bradley-Terry

```
Tennis <- read.table("http://www.stat.ufl.edu/~aa/cat/data/Tennis.dat",header=TRUE)
Tennis
```

```
   Djokovic Federer Murray Nadal Wawrinka nij nji
1         1      -1      0     0        0   9   6
2         1       0     -1     0        0  14   3
3         1       0      0    -1        0   9   2
4         1       0      0     0       -1   4   3
5         0       1     -1     0        0   5   0
6         0       1      0    -1        0   5   1
7         0       1      0     0       -1   7   2
8         0       0      1    -1        0   2   4
9         0       0      1     0       -1   2   2
10        0       0      0     1       -1   4   3
```

```
Tennis
```

```
   Djokovic Federer Murray Nadal Wawrinka nij nji
1         1      -1      0     0        0   9   6
2         1       0     -1     0        0  14   3
3         1       0      0    -1        0   9   2
4         1       0      0     0       -1   4   3
5         0       1     -1     0        0   5   0
6         0       1      0    -1        0   5   1
7         0       1      0     0       -1   7   2
8         0       0      1    -1        0   2   4
9         0       0      1     0       -1   2   2
10        0       0      0     1       -1   4   3
```

```r
data <- data.frame(
  Winner = c("Djokovic", "Federer", "Murray", "Nadal", "Wawrinka"),
  Djokovic = c(NA, 6, 3, 2, 3),
  Federer = c(9, NA, 0, 1, 2),
  Murray = c(14, 5, NA, 4, 2),
  Nadal = c(9, 5,2, NA, 3),
  Wawrinka = c(4, 7, 2, 4, NA)
)
table_result <- as.matrix(data[,-1])
rownames(table_result) <- data$Winner
table_result
```

```
         Djokovic Federer Murray Nadal Wawrinka
Djokovic       NA       9     14     9        4
Federer         6      NA      5     5        7
Murray          3       0     NA     2        2
Nadal           2       1      4    NA        4
Wawrinka        3       2      2     3       NA
```

```r
library(knitr)
kable(table_result, format = "markdown", col.names = c("Djokovic", "Federer", "Murray", "Nada
      caption = "Tennis Match Wins (Loser in Columns, Winner in Rows)")
```

Table 1: Tennis Match Wins (Loser in Columns, Winner in Rows)

	Djokovic	Federer	Murray	Nadal	Wawrinka
Djokovic	NA	9	14	9	4
Federer	6	NA	5	5	7
Murray	3	0	NA	2	2
Nadal	2	1	4	NA	4
Wawrinka	3	2	2	3	NA

```r
fit <- glm(nij/(nij+nji) ~ -1 + Djokovic + Federer + Murray + Nadal + Wawrinka, family=binom
summary(fit)
```

```
Call:
glm(formula = nij/(nij + nji) ~ -1 + Djokovic + Federer + Murray +
    Nadal + Wawrinka, family = binomial, data = Tennis, weights = nij +
```

```
    nji)

Coefficients: (1 not defined because of singularities)
         Estimate Std. Error z value Pr(>|z|)
Djokovic  1.17612    0.49952   2.354   0.0185 *
Federer   1.13578    0.51095   2.223   0.0262 *
Murray   -0.56852    0.56833  -1.000   0.3172
Nadal    -0.06185    0.51487  -0.120   0.9044
Wawrinka       NA         NA      NA       NA
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

(Dispersion parameter for binomial family taken to be 1)

    Null deviance: 26.8960  on 10  degrees of freedom
Residual deviance:  4.3958  on  6  degrees of freedom
AIC: 34.041

Number of Fisher Scoring iterations: 4
```

```r
library(BradleyTerry2)
Head2Head<-countsToBinomial(table_result)
names(Head2Head)[3:4]<-c("Win", "Lose")
model<-BTm(cbind(Win, Lose), player1, player2, formula=~player, id="player", refcat="Wawrinka
summary(model)
```

```
Call:
BTm(outcome = cbind(Win, Lose), player1 = player1, player2 = player2,
    formula = ~player, id = "player", refcat = "Wawrinka", data = Head2Head)

Coefficients:
               Estimate Std. Error z value Pr(>|z|)
playerDjokovic  1.17612    0.49952   2.354   0.0185 *
playerFederer   1.13578    0.51095   2.223   0.0262 *
playerMurray   -0.56852    0.56833  -1.000   0.3172
playerNadal    -0.06185    0.51487  -0.120   0.9044
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

(Dispersion parameter for binomial family taken to be 1)
```

```
    Null deviance: 26.8960  on 10  degrees of freedom
Residual deviance:  4.3958  on  6  degrees of freedom
AIC: 34.041

Number of Fisher Scoring iterations: 4
```

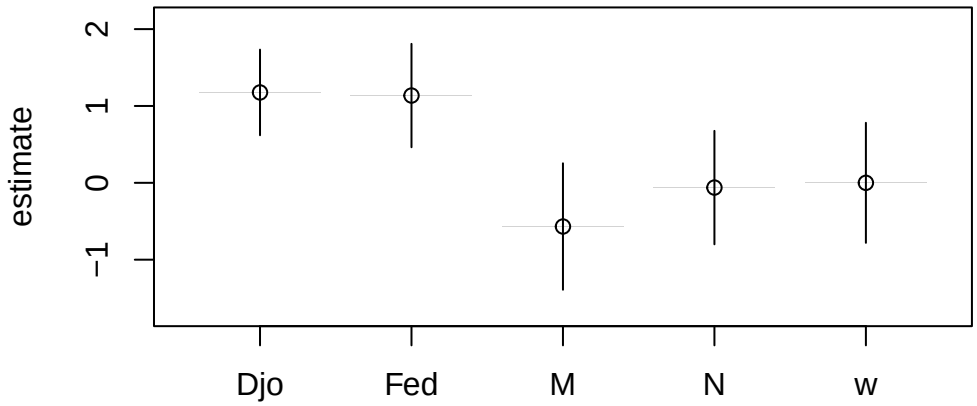
```
BTabilities(model)
```

```
             ability      s.e.
Djokovic  1.17612172 0.4995230
Federer   1.13578408 0.5109457
Murray   -0.56851913 0.5683333
Nadal    -0.06185141 0.5148698
Wawrinka  0.00000000 0.0000000
```

```
model2<-update(model, refcat="Nadal")
BTabilities(model2)
```

```
             ability      s.e.
Djokovic  1.23797313 0.4736563
Federer   1.19763549 0.5162229
Murray   -0.50666771 0.5367784
Nadal     0.00000000 0.0000000
Wawrinka  0.06185141 0.5148698
```

```
library("qvcalc")
tennis.qv <- qvcalc(BTabilities(model))
plot(tennis.qv,levelNames = c("Djo","Fed","M","N","w"))
```


Intervals based on quasi standard errors
estimate
2
1
0
−1
Djo
Fed
M
N
w