Spatial

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2015

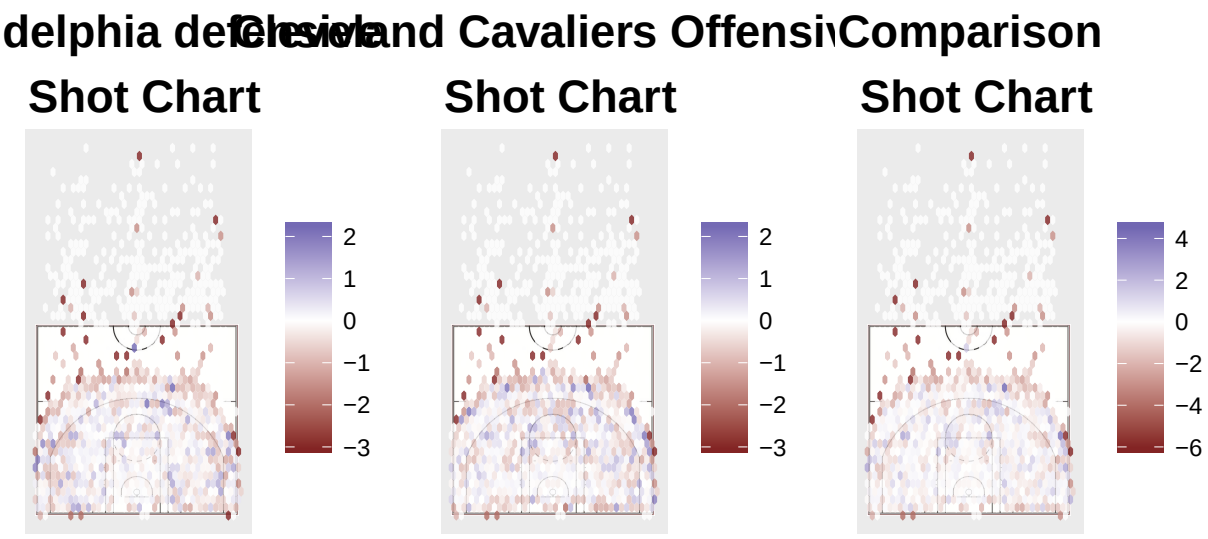
2016

2014

```
ShotComparison <- function(OffTeam, DefTown, SeasondataOff, SeasonDataDef, nbins = 40) {
  #Filter the offensive data of the Offensive Team
  Off <- filter(SeasondataOff, TEAM_NAME == OffTeam)
  #Filter the Deffensive data of the Defensive team
  deff <- SeasonDataDef[names(SeasonDataDef) == DefTown][[1]]
  #Get the maximum and minumum values for x and y
  xbnds <- range(c(SeasondataOff$LOC_X, deff$LOC_X))
  ybnds <- range(c(SeasondataOff$LOC_Y, deff$LOC_Y))
  #Make hexbin dataframes out of the teams
  makeHexData <- function(df) {
    h <- hexbin(df$LOC_X, df$LOC_Y, nbins, xbnds = xbnds, ybnds = ybnds, IDs = TRUE)
    data.frame(hcell2xy(h),
               PPS = tapply(as.numeric(as.character(df$SHOT_MADE_FLAG))*ifelse(tolower(df$SHOT_TYPE) ==
               ST = tapply(df$SHOT_MADE_FLAG, h@cID, FUN = function(z) length(z)),
               cid = h@cell)
  }
  ##Total NBA data
  Totalhex <- makeHexData(SeasondataOff)
  ##Defensive team data
  Defhex <- makeHexData(deff)
  ##Offensive team data
  Offhex <- makeHexData(Off)
  #Merge offensive and deffensive data with total data by Cell id
  DeffbyCell <- merge(Totalhex, Defhex, by = "cid", all = T)
  OffByCell <- merge(Totalhex, Offhex, by = "cid", all = T)
  ##  when calculating the difference empty cells should count as 0
  DeffbyCell$PPS.x[is.na(DeffbyCell$PPS.x)] <- 0
  DeffbyCell$PPS.y[is.na(DeffbyCell$PPS.y)] <- 0
  DeffbyCell$ST.y[is.na(DeffbyCell$ST.y)] <- 0

  OffByCell$PPS.x[is.na(OffByCell$PPS.x)] <- 0
  OffByCell$PPS.y[is.na(OffByCell$PPS.y)] <- 0
  OffByCell$ST.y[is.na(OffByCell$ST.y)] <- 0
  #  make a "difference" data.frame
  DiffDeff <- data.frame(x = ifelse(is.na(DeffbyCell$x.x), DeffbyCell$x.y, DeffbyCell$x.x),
                         y = ifelse(is.na(DeffbyCell$y.x), DeffbyCell$y.y, DeffbyCell$y.x),
                         PPS= DeffbyCell$PPS.y - DeffbyCell$PPS.x,
```

```
                      cid= DeffbyCell$cid,
                      ST = DeffbyCell$ST.y)

DiffOff <- data.frame(x = ifelse(is.na(OffByCell$x.x), OffByCell$x.y, OffByCell$x.x),
                      y = ifelse(is.na(OffByCell$y.x), OffByCell$y.y, OffByCell$y.x),
                      PPS= OffByCell$PPS.y - OffByCell$PPS.x,
                      ST = OffByCell$ST.x,
                      cid = OffByCell$cid,
                      ST = OffByCell$ST.y)
#make team comparisons
Comparison <- merge(DiffOff, DiffDeff, by = "cid", all = T)
Comparison <- Comparison[,-c(6:7)]
Comparison$Diff <- c(Comparison$PPS.x + Comparison$PPS.y)


PPSAA <- weighted.mean((Comparison$PPS.x + Comparison$PPS.y), Comparison$ST.x)

OFF <- ggplot(DiffOff)  +
  annotation_custom(court, -250, 250, -52, 418) +
  geom_hex(aes(x = x, y = y, fill = PPS),
           stat = "identity", alpha = 0.8) +
  guides(alpha = FALSE, size = FALSE) +
  coord_fixed()  +theme(line = element_blank(),
                        axis.title.x = element_blank(),
                        axis.title.y = element_blank(),
                        axis.text.x = element_blank(),
                        axis.text.y = element_blank(),
                        legend.title = element_blank(),
                        plot.title = element_text(size = 17, lineheight = 1.2, face = "bold")) + ggti
DEF <- ggplot(DiffDeff)  +
  annotation_custom(court, -250, 250, -52, 418) +
  geom_hex(aes(x = x, y = y, fill = PPS),
           stat = "identity", alpha = 0.8) +
  guides(alpha = FALSE, size = FALSE) +

  coord_fixed()  +theme(line = element_blank(),
                        axis.title.x = element_blank(),
                        axis.title.y = element_blank(),
                        axis.text.x = element_blank(),
                        axis.text.y = element_blank(),
                        legend.title = element_blank(),
                        plot.title = element_text(size = 17, lineheight = 1.2, face = "bold")) + ggti

COMP <- ggplot(Comparison)  +
  annotation_custom(court, -250, 250, -52, 418) +
  geom_hex(aes(x = x.x, y = y.x, fill = Diff),
           stat = "identity", alpha = 0.8) +
  guides(alpha = FALSE, size = FALSE) +

  coord_fixed()  +theme(line = element_blank(),
                        axis.title.x = element_blank(),
                        axis.title.y = element_blank(),
                        axis.text.x = element_blank(),
```

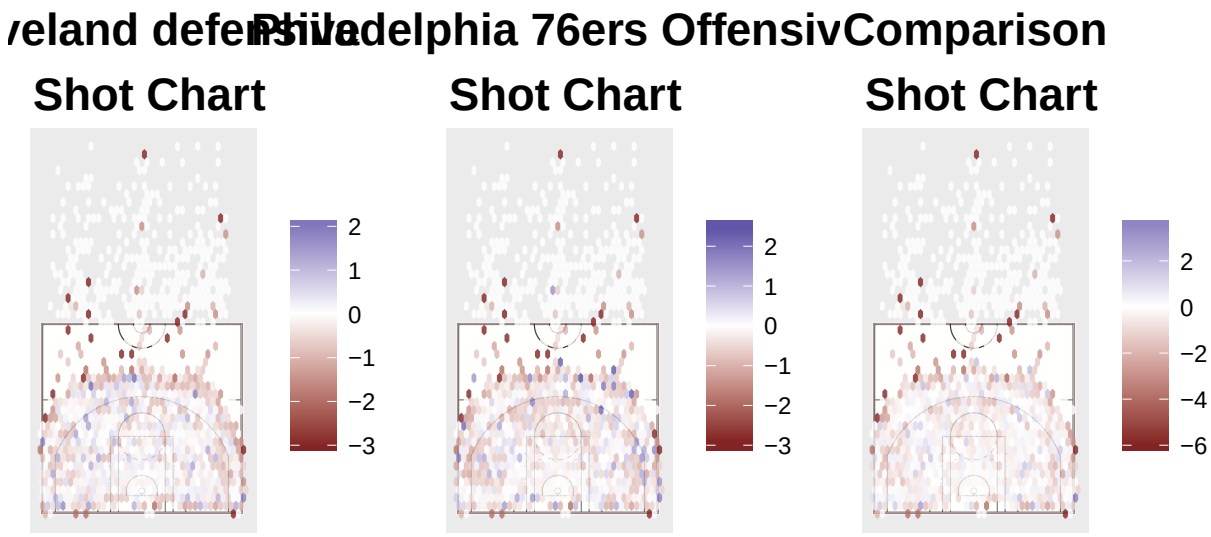
```
                          axis.text.y = element_blank(),
                          legend.title = element_blank(),
                          plot.title = element_text(size = 17, lineheight = 1.2, face = "bold")) + ggti

  grid.arrange(DEF, OFF, COMP, ncol=3)

  return(list(Off = DiffOff, deff = DiffDeff, Comparison = Comparison, Total = Totalhex, PPSAA = PPSAA))
}

Com1 <- ShotComparison(OffTeam = "Cleveland Cavaliers", DefTown = "Philadelphia", SeasondataOff = shotDa
```




```
Com1$PPSAA
```

```
## [1] 0.02043016
```

```
Com2 <- ShotComparison(OffTeam = "Philadelphia 76ers", DefTown = "Cleveland", SeasondataOff = shotDataT
```




```
Com2$PPSAA
```

```
## [1] -0.1028978
```

```
ShotComparison <- function(OffTeam, DefTown, SeasondataOff, SeasonDataDef, nbins = 30) {
  #Filter the offensive data of the Offensive Team
  Off <- filter(SeasondataOff, TEAM_NAME == OffTeam)
  #Filter the Deffensive data of the Defensive team
  deff <- SeasonDataDef[names(SeasonDataDef) == DefTown][[1]]
  #Get the maximum and minumum values for x and y
  xbnds <- range(c(SeasondataOff$LOC_X, deff$LOC_X))
  ybnds <- range(c(SeasondataOff$LOC_Y, deff$LOC_Y))
  #Make hexbin dataframes out of the teams
  makeHexData <- function(df) {
    h <- hexbin(df$LOC_X, df$LOC_Y, nbins, xbnds = xbnds, ybnds = ybnds, IDs = TRUE)
    data.frame(hcell2xy(h),
               PPS = tapply(as.numeric(as.character(df$SHOT_MADE_FLAG))*ifelse(tolower(df$SHOT_TYPE) ==
               ST = tapply(df$SHOT_MADE_FLAG, h@cID, FUN = function(z) length(z)),
               cid = h@cell)
  }
  ##Total NBA data
  Totalhex <- makeHexData(SeasondataOff)
  ##Defensive team data
  Defhex <- makeHexData(deff)
  ##Offensive team data
```

```r
Offhex <- makeHexData(Off)
#Merge offensive and deffensive data with total data by Cell id
DeffbyCell <- merge(Totalhex, Defhex, by = "cid", all = T)
OffByCell <- merge(Totalhex, Offhex, by = "cid", all = T)
##  when calculating the difference empty cells should count as 0
DeffbyCell$PPS.x[is.na(DeffbyCell$PPS.x)] <- 0
DeffbyCell$PPS.y[is.na(DeffbyCell$PPS.y)] <- 0
DeffbyCell$ST.y[is.na(DeffbyCell$ST.y)] <- 0

OffByCell$PPS.x[is.na(OffByCell$PPS.x)] <- 0
OffByCell$PPS.y[is.na(OffByCell$PPS.y)] <- 0
OffByCell$ST.y[is.na(OffByCell$ST.y)] <- 0
#  make a "difference" data.frame
DiffDeff <- data.frame(x = ifelse(is.na(DeffbyCell$x.x), DeffbyCell$x.y, DeffbyCell$x.x),
                       y = ifelse(is.na(DeffbyCell$y.x), DeffbyCell$y.y, DeffbyCell$y.x),
                       PPS= DeffbyCell$PPS.y - DeffbyCell$PPS.x,
                       cid= DeffbyCell$cid,
                       ST = DeffbyCell$ST.y)

DiffOff <- data.frame(x = ifelse(is.na(OffByCell$x.x), OffByCell$x.y, OffByCell$x.x),
                       y = ifelse(is.na(OffByCell$y.x), OffByCell$y.y, OffByCell$y.x),
                       PPS= OffByCell$PPS.y - OffByCell$PPS.x,
                       ST = OffByCell$ST.x,
                       cid = OffByCell$cid,
                       ST = OffByCell$ST.y)
#make team comparisons
Comparison <- merge(DiffOff, DiffDeff, by = "cid", all = T)
Comparison <- Comparison[,-c(6:7)]
Comparison$Diff <- c(Comparison$PPS.x + Comparison$PPS.y)


PPSAA <- weighted.mean((Comparison$PPS.x + Comparison$PPS.y), Comparison$ST.x)
print(PPSAA)
# OFF <- ggplot(DiffOff)  +
#   annotation_custom(court, -250, 250, -52, 418) +
#   geom_hex(aes(x = x, y = y, fill = PPS),
#            stat = "identity", alpha = 0.8) +
#   guides(alpha = FALSE, size = FALSE) +
#   coord_fixed()  +theme(line = element_blank(),
#                         axis.title.x = element_blank(),
#                         axis.title.y = element_blank(),
#                         axis.text.x = element_blank(),
#                         axis.text.y = element_blank(),
#                         legend.title = element_blank(),
#                         plot.title = element_text(size = 17, lineheight = 1.2, face = "bold")) + gg
# DEF <- ggplot(DiffDeff)  +
#   annotation_custom(court, -250, 250, -52, 418) +
#   geom_hex(aes(x = x, y = y, fill = PPS),
#            stat = "identity", alpha = 0.8) +
#   guides(alpha = FALSE, size = FALSE) +
#
#   coord_fixed()  +theme(line = element_blank(),
#                         axis.title.x = element_blank(),
```

```
  #                         axis.title.y = element_blank(),
  #                         axis.text.x = element_blank(),
  #                         axis.text.y = element_blank(),
  #                         legend.title = element_blank(),
  #                         plot.title = element_text(size = 17, lineheight = 1.2, face = "bold")) + gg
  #
  # COMP <- ggplot(Comparison)  +
  #   annotation_custom(court, -250, 250, -52, 418) +
  #   geom_hex(aes(x = x.x, y = y.x, fill = Diff),
  #            stat = "identity", alpha = 0.8) +
  #   guides(alpha = FALSE, size = FALSE) +
  #
  #   coord_fixed()  +theme(line = element_blank(),
  #                         axis.title.x = element_blank(),
  #                         axis.title.y = element_blank(),
  #                         axis.text.x = element_blank(),
  #                         axis.text.y = element_blank(),
  #                         legend.title = element_blank(),
  #                         plot.title = element_text(size = 17, lineheight = 1.2, face = "bold")) + gg
  #
  # grid.arrange(DEF, OFF, COMP, ncol=3)

  return(PPSAA)
}


Offensive_teams <- as.character(unique(shotDataTotal2016$TEAM_NAME))

defenseve_names <- names(shotDatafDef2016)
df2016 <- data.frame(matrix(ncol = 30, nrow = 30))
colnames(df2016) <- as.character(unique(shotDataTotal2016$TEAM_NAME))
rownames(df2016) <- names(shotDatafDef2016)

system.time(for (i in 1:length(Offensive_teams)) {
  Offensive_team <- Offensive_teams[i]
  for (j in 1:length(defenseve_names)){
    df2016[j,i] <- ShotComparison(OffTeam = Offensive_team, DefTown =                    defenseve_
  }
})
```

```
## [1] -0.1155454
## [1] -0.08707377
## [1] -0.0830189
## [1] -0.01384599
## [1] -0.08412699
## [1] -0.05694221
## [1] -0.03634887
## [1] -0.09020081
## [1] -0.04160005
## [1] -0.0870888
## [1] -0.03884313
## [1] -0.08610983
## [1] -0.08418332
```

```
## [1] -0.05034676
## [1] -0.01471371
## [1] -0.08905573
## [1] -0.04785826
## [1] -0.08751748
## [1] -0.03115664
## [1] -0.02559498
## [1] -0.05279838
## [1] -0.009853816
## [1] -0.1022051
## [1] -0.1088658
## [1] -0.07024175
## [1] -0.07485516
## [1] -0.05301926
## [1] -0.03974702
## [1] -0.07151634
## [1] -0.08415645
## [1] -0.06973204
## [1] -0.04126043
## [1] -0.03720556
## [1] 0.03196734
## [1] -0.03831365
## [1] -0.01112888
## [1] 0.009464468
## [1] -0.04438748
## [1] 0.004213292
## [1] -0.04127546
## [1] 0.006970204
## [1] -0.04029649
## [1] -0.03836998
## [1] -0.004533422
## [1] 0.03109963
## [1] -0.04324239
## [1] -0.002044926
## [1] -0.04170414
## [1] 0.0146567
## [1] 0.02021836
## [1] -0.006985046
## [1] 0.03595952
## [1] -0.05639175
## [1] -0.06305243
## [1] -0.02442842
## [1] -0.02904183
## [1] -0.007205921
## [1] 0.006066315
## [1] -0.02570301
## [1] -0.03834312
## [1] -0.07673236
## [1] -0.04826075
## [1] -0.04420588
## [1] 0.02496703
## [1] -0.04531397
## [1] -0.01812919
## [1] 0.002464152
```

```
## [1] -0.05138779
## [1] -0.002787025
## [1] -0.04827578
## [1] -3.01121e-05
## [1] -0.04729681
## [1] -0.0453703
## [1] -0.01153374
## [1] 0.02409931
## [1] -0.05024271
## [1] -0.009045242
## [1] -0.04870446
## [1] 0.007656383
## [1] 0.01321804
## [1] -0.01398536
## [1] 0.0289592
## [1] -0.06339207
## [1] -0.07005274
## [1] -0.03142873
## [1] -0.03604214
## [1] -0.01420624
## [1] -0.000934001
## [1] -0.03270332
## [1] -0.04534343
## [1] -0.04250202
## [1] -0.01403041
## [1] -0.009975545
## [1] 0.05919736
## [1] -0.01108364
## [1] 0.01610114
## [1] 0.03669449
## [1] -0.01715746
## [1] 0.03144331
## [1] -0.01404544
## [1] 0.03420022
## [1] -0.01306647
## [1] -0.01113996
## [1] 0.0226966
## [1] 0.05832964
## [1] -0.01601238
## [1] 0.02518509
## [1] -0.01447412
## [1] 0.04188672
## [1] 0.04744837
## [1] 0.02024497
## [1] 0.06318954
## [1] -0.02916174
## [1] -0.03582241
## [1] 0.002801601
## [1] -0.001811809
## [1] 0.0200241
## [1] 0.03329633
## [1] 0.00152701
## [1] -0.0111131
## [1] -0.08122795
```

```
## [1] -0.05275633
## [1] -0.04870147
## [1] 0.02047144
## [1] -0.04980956
## [1] -0.02262478
## [1] -0.002031436
## [1] -0.05588338
## [1] -0.007282612
## [1] -0.05277136
## [1] -0.0045257
## [1] -0.05179239
## [1] -0.04986589
## [1] -0.01602933
## [1] 0.01960372
## [1] -0.0547383
## [1] -0.01354083
## [1] -0.05320005
## [1] 0.003160796
## [1] 0.008722454
## [1] -0.01848095
## [1] 0.02446362
## [1] -0.06788766
## [1] -0.07454833
## [1] -0.03592432
## [1] -0.04053773
## [1] -0.01870182
## [1] -0.005429589
## [1] -0.03719891
## [1] -0.04983902
## [1] 0.00994497
## [1] 0.03841658
## [1] 0.04247145
## [1] 0.1116444
## [1] 0.04136336
## [1] 0.06854813
## [1] 0.08914148
## [1] 0.03528954
## [1] 0.0838903
## [1] 0.03840155
## [1] 0.08664722
## [1] 0.03938052
## [1] 0.04130703
## [1] 0.07514359
## [1] 0.1107766
## [1] 0.03643462
## [1] 0.07763209
## [1] 0.03797287
## [1] 0.09433371
## [1] 0.09989537
## [1] 0.07269197
## [1] 0.1156365
## [1] 0.02328526
## [1] 0.01662459
## [1] 0.0552486
```

```
## [1] 0.05063519
## [1] 0.07247109
## [1] 0.08574333
## [1] 0.053974
## [1] 0.04133389
## [1] -0.05452651
## [1] -0.0260549
## [1] -0.02200003
## [1] 0.04717287
## [1] -0.02310812
## [1] 0.004076654
## [1] 0.02467
## [1] -0.02918194
## [1] 0.01941882
## [1] -0.02606993
## [1] 0.02217574
## [1] -0.02509096
## [1] -0.02316445
## [1] 0.01067211
## [1] 0.04630516
## [1] -0.02803686
## [1] 0.01316061
## [1] -0.02649861
## [1] 0.02986223
## [1] 0.03542389
## [1] 0.008220486
## [1] 0.05116505
## [1] -0.04118622
## [1] -0.04784689
## [1] -0.009222886
## [1] -0.01383629
## [1] 0.00799961
## [1] 0.02127185
## [1] -0.01049748
## [1] -0.02313759
## [1] -0.04901355
## [1] -0.02054194
## [1] -0.01648707
## [1] 0.05268583
## [1] -0.01759517
## [1] 0.009589611
## [1] 0.03018296
## [1] -0.02366899
## [1] 0.02493178
## [1] -0.02055697
## [1] 0.02768869
## [1] -0.019578
## [1] -0.01765149
## [1] 0.01618507
## [1] 0.05181811
## [1] -0.0225239
## [1] 0.01867356
## [1] -0.02098565
## [1] 0.03537519
```

```
## [1] 0.04093685
## [1] 0.01373344
## [1] 0.05667801
## [1] -0.03567327
## [1] -0.04233394
## [1] -0.003709929
## [1] -0.008323338
## [1] 0.01351257
## [1] 0.0267848
## [1] -0.004984519
## [1] -0.01762463
## [1] -0.1231036
## [1] -0.09463202
## [1] -0.09057715
## [1] -0.02140425
## [1] -0.09168524
## [1] -0.06450047
## [1] -0.04390712
## [1] -0.09775906
## [1] -0.0491583
## [1] -0.09464705
## [1] -0.04640138
## [1] -0.09366808
## [1] -0.09174157
## [1] -0.05790501
## [1] -0.02227196
## [1] -0.09661398
## [1] -0.05541651
## [1] -0.09507573
## [1] -0.03871489
## [1] -0.03315323
## [1] -0.06035663
## [1] -0.01741207
## [1] -0.1097633
## [1] -0.116424
## [1] -0.07780001
## [1] -0.08241342
## [1] -0.06057751
## [1] -0.04730527
## [1] -0.0790746
## [1] -0.09171471
## [1] -0.1081082
## [1] -0.07963662
## [1] -0.07558175
## [1] -0.006408848
## [1] -0.07668984
## [1] -0.04950507
## [1] -0.02891172
## [1] -0.08276367
## [1] -0.0341629
## [1] -0.07965165
## [1] -0.03140599
## [1] -0.07867268
## [1] -0.07674617
```

```
## [1] -0.04290961
## [1] -0.007276566
## [1] -0.08161858
## [1] -0.04042112
## [1] -0.08008033
## [1] -0.02371949
## [1] -0.01815783
## [1] -0.04536124
## [1] -0.002416671
## [1] -0.09476795
## [1] -0.1014286
## [1] -0.06280461
## [1] -0.06741802
## [1] -0.04558211
## [1] -0.03230988
## [1] -0.0640792
## [1] -0.07671931
## [1] -0.05540715
## [1] -0.02693554
## [1] -0.02288067
## [1] 0.04629223
## [1] -0.02398876
## [1] 0.003196014
## [1] 0.02378936
## [1] -0.03006258
## [1] 0.01853818
## [1] -0.02695057
## [1] 0.0212951
## [1] -0.0259716
## [1] -0.02404509
## [1] 0.009791469
## [1] 0.04542452
## [1] -0.0289175
## [1] 0.01227997
## [1] -0.02737925
## [1] 0.02898159
## [1] 0.03454325
## [1] 0.007339846
## [1] 0.05028441
## [1] -0.04206686
## [1] -0.04872753
## [1] -0.01010353
## [1] -0.01471693
## [1] 0.00711897
## [1] 0.02039121
## [1] -0.01137812
## [1] -0.02401823
## [1] -0.0588809
## [1] -0.03040928
## [1] -0.02635442
## [1] 0.04281849
## [1] -0.02746251
## [1] -0.0002777308
## [1] 0.02031561
```

```
## [1] -0.03353633
## [1] 0.01506444
## [1] -0.03042431
## [1] 0.01782135
## [1] -0.02944534
## [1] -0.02751884
## [1] 0.006317724
## [1] 0.04195077
## [1] -0.03239125
## [1] 0.008806221
## [1] -0.03085299
## [1] 0.02550785
## [1] 0.0310695
## [1] 0.003866101
## [1] 0.04681067
## [1] -0.04554061
## [1] -0.05220128
## [1] -0.01357727
## [1] -0.01819068
## [1] 0.003645226
## [1] 0.01691746
## [1] -0.01485186
## [1] -0.02749197
## [1] -0.05359022
## [1] -0.02511861
## [1] -0.02106374
## [1] 0.04810917
## [1] -0.02217183
## [1] 0.005012946
## [1] 0.02560629
## [1] -0.02824565
## [1] 0.02035511
## [1] -0.02513364
## [1] 0.02311203
## [1] -0.02415467
## [1] -0.02222816
## [1] 0.0116084
## [1] 0.04724145
## [1] -0.02710057
## [1] 0.0140969
## [1] -0.02556232
## [1] 0.03079852
## [1] 0.03636018
## [1] 0.009156777
## [1] 0.05210134
## [1] -0.04024993
## [1] -0.0469106
## [1] -0.008286594
## [1] -0.0129
## [1] 0.008935902
## [1] 0.02220814
## [1] -0.009561184
## [1] -0.02220129
## [1] -0.07100078
```

```
## [1] -0.04252917
## [1] -0.0384743
## [1] 0.0306986
## [1] -0.03958239
## [1] -0.01239762
## [1] 0.00819573
## [1] -0.04565621
## [1] 0.002944553
## [1] -0.0425442
## [1] 0.005701466
## [1] -0.04156523
## [1] -0.03963872
## [1] -0.00580216
## [1] 0.02983089
## [1] -0.04451113
## [1] -0.003313664
## [1] -0.04297288
## [1] 0.01338796
## [1] 0.01894962
## [1] -0.008253784
## [1] 0.03469078
## [1] -0.05766049
## [1] -0.06432116
## [1] -0.02569715
## [1] -0.03031056
## [1] -0.008474659
## [1] 0.004797577
## [1] -0.02697175
## [1] -0.03961186
## [1] -0.03728477
## [1] -0.008813157
## [1] -0.004758289
## [1] 0.06441462
## [1] -0.00586638
## [1] 0.0213184
## [1] 0.04191174
## [1] -0.0119402
## [1] 0.03666057
## [1] -0.008828187
## [1] 0.03941748
## [1] -0.007849216
## [1] -0.005922708
## [1] 0.02791385
## [1] 0.0635469
## [1] -0.01079512
## [1] 0.03040235
## [1] -0.009256868
## [1] 0.04710397
## [1] 0.05266563
## [1] 0.02546223
## [1] 0.06840679
## [1] -0.02394448
## [1] -0.03060515
## [1] 0.008018857
```

```
## [1] 0.003405447
## [1] 0.02524135
## [1] 0.03851359
## [1] 0.006744266
## [1] -0.005895844
## [1] -0.05518649
## [1] -0.02671488
## [1] -0.02266001
## [1] 0.0465129
## [1] -0.0237681
## [1] 0.003416678
## [1] 0.02401002
## [1] -0.02984192
## [1] 0.01875885
## [1] -0.0267299
## [1] 0.02151576
## [1] -0.02575093
## [1] -0.02382443
## [1] 0.01001213
## [1] 0.04564518
## [1] -0.02869684
## [1] 0.01250063
## [1] -0.02715859
## [1] 0.02920226
## [1] 0.03476391
## [1] 0.00756051
## [1] 0.05050508
## [1] -0.0418462
## [1] -0.04850687
## [1] -0.009882861
## [1] -0.01449627
## [1] 0.007339635
## [1] 0.02061187
## [1] -0.01115745
## [1] -0.02379756
## [1] -0.07837181
## [1] -0.0499002
## [1] -0.04584533
## [1] 0.02332758
## [1] -0.04695342
## [1] -0.01976864
## [1] 0.0008247026
## [1] -0.05302724
## [1] -0.004426474
## [1] -0.04991523
## [1] -0.001669561
## [1] -0.04893625
## [1] -0.04700975
## [1] -0.01317319
## [1] 0.02245986
## [1] -0.05188216
## [1] -0.01068469
## [1] -0.05034391
## [1] 0.006016934
```

```
## [1] 0.01157859
## [1] -0.01562481
## [1] 0.02731976
## [1] -0.06503152
## [1] -0.07169219
## [1] -0.03306818
## [1] -0.03768159
## [1] -0.01584569
## [1] -0.00257345
## [1] -0.03434277
## [1] -0.04698288
## [1] -0.1000877
## [1] -0.07161604
## [1] -0.06756117
## [1] 0.001611732
## [1] -0.06866926
## [1] -0.04148449
## [1] -0.02089114
## [1] -0.07474309
## [1] -0.02614232
## [1] -0.07163107
## [1] -0.02338541
## [1] -0.0706521
## [1] -0.06872559
## [1] -0.03488903
## [1] 0.0007440143
## [1] -0.073598
## [1] -0.03240054
## [1] -0.07205975
## [1] -0.01569891
## [1] -0.01013725
## [1] -0.03734066
## [1] 0.00560391
## [1] -0.08674736
## [1] -0.09340804
## [1] -0.05478403
## [1] -0.05939744
## [1] -0.03756153
## [1] -0.0242893
## [1] -0.05605862
## [1] -0.06869873
## [1] -0.106116
## [1] -0.07764443
## [1] -0.07358956
## [1] -0.004416656
## [1] -0.07469765
## [1] -0.04751288
## [1] -0.02691953
## [1] -0.08077147
## [1] -0.03217071
## [1] -0.07765946
## [1] -0.02941379
## [1] -0.07668049
## [1] -0.07475398
```

```
## [1] -0.04091742
## [1] -0.005284374
## [1] -0.07962639
## [1] -0.03842892
## [1] -0.07808814
## [1] -0.0217273
## [1] -0.01616564
## [1] -0.04336904
## [1] -0.0004244782
## [1] -0.09277575
## [1] -0.09943642
## [1] -0.06081242
## [1] -0.06542582
## [1] -0.04358992
## [1] -0.03031768
## [1] -0.06208701
## [1] -0.07472712
## [1] -0.07554851
## [1] -0.0470769
## [1] -0.04302203
## [1] 0.02615087
## [1] -0.04413013
## [1] -0.01694535
## [1] 0.003647996
## [1] -0.05020395
## [1] -0.001603181
## [1] -0.04709193
## [1] 0.001153732
## [1] -0.04611296
## [1] -0.04418645
## [1] -0.01034989
## [1] 0.02528315
## [1] -0.04905886
## [1] -0.007861398
## [1] -0.04752061
## [1] 0.008840227
## [1] 0.01440189
## [1] -0.01280152
## [1] 0.03014305
## [1] -0.06220823
## [1] -0.0688689
## [1] -0.03024489
## [1] -0.0348583
## [1] -0.01302239
## [1] 0.0002498431
## [1] -0.03151948
## [1] -0.04415959
## [1] -0.08805472
## [1] -0.0595831
## [1] -0.05552824
## [1] 0.01364467
## [1] -0.05663633
## [1] -0.02945155
## [1] -0.008858206
```

```
## [1] -0.06271015
## [1] -0.01410938
## [1] -0.05959813
## [1] -0.01135247
## [1] -0.05861916
## [1] -0.05669266
## [1] -0.0228561
## [1] 0.01277695
## [1] -0.06156507
## [1] -0.0203676
## [1] -0.06002682
## [1] -0.003665975
## [1] 0.001895683
## [1] -0.02530772
## [1] 0.01763685
## [1] -0.07471443
## [1] -0.0813751
## [1] -0.04275109
## [1] -0.0473645
## [1] -0.0255286
## [1] -0.01225636
## [1] -0.04402568
## [1] -0.05666579
## [1] -0.04797187
## [1] -0.01950026
## [1] -0.01544539
## [1] 0.05372752
## [1] -0.01655348
## [1] 0.0106313
## [1] 0.03122464
## [1] -0.0226273
## [1] 0.02597347
## [1] -0.01951529
## [1] 0.02873038
## [1] -0.01853631
## [1] -0.01660981
## [1] 0.01722675
## [1] 0.0528598
## [1] -0.02148222
## [1] 0.01971525
## [1] -0.01994397
## [1] 0.03641687
## [1] 0.04197853
## [1] 0.01477513
## [1] 0.0577197
## [1] -0.03463158
## [1] -0.04129225
## [1] -0.002668242
## [1] -0.007281652
## [1] 0.01455425
## [1] 0.02782649
## [1] -0.003942833
## [1] -0.01658294
## [1] 0.01577549
```

```
## [1] 0.0442471
## [1] 0.04830197
## [1] 0.1174749
## [1] 0.04719388
## [1] 0.07437866
## [1] 0.094972
## [1] 0.04112006
## [1] 0.08972083
## [1] 0.04423207
## [1] 0.09247774
## [1] 0.04521104
## [1] 0.04713755
## [1] 0.08097411
## [1] 0.1166072
## [1] 0.04226514
## [1] 0.08346261
## [1] 0.04380339
## [1] 0.1001642
## [1] 0.1057259
## [1] 0.07852249
## [1] 0.1214671
## [1] 0.02911578
## [1] 0.02245511
## [1] 0.06107912
## [1] 0.05646571
## [1] 0.07830161
## [1] 0.09157385
## [1] 0.05980453
## [1] 0.04716442
## [1] -0.05183947
## [1] -0.02336785
## [1] -0.01931299
## [1] 0.04985992
## [1] -0.02042108
## [1] 0.006763699
## [1] 0.02735704
## [1] -0.0264949
## [1] 0.02210587
## [1] -0.02338288
## [1] 0.02486278
## [1] -0.02240391
## [1] -0.02047741
## [1] 0.01335915
## [1] 0.0489922
## [1] -0.02534982
## [1] 0.01584765
## [1] -0.02381156
## [1] 0.03254928
## [1] 0.03811093
## [1] 0.01090753
## [1] 0.0538521
## [1] -0.03849918
## [1] -0.04515985
## [1] -0.00653584
```

```
## [1] -0.01114925
## [1] 0.01068666
## [1] 0.02395889
## [1] -0.007810431
## [1] -0.02045054
## [1] -0.1016691
## [1] -0.07319752
## [1] -0.06914265
## [1] 3.025283e-05
## [1] -0.07025074
## [1] -0.04306597
## [1] -0.02247262
## [1] -0.07632457
## [1] -0.0277238
## [1] -0.07321255
## [1] -0.02496689
## [1] -0.07223358
## [1] -0.07030707
## [1] -0.03647051
## [1] -0.0008374651
## [1] -0.07517948
## [1] -0.03398202
## [1] -0.07364123
## [1] -0.01728039
## [1] -0.01171873
## [1] -0.03892214
## [1] 0.00402243
## [1] -0.08832884
## [1] -0.09498952
## [1] -0.05636551
## [1] -0.06097892
## [1] -0.03914301
## [1] -0.02587078
## [1] -0.0576401
## [1] -0.07028021
## [1] -0.064248
## [1] -0.03577639
## [1] -0.03172153
## [1] 0.03745138
## [1] -0.03282962
## [1] -0.00564484
## [1] 0.01494851
## [1] -0.03890344
## [1] 0.009697329
## [1] -0.03579142
## [1] 0.01245424
## [1] -0.03481245
## [1] -0.03288594
## [1] 0.0009506148
## [1] 0.03658366
## [1] -0.03775836
## [1] 0.003439111
## [1] -0.0362201
## [1] 0.02014074
```

```
## [1] 0.02570239
## [1] -0.001501009
## [1] 0.04144356
## [1] -0.05090772
## [1] -0.05756839
## [1] -0.01894438
## [1] -0.02355779
## [1] -0.001721884
## [1] 0.01155035
## [1] -0.02021897
## [1] -0.03285908
## [1] -0.00331059
## [1] 0.02516102
## [1] 0.02921589
## [1] 0.09838879
## [1] 0.0281078
## [1] 0.05529257
## [1] 0.07588592
## [1] 0.02203398
## [1] 0.07063474
## [1] 0.02514599
## [1] 0.07339166
## [1] 0.02612496
## [1] 0.02805147
## [1] 0.06188803
## [1] 0.09752108
## [1] 0.02317906
## [1] 0.06437653
## [1] 0.02471731
## [1] 0.08107815
## [1] 0.08663981
## [1] 0.05943641
## [1] 0.102381
## [1] 0.0100297
## [1] 0.003369026
## [1] 0.04199304
## [1] 0.03737963
## [1] 0.05921553
## [1] 0.07248777
## [1] 0.04071844
## [1] 0.02807833
## [1] -0.0435826
## [1] -0.01511099
## [1] -0.01105612
## [1] 0.05811678
## [1] -0.01216421
## [1] 0.01502056
## [1] 0.03561391
## [1] -0.01823804
## [1] 0.03036273
## [1] -0.01512602
## [1] 0.03311964
## [1] -0.01414705
## [1] -0.01222054
```

```
## [1] 0.02161602
## [1] 0.05724906
## [1] -0.01709295
## [1] 0.02410451
## [1] -0.0155547
## [1] 0.04080614
## [1] 0.0463678
## [1] 0.01916439
## [1] 0.06210896
## [1] -0.03024231
## [1] -0.03690299
## [1] 0.001721022
## [1] -0.002892387
## [1] 0.01894352
## [1] 0.03221575
## [1] 0.0004464316
## [1] -0.01219368
## [1] -0.1369599
## [1] -0.1084883
## [1] -0.1044334
## [1] -0.03526052
## [1] -0.1055415
## [1] -0.07835674
## [1] -0.0577634
## [1] -0.1116153
## [1] -0.06301457
## [1] -0.1085033
## [1] -0.06025766
## [1] -0.1075244
## [1] -0.1055978
## [1] -0.07176129
## [1] -0.03612824
## [1] -0.1104703
## [1] -0.06927279
## [1] -0.108932
## [1] -0.05257117
## [1] -0.04700951
## [1] -0.07421291
## [1] -0.03126835
## [1] -0.1236196
## [1] -0.1302803
## [1] -0.09165628
## [1] -0.09626969
## [1] -0.07443379
## [1] -0.06116155
## [1] -0.09293087
## [1] -0.105571
## [1] -0.06820139
## [1] -0.03972978
## [1] -0.03567491
## [1] 0.03349799
## [1] -0.03678301
## [1] -0.00959823
## [1] 0.01099512
```

```
## [1] -0.04285683
## [1] 0.005743939
## [1] -0.03974481
## [1] 0.008500851
## [1] -0.03876584
## [1] -0.03683933
## [1] -0.003002775
## [1] 0.03263027
## [1] -0.04171175
## [1] -0.0005142785
## [1] -0.04017349
## [1] 0.01618735
## [1] 0.021749
## [1] -0.005454398
## [1] 0.03749017
## [1] -0.05486111
## [1] -0.06152178
## [1] -0.02289777
## [1] -0.02751118
## [1] -0.005675274
## [1] 0.007596962
## [1] -0.02417236
## [1] -0.03681247

##    user  system elapsed
##  207.74    4.38  213.44
```

```
write.csv(df2016, "datos2016.csv")
```

```
saveRDS(shotDataTotal2016, "shotDataTotal2016.rds")
saveRDS(shotDatafDef2016, "shotDatafDef2016.rds")
saveRDS(shotDataTotal2015, "shotDataTotal2015.rds")
saveRDS(shotDatafDef2015, "shotDatafDef2015.rds")
saveRDS(shotDataTotal2014, "shotDataTotal2014.rds")
saveRDS(shotDatafDef2014, "shotDatafDef2014.rds")
```

```
Offensive_teams <- as.character(unique(shotDataTotal2015$TEAM_NAME))

defenseve_names <- names(shotDatafDef2015)
df2015 <- data.frame(matrix(ncol = 30, nrow = 30))
colnames(df2015) <- as.character(unique(shotDataTotal2015$TEAM_NAME))
rownames(df2015) <- names(shotDatafDef2015)

system.time(for (i in 1:length(Offensive_teams)) {
  Offensive_team <- Offensive_teams[i]
  for (j in 1:length(defenseve_names)){
    df2015[j,i] <- ShotComparison(OffTeam = Offensive_team, DefTown =                    defenseve_
  }
})
```

```
## [1] -0.004316868
## [1] 0.007045388
## [1] 0.009287763
```

```
## [1] 0.01125722
## [1] -0.005947105
## [1] 0.02533465
## [1] 0.03368433
## [1] -0.005818581
## [1] -0.0166993
## [1] 0.01866802
## [1] 0.04180612
## [1] 0.007062303
## [1] -0.05740397
## [1] 0.06570761
## [1] 0.0181956
## [1] 0.05226595
## [1] 0.05271058
## [1] -0.01060374
## [1] 0.01137377
## [1] 0.01410869
## [1] -0.002733073
## [1] 0.05579843
## [1] 0.009811478
## [1] -0.02377966
## [1] 0.03411619
## [1] 0.03023631
## [1] 0.003410015
## [1] 0.003718937
## [1] 0.002255271
## [1] 0.007764721
## [1] -0.0277239
## [1] -0.01636164
## [1] -0.01411927
## [1] -0.01214981
## [1] -0.02935414
## [1] 0.001927622
## [1] 0.0102773
## [1] -0.02922561
## [1] -0.04010634
## [1] -0.004739015
## [1] 0.01839909
## [1] -0.01634473
## [1] -0.080811
## [1] 0.04230058
## [1] -0.005211431
## [1] 0.02885892
## [1] 0.02930355
## [1] -0.03401077
## [1] -0.01203327
## [1] -0.00929834
## [1] -0.0261401
## [1] 0.0323914
## [1] -0.01359555
## [1] -0.04718669
## [1] 0.01070916
## [1] 0.006829276
## [1] -0.01999702
```

```
## [1] -0.01968809
## [1] -0.02115176
## [1] -0.01564231
## [1] 0.009572189
## [1] 0.02093445
## [1] 0.02317682
## [1] 0.02514628
## [1] 0.007941952
## [1] 0.03922371
## [1] 0.04757339
## [1] 0.008070477
## [1] -0.002810247
## [1] 0.03255707
## [1] 0.05569518
## [1] 0.02095136
## [1] -0.04351491
## [1] 0.07959667
## [1] 0.03208466
## [1] 0.06615501
## [1] 0.06659964
## [1] 0.00328532
## [1] 0.02526282
## [1] 0.02799775
## [1] 0.01115598
## [1] 0.06968749
## [1] 0.02370054
## [1] -0.009890598
## [1] 0.04800524
## [1] 0.04412536
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## [1] -0.0008079819
## [1] 0.1223036
## [1] 0.07479158
## [1] 0.1088619
## [1] 0.1093066
## [1] 0.04599225
## [1] 0.06796975
## [1] 0.07070468
## [1] 0.05386291
## [1] 0.1123944
## [1] 0.06640746
## [1] 0.03281633
## [1] 0.09071217
## [1] 0.08683229
## [1] 0.060006
## [1] 0.06031492
## [1] 0.05885126
## [1] 0.06436071
## [1] -0.04550066
## [1] -0.0341384
## [1] -0.03189602
## [1] -0.02992657
## [1] -0.04713089
## [1] -0.01584913
## [1] -0.007499455
## [1] -0.04700237
## [1] -0.05788309
## [1] -0.02251577
## [1] 0.0006223333
## [1] -0.03412148
## [1] -0.09858775
## [1] 0.02452382
## [1] -0.02298819
## [1] 0.01108217
## [1] 0.01152679
## [1] -0.05178752
## [1] -0.02981002
## [1] -0.0270751
## [1] -0.04391686
## [1] 0.01461464
## [1] -0.03137231
## [1] -0.06496344
## [1] -0.0070676
## [1] -0.01094748
## [1] -0.03777377
## [1] -0.03746485
## [1] -0.03892852
## [1] -0.03341907
## [1] 0.007108708
## [1] 0.01847096
## [1] 0.02071334
```

```
## [1] 0.02268279
## [1] 0.005478471
## [1] 0.03676023
## [1] 0.04510991
## [1] 0.005606996
## [1] -0.005273728
## [1] 0.03009359
## [1] 0.0532317
## [1] 0.01848788
## [1] -0.04597839
## [1] 0.07713319
## [1] 0.02962118
## [1] 0.06369153
## [1] 0.06413616
## [1] 0.0008218389
## [1] 0.02279934
## [1] 0.02553427
## [1] 0.008692504
## [1] 0.06722401
## [1] 0.02123705
## [1] -0.01235408
## [1] 0.04554176
## [1] 0.04166188
## [1] 0.01483559
## [1] 0.01514451
## [1] 0.01368085
## [1] 0.0191903
## [1] -0.01824868
## [1] -0.006886422
## [1] -0.004644047
## [1] -0.002674592
## [1] -0.01987892
## [1] 0.01140284
## [1] 0.01975252
## [1] -0.01975039
## [1] -0.03063111
## [1] 0.004736206
## [1] 0.02787431
## [1] -0.006869507
## [1] -0.07133578
## [1] 0.0517758
## [1] 0.004263789
## [1] 0.03833414
## [1] 0.03877877
## [1] -0.02453555
## [1] -0.002558045
## [1] 0.0001768806
## [1] -0.01666488
## [1] 0.04186662
## [1] -0.004120332
## [1] -0.03771147
## [1] 0.02018438
## [1] 0.0163045
## [1] -0.01052179
```

```
## [1] -0.01021287
## [1] -0.01167654
## [1] -0.006167089
## [1] 0.05274472
## [1] 0.06410698
## [1] 0.06634935
## [1] 0.06831881
## [1] 0.05111449
## [1] 0.08239624
## [1] 0.09074592
## [1] 0.05124301
## [1] 0.04036229
## [1] 0.07572961
## [1] 0.09886771
## [1] 0.06412389
## [1] -0.0003423761
## [1] 0.1227692
## [1] 0.07525719
## [1] 0.1093275
## [1] 0.1097722
## [1] 0.04645785
## [1] 0.06843536
## [1] 0.07117028
## [1] 0.05432852
## [1] 0.11286
## [1] 0.06687307
## [1] 0.03328194
## [1] 0.09117778
## [1] 0.0872979
## [1] 0.06047161
## [1] 0.06078053
## [1] 0.05931686
## [1] 0.06482631

##    user  system elapsed
##  185.35    7.99  194.13
```

```
write.csv(df2015, "datos2015.csv")
```

```
Offensive_teams <- as.character(unique(shotDataTotal2014$TEAM_NAME))

defenseve_names <- names(shotDatafDef2014)
df2014 <- data.frame(matrix(ncol = 30, nrow = 30))
colnames(df2014) <- as.character(unique(shotDataTotal2014$TEAM_NAME))
rownames(df2014) <- names(shotDatafDef2014)

system.time(for (i in 1:length(Offensive_teams)) {
  Offensive_team <- Offensive_teams[i]
  for (j in 1:length(defenseve_names)){
    df2014[j,i] <- ShotComparison(OffTeam = Offensive_team, DefTown =                    defenseve_
  }
})
```

```
## [1] 0.0002619563
```

```
## [1] -0.01747655
## [1] -0.003720991
## [1] 0.01611212
## [1] -0.04903562
## [1] 0.0144222
## [1] -0.004155506
## [1] -0.02181122
## [1] -0.01534032
## [1] -0.03358493
## [1] 0.01486542
## [1] -0.01690414
## [1] 0.00807629
## [1] 0.01734648
## [1] 0.004810108
## [1] 0.000729582
## [1] 0.01170408
## [1] -0.06456484
## [1] 0.02167651
## [1] -0.01700697
## [1] -0.01582036
## [1] 0.0346672
## [1] -0.01626862
## [1] -0.04805174
## [1] -0.01088898
## [1] 0.02902314
## [1] -0.01267779
## [1] 0.005521884
## [1] -0.003404863
## [1] -0.03191238
## [1] -0.01476054
## [1] -0.03249905
## [1] -0.01874349
## [1] 0.00108962
## [1] -0.06405812
## [1] -0.0006002966
## [1] -0.01917801
## [1] -0.03683372
## [1] -0.03036282
## [1] -0.04860743
## [1] -0.0001570831
## [1] -0.03192664
## [1] -0.006946211
## [1] 0.00232398
## [1] -0.01021239
## [1] -0.01429292
## [1] -0.003318424
## [1] -0.07958734
## [1] 0.006654013
## [1] -0.03202947
## [1] -0.03084286
## [1] 0.0196447
## [1] -0.03129113
## [1] -0.06307424
## [1] -0.02591148
```

```
## [1] 0.01400064
## [1] -0.02770029
## [1] -0.009500616
## [1] -0.01842736
## [1] -0.04693488
## [1] 0.05406389
## [1] 0.03632539
## [1] 0.05008095
## [1] 0.06991406
## [1] 0.004766315
## [1] 0.06822414
## [1] 0.04964643
## [1] 0.03199071
## [1] 0.03846162
## [1] 0.020217
## [1] 0.06866735
## [1] 0.03689779
## [1] 0.06187823
## [1] 0.07114842
## [1] 0.05861204
## [1] 0.05453152
## [1] 0.06550601
## [1] -0.0107629
## [1] 0.07547845
## [1] 0.03679497
## [1] 0.03798158
## [1] 0.08846914
## [1] 0.03753331
## [1] 0.005750198
## [1] 0.04291296
## [1] 0.08282508
## [1] 0.04112415
## [1] 0.05932382
## [1] 0.05039707
## [1] 0.02188956
## [1] -0.0397347
## [1] -0.05747321
## [1] -0.04371765
## [1] -0.02388454
## [1] -0.08903228
## [1] -0.02557445
## [1] -0.04415216
## [1] -0.06180788
## [1] -0.05533697
## [1] -0.07358159
## [1] -0.02513124
## [1] -0.0569008
## [1] -0.03192037
## [1] -0.02265018
## [1] -0.03518655
## [1] -0.03926708
## [1] -0.02829258
## [1] -0.1045615
## [1] -0.01832015
```

```
## [1] -0.05700363
## [1] -0.05581702
## [1] -0.005329458
## [1] -0.05626528
## [1] -0.0880484
## [1] -0.05088563
## [1] -0.01097352
## [1] -0.05267445
## [1] -0.03447477
## [1] -0.04340152
## [1] -0.07190904
## [1] 0.01417633
## [1] -0.003562172
## [1] 0.01019338
## [1] 0.03002649
## [1] -0.03512125
## [1] 0.02833658
## [1] 0.009758869
## [1] -0.00789685
## [1] -0.001425942
## [1] -0.01967056
## [1] 0.02877979
## [1] -0.002989768
## [1] 0.02199066
## [1] 0.03126085
## [1] 0.01872448
## [1] 0.01464396
## [1] 0.02561845
## [1] -0.05065047
## [1] 0.03559089
## [1] -0.003092592
## [1] -0.001905984
## [1] 0.04858158
## [1] -0.00235425
## [1] -0.03413736
## [1] 0.003025399
## [1] 0.04293752
## [1] 0.001236588
## [1] 0.01943626
## [1] 0.01050951
## [1] -0.01799801
## [1] 0.03564337
## [1] 0.01790487
## [1] 0.03166042
## [1] 0.05149353
## [1] -0.01365421
## [1] 0.04980362
## [1] 0.03122591
## [1] 0.01357019
## [1] 0.0200411
## [1] 0.00179648
## [1] 0.05024683
## [1] 0.01847727
## [1] 0.0434577
```

```
## [1] 0.05272789
## [1] 0.04019152
## [1] 0.036111
## [1] 0.04708549
## [1] -0.02918343
## [1] 0.05705793
## [1] 0.01837445
## [1] 0.01956106
## [1] 0.07004861
## [1] 0.01911279
## [1] -0.01267032
## [1] 0.02449244
## [1] 0.06440456
## [1] 0.02270363
## [1] 0.0409033
## [1] 0.03197655
## [1] 0.003469033
## [1] 0.02763618
## [1] 0.009897681
## [1] 0.02365324
## [1] 0.04348635
## [1] -0.02166139
## [1] 0.04179643
## [1] 0.02321872
## [1] 0.005563004
## [1] 0.01203391
## [1] -0.006210706
## [1] 0.04223965
## [1] 0.01047009
## [1] 0.03545052
## [1] 0.04472071
## [1] 0.03218434
## [1] 0.02810381
## [1] 0.0390783
## [1] -0.03719061
## [1] 0.04905074
## [1] 0.01036726
## [1] 0.01155387
## [1] 0.06204143
## [1] 0.0111056
## [1] -0.02067751
## [1] 0.01648525
## [1] 0.05639737
## [1] 0.01469644
## [1] 0.03289611
## [1] 0.02396937
## [1] -0.004538153
## [1] -0.04963091
## [1] -0.06736941
## [1] -0.05361385
## [1] -0.03378074
## [1] -0.09892848
## [1] -0.03547066
## [1] -0.05404837
```

```
## [1] -0.07170409
## [1] -0.06523318
## [1] -0.0834778
## [1] -0.03502745
## [1] -0.06679701
## [1] -0.04181657
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## [1] -0.03818879
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## [1] -0.02821635
## [1] -0.06689983
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## [1] -0.02086972
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## [1] -0.08180524
## [1] -0.07748911
## [1] -0.09522761
## [1] -0.08147206
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## [1] -0.08190657
## [1] -0.09956229
## [1] -0.09309138
## [1] -0.111336
## [1] -0.06288565
## [1] -0.09465521
## [1] -0.06967478
## [1] -0.06040459
## [1] -0.07294096
## [1] -0.07702149
## [1] -0.06604699
## [1] -0.1423159
## [1] -0.05607455
## [1] -0.09475803
## [1] -0.09357143
## [1] -0.04308387
## [1] -0.09401969
## [1] -0.1258028
## [1] -0.08864004
## [1] -0.04872793
## [1] -0.09042885
## [1] -0.07222918
## [1] -0.08115593
## [1] -0.1096634
## [1] 0.01975951
```

```
## [1] 0.002021011
## [1] 0.01577657
## [1] 0.03560968
## [1] -0.02953806
## [1] 0.03391976
## [1] 0.01534205
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## [1] -0.01408738
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## [1] 0.0485207
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## [1] 0.0160927
## [1] -0.01241482
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## [1] -0.07202657
## [1] -0.05827101
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## [1] -0.1035856
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## [1] -0.07636124
## [1] -0.06989034
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## [1] -0.07145416
## [1] -0.04647373
## [1] -0.03720354
## [1] -0.04973991
## [1] -0.05382044
## [1] -0.04284594
## [1] -0.1191149
## [1] -0.03287351
## [1] -0.07155699
## [1] -0.07037038
## [1] -0.01988282
## [1] -0.07081865
## [1] -0.1026018
## [1] -0.065439
```

```
## [1] -0.02552688
## [1] -0.06722781
## [1] -0.04902814
## [1] -0.05795488
## [1] -0.0864624
## [1] 0.02098745
## [1] 0.003248945
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## [1] 0.005385176
## [1] -0.01285944
## [1] 0.03559091
## [1] 0.003821349
## [1] 0.02880178
## [1] 0.03807197
## [1] 0.0255356
## [1] 0.02145507
## [1] 0.03242957
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## [1] 0.04240201
## [1] 0.003718525
## [1] 0.004905133
## [1] 0.05539269
## [1] 0.004456867
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## [1] 0.009836517
## [1] 0.04974863
## [1] 0.008047705
## [1] 0.02624738
## [1] 0.01732063
## [1] -0.01118689
## [1] -0.09112148
## [1] -0.10886
## [1] -0.09510443
## [1] -0.07527132
## [1] -0.1404191
## [1] -0.07696124
## [1] -0.09553894
## [1] -0.1131947
## [1] -0.1067238
## [1] -0.1249684
## [1] -0.07651802
## [1] -0.1082876
## [1] -0.08330715
## [1] -0.07403696
## [1] -0.08657333
## [1] -0.09065386
## [1] -0.07967936
## [1] -0.1559483
## [1] -0.06970693
```

```
## [1] -0.1083904
## [1] -0.1072038
## [1] -0.05671624
## [1] -0.1076521
## [1] -0.1394352
## [1] -0.1022724
## [1] -0.0623603
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## [1] -0.01200125
## [1] -0.03024587
## [1] 0.01820448
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## [1] -0.06831613
## [1] -0.08597185
## [1] -0.07950094
## [1] -0.09774556
## [1] -0.0492952
## [1] -0.08106476
## [1] -0.05608433
```

```
## [1] -0.04681414
## [1] -0.05935051
## [1] -0.06343104
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## [1] -0.1287255
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## [1] -0.05851061
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## [1] -0.02582382
## [1] -0.03836019
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## [1] -0.06017726
## [1] -0.05899065
## [1] -0.008503096
## [1] -0.05943892
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## [1] -0.05584808
## [1] -0.03764841
## [1] -0.04657516
## [1] -0.07508268
## [1] -0.008941468
## [1] -0.02667997
## [1] -0.01292442
## [1] 0.006908695
## [1] -0.05823905
## [1] 0.005218779
## [1] -0.01335893
```

```
## [1] -0.03101465
## [1] -0.02454374
## [1] -0.04278836
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## [1] -0.05725516
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## [1] -0.07645434
## [1] -0.06998343
## [1] -0.08822805
## [1] -0.0397777
## [1] -0.07154726
## [1] -0.04656682
## [1] -0.03729663
## [1] -0.04983301
## [1] -0.05391353
## [1] -0.04293904
## [1] -0.119208
## [1] -0.0329666
## [1] -0.07165008
## [1] -0.07046347
## [1] -0.01997591
## [1] -0.07091174
## [1] -0.1026949
## [1] -0.06553209
## [1] -0.02561997
## [1] -0.0673209
## [1] -0.04912123
## [1] -0.05804798
## [1] -0.08655549
## [1] 0.01086871
```

```
## [1] -0.006869794
## [1] 0.006885762
## [1] 0.02671887
## [1] -0.03842887
## [1] 0.02502896
## [1] 0.006451247
## [1] -0.01120447
## [1] -0.004733564
## [1] -0.02297818
## [1] 0.02547217
## [1] -0.00629739
## [1] 0.01868304
## [1] 0.02795323
## [1] 0.01541686
## [1] 0.01133633
## [1] 0.02231083
## [1] -0.05395809
## [1] 0.03228327
## [1] -0.006400214
## [1] -0.005213606
## [1] 0.04527395
## [1] -0.005661872
## [1] -0.03744499
## [1] -0.0002822225
## [1] 0.03962989
## [1] -0.002071034
## [1] 0.01612864
## [1] 0.00720189
## [1] -0.02130563
## [1] 0.006892539
## [1] -0.01084596
## [1] 0.002909592
## [1] 0.0227427
## [1] -0.04240504
## [1] 0.02105279
## [1] 0.002475077
## [1] -0.01518064
## [1] -0.008709733
## [1] -0.02695435
## [1] 0.021496
## [1] -0.01027356
## [1] 0.01470687
## [1] 0.02397706
## [1] 0.01144069
## [1] 0.007360165
## [1] 0.01833466
## [1] -0.05793426
## [1] 0.0283071
## [1] -0.01037638
## [1] -0.009189776
## [1] 0.04129778
## [1] -0.009638042
## [1] -0.04142116
## [1] -0.004258392
```

```
## [1] 0.03565372
## [1] -0.006047204
## [1] 0.01215247
## [1] 0.00322572
## [1] -0.0252818
## [1] 0.03413202
## [1] 0.01639351
## [1] 0.03014907
## [1] 0.04998218
## [1] -0.01516556
## [1] 0.04829227
## [1] 0.02971456
## [1] 0.01205884
## [1] 0.01852975
## [1] 0.0002851276
## [1] 0.04873548
## [1] 0.01696592
## [1] 0.04194635
## [1] 0.05121654
## [1] 0.03868017
## [1] 0.03459964
## [1] 0.04557414
## [1] -0.03069478
## [1] 0.05554657
## [1] 0.01686309
## [1] 0.0180497
## [1] 0.06853726
## [1] 0.01760144
## [1] -0.01418168
## [1] 0.02298109
## [1] 0.0628932
## [1] 0.02119227
## [1] 0.03939195
## [1] 0.0304652
## [1] 0.00195768
## [1] -0.0002960629
## [1] -0.01803457
## [1] -0.00427901
## [1] 0.0155541
## [1] -0.04959364
## [1] 0.01386418
## [1] -0.004713525
## [1] -0.02236924
## [1] -0.01589834
## [1] -0.03414295
## [1] 0.0143074
## [1] -0.01746216
## [1] 0.00751827
## [1] 0.01678846
## [1] 0.004252089
## [1] 0.0001715627
## [1] 0.01114606
## [1] -0.06512286
## [1] 0.02111849
```

```
## [1] -0.01756499
## [1] -0.01637838
## [1] 0.03410918
## [1] -0.01682664
## [1] -0.04860976
## [1] -0.01144699
## [1] 0.02846512
## [1] -0.01323581
## [1] 0.004963865
## [1] -0.003962882
## [1] -0.0324704
## [1] 0.07643235
## [1] 0.05869384
## [1] 0.0724494
## [1] 0.09228251
## [1] 0.02713477
## [1] 0.09059259
## [1] 0.07201488
## [1] 0.05435917
## [1] 0.06083007
## [1] 0.04258546
## [1] 0.09103581
## [1] 0.05926625
## [1] 0.08424668
## [1] 0.09351687
## [1] 0.0809805
## [1] 0.07689997
## [1] 0.08787447
## [1] 0.01160555
## [1] 0.0978469
## [1] 0.05916342
## [1] 0.06035003
## [1] 0.1108376
## [1] 0.05990176
## [1] 0.02811865
## [1] 0.06528141
## [1] 0.1051935
## [1] 0.0634926
## [1] 0.08169227
## [1] 0.07276553
## [1] 0.04425801
## [1] -0.02144852
## [1] -0.03918703
## [1] -0.02543147
## [1] -0.00559836
## [1] -0.0707461
## [1] -0.007288276
## [1] -0.02586599
## [1] -0.0435217
## [1] -0.0370508
## [1] -0.05529541
## [1] -0.006845062
## [1] -0.03861462
## [1] -0.01363419
```

```
## [1] -0.004364
## [1] -0.01690037
## [1] -0.0209809
## [1] -0.0100064
## [1] -0.08627532
## [1] -3.396632e-05
## [1] -0.03871745
## [1] -0.03753084
## [1] 0.01295672
## [1] -0.0379791
## [1] -0.06976222
## [1] -0.03259945
## [1] 0.007312662
## [1] -0.03438827
## [1] -0.0161886
## [1] -0.02511534
## [1] -0.05362286
## [1] 0.02070013
## [1] 0.002961629
## [1] 0.01671719
## [1] 0.0365503
## [1] -0.02859745
## [1] 0.03486038
## [1] 0.01628267
## [1] -0.001373049
## [1] 0.00509786
## [1] -0.01314676
## [1] 0.03530359
## [1] 0.003534033
## [1] 0.02851447
## [1] 0.03778466
## [1] 0.02524828
## [1] 0.02116776
## [1] 0.03214225
## [1] -0.04412666
## [1] 0.04211469
## [1] 0.003431209
## [1] 0.004617817
## [1] 0.05510538
## [1] 0.004169551
## [1] -0.02761356
## [1] 0.009549201
## [1] 0.04946132
## [1] 0.007760389
## [1] 0.02596006
## [1] 0.01703331
## [1] -0.01147421
## [1] -0.008368342
## [1] -0.02610684
## [1] -0.01235129
## [1] 0.007481822
## [1] -0.05766592
## [1] 0.005791906
## [1] -0.0127858
```

```
## [1] -0.03044152
## [1] -0.02397061
## [1] -0.04221523
## [1] 0.006235119
## [1] -0.02553444
## [1] -0.0005540083
## [1] 0.008716182
## [1] -0.00382019
## [1] -0.007900716
## [1] 0.003073779
## [1] -0.07319514
## [1] 0.01304622
## [1] -0.02563726
## [1] -0.02445066
## [1] 0.0260369
## [1] -0.02489892
## [1] -0.05668204
## [1] -0.01951927
## [1] 0.02039284
## [1] -0.02130808
## [1] -0.003108414
## [1] -0.01203516
## [1] -0.04054268
## [1] 0.01503425
## [1] -0.002704252
## [1] 0.0110513
## [1] 0.03088442
## [1] -0.03426333
## [1] 0.0291945
## [1] 0.01061679
## [1] -0.007038929
## [1] -0.000568021
## [1] -0.01881264
## [1] 0.02963771
## [1] -0.002131847
## [1] 0.02284858
## [1] 0.03211878
## [1] 0.0195824
## [1] 0.01550188
## [1] 0.02647637
## [1] -0.04979255
## [1] 0.03644881
## [1] -0.002234671
## [1] -0.001048063
## [1] 0.0494395
## [1] -0.00149633
## [1] -0.03327944
## [1] 0.00388332
## [1] 0.04379544
## [1] 0.002094509
## [1] 0.02029418
## [1] 0.01136743
## [1] -0.01714009
## [1] -0.03080231
```

```
## [1] -0.04854081
## [1] -0.03478525
## [1] -0.01495214
## [1] -0.08009989
## [1] -0.01664206
## [1] -0.03521977
## [1] -0.05287549
## [1] -0.04640458
## [1] -0.0646492
## [1] -0.01619885
## [1] -0.04796841
## [1] -0.02298797
## [1] -0.01371778
## [1] -0.02625416
## [1] -0.03033468
## [1] -0.01936019
## [1] -0.0956291
## [1] -0.009387751
## [1] -0.04807123
## [1] -0.04688462
## [1] 0.003602936
## [1] -0.04733289
## [1] -0.079116
## [1] -0.04195324
## [1] -0.002041123
## [1] -0.04374205
## [1] -0.02554238
## [1] -0.03446913
## [1] -0.06297665
## [1] -0.003573787
## [1] -0.02131229
## [1] -0.007556734
## [1] 0.01227638
## [1] -0.05287136
## [1] 0.01058646
## [1] -0.007991249
## [1] -0.02564697
## [1] -0.01917606
## [1] -0.03742068
## [1] 0.01102967
## [1] -0.02073989
## [1] 0.004240547
## [1] 0.01351074
## [1] 0.0009743648
## [1] -0.003106161
## [1] 0.007868334
## [1] -0.06840058
## [1] 0.01784077
## [1] -0.02084271
## [1] -0.0196561
## [1] 0.03083146
## [1] -0.02010437
## [1] -0.05188748
## [1] -0.01472472
```

```
## [1] 0.0251874
## [1] -0.01651353
## [1] 0.001686141
## [1] -0.007240606
## [1] -0.03574812
## [1] 0.04875346
## [1] 0.03101496
## [1] 0.04477052
## [1] 0.06460363
## [1] -0.0005441139
## [1] 0.06291371
## [1] 0.044336
## [1] 0.02668028
## [1] 0.03315119
## [1] 0.01490657
## [1] 0.06335692
## [1] 0.03158736
## [1] 0.0565678
## [1] 0.06583799
## [1] 0.05330161
## [1] 0.04922109
## [1] 0.06019558
## [1] -0.01607333
## [1] 0.07016802
## [1] 0.03148454
## [1] 0.03267115
## [1] 0.08315871
## [1] 0.03222288
## [1] 0.0004397689
## [1] 0.03760253
## [1] 0.07751465
## [1] 0.03581372
## [1] 0.05401339
## [1] 0.04508664
## [1] 0.01657913

##    user  system elapsed
##  196.49    4.68  201.70
```

```
write.csv(df2014, "datos2014.csv")
```

2013

```
Offensive_teams <- as.character(unique(shotDataTotal2014$TEAM_NAME))

defenseve_names <- names(shotDatafDef2014)
df2013 <- data.frame(matrix(ncol = 30, nrow = 30))
colnames(df2013) <- as.character(unique(shotDataTotal2013$TEAM_NAME))
rownames(df2013) <- names(shotDatafDef2013)

system.time(for (i in 1:length(Offensive_teams)) {
```

```
  Offensive_team <- Offensive_teams[i]
  for (j in 1:length(defenseve_names)){
    df2013[j,i] <- ShotComparison(OffTeam = Offensive_team, DefTown =                    defenseve_
  }
})
```

```
## [1] -0.03864543
## [1] -0.0712738
## [1] -0.004145729
## [1] 0.01280662
## [1] -0.03777763
## [1] -0.03265341
## [1] -0.04127023
## [1] -0.02324699
## [1] 0.005298339
## [1] -0.01588148
## [1] -0.01101577
## [1] -0.05978233
## [1] -0.06769072
## [1] 0.01125323
## [1] 0.007732375
## [1] -0.01472746
## [1] -0.001441229
## [1] -0.07629369
## [1] -0.01911559
## [1] 0.009153025
## [1] -0.01067805
## [1] 0.02894936
## [1] -0.04208972
## [1] -0.0805413
## [1] -0.004312138
## [1] -0.005272992
## [1] -0.06742441
## [1] -0.04195578
## [1] -0.0276225
## [1] -0.01497001
## [1] -0.03278311
## [1] -0.06541149
## [1] 0.001716583
## [1] 0.01866893
## [1] -0.03191532
## [1] -0.0267911
## [1] -0.03540792
## [1] -0.01738468
## [1] 0.01116065
## [1] -0.01001916
## [1] -0.005153461
## [1] -0.05392001
## [1] -0.06182841
## [1] 0.01711555
## [1] 0.01359469
## [1] -0.008865152
## [1] 0.004421084
```

```
## [1] -0.07043138
## [1] -0.01325327
## [1] 0.01501534
## [1] -0.004815734
## [1] 0.03481167
## [1] -0.0362274
## [1] -0.07467898
## [1] 0.001550174
## [1] 0.0005893203
## [1] -0.06156209
## [1] -0.03609347
## [1] -0.02176019
## [1] -0.009107695
## [1] 0.05709238
## [1] 0.02446401
## [1] 0.09159208
## [1] 0.1085444
## [1] 0.05796018
## [1] 0.06308439
## [1] 0.05446758
## [1] 0.07249081
## [1] 0.1010361
## [1] 0.07985633
## [1] 0.08472204
## [1] 0.03595548
## [1] 0.02804709
## [1] 0.106991
## [1] 0.1034702
## [1] 0.08101035
## [1] 0.09429658
## [1] 0.01944412
## [1] 0.07662222
## [1] 0.1048908
## [1] 0.08505976
## [1] 0.1246872
## [1] 0.05364809
## [1] 0.01519651
## [1] 0.09142567
## [1] 0.09046482
## [1] 0.0283134
## [1] 0.05378203
## [1] 0.06811531
## [1] 0.0807678
## [1] -0.06014834
## [1] -0.09277672
## [1] -0.02564865
## [1] -0.008696298
## [1] -0.05928055
## [1] -0.05415633
## [1] -0.06277315
## [1] -0.04474991
## [1] -0.01620458
## [1] -0.03738439
## [1] -0.03251869
```

```
## [1] -0.08128524
## [1] -0.08919364
## [1] -0.01024968
## [1] -0.01377054
## [1] -0.03623038
## [1] -0.02294415
## [1] -0.09779661
## [1] -0.04061851
## [1] -0.01234989
## [1] -0.03218096
## [1] 0.007446441
## [1] -0.06359263
## [1] -0.1020442
## [1] -0.02581506
## [1] -0.02677591
## [1] -0.08892732
## [1] -0.0634587
## [1] -0.04912542
## [1] -0.03647293
## [1] -0.001368047
## [1] -0.03399642
## [1] 0.03313165
## [1] 0.050084
## [1] -0.0005002517
## [1] 0.004623964
## [1] -0.003992856
## [1] 0.01403038
## [1] 0.04257572
## [1] 0.0213959
## [1] 0.02626161
## [1] -0.02250495
## [1] -0.03041334
## [1] 0.04853061
## [1] 0.04500975
## [1] 0.02254991
## [1] 0.03583615
## [1] -0.03901631
## [1] 0.01816179
## [1] 0.0464304
## [1] 0.02659933
## [1] 0.06622674
## [1] -0.004812339
## [1] -0.04326392
## [1] 0.03296524
## [1] 0.03200439
## [1] -0.03014703
## [1] -0.004678405
## [1] 0.009654879
## [1] 0.02230737
## [1] 0.03913944
## [1] 0.006511063
## [1] 0.07363914
## [1] 0.09059148
## [1] 0.04000723
```

```
## [1] 0.04513145
## [1] 0.03651463
## [1] 0.05453787
## [1] 0.0830832
## [1] 0.06190339
## [1] 0.06676909
## [1] 0.01800254
## [1] 0.01009415
## [1] 0.0890381
## [1] 0.08551724
## [1] 0.0630574
## [1] 0.07634364
## [1] 0.001491177
## [1] 0.05866928
## [1] 0.08693789
## [1] 0.06710682
## [1] 0.1067342
## [1] 0.03569515
## [1] -0.002756432
## [1] 0.07347273
## [1] 0.07251187
## [1] 0.01036046
## [1] 0.03582908
## [1] 0.05016237
## [1] 0.06281486
## [1] -0.01688612
## [1] -0.04951449
## [1] 0.01761358
## [1] 0.03456593
## [1] -0.01601832
## [1] -0.01089411
## [1] -0.01951092
## [1] -0.001487685
## [1] 0.02705765
## [1] 0.005877833
## [1] 0.01074354
## [1] -0.03802302
## [1] -0.04593141
## [1] 0.03301254
## [1] 0.02949168
## [1] 0.007031845
## [1] 0.02031808
## [1] -0.05453438
## [1] 0.002643722
## [1] 0.03091233
## [1] 0.01108126
## [1] 0.05070867
## [1] -0.02033041
## [1] -0.05878199
## [1] 0.01744717
## [1] 0.01648632
## [1] -0.0456651
## [1] -0.02019647
## [1] -0.005863189
```

```
## [1] 0.006789302
## [1] -0.086625
## [1] -0.1192534
## [1] -0.0521253
## [1] -0.03517296
## [1] -0.08575721
## [1] -0.08063299
## [1] -0.08924981
## [1] -0.07122657
## [1] -0.04268124
## [1] -0.06386105
## [1] -0.05899535
## [1] -0.1077619
## [1] -0.1156703
## [1] -0.03672634
## [1] -0.0402472
## [1] -0.06270704
## [1] -0.0494208
## [1] -0.1242733
## [1] -0.06709516
## [1] -0.03882655
## [1] -0.05865762
## [1] -0.01903022
## [1] -0.09006929
## [1] -0.1285209
## [1] -0.05229171
## [1] -0.05325257
## [1] -0.115404
## [1] -0.08993536
## [1] -0.07560207
## [1] -0.06294958
## [1] -0.03093389
## [1] -0.06356227
## [1] 0.003565807
## [1] 0.02051816
## [1] -0.03006609
## [1] -0.02494188
## [1] -0.0335587
## [1] -0.01553546
## [1] 0.01300988
## [1] -0.00816994
## [1] -0.003304237
## [1] -0.05207079
## [1] -0.05997918
## [1] 0.01896477
## [1] 0.01544391
## [1] -0.007015928
## [1] 0.006270308
## [1] -0.06858215
## [1] -0.01140405
## [1] 0.01686456
## [1] -0.00296651
## [1] 0.0366609
## [1] -0.03437818
```

```
## [1] -0.07282976
## [1] 0.003399398
## [1] 0.002438544
## [1] -0.05971287
## [1] -0.03424425
## [1] -0.01991096
## [1] -0.007258471
## [1] -0.006074565
## [1] -0.03870294
## [1] 0.02842513
## [1] 0.04537748
## [1] -0.005206769
## [1] -8.255356e-05
## [1] -0.008699373
## [1] 0.009323866
## [1] 0.0378692
## [1] 0.01668938
## [1] 0.02155509
## [1] -0.02721146
## [1] -0.03511986
## [1] 0.0438241
## [1] 0.04030324
## [1] 0.0178434
## [1] 0.03112963
## [1] -0.04372283
## [1] 0.01345527
## [1] 0.04172389
## [1] 0.02189281
## [1] 0.06152022
## [1] -0.009518856
## [1] -0.04797044
## [1] 0.02825872
## [1] 0.02729787
## [1] -0.03485355
## [1] -0.009384922
## [1] 0.004948362
## [1] 0.01760085
## [1] -0.01895369
## [1] -0.05158207
## [1] 0.015546
## [1] 0.03249835
## [1] -0.0180859
## [1] -0.01296168
## [1] -0.0215785
## [1] -0.003555263
## [1] 0.02499007
## [1] 0.003810255
## [1] 0.008675959
## [1] -0.04009059
## [1] -0.04799899
## [1] 0.03094497
## [1] 0.02742411
## [1] 0.004964268
## [1] 0.0182505
```

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## [1] -0.05660196
## [1] 0.0005761447
## [1] 0.02884476
## [1] 0.009013685
## [1] 0.04864109
## [1] -0.02239799
## [1] -0.06084956
## [1] 0.01537959
## [1] 0.01441874
## [1] -0.04773268
## [1] -0.02226405
## [1] -0.007930767
## [1] 0.004721724
## [1] -0.04985541
## [1] -0.08248379
## [1] -0.01535571
## [1] 0.001596636
## [1] -0.04898761
## [1] -0.0438634
## [1] -0.05248022
## [1] -0.03445698
## [1] -0.005911645
## [1] -0.02709146
## [1] -0.02222576
## [1] -0.07099231
## [1] -0.0789007
## [1] 4.325081e-05
## [1] -0.003477608
## [1] -0.02593745
## [1] -0.01265121
## [1] -0.08750367
## [1] -0.03032557
## [1] -0.002056959
## [1] -0.02188803
## [1] 0.01773938
## [1] -0.0532997
## [1] -0.09175128
## [1] -0.01552212
## [1] -0.01648298
## [1] -0.07863439
## [1] -0.05316577
## [1] -0.03883248
## [1] -0.02617999
## [1] -0.09240248
## [1] -0.1250309
## [1] -0.05790279
## [1] -0.04095044
## [1] -0.09153469
## [1] -0.08641047
## [1] -0.09502729
## [1] -0.07700405
## [1] -0.04845872
## [1] -0.06963853
## [1] -0.06477283
```

```
## [1] -0.1135394
## [1] -0.1214478
## [1] -0.04250382
## [1] -0.04602468
## [1] -0.06848452
## [1] -0.05519829
## [1] -0.1300507
## [1] -0.07287264
## [1] -0.04460403
## [1] -0.0644351
## [1] -0.0248077
## [1] -0.09584677
## [1] -0.1342984
## [1] -0.0580692
## [1] -0.05903005
## [1] -0.1211815
## [1] -0.09571284
## [1] -0.08137956
## [1] -0.06872707
## [1] -0.02270848
## [1] -0.05533686
## [1] 0.01179121
## [1] 0.02874356
## [1] -0.02184069
## [1] -0.01671647
## [1] -0.02533329
## [1] -0.007310054
## [1] 0.02123528
## [1] 5.546426e-05
## [1] 0.004921168
## [1] -0.04384539
## [1] -0.05175378
## [1] 0.02719018
## [1] 0.02366932
## [1] 0.001209477
## [1] 0.01449571
## [1] -0.06035675
## [1] -0.003178646
## [1] 0.02508997
## [1] 0.005258895
## [1] 0.0448863
## [1] -0.02615278
## [1] -0.06460436
## [1] 0.0116248
## [1] 0.01066395
## [1] -0.05148747
## [1] -0.02601884
## [1] -0.01168556
## [1] 0.0009669333
## [1] -0.09631065
## [1] -0.128939
## [1] -0.06181095
## [1] -0.0448586
## [1] -0.09544285
```

```
## [1] -0.09031864
## [1] -0.09893546
## [1] -0.08091222
## [1] -0.05236688
## [1] -0.0735467
## [1] -0.06868099
## [1] -0.1174475
## [1] -0.1253559
## [1] -0.04641199
## [1] -0.04993285
## [1] -0.07239269
## [1] -0.05910645
## [1] -0.1339589
## [1] -0.07678081
## [1] -0.0485122
## [1] -0.06834327
## [1] -0.02871586
## [1] -0.09975494
## [1] -0.1382065
## [1] -0.06197736
## [1] -0.06293821
## [1] -0.1250896
## [1] -0.099621
## [1] -0.08528772
## [1] -0.07263523
## [1] -0.1036306
## [1] -0.136259
## [1] -0.06913093
## [1] -0.05217858
## [1] -0.1027628
## [1] -0.09763861
## [1] -0.1062554
## [1] -0.08823219
## [1] -0.05968686
## [1] -0.08086668
## [1] -0.07600097
## [1] -0.1247675
## [1] -0.1326759
## [1] -0.05373196
## [1] -0.05725282
## [1] -0.07971266
## [1] -0.06642643
## [1] -0.1412789
## [1] -0.08410079
## [1] -0.05583217
## [1] -0.07566325
## [1] -0.03603584
## [1] -0.1070749
## [1] -0.1455265
## [1] -0.06929734
## [1] -0.07025819
## [1] -0.1324096
## [1] -0.106941
## [1] -0.0926077
```

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## [1] -0.07995521
## [1] -0.0394379
## [1] -0.07206628
## [1] -0.004938208
## [1] 0.01201414
## [1] -0.03857011
## [1] -0.03344589
## [1] -0.04206271
## [1] -0.02403947
## [1] 0.00450586
## [1] -0.01667396
## [1] -0.01180825
## [1] -0.0605748
## [1] -0.0684832
## [1] 0.01046076
## [1] 0.006939897
## [1] -0.01551994
## [1] -0.002233708
## [1] -0.07708617
## [1] -0.01990807
## [1] 0.008360546
## [1] -0.01147053
## [1] 0.02815688
## [1] -0.0428822
## [1] -0.08133378
## [1] -0.005104617
## [1] -0.006065471
## [1] -0.06821689
## [1] -0.04274826
## [1] -0.02841498
## [1] -0.01576249
## [1] -0.08125535
## [1] -0.1138837
## [1] -0.04675565
## [1] -0.02980331
## [1] -0.08038756
## [1] -0.07526334
## [1] -0.08388016
## [1] -0.06585692
## [1] -0.03731159
## [1] -0.0584914
## [1] -0.0536257
## [1] -0.1023923
## [1] -0.1103006
## [1] -0.03135669
## [1] -0.03487755
## [1] -0.05733739
## [1] -0.04405115
## [1] -0.1189036
## [1] -0.06172551
## [1] -0.0334569
## [1] -0.05328797
## [1] -0.01366057
## [1] -0.08469964
```

```
## [1] -0.1231512
## [1] -0.04692206
## [1] -0.04788292
## [1] -0.1100343
## [1] -0.08456571
## [1] -0.07023242
## [1] -0.05757993

## Warning in min(x): no non-missing arguments to min; returning Inf

## Warning in max(x): no non-missing arguments to max; returning -Inf

## Warning in min(x): no non-missing arguments to min; returning Inf

## Warning in max(x): no non-missing arguments to max; returning -Inf

## [1] -1.012184

## Warning in min(x): no non-missing arguments to min; returning Inf

## Warning in min(x): no non-missing arguments to max; returning -Inf

## Warning in min(x): no non-missing arguments to min; returning Inf

## Warning in max(x): no non-missing arguments to max; returning -Inf

## [1] -1.044812

## Warning in min(x): no non-missing arguments to min; returning Inf

## Warning in min(x): no non-missing arguments to max; returning -Inf

## Warning in min(x): no non-missing arguments to min; returning Inf

## Warning in max(x): no non-missing arguments to max; returning -Inf

## [1] -0.9776842

## Warning in min(x): no non-missing arguments to min; returning Inf

## Warning in min(x): no non-missing arguments to max; returning -Inf

## Warning in min(x): no non-missing arguments to min; returning Inf

## Warning in max(x): no non-missing arguments to max; returning -Inf

## [1] -0.9607318
```

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## Warning in min(x): no non-missing arguments to min; returning Inf
## Warning in min(x): no non-missing arguments to max; returning -Inf
## Warning in min(x): no non-missing arguments to min; returning Inf
## Warning in max(x): no non-missing arguments to max; returning -Inf
## [1] -1.011316
## Warning in min(x): no non-missing arguments to min; returning Inf
## Warning in min(x): no non-missing arguments to max; returning -Inf
## Warning in min(x): no non-missing arguments to min; returning Inf
## Warning in max(x): no non-missing arguments to max; returning -Inf
## [1] -1.006192
## Warning in min(x): no non-missing arguments to min; returning Inf
## Warning in min(x): no non-missing arguments to max; returning -Inf
## Warning in min(x): no non-missing arguments to min; returning Inf
## Warning in max(x): no non-missing arguments to max; returning -Inf
## [1] -1.014809
## Warning in min(x): no non-missing arguments to min; returning Inf
## Warning in min(x): no non-missing arguments to max; returning -Inf
## Warning in min(x): no non-missing arguments to min; returning Inf
## Warning in max(x): no non-missing arguments to max; returning -Inf
## [1] -0.9967855
## Warning in min(x): no non-missing arguments to min; returning Inf
## Warning in min(x): no non-missing arguments to max; returning -Inf
## Warning in min(x): no non-missing arguments to min; returning Inf
## Warning in max(x): no non-missing arguments to max; returning -Inf
## [1] -0.9682401
```

```
## Warning in min(x): no non-missing arguments to min; returning Inf
## Warning in min(x): no non-missing arguments to max; returning -Inf
## Warning in min(x): no non-missing arguments to min; returning Inf
## Warning in max(x): no non-missing arguments to max; returning -Inf
## [1] -0.9894199
## Warning in min(x): no non-missing arguments to min; returning Inf
## Warning in min(x): no non-missing arguments to max; returning -Inf
## Warning in min(x): no non-missing arguments to min; returning Inf
## Warning in max(x): no non-missing arguments to max; returning -Inf
## [1] -0.9845542
## Warning in min(x): no non-missing arguments to min; returning Inf
## Warning in min(x): no non-missing arguments to max; returning -Inf
## Warning in min(x): no non-missing arguments to min; returning Inf
## Warning in max(x): no non-missing arguments to max; returning -Inf
## [1] -1.033321
## Warning in min(x): no non-missing arguments to min; returning Inf
## Warning in min(x): no non-missing arguments to max; returning -Inf
## Warning in min(x): no non-missing arguments to min; returning Inf
## Warning in max(x): no non-missing arguments to max; returning -Inf
## [1] -1.041229
## Warning in min(x): no non-missing arguments to min; returning Inf
## Warning in min(x): no non-missing arguments to max; returning -Inf
## Warning in min(x): no non-missing arguments to min; returning Inf
## Warning in max(x): no non-missing arguments to max; returning -Inf
## [1] -0.9622852
```

```
## Warning in min(x): no non-missing arguments to min; returning Inf
## Warning in min(x): no non-missing arguments to max; returning -Inf
## Warning in min(x): no non-missing arguments to min; returning Inf
## Warning in max(x): no non-missing arguments to max; returning -Inf
## [1] -0.9658061
## Warning in min(x): no non-missing arguments to min; returning Inf
## Warning in min(x): no non-missing arguments to max; returning -Inf
## Warning in min(x): no non-missing arguments to min; returning Inf
## Warning in max(x): no non-missing arguments to max; returning -Inf
## [1] -0.9882659
## Warning in min(x): no non-missing arguments to min; returning Inf
## Warning in min(x): no non-missing arguments to max; returning -Inf
## Warning in min(x): no non-missing arguments to min; returning Inf
## Warning in max(x): no non-missing arguments to max; returning -Inf
## [1] -0.9749797
## Warning in min(x): no non-missing arguments to min; returning Inf
## Warning in min(x): no non-missing arguments to max; returning -Inf
## Warning in min(x): no non-missing arguments to min; returning Inf
## Warning in max(x): no non-missing arguments to max; returning -Inf
## [1] -1.049832
## Warning in min(x): no non-missing arguments to min; returning Inf
## Warning in min(x): no non-missing arguments to max; returning -Inf
## Warning in min(x): no non-missing arguments to min; returning Inf
## Warning in max(x): no non-missing arguments to max; returning -Inf
## [1] -0.992654
```

```
## Warning in min(x): no non-missing arguments to min; returning Inf
## Warning in min(x): no non-missing arguments to max; returning -Inf
## Warning in min(x): no non-missing arguments to min; returning Inf
## Warning in max(x): no non-missing arguments to max; returning -Inf
## [1] -0.9643854
## Warning in min(x): no non-missing arguments to min; returning Inf
## Warning in min(x): no non-missing arguments to max; returning -Inf
## Warning in min(x): no non-missing arguments to min; returning Inf
## Warning in max(x): no non-missing arguments to max; returning -Inf
## [1] -0.9842165
## Warning in min(x): no non-missing arguments to min; returning Inf
## Warning in min(x): no non-missing arguments to max; returning -Inf
## Warning in min(x): no non-missing arguments to min; returning Inf
## Warning in max(x): no non-missing arguments to max; returning -Inf
## [1] -0.9445891
## Warning in min(x): no non-missing arguments to min; returning Inf
## Warning in min(x): no non-missing arguments to max; returning -Inf
## Warning in min(x): no non-missing arguments to min; returning Inf
## Warning in max(x): no non-missing arguments to max; returning -Inf
## [1] -1.015628
## Warning in min(x): no non-missing arguments to min; returning Inf
## Warning in min(x): no non-missing arguments to max; returning -Inf
## Warning in min(x): no non-missing arguments to min; returning Inf
## Warning in max(x): no non-missing arguments to max; returning -Inf
## [1] -1.05408
```

```
## Warning in min(x): no non-missing arguments to min; returning Inf
## Warning in min(x): no non-missing arguments to max; returning -Inf
## Warning in min(x): no non-missing arguments to min; returning Inf
## Warning in max(x): no non-missing arguments to max; returning -Inf
## [1] -0.9778506
## Warning in min(x): no non-missing arguments to min; returning Inf
## Warning in min(x): no non-missing arguments to max; returning -Inf
## Warning in min(x): no non-missing arguments to min; returning Inf
## Warning in max(x): no non-missing arguments to max; returning -Inf
## [1] -0.9788115
## Warning in min(x): no non-missing arguments to min; returning Inf
## Warning in min(x): no non-missing arguments to max; returning -Inf
## Warning in min(x): no non-missing arguments to min; returning Inf
## Warning in max(x): no non-missing arguments to max; returning -Inf
## [1] -1.040963
## Warning in min(x): no non-missing arguments to min; returning Inf
## Warning in min(x): no non-missing arguments to max; returning -Inf
## Warning in min(x): no non-missing arguments to min; returning Inf
## Warning in max(x): no non-missing arguments to max; returning -Inf
## [1] -1.015494
## Warning in min(x): no non-missing arguments to min; returning Inf
## Warning in min(x): no non-missing arguments to max; returning -Inf
## Warning in min(x): no non-missing arguments to min; returning Inf
## Warning in max(x): no non-missing arguments to max; returning -Inf
## [1] -1.001161
```

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## Warning in min(x): no non-missing arguments to min; returning Inf

## Warning in min(x): no non-missing arguments to max; returning -Inf

## Warning in min(x): no non-missing arguments to min; returning Inf

## Warning in max(x): no non-missing arguments to max; returning -Inf

## [1] -0.9885085
## [1] -0.009214174
## [1] -0.04184255
## [1] 0.02528552
## [1] 0.04223787
## [1] -0.008346378
## [1] -0.003222163
## [1] -0.01183898
## [1] 0.006184257
## [1] 0.03472959
## [1] 0.01354978
## [1] 0.01841548
## [1] -0.03035107
## [1] -0.03825947
## [1] 0.04068449
## [1] 0.03716363
## [1] 0.01470379
## [1] 0.02799002
## [1] -0.04686244
## [1] 0.01031566
## [1] 0.03858428
## [1] 0.01875321
## [1] 0.05838061
## [1] -0.01265846
## [1] -0.05111004
## [1] 0.02511911
## [1] 0.02415826
## [1] -0.03799315
## [1] -0.01252453
## [1] 0.001808753
## [1] 0.01446124
## [1] 0.02006146
## [1] -0.01256692
## [1] 0.05456115
## [1] 0.0715135
## [1] 0.02092925
## [1] 0.02605347
## [1] 0.01743665
## [1] 0.03545989
## [1] 0.06400522
## [1] 0.04282541
## [1] 0.04769111
## [1] -0.001075442
## [1] -0.008983836
## [1] 0.06996012
```

```
## [1] 0.06643926
## [1] 0.04397942
## [1] 0.05726565
## [1] -0.0175868
## [1] 0.0395913
## [1] 0.06785991
## [1] 0.04802884
## [1] 0.08765624
## [1] 0.01661717
## [1] -0.02183441
## [1] 0.05439475
## [1] 0.05343389
## [1] -0.008717523
## [1] 0.0167511
## [1] 0.03108438
## [1] 0.04373688
## [1] -0.06242214
## [1] -0.09505051
## [1] -0.02792244
## [1] -0.01097009
## [1] -0.06155434
## [1] -0.05643013
## [1] -0.06504695
## [1] -0.04702371
## [1] -0.01847837
## [1] -0.03965819
## [1] -0.03479248
## [1] -0.08355904
## [1] -0.09146743
## [1] -0.01252348
## [1] -0.01604434
## [1] -0.03850418
## [1] -0.02521794
## [1] -0.1000704
## [1] -0.0428923
## [1] -0.01462369
## [1] -0.03445476
## [1] 0.005172648
## [1] -0.06586643
## [1] -0.104318
## [1] -0.02808885
## [1] -0.0290497
## [1] -0.09120112
## [1] -0.06573249
## [1] -0.05139921
## [1] -0.03874672
## [1] 0.03388551
## [1] 0.001257139
## [1] 0.06838521
## [1] 0.08533756
## [1] 0.03475331
## [1] 0.03987753
## [1] 0.03126071
## [1] 0.04928395
```

```
## [1] 0.07782928
## [1] 0.05664946
## [1] 0.06151517
## [1] 0.01274861
## [1] 0.004840221
## [1] 0.08378418
## [1] 0.08026332
## [1] 0.05780348
## [1] 0.07108971
## [1] -0.003762747
## [1] 0.05341535
## [1] 0.08168397
## [1] 0.06185289
## [1] 0.1014803
## [1] 0.03044122
## [1] -0.008010356
## [1] 0.0682188
## [1] 0.06725795
## [1] 0.005106534
## [1] 0.03057516
## [1] 0.04490844
## [1] 0.05756093
## [1] -0.01469978
## [1] -0.04732815
## [1] 0.01979992
## [1] 0.03675227
## [1] -0.01383198
## [1] -0.008707768
## [1] -0.01732459
## [1] 0.0006986521
## [1] 0.02924399
## [1] 0.00806417
## [1] 0.01292987
## [1] -0.03583668
## [1] -0.04374507
## [1] 0.03519888
## [1] 0.03167802
## [1] 0.009218183
## [1] 0.02250442
## [1] -0.05234804
## [1] 0.00483006
## [1] 0.03309867
## [1] 0.0132676
## [1] 0.05289501
## [1] -0.01814407
## [1] -0.05659565
## [1] 0.01963351
## [1] 0.01867265
## [1] -0.04347876
## [1] -0.01801014
## [1] -0.003676852
## [1] 0.008975639
## [1] 0.02097152
## [1] -0.01165686
```

```
## [1] 0.05547121
## [1] 0.07242356
## [1] 0.02183931
## [1] 0.02696353
## [1] 0.01834671
## [1] 0.03636995
## [1] 0.06491528
## [1] 0.04373547
## [1] 0.04860117
## [1] -0.000165383
## [1] -0.008073776
## [1] 0.07087018
## [1] 0.06734932
## [1] 0.04488948
## [1] 0.05817571
## [1] -0.01667674
## [1] 0.04050136
## [1] 0.06876997
## [1] 0.0489389
## [1] 0.0885663
## [1] 0.01752723
## [1] -0.02092435
## [1] 0.0553048
## [1] 0.05434395
## [1] -0.007807464
## [1] 0.01766116
## [1] 0.03199444
## [1] 0.04464694
## [1] -0.0364805
## [1] -0.06910888
## [1] -0.001980803
## [1] 0.01497155
## [1] -0.0356127
## [1] -0.03048849
## [1] -0.03910531
## [1] -0.02108207
## [1] 0.007463265
## [1] -0.01371655
## [1] -0.008850847
## [1] -0.0576174
## [1] -0.06552579
## [1] 0.01341816
## [1] 0.009897302
## [1] -0.01256254
## [1] 0.0007236974
## [1] -0.07412876
## [1] -0.01695066
## [1] 0.01131795
## [1] -0.00851312
## [1] 0.03111429
## [1] -0.03992479
## [1] -0.07837637
## [1] -0.002147212
## [1] -0.003108066
```

```
## [1] -0.06525948
## [1] -0.03979086
## [1] -0.02545757
## [1] -0.01280508
## [1] -0.05523787
## [1] -0.08786624
## [1] -0.02073817
## [1] -0.003785821
## [1] -0.05437007
## [1] -0.04924586
## [1] -0.05786267
## [1] -0.03983944
## [1] -0.0112941
## [1] -0.03247392
## [1] -0.02760821
## [1] -0.07637477
## [1] -0.08428316
## [1] -0.005339206
## [1] -0.008860065
## [1] -0.0313199
## [1] -0.01803367
## [1] -0.09288613
## [1] -0.03570803
## [1] -0.007439416
## [1] -0.02727049
## [1] 0.01235692
## [1] -0.05868216
## [1] -0.09713374
## [1] -0.02090458
## [1] -0.02186543
## [1] -0.08401685
## [1] -0.05854822
## [1] -0.04421494
## [1] -0.03156245
## [1] -0.06070257
## [1] -0.09333094
## [1] -0.02620287
## [1] -0.009250522
## [1] -0.05983477
## [1] -0.05471056
## [1] -0.06332738
## [1] -0.04530414
## [1] -0.0167588
## [1] -0.03793862
## [1] -0.03307292
## [1] -0.08183947
## [1] -0.08974786
## [1] -0.01080391
## [1] -0.01432477
## [1] -0.03678461
## [1] -0.02349837
## [1] -0.09835083
## [1] -0.04117273
## [1] -0.01290412
```

```
## [1] -0.03273519
## [1] 0.006892217
## [1] -0.06414686
## [1] -0.1025984
## [1] -0.02636928
## [1] -0.02733013
## [1] -0.08948155
## [1] -0.06401293
## [1] -0.04967964
## [1] -0.03702715
## [1] -0.03984215
## [1] -0.07247052
## [1] -0.005342449
## [1] 0.0116099
## [1] -0.03897435
## [1] -0.03385013
## [1] -0.04246695
## [1] -0.02444371
## [1] 0.004101619
## [1] -0.0170782
## [1] -0.01221249
## [1] -0.06097905
## [1] -0.06888744
## [1] 0.01005651
## [1] 0.006535656
## [1] -0.01592418
## [1] -0.002637949
## [1] -0.07749041
## [1] -0.02031231
## [1] 0.007956305
## [1] -0.01187477
## [1] 0.02775264
## [1] -0.04328644
## [1] -0.08173802
## [1] -0.005508858
## [1] -0.006469712
## [1] -0.06862113
## [1] -0.0431525
## [1] -0.02881922
## [1] -0.01616673
## [1] 0.03871586
## [1] 0.006087485
## [1] 0.07321556
## [1] 0.09016791
## [1] 0.03958366
## [1] 0.04470787
## [1] 0.03609105
## [1] 0.05411429
## [1] 0.08265963
## [1] 0.06147981
## [1] 0.06634551
## [1] 0.01757896
## [1] 0.009670567
## [1] 0.08861452
```

```
## [1] 0.08509366
## [1] 0.06263382
## [1] 0.07592006
## [1] 0.001067599
## [1] 0.0582457
## [1] 0.08651431
## [1] 0.06668324
## [1] 0.1063106
## [1] 0.03527157
## [1] -0.00318001
## [1] 0.07304915
## [1] 0.07208829
## [1] 0.00993688
## [1] 0.0354055
## [1] 0.04973879
## [1] 0.06239128
```

```
##    user  system elapsed
##  184.03    0.25  184.92
```

```
write.csv(df2014, "datos2013.csv")
saveRDS(shotDataTotal2014, "shotDataTotal2013.rds")
saveRDS(shotDatafDef2014, "shotDatafDef2013.rds")
```