Most_Accurate

```r
# vector of the rating difference
diffs <- c(0, 20, 40, 60, 80, 100,
           120, 140, 160, 180, 200, 220, 240, 260, 280, 300)
# vector of the average rating
ratings <- c(1400, 1600, 1800, 2000, 2200, 2400, 2600)
# matrix of the draw probabilities
draw_matrix <- matrix(byrow = TRUE, nrow = length(ratings),
  c(21, 24, 25, 24, 24, 22, 23, 24, 22, 22, 20, 20, 21, 19, 18, 17,  # 1400
    28, 29, 30, 29, 27, 27, 27, 26, 25, 25, 23, 22, 20, 20, 20, 19,  # 1600
    31, 32, 32, 32, 30, 30, 28, 27, 26, 25, 23, 23, 22, 22, 20, 20,  # 1800
    35, 35, 34, 33, 32, 31, 30, 29, 27, 25, 25, 24, 21, 21, 19, 19,  # 2000
    42, 42, 40, 39, 37, 36, 34, 32, 30, 28, 25, 24, 22, 20, 19, 17,  # 2200
    54, 53, 51, 50, 47, 45, 41, 38, 35, 33, 30, 26, 24, 22, 19, 18,  # 2400
    57, 54, 54, 52, 51, 50, 45, 42, 40, 37, 34, 31, 30, 28, 29, 25   # 2600
  )
) / 100 # from the percent to the probability
# converting the matrix and columns in a suitable form for nls
Rbar_vec  <- rep(ratings, each = length(diffs)) #1400*16, 1600*16,...
D_vec     <- rep(diffs,   times = length(ratings))# 0, 20, …, 300, then again 0, 20, …, 300,....
P_obs_vec <- as.vector(t(draw_matrix))#flattening the matrix
df <- data.frame(Rbar  = Rbar_vec, D= D_vec,P_obs = P_obs_vec)
# a quick check
head(df)
```

```
##   Rbar   D P_obs
## 1 1400   0  0.21
## 2 1400  20  0.24
## 3 1400  40  0.25
## 4 1400  60  0.24
## 5 1400  80  0.24
## 6 1400 100  0.22
```

```r
fit_nls <- nls(
  formula = P_obs ~ 1 / (1 + exp( - ( b*(Rbar - 2300) - g * abs(D) ) )),
  data    = df,
  start   = list(b = 0.005, g = 0.01)
)
# estimated coefficients
coef(fit_nls)
```

```
##            b            g
## 0.0008863696 0.0042007923
```