   0       High
## 3 2     2    1   0       High
## 4 3     2    1   0       High
## 5 4     2    1  39       High
## 6 5     2    1   0       High
```

```r
SZSP <- SZSP[,-1]
SZSP <- na.omit(SZSP)
SZSP$ZONE <- factor(SZSP$ZONE)
```

```r
# check the data - there's a weird entry that is blank
table(SZSP$Price_Tier)
```

```
##
## CubFighter       High        Low     Medium
##       2502       6380       2727       9558
```

```r
# Clean the blank entry
SZSP <- SZSP[SZSP$Price_Tier != "",]
SZSP$Price_Tier <- factor(SZSP$Price_Tier)
```

```r
# check the data again - it should be fine now :)
table(SZSP$Price_Tier)    # and it is!
```

```
## 
## CubFighter       High        Low     Medium
##       2502       6380       2727       9558
```

```r
# Now do the same for this summary of beer data
df <- read.csv("Beer_MPPPTB.csv",header=T,strip.white=TRUE)
df <- df[,-1]
table(df$Price_Tier)
```

```
## 
##            CubFighter       High        Low     Medium
##         8           9         24          9         39
```

```r
df <- df[df$Price_Tier != "",]
df$Price_Tier <- factor(df$Price_Tier)
table(df$Price_Tier)
```

```
## 
## CubFighter       High        Low     Medium
##          9         24          9         39
```

```r
# And do the same one more time for this file :)
# CHE_Summary.csv is the result of aggregating across the cheese data
ch <- read.csv("CHE_Summary.csv",header=T,strip.white=TRUE,stringsAsFactors=F)
head(ch)
```

```
##   X index STORE WEEK Count      Mean Median Minimum Maximum Profit_Count
## 1 0     0     2    1  3164 13.46383      7       0     331      6201.75
## 2 1     1     2    2  3103 13.20426      8       0     267      6277.66
## 3 2     2     2    3  2972 12.64681      7       0     229      6171.57
## 4 3     3     2    4  2820 12.00000      7       0     214      6113.11
## 5 4     4     2    5  3258 13.86383      7       0     378      6428.73
## 6 5     5     2    6  2994 12.74043      7       0     236      6798.12
##   Profit_Mean Profit_Median Profit_Minimum Profit_Maximum Price_Count
## 1    26.39043         31.21              0          47.32      406.54
## 2    26.71345         30.65              0          48.60      415.75
## 3    26.26200         30.24              0          48.60      422.75
## 4    26.01323         29.82              0          48.60      418.36
## 5    27.35630         31.05              0          48.42      433.89
## 6    28.92817         32.98              0          49.61      449.82
##   Price_Mean Price_Median Price_Minimum Price_Maximum       Date Price_Tier
## 1   1.729957         1.81             0          8.19  6/06/1991       High
## 2   1.769149         1.81             0          8.19 13/06/1991       High
## 3   1.798936         1.83             0          8.19 20/06/1991       High
## 4   1.780255         1.85             0          8.19 27/06/1991       High
## 5   1.846340         1.99             0          9.29  4/07/1991       High
## 6   1.914128         2.03             0          9.29 11/07/1991       High
##   Public_holiday
```

```
## 1            No
## 2            No
## 3            No
## 4            No
## 5           Yes
## 6            No
```

```
ch <- ch[,c(-1,-2,-22)]
ch <- na.omit(ch)
table(ch$Price_Tier)
```

```
##
##           CubFighter       High        Low     Medium
##     11638       2502       6380       2727      10164
```

```
ch <- ch[ch$Price_Tier != "",]
ch$Price_Tier <- factor(ch$Price_Tier)
table(ch$Price_Tier)
```

```
##
## CubFighter       High        Low     Medium
##       2502       6380       2727      10164
```

```
# We also did some specific beer brand analysis
bm <- read.csv("Bud-vs-Miller-dates-GOOD.csv",header=TRUE)
head(bm)
```

```
##         BRAND Price_Tier WEEK Sum       DATE
## 1 Budweiser CubFighter   91  21  6/06/1991
## 2 Budweiser CubFighter   92  21 06/13/1991
## 3 Budweiser CubFighter   93  20 06/20/1991
## 4 Budweiser CubFighter   94  19 06/27/1991
## 5 Budweiser CubFighter   95  21  7/04/1991
## 6 Budweiser CubFighter   96  30  7/11/1991
```

Dotplots

- Dotplot of cheese data - isolate a week of interest

```
idx <- which(ch$"WEEK"==9)
length(idx)
```

```
## [1] 56
```

```
dplot_df <- ch[idx,c(1,8)]
```

- cheese stores

14

```
STORES <- c(5,9,12,14,32,40,49,52,56,62,70,71,78,80,81,84,86,93,97,100,102,104,113,115,116, 118, 119, 1
dx <- match(STORES,dplot_df$STORE)

idx <- which(dplot_df$Profit_Count!=0)
dplot_df <- dplot_df[idx,]
```

- isolate a store of interest

```
dplot_df$fact <- ifelse(dplot_df$STORE==94,'Y','N')
head(dplot_df)
```

```
##      STORE Profit_Count fact
## 9        2      5878.05    N
## 402      5      5963.54    N
## 795      8      6101.25    N
## 1188     9      5917.05    N
## 1581    12      6472.68    N
## 1974    14      6493.03    N
```

- Plot Total Profit/Store in Week 9 and highlight store 94
- you will need to re-size the graph to see the labels

```
ggplot(dplot_df,aes(x=factor(STORE),fill=factor(fact),y=Profit_Count)) +
        geom_dotplot(binaxis = "y", stackdir = "center") +
        xlab("Store") + ylab("Total Profit ($USD)") +
        theme(legend.position="none",axis.title=element_text(size=14), axis.text=element_text(size=12))
        scale_fill_manual(values=c("#8595E1","#E07B91")) +
        theme(text = element_text(size=20),axis.text.x = element_text(angle=90, hjust=1))
```
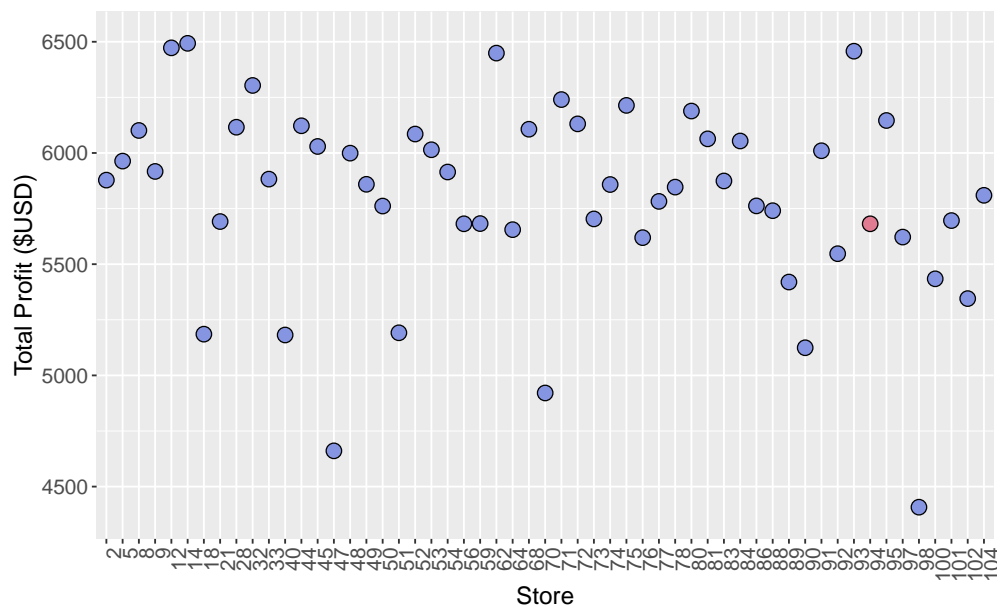
Boutplots (Original, Notched, Violin)

- Boxplot of Sum

```
ggplot(SZSP, aes(x=ZONE, y=Sum, fill=ZONE)) +
      geom_boxplot() +
      theme(legend.position="none") +
      ylab("Sales Volume")
```
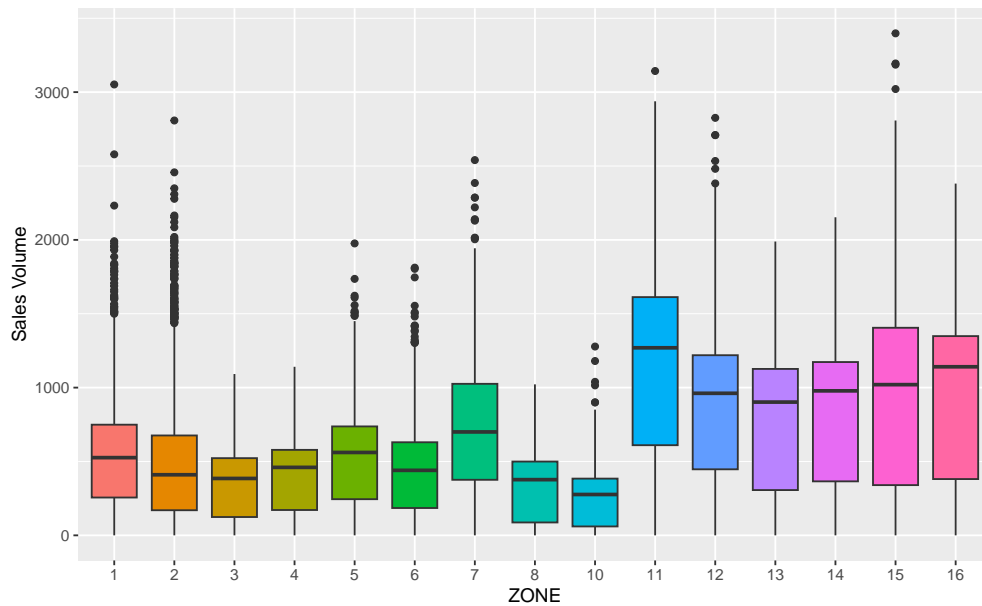

- Boxplot Notched (False/True)

```
ggplot(SZSP, aes(x=ZONE, y=Sum, fill=ZONE)) +
      geom_boxplot(outlier.colour="black", outlier.shape=16,outlier.size=2, notch=FALSE) +
      theme(axis.title=element_text(size=14),axis.text=element_text(size=12),legend.position="none") +
      ylab("Beer Sales (Volume)\n") + xlab("\nZone")
```
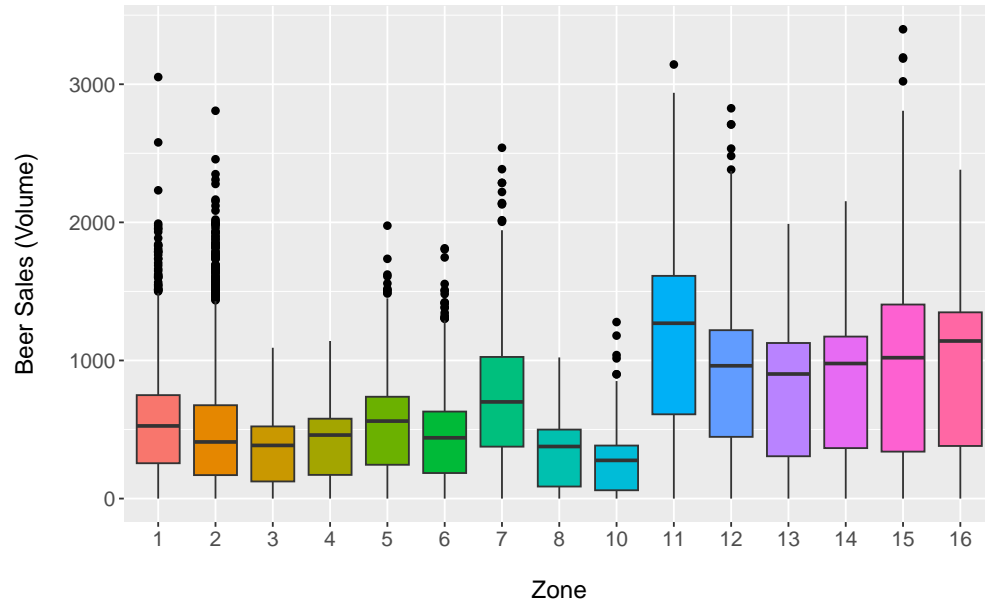
Violin Plot

```
ggplot(SZSP, aes(x=ZONE, y=Sum, fill=ZONE)) +
       geom_violin() +
       theme(text = element_text(size=14),legend.position="none") +
       ylab("Beer Sales (Volume)\n") + xlab("\nZone")
```
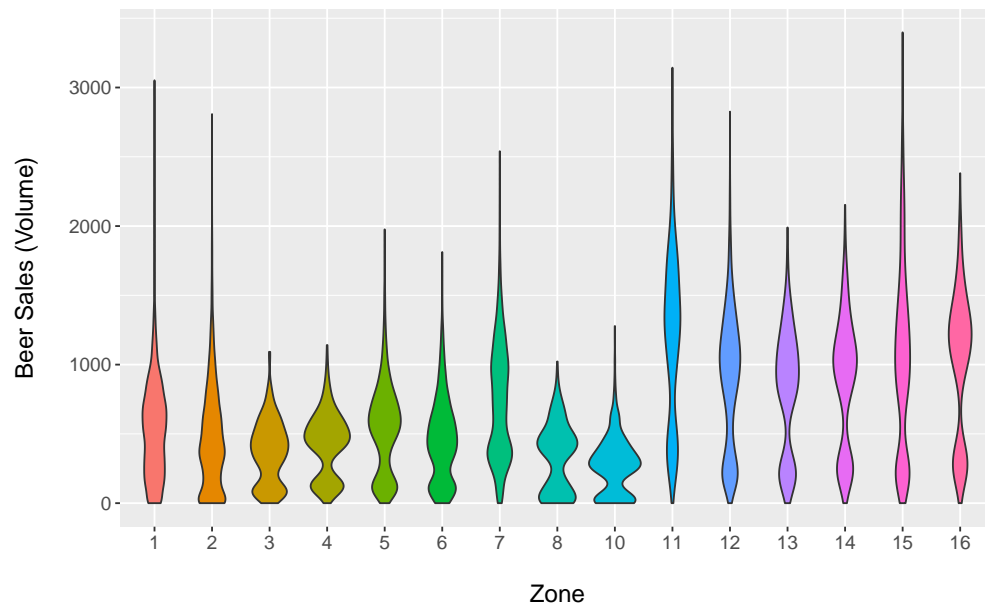
Boxplots by group

```
ggplot(aes(y = Sum, x = BRAND, fill = Price_Tier), data = bm) +
    geom_boxplot() +
    theme(panel.background = element_rect(fill ="white"), panel.grid.major = element_line(colour = "#
        axis.title=element_text(size=14),axis.text=element_text(size=12)) +
    ylab("Number of units sold per week\n") + xlab("\nBrand") +
    scale_fill_manual(values=c("#ffffff","#cce8f8", "#000000","#E69F00"))
```
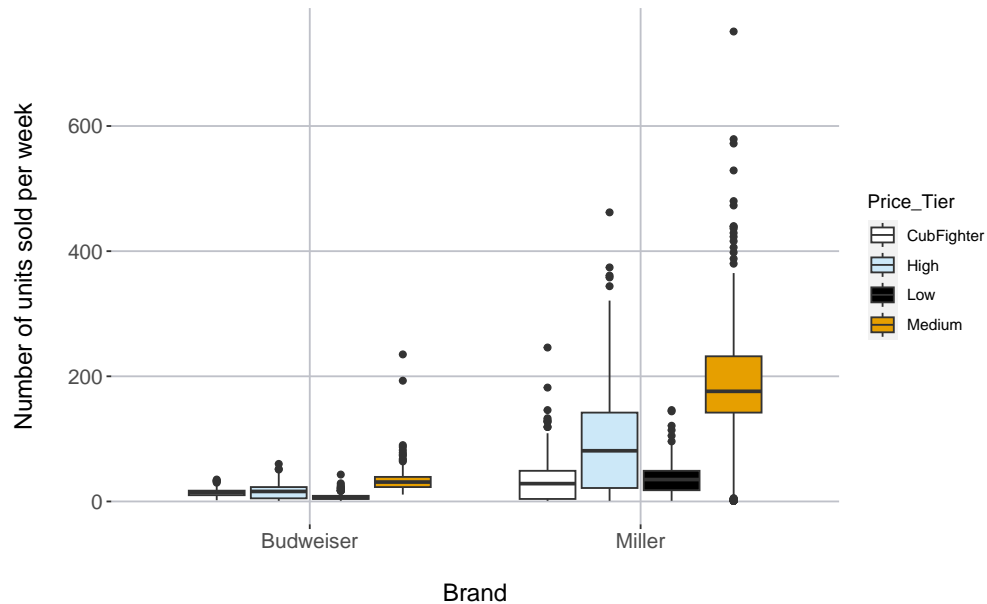

Boxplot Sales by Zone, filled by Price Tier

```
ggplot(SZSP, aes(ZONE, Sum, fill = factor(Price_Tier))) +
    scale_y_continuous(breaks=seq(0,3500,by=500)) +
    theme(axis.text.x = element_text(size=14,hjust = 1,vjust = 1)) +
    xlab("Zone") + ylab("Beer Sales (Volume)") +
    guides(fill=FALSE) +
    geom_boxplot() + facet_grid(.~Price_Tier, scales="free")
```

```
## Warning: The '<scale>' argument of 'guides()' cannot be 'FALSE'. Use "none" instead as
## of ggplot2 3.3.4.
## This warning is displayed once every 8 hours.
## Call 'lifecycle::last_lifecycle_warnings()' to see where this warning was
## generated.
```
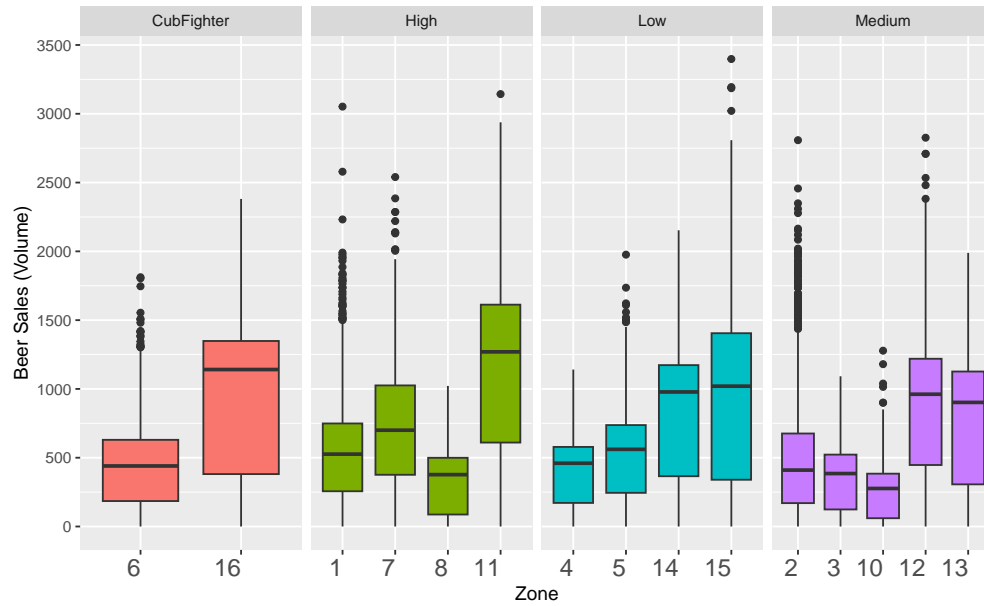
Boxplot Sales by Store, filled by Price Tier

```
ggplot(beern, aes(factor(STORE), Sum, fill = factor(Price_Tier))) +
    scale_y_continuous(breaks=seq(0,3500,by=500)) +
    theme(axis.text.x = element_text(size  = 6,angle = 90,hjust = 1,vjust = 1)) +
    xlab("Store") + ylab("Beer Sales (Volume)") +
    guides(fill=FALSE) +
    geom_boxplot() +
    facet_grid(.~Price_Tier, scales="free")
```
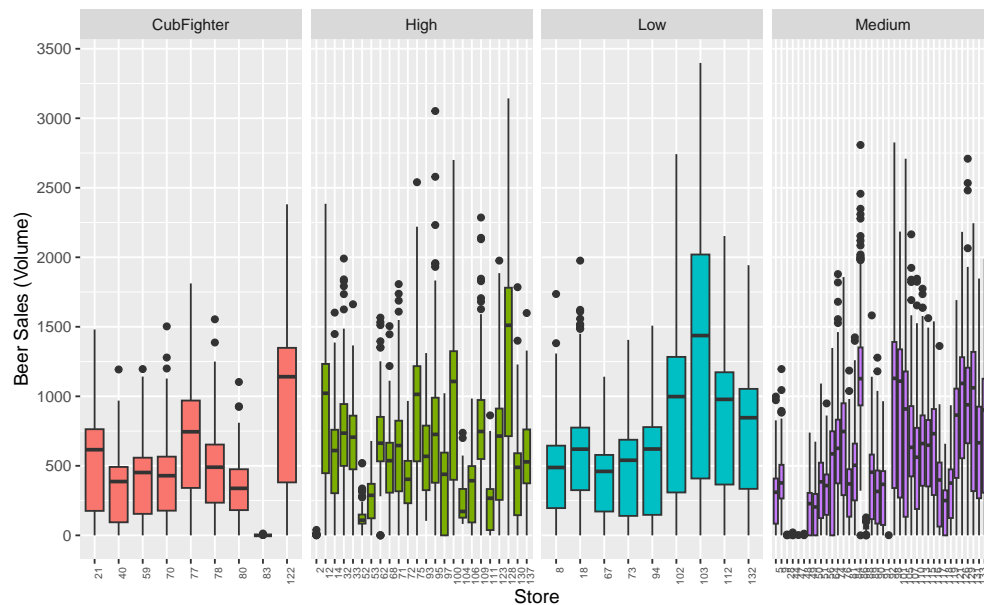
Rainfall Plot

```
ggplot(beern, aes(factor(STORE), Sum)) +
        theme(axis.text.x = element_text(angle = 90, hjust = 1)) +
        xlab("Store") + ylab("Beer Sales (Volume)\n")  +
        geom_point(color='#149EF3') +
        theme(text = element_text(size=14),legend.position="none")
```
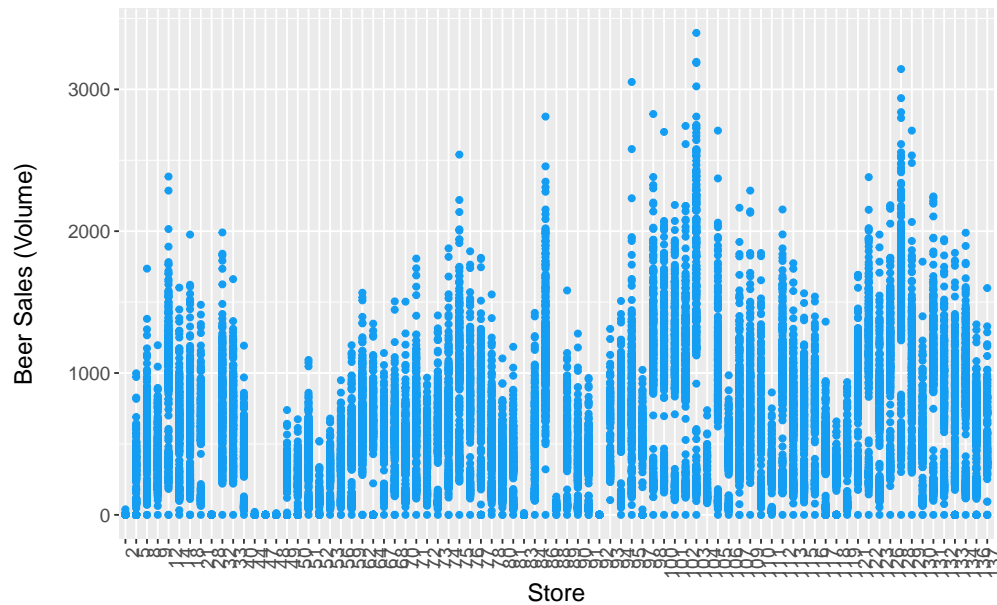


```
ggplot(SZSP, aes(ZONE, Sum)) +
     theme(axis.text.x = element_text(hjust = 1)) +
     xlab("Zone") + ylab("Beer Sales (Volume)\n")  +
     geom_point(color='#DD3497') +
     theme(text = element_text(size=14),legend.position="none")
```
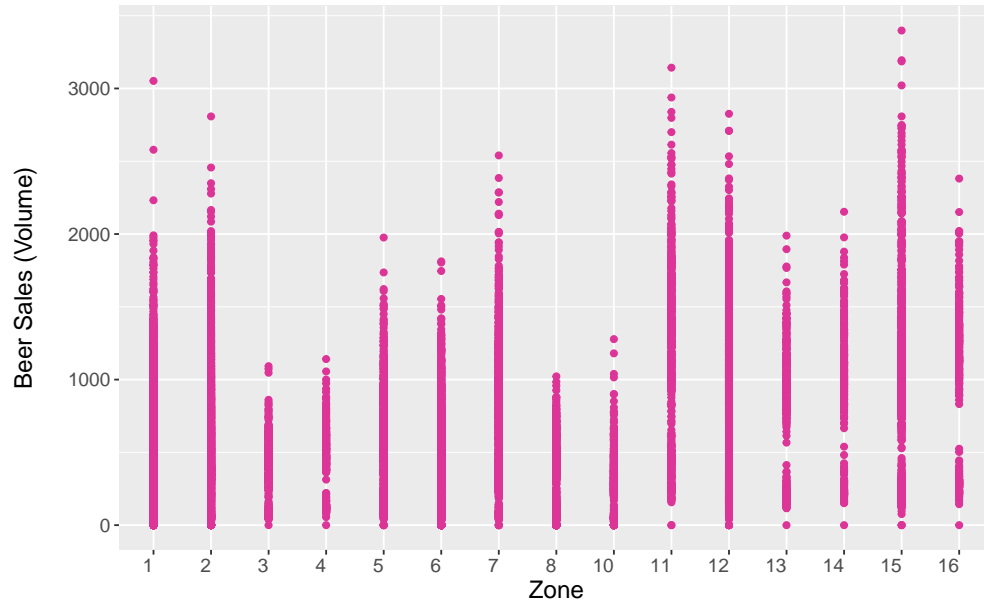
Bubble & Swarm Plots

Bubble Plots

```
df1 <- df
df2 <- as.data.frame(sapply(df,gsub,pattern="High",replacement="H"))
df2 <- as.data.frame(sapply(df2,gsub,pattern="Low",replacement="L"))
df2 <- as.data.frame(sapply(df2,gsub,pattern="Medium",replacement="M"))
df2 <- as.data.frame(sapply(df2,gsub,pattern="CubFighter",replacement="C"))

df1$Price_Tier <- df2$Price_Tier
```

Profit by zone

```
radius <- sqrt(df1$MOVE/ pi )
        symbols(df1$PRICE, df1$PROFIT, circles=radius, inches=0.35, fg="white", bg="#E7298A", xlab="P:
        text(df1$PRICE, df1$PROFIT, df1$Price_Tier, cex=0.5)
```
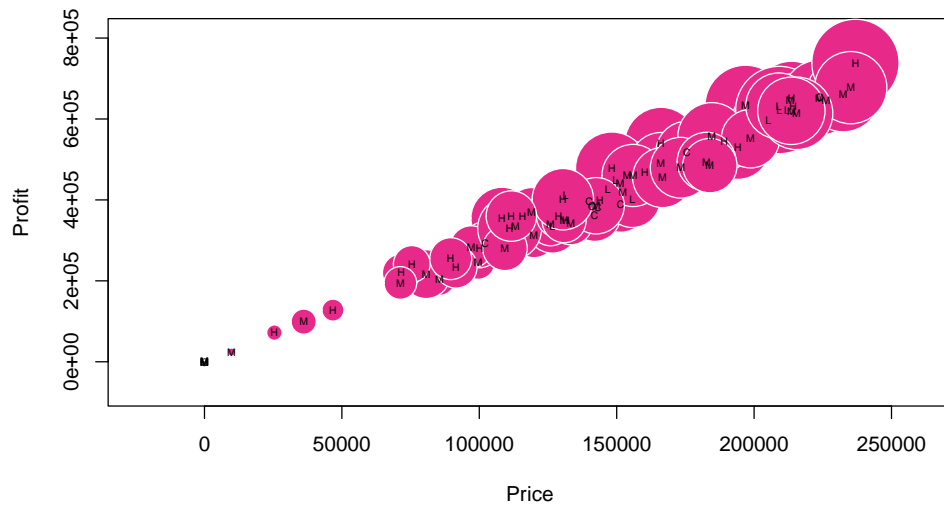
```
cbbPalette <- c("#000000", "#56B4E9", "#D55E00",  "#CC79A7")
pt <- as.factor(df$Price_Tier)
ggplot(df,aes(x=df$PRICE, y=df$PROFIT, group=pt,shape=pt,size=radius,colour=df$Price_Tier)) +
            scale_shape_manual(values=c(15,16,17,18)) +
            scale_colour_manual(values=cbbPalette) +
            theme(panel.background = element_rect(fill ="white"), panel.grid.major = element_line(col
            geom_point( alpha=0.8) +
            guides(colour = FALSE, shape = guide_legend(order = 1)) +
            labs(shape = "Price Tier",size="Scale") +
              scale_x_continuous("Beer Price (volume)") +
              scale_y_continuous("Beer Profit (volume)")
```
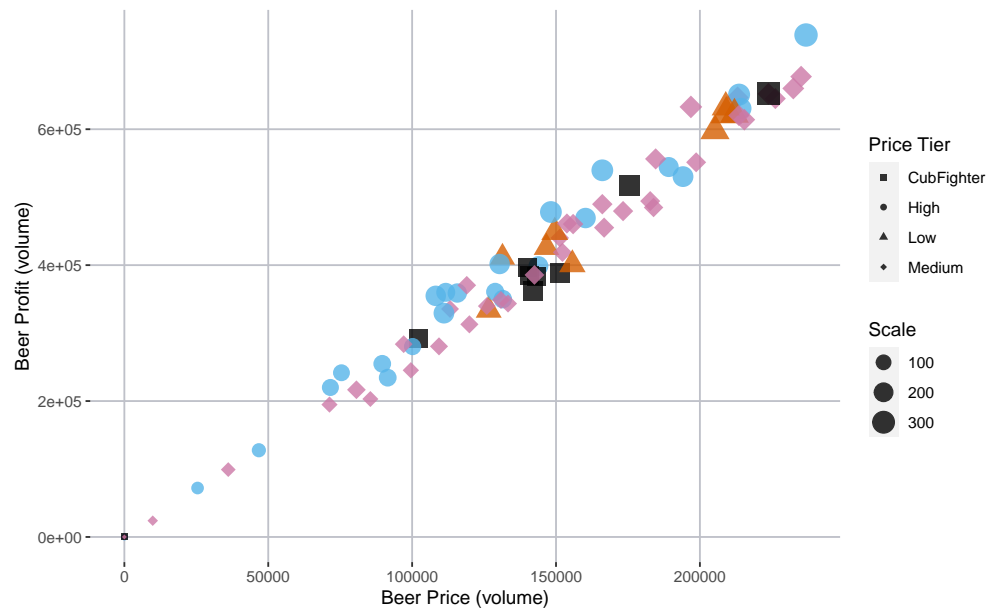

```

```
ggplot(df, aes(df$PRICE, y=df$PROFIT, colour=df$Price_Tier, size=radius)) +
    geom_point(alpha=0.8) +
    scale_colour_brewer(palette="Spectral", type="qual",name="Price Tier") +
    guides(colour = guide_legend(override.aes = list(alpha = 1))) +
    scale_x_continuous("Cheese Price") +
    scale_y_continuous("Cheese Profit (gross margin)")
```



## Swarm Plots

print(unique(df1$Price_Tier))

```
# Load Required Libraries
pacman::p_load(ggbeeswarm)
```

```
# ggplot2 Swarm Plot
ggplot(SZSP, aes(x = Price_Tier, y = Sum, color = Price_Tier)) +
  geom_beeswarm() +
  scale_color_manual(values = c("#32AAB5", "#60C4BC", "#8CD9C0", "#B3E7C5")) +
  labs(x = "Price Tier", y = "Profit") +
  theme_minimal()
```

```
head(SZSP)
```

```
##    STORE ZONE Sum Price_Tier
## 1     2    1   0       High
## 2     2    1   0       High
## 3     2    1   0       High
## 4     2    1   0       High
## 5     2    1  39       High
## 6     2    1   0       High
```

```
head(df1)
```

```
##    STORE    MOVE      PRICE      PROFIT Price_Tier SALE       BEER    SINGLE
## 1     2      95      38.43       21.22          H    B     201.83 0.2976210
## 2     5   61844   99557.02   245272.05          M    B  491579.21 0.2645853
## 3     8  143566  146682.90   425928.76          L    S 2321011.11 0.2503721
## 4     9  123770  151302.72   440028.62          M    B 2053018.45 0.2300052
## 5    12  287698  166089.13   539546.26          H    B 3453734.42 0.4516373
## 6    14  175071  143887.31   398704.43          H    B 2400247.50 0.2233518
```

```r
# ggplot2 Swarm Plot
ggplot(df1, aes(x = Price_Tier, y = PRICE, color = Price_Tier)) +
  geom_beeswarm() +
  scale_color_manual(values = c("#32AAB5", "#60C4BC", "#8CD9C0", "#B3E7C5")) +
  labs(x = "Price Tier", y = "Profit") +
  theme_minimal()
```
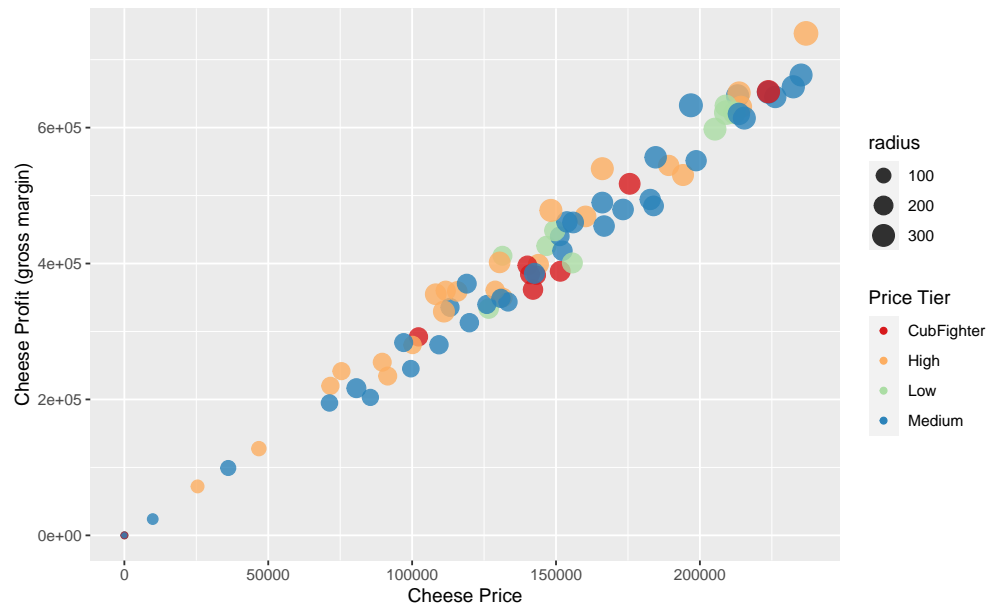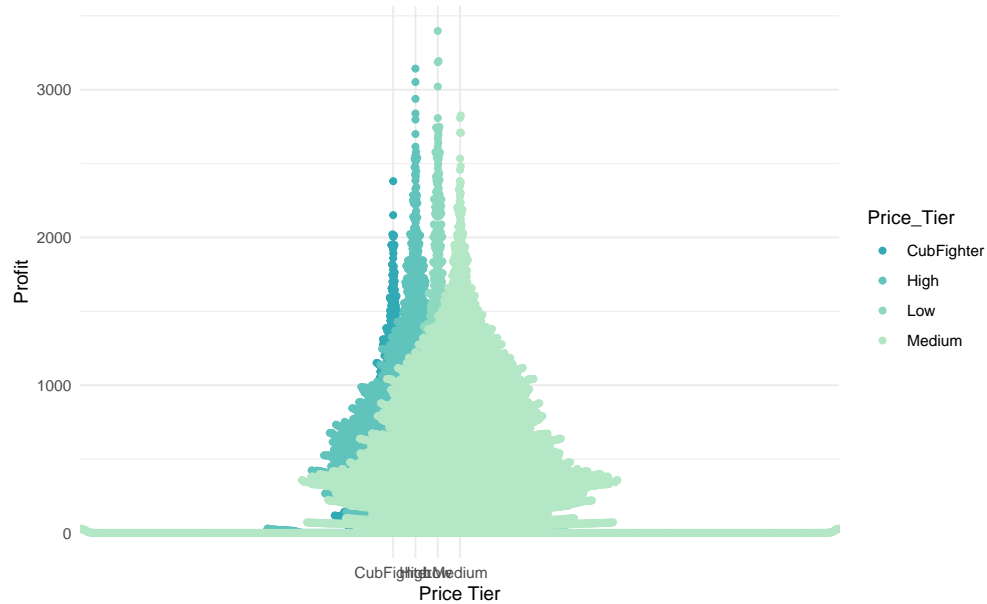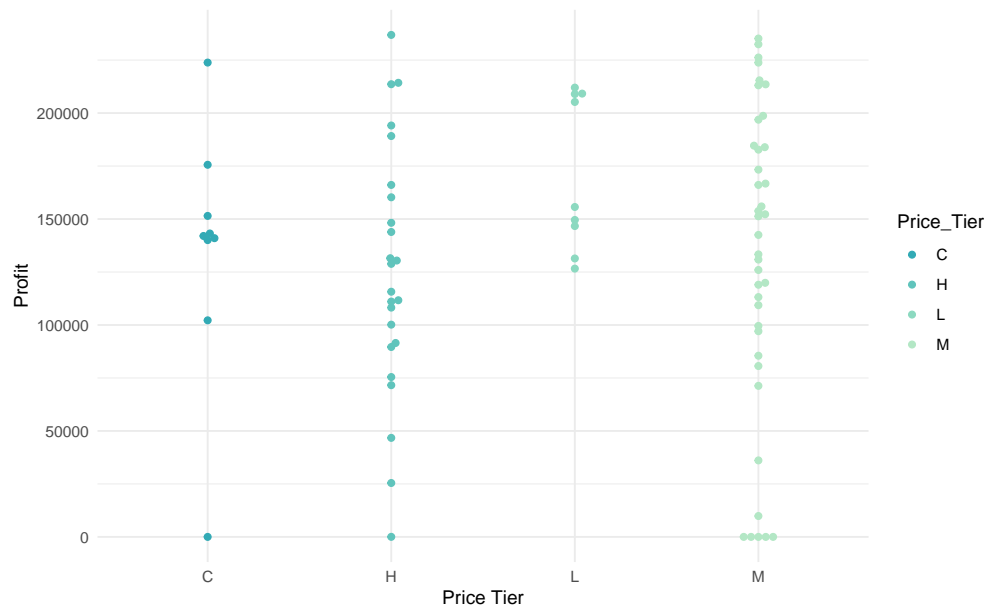
100% Stacked Bar

cheese data

Count by Price Tier

```
p <- ggplot(aes(x=WEEK, weight=Count, fill=Price_Tier), data=ch)
p + geom_bar(position='fill') + scale_y_continuous(labels = percent) +
    scale_fill_brewer(palette="PuOr") +
    labs(x="X Label", y="Y Label", title="An Example Stacked Column Percentage Chart")
```

```
## Warning: Removed 4 rows containing missing values (`geom_bar()`).
```

An Example Stacked Column Percentage Chart
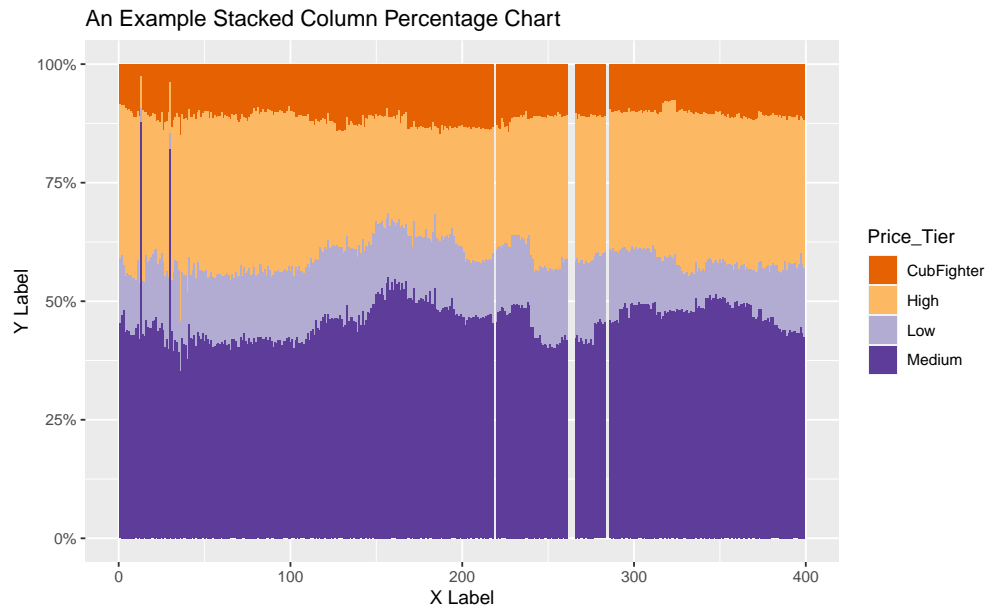
Average Price by Price Tier

```
p <- ggplot(aes(x=WEEK, weight=Price_Mean, fill=Price_Tier), data=ch)
p + geom_bar(position='fill') + scale_y_continuous(labels = percent_format()) +
    scale_fill_brewer(palette="Spectral") + theme(axis.title=element_text(size=14),axis.text=element_t
    labs(x="Weeks of the Year", y="Average Beer Price ($USD)")
```

```
## Warning: Removed 4 rows containing missing values ('geom_bar()').
```
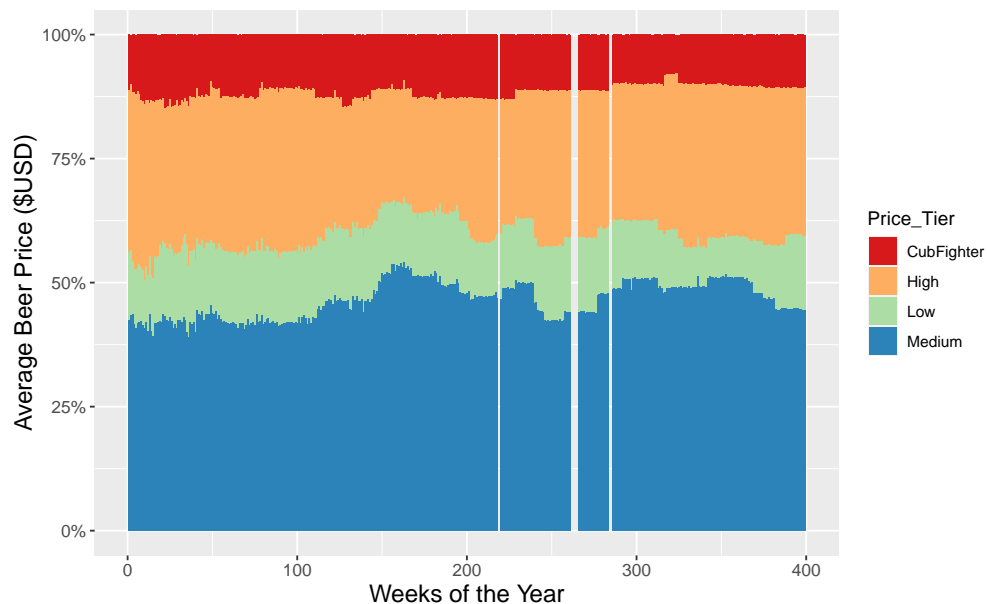
Calendar Heat Map

```
head(ch)
```

```
##    STORE WEEK Count     Mean Median Minimum Maximum Profit_Count Profit_Mean
## 1     2    1  3164 13.46383      7       0     331      6201.75    26.39043
## 2     2    2  3103 13.20426      8       0     267      6277.66    26.71345
## 3     2    3  2972 12.64681      7       0     229      6171.57    26.26200
## 4     2    4  2820 12.00000      7       0     214      6113.11    26.01323
## 5     2    5  3258 13.86383      7       0     378      6428.73    27.35630
## 6     2    6  2994 12.74043      7       0     236      6798.12    28.92817
##    Profit_Median Profit_Minimum Profit_Maximum Price_Count Price_Mean
## 1          31.21              0          47.32      406.54   1.729957
## 2          30.65              0          48.60      415.75   1.769149
## 3          30.24              0          48.60      422.75   1.798936
## 4          29.82              0          48.60      418.36   1.780255
## 5          31.05              0          48.42      433.89   1.846340
## 6          32.98              0          49.61      449.82   1.914128
##    Price_Median Price_Minimum Price_Maximum       Date Price_Tier
## 1          1.81             0          8.19  6/06/1991       High
## 2          1.81             0          8.19 13/06/1991       High
## 3          1.83             0          8.19 20/06/1991       High
## 4          1.85             0          8.19 27/06/1991       High
## 5          1.99             0          9.29  4/07/1991       High
## 6          2.03             0          9.29 11/07/1991       High
```

```r
# Load Required Libraries
pacman::p_load(lubridate)
```

```r
# Save Original Data
safe <- ch
pal <- colorRampPalette(c("#010184", "#b0f0b0"))

# Remove invalid Dates
ch <- ch %>% filter(!is.na(dmy(Date)))
```

```r
# Apply transformations
ch <- ch %>%
  mutate(
    Date = dmy(Date),
    year = year(Date),
    month = month(Date),
    monthf = factor(month, levels = 1:12, labels = month.abb, ordered = TRUE),
    weekday = wday(Date),
    weekdayf = factor(weekday, levels = 1:7, labels = c('Mon', 'Tue', 'Wed', 'Thu', 'Fri', 'Sat', 'Sun')
  ) %>%
  group_by(year, month) %>%
  mutate(
    week = week(Date),
    monthweek = 1 + week - min(week)
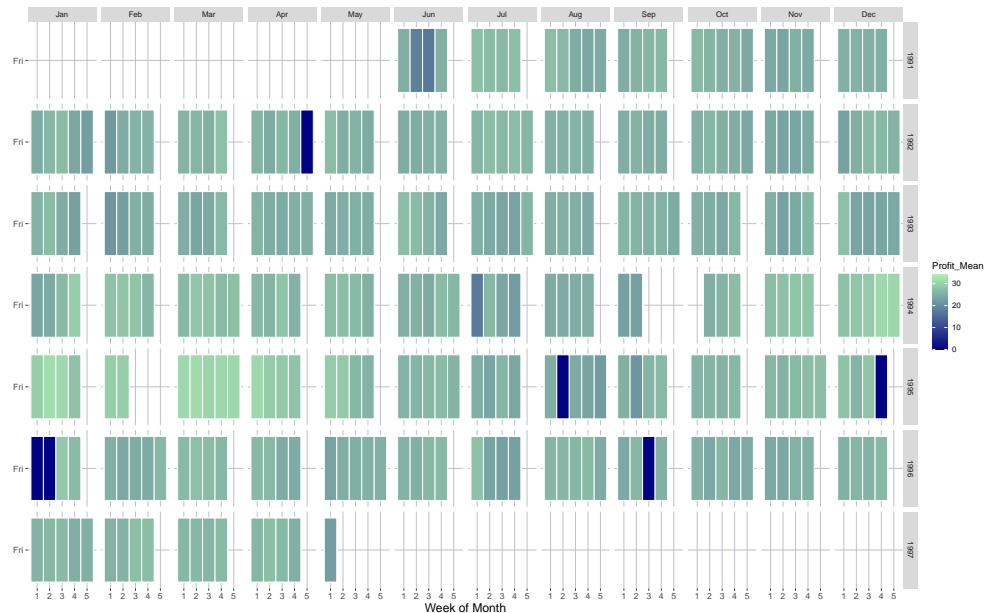  )
```

```r
# Calculate the week of the month
ch <- ch %>% mutate(day = day(Date), monthweek = ceiling(day / 7))

# Remove NAs
ch <- ch %>% filter(!is.na(monthweek) & !is.na(weekdayf) & !is.na(Profit_Mean))



# Plot
ggplot(ch, aes(x = monthweek, y = weekdayf, fill = Profit_Mean)) +
  geom_tile(color = "white") +
  facet_grid(year ~ monthf) +
  scale_fill_gradientn(colors = pal(10)) +
  theme(
    panel.background = element_rect(fill = "white"),
    panel.grid.major = element_line(color = "#BFC1C9"),
    axis.title = element_text(size = 14),
    axis.text = element_text(size = 10)
  ) +
  xlab("Week of Month") +
  ylab("")
```



```r
# Restore Original Data
ch <- safe
```