

Bios 301: Final Project

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Due Tuesday, 9 December, 6:00 PM

200 points total.

Submit a single knitr file (named `final.rmd`), along with a valid PDF output file. Add your name as `author` to the file's metadata section. Raw R code/output or word processor files are not acceptable.

All work should be done by the student, please no collaboration. You may ask the instructor for help or clarification.

Obtain a copy of the [football-values lecture](#) – make sure to update this repository if you have previously cloned it. Save the six CSV files in your working directory (note the new file `nfl_current14.csv`). You may utilize [assignment 2](#), [question 3](#) in your solution.

Task 1: Finding Residuals (80 points)

At the beginning of the course we examined projections for the 2014 NFL season. With the season ~65% completed, let's compare the observed values to the estimated values. Place all code at the end of the instructions.

1. Read in the five projection files

```
k <- read.csv('proj_k14.csv', header=TRUE, stringsAsFactors=FALSE)
qb <- read.csv('proj_qb14.csv', header=TRUE, stringsAsFactors=FALSE)
rb <- read.csv('proj_rb14.csv', header=TRUE, stringsAsFactors=FALSE)
te <- read.csv('proj_te14.csv', header=TRUE, stringsAsFactors=FALSE)
wr <- read.csv('proj_wr14.csv', header=TRUE, stringsAsFactors=FALSE)
```

2. Add a column for position

```
k[, 'pos'] <- 'k'
qb[, 'pos'] <- 'qb'
rb[, 'pos'] <- 'rb'
te[, 'pos'] <- 'te'
wr[, 'pos'] <- 'wr'
```

3. Combine these files

```
cols <- unique(c(names(k), names(qb), names(rb), names(te), names(wr)))
k[, setdiff(cols, names(k))] <- 0
qb[, setdiff(cols, names(qb))] <- 0
rb[, setdiff(cols, names(rb))] <- 0
te[, setdiff(cols, names(te))] <- 0
wr[, setdiff(cols, names(wr))] <- 0
x <- rbind(k[, cols], qb[, cols], rb[, cols], te[, cols], wr[, cols])
names(x) <- gsub('[.]', '', names(x))
```

4. The projection data assumes teams play 16 games. The observed data is taken after week 11, where 30 teams have played 10 games, and 2 teams (PIT and CAR) have played 11. The projection data includes a column for a player's team. In the projection data, multiply the numeric columns by percent of the season played (so 11/16 if team is PIT/CAR, otherwise, 10/16).

```
x[which(x$XTeam=='PIT' | x$XTeam=='CAR'),sapply(x, is.numeric)]<-x[which(x$XTeam=='PIT' | x$XTeam=='CAR')*11/16]
x[which(!(x$XTeam=='PIT' | x$XTeam=='CAR')),sapply(x, is.numeric)]<-x[which(!(x$XTeam=='PIT' | x$XTeam=='CAR'))*10/16]
```

5. Read in the observed data (nfl_current14.csv)

```
current <- read.csv('nfl_current14.csv', header=TRUE, stringsAsFactors=FALSE)
```

6. Merge the projected data with the observed data by the player's name

```
total <- merge(x,current,by='PlayerName')
total[which(total$PlayerName=='Dexter McCluster')[1],sapply(total, is.numeric)]<-colMeans(total[which(total$PlayerName=='Dexter McCluster')[1],])
total[which(total$PlayerName=='Zach Miller')[1],sapply(total, is.numeric)]<-colMeans(total[which(total$PlayerName=='Zach Miller')[1],])
total<-total[c(-which(total$PlayerName=='Dexter McCluster')[2],-which(total$PlayerName=='Zach Miller')[2]),]
rownames(total) <- 1:nrow(total)
# Here I merged the duplicate records by taking means of the two
```

7. Determine the proper mapping of categories in the projected data to the observed data. For instance, fg=>FGM, fga=>FGA, xpt=>XPM (the rest should be easy). Hint: there should be 15 mapped categories.

```
name.proj <- names(total)[c(3:5,8:19)]
name.current<-c('FGM','FGA','XPM','Comp.pass','Att.pass','Yds.pass','TD.pass','Int.pass','Att.rush','Yds.rush','TD.rush')
```

8. Create the following vector pred.pos <- c(k=20, qb=20, rb=40, wr=60, te=20). This is the number of players to examine at each position.

```
pred.pos <- c(k=20, qb=20, rb=40, wr=60, te=20)
```

9. Create a list of residual values by position

```
rv<-vector("list",length=5)
names(rv) <- c('k','qb','rb','wr','te')
criteria <- c('fg','pass_tds','rush_tds','rec_tds','rec_tds')
```

10. When subsetting by position, re-order the data as follows:

- if position = 'k', order by projected 'fg' descendingly
 - if position = 'qb', order by projected 'pass_tds' descendingly
 - if position = 'rb', order by projected 'rush_tds' descendingly
 - if position = 'wr', order by projected 'rec_tds' descendingly
 - if position = 'te', order by projected 'rec_tds' descendingly
1. Reduce the subset to the number of rows given above. For instance, look at the top 40 'rb', ordered by projected rushing touchdowns.
 2. Take the difference between the observed data and the projected data for each category. Thus, the residuals for 'rb' should be a 40x15 data.frame or matrix.

```

n <- 1
for(i in names(rv)){
  rv[[i]]<-total[which(total$pos==i)[order(total[which(total$pos==i),criteria[n]],decreasing=TRUE)]]
  rownames(rv[[i]]) <- NULL
  n <- n+1
}

for(i in names(rv)){
  n<-1
  for(j in name.proj){
    rv[[i]][[j]]<-rv[[i]][[name.current[n]]]-rv[[i]][[j]]
    n<-n+1
  }
  rv[[i]]<-rv[[i]][,name.proj]
}
# Here are the values for residual
rv

```

```

## $k
##      fg      fga      xpt pass_att pass_cmp pass_yds pass_tds pass_ints
## 1 -1.9375 -1.3125  4.8750         0         0         0         0         0
## 2  3.6250  2.1875  3.5625         0         0         0         0         0
## 3  2.5625  0.3750  9.5625         0         0         0         0         0
## 4 -0.4375  1.4375 -6.0625         0         0         0         0         0
## 5  0.3125  0.0625 -0.6875         0         0         0         0         0
## 6 -2.4375 -4.1250 -1.3125         0         0         0         0         0
## 7 -1.1250  0.1250  2.8750         0         0         0         0         0
## 8 -2.1250 -2.6875  0.7500         0         0         0         0         0
## 9  0.1250 -0.4875  4.4312         0         0         0         0         0
## 10 -2.3750 -3.5000  5.2500         0         0         0         0         0
## 11  0.8813  2.1313 -4.4375         0         0         0         0         0
## 12  1.0625  1.7500 -8.0000         0         0         0         0         0
## 13 -8.6250 -9.1250 -3.8750         0         0         0         0         0
## 14  4.5000  5.0000  4.6875         0         0         0         0         0
## 15 -1.3125 -3.0625 -4.5000         0         0         0         0         0
## 16  5.7500  6.0000 -6.4375         0         0         0         0         0
## 17  0.8750 -0.9375 -6.1875         0         0         0         0         0
## 18 -0.8750 -1.3125 -3.7500         0         0         0         0         0
## 19 -4.6875 -5.8125 -5.8125         0         0         0         0         0
## 20 -5.6250 -8.6250  3.5000         0         0         0         0         0
##      rush_att rush_yds rush_tds fumbles rec_att rec_yds rec_tds
## 1          0          0          0         0         0         0
## 2          0          0          0         0         0         0
## 3          0          0          0         0         0         0
## 4          0          0          0         0         0         0
## 5          0          0          0         0         0         0
## 6          0          0          0         0         0         0
## 7          0          0          0         0         0         0
## 8          0          0          0         0         0         0
## 9          0          0          0         0         0         0
## 10         0          0          0         0         0         0
## 11         0          0          0         0         0         0
## 12         0          0          0         0         0         0
## 13         0          0          0         0         0         0

```

```

## 14      0      0      0      0      0      0      0
## 15      0      0      0      0      0      0      0
## 16      0      0      0      0      0      0      0
## 17      0      0      0      0      0      0      0
## 18      0      0      0      0      0      0      0
## 19      0      0      0      0      0      0      0
## 20      0      0      0      0      0      0      0
##
## $qb
##      fg fga xpt pass_att pass_cmp pass_yds pass_tds pass_ints rush_att
## 1      0  0  0 -126.62 136.375   3.062   1.625   1.5000 -0.0625
## 2      0  0  0 -110.94 149.375  -90.562  -5.875   1.0625 -1.1875
## 3      0  0  0 -131.06  87.188  -98.250   4.625  -2.0625 -9.0000
## 4      0  0  0 -174.88 125.125 -316.000  -8.062  -1.4375  8.3125
## 5      0  0  0 -119.16 157.731  354.450   4.475  -3.5563  1.7500
## 6      0  0  0 -201.69  20.250 -566.312  -1.500  -3.8125 -0.8750
## 7      0  0  0 -163.19 115.438 -187.625   4.875  -2.3125  2.7500
## 8      0  0  0  -90.44 160.312  172.125   2.312   3.0625 12.0625
## 9      0  0  0 -147.25 118.312 -152.188  -1.688  -1.0000 -0.2500
## 10     0  0  0 -149.12  95.312 -558.625  -5.500   2.3750 -23.6250
## 11     0  0  0 -130.19  96.125 -253.562   2.812  -0.8750  7.6875
## 12     0  0  0 -212.50   4.125 -1054.062  -6.750  -9.3125 -3.9375
## 13     0  0  0 -144.56  97.875 -180.438  -6.375  -0.4375  2.6875
## 14     0  0  0 -100.12 138.562  -19.625  -2.312  -1.3125  9.0625
## 15     0  0  0  -92.56 208.125  737.375  11.875   3.3125 -0.3125
## 16     0  0  0  -90.62 119.250 -199.000  -2.938  -2.6250 17.6250
## 17     0  0  0 -117.44 156.125   13.438   2.438   1.3125 -4.6250
## 18     0  0  0 -133.56 137.250   38.562   1.938  -2.4375 -0.5000
## 19     0  0  0 -140.16 131.219  -92.831  -3.056  -0.0375 -12.3125
## 20     0  0  0 -129.44 134.188 -185.500   2.750  -3.3125  6.6875
##      rush_yds rush_tds fumbles rec_att rec_yds rec_tds
## 1      -4.375   0.0000  0.1250      0      0      0
## 2       7.188   0.6875  2.7500      0      0      0
## 3       8.625  -0.2500  4.7500      0      0      0
## 4      -7.188   1.2500  3.4375      0      0      0
## 5     -39.219  -0.6875  4.5938      0      0      0
## 6      12.812  -0.3125  1.4375      0      0      0
## 7      -3.188  -0.6875  4.1250      0      0      0
## 8      23.562   0.3750  8.1250      0      0      0
## 9      29.438  -0.5000  1.7500      0      0      0
## 10    -82.125  -1.3125  2.1250      0      0      0
## 11     38.062   0.0000  3.8125      0      0      0
## 12     17.000   0.0000  0.8125      0      0      0
## 13      5.250   1.0625 -0.8750      1     18      1
## 14      5.500  -2.5625  4.7500      0      0      0
## 15    -53.938  -0.0625  4.1250      0      0      0
## 16    284.812   2.4375  4.8125      1     17      0
## 17     17.875   1.0000  3.7500      0      0      0
## 18    -15.938  -0.4375  0.1250      0      0      0
## 19   -109.325  -2.3312  5.2812      0      0      0
## 20    111.562  -0.8125  3.8125      1     -4      0
##
## $rb
##      fg fga xpt pass_att pass_cmp pass_yds pass_tds pass_ints rush_att

```

## 1	0	0	0	0	0	0	0	0	-164.000
## 2	0	0	0	0	0	0	0	0	-42.375
## 3	0	0	0	0	0	0	0	0	15.062
## 4	0	0	0	0	0	0	0	0	4.250
## 5	0	0	0	0	0	0	0	0	-25.375
## 6	0	0	0	0	0	0	0	0	-99.688
## 7	0	0	0	0	0	0	0	0	3.688
## 8	0	0	0	0	0	0	0	0	10.887
## 9	0	0	0	0	0	0	0	0	101.062
## 10	0	0	0	0	0	0	0	0	-111.375
## 11	0	0	0	0	0	0	0	0	-49.938
## 12	0	0	0	0	0	0	0	0	-114.062
## 13	0	0	0	0	0	0	0	0	1.500
## 14	0	0	0	0	0	0	0	0	6.250
## 15	0	0	0	0	0	0	0	0	-4.250
## 16	0	0	0	0	0	0	0	0	-110.750
## 17	0	0	0	0	0	0	0	0	-40.562
## 18	0	0	0	0	0	0	0	0	-121.250
## 19	0	0	0	0	0	0	0	0	-4.938
## 20	0	0	0	0	0	0	0	0	-26.250
## 21	0	0	0	0	0	0	0	0	-39.062
## 22	0	0	0	0	0	0	0	0	26.000
## 23	0	0	0	0	0	0	0	0	-55.000
## 24	0	0	0	0	0	0	0	0	-40.500
## 25	0	0	0	0	0	0	0	0	6.500
## 26	0	0	0	0	0	0	0	0	-60.438
## 27	0	0	0	0	1	0	0	0	-41.938
## 28	0	0	0	0	0	0	0	0	-58.188
## 29	0	0	0	0	0	0	0	0	-35.000
## 30	0	0	0	0	0	0	0	0	-31.688
## 31	0	0	0	0	0	0	0	0	-90.688
## 32	0	0	0	0	0	0	0	0	13.375
## 33	0	0	0	0	0	0	0	0	-21.075
## 34	0	0	0	0	0	0	0	0	22.312
## 35	0	0	0	0	0	0	0	0	-59.812
## 36	0	0	0	0	0	0	0	0	64.000
## 37	0	0	0	0	0	0	0	0	-61.500
## 38	0	0	0	0	0	0	0	0	45.188
## 39	0	0	0	0	0	0	0	0	-64.188
## 40	0	0	0	0	0	0	0	0	-20.875
##	rush_yds	rush_tds	fumbles	rec_att	rec_yds	rec_tds			
## 1	-786.69	-6.9375	-1.56250	-24.438	-153.312	-0.9375			
## 2	-229.88	-1.6250	1.37500	3.562	152.125	1.3750			
## 3	-177.81	-4.3125	0.75000	-5.062	-130.562	-1.5625			
## 4	55.12	2.6875	-0.25000	7.250	116.688	2.3750			
## 5	-116.88	2.0000	1.75000	-20.062	-226.438	-0.5000			
## 6	-530.56	-4.8750	-0.56250	-21.312	-149.750	-0.9375			
## 7	-106.69	0.1875	0.43750	1.750	40.500	-0.1875			
## 8	167.59	-3.7750	-0.68750	23.038	224.262	1.3813			
## 9	532.00	1.5000	3.75000	1.125	22.000	-0.6250			
## 10	-492.06	-4.3750	0.75000	-3.000	20.188	-0.5000			
## 11	-288.56	-3.1875	-1.25000	-1.500	-15.812	0.0000			
## 12	-573.88	-4.0000	-1.25000	-13.125	-113.438	-0.9375			
## 13	-61.88	-1.8750	-0.25000	25.312	235.375	1.1875			

```

## 14  -21.69  -2.8125  0.37500  -2.750  11.562  1.0000
## 15   94.19   2.5000  0.75000  -2.688   3.938  2.0000
## 16 -550.44  -3.3125  0.06250 -11.375 -35.500 -0.6250
## 17 -302.88  -0.1250 -2.18750  -8.062 -55.438 -0.1250
## 18 -556.19  -3.1250  0.06250  -9.000 -52.625 -0.3750
## 19 -100.19  -0.9375  1.43750  -6.875 -21.812 -0.7500
## 20 -133.38  -1.9375 -0.25000  -8.688 -57.125 -0.6250
## 21 -197.44  -1.9375  0.12500  -4.625   1.875 -0.4375
## 22  170.81   1.2500  1.68750  11.125 122.125 -0.1875
## 23 -284.50  -1.6875 -0.93750  -8.875 -69.938 -0.7500
## 24 -135.19  -1.5000  2.00000  -3.125 -20.062  0.0000
## 25  -39.50   0.5000 -0.31250  -5.438 -49.312 -0.6250
## 26 -354.19  -3.4375  0.43750  -9.375 -65.438  0.3125
## 27 -180.62  -2.3750  2.06250  14.688 120.875  0.5625
## 28 -237.56  -2.3125 -0.56250  -6.750 -66.125  0.1250
## 29 -227.06   1.8125 -1.56250 -13.562 -134.250 -1.8125
## 30 -169.62  -1.0625  0.68750 -11.875 -79.562 -0.1875
## 31 -423.56  -3.0625  0.37500 -13.375 -109.625 -0.4375
## 32  -28.25  -0.0625  0.00000  -6.250 -66.375  0.8125
## 33  -88.68  -0.9562 -0.03125   1.394   3.069  0.0000
## 34  155.81   2.1250  2.37500   5.875  19.062  0.8125
## 35 -253.06  -1.7500 -0.31250  -0.375 -10.688  2.0000
## 36   15.50   0.3125  1.06250   8.438  68.625  0.6250
## 37 -243.44  -1.6250 -0.93750 -17.125 -136.938 -0.6250
## 38   13.19   1.4375  0.68750   4.125  25.375  0.0000
## 39 -260.62  -2.5625 -0.31250  -5.500 -44.000 -0.1875
## 40  -89.81  -1.5625  0.68750  -6.500 -46.812  0.0000

```

```
##
```

```
## $wr
```

```

##      fg fga xpt pass_att pass_cmp pass_yds pass_tds pass_ints rush_att
## 1      0  0  0          0          0          0          0          0  0.0000
## 2      0  0  0          0          0          0          0          0  0.0000
## 3      0  0  0          0          0          0          0          0 -0.3125
## 4      0  0  0          0          0          0          0          0  0.0000
## 5      0  0  0          0          0          0          0          0  2.0000
## 6      0  0  0          0          0          0          0          0  0.0000
## 7      0  0  0          0          0          0          0          0 -1.5000
## 8      0  0  0          0          0          0          0          0 -0.6250
## 9      0  0  0          0          0          0          0          0  0.0000
## 10     0  0  0          0          0          0          0          0  0.0000
## 11     0  0  0          2          2         20          1          0 -0.4688
## 12     0  0  0          0          0          0          0          0 -1.8125
## 13     0  0  0          0          0          0          0          0 -1.3125
## 14     0  0  0          0          0          0          0          0 -0.3125
## 15     0  0  0          0          0          0          0          0  0.6875
## 16     0  0  0          0          0          0          0          0  0.8125
## 17     0  0  0          0          0          0          0          0  0.0000
## 18     0  0  0          0          0          0          0          0  0.0000
## 19     0  0  0          0          0          0          0          0 -0.4375
## 20     0  0  0          0          0          0          0          0  1.0000
## 21     0  0  0          0          0          0          0          0  0.0000
## 22     0  0  0          0          0          0          0          0  5.6875
## 23     0  0  0          0          0          0          0          0  0.0000
## 24     0  0  0          0          0          0          0          0  0.0000

```

## 25	0	0	0	0	0	0	0	0	-1.2500
## 26	0	0	0	0	0	0	0	0	9.1875
## 27	0	0	0	0	0	0	0	0	-0.6250
## 28	0	0	0	0	0	0	0	0	0.1250
## 29	0	0	0	0	0	0	0	0	-1.2500
## 30	0	0	0	0	0	0	0	0	0.0000
## 31	0	0	0	0	0	0	0	0	6.7500
## 32	0	0	0	0	0	0	0	0	-1.1875
## 33	0	0	0	0	0	0	0	0	0.0000
## 34	0	0	0	0	0	0	0	0	0.0000
## 35	0	0	0	0	0	0	0	0	0.0000
## 36	0	0	0	0	1	0	0	0	0.1875
## 37	0	0	0	0	0	0	0	0	4.1875
## 38	0	0	0	0	0	0	0	0	-0.9375
## 39	0	0	0	0	0	0	0	0	0.0000
## 40	0	0	0	0	0	0	0	0	0.0000
## 41	0	0	0	0	0	0	0	0	0.0000
## 42	0	0	0	0	0	0	0	0	0.0000
## 43	0	0	0	0	0	0	0	0	0.0000
## 44	0	0	0	0	0	0	0	0	0.0000
## 45	0	0	0	0	0	0	0	0	0.0000
## 46	0	0	0	0	0	0	0	0	2.6875
## 47	0	0	0	0	0	0	0	0	0.0000
## 48	0	0	0	0	1	0	0	0	-0.6250
## 49	0	0	0	0	0	0	0	0	0.0000
## 50	0	0	0	0	0	0	0	0	0.0000
## 51	0	0	0	0	0	0	0	0	-0.6250
## 52	0	0	0	0	0	0	0	0	0.0000
## 53	0	0	0	0	0	0	0	0	12.1875
## 54	0	0	0	0	0	0	0	0	0.0000
## 55	0	0	0	0	0	0	0	0	3.3125
## 56	0	0	0	0	0	0	0	0	0.0000
## 57	0	0	0	0	0	0	0	0	-0.6250
## 58	0	0	0	0	0	0	0	0	0.0000
## 59	0	0	0	0	0	0	0	0	1.3750
## 60	0	0	0	0	0	0	0	0	-0.6250
##	rush_yds	rush_tds	fumbles	rec_att	rec_yds	rec_tds			
## 1	0.0000	0.0000	-0.3125	12.7500	204.000	-1.9375			
## 2	0.0000	0.0000	-0.6250	-24.6250	-466.625	-4.5625			
## 3	-2.5000	0.0000	-0.6250	-2.6875	-28.250	0.8750			
## 4	0.0000	0.0000	1.0000	-14.3750	-204.062	1.3125			
## 5	2.0000	0.0000	2.0000	-28.0000	-314.000	-2.5625			
## 6	0.0000	0.0000	-0.3125	10.0000	213.875	2.6875			
## 7	-21.1875	0.0000	1.6875	9.1250	41.562	-3.3125			
## 8	-3.4375	0.0000	1.0000	-7.1250	-15.625	-3.6250			
## 9	0.0000	0.0000	-0.6250	-22.1250	-359.938	-4.3750			
## 10	0.0000	0.0000	-0.6250	8.1875	-136.375	-4.1875			
## 11	-14.8438	0.0000	1.6562	16.8438	221.600	3.8438			
## 12	-17.6250	-0.3125	0.3750	3.5625	-36.812	-1.0000			
## 13	-50.0625	0.0000	0.3750	-0.0625	43.938	5.1250			
## 14	-3.7500	0.0000	0.0000	-2.5625	-183.188	-2.8750			
## 15	0.2500	0.0000	-0.6250	-7.5625	-211.938	-0.8125			
## 16	-17.0000	0.0000	0.0000	2.6875	220.312	-0.4375			
## 17	0.0000	0.0000	0.6875	-6.5000	-115.062	0.6250			

```

## 18  0.0000  0.0000 -0.6250 -29.6250 -350.375 -3.3750
## 19 40.8125  0.3750  0.0000 -15.1875 -248.500 -3.1875
## 20  2.0000  0.0000  2.0000 -22.0000 -243.125 -0.1250
## 21  0.0000  0.0000 -0.3125 12.1875 299.188  5.0000
## 22 22.0625  0.0000  0.6875 24.4375 353.750  3.1250
## 23  0.0000  0.0000 -0.6250  2.9375 -112.938  0.1250
## 24  0.0000  0.0000  0.6875 -13.5625 -71.312 -2.8750
## 25 -5.9375  0.0000 -0.9375 -10.0000 -127.125  2.1250
## 26 90.3750  0.3750  1.6875 -7.6875 -266.375 -3.8125
## 27 -5.9375  0.0000 -0.3125 -12.0625 -278.188 -0.8125
## 28 -3.6250  0.0000  0.3750 24.8125 353.438 -0.7500
## 29 -10.3125 0.0000 -0.3125 -14.1250 -216.500  2.2500
## 30  0.0000  0.0000  2.0000 -2.8750 -165.938 -2.6875
## 31 73.3750  0.0000  1.3750  2.0000 -18.188 -1.6875
## 32 -10.1250 0.0000 -0.6250  7.5625 109.875  1.3125
## 33  0.0000  0.0000 -0.3125 14.1875 322.688  3.3750
## 34  0.0000  0.0000 -0.3125 14.3750  30.375 -1.5625
## 35  0.0000  0.0000  0.6875  3.7500 -111.188 -2.5000
## 36 -8.0625  0.0000  1.6875 -0.7500 -70.688  2.5625
## 37 56.7500  1.0000  0.0625 20.5625  95.250 -0.3750
## 38 -7.5000  0.0000  0.6875  2.6250 -27.375 -1.3125
## 39  0.0000  0.0000  0.6562 19.2062 278.500  4.7687
## 40  0.0000  0.0000 -0.3125 -31.8125 -440.062 -3.1250
## 41  0.0000  0.0000  1.0000 -0.1875  -1.312 -3.0625
## 42  0.0000  0.0000 -0.6250 -29.2500 -373.312 -2.0000
## 43  0.0000  0.0000  0.0000 -8.6250 -249.812  0.1250
## 44  0.0000  0.0000  3.0000 12.6875  31.188  0.1250
## 45  0.0000  0.0000  0.0000 -2.2500  -1.562 -0.8750
## 46 41.5000  0.0000  0.3750 -11.9375 -178.938  1.1250
## 47  0.0000  0.0000  0.0000  3.7500  42.688 -0.8750
## 48 -4.3750  0.0000 -0.3125 18.5000 186.250  0.1875
## 49  0.0000  0.0000  0.6875  9.1250 268.000  1.1875
## 50  0.0000  0.0000  0.0625 15.0000 293.688  1.1875
## 51 -4.3750  0.0000 -0.3125 10.5000  26.312 -0.6875
## 52  0.0000  0.0000 -0.3125 -1.0000  15.125 -0.6875
## 53 11.7500 -0.6250  1.0625 -14.8125 -258.438 -2.6875
## 54  0.0000  0.0000 -1.0312 -1.4813  -3.356 -2.6125
## 55 13.1562  0.0000 -0.3438  6.4375  25.856 -0.6125
## 56  0.0000  0.0000  1.0000 -5.1875 -146.000 -1.5625
## 57 -5.3125  0.0000 -1.2500 -23.1250 -362.000 -1.5625
## 58  0.0000  0.0000 -0.3125 17.6875 167.188  3.5000
## 59 -0.3125  0.0000 -0.6250 -12.8125 -235.688 -2.3750
## 60 -3.7500  0.0000 -0.3125 17.0625 254.375  2.8125
##
## $te
##  fg fga xpt pass_att pass_cmp pass_yds pass_tds pass_ints rush_att
## 1  0  0  0      0      0      0      0      0      0
## 2  0  0  0      0      0      0      0      0      0
## 3  0  0  0      0      0      0      0      0      1
## 4  0  0  0      0      0      0      0      0      0
## 5  0  0  0      0      0      0      0      0      0
## 6  0  0  0      0      0      0      0      0      0
## 7  0  0  0      0      0      0      0      0      0
## 8  0  0  0      0      0      0      0      0      0

```



```
## 9 0 0 0 0 0 0 0 0 0
## 10 0 0 0 0 0 0 0 0 0
## 11 0 0 0 0 0 0 0 0 0
## 12 0 0 0 0 0 0 0 0 0
## 13 0 0 0 0 0 0 0 0 0
## 14 0 0 0 0 0 0 0 0 0
## 15 0 0 0 0 0 0 0 0 0
## 16 0 0 0 0 0 0 0 0 0
## 17 0 0 0 0 0 0 0 0 0
## 18 0 0 0 0 0 0 0 0 0
## 19 0 0 0 0 0 0 0 0 0
## 20 0 0 0 0 0 0 0 0 1
##      rush_yds rush_tds fumbles rec_att rec_yds rec_tds
## 1      0      0 1.0000  4.188 -114.69 -1.0625
## 2      0      0 0.6875 -7.625 -160.12  5.1875
## 3      4      0 -0.3125 -19.625 -338.06 -4.0625
## 4      0      0 0.0000 10.500  161.69  3.0625
## 5      0      0 0.0000 -29.562 -334.44 -3.3750
## 6      0      0 0.0000 -24.312 -349.88 -4.2500
## 7      0      0 0.0000 -8.938 -100.81 -1.0625
## 8      0      0 0.0000 -16.500 -247.75 -4.0625
## 9      0      0 -0.3438  6.294  143.77  1.2188
## 10     0      0 -0.3125 -33.562 -300.00 -2.6875
## 11     0      0 0.6875  1.750  130.69  0.5000
## 12     0      0 0.0000 -14.812 -240.56 -2.5000
## 13     0      0 0.6875 -5.125  -15.50 -1.5000
## 14     0      0 0.3125  0.650   31.99 -1.4375
## 15     0      0 0.0000 -15.688 -233.62 -3.1875
## 16     0      0 -0.3125 13.938  139.19  1.8750
## 17     0      0 1.0000 -1.188   42.56  3.9375
## 18     0      0 -0.6250  3.312  -69.44 -0.9375
## 19     0      0 -0.3125 -1.062   39.06  6.1875
## 20     0      0 -0.6250  3.688   82.19 -1.7500
```

Stub Answer The result of task 1 is necessary to complete task 3. If you were unable to generate a list of residuals, please use the following code to simulate residuals. Otherwise, you do not need this code.

```
pred.pos <- c(k=20, qb=20, rb=40, wr=60, te=20)
noise <- list()
empty <- data.frame(fg=0, fga=0, xpt=0, pass_att=0, pass_cmp=0, pass_yds=0, pass_tds=0, pass_ints=0,
                    rush_att=0, rush_yds=0, rush_tds=0, fumbles=0, rec_att=0, rec_yds=0, rec_tds=0)
for(i in names(pred.pos)) {
  noise[[i]] <- empty[rep(1,pred.pos[i]),]
  row.names(noise[[i]]) <- NULL
}
set.seed(35)
noise$k$fg <- rnorm(20, 0, 3)
noise$k$fga <- rnorm(20, 0, 4)
noise$k$xpt <- rnorm(20, 0, 5)
noise$qb$pass_att <- rnorm(20, 0, 25)
noise$qb$pass_cmp <- rnorm(20, 0, 15)
noise$qb$pass_yds <- rnorm(20, 0, 150)
noise$qb$pass_tds <- rnorm(20, 0, 4)
```

```

noise$qb$pass_ints <- rnorm(20, 0, 2)
noise$rb$rush_att <- rnorm(40, 0, 40)
noise$rb$rush_yds <- rnorm(40, 0, 200)
noise$rb$rush_tds <- rnorm(40, 0, 2)
noise$rb$fumbles <- rnorm(40, 0, 1)
noise$wr$rec_att <- rnorm(60, 0, 10)
noise$wr$rec_yds <- rnorm(60, 0, 160)
noise$wr$rec_tds <- rnorm(60, 0, 2)
noise$te$rec_att <- rnorm(20, 0, 10)
noise$te$rec_yds <- rnorm(20, 0, 120)
noise$te$rec_tds <- rnorm(20, 0, 2)

```

Task 2: Creating League S3 Class (80 points)

Create an S3 class called `league`. Place all code at the end of the instructions.

1. Create a function `league` that takes 5 arguments (`stats`, `nteam`s, `cap`, `pos`, `points`)
 - Inside the function, save the `stats` argument as an element of a list
 - The other arguments can also be saved on the list, or saved as attributes of the list
 - Define the class of the list as `league`
 - Add another list element, `fan_pts`, which is assigned the output of function `calcPoints` (defined below)
 - Add another list element, `values`, which is assigned the output of function `buildValues` (defined below)
 - Add another list element, `sims`, and assign it to `NULL`
 - Return the list (which should be a S3 class now)
 - It's worth mentioning that in OOP terminology, `stats`, `fan_pts`, `values`, and `sims` are attributes of the `league` class. This may be confusing as any R variable may have attributes (see `?attr` or `?attributes`). Henceforth, I will simply refer to `stats`, etc as list elements. `nteam`s, `cap`, `pos`, and `points` will either be list elements or list attributes (depending on how you define your class), and I will refer to them as settings.
1. Create a function `calcPoints` that takes 1 argument, a league object
 - Use the `stats` list element and the `points` setting from the league object
 - Calculate points for each stat category by multiplying that stat by its respective point multiplier
 - Create a new column `Points`, which is the sum of all the points categories
 - Order the data set by `Points` descendingly
 - Return the data set with the following columns: `PlayerName`, `XTeam`, `pos`, `Points`
 - Note this will be assigned to the `fan_pts` list element
1. Create a function `buildValues` that takes 1 argument, a league object
 - Use the `fan_pts` list element and the `nteam`s, `cap`, and `pos` settings
 - Order the data set by `Points` descendingly
 - Create a new column `marg`
 - Order the data set by `marg` descendingly
 - Create a new column `value`

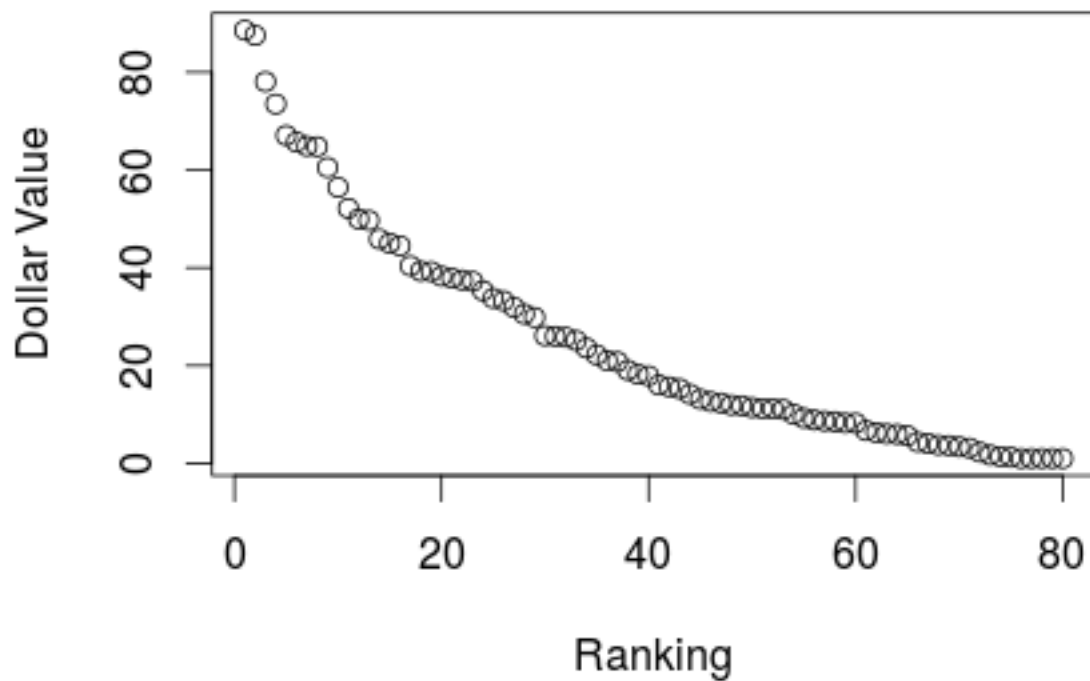
- Return the data set with the following columns: `PlayerName`, `XTeam`, `pos`, `Points`, `marg`, `value`
- Note this will be assigned to the `values` list element

1. Create a `print` method for the league class

- Print the `values` list element

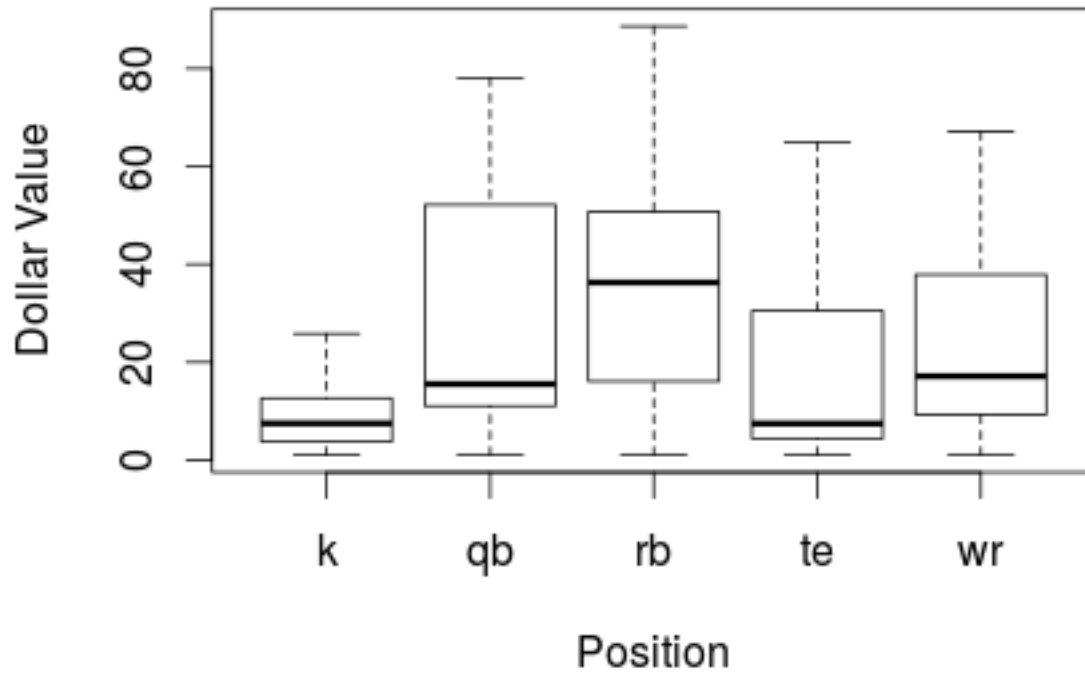
1. Create a `plot` method for the league class

- Plot the `value` column of the `values` list element
- Add minimal plotting decorations (such as axis labels)
- Here's an example:



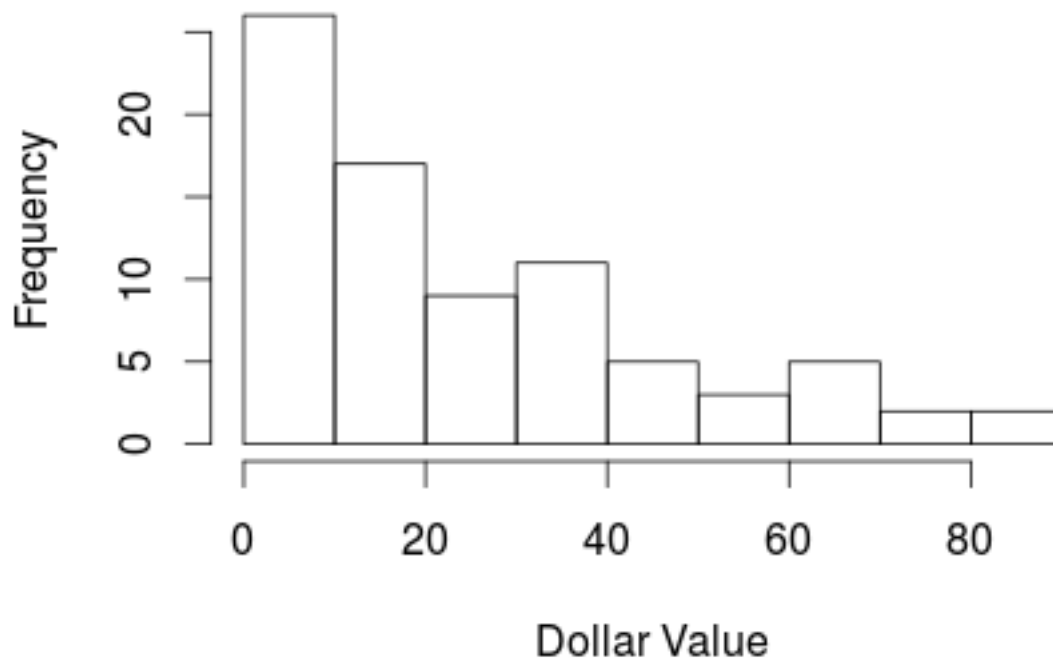
1. Create a `boxplot` method for the league class

- Run `boxplot` of `value` by `pos` from the `values` list element
- Add minimal plotting decorations
- Here's an example:



1. Create a `hist` method for the `league` class
 - Run `hist` on the `value` column of the `values` list element
 - Add minimal plotting decorations
 - Here's an example:

League Histogram



I will test your code with the following:

```
r # x is combined projection data pos <- list(qb=1, rb=2, wr=3, te=1, k=1) pnts <- list(fg=4,
xpt=1, pass_yds=1/25, pass_tds=4, pass_ints=-2, rush_yds=1/10, rush_tds=6, fumbles=-2,
rec_yds=1/20, rec_tds=6) l <- league(x, 10, 200, pos, pnts) l hist(1) boxplot(1) plot(1)
```

I will test your code with additional league settings (using the same projection data). I will try some things that should work and some things that should break. Don't be too concerned, but here's some things I might try:

- Not including all positions
- Including new positions that don't exist
- Requiring no players at a position
- Requiring too many players at a position (ie - there aren't 100 kickers)

Note that at this point it should be easy to change a league setting (such as `nteams`) and re-run `calcPoints` and `buildValues`.

```
calcPoints <- function(lgobj){
  lgobj$stats[,"Points"] <- 0
  for(i in names(lgobj$points)){
    lgobj$stats[,"Points"] <- lgobj$stats[,"Points"]+lgobj$stats[[i]]*lgobj$points[[i]]
  }
  lgobj$stats <- lgobj$stats[order(lgobj$stats[, 'Points'], decreasing=TRUE),][,c("PlayerName", "XTeam")]
```

```

    return(lgobj$stats)
}

buildValues <- function(x2){
  x2$fan_pnts <- x2$fan_pnts[order(x2$fan_pnts[, 'Points'], decreasing=TRUE),]
  ix <- vector('list',length(x2$pos))
  names(ix)<-names(x2$pos)
  x2$fan_pnts[, 'marg']<- NA
  for(i in names(ix)){
    ix[[i]]<-which(x2$fan_pnts[, 'pos']==i)
    if(x2$pos[[i]]>0){
      x2$fan_pnts[ix[[i]], 'marg']<-x2$fan_pnts[ix[[i]], 'Points']-x2$fan_pnts[ix[[i]] [pos[[i]]*x2$ntear
    }
  }
  x3<-x2$fan_pnts[x2$fan_pnts[, 'marg'] >= 0 & !is.na(x2$fan_pnts[, 'marg']),]
  x3 <- x3[order(x3[, 'marg'], decreasing=TRUE),]
  rownames(x3) <- NULL
  x3[, 'value'] <- x3[, 'marg']*(x2$ntteams*x2$cap-nrow(x3))/sum(x3[, 'marg']) + 1
  x3<-x3[,c('PlayerName', 'XTeam', 'pos', 'Points', 'marg', 'value')]
  return(x3)
}

league <- function(stats,ntteams,cap,pos,points){
  stl <- list(stats,ntteams,cap,pos,points)
  names(stl)<-c('stats', 'ntteams', 'cap', 'pos', 'points')
  stl$fan_pnts <-calcPoints(stl)
  stl$values<-buildValues(stl)
  stl<-append(stl,list(sims=NULL))
  class(stl) <- "league"
  return(stl)
}

print.league <- function(x){
  cat("The values for players:\n")
  print(x$values)
}

plot.league <- function(x){
  plot(x$values$value,xlab="Ranking",ylab="Dollar Value")
}

boxplot.league <- function(x){
  boxplot(x$values$value~x$values$pos,xlab="position",ylab="Dollar Value")
}

hist.league <- function(x){
  hist(x$values$value,main="League Histogram",xlab="Dollar Value",ylab="Frequency")
}

```

Test:

```

pos <- list(qb=1, rb=2, wr=3, te=1, k=1)
pnts <- list(fg=4, xpt=1, pass_yds=1/25, pass_tds=4, pass_ints=-2,                rush_yds=1/10, rush_tds=

```

```
l <- league(x, 10, 200, pos, pnts)
l
```

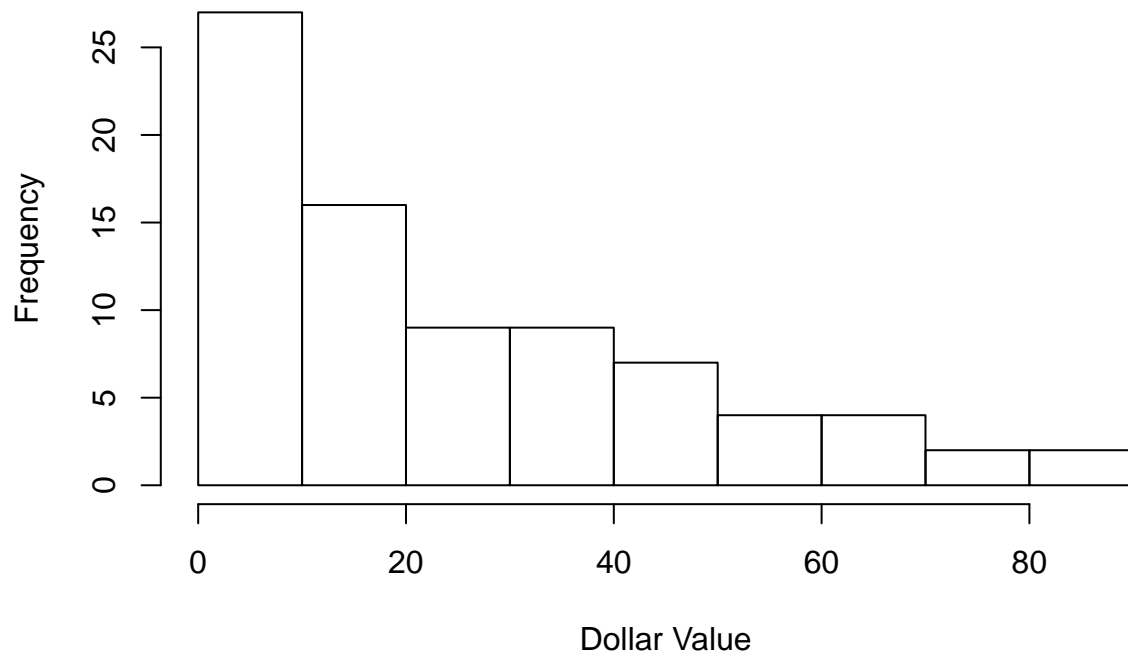
```
## The values for players:
```

##	PlayerName	XTeam	pos	Points	marg	value
## 1	Jamaal Charles	KC	rb	148.11	53.64375	88.824
## 2	LeSean McCoy	PHI	rb	147.46	52.99375	87.759
## 3	Peyton Manning	DEN	qb	226.50	45.36112	75.264
## 4	Adrian Peterson	MIN	rb	138.86	44.39375	73.680
## 5	Calvin Johnson	DET	wr	93.46	40.46563	67.249
## 6	Matt Forte	CHI	rb	134.09	39.62812	65.878
## 7	Demaryius Thomas	DEN	wr	92.05	39.05938	64.947
## 8	Jimmy Graham	NO	te	85.26	37.48750	62.373
## 9	Aaron Rodgers	GB	qb	215.76	34.61863	57.676
## 10	Eddie Lacy	GB	rb	128.43	33.96563	56.607
## 11	Le'Veon Bell	PIT	rb	128.31	33.84937	56.417
## 12	Julio Jones	ATL	wr	82.99	30.00000	50.115
## 13	Dez Bryant	DAL	wr	82.81	29.82187	49.823
## 14	Drew Brees	NO	qb	210.64	29.49988	49.296
## 15	A.J. Green	CIN	wr	80.47	27.48437	45.996
## 16	Antonio Brown	PIT	wr	80.00	27.01375	45.226
## 17	Marshawn Lynch	SEA	rb	121.43	26.96250	45.142
## 18	Brandon Marshall	CHI	wr	79.63	26.63750	44.610
## 19	Montee Ball	DEN	rb	118.59	24.12813	40.502
## 20	Jordy Nelson	GB	wr	76.46	23.46563	39.417
## 21	DeMarco Murray	DAL	rb	117.30	22.83438	38.384
## 22	Alshon Jeffery	CHI	wr	75.58	22.58750	37.979
## 23	Alfred Morris	WAS	rb	116.82	22.35313	37.596
## 24	Julius Thomas	DEN	te	69.56	21.78438	36.665
## 25	Cam Newton	CAR	qb	202.33	21.18188	35.678
## 26	Doug Martin	TB	rb	115.48	21.01875	35.411
## 27	Arian Foster	HOU	rb	114.53	20.06875	33.856
## 28	Zac Stacy	STL	rb	113.40	18.93125	31.994
## 29	Randall Cobb	GB	wr	70.66	17.66875	29.927
## 30	Rob Gronkowski	NE	te	64.24	16.46875	27.962
## 31	Giovani Bernard	CIN	rb	109.84	15.37812	26.176
## 32	Larry Fitzgerald	ARI	wr	67.78	14.78438	25.204
## 33	Stephen Gostkowski	NE	k	112.94	13.87500	23.716
## 34	Vincent Jackson	TB	wr	66.83	13.84375	23.664
## 35	Vernon Davis	SF	te	61.45	13.68125	23.398
## 36	Toby Gerhart	JAC	rb	106.72	12.25313	21.060
## 37	Cordarrelle Patterson	MIN	wr	65.12	12.12813	20.856
## 38	Colin Kaepernick	SF	qb	192.29	11.15112	19.256
## 39	Michael Crabtree	SF	wr	64.05	11.05625	19.101
## 40	Keenan Allen	SD	wr	63.54	10.55313	18.277
## 41	Wes Welker	DEN	wr	62.20	9.20625	16.072
## 42	Andre Johnson	HOU	wr	61.97	8.98125	15.704
## 43	Percy Harvin	SEA	wr	61.73	8.74063	15.310
## 44	Matthew Stafford	DET	qb	189.67	8.52488	14.957
## 45	Pierre Garcon	WAS	wr	59.95	6.96250	12.399
## 46	Phil Dawson	SF	k	105.81	6.75000	12.051
## 47	Roddy White	ATL	wr	59.68	6.68750	11.949
## 48	Michael Floyd	ARI	wr	59.61	6.61563	11.831

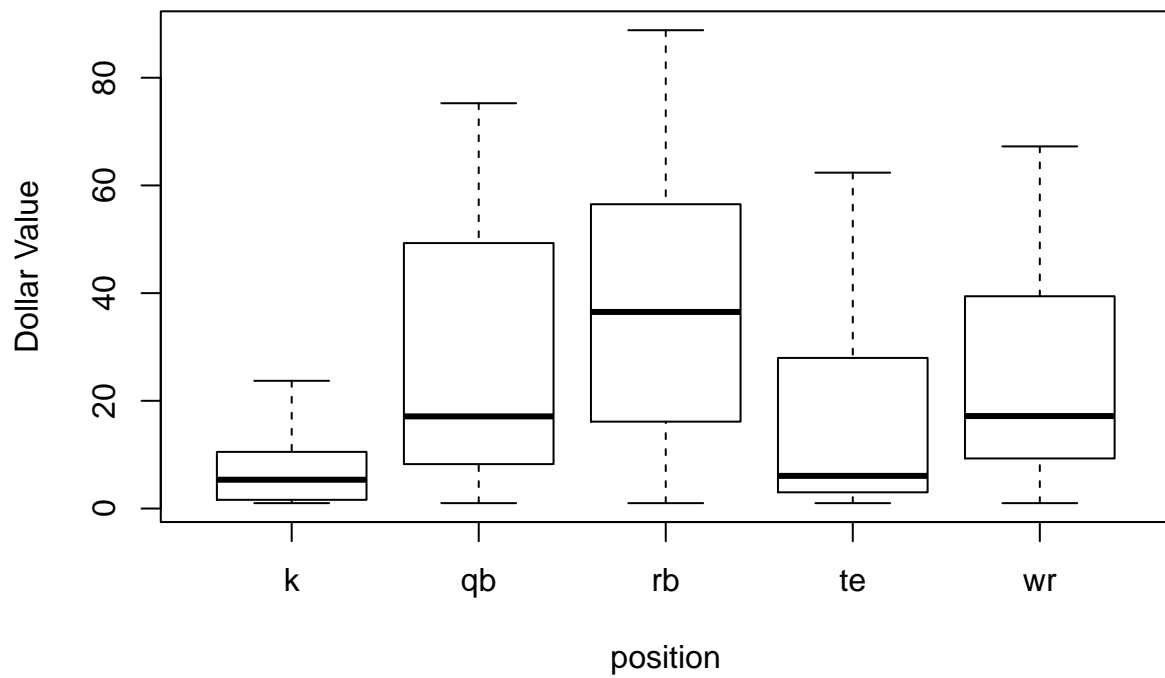
## 49	Victor Cruz	NYG	wr	59.37	6.37812	11.442
## 50	Bishop Sankey	TEN	rb	100.70	6.23125	11.202
## 51	Justin Tucker	BAL	k	104.88	5.81250	10.516
## 52	Nick Foles	PHI	qb	186.75	5.60862	10.182
## 53	Ryan Mathews	SD	rb	100.03	5.55938	10.102
## 54	DeSean Jackson	WAS	wr	58.06	5.06875	9.298
## 55	Frank Gore	SF	rb	98.92	4.45000	8.285
## 56	Andrew Luck	IND	qb	185.57	4.42488	8.244
## 57	Robert Griffin III	WAS	qb	185.47	4.32112	8.074
## 58	Steven Hauschka	SEA	k	102.44	3.37500	6.525
## 59	Andre Ellington	ARI	rb	97.72	3.25312	6.326
## 60	Jason Witten	DAL	te	50.97	3.19375	6.229
## 61	Adam Vinatieri	IND	k	102.19	3.12500	6.116
## 62	Torrey Smith	BAL	wr	56.03	3.04062	5.978
## 63	Greg Olsen	CAR	te	50.76	2.98969	5.895
## 64	Mason Crosby	GB	k	101.25	2.18750	4.581
## 65	Jeremy Maclin	PHI	wr	54.47	1.47500	3.415
## 66	Dennis Pitta	BAL	te	49.24	1.47188	3.410
## 67	Jordan Cameron	CLE	te	49.00	1.22812	3.011
## 68	Mike Wallace	MIA	wr	53.79	0.80000	2.310
## 69	Dan Bailey	DAL	k	99.62	0.56250	1.921
## 70	Jordan Reed	WAS	te	48.21	0.44063	1.721
## 71	Ty Hilton	IND	wr	53.42	0.43437	1.711
## 72	Matt Prater	DEN	k	99.44	0.37500	1.614
## 73	Emmanuel Sanders	DEN	wr	53.23	0.24063	1.394
## 74	Julian Edelman	NE	wr	53.15	0.15625	1.256
## 75	Shaun Suisham	PIT	k	99.07	0.00625	1.010
## 76	Ben Roethlisberger	PIT	qb	181.14	0.00000	1.000
## 77	Nick Novak	SD	k	99.06	0.00000	1.000
## 78	C.J. Spiller	BUF	rb	94.47	0.00000	1.000
## 79	Marques Colston	NO	wr	52.99	0.00000	1.000
## 80	Kyle Rudolph	MIN	te	47.77	0.00000	1.000

```
hist(1)
```

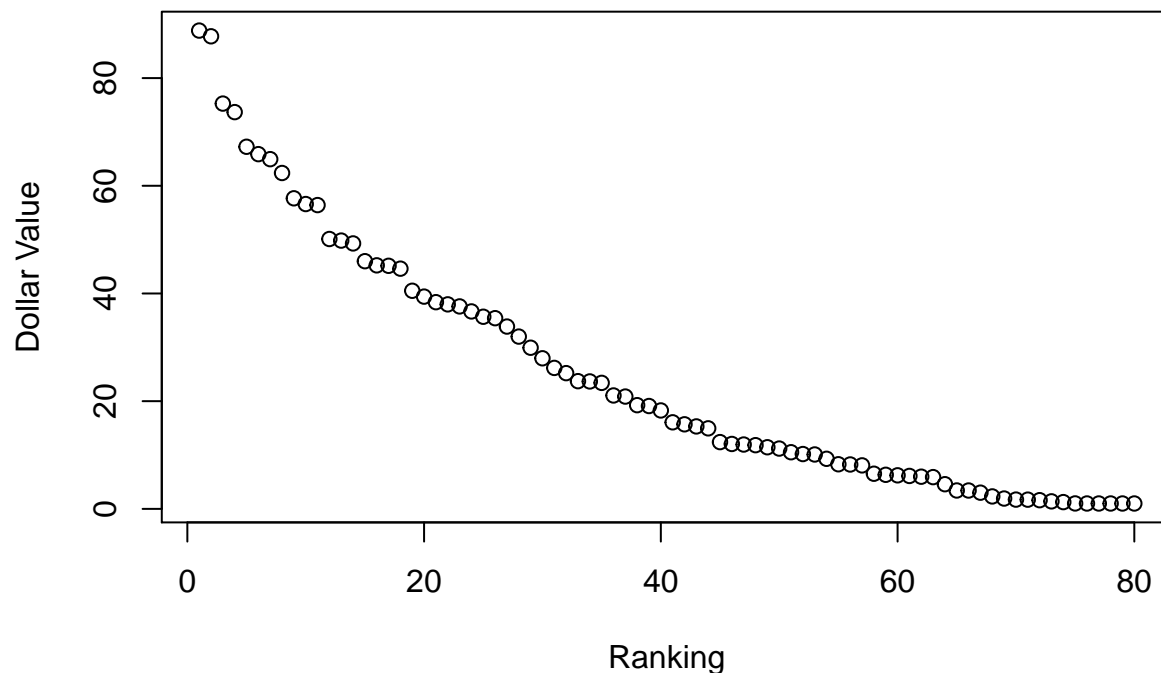

League Histogram



```
boxplot(1)
```



```
plot(1)
```

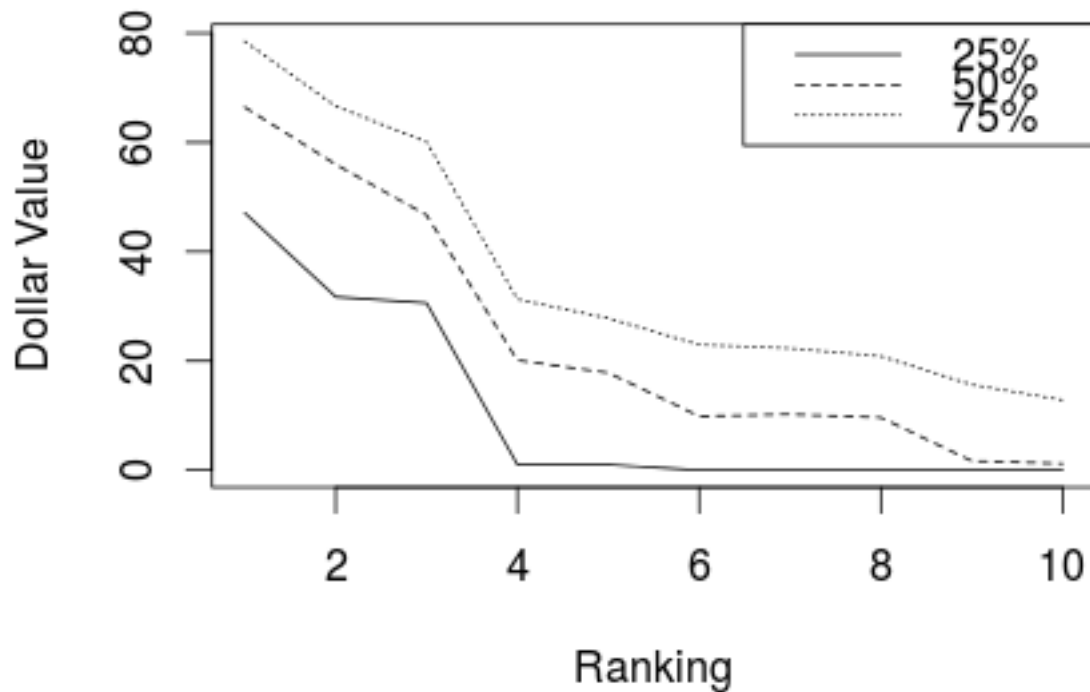


Task 3: Simulations with Residuals (40 points)

Using residuals from task 1, create a list of league simulations to save in the list element `sims`. The simulations will be used to generate confidence intervals for player values. Place all code at the end of the instructions.

1. Create a function `addNoise` that takes 4 arguments: a league object, a list of residuals, number of simulations to generate, and a RNG seed
 - Use the `stats` list element and the `pos` setting
 - Set a RNG seed to ensure reproducibility
 - For each simulation iterate over each position in the residuals
 - Simulate new stats for the given position
 - Assume residuals is a list, and the 'qb' element contains a 20x15 matrix
 - Calculate the number of quarterbacks found in `stats` - assume this is 35 (which is not real value)
 - Sample from 1 to 20 (with replacement) 35 times
 - Use the sample of 35 to select rows from the residuals
 - Add the 35 rows of residuals to the 35 rows of stats
 - Note: stats can't be negative so replace any negative values with 0
 - Use the new, simulated stats data set and the old league settings to generate a new league object
 - Save the `values` list element of the new league object in a list for each simulation
 - Merge the list of values by `PlayerName`
 - Start with the `stats` data set, using the "PlayerName", "XTeam", "pos" columns
 - `value` is the only column you need to merge from `values`
 - Remember that the `values` list element only has rows for the number of required players while the `stats` list element has rows for all projected players. Thus some players will have values in some simulations, but not in others. When merging, set a player's value to 0 if he is not found in the `values` list element.

- If 1000 simulations are requested, you should end up with a data frame with 1003 columns
 - Assign the merged values data set to the `sims` list element (of the original league object)
 - Return the league object
1. Create a `quantile` method for the league class; it takes at least two arguments, a league object and a probs vector
 - This method requires the `sims` list element; it should fail if `sims` is NULL
 - The `probs` vector should default to `c(0.25, 0.5, 0.75)`
 - Run `quantile` for each row, passing it `probs` (and any additional arguments)
 - Return a data set with columns for “PlayerName”, “XTeam”, “pos”, and for each probability
 1. Create a function `conf.interval`; it takes at least two arguments, a league object and a probs vector
 - This method requires the `sims` list element; it should fail if `sims` is NULL
 - Use the `nteams` and `pos` settings
 - Call `quantile` on the league object
 - Iterate over each position, saving results as a list
 - Subset the output of quantile by position
 - Order this data set by the last column (which should be the highest probability) descendingly
 - Restrict the number of rows to the number of required players at this position
 - Set the class of this list to `league.conf.interval`
 - Return the new object
 1. Create a `plot` method for the `league.conf.interval` class; it takes at least two arguments, a `league.conf.interval` object and a position
 - Select the list element that matches the position - this data set holds the quantile values for each player
 - Plot lines for each probability; using the defaults, you would have three lines (0.25, 0.5, 0.75)
 - Add minimal plotting decorations (such as axis labels)
 - Add a legend to distinguish each line
 - Here’s an example:



```

addNoise <- function(l,rv,num,seed=100){
  set.seed(seed)
  nos<-vector("list",length(rv))
  names(nos)<-names(rv)
  results<-cbind(PlayerName=l$stats$PlayerName,XTeam=l$stats$XTeam,pos=l$stats$pos)
  data <- data.frame(matrix(0,nrow=nrow(l$stats),ncol=num))
  names(data)<-paste("simulation", 1:num, sep="")
  results<-cbind(results,data)
  for(n in 1:num){
    for(i in names(nos)){
      nos[[i]]<-length(which(l$stats$pos==i))
      l$stats[which(l$stats$pos==i),names(rv[[i]])]<-l$stats[which(l$stats$pos==i),names(rv[[i]])]+rv[[i]]
    }
    l$stats[,sapply(l$stats,is.numeric)][l$stats[,sapply(l$stats,is.numeric)]<0]<-0
    l<-league(l$stats,l$nteam,l$cap,l$pos,l$points)
    for(i in 1:nrow(l$values)){
      results[results[, "PlayerName"]==l$values$PlayerName[i],n+3]<-l$values$value[i]
    }
  }
  l$sims<-results
  return(l)
}

```

```

quantile.league <- function(l,probs=c(0.25, 0.5, 0.75)){
  temp <- data.frame(t(apply(l$sims[,4:length(l$sims)],1,quantile,probs=c(0.25, 0.5, 0.75))))
  names(temp)<-c("25%", "50%", "75%")
  quant <- cbind(PlayerName=l$stats$PlayerName,XTeam=l$stats$XTeam,pos=l$stats$pos,temp)
  return(quant)
}

conf.interval <- function(l,probs=c(0.25, 0.5, 0.75)){
  temp<-quantile(l)
  temp<-temp[order(temp[,ncol(temp)], decreasing=TRUE),]
  qout<-vector("list",length=length(l$pos))
  names(qout)<-names(l$pos)
  for(i in names(qout)){
    qout[[i]]<-temp[which(temp[, "pos"]==i)[seq(1$nteams*1$pos[[i]]),]
    row.names(qout[[i]])<-NULL
  }
  class(qout) <- "league.conf.interval"
  return(qout)
}

plot.league.conf.interval <- function(qout,position){
  plot(c(1,10),c(0,qout[[position]][1,"75%"]+10),xlab="Ranking",ylab="Dollar Value",main=paste("quant.",position))
  lines(seq(nrow(qout[[position]])),qout[[position]][,"75%"],lty=3)
  lines(seq(nrow(qout[[position]])),qout[[position]][,"50%"],lty=2)
  lines(seq(nrow(qout[[position]])),qout[[position]][,"25%"],lty=1)
  legend('topright',c("25%", "50%", "75%"),lty=c(1,2,3))
}

```

Here I just use a small number of simulations to test my code. It will take long time for 10000 simulations

```

l1 <- addNoise(l, rv, 1000)
quantile(l1)

```

##		PlayerName	XTeam	pos	25%	50%	75%
## 1		Stephen Gostkowski	NE	k	0.000	0.000	3.371
## 2		Phil Dawson	SF	k	0.000	0.000	4.190
## 3		Justin Tucker	BAL	k	0.000	0.000	12.808
## 4		Matt Prater	DEN	k	0.000	0.000	9.827
## 5		Mason Crosby	GB	k	0.000	0.000	7.698
## 6		Steven Hauschka	SEA	k	0.000	0.000	4.877
## 7		Adam Vinatieri	IND	k	0.000	0.000	1.240
## 8		Dan Bailey	DAL	k	0.000	0.000	0.000
## 9		Shayne Graham	NO	k	0.000	0.000	0.000
## 10		Nick Novak	SD	k	0.000	1.000	10.333
## 11		Matt Bryant	ATL	k	0.000	0.000	0.000
## 12		Robbie Gould	CHI	k	0.000	0.000	0.000
## 13		Alex Henery	PHI	k	0.000	0.000	2.259
## 14		Blair Walsh	MIN	k	0.000	0.000	0.000
## 15		Shaun Suisham	PIT	k	0.000	3.575	15.305
## 16		Jay Feely	ARI	k	0.000	0.000	0.000
## 17		Greg Zuerlein	STL	k	0.000	0.000	0.000
## 18		Dan Carpenter	BUF	k	0.000	0.000	0.000
## 19		Ryan Succop	KC	k	0.000	0.000	0.000

## 20	Caleb Sturgis	MIA	k	0.000	0.000	0.000
## 21	Sebastian Janikowski	OAK	k	0.000	0.000	1.000
## 22	Graham Gano	CAR	k	0.000	0.000	3.450
## 23	Nick Folk	NYJ	k	0.000	0.000	11.352
## 24	Mike Nugent	CIN	k	0.000	0.000	9.687
## 25	Josh Brown	NYG	k	0.000	0.000	0.000
## 26	Connor Barth	TB	k	0.000	0.000	0.000
## 27	Randy Bullock	HOU	k	0.000	0.000	1.000
## 28	Josh Scobee	JAC	k	0.000	0.000	5.359
## 29	Billy Cundiff	CLE	k	0.000	0.000	1.110
## 30	Kai Forbath	WAS	k	0.000	0.000	0.000
## 31	Maikon Bonani	TEN	k	0.000	0.000	0.000
## 32	Nate Freese	DET	k	0.000	0.000	0.000
## 33	Giorgio Tavecchio	DET	k	0.000	0.000	5.913
## 34	Dustin Hopkins	BUF	k	0.000	0.000	1.000
## 35	Peyton Manning	DEN	qb	0.000	0.000	0.000
## 36	Aaron Rodgers	GB	qb	0.000	0.000	0.000
## 37	Drew Brees	NO	qb	0.000	0.000	0.000
## 38	Colin Kaepernick	SF	qb	0.000	0.000	0.000
## 39	Matthew Stafford	DET	qb	0.000	0.000	0.000
## 40	Nick Foles	PHI	qb	0.000	0.000	0.000
## 41	Andrew Luck	IND	qb	0.000	0.000	0.000
## 42	Robert Griffin III	WAS	qb	0.000	0.000	0.000
## 43	Cam Newton	CAR	qb	0.000	0.000	0.000
## 44	Matt Ryan	ATL	qb	0.000	0.000	0.000
## 45	Tom Brady	NE	qb	0.000	0.000	3.390
## 46	Tony Romo	DAL	qb	0.000	0.000	0.000
## 47	Russell Wilson	SEA	qb	0.000	0.000	0.000
## 48	Jay Cutler	CHI	qb	0.000	0.000	0.000
## 49	Philip Rivers	SD	qb	0.000	0.000	0.000
## 50	Ben Roethlisberger	PIT	qb	0.000	59.473	115.930
## 51	Andy Dalton	CIN	qb	0.000	0.000	0.000
## 52	Ryan Tannehill	MIA	qb	0.000	0.000	0.000
## 53	Alex Smith	KC	qb	0.000	0.000	0.000
## 54	Carson Palmer	ARI	qb	0.000	0.000	0.000
## 55	Joe Flacco	BAL	qb	0.000	0.000	0.000
## 56	Sam Bradford	STL	qb	0.000	0.000	0.000
## 57	Eli Manning	NYG	qb	0.000	0.000	8.599
## 58	Josh McCown	TB	qb	0.000	0.000	0.000
## 59	E.J. Manuel	BUF	qb	0.000	0.000	0.000
## 60	Jake Locker	TEN	qb	0.000	0.000	0.000
## 61	Johnny Manziel	CLE	qb	0.000	0.000	0.000
## 62	Geno Smith	NYJ	qb	0.000	0.000	0.000
## 63	Teddy Bridgewater	MIN	qb	0.000	0.000	0.000
## 64	Matt Schaub	OAK	qb	0.000	0.000	1.000
## 65	Chad Henne	JAC	qb	0.000	0.000	0.000
## 66	Ryan Fitzpatrick	HOU	qb	0.000	6.315	45.662
## 67	Michael Vick	NYJ	qb	0.000	0.000	1.000
## 68	Matt Cassel	MIN	qb	0.000	0.000	1.000
## 69	Blake Bortles	JAC	qb	0.000	0.000	0.000
## 70	Tom Savage	HOU	qb	0.000	0.000	0.000
## 71	Brian Hoyer	CLE	qb	0.000	0.000	0.000
## 72	Case Keenum	HOU	qb	0.000	3.620	96.072
## 73	Derek Carr	OAK	qb	0.000	0.000	0.000

## 74	Mike Glennon	TB	qb	0.000	0.000	0.000
## 75	Charlie Whitehurst	TEN	qb	0.000	0.000	0.000
## 76	Kirk Cousins	WAS	qb	0.000	0.000	0.000
## 77	Shaun Hill	STL	qb	0.000	0.000	0.000
## 78	Zach Mettenberger	TEN	qb	0.000	0.000	0.000
## 79	Jordan Palmer	CHI	qb	0.000	0.000	0.000
## 80	Terrelle Pryor	SEA	qb	0.000	0.000	0.000
## 81	Bruce Gradkowski	PIT	qb	0.000	0.000	0.000
## 82	Matt Flynn	GB	qb	0.000	0.000	0.000
## 83	Brandon Weeden	DAL	qb	0.000	0.000	0.000
## 84	Mark Sanchez	PHI	qb	0.000	0.000	0.000
## 85	Josh Freeman	FA	qb	0.000	0.000	0.000
## 86	Thaddeus Lewis	BUF	qb	0.000	0.000	0.000
## 87	Derek Anderson	CAR	qb	0.000	0.000	0.000
## 88	Blaine Gabbert	SF	qb	0.000	0.000	0.000
## 89	Matt Moore	MIA	qb	0.000	0.000	0.000
## 90	Chase Daniel	KC	qb	0.000	0.000	24.996
## 91	Jason Campbell	CIN	qb	0.000	0.000	0.000
## 92	Tyrod Taylor	BAL	qb	0.000	0.000	0.000
## 93	Tarvaris Jackson	SEA	qb	0.000	0.000	0.000
## 94	Brock Osweiler	DEN	qb	0.000	0.000	0.000
## 95	Christian Ponder	MIN	qb	0.000	0.000	0.000
## 96	Matt Hasselbeck	IND	qb	0.000	0.000	0.000
## 97	Domanique Davis	ATL	qb	0.000	0.000	0.000
## 98	Taylor Yates	ATL	qb	0.000	0.000	0.000
## 99	Drew Stanton	ARI	qb	0.000	0.000	0.000
## 100	Ryan Mallett	NE	qb	0.000	0.000	0.000
## 101	Logan Thomas	ARI	qb	0.000	0.000	0.000
## 102	Ryan Nassib	NYG	qb	0.000	0.000	0.000
## 103	AJ McCarron	CIN	qb	0.000	39.238	69.528
## 104	Jimmy Garoppolo	NE	qb	0.000	0.000	0.000
## 105	Luke McCown	NO	qb	0.000	0.000	0.000
## 106	Landry Jones	PIT	qb	0.000	0.000	8.499
## 107	Brad Sorensen	SD	qb	0.000	0.000	0.000
## 108	Colt McCoy	WAS	qb	0.000	0.000	0.000
## 109	Matt McGloin	OAK	qb	0.000	0.000	1.004
## 110	Aaron Murray	KC	qb	0.000	0.000	0.000
## 111	Dan Orlovsky	DET	qb	0.000	1.000	30.941
## 112	Tyler Bray	KC	qb	74.883	185.718	245.728
## 113	Matt Barkley	PHI	qb	0.000	0.000	0.000
## 114	Jamaal Charles	KC	rb	0.000	0.000	0.000
## 115	LeSean McCoy	PHI	rb	0.000	0.000	0.000
## 116	Matt Forte	CHI	rb	0.000	0.000	0.000
## 117	Adrian Peterson	MIN	rb	0.000	0.000	0.000
## 118	Eddie Lacy	GB	rb	0.000	0.000	0.000
## 119	DeMarco Murray	DAL	rb	0.000	0.000	0.000
## 120	Montee Ball	DEN	rb	0.000	0.000	0.000
## 121	Le'Veon Bell	PIT	rb	0.000	0.000	0.000
## 122	Marshawn Lynch	SEA	rb	0.000	0.000	0.000
## 123	Arian Foster	HOU	rb	0.000	0.000	0.000
## 124	Giovani Bernard	CIN	rb	0.000	0.000	0.000
## 125	Doug Martin	TB	rb	0.000	0.000	0.000
## 126	Alfred Morris	WAS	rb	0.000	0.000	0.000
## 127	Zac Stacy	STL	rb	0.000	11.994	40.392

## 128	Toby Gerhart	JAC	rb	0.000	0.000	0.000
## 129	Andre Ellington	ARI	rb	0.000	0.000	0.000
## 130	Bishop Sankey	TEN	rb	0.000	0.000	0.000
## 131	Ryan Mathews	SD	rb	0.000	0.000	0.000
## 132	Reggie Bush	DET	rb	0.000	0.000	0.000
## 133	Frank Gore	SF	rb	0.000	0.000	0.000
## 134	C.J. Spiller	BUF	rb	0.000	0.000	0.000
## 135	Ray Rice	BAL	rb	0.000	0.000	0.000
## 136	Joique Bell	DET	rb	0.000	0.000	0.000
## 137	Trent Richardson	IND	rb	0.000	0.000	0.000
## 138	Rashad Jennings	NYG	rb	0.000	0.000	0.000
## 139	Chris Johnson	NYJ	rb	0.000	0.000	0.000
## 140	Shane Vereen	NE	rb	0.000	0.000	0.000
## 141	Ben Tate	CLE	rb	0.000	0.000	0.000
## 142	Stevan Ridley	NE	rb	0.000	0.000	0.000
## 143	Steven Jackson	ATL	rb	0.000	0.000	0.000
## 144	Pierre Thomas	NO	rb	0.000	0.000	1.629
## 145	Maurice Jones-Drew	OAK	rb	0.000	0.000	0.000
## 146	Fred Jackson	BUF	rb	0.000	0.000	0.000
## 147	DeAngelo Williams	CAR	rb	0.000	0.000	0.000
## 148	Lamar Miller	MIA	rb	0.000	0.000	0.000
## 149	Danny Woodhead	SD	rb	0.000	0.000	0.000
## 150	Terrance West	CLE	rb	0.000	0.000	0.000
## 151	Khiry Robinson	NO	rb	0.000	0.000	0.000
## 152	Knowshon Moreno	MIA	rb	0.000	0.000	0.000
## 153	Bernard Pierce	BAL	rb	0.000	0.000	0.000
## 154	Jeremy Hill	CIN	rb	0.000	0.000	1.957
## 155	Darren Sproles	PHI	rb	0.000	10.113	21.597
## 156	Christopher Ivory	NYJ	rb	0.000	0.000	18.564
## 157	Devonta Freeman	ATL	rb	0.000	0.000	0.000
## 158	Darren McFadden	OAK	rb	0.000	4.801	22.413
## 159	Dexter McCluster	TEN	rb	0.000	1.000	16.317
## 160	Christine Michael	SEA	rb	0.000	0.000	0.000
## 161	Tre Mason	STL	rb	0.000	0.000	0.000
## 162	Stepfan Taylor	ARI	rb	0.000	0.000	8.677
## 163	Andre Williams	NYG	rb	0.000	0.000	0.000
## 164	LeGarrette Blount	PIT	rb	0.000	0.000	0.000
## 165	Shonn Greene	TEN	rb	0.000	0.000	0.000
## 166	Carlos Hyde	SF	rb	0.000	0.000	0.000
## 167	Knile Davis	KC	rb	0.000	0.000	0.000
## 168	Mike Tolbert	CAR	rb	0.000	7.869	29.275
## 169	Jonathan Stewart	CAR	rb	0.000	0.000	0.000
## 170	Roy Helu	WAS	rb	0.000	0.000	0.000
## 171	Andre Brown	HOU	rb	0.000	0.000	0.000
## 172	Lance Dunbar	DAL	rb	0.000	0.000	0.000
## 173	Charles Sims	TB	rb	0.000	0.000	0.000
## 174	C.J. Anderson	DEN	rb	0.000	0.000	0.000
## 175	Ahmad Bradshaw	IND	rb	0.000	0.000	0.000
## 176	James Starks	GB	rb	19.246	37.126	52.761
## 177	Donald Brown	SD	rb	0.000	0.000	0.000
## 178	Marcel Reece	OAK	rb	0.000	0.000	0.000
## 179	Mark Ingram	NO	rb	0.000	0.000	0.000
## 180	James White	NE	rb	0.000	0.000	0.000
## 181	David Wilson	NYG	rb	0.000	0.000	9.055

## 182	Jacquizz Rodgers	ATL	rb	0.000	0.000	0.000
## 183	Ka'Deem Carey	CHI	rb	0.000	2.616	35.607
## 184	Latavius Murray	OAK	rb	0.000	0.000	0.000
## 185	Ronnie Hillman	DEN	rb	0.000	0.000	0.000
## 186	Travaris Cadet	NO	rb	0.000	0.000	0.000
## 187	Bilal Powell	NYJ	rb	0.000	0.000	0.000
## 188	Brandon Bolden	NE	rb	0.000	0.000	0.000
## 189	Jordan Todman	JAC	rb	0.000	0.000	0.000
## 190	Jerick McKinnon	MIN	rb	0.000	0.000	0.000
## 191	Bryce Brown	BUF	rb	0.000	0.000	0.000
## 192	Chris Polk	PHI	rb	0.000	0.000	13.017
## 193	Denard Robinson	JAC	rb	0.000	16.169	30.916
## 194	BenJarvus Green-Ellis	CIN	rb	0.000	0.000	2.799
## 195	Mike James	TB	rb	0.000	0.000	17.850
## 196	Daniel Thomas	MIA	rb	0.000	0.000	0.000
## 197	Marcus Lattimore	SF	rb	0.000	0.000	0.000
## 198	Alfred Blue	HOU	rb	0.000	0.000	9.225
## 199	Isaiah Crowell	CLE	rb	0.000	0.000	0.000
## 200	Jonathan Dwyer	ARI	rb	0.000	0.000	0.000
## 201	Matt Asiata	MIN	rb	0.000	0.000	0.000
## 202	Lache Seastrunk	WAS	rb	0.000	0.000	0.000
## 203	Robert Turbin	SEA	rb	0.000	0.000	5.655
## 204	Dri Archer	PIT	rb	0.000	0.000	0.000
## 205	Lorenzo Taliaferro	BAL	rb	0.000	0.000	0.000
## 206	Peyton Hillis	NYG	rb	0.000	0.000	0.000
## 207	Darrel Young	WAS	rb	0.000	0.000	0.000
## 208	Benny Cunningham	STL	rb	5.780	17.684	29.814
## 209	DuJuan Harris	GB	rb	0.000	0.000	0.000
## 210	Dan Herron	IND	rb	0.000	0.000	0.000
## 211	Theo Riddick	DET	rb	0.000	0.000	0.000
## 212	Jackie Battle	TEN	rb	0.000	0.000	0.000
## 213	Bobby Rainey	TB	rb	0.000	0.000	0.000
## 214	Anthony Dixon	BUF	rb	0.000	0.000	0.000
## 215	Joseph Randle	DAL	rb	0.000	0.000	0.000
## 216	De'Anthony Thomas	KC	rb	0.000	0.000	4.014
## 217	Justin Forsett	BAL	rb	0.000	0.000	0.000
## 218	John Kuhn	GB	rb	0.000	0.000	0.000
## 219	Chris Ogbonnaya	CLE	rb	0.000	0.000	0.000
## 220	Jed Collins	DET	rb	0.000	0.000	0.000
## 221	Anthony Sherman	KC	rb	0.000	0.000	0.000
## 222	Dennis Johnson	HOU	rb	0.000	0.000	0.000
## 223	Frank Summers	BUF	rb	0.000	0.000	0.000
## 224	Derrick Coleman	SEA	rb	0.000	0.000	0.000
## 225	Mikel Leshoure	DET	rb	0.000	0.000	0.000
## 226	Bruce Miller	SF	rb	0.000	3.492	16.662
## 227	Shaun Draughn	CHI	rb	0.000	0.000	0.000
## 228	Storm Johnson	JAC	rb	0.000	0.000	0.000
## 229	Erik Lorig	NO	rb	0.000	0.000	0.000
## 230	Michael Ford	CHI	rb	0.000	0.000	19.360
## 231	Will Johnson	PIT	rb	0.000	0.000	0.000
## 232	Dion Lewis	CLE	rb	0.000	0.000	0.000
## 233	Cyrus Gray	KC	rb	0.000	0.000	0.000
## 234	Kenjon Barner	CAR	rb	0.000	0.000	0.000
## 235	Tommy Bohanon	NYJ	rb	0.000	0.000	0.000

## 236	Kyle Juszczyk	BAL	rb	0.000	0.000	0.000
## 237	Cedric Peerman	CIN	rb	0.000	0.000	0.000
## 238	Chris Thompson	WAS	rb	0.000	0.000	0.000
## 239	Daryl Richardson	NYJ	rb	0.000	0.000	0.000
## 240	Ryan Williams	DAL	rb	0.000	0.000	0.000
## 241	Mike Gillislee	MIA	rb	0.000	0.000	0.000
## 242	Chris Rainey	IND	rb	0.000	0.000	0.000
## 243	Henry Hynoski	NYG	rb	0.000	0.000	0.000
## 244	Stanley Havili	IND	rb	0.000	0.000	0.000
## 245	Marion Grice	SD	rb	0.000	0.000	0.000
## 246	Edwin Baker	CLE	rb	0.000	32.223	68.559
## 247	Jorvorskie Lane	TB	rb	0.000	0.000	0.000
## 248	James Develin	NE	rb	0.000	0.000	0.000
## 249	Antone Smith	ATL	rb	0.000	0.000	2.030
## 250	Joe McKnight	KC	rb	0.000	0.000	0.000
## 251	Jerome Felton	MIN	rb	0.000	0.000	11.060
## 252	Tony Fiammetta	CHI	rb	0.000	0.000	0.000
## 253	Jeremy Stewart	OAK	rb	0.000	0.000	0.000
## 254	Tyler Gaffney	CAR	rb	0.000	0.000	0.000
## 255	Leon Washington	TEN	rb	0.000	0.000	0.000
## 256	Jalen Parmele	ARI	rb	0.000	0.000	0.000
## 257	Tyler Clutts	DAL	rb	0.000	0.000	0.000
## 258	Alvester Alexander	PIT	rb	0.000	0.000	0.000
## 259	Patrick DiMarco	ATL	rb	0.000	0.000	0.000
## 260	LaMichael James	SF	rb	0.000	0.000	0.000
## 261	Collin Mooney	TEN	rb	0.000	0.000	0.000
## 262	Johnathan Franklin	GB	rb	0.000	0.000	0.000
## 263	Jonathan Grimes	HOU	rb	0.000	0.000	0.000
## 264	Will Ta'ufou'ou	JAC	rb	0.000	0.000	13.188
## 265	Evan Royster	WAS	rb	0.000	0.000	6.892
## 266	Isaiah Pead	STL	rb	0.000	0.000	1.000
## 267	Jay Prosch	HOU	rb	0.000	0.000	0.000
## 268	Michael Cox	NYG	rb	0.000	0.000	0.000
## 269	Miguel Maysonet	PIT	rb	0.000	0.000	0.250
## 270	Robert Hughes	ARI	rb	0.000	0.000	0.000
## 271	Lonnie Pryor	TB	rb	0.000	0.000	6.343
## 272	Spencer Ware	SEA	rb	0.000	9.202	42.997
## 273	Cierre Wood	BAL	rb	0.000	0.000	0.000
## 274	Vick Ballard	IND	rb	0.000	0.000	0.000
## 275	Kendall Hunter	SF	rb	0.000	0.000	0.000
## 276	Jimmy Graham	NO	te	0.000	0.000	0.000
## 277	Julius Thomas	DEN	te	0.000	0.000	0.000
## 278	Rob Gronkowski	NE	te	0.000	0.000	0.000
## 279	Vernon Davis	SF	te	0.000	0.000	0.000
## 280	Jason Witten	DAL	te	0.000	0.000	0.000
## 281	Jordan Cameron	CLE	te	0.000	0.000	0.000
## 282	Dennis Pitta	BAL	te	0.000	0.000	0.000
## 283	Greg Olsen	CAR	te	0.000	0.000	0.000
## 284	Jordan Reed	WAS	te	0.000	0.000	0.000
## 285	Kyle Rudolph	MIN	te	0.000	0.000	0.000
## 286	Zach Ertz	PHI	te	0.000	0.000	0.000
## 287	Martellus Bennett	CHI	te	0.000	0.000	0.000
## 288	Heath Miller	PIT	te	0.000	0.000	0.000
## 289	Ladarius Green	SD	te	0.000	0.000	0.000

## 290	Antonio Gates	SD	te	0.000	0.000	0.000
## 291	Delanie Walker	TEN	te	0.000	0.000	0.000
## 292	Charles Clay	MIA	te	0.000	0.000	0.000
## 293	Eric Ebron	DET	te	0.000	0.000	0.000
## 294	Jared Cook	STL	te	0.000	0.000	0.000
## 295	Dwayne Allen	IND	te	0.000	0.000	0.000
## 296	Garrett Graham	HOU	te	0.000	0.000	0.000
## 297	Tyler Eifert	CIN	te	0.000	0.000	0.000
## 298	Jace Amaro	NYJ	te	0.000	0.000	0.000
## 299	Scott Chandler	BUF	te	0.000	0.000	0.000
## 300	Marcedes Lewis	JAC	te	0.000	0.000	0.000
## 301	Coby Fleener	IND	te	0.000	0.000	0.000
## 302	Brent Celek	PHI	te	0.000	0.000	0.000
## 303	Zach Miller	SEA	te	0.000	0.000	0.000
## 304	Jermaine Gresham	CIN	te	0.000	0.000	0.000
## 305	Travis Kelce	KC	te	0.000	0.000	0.000
## 306	Adrien Robinson	NYG	te	0.000	0.000	0.000
## 307	Mychal Rivera	OAK	te	0.000	0.000	0.000
## 308	Austin Seferian-Jenkins	TB	te	0.000	0.000	0.000
## 309	Owen Daniels	BAL	te	0.000	0.000	0.000
## 310	Levine Toilolo	ATL	te	0.000	0.000	0.000
## 311	Brandon Bostick	GB	te	0.000	0.000	0.000
## 312	Tim Wright	TB	te	0.000	0.000	0.000
## 313	Andrew Quarless	GB	te	0.000	0.000	0.000
## 314	Jermichael Finley	FA	te	0.000	0.000	0.000
## 315	Brandon Pettigrew	DET	te	0.000	0.000	0.000
## 316	C.J. Fiedorowicz	HOU	te	0.000	0.000	13.367
## 317	Robert Housler	ARI	te	0.000	0.000	0.000
## 318	Anthony Fasano	KC	te	0.000	0.000	0.000
## 319	Ryan Griffin	HOU	te	0.000	0.000	0.000
## 320	Luke Willson	SEA	te	0.000	0.000	0.000
## 321	Gavin Escobar	DAL	te	0.000	0.000	0.000
## 322	Jeff Cumberland	NYJ	te	0.000	0.000	0.000
## 323	John Carlson	ARI	te	0.000	0.000	0.000
## 324	Lance Kendricks	STL	te	0.000	0.000	0.000
## 325	Brandon Myers	TB	te	0.000	0.000	0.000
## 326	David Ausberry	OAK	te	0.000	0.000	1.427
## 327	Benjamin Watson	NO	te	0.000	0.000	0.000
## 328	Ed Dickson	CAR	te	0.000	0.000	0.000
## 329	Joseph Fauria	DET	te	0.000	0.000	0.000
## 330	Clay Harbor	JAC	te	0.000	0.000	0.000
## 331	Tony Moeaki	BUF	te	0.000	0.000	0.000
## 332	Demetrius Harris	KC	te	0.000	0.000	0.000
## 333	Michael Hoomanawanui	NE	te	0.000	0.000	0.000
## 334	Kellen Davis	NYG	te	0.000	0.000	0.000
## 335	Vance McDonald	SF	te	0.000	0.000	0.000
## 336	Jacob Tamme	DEN	te	0.000	0.000	0.000
## 337	Logan Paulsen	WAS	te	0.000	0.000	0.000
## 338	Virgil Green	DEN	te	0.000	0.000	0.000
## 339	Cory Harkey	STL	te	0.000	0.000	0.000
## 340	Rhett Ellison	MIN	te	0.000	0.000	0.000
## 341	Gary Barnidge	CLE	te	0.000	0.000	0.000
## 342	Jim Dray	CLE	te	0.000	0.000	0.000
## 343	Dion Sims	MIA	te	0.000	0.000	0.000

## 344	Troy Niklas	ARI	te	0.000	0.000	0.000
## 345	Richard Rodgers	GB	te	0.000	0.000	0.000
## 346	James Hanna	DAL	te	0.000	0.000	0.000
## 347	Crockett Gillmore	BAL	te	0.000	0.000	0.000
## 348	Zach Sudfeld	NYJ	te	0.000	0.000	0.000
## 349	Bear Pascoe	ATL	te	0.000	0.000	0.000
## 350	Anthony McCoy	SEA	te	0.000	0.000	0.000
## 351	Arthur Lynch	MIA	te	0.000	0.000	0.000
## 352	Matt Spaeth	PIT	te	0.000	0.000	0.000
## 353	Jake Ballard	ARI	te	0.000	0.000	0.000
## 354	Josh Hill	FA	te	0.000	0.000	0.000
## 355	James Casey	PHI	te	0.000	0.000	0.000
## 356	Nick Kasa	OAK	te	0.000	0.000	0.000
## 357	Joel Dreessen	DEN	te	0.000	0.000	0.000
## 358	Sean McGrath	KC	te	0.000	0.000	0.000
## 359	David Paulson	PIT	te	0.000	0.000	0.000
## 360	Larry Donnell	NYG	te	0.000	0.000	0.000
## 361	Michael Egnew	MIA	te	0.000	0.000	10.215
## 362	Fendi Onobun	CHI	te	0.000	0.000	0.000
## 363	Chase Ford	MIN	te	0.000	0.000	0.000
## 364	Chris Gragg	BUF	te	0.000	0.000	0.000
## 365	D.J. Williams	NE	te	0.000	0.000	0.000
## 366	Mickey Shuler	ATL	te	0.000	0.000	0.000
## 367	Gerell Robinson	DEN	te	0.000	0.000	0.000
## 368	Dante Rosario	CHI	te	0.000	0.000	0.000
## 369	John Phillips	SD	te	0.000	0.000	0.000
## 370	Craig Stevens	TEN	te	0.000	0.000	0.000
## 371	Weslye Saunders	IND	te	0.000	0.000	0.000
## 372	Taylor Thompson	TEN	te	0.000	0.000	0.000
## 373	Ryan Taylor	GB	te	0.000	0.000	0.000
## 374	Lee Smith	BUF	te	0.000	0.000	0.000
## 375	Garrett Celek	SF	te	0.000	0.000	0.000
## 376	Niles Paul	WAS	te	0.000	0.000	0.000
## 377	Allen Reisner	MIN	te	0.000	0.000	0.000
## 378	Kevin Brock	CIN	te	0.000	0.000	0.000
## 379	Michael Palmer	PIT	te	0.000	0.000	0.000
## 380	David Johnson	SD	te	0.000	0.000	0.000
## 381	Jack Doyle	IND	te	0.000	0.000	0.000
## 382	Konrad Reuland	FA	te	0.000	0.000	0.000
## 383	Luke Stocker	TB	te	0.000	0.000	0.000
## 384	MarQueis Gray	CLE	te	0.000	0.000	0.000
## 385	Matthew Mulligan	CHI	te	0.000	0.000	0.000
## 386	Darren Fells	ARI	te	0.000	0.000	0.000
## 387	Zach Miller	CHI	te	0.000	0.000	0.000
## 388	Mike McNeill	CAR	te	0.000	0.000	0.000
## 389	Andrew Szczerba	ATL	te	0.000	0.000	0.000
## 390	Brandon Barden	JAC	te	0.000	0.000	0.000
## 391	Daniel Fells	NYG	te	0.000	0.000	0.000
## 392	Emil Igwenagu	PHI	te	0.000	0.000	0.000
## 393	Richard Gordon	KC	te	0.000	0.000	0.000
## 394	Ted Bolser	WAS	te	0.000	0.000	0.000
## 395	Richie Brockel	CAR	te	0.000	0.000	0.000
## 396	Brandon Williams	ARI	te	0.000	0.000	0.000
## 397	Brad Smelley	HOU	te	0.000	0.000	0.000

## 398	Calvin Johnson	DET	wr	0.000	0.000	13.531
## 399	Demaryius Thomas	DEN	wr	0.000	0.000	0.000
## 400	Julio Jones	ATL	wr	0.000	0.000	0.000
## 401	Dez Bryant	DAL	wr	0.000	0.000	0.000
## 402	A.J. Green	CIN	wr	0.000	0.000	7.047
## 403	Brandon Marshall	CHI	wr	0.000	0.000	0.000
## 404	Jordy Nelson	GB	wr	0.000	0.000	0.000
## 405	Alshon Jeffery	CHI	wr	0.000	0.000	6.557
## 406	Antonio Brown	PIT	wr	0.000	0.000	0.000
## 407	Randall Cobb	GB	wr	0.000	0.000	0.000
## 408	Vincent Jackson	TB	wr	0.000	0.000	0.000
## 409	Andre Johnson	HOU	wr	0.000	0.000	0.000
## 410	Larry Fitzgerald	ARI	wr	0.000	0.000	0.000
## 411	Michael Crabtree	SF	wr	0.000	0.000	0.000
## 412	Keenan Allen	SD	wr	0.000	0.000	0.000
## 413	Pierre Garcon	WAS	wr	0.000	0.000	0.000
## 414	Michael Floyd	ARI	wr	0.000	0.000	0.000
## 415	Cordarrelle Patterson	MIN	wr	0.000	0.000	0.000
## 416	Victor Cruz	NYG	wr	0.000	0.000	0.000
## 417	Roddy White	ATL	wr	0.000	1.094	20.677
## 418	Wes Welker	DEN	wr	0.000	0.000	0.000
## 419	Percy Harvin	SEA	wr	0.000	0.000	0.000
## 420	Torrey Smith	BAL	wr	0.000	0.000	0.000
## 421	DeSean Jackson	WAS	wr	0.000	0.000	0.000
## 422	Jeremy Maclin	PHI	wr	0.000	0.000	0.000
## 423	Mike Wallace	MIA	wr	0.000	0.000	0.000
## 424	Julian Edelman	NE	wr	0.000	0.000	0.000
## 425	Ty Hilton	IND	wr	0.000	0.000	0.000
## 426	Marques Colston	NO	wr	0.000	0.000	0.000
## 427	Emmanuel Sanders	DEN	wr	0.000	0.000	2.712
## 428	Golden Tate	DET	wr	0.000	0.000	0.000
## 429	Kendall Wright	TEN	wr	0.000	0.000	0.000
## 430	Eric Decker	NYJ	wr	0.000	0.000	0.000
## 431	Terrance Williams	DAL	wr	0.000	0.000	0.000
## 432	Sammy Watkins	BUF	wr	0.000	0.000	7.687
## 433	Reggie Wayne	IND	wr	0.000	0.000	0.000
## 434	Rueben Randle	NYG	wr	0.000	0.000	0.000
## 435	Dwayne Bowe	KC	wr	0.000	0.000	0.000
## 436	Riley Cooper	PHI	wr	0.000	0.000	0.000
## 437	Tavon Austin	STL	wr	0.000	0.000	0.000
## 438	Mike Evans	TB	wr	0.000	0.000	0.000
## 439	Marvin Jones	CIN	wr	0.000	0.000	0.000
## 440	Cecil Shorts	JAC	wr	0.000	0.000	0.000
## 441	Anquan Boldin	SF	wr	0.000	0.000	5.730
## 442	DeAndre Hopkins	HOU	wr	0.000	12.024	33.228
## 443	Kenny Stills	NO	wr	0.000	0.000	1.127
## 444	Brandin Cooks	NO	wr	0.000	0.000	0.000
## 445	Hakeem Nicks	IND	wr	0.000	0.000	0.000
## 446	Brian Hartline	MIA	wr	0.000	0.000	0.000
## 447	James Jones	OAK	wr	0.000	0.000	0.000
## 448	Jarrett Boykin	GB	wr	0.000	0.000	0.000
## 449	Danny Amendola	NE	wr	0.000	0.000	0.000
## 450	Doug Baldwin	SEA	wr	0.000	0.000	0.000
## 451	Kelvin Benjamin	CAR	wr	0.000	0.000	0.000

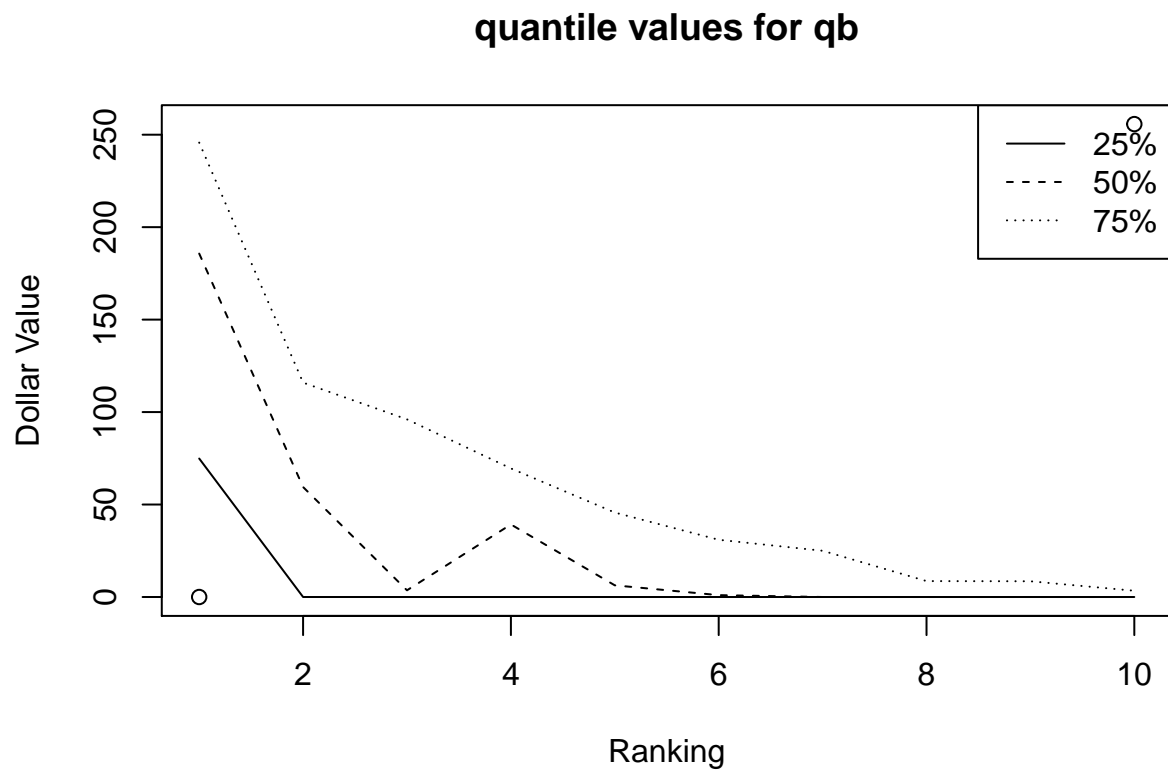
## 452	Harry Douglas	ATL	wr	0.000	0.000	0.000
## 453	Greg Jennings	MIN	wr	0.000	0.000	0.000
## 454	Justin Hunter	TEN	wr	0.000	0.000	0.000
## 455	Steve Smith	BAL	wr	0.000	0.000	0.000
## 456	Rod Streater	OAK	wr	0.000	0.000	1.000
## 457	Odell Beckham Jr.	NYG	wr	0.000	0.000	0.000
## 458	Robert Woods	BUF	wr	0.000	0.000	0.000
## 459	Andrew Hawkins	CLE	wr	0.000	0.000	5.066
## 460	Jordan Matthews	PHI	wr	0.000	0.000	0.000
## 461	Jerricho Cotchery	CAR	wr	0.000	0.000	0.000
## 462	Markus Wheaton	PIT	wr	0.000	0.000	0.000
## 463	Chris Givens	STL	wr	0.000	0.000	0.000
## 464	Marqise Lee	JAC	wr	0.000	0.000	0.000
## 465	Nate Washington	TEN	wr	0.000	0.000	0.000
## 466	Aaron Dobson	NE	wr	0.000	0.000	0.000
## 467	Donnie Avery	KC	wr	0.000	0.000	15.590
## 468	Lance Moore	PIT	wr	0.000	0.000	0.000
## 469	Jeremy Kerley	NYJ	wr	0.000	0.000	0.000
## 470	Mike Williams	BUF	wr	0.000	0.000	0.000
## 471	Brandon LaFell	NE	wr	0.000	0.000	7.184
## 472	Andre Roberts	WAS	wr	0.000	0.000	0.000
## 473	Denarius Moore	OAK	wr	0.000	0.000	2.369
## 474	Nate Burleson	CLE	wr	0.000	0.000	0.000
## 475	Dexter McCluster	TEN	wr	0.000	1.000	16.317
## 476	Santonio Holmes	FA	wr	0.000	0.000	0.000
## 477	Miles Austin	CLE	wr	0.000	0.000	0.000
## 478	Steve Johnson	SF	wr	0.000	0.000	0.000
## 479	Ted Ginn Jr.	ARI	wr	0.000	0.000	0.000
## 480	Kenny Britt	STL	wr	0.000	0.000	0.000
## 481	Jerome Simpson	MIN	wr	0.000	0.000	0.000
## 482	Brandon Gibson	MIA	wr	0.000	0.000	0.000
## 483	Allen Robinson	JAC	wr	0.000	0.000	0.000
## 484	Paul Richardson	SEA	wr	0.000	0.000	10.622
## 485	Malcom Floyd	SD	wr	0.000	0.000	0.000
## 486	Greg Little	OAK	wr	0.000	0.000	0.000
## 487	Davante Adams	GB	wr	0.000	0.000	0.000
## 488	Martavis Bryant	PIT	wr	0.000	0.000	0.000
## 489	Kenbrell Thompson	NE	wr	0.000	0.000	0.000
## 490	Brian Quick	STL	wr	0.000	0.000	0.000
## 491	Eddie Royal	SD	wr	0.000	0.000	0.000
## 492	Junior Hemingway	KC	wr	0.000	0.000	0.000
## 493	Jacoby Jones	BAL	wr	0.000	0.000	0.000
## 494	Mohamed Sanu	CIN	wr	0.000	0.000	0.000
## 495	Cole Beasley	DAL	wr	0.000	1.000	14.653
## 496	John Brown	ARI	wr	0.000	0.000	0.000
## 497	Marquess Wilson	CHI	wr	0.000	0.000	0.000
## 498	Jason Avant	CAR	wr	0.000	0.000	0.000
## 499	Jerrel Jernigan	NYG	wr	0.000	0.000	0.000
## 500	Marlon Brown	BAL	wr	0.000	0.000	0.000
## 501	Darrius Heyward-Bey	PIT	wr	0.000	0.000	0.000
## 502	Josh Gordon	CLE	wr	0.000	0.000	0.000
## 503	Devin Street	DAL	wr	0.000	0.000	0.000
## 504	Robert Meachem	NO	wr	0.000	0.000	0.000
## 505	Jarvis Landry	MIA	wr	0.000	0.000	0.000

## 506	Marquise Goodwin	BUF	wr	0.000	0.000	0.000
## 507	Austin Pettis	STL	wr	0.000	0.000	0.000
## 508	Jermaine Kearse	SEA	wr	0.000	0.000	0.000
## 509	Andre Holmes	OAK	wr	0.000	0.000	0.000
## 510	Mike Brown	JAC	wr	0.000	0.000	0.000
## 511	A.J. Jenkins	KC	wr	0.000	0.000	0.000
## 512	Earl Bennett	CLE	wr	0.000	0.000	0.000
## 513	Stephen Hill	NYJ	wr	0.000	0.000	0.000
## 514	Santana Moss	WAS	wr	0.000	0.000	0.000
## 515	Stedman Bailey	STL	wr	0.000	0.000	1.976
## 516	Ace Sanders	JAC	wr	0.000	0.000	0.000
## 517	Vincent Brown	SD	wr	0.000	0.000	0.000
## 518	Robert Herron	TB	wr	0.000	0.000	12.815
## 519	Tiquan Underwood	CAR	wr	0.000	0.000	0.000
## 520	Brandon Lloyd	SF	wr	0.000	0.000	0.000
## 521	Keshawn Martin	HOU	wr	0.000	0.000	0.000
## 522	Kris Durham	DET	wr	0.000	0.000	1.768
## 523	Jalen Saunders	NYJ	wr	0.000	0.000	0.000
## 524	Joseph Morgan	NO	wr	0.000	0.000	0.000
## 525	Kevin Ogletree	DET	wr	0.000	0.000	0.000
## 526	Kevin Norwood	SEA	wr	0.000	0.000	0.000
## 527	Donte Moncrief	IND	wr	0.000	0.000	0.000
## 528	Damian Williams	FA	wr	0.000	0.000	0.000
## 529	Josh Huff	PHI	wr	0.000	0.000	0.000
## 530	Arrelious Benn	PHI	wr	0.000	0.000	0.000
## 531	Jarius Wright	MIN	wr	0.000	0.000	0.000
## 532	Travis Benjamin	CLE	wr	0.000	0.000	0.000
## 533	Cody Latimer	DEN	wr	0.000	0.000	0.000
## 534	Chris Owusu	TB	wr	0.000	0.000	0.000
## 535	Mario Manningham	NYG	wr	0.000	12.537	32.363
## 536	DeVier Posey	HOU	wr	0.000	0.000	0.000
## 537	Kyle Williams	KC	wr	0.000	0.000	0.000
## 538	Jon Baldwin	SF	wr	0.000	0.000	0.000
## 539	Leonard Hankerson	WAS	wr	0.000	0.000	0.000
## 540	Jared Abbrederis	GB	wr	0.000	0.000	0.000
## 541	Drew Davis	ATL	wr	0.000	0.000	71.709
## 542	Jeremy Ross	DET	wr	0.000	0.000	0.000
## 543	Andre Caldwell	DEN	wr	0.000	0.000	0.000
## 544	Jeff Janis	GB	wr	0.000	0.000	0.000
## 545	T.J. Graham	BUF	wr	0.000	0.000	0.000
## 546	Griff Whalen	IND	wr	0.000	0.000	0.000
## 547	Aldrick Robinson	WAS	wr	0.000	0.000	0.000
## 548	Da'Rick Rogers	IND	wr	0.000	0.000	0.000
## 549	David Nelson	NYJ	wr	0.000	2.286	20.585
## 550	Ryan Broyles	DET	wr	0.000	0.000	0.000
## 551	Weston Dressler	KC	wr	0.000	0.000	0.000
## 552	Juron Criner	OAK	wr	0.000	0.000	0.000
## 553	Louis Murphy	TB	wr	0.000	6.587	28.126
## 554	Jaron Brown	ARI	wr	0.000	0.000	0.000
## 555	Josh Morgan	CHI	wr	0.000	0.000	0.000
## 556	Rishard Matthews	MIA	wr	0.000	0.000	0.000
## 557	Tavarres King	CAR	wr	0.000	0.000	0.000
## 558	Jacoby Ford	NYJ	wr	0.000	0.000	0.000
## 559	Darius Johnson	ATL	wr	0.000	0.000	0.000

## 560	Brice Butler	OAK	wr	0.000	0.000	19.550
## 561	Bruce Ellington	SF	wr	0.000	4.923	21.020
## 562	Quinton Patton	SF	wr	0.000	0.000	0.000
## 563	Marcus Harris	NYG	wr	0.000	0.000	0.000
## 564	Derek Moye	PIT	wr	0.000	0.000	0.000
## 565	Ricardo Lockette	SEA	wr	0.000	0.000	0.000
## 566	TJ Jones	DET	wr	0.000	0.000	12.612
## 567	Mike Thomas	HOU	wr	0.000	0.000	0.000
## 568	Charles Johnson	CLE	wr	0.000	0.000	15.882
## 569	Nick Toon	NO	wr	0.000	0.000	0.000
## 570	Myles White	GB	wr	0.000	0.000	0.000
## 571	Dane Sanzenbacher	CIN	wr	0.000	0.000	0.000
## 572	Devin Hester	ATL	wr	0.000	0.000	4.253
## 573	Alan Bonner	HOU	wr	0.000	0.000	0.000
## 574	Greg Salas	NYJ	wr	0.000	0.000	0.000
## 575	Justin Brown	PIT	wr	0.000	0.000	0.000
## 576	Dwayne Harris	DAL	wr	0.000	0.000	0.000
## 577	Ryan Whalen	CIN	wr	0.000	0.000	0.000
## 578	Lavelle Hawkins	TB	wr	0.000	0.000	0.000
## 579	Kealoha Pilaes	CAR	wr	0.000	0.000	0.000
## 580	Seyi Ajirotutu	SD	wr	0.000	0.000	0.000
## 581	Josh Boyce	NE	wr	0.000	0.000	0.000
## 582	Armon Binns	MIA	wr	0.000	0.000	0.000
## 583	Damaris Johnson	PHI	wr	0.000	0.000	0.000
## 584	Anthony Armstrong	CLE	wr	0.000	0.000	0.000
## 585	Tandon Doss	JAC	wr	0.000	0.000	0.000
## 586	Rodney Smith	MIN	wr	0.000	0.000	0.000
## 587	Lestar Jean	MIN	wr	0.000	0.000	9.269
## 588	Brenton Bersin	CAR	wr	0.000	0.000	0.000
## 589	Deonte Thompson	BAL	wr	0.000	0.000	0.000
## 590	Brittan Golden	ARI	wr	0.000	0.000	0.000
## 591	Clyde Gates	NYJ	wr	0.000	0.000	0.000
## 592	Kevin Dorsey	GB	wr	0.000	0.000	1.861
## 593	Naaman Roosevelt	DET	wr	0.000	0.000	8.121
## 594	Adam Thielen	MIN	wr	0.000	0.000	15.764
## 595	Chris Hogan	BUF	wr	0.000	3.944	24.396
## 596	Michael Campanaro	BAL	wr	0.000	0.000	0.000
## 597	Jeff Maehl	PHI	wr	0.000	0.000	0.000
## 598	Terrence Toliver	CHI	wr	0.000	0.000	0.000
## 599	Ryan Grant	WAS	wr	0.000	0.000	0.000
## 600	Marvin McNutt	CAR	wr	0.000	0.000	7.858
## 601	Michael Preston	TEN	wr	0.000	0.000	0.000
## 602	Eric Weems	CHI	wr	0.000	0.000	1.090
## 603	Andy Tanner	NO	wr	0.000	0.000	0.000
## 604	Tommy Streeter	TB	wr	0.000	0.000	1.004
## 605	Kamar Aiken	BAL	wr	0.000	0.000	0.000
## 606	Russell Shepard	TB	wr	0.000	0.000	0.000
## 607	Tevin Reese	SD	wr	0.000	0.000	13.360
## 608	Domenik Hixon	CHI	wr	0.000	0.000	0.000
## 609	Brandon Tate	CIN	wr	0.000	1.000	11.385
## 610	Brad Smith	PHI	wr	0.000	0.000	0.000
## 611	Pat Edwards	DET	wr	1.512	14.689	31.491
## 612	Eric Page	TB	wr	0.000	0.000	0.000
## 613	Corey Fuller	DET	wr	0.000	0.000	0.000

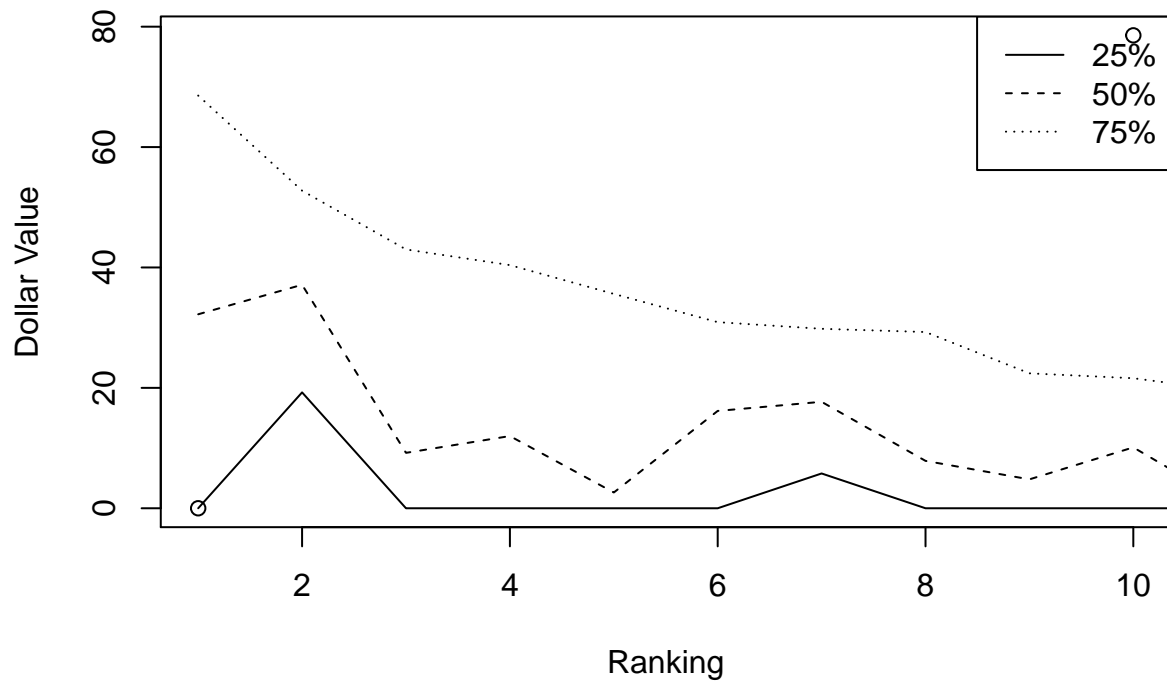

```
## 614      Kassim Osgood    SF  wr  0.000  0.000  0.000
## 615      Marc Mariani    TEN wr  0.000  0.000  0.000
## 616      Justin Blackmon JAC  wr  0.000  0.000  0.000
## 617      Sidney Rice     SEA  wr  0.000  0.000  0.000
```

```
ci <- conf.interval(l1)
plot(ci, 'qb')
```



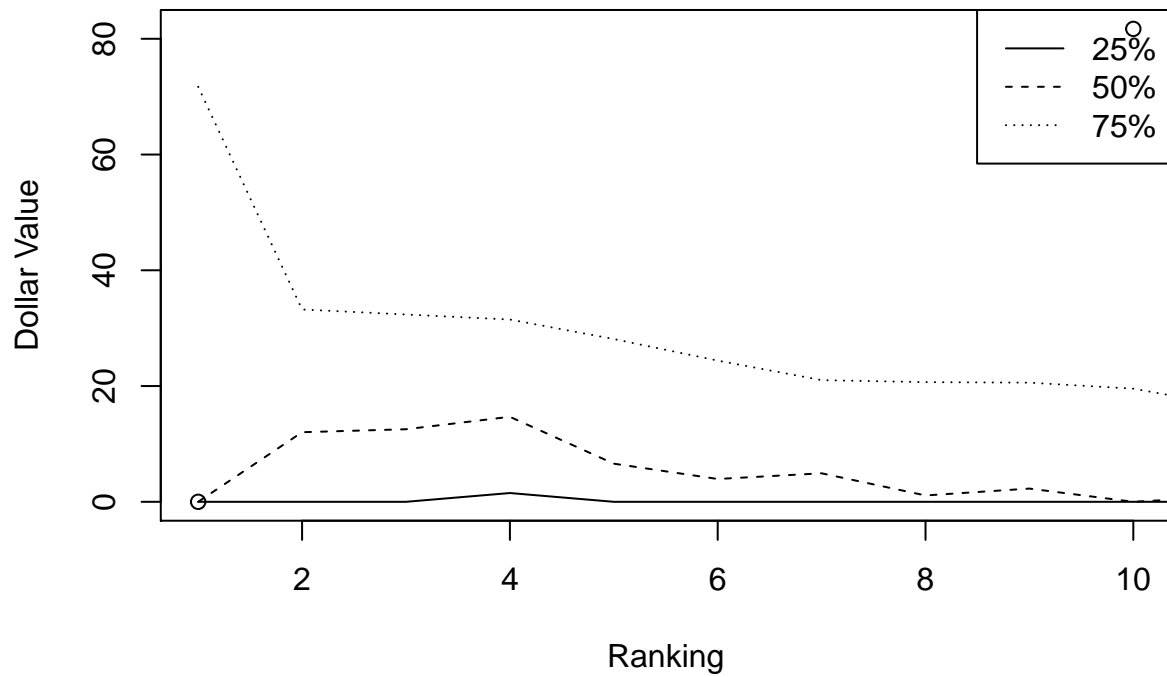
```
plot(ci, 'rb')
```

quantile values for rb



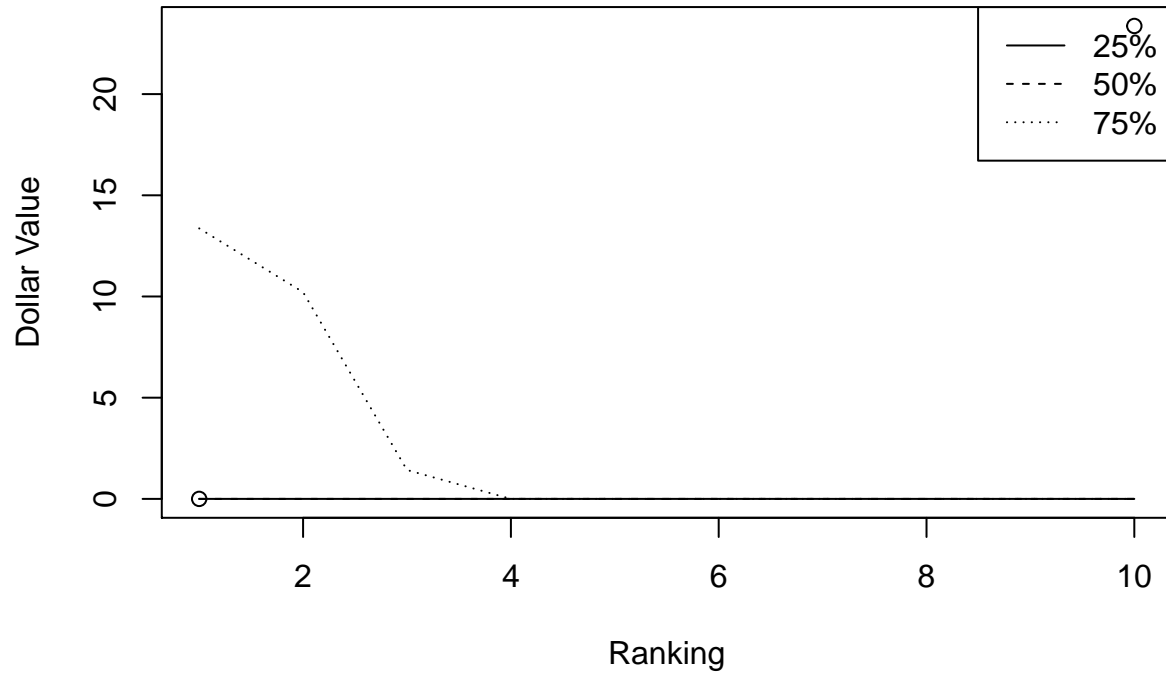
```
plot(ci, 'wr')
```

quantile values for wr



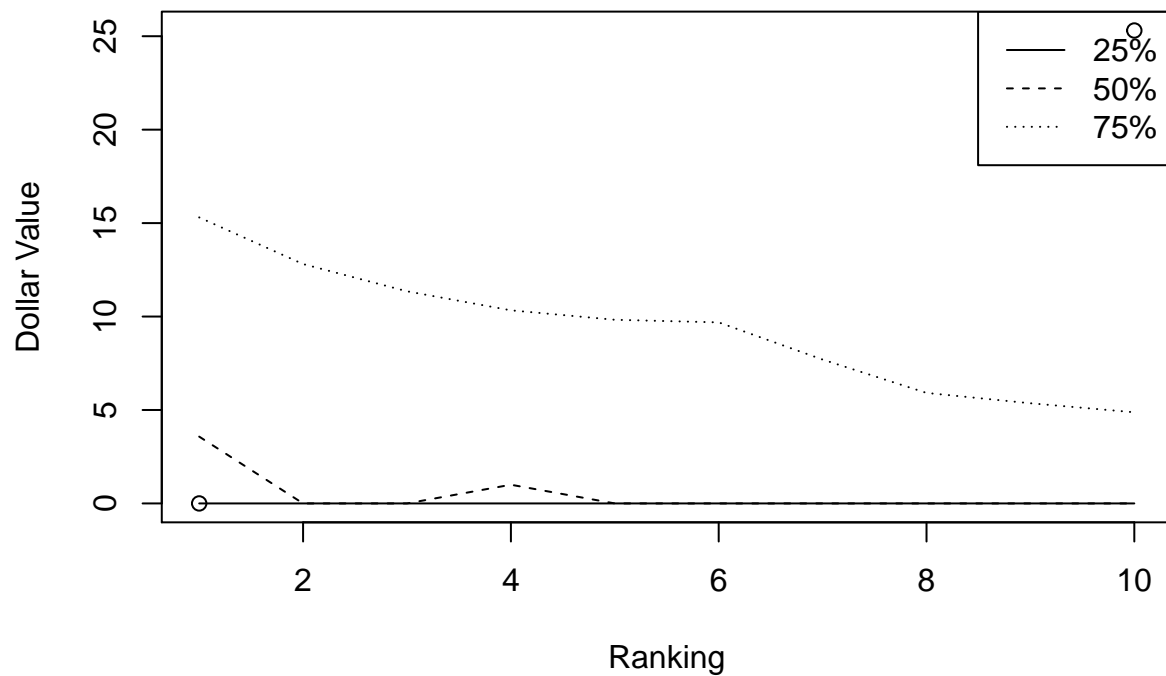
```
plot(ci, 'te')
```

quantile values for te



```
plot(ci, 'k')
```

quantile values for k



I will test your code with the following:

```
l1 <- addNoise(l, noise, 10000)
quantile(l1)
ci <- conf.interval(l1)
plot(ci, 'qb')
plot(ci, 'rb')
plot(ci, 'wr')
plot(ci, 'te')
plot(ci, 'k')
```

Additional Tips

This project is intentionally difficult. Use your best judgement in interpreting my instructions, and please do not hesitate to ask for clarification.

My expectation is that you complete tasks 1 and 2 - you have most of the code for this, it's a matter of restructuring it.

If you're stuck, use a stub answer, explain your algorithm, why it fails, and move on. Attempt everything.