Beta Regular

Rubens Cortelazzi Roncato

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```
source("dados_regular.R")
```

```
## -- Attaching core tidyverse packages ------------------------ tidyverse 2.0.0 --
## v dplyr     1.1.4     v readr     2.1.5
## v forcats   1.0.0     v stringr   1.5.1
## v lubridate 1.9.3     v tibble    3.2.1
## v purrr     1.0.2     v tidyr     1.3.1
## -- Conflicts ------------------------------------------ tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()
## i Use the conflicted package (<http://conflicted.r-lib.org/>) to force all conflicts to become errors
## Loading required package: splines
##
## Loading required package: gamlss.data
##
##
## Attaching package: 'gamlss.data'
##
##
## The following object is masked from 'package:datasets':
##
##     sleep
##
##
## Loading required package: gamlss.dist
##
## Loading required package: nlme
##
##
## Attaching package: 'nlme'
##
##
## The following object is masked from 'package:dplyr':
##
##     collapse
##
##
## Loading required package: parallel
##
##  **********   GAMLSS Version 5.4-22  **********
##
## For more on GAMLSS look at https://www.gamlss.com/
##
```

```
## Type gamlssNews() to see new features/changes/bug fixes.
##
##
## Loading required package: carData
##
##
## Attaching package: 'car'
##
##
## The following object is masked from 'package:dplyr':
##
##     recode
##
##
## The following object is masked from 'package:purrr':
##
##     some
##
##
## Loading required package: zoo
##
##
## Attaching package: 'zoo'
##
##
## The following objects are masked from 'package:base':
##
##     as.Date, as.Date.numeric
```

```
#Probito e logito são as melhores funções de ligação, mas loglog e cloglog até que estão adequadas.

##### Regressão beta sem alterar a função de ligação. (logito) #######
## Modelo completo ##
modelo_beta1 <- betareg(WINP ~ .,data = dados_regressao) #Regressão com todos os dados do modelo
modelo_beta1
```

```
##
## Call:
## betareg(formula = WINP ~ ., data = dados_regressao)
##
## Coefficients (mean model with logit link):
##                (Intercept)          TEAMBoston Celtics
##                  -1.745e+00                  -5.872e-02
##          TEAMBrooklyn Nets       TEAMCharlotte Bobcats
##                   2.832e-02                   3.030e-02
##      TEAMCharlotte Hornets           TEAMChicago Bulls
##                  -3.680e-02                   4.665e-02
##    TEAMCleveland Cavaliers        TEAMDallas Mavericks
##                   2.738e-02                  -7.466e-02
##         TEAMDenver Nuggets         TEAMDetroit Pistons
##                   7.960e-04                  -1.206e-01
##  TEAMGolden State Warriors         TEAMHouston Rockets
##                  -6.539e-02                   5.090e-02
##         TEAMIndiana Pacers             TEAMLA Clippers
##                  -1.953e-02                  -3.467e-02
```

```
##   TEAMLos Angeles Clippers      TEAMLos Angeles Lakers
##                -7.768e-02                   3.365e-02
##      TEAMMemphis Grizzlies             TEAMMiami Heat
##                 5.078e-02                  -1.300e-02
##        TEAMMilwaukee Bucks  TEAMMinnesota Timberwolves
##                -6.946e-02                  -1.912e-01
##        TEAMNew Jersey Nets    TEAMNew Orleans Hornets
##                -1.403e-01                  -8.191e-02
##   TEAMNew Orleans Pelicans         TEAMNew York Knicks
##                -1.439e-01                  -9.262e-02
##  TEAMOklahoma City Thunder           TEAMOrlando Magic
##                 8.418e-03                  -6.816e-02
##     TEAMPhiladelphia 76ers            TEAMPhoenix Suns
##                -9.044e-02                  -2.098e-02
## TEAMPortland Trail Blazers        TEAMSacramento Kings
##                 4.528e-02                  -4.641e-02
##      TEAMSan Antonio Spurs         TEAMToronto Raptors
##                -5.241e-02                  -5.236e-02
##              TEAMUtah Jazz      TEAMWashington Wizards
##                -1.252e-01                  -6.334e-02
##                       PTS                         FGM
##                -1.295e-01                   1.809e-01
##                       FGA                         FGP
##                 1.261e-02                   9.625e-02
##                     `3PM`                       `3PA`
##                 7.866e-02                   2.018e-02
##                     `3PP`                         FTM
##                 2.312e-02                   2.918e-01
##                       FTA                         FTP
##                -1.361e-01                  -3.677e-02
##                      OREB                        DREB
##                 2.405e-01                   2.396e-01
##                       REB                         AST
##                -2.072e-01                   8.921e-03
##                       TOV                         STL
##                -4.091e-02                   4.407e-02
##                       BLK                        BLKA
##                -2.996e-05                  -2.126e-02
##                        PF                         PFD
##                -6.279e-03                   2.031e-02
##                 PlusMinus           Numero_temporada2
##                 1.127e-01                   2.159e-02
##          Numero_temporada3           Numero_temporada4
##                 2.208e-02                   4.392e-02
##          Numero_temporada5           Numero_temporada6
##                 7.635e-03                  -6.389e-03
##          Numero_temporada7           Numero_temporada8
##                 1.586e-02                   7.495e-03
##          Numero_temporada9          Numero_temporada10
##                -3.937e-03                  -2.007e-02
##         Numero_temporada11          Numero_temporada12
##                -1.917e-02                  -9.702e-03
##         Numero_temporada13          Numero_temporada14
##                -4.290e-02                  -4.930e-02
```

```
##         Numero_temporada15
##                  -1.769e-02
##
## Phi coefficients (precision model with identity link):
## (phi)
## 188.6
```

```
summary(modelo_beta1) #Pseudo R-squared: 0.9351
```

```
##
## Call:
## betareg(formula = WINP ~ ., data = dados_regressao)
##
## Standardized weighted residuals 2:
##     Min      1Q  Median      3Q     Max
## -3.4694 -0.7137  0.0481  0.7442  3.6179
##
## Coefficients (mean model with logit link):
##                              Estimate Std. Error z value Pr(>|z|)
## (Intercept)                -1.745e+00  5.410e+00  -0.323  0.74700
## TEAMBoston Celtics         -5.872e-02  5.787e-02  -1.015  0.31021
## TEAMBrooklyn Nets           2.832e-02  6.136e-02   0.462  0.64439
## TEAMCharlotte Bobcats       3.030e-02  8.226e-02   0.368  0.71261
## TEAMCharlotte Hornets      -3.680e-02  6.668e-02  -0.552  0.58100
## TEAMChicago Bulls           4.665e-02  5.802e-02   0.804  0.42138
## TEAMCleveland Cavaliers     2.738e-02  5.843e-02   0.469  0.63932
## TEAMDallas Mavericks       -7.466e-02  5.942e-02  -1.256  0.20896
## TEAMDenver Nuggets          7.960e-04  5.788e-02   0.014  0.98903
## TEAMDetroit Pistons        -1.206e-01  6.059e-02  -1.990  0.04657 *
## TEAMGolden State Warriors  -6.539e-02  6.203e-02  -1.054  0.29177
## TEAMHouston Rockets         5.090e-02  6.041e-02   0.843  0.39943
## TEAMIndiana Pacers         -1.953e-02  5.729e-02  -0.341  0.73318
## TEAMLA Clippers            -3.467e-02  7.062e-02  -0.491  0.62343
## TEAMLos Angeles Clippers   -7.768e-02  7.612e-02  -1.020  0.30753
## TEAMLos Angeles Lakers      3.365e-02  5.856e-02   0.575  0.56556
## TEAMMemphis Grizzlies       5.078e-02  5.920e-02   0.858  0.39103
## TEAMMiami Heat             -1.300e-02  5.844e-02  -0.223  0.82391
## TEAMMilwaukee Bucks        -6.946e-02  5.694e-02  -1.220  0.22253
## TEAMMinnesota Timberwolves -1.912e-01  5.818e-02  -3.287  0.00101 **
## TEAMNew Jersey Nets        -1.403e-01  9.488e-02  -1.479  0.13924
## TEAMNew Orleans Hornets    -8.191e-02  8.099e-02  -1.011  0.31185
## TEAMNew Orleans Pelicans   -1.439e-01  6.294e-02  -2.287  0.02218 *
## TEAMNew York Knicks        -9.262e-02  5.913e-02  -1.566  0.11728
## TEAMOklahoma City Thunder   8.418e-03  6.275e-02   0.134  0.89329
## TEAMOrlando Magic          -6.816e-02  5.810e-02  -1.173  0.24075
## TEAMPhiladelphia 76ers     -9.044e-02  5.912e-02  -1.530  0.12606
## TEAMPhoenix Suns           -2.098e-02  5.980e-02  -0.351  0.72569
## TEAMPortland Trail Blazers  4.528e-02  5.908e-02   0.766  0.44348
## TEAMSacramento Kings       -4.641e-02  5.871e-02  -0.791  0.42918
## TEAMSan Antonio Spurs      -5.241e-02  5.848e-02  -0.896  0.37018
## TEAMToronto Raptors        -5.236e-02  5.844e-02  -0.896  0.37029
## TEAMUtah Jazz              -1.252e-01  5.805e-02  -2.156  0.03108 *
## TEAMWashington Wizards     -6.334e-02  5.841e-02  -1.084  0.27818
## PTS                        -1.295e-01  1.044e-01  -1.240  0.21487
## FGM                         1.809e-01  2.095e-01   0.863  0.38788
```

```
## FGA                          1.261e-02  6.091e-02   0.207  0.83595
## FGP                          9.625e-02  1.093e-01   0.880  0.37861
## `3PM`                        7.866e-02  1.214e-01   0.648  0.51691
## `3PA`                        2.018e-02  2.294e-02   0.880  0.37896
## `3PP`                        2.312e-02  1.587e-02   1.457  0.14507
## FTM                          2.918e-01  1.315e-01   2.219  0.02646 *
## FTA                         -1.361e-01  8.040e-02  -1.692  0.09058 .
## FTP                         -3.677e-02  2.421e-02  -1.519  0.12881
## OREB                         2.405e-01  1.531e-01   1.570  0.11638
## DREB                         2.396e-01  1.521e-01   1.575  0.11522
## REB                         -2.072e-01  1.512e-01  -1.370  0.17067
## AST                          8.921e-03  6.813e-03   1.309  0.19039
## TOV                         -4.091e-02  1.584e-02  -2.583  0.00979 **
## STL                          4.407e-02  1.750e-02   2.518  0.01182 *
## BLK                         -2.996e-05  1.234e-02  -0.002  0.99806
## BLKA                        -2.126e-02  1.802e-02  -1.180  0.23788
## PF                          -6.279e-03  7.880e-03  -0.797  0.42554
## PFD                          2.031e-02  1.578e-02   1.287  0.19803
## PlusMinus                    1.127e-01  6.422e-03  17.550  < 2e-16 ***
## Numero_temporada2            2.159e-02  4.180e-02   0.517  0.60545
## Numero_temporada3            2.208e-02  4.134e-02   0.534  0.59321
## Numero_temporada4            4.392e-02  4.785e-02   0.918  0.35862
## Numero_temporada5            7.635e-03  4.540e-02   0.168  0.86644
## Numero_temporada6           -6.389e-03  4.373e-02  -0.146  0.88383
## Numero_temporada7            1.586e-02  4.813e-02   0.329  0.74179
## Numero_temporada8            7.495e-03  5.156e-02   0.145  0.88442
## Numero_temporada9           -3.937e-03  5.560e-02  -0.071  0.94355
## Numero_temporada10          -2.007e-02  6.237e-02  -0.322  0.74766
## Numero_temporada11          -1.917e-02  7.321e-02  -0.262  0.79344
## Numero_temporada12          -9.702e-03  7.472e-02  -0.130  0.89668
## Numero_temporada13          -4.290e-02  7.961e-02  -0.539  0.59001
## Numero_temporada14          -4.930e-02  7.999e-02  -0.616  0.53770
## Numero_temporada15          -1.769e-02  7.537e-02  -0.235  0.81447
##
## Phi coefficients (precision model with identity link):
##       Estimate Std. Error z value Pr(>|z|)
## (phi)   188.59      12.54   15.04   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Type of estimator: ML (maximum likelihood)
## Log-likelihood: 875.5 on 70 Df
## Pseudo R-squared: 0.9431
## Number of iterations: 85 (BFGS) + 2 (Fisher scoring)
```

```
coef(modelo_beta1)
```

```
##                (Intercept)         TEAMBoston Celtics
##              -1.745305e+00              -5.872278e-02
##          TEAMBrooklyn Nets      TEAMCharlotte Bobcats
##               2.832046e-02               3.030130e-02
##      TEAMCharlotte Hornets          TEAMChicago Bulls
##              -3.680003e-02               4.665287e-02
##    TEAMCleveland Cavaliers       TEAMDallas Mavericks
##               2.738150e-02              -7.465537e-02
```

```
##         TEAMDenver Nuggets        TEAMDetroit Pistons
##               7.960450e-04             -1.205830e-01
##  TEAMGolden State Warriors        TEAMHouston Rockets
##              -6.539479e-02              5.090157e-02
##         TEAMIndiana Pacers            TEAMLA Clippers
##              -1.953120e-02             -3.467491e-02
##   TEAMLos Angeles Clippers     TEAMLos Angeles Lakers
##              -7.767972e-02              3.365024e-02
##      TEAMMemphis Grizzlies             TEAMMiami Heat
##               5.077514e-02             -1.300406e-02
##        TEAMMilwaukee Bucks TEAMMinnesota Timberwolves
##              -6.945768e-02             -1.912273e-01
##        TEAMNew Jersey Nets    TEAMNew Orleans Hornets
##              -1.402955e-01             -8.191002e-02
##   TEAMNew Orleans Pelicans        TEAMNew York Knicks
##              -1.439481e-01             -9.261691e-02
##  TEAMOklahoma City Thunder          TEAMOrlando Magic
##               8.417588e-03             -6.816129e-02
##     TEAMPhiladelphia 76ers           TEAMPhoenix Suns
##              -9.044109e-02             -2.098178e-02
## TEAMPortland Trail Blazers       TEAMSacramento Kings
##               4.527774e-02             -4.641320e-02
##      TEAMSan Antonio Spurs        TEAMToronto Raptors
##              -5.240692e-02             -5.235612e-02
##              TEAMUtah Jazz     TEAMWashington Wizards
##              -1.251666e-01             -6.334134e-02
##                        PTS                       FGM
##              -1.294613e-01              1.809036e-01
##                        FGA                       FGP
##               1.261344e-02              9.624606e-02
##                      `3PM`                     `3PA`
##               7.866079e-02              2.018350e-02
##                      `3PP`                       FTM
##               2.312384e-02              2.917673e-01
##                        FTA                       FTP
##              -1.360663e-01             -3.676938e-02
##                       OREB                      DREB
##               2.404508e-01              2.396351e-01
##                        REB                       AST
##              -2.071504e-01              8.921345e-03
##                        TOV                       STL
##              -4.090862e-02              4.406960e-02
##                        BLK                      BLKA
##              -2.996362e-05             -2.126404e-02
##                         PF                       PFD
##              -6.279295e-03              2.030551e-02
##                 PlusMinus          Numero_temporada2
##               1.127014e-01              2.159125e-02
##          Numero_temporada3          Numero_temporada4
##               2.208426e-02              4.392387e-02
##          Numero_temporada5          Numero_temporada6
##               7.635002e-03             -6.389172e-03
##          Numero_temporada7          Numero_temporada8
##               1.585959e-02              7.495354e-03
```

```
##          Numero_temporada9         Numero_temporada10
##              -3.936868e-03              -2.006634e-02
##         Numero_temporada11         Numero_temporada12
##              -1.916999e-02              -9.702389e-03
##         Numero_temporada13         Numero_temporada14
##              -4.289760e-02              -4.929656e-02
##         Numero_temporada15                      (phi)
##              -1.768608e-02               1.885922e+02
```

```
car::Anova(modelo_beta1)
```

```
## Analysis of Deviance Table (Type II tests)
##
## Response: WINP
##                   Df    Chisq Pr(>Chisq)
## TEAM              33  63.4483   0.001120 **
## PTS                1   1.5383   0.214874
## FGM                1   0.7456   0.387885
## FGA                1   0.0429   0.835945
## FGP                1   0.7752   0.378611
## `3PM`              1   0.4201   0.516908
## `3PA`              1   0.7741   0.378957
## `3PP`              1   2.1233   0.145072
## FTM                1   4.9257   0.026460 *
## FTA                1   2.8641   0.090577 .
## FTP                1   2.3068   0.128809
## OREB               1   2.4653   0.116382
## DREB               1   2.4812   0.115217
## REB                1   1.8770   0.170672
## AST                1   1.7146   0.190394
## TOV                1   6.6730   0.009789 **
## STL                1   6.3381   0.011817 *
## BLK                1   0.0000   0.998063
## BLKA               1   1.3931   0.237884
## PF                 1   0.6350   0.425538
## PFD                1   1.6568   0.198032
## PlusMinus          1 307.9936  < 2.2e-16 ***
## Numero_temporada 14   2.8193   0.999352
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
### Modelo com variáveis significantes com alfa = 5% ##
modelo_beta11 <- betareg(WINP ~ PlusMinus,data = dados_regressao)
modelo_beta11
```

```
##
## Call:
## betareg(formula = WINP ~ PlusMinus, data = dados_regressao)
##
## Coefficients (mean model with logit link):
## (Intercept)    PlusMinus
##    -0.00525      0.13558
##
## Phi coefficients (precision model with identity link):
## (phi)
```

```
## 154.5
```

```
summary(modelo_beta11) #Pseudo R-squared: 0.9303.
```

```
##
## Call:
## betareg(formula = WINP ~ PlusMinus, data = dados_regressao)
##
## Standardized weighted residuals 2:
##     Min      1Q  Median      3Q     Max
## -2.8438 -0.6407  0.0532  0.6627  3.1059
##
## Coefficients (mean model with logit link):
##             Estimate Std. Error z value Pr(>|z|)
## (Intercept) -0.005250   0.007900  -0.665    0.506
## PlusMinus    0.135583   0.001826  74.262   <2e-16 ***
##
## Phi coefficients (precision model with identity link):
##       Estimate Std. Error z value Pr(>|z|)
## (phi)   154.54      10.27   15.04   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Type of estimator: ML (maximum likelihood)
## Log-likelihood: 830.7 on 3 Df
## Pseudo R-squared: 0.9303
## Number of iterations: 31 (BFGS) + 2 (Fisher scoring)
```

```
coef(modelo_beta11)
```

```
##  (Intercept)    PlusMinus        (phi)
##  -0.00525011   0.13558285 154.53788569
```

```
car::Anova(modelo_beta11)
```

```
## Analysis of Deviance Table (Type II tests)
##
## Response: WINP
##           Df  Chisq Pr(>Chisq)
## PlusMinus  1 5514.9  < 2.2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
exp((-1)*0.135583) #0.8732067, sendo beta_1 = 0.135583
```

```
## [1] 0.8732067
```

```
### Modelo com variáveis significantes com alfa = 10% ###
modelo_beta12 <- betareg(WINP ~ `3PP` + STL + PF + PlusMinus,data = dados_regressao)
modelo_beta12
```

```
##
## Call:
## betareg(formula = WINP ~ `3PP` + STL + PF + PlusMinus, data = dados_regressao)
##
## Coefficients (mean model with logit link):
## (Intercept)        `3PP`          STL           PF    PlusMinus
##   -0.115722     0.009726     0.005801    -0.013857     0.132532
```

```
##
## Phi coefficients (precision model with identity link):
## (phi)
## 157.4
```

```
summary(modelo_beta12) #Pseudo R-squared: 0.9319 e STL não foi significante
```

```
##
## Call:
## betareg(formula = WINP ~ `3PP` + STL + PF + PlusMinus, data = dados_regressao)
##
## Standardized weighted residuals 2:
##     Min      1Q  Median      3Q     Max
## -3.0142 -0.5959  0.0766  0.6437  2.9753
##
## Coefficients (mean model with logit link):
##              Estimate Std. Error z value Pr(>|z|)
## (Intercept) -0.115722   0.231966  -0.499   0.6179
## `3PP`        0.009726   0.005322   1.827   0.0676 .
## STL          0.005801   0.010065   0.576   0.5644
## PF          -0.013857   0.005843  -2.372   0.0177 *
## PlusMinus    0.132532   0.002224  59.587   <2e-16 ***
##
## Phi coefficients (precision model with identity link):
##       Estimate Std. Error z value Pr(>|z|)
## (phi)   157.41      10.46   15.04   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Type of estimator: ML (maximum likelihood)
## Log-likelihood: 834.8 on 6 Df
## Pseudo R-squared: 0.9319
## Number of iterations: 27 (BFGS) + 3 (Fisher scoring)
```

```
coef(modelo_beta12)
```

```
##   (Intercept)         `3PP`           STL            PF     PlusMinus
##  -0.115721982   0.009725968   0.005800542  -0.013857169   0.132532493
##         (phi)
## 157.406650684
```

```
car::Anova(modelo_beta12)
```

```
## Analysis of Deviance Table (Type II tests)
##
## Response: WINP
##           Df     Chisq Pr(>Chisq)
## `3PP`      1    3.3394    0.06764 .
## STL        1    0.3321    0.56442
## PF         1    5.6249    0.01771 *
## PlusMinus  1 3550.6364    < 2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
exp((-1)*0.008651) #0.9913863, sendo beta_1 = 0.008651
```

```
## [1] 0.9913863
```

```r
exp((-1)*0.133771) #0.8747904, sendo beta_2 = 0.133771
```

```
## [1] 0.8747904
```

```r
#####Fazendo a regressão beta, mas com loglog ######

### Com todas as variáveis do modelo ###
modelo_beta2 <- betareg(WINP ~ .,data = dados_regressao, link = "loglog") #Regressão com todos os dados
modelo_beta2
```

```
##
## Call:
## betareg(formula = WINP ~ ., data = dados_regressao, link = "loglog")
##
## Coefficients (mean model with loglog link):
##                 (Intercept)          TEAMBoston Celtics
##                  -2.5748311                  -0.0310383
##           TEAMBrooklyn Nets       TEAMCharlotte Bobcats
##                  -0.0020376                   0.0645812
##      TEAMCharlotte Hornets           TEAMChicago Bulls
##                  -0.0322433                   0.0300729
##    TEAMCleveland Cavaliers        TEAMDallas Mavericks
##                   0.0542202                  -0.0704542
##         TEAMDenver Nuggets         TEAMDetroit Pistons
##                  -0.0008745                  -0.0813921
##  TEAMGolden State Warriors         TEAMHouston Rockets
##                  -0.0370155                   0.0329937
##         TEAMIndiana Pacers             TEAMLA Clippers
##                  -0.0268029                  -0.0112272
##   TEAMLos Angeles Clippers      TEAMLos Angeles Lakers
##                  -0.0204851                   0.0247158
##      TEAMMemphis Grizzlies              TEAMMiami Heat
##                   0.0250546                  -0.0123152
##        TEAMMilwaukee Bucks  TEAMMinnesota Timberwolves
##                  -0.0544658                  -0.1273256
##        TEAMNew Jersey Nets     TEAMNew Orleans Hornets
##                  -0.0727921                  -0.0848379
##   TEAMNew Orleans Pelicans         TEAMNew York Knicks
##                  -0.1278128                  -0.0655195
##  TEAMOklahoma City Thunder           TEAMOrlando Magic
##                   0.0241569                  -0.0474257
##     TEAMPhiladelphia 76ers            TEAMPhoenix Suns
##                  -0.0481380                   0.0001808
## TEAMPortland Trail Blazers        TEAMSacramento Kings
##                   0.0345147                  -0.0318685
##      TEAMSan Antonio Spurs         TEAMToronto Raptors
##                   0.0065217                  -0.0371635
##              TEAMUtah Jazz      TEAMWashington Wizards
##                  -0.0889567                  -0.0512118
##                         PTS                         FGM
##                  -0.1116532                   0.1193063
##                         FGA                         FGP
##                   0.0254206                   0.1150214
##                       `3PM`                       `3PA`
```

```
##                   0.0817470                   0.0149311
##                       `3PP`                         FTM
##                   0.0134865                   0.2494966
##                         FTA                         FTP
##                  -0.1167004                  -0.0300511
##                        OREB                        DREB
##                   0.1834932                   0.1834465
##                         REB                         AST
##                  -0.1505132                   0.0055559
##                         TOV                         STL
##                  -0.0313734                   0.0431690
##                         BLK                        BLKA
##                   0.0056344                  -0.0144733
##                          PF                         PFD
##                  -0.0059083                   0.0162536
##                   PlusMinus            Numero_temporada2
##                   0.0736376                   0.0200147
##           Numero_temporada3           Numero_temporada4
##                   0.0189583                   0.0298322
##           Numero_temporada5           Numero_temporada6
##                  -0.0092281                  -0.0119186
##           Numero_temporada7           Numero_temporada8
##                   0.0004450                  -0.0163519
##           Numero_temporada9          Numero_temporada10
##                  -0.0310136                  -0.0490129
##          Numero_temporada11          Numero_temporada12
##                  -0.0409536                  -0.0429544
##          Numero_temporada13          Numero_temporada14
##                  -0.0628885                  -0.0712470
##          Numero_temporada15
##                  -0.0416237
##
## Phi coefficients (precision model with identity link):
## (phi)
## 172.2
```

```
summary(modelo_beta2) #Pseudo R-squared: 0.9276
```

```
##
## Call:
## betareg(formula = WINP ~ ., data = dados_regressao, link = "loglog")
##
## Standardized weighted residuals 2:
##     Min      1Q  Median      3Q     Max
## -3.1892 -0.6948  0.0287  0.7485  4.5162
##
## Coefficients (mean model with loglog link):
##                              Estimate Std. Error z value Pr(>|z|)
## (Intercept)                -2.5748311  3.9773694  -0.647 0.517392
## TEAMBoston Celtics         -0.0310383  0.0445957  -0.696 0.486434
## TEAMBrooklyn Nets          -0.0020376  0.0449077  -0.045 0.963809
## TEAMCharlotte Bobcats       0.0645812  0.0577936   1.117 0.263804
## TEAMCharlotte Hornets      -0.0322433  0.0483920  -0.666 0.505223
## TEAMChicago Bulls           0.0300729  0.0433148   0.694 0.487503
## TEAMCleveland Cavaliers     0.0542202  0.0429559   1.262 0.206867
```

```
## TEAMDallas Mavericks       -0.0704542  0.0450434  -1.564 0.117785
## TEAMDenver Nuggets         -0.0008745  0.0442396  -0.020 0.984229
## TEAMDetroit Pistons        -0.0813921  0.0432075  -1.884 0.059599 .
## TEAMGolden State Warriors  -0.0370155  0.0459785  -0.805 0.420785
## TEAMHouston Rockets         0.0329937  0.0445017   0.741 0.458449
## TEAMIndiana Pacers         -0.0268029  0.0427181  -0.627 0.530372
## TEAMLA Clippers            -0.0112272  0.0549646  -0.204 0.838148
## TEAMLos Angeles Clippers   -0.0204851  0.0553210  -0.370 0.711162
## TEAMLos Angeles Lakers      0.0247158  0.0432187   0.572 0.567404
## TEAMMemphis Grizzlies       0.0250546  0.0442910   0.566 0.571611
## TEAMMiami Heat             -0.0123152  0.0450744  -0.273 0.784684
## TEAMMilwaukee Bucks        -0.0544658  0.0426320  -1.278 0.201398
## TEAMMinnesota Timberwolves -0.1273256  0.0408747  -3.115 0.001839 **
## TEAMNew Jersey Nets        -0.0727921  0.0613191  -1.187 0.235187
## TEAMNew Orleans Hornets    -0.0848379  0.0586305  -1.447 0.147900
## TEAMNew Orleans Pelicans   -0.1278128  0.0460235  -2.777 0.005484 **
## TEAMNew York Knicks        -0.0655195  0.0426117  -1.538 0.124148
## TEAMOklahoma City Thunder   0.0241569  0.0464250   0.520 0.602825
## TEAMOrlando Magic          -0.0474257  0.0417776  -1.135 0.256294
## TEAMPhiladelphia 76ers     -0.0481380  0.0431401  -1.116 0.264485
## TEAMPhoenix Suns            0.0001808  0.0433658   0.004 0.996674
## TEAMPortland Trail Blazers  0.0345147  0.0441671   0.781 0.434533
## TEAMSacramento Kings       -0.0318685  0.0414054  -0.770 0.441495
## TEAMSan Antonio Spurs       0.0065217  0.0453769   0.144 0.885719
## TEAMToronto Raptors        -0.0371635  0.0438109  -0.848 0.396288
## TEAMUtah Jazz              -0.0889567  0.0438609  -2.028 0.042545 *
## TEAMWashington Wizards     -0.0512118  0.0420446  -1.218 0.223211
## PTS                        -0.1116532  0.0759858  -1.469 0.141725
## FGM                         0.1193063  0.1539152   0.775 0.438255
## FGA                         0.0254206  0.0447798   0.568 0.570252
## FGP                         0.1150214  0.0801337   1.435 0.151182
## `3PM`                       0.0817470  0.0882394   0.926 0.354226
## `3PA`                       0.0149311  0.0163706   0.912 0.361733
## `3PP`                       0.0134865  0.0112871   1.195 0.232140
## FTM                         0.2494966  0.0973226   2.564 0.010359 *
## FTA                        -0.1167004  0.0603738  -1.933 0.053241 .
## FTP                        -0.0300511  0.0181482  -1.656 0.097747 .
## OREB                        0.1834932  0.1113579   1.648 0.099398 .
## DREB                        0.1834465  0.1104698   1.661 0.096793 .
## REB                        -0.1505132  0.1099075  -1.369 0.170858
## AST                         0.0055559  0.0051016   1.089 0.276129
## TOV                        -0.0313734  0.0114885  -2.731 0.006317 **
## STL                         0.0431690  0.0127538   3.385 0.000712 ***
## BLK                         0.0056344  0.0090518   0.622 0.533639
## BLKA                       -0.0144733  0.0132368  -1.093 0.274211
## PF                         -0.0059083  0.0056545  -1.045 0.296074
## PFD                         0.0162536  0.0115674   1.405 0.159987
## PlusMinus                   0.0736376  0.0046733  15.757  < 2e-16 ***
## Numero_temporada2           0.0200147  0.0306378   0.653 0.513584
## Numero_temporada3           0.0189583  0.0300206   0.632 0.527707
## Numero_temporada4           0.0298322  0.0349068   0.855 0.392758
## Numero_temporada5          -0.0092281  0.0332438  -0.278 0.781329
## Numero_temporada6          -0.0119186  0.0320046  -0.372 0.709593
## Numero_temporada7           0.0004450  0.0350884   0.013 0.989882
```

```
## Numero_temporada8          -0.0163519  0.0374546  -0.437 0.662416
## Numero_temporada9          -0.0310136  0.0408208  -0.760 0.447404
## Numero_temporada10         -0.0490129  0.0456531  -1.074 0.283005
## Numero_temporada11         -0.0409536  0.0535378  -0.765 0.444302
## Numero_temporada12         -0.0429544  0.0543137  -0.791 0.429027
## Numero_temporada13         -0.0628885  0.0587066  -1.071 0.284064
## Numero_temporada14         -0.0712470  0.0591053  -1.205 0.228039
## Numero_temporada15         -0.0416237  0.0557923  -0.746 0.455638
##
## Phi coefficients (precision model with identity link):
##       Estimate Std. Error z value Pr(>|z|)
## (phi)   172.20      11.45   15.04   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Type of estimator: ML (maximum likelihood)
## Log-likelihood: 855.2 on 70 Df
## Pseudo R-squared: 0.9364
## Number of iterations: 84 (BFGS) + 2 (Fisher scoring)
```

```
coef(modelo_beta2)
```

```
##                (Intercept)         TEAMBoston Celtics
##              -2.574831e+00              -3.103825e-02
##          TEAMBrooklyn Nets      TEAMCharlotte Bobcats
##              -2.037641e-03               6.458115e-02
##      TEAMCharlotte Hornets          TEAMChicago Bulls
##              -3.224326e-02               3.007288e-02
##    TEAMCleveland Cavaliers       TEAMDallas Mavericks
##               5.422019e-02              -7.045416e-02
##         TEAMDenver Nuggets        TEAMDetroit Pistons
##              -8.744818e-04              -8.139209e-02
##  TEAMGolden State Warriors        TEAMHouston Rockets
##              -3.701549e-02               3.299370e-02
##         TEAMIndiana Pacers            TEAMLA Clippers
##              -2.680295e-02              -1.122721e-02
##   TEAMLos Angeles Clippers     TEAMLos Angeles Lakers
##              -2.048514e-02               2.471582e-02
##      TEAMMemphis Grizzlies             TEAMMiami Heat
##               2.505457e-02              -1.231520e-02
##        TEAMMilwaukee Bucks TEAMMinnesota Timberwolves
##              -5.446581e-02              -1.273256e-01
##        TEAMNew Jersey Nets    TEAMNew Orleans Hornets
##              -7.279210e-02              -8.483785e-02
##   TEAMNew Orleans Pelicans        TEAMNew York Knicks
##              -1.278128e-01              -6.551949e-02
##  TEAMOklahoma City Thunder          TEAMOrlando Magic
##               2.415689e-02              -4.742568e-02
##     TEAMPhiladelphia 76ers           TEAMPhoenix Suns
##              -4.813803e-02               1.807543e-04
## TEAMPortland Trail Blazers       TEAMSacramento Kings
##               3.451473e-02              -3.186853e-02
##      TEAMSan Antonio Spurs        TEAMToronto Raptors
##               6.521748e-03              -3.716346e-02
##              TEAMUtah Jazz     TEAMWashington Wizards
```

```
##              -8.895670e-02              -5.121178e-02
##                        PTS                        FGM
##              -1.116532e-01               1.193063e-01
##                        FGA                        FGP
##               2.542062e-02               1.150214e-01
##                      `3PM`                      `3PA`
##               8.174701e-02               1.493112e-02
##                      `3PP`                        FTM
##               1.348652e-02               2.494966e-01
##                        FTA                        FTP
##              -1.167004e-01              -3.005111e-02
##                       OREB                       DREB
##               1.834932e-01               1.834465e-01
##                        REB                        AST
##              -1.505132e-01               5.555943e-03
##                        TOV                        STL
##              -3.137344e-02               4.316895e-02
##                        BLK                       BLKA
##               5.634362e-03              -1.447332e-02
##                         PF                        PFD
##              -5.908282e-03               1.625360e-02
##                  PlusMinus          Numero_temporada2
##               7.363761e-02               2.001468e-02
##          Numero_temporada3          Numero_temporada4
##               1.895828e-02               2.983222e-02
##          Numero_temporada5          Numero_temporada6
##              -9.228082e-03              -1.191861e-02
##          Numero_temporada7          Numero_temporada8
##               4.449677e-04              -1.635194e-02
##          Numero_temporada9         Numero_temporada10
##              -3.101360e-02              -4.901288e-02
##         Numero_temporada11         Numero_temporada12
##              -4.095365e-02              -4.295440e-02
##         Numero_temporada13         Numero_temporada14
##              -6.288852e-02              -7.124704e-02
##         Numero_temporada15                       (phi)
##              -4.162372e-02               1.722039e+02
```

```
### com variáveis significantes com alfa = 5% ###
modelo_beta21 <- betareg(WINP ~ STL + PF + PlusMinus,data = dados_regressao, link = "loglog") #Regressã
modelo_beta21
```

```
##
## Call:
## betareg(formula = WINP ~ STL + PF + PlusMinus, data = dados_regressao,
##     link = "loglog")
##
## Coefficients (mean model with loglog link):
## (Intercept)          STL           PF    PlusMinus
##    0.596869     0.004795    -0.011997     0.092285
##
## Phi coefficients (precision model with identity link):
## (phi)
## 139.4
```

```r
summary(modelo_beta21) #Pseudo R-squared: 0.9229
```

```
##
## Call:
## betareg(formula = WINP ~ STL + PF + PlusMinus, data = dados_regressao,
##     link = "loglog")
##
## Standardized weighted residuals 2:
##     Min      1Q  Median      3Q     Max
## -3.0613 -0.5808  0.0294  0.6645  4.0164
##
## Coefficients (mean model with loglog link):
##              Estimate Std. Error z value Pr(>|z|)
## (Intercept)  0.596869   0.091508   6.523 6.91e-11 ***
## STL          0.004795   0.007444   0.644  0.51949
## PF          -0.011997   0.004281  -2.802  0.00508 **
## PlusMinus    0.092285   0.001316  70.130  < 2e-16 ***
##
## Phi coefficients (precision model with identity link):
##       Estimate Std. Error z value Pr(>|z|)
## (phi)  139.407      9.263   15.05   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Type of estimator: ML (maximum likelihood)
## Log-likelihood: 807.6 on 5 Df
## Pseudo R-squared: 0.9229
## Number of iterations: 28 (BFGS) + 2 (Fisher scoring)
```

```r
coef(modelo_beta21)
```

```
##   (Intercept)           STL            PF     PlusMinus         (phi)
##   0.596868894   0.004794876  -0.011997188   0.092284526 139.407335668
```

```r
### com variáveis significantes com alfa = 10%###
modelo_beta22 <- betareg(WINP ~ FTM + STL + PF + PlusMinus,data = dados_regressao, link = "loglog") #Re
modelo_beta22
```

```
##
## Call:
## betareg(formula = WINP ~ FTM + STL + PF + PlusMinus, data = dados_regressao,
##     link = "loglog")
##
## Coefficients (mean model with loglog link):
## (Intercept)          FTM          STL           PF    PlusMinus
##   0.5958444    0.0001016    0.0048185   -0.0120441    0.0922739
##
## Phi coefficients (precision model with identity link):
## (phi)
## 139.4
```

```r
summary(modelo_beta22) #0.9229
```

```
##
## Call:
## betareg(formula = WINP ~ FTM + STL + PF + PlusMinus, data = dados_regressao,
```

```
##     link = "loglog")
##
## Standardized weighted residuals 2:
##     Min      1Q  Median      3Q     Max
## -3.0707 -0.5812  0.0308  0.6646  4.0215
##
## Coefficients (mean model with loglog link):
##               Estimate Std. Error z value Pr(>|z|)
## (Intercept)  0.5958444  0.0985428   6.047 1.48e-09 ***
## FTM          0.0001016  0.0035822   0.028  0.97736
## STL          0.0048185  0.0074893   0.643  0.51998
## PF          -0.0120441  0.0045801  -2.630  0.00855 **
## PlusMinus    0.0922739  0.0013687  67.415  < 2e-16 ***
##
## Phi coefficients (precision model with identity link):
##       Estimate Std. Error z value Pr(>|z|)
## (phi)  139.408      9.263   15.05   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Type of estimator: ML (maximum likelihood)
## Log-likelihood: 807.6 on 6 Df
## Pseudo R-squared: 0.9229
## Number of iterations: 32 (BFGS) + 2 (Fisher scoring)
```

```r
coef(modelo_beta22)
```

```
##   (Intercept)           FTM           STL            PF     PlusMinus
##  5.958444e-01  1.016388e-04  4.818457e-03 -1.204406e-02  9.227391e-02
##         (phi)
##  1.394076e+02
```

```r
##### Fazendo a regressão beta, mas com probito #######

### Modelo completo ###
modelo_beta_probit <- betareg(WINP ~  .,data = dados_regressao, link = "probit")
modelo_beta_probit
```

```
##
## Call:
## betareg(formula = WINP ~ ., data = dados_regressao, link = "probit")
##
## Coefficients (mean model with probit link):
##                (Intercept)          TEAMBoston Celtics
##                 -1.0013443                  -0.0358906
##          TEAMBrooklyn Nets       TEAMCharlotte Bobcats
##                  0.0153056                   0.0214086
##      TEAMCharlotte Hornets           TEAMChicago Bulls
##                 -0.0257201                   0.0273135
##    TEAMCleveland Cavaliers        TEAMDallas Mavericks
##                  0.0160671                  -0.0468740
##         TEAMDenver Nuggets         TEAMDetroit Pistons
##                  0.0008527                  -0.0775217
##  TEAMGolden State Warriors         TEAMHouston Rockets
##                 -0.0422696                   0.0313982
```

```
##         TEAMIndiana Pacers             TEAMLA Clippers
##                -0.0126755                -0.0222272
##   TEAMLos Angeles Clippers     TEAMLos Angeles Lakers
##                -0.0487710                 0.0199564
##      TEAMMemphis Grizzlies             TEAMMiami Heat
##                 0.0295976                -0.0091092
##        TEAMMilwaukee Bucks TEAMMinnesota Timberwolves
##                -0.0460280                -0.1203816
##        TEAMNew Jersey Nets    TEAMNew Orleans Hornets
##                -0.0886511                -0.0541575
##   TEAMNew Orleans Pelicans         TEAMNew York Knicks
##                -0.0921117                -0.0582871
##  TEAMOklahoma City Thunder           TEAMOrlando Magic
##                 0.0064276                -0.0440548
##     TEAMPhiladelphia 76ers            TEAMPhoenix Suns
##                -0.0543098                -0.0111779
## TEAMPortland Trail Blazers        TEAMSacramento Kings
##                 0.0291181                -0.0324679
##      TEAMSan Antonio Spurs         TEAMToronto Raptors
##                -0.0312853                -0.0318790
##              TEAMUtah Jazz     TEAMWashington Wizards
##                -0.0779991                -0.0413914
##                       PTS                       FGM
##                -0.0762144                 0.1047945
##                       FGA                       FGP
##                 0.0070226                 0.0588424
##                    `3PM`                     `3PA`
##                 0.0466906                 0.0119210
##                    `3PP`                       FTM
##                 0.0140541                 0.1780922
##                       FTA                       FTP
##                -0.0856901                -0.0231773
##                      OREB                      DREB
##                 0.1489185                 0.1486199
##                       REB                       AST
##                -0.1277063                 0.0055487
##                       TOV                       STL
##                -0.0259709                 0.0287746
##                       BLK                      BLKA
##                -0.0006853                -0.0125765
##                        PF                       PFD
##                -0.0041846                 0.0133503
##                 PlusMinus          Numero_temporada2
##                 0.0691259                 0.0139977
##          Numero_temporada3          Numero_temporada4
##                 0.0136896                 0.0274058
##          Numero_temporada5          Numero_temporada6
##                 0.0023308                -0.0040049
##          Numero_temporada7          Numero_temporada8
##                 0.0087548                 0.0019810
##          Numero_temporada9         Numero_temporada10
##                -0.0043450                -0.0137993
##         Numero_temporada11         Numero_temporada12
##                -0.0126127                -0.0069202
```

```
##         Numero_temporada13          Numero_temporada14
##                 -0.0263853                  -0.0305975
##         Numero_temporada15
##                 -0.0091389
##
## Phi coefficients (precision model with identity link):
## (phi)
## 188.3
```

```
summary(modelo_beta_probit) #Pseudo R-squared: 0.9303
```

```
##
## Call:
## betareg(formula = WINP ~ ., data = dados_regressao, link = "probit")
##
## Standardized weighted residuals 2:
##     Min      1Q  Median      3Q     Max
## -3.4740 -0.7159  0.0601  0.7294  3.4801
##
## Coefficients (mean model with probit link):
##                               Estimate Std. Error z value Pr(>|z|)
## (Intercept)                -1.0013443  3.3187169  -0.302  0.76286
## TEAMBoston Celtics         -0.0358906  0.0357051  -1.005  0.31480
## TEAMBrooklyn Nets           0.0153056  0.0379863   0.403  0.68700
## TEAMCharlotte Bobcats       0.0214086  0.0504914   0.424  0.67156
## TEAMCharlotte Hornets      -0.0257201  0.0412817  -0.623  0.53326
## TEAMChicago Bulls           0.0273135  0.0358880   0.761  0.44661
## TEAMCleveland Cavaliers     0.0160671  0.0357688   0.449  0.65329
## TEAMDallas Mavericks       -0.0468740  0.0368210  -1.273  0.20301
## TEAMDenver Nuggets          0.0008527  0.0357791   0.024  0.98099
## TEAMDetroit Pistons        -0.0775217  0.0373457  -2.076  0.03791 *
## TEAMGolden State Warriors  -0.0422696  0.0380893  -1.110  0.26711
## TEAMHouston Rockets         0.0313982  0.0371619   0.845  0.39816
## TEAMIndiana Pacers         -0.0126755  0.0355210  -0.357  0.72121
## TEAMLA Clippers            -0.0222272  0.0436935  -0.509  0.61096
## TEAMLos Angeles Clippers   -0.0487710  0.0464122  -1.051  0.29334
## TEAMLos Angeles Lakers      0.0199564  0.0360393   0.554  0.57976
## TEAMMemphis Grizzlies       0.0295976  0.0366422   0.808  0.41924
## TEAMMiami Heat             -0.0091092  0.0361691  -0.252  0.80116
## TEAMMilwaukee Bucks        -0.0460280  0.0351797  -1.308  0.19075
## TEAMMinnesota Timberwolves -0.1203816  0.0357906  -3.363  0.00077 ***
## TEAMNew Jersey Nets        -0.0886511  0.0574744  -1.542  0.12297
## TEAMNew Orleans Hornets    -0.0541575  0.0502806  -1.077  0.28143
## TEAMNew Orleans Pelicans   -0.0921117  0.0391118  -2.355  0.01852 *
## TEAMNew York Knicks        -0.0582871  0.0364828  -1.598  0.11012
## TEAMOklahoma City Thunder   0.0064276  0.0385893   0.167  0.86771
## TEAMOrlando Magic          -0.0440548  0.0357576  -1.232  0.21793
## TEAMPhiladelphia 76ers     -0.0543098  0.0363600  -1.494  0.13526
## TEAMPhoenix Suns           -0.0111779  0.0367684  -0.304  0.76112
## TEAMPortland Trail Blazers  0.0291181  0.0365045   0.798  0.42507
## TEAMSacramento Kings       -0.0324679  0.0361754  -0.898  0.36944
## TEAMSan Antonio Spurs      -0.0312853  0.0358681  -0.872  0.38308
## TEAMToronto Raptors        -0.0318790  0.0360903  -0.883  0.37707
## TEAMUtah Jazz              -0.0779991  0.0358747  -2.174  0.02969 *
## TEAMWashington Wizards     -0.0413914  0.0361181  -1.146  0.25179
```

```
## PTS                         -0.0762144  0.0640868  -1.189  0.23435
## FGM                          0.1047945  0.1289936   0.812  0.41656
## FGA                          0.0070226  0.0374045   0.188  0.85107
## FGP                          0.0588424  0.0670284   0.878  0.38001
## `3PM`                        0.0466906  0.0746723   0.625  0.53179
## `3PA`                        0.0119210  0.0140558   0.848  0.39637
## `3PP`                        0.0140541  0.0097219   1.446  0.14829
## FTM                          0.1780922  0.0807592   2.205  0.02744 *
## FTA                         -0.0856901  0.0494964  -1.731  0.08341 .
## FTP                         -0.0231773  0.0149053  -1.555  0.11995
## OREB                         0.1489185  0.0942988   1.579  0.11429
## DREB                         0.1486199  0.0936764   1.587  0.11262
## REB                         -0.1277063  0.0931088  -1.372  0.17019
## AST                          0.0055487  0.0041978   1.322  0.18623
## TOV                         -0.0259709  0.0097514  -2.663  0.00774 **
## STL                          0.0287746  0.0107815   2.669  0.00761 **
## BLK                         -0.0006853  0.0075823  -0.090  0.92798
## BLKA                        -0.0125765  0.0110892  -1.134  0.25675
## PF                          -0.0041846  0.0048505  -0.863  0.38830
## PFD                          0.0133503  0.0096920   1.377  0.16837
## PlusMinus                    0.0691259  0.0039499  17.501  < 2e-16 ***
## Numero_temporada2            0.0139977  0.0256947   0.545  0.58591
## Numero_temporada3            0.0136896  0.0253855   0.539  0.58970
## Numero_temporada4            0.0274058  0.0293636   0.933  0.35065
## Numero_temporada5            0.0023308  0.0278705   0.084  0.93335
## Numero_temporada6           -0.0040049  0.0268796  -0.149  0.88156
## Numero_temporada7            0.0087548  0.0295598   0.296  0.76710
## Numero_temporada8            0.0019810  0.0316689   0.063  0.95012
## Numero_temporada9           -0.0043450  0.0342150  -0.127  0.89895
## Numero_temporada10          -0.0137993  0.0383553  -0.360  0.71902
## Numero_temporada11          -0.0126127  0.0450480  -0.280  0.77949
## Numero_temporada12          -0.0069202  0.0459277  -0.151  0.88023
## Numero_temporada13          -0.0263853  0.0489784  -0.539  0.59009
## Numero_temporada14          -0.0305975  0.0492374  -0.621  0.53432
## Numero_temporada15          -0.0091389  0.0464419  -0.197  0.84400
##
## Phi coefficients (precision model with identity link):
##       Estimate Std. Error z value Pr(>|z|)
## (phi)   188.30      12.52   15.04   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Type of estimator: ML (maximum likelihood)
## Log-likelihood: 875.2 on 70 Df
## Pseudo R-squared: 0.9445
## Number of iterations: 84 (BFGS) + 2 (Fisher scoring)
```

```
coef(modelo_beta_probit)
```

```
##                (Intercept)         TEAMBoston Celtics
##              -1.001344e+00              -3.589056e-02
##          TEAMBrooklyn Nets      TEAMCharlotte Bobcats
##               1.530564e-02               2.140859e-02
##      TEAMCharlotte Hornets          TEAMChicago Bulls
##              -2.572009e-02               2.731350e-02
```

```
##    TEAMCleveland Cavaliers       TEAMDallas Mavericks
##               1.606710e-02              -4.687399e-02
##         TEAMDenver Nuggets        TEAMDetroit Pistons
##               8.527497e-04              -7.752168e-02
##  TEAMGolden State Warriors        TEAMHouston Rockets
##              -4.226962e-02               3.139821e-02
##         TEAMIndiana Pacers            TEAMLA Clippers
##              -1.267553e-02              -2.222720e-02
##   TEAMLos Angeles Clippers     TEAMLos Angeles Lakers
##              -4.877096e-02               1.995638e-02
##      TEAMMemphis Grizzlies             TEAMMiami Heat
##               2.959764e-02              -9.109218e-03
##        TEAMMilwaukee Bucks TEAMMinnesota Timberwolves
##              -4.602804e-02              -1.203816e-01
##        TEAMNew Jersey Nets    TEAMNew Orleans Hornets
##              -8.865106e-02              -5.415755e-02
##   TEAMNew Orleans Pelicans        TEAMNew York Knicks
##              -9.211171e-02              -5.828710e-02
##  TEAMOklahoma City Thunder          TEAMOrlando Magic
##               6.427582e-03              -4.405484e-02
##     TEAMPhiladelphia 76ers           TEAMPhoenix Suns
##              -5.430981e-02              -1.117790e-02
## TEAMPortland Trail Blazers       TEAMSacramento Kings
##               2.911815e-02              -3.246790e-02
##      TEAMSan Antonio Spurs        TEAMToronto Raptors
##              -3.128532e-02              -3.187898e-02
##              TEAMUtah Jazz     TEAMWashington Wizards
##              -7.799911e-02              -4.139143e-02
##                        PTS                        FGM
##              -7.621443e-02               1.047945e-01
##                        FGA                        FGP
##               7.022635e-03               5.884237e-02
##                      `3PM`                      `3PA`
##               4.669058e-02               1.192104e-02
##                      `3PP`                        FTM
##               1.405411e-02               1.780922e-01
##                        FTA                        FTP
##              -8.569014e-02              -2.317733e-02
##                       OREB                       DREB
##               1.489185e-01               1.486199e-01
##                        REB                        AST
##              -1.277063e-01               5.548716e-03
##                        TOV                        STL
##              -2.597093e-02               2.877456e-02
##                        BLK                       BLKA
##              -6.852902e-04              -1.257647e-02
##                         PF                        PFD
##              -4.184552e-03               1.335032e-02
##                  PlusMinus          Numero_temporada2
##               6.912595e-02               1.399768e-02
##          Numero_temporada3          Numero_temporada4
##               1.368963e-02               2.740578e-02
##          Numero_temporada5          Numero_temporada6
##               2.330759e-03              -4.004907e-03
```

```
##          Numero_temporada7          Numero_temporada8
##               8.754754e-03               1.980995e-03
##          Numero_temporada9         Numero_temporada10
##              -4.344997e-03              -1.379927e-02
##         Numero_temporada11         Numero_temporada12
##              -1.261265e-02              -6.920223e-03
##         Numero_temporada13         Numero_temporada14
##              -2.638530e-02              -3.059747e-02
##         Numero_temporada15                       (phi)
##              -9.138867e-03               1.883002e+02
```

```
### Modelo com 5% ###
modelo_beta_probit1 <- betareg(WINP ~  PlusMinus,data = dados_regressao, link = "probit")
modelo_beta_probit1
```

```
##
## Call:
## betareg(formula = WINP ~ PlusMinus, data = dados_regressao, link = "probit")
##
## Coefficients (mean model with probit link):
## (Intercept)    PlusMinus
##   -0.002604     0.083538
##
## Phi coefficients (precision model with identity link):
## (phi)
## 153.6
```

```
summary(modelo_beta_probit1) #Pseudo R-squared: 0.9317
```

```
##
## Call:
## betareg(formula = WINP ~ PlusMinus, data = dados_regressao, link = "probit")
##
## Standardized weighted residuals 2:
##     Min      1Q  Median      3Q     Max
## -2.8655 -0.6519  0.0368  0.6584  3.1984
##
## Coefficients (mean model with probit link):
##              Estimate Std. Error z value Pr(>|z|)
## (Intercept) -0.002604   0.004877  -0.534    0.593
## PlusMinus    0.083538   0.001096  76.239   <2e-16 ***
##
## Phi coefficients (precision model with identity link):
##       Estimate Std. Error z value Pr(>|z|)
## (phi)   153.56      10.21   15.04   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Type of estimator: ML (maximum likelihood)
## Log-likelihood: 829.2 on 3 Df
## Pseudo R-squared: 0.9317
## Number of iterations: 22 (BFGS) + 3 (Fisher scoring)
```

```
coef(modelo_beta_probit1)
```

```
##   (Intercept)     PlusMinus         (phi)
```

```
##  -0.002603764   0.083537531 153.562252149
```

```
### Modelo com 10% ###
modelo_beta_probit2 <- betareg(WINP ~ `3PP` + TOV + STL + PF + PlusMinus,data = dados_regressao, link =
modelo_beta_probit2
```

```
##
## Call:
## betareg(formula = WINP ~ `3PP` + TOV + STL + PF + PlusMinus, data = dados_regressao,
##     link = "probit")
##
## Coefficients (mean model with probit link):
## (Intercept)        `3PP`          TOV          STL           PF    PlusMinus
##  -0.0671991    0.0059479    0.0002532    0.0039662   -0.0089563    0.0816533
##
## Phi coefficients (precision model with identity link):
## (phi)
## 156.5
```

```
summary(modelo_beta_probit2) #Pseudo R-squared: 0.9331
```

```
##
## Call:
## betareg(formula = WINP ~ `3PP` + TOV + STL + PF + PlusMinus, data = dados_regressao,
##     link = "probit")
##
## Standardized weighted residuals 2:
##     Min      1Q  Median      3Q     Max
## -3.0562 -0.6143  0.0566  0.6671  3.0617
##
## Coefficients (mean model with probit link):
##              Estimate Std. Error z value Pr(>|z|)
## (Intercept) -0.0671991  0.1501123  -0.448   0.6544
## `3PP`        0.0059479  0.0032840   1.811   0.0701 .
## TOV          0.0002532  0.0049740   0.051   0.9594
## STL          0.0039662  0.0062975   0.630   0.5288
## PF          -0.0089563  0.0037562  -2.384   0.0171 *
## PlusMinus    0.0816533  0.0013798  59.178   <2e-16 ***
##
## Phi coefficients (precision model with identity link):
##       Estimate Std. Error z value Pr(>|z|)
## (phi)   156.55      10.41   15.04   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Type of estimator: ML (maximum likelihood)
## Log-likelihood: 833.6 on 7 Df
## Pseudo R-squared: 0.9331
## Number of iterations: 16 (BFGS) + 2 (Fisher scoring)
```

```
coef(modelo_beta_probit2)
```

```
##   (Intercept)         `3PP`           TOV           STL            PF
## -6.719908e-02  5.947906e-03  2.532476e-04  3.966216e-03 -8.956325e-03
##     PlusMinus         (phi)
##  8.165333e-02  1.565477e+02
```

```r
##### Fazendo a regressão beta, mas com cloglog ####

### Modelo completo ###
modelo_beta_cloglog <- betareg(WINP ~  .,data = dados_regressao, link = "cloglog")
modelo_beta_cloglog
```

```
##
## Call:
## betareg(formula = WINP ~ ., data = dados_regressao, link = "cloglog")
##
## Coefficients (mean model with cloglog link):
##                 (Intercept)          TEAMBoston Celtics
##                    0.794062                   -0.049746
##           TEAMBrooklyn Nets       TEAMCharlotte Bobcats
##                    0.032015                   -0.007763
##      TEAMCharlotte Hornets           TEAMChicago Bulls
##                   -0.030385                    0.029472
##    TEAMCleveland Cavaliers        TEAMDallas Mavericks
##                   -0.023293                   -0.040152
##         TEAMDenver Nuggets         TEAMDetroit Pistons
##                    0.003782                   -0.100966
##  TEAMGolden State Warriors         TEAMHouston Rockets
##                   -0.071263                    0.037661
##         TEAMIndiana Pacers             TEAMLA Clippers
##                   -0.005548                   -0.046883
##   TEAMLos Angeles Clippers      TEAMLos Angeles Lakers
##                   -0.101459                    0.018101
##      TEAMMemphis Grizzlies              TEAMMiami Heat
##                    0.039985                   -0.014300
##        TEAMMilwaukee Bucks  TEAMMinnesota Timberwolves
##                   -0.055821                   -0.153952
##        TEAMNew Jersey Nets     TEAMNew Orleans Hornets
##                   -0.149391                   -0.044444
##   TEAMNew Orleans Pelicans         TEAMNew York Knicks
##                   -0.084526                   -0.070914
##  TEAMOklahoma City Thunder           TEAMOrlando Magic
##                   -0.004848                   -0.060840
##     TEAMPhiladelphia 76ers            TEAMPhoenix Suns
##                   -0.071749                   -0.027942
## TEAMPortland Trail Blazers        TEAMSacramento Kings
##                    0.029650                   -0.053944
##      TEAMSan Antonio Spurs         TEAMToronto Raptors
##                   -0.068963                   -0.040074
##              TEAMUtah Jazz      TEAMWashington Wizards
##                   -0.089508                   -0.048661
##                       PTS                         FGM
##                   -0.033787                    0.072426
##                       FGA                         FGP
##                   -0.014226                    0.010500
##                      `3PM`                       `3PA`
##                    0.011649                    0.006716
##                      `3PP`                         FTM
##                    0.015503                    0.126496
##                       FTA                         FTP
```

```
##                   -0.077220                   -0.022413
##                        OREB                        DREB
##                    0.159384                    0.159742
##                         REB                         AST
##                   -0.144689                    0.006588
##                         TOV                         STL
##                   -0.028492                    0.023392
##                         BLK                        BLKA
##                   -0.009382                   -0.015763
##                          PF                         PFD
##                   -0.003075                    0.015583
##                   PlusMinus           Numero_temporada2
##                    0.083820                    0.015464
##          Numero_temporada3           Numero_temporada4
##                    0.011259                    0.040035
##          Numero_temporada5           Numero_temporada6
##                    0.016745                    0.008075
##          Numero_temporada7           Numero_temporada8
##                    0.026295                    0.022804
##          Numero_temporada9          Numero_temporada10
##                    0.022939                    0.024505
##         Numero_temporada11          Numero_temporada12
##                    0.020872                    0.033090
##         Numero_temporada13          Numero_temporada14
##                    0.008507                    0.012403
##         Numero_temporada15
##                    0.031133
##
## Phi coefficients (precision model with identity link):
## (phi)
## 177.2
```

```
summary(modelo_beta_cloglog) #Pseudo R-squared: 0.9286
```

```
##
## Call:
## betareg(formula = WINP ~ ., data = dados_regressao, link = "cloglog")
##
## Standardized weighted residuals 2:
##     Min      1Q  Median      3Q     Max
## -3.7117 -0.7111  0.0827  0.7543  3.4055
##
## Coefficients (mean model with cloglog link):
##                             Estimate Std. Error z value Pr(>|z|)
## (Intercept)                 0.794062   3.897840   0.204 0.838574
## TEAMBoston Celtics         -0.049746   0.040495  -1.228 0.219283
## TEAMBrooklyn Nets           0.032015   0.045192   0.708 0.478686
## TEAMCharlotte Bobcats      -0.007763   0.062579  -0.124 0.901278
## TEAMCharlotte Hornets      -0.030385   0.049922  -0.609 0.542763
## TEAMChicago Bulls           0.029472   0.041905   0.703 0.481857
## TEAMCleveland Cavaliers    -0.023293   0.041461  -0.562 0.574246
## TEAMDallas Mavericks       -0.040152   0.042520  -0.944 0.345011
## TEAMDenver Nuggets          0.003782   0.040884   0.093 0.926286
## TEAMDetroit Pistons        -0.100966   0.045956  -2.197 0.028018 *
## TEAMGolden State Warriors  -0.071263   0.044303  -1.609 0.107713
```

```
## TEAMHouston Rockets         0.037661   0.043415   0.867 0.385689
## TEAMIndiana Pacers         -0.005548   0.041668  -0.133 0.894080
## TEAMLA Clippers            -0.046883   0.049496  -0.947 0.343532
## TEAMLos Angeles Clippers   -0.101459   0.054306  -1.868 0.061723 .
## TEAMLos Angeles Lakers      0.018101   0.042150   0.429 0.667605
## TEAMMemphis Grizzlies       0.039985   0.042720   0.936 0.349288
## TEAMMiami Heat             -0.014300   0.041241  -0.347 0.728780
## TEAMMilwaukee Bucks        -0.055821   0.040991  -1.362 0.173267
## TEAMMinnesota Timberwolves -0.153952   0.044522  -3.458 0.000544 ***
## TEAMNew Jersey Nets        -0.149391   0.078059  -1.914 0.055642 .
## TEAMNew Orleans Hornets    -0.044444   0.060919  -0.730 0.465656
## TEAMNew Orleans Pelicans   -0.084526   0.047177  -1.792 0.073186 .
## TEAMNew York Knicks        -0.070914   0.044070  -1.609 0.107590
## TEAMOklahoma City Thunder  -0.004848   0.045168  -0.107 0.914522
## TEAMOrlando Magic          -0.060840   0.043203  -1.408 0.159061
## TEAMPhiladelphia 76ers     -0.071749   0.042973  -1.670 0.094991 .
## TEAMPhoenix Suns           -0.027942   0.043537  -0.642 0.521005
## TEAMPortland Trail Blazers  0.029650   0.042488   0.698 0.485284
## TEAMSacramento Kings       -0.053944   0.045043  -1.198 0.231068
## TEAMSan Antonio Spurs      -0.068963   0.040007  -1.724 0.084753 .
## TEAMToronto Raptors        -0.040074   0.041814  -0.958 0.337877
## TEAMUtah Jazz              -0.089508   0.041434  -2.160 0.030755 *
## TEAMWashington Wizards     -0.048661   0.043958  -1.107 0.268295
## PTS                        -0.033787   0.075535  -0.447 0.654659
## FGM                         0.072426   0.151218   0.479 0.631973
## FGA                        -0.014226   0.043940  -0.324 0.746121
## FGP                         0.010500   0.078794   0.133 0.893987
## `3PM`                       0.011649   0.088566   0.132 0.895358
## `3PA`                       0.006716   0.016939   0.396 0.691751
## `3PP`                       0.015503   0.011755   1.319 0.187244
## FTM                         0.126496   0.094051   1.345 0.178636
## FTA                        -0.077220   0.057038  -1.354 0.175793
## FTP                        -0.022413   0.017214  -1.302 0.192897
## OREB                        0.159384   0.111951   1.424 0.154535
## DREB                        0.159742   0.111347   1.435 0.151393
## REB                        -0.144689   0.110579  -1.308 0.190717
## AST                         0.006588   0.004863   1.355 0.175544
## TOV                        -0.028492   0.011655  -2.445 0.014501 *
## STL                         0.023392   0.012802   1.827 0.067682 .
## BLK                        -0.009382   0.008911  -1.053 0.292415
## BLKA                       -0.015763   0.013052  -1.208 0.227171
## PF                         -0.003075   0.005872  -0.524 0.600562
## PFD                         0.015583   0.011391   1.368 0.171313
## PlusMinus                   0.083820   0.004711  17.791  < 2e-16 ***
## Numero_temporada2           0.015464   0.029987   0.516 0.606065
## Numero_temporada3           0.011259   0.029882   0.377 0.706333
## Numero_temporada4           0.040035   0.034638   1.156 0.247763
## Numero_temporada5           0.016745   0.032747   0.511 0.609110
## Numero_temporada6           0.008075   0.031594   0.256 0.798272
## Numero_temporada7           0.026295   0.034742   0.757 0.449142
## Numero_temporada8           0.022804   0.037388   0.610 0.541920
## Numero_temporada9           0.022939   0.040186   0.571 0.568119
## Numero_temporada10          0.024505   0.045152   0.543 0.587325
## Numero_temporada11          0.020872   0.053113   0.393 0.694335
```

```
## Numero_temporada12          0.033090   0.054381   0.608 0.542871
## Numero_temporada13          0.008507   0.057394   0.148 0.882173
## Numero_temporada14          0.012403   0.057577   0.215 0.829445
## Numero_temporada15          0.031133   0.054360   0.573 0.566840
##
## Phi coefficients (precision model with identity link):
##       Estimate Std. Error z value Pr(>|z|)
## (phi)   177.16      11.78   15.04   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Type of estimator: ML (maximum likelihood)
## Log-likelihood: 861.6 on 70 Df
## Pseudo R-squared: 0.9371
## Number of iterations: 84 (BFGS) + 3 (Fisher scoring)
```

```
coef(modelo_beta_cloglog)
```

```
##                (Intercept)         TEAMBoston Celtics
##                0.794061903               -0.049745578
##          TEAMBrooklyn Nets      TEAMCharlotte Bobcats
##                0.032014544               -0.007762744
##      TEAMCharlotte Hornets          TEAMChicago Bulls
##               -0.030384700                0.029472247
##    TEAMCleveland Cavaliers       TEAMDallas Mavericks
##               -0.023293336               -0.040152091
##         TEAMDenver Nuggets        TEAMDetroit Pistons
##                0.003782486               -0.100966071
##  TEAMGolden State Warriors        TEAMHouston Rockets
##               -0.071263213                0.037661012
##         TEAMIndiana Pacers            TEAMLA Clippers
##               -0.005547736               -0.046883376
##   TEAMLos Angeles Clippers     TEAMLos Angeles Lakers
##               -0.101459104                0.018100666
##      TEAMMemphis Grizzlies             TEAMMiami Heat
##                0.039984910               -0.014300101
##        TEAMMilwaukee Bucks TEAMMinnesota Timberwolves
##               -0.055820509               -0.153952199
##        TEAMNew Jersey Nets    TEAMNew Orleans Hornets
##               -0.149391446               -0.044444117
##   TEAMNew Orleans Pelicans        TEAMNew York Knicks
##               -0.084526040               -0.070913528
##  TEAMOklahoma City Thunder          TEAMOrlando Magic
##               -0.004848121               -0.060840209
##     TEAMPhiladelphia 76ers           TEAMPhoenix Suns
##               -0.071748604               -0.027941599
## TEAMPortland Trail Blazers       TEAMSacramento Kings
##                0.029649641               -0.053944209
##      TEAMSan Antonio Spurs        TEAMToronto Raptors
##               -0.068962890               -0.040073669
##              TEAMUtah Jazz     TEAMWashington Wizards
##               -0.089507746               -0.048661124
##                        PTS                        FGM
##               -0.033786667                0.072426119
##                        FGA                        FGP
```

```
##               -0.014225824                0.010500153
##                      `3PM`                      `3PA`
##                0.011648944                0.006716078
##                      `3PP`                        FTM
##                0.015502552                0.126495920
##                        FTA                        FTP
##               -0.077219752               -0.022413468
##                       OREB                       DREB
##                0.159384086                0.159741948
##                        REB                        AST
##               -0.144688677                0.006587774
##                        TOV                        STL
##               -0.028491528                0.023391606
##                        BLK                       BLKA
##               -0.009382294               -0.015763061
##                         PF                        PFD
##               -0.003074659                0.015583433
##                  PlusMinus          Numero_temporada2
##                0.083819751                0.015464124
##          Numero_temporada3          Numero_temporada4
##                0.011259058                0.040034613
##          Numero_temporada5          Numero_temporada6
##                0.016744863                0.008074857
##          Numero_temporada7          Numero_temporada8
##                0.026294706                0.022803602
##          Numero_temporada9         Numero_temporada10
##                0.022939249                0.024504845
##         Numero_temporada11         Numero_temporada12
##                0.020872417                0.033089781
##         Numero_temporada13         Numero_temporada14
##                0.008506607                0.012402892
##         Numero_temporada15                      (phi)
##                0.031132506              177.162033104
```

```
### Modelo com 5% ###
modelo_beta_cloglog1 <- betareg(WINP ~  PlusMinus,data = dados_regressao, link = "cloglog")
modelo_beta_cloglog1
```

```
##
## Call:
## betareg(formula = WINP ~ PlusMinus, data = dados_regressao, link = "cloglog")
##
## Coefficients (mean model with cloglog link):
## (Intercept)    PlusMinus
##    -0.39703      0.09631
##
## Phi coefficients (precision model with identity link):
## (phi)
## 144.2
```

```
summary(modelo_beta_cloglog1) #Pseudo R-squared: 0.9242
```

```
##
## Call:
## betareg(formula = WINP ~ PlusMinus, data = dados_regressao, link = "cloglog")
```

```
##
## Standardized weighted residuals 2:
##     Min      1Q  Median      3Q     Max
## -3.5464 -0.6891  0.0368  0.6729  2.4219
##
## Coefficients (mean model with cloglog link):
##              Estimate Std. Error z value Pr(>|z|)
## (Intercept) -0.397032   0.005906  -67.22   <2e-16 ***
## PlusMinus    0.096306   0.001323   72.82   <2e-16 ***
##
## Phi coefficients (precision model with identity link):
##       Estimate Std. Error z value Pr(>|z|)
## (phi)  144.247      9.586   15.05   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Type of estimator: ML (maximum likelihood)
## Log-likelihood: 815.4 on 3 Df
## Pseudo R-squared: 0.9242
## Number of iterations: 18 (BFGS) + 2 (Fisher scoring)
```

```
coef(modelo_beta_cloglog1)
```

```
##  (Intercept)    PlusMinus        (phi)
##  -0.39703232   0.09630647 144.24737336
```

```
### Modelo com 10% ###
modelo_beta_cloglog2 <- betareg(WINP ~ `3PP` + TOV + PlusMinus,data = dados_regressao, link = "cloglog")
modelo_beta_cloglog2
```

```
##
## Call:
## betareg(formula = WINP ~ `3PP` + TOV + PlusMinus, data = dados_regressao,
##     link = "cloglog")
##
## Coefficients (mean model with cloglog link):
## (Intercept)        `3PP`          TOV    PlusMinus
##   -0.465053     0.005727    -0.009590     0.094564
##
## Phi coefficients (precision model with identity link):
## (phi)
## 146.1
```

```
summary(modelo_beta_cloglog2) #Pseudo R-squared: 0.9249
```

```
##
## Call:
## betareg(formula = WINP ~ `3PP` + TOV + PlusMinus, data = dados_regressao,
##     link = "cloglog")
##
## Standardized weighted residuals 2:
##     Min      1Q  Median      3Q     Max
## -3.4828 -0.6414  0.0531  0.6280  2.4729
##
## Coefficients (mean model with cloglog link):
##              Estimate Std. Error z value Pr(>|z|)
```

```
## (Intercept) -0.465053   0.159339  -2.919  0.00352 **
## `3PP`        0.005727   0.003769   1.519  0.12865
## TOV         -0.009590   0.005464  -1.755  0.07923 .
## PlusMinus    0.094564   0.001556  60.759  < 2e-16 ***
##
## Phi coefficients (precision model with identity link):
##       Estimate Std. Error z value Pr(>|z|)
## (phi)  146.075      9.708   15.05   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Type of estimator: ML (maximum likelihood)
## Log-likelihood: 818.2 on 5 Df
## Pseudo R-squared: 0.9252
## Number of iterations: 23 (BFGS) + 2 (Fisher scoring)
```

```
coef(modelo_beta_cloglog2)
```

```
##   (Intercept)         `3PP`           TOV     PlusMinus         (phi)
##  -0.465052536   0.005727213  -0.009589926   0.094563688 146.074986350
```

```
##### Fazendo a regressão beta, mas com cauchito ### ######
### Modelo completo ###
modelo_beta_cauchit <- betareg(WINP ~  .,data = dados_regressao, link = "cauchit")
modelo_beta_cauchit
```

```
##
## Call:
## betareg(formula = WINP ~ ., data = dados_regressao, link = "cauchit")
##
## Coefficients (mean model with cauchit link):
##                (Intercept)          TEAMBoston Celtics
##                  -1.9294532                  -0.0531565
##          TEAMBrooklyn Nets       TEAMCharlotte Bobcats
##                   0.0393638                   0.0214512
##      TEAMCharlotte Hornets           TEAMChicago Bulls
##                  -0.0122354                   0.0526594
##    TEAMCleveland Cavaliers        TEAMDallas Mavericks
##                   0.0255651                  -0.0587966
##         TEAMDenver Nuggets         TEAMDetroit Pistons
##                  -0.0011402                  -0.0796485
##  TEAMGolden State Warriors         TEAMHouston Rockets
##                  -0.0444215                   0.0398872
##         TEAMIndiana Pacers             TEAMLA Clippers
##                  -0.0126811                  -0.0188809
##   TEAMLos Angeles Clippers      TEAMLos Angeles Lakers
##                  -0.0579196                   0.0348796
##      TEAMMemphis Grizzlies              TEAMMiami Heat
##                   0.0584574                  -0.0007637
##        TEAMMilwaukee Bucks  TEAMMinnesota Timberwolves
##                  -0.0376318                  -0.1461081
##        TEAMNew Jersey Nets     TEAMNew Orleans Hornets
##                  -0.1087329                  -0.0413528
##   TEAMNew Orleans Pelicans         TEAMNew York Knicks
##                  -0.0962556                  -0.0724685
```

```
##  TEAMOklahoma City Thunder           TEAMOrlando Magic
##                  -0.0033757                  -0.0424234
##     TEAMPhiladelphia 76ers            TEAMPhoenix Suns
##                  -0.0853749                  -0.0348714
## TEAMPortland Trail Blazers        TEAMSacramento Kings
##                   0.0280326                  -0.0123978
##      TEAMSan Antonio Spurs         TEAMToronto Raptors
##                  -0.0516808                  -0.0484401
##              TEAMUtah Jazz      TEAMWashington Wizards
##                  -0.1001803                  -0.0388172
##                         PTS                         FGM
##                  -0.1224275                   0.1762786
##                         FGA                         FGP
##                   0.0169129                   0.0846575
##                        `3PM`                       `3PA`
##                   0.0759079                   0.0174448
##                        `3PP`                         FTM
##                   0.0183408                   0.2460400
##                         FTA                         FTP
##                  -0.1011242                  -0.0274292
##                        OREB                        DREB
##                   0.2087720                   0.2072405
##                         REB                         AST
##                  -0.1877038                   0.0070287
##                         TOV                         STL
##                  -0.0284671                   0.0229752
##                         BLK                        BLKA
##                   0.0047889                  -0.0236418
##                          PF                         PFD
##                  -0.0025565                   0.0112414
##                   PlusMinus           Numero_temporada2
##                   0.1013406                   0.0148863
##           Numero_temporada3           Numero_temporada4
##                   0.0188671                   0.0394445
##           Numero_temporada5           Numero_temporada6
##                   0.0264375                  -0.0024655
##           Numero_temporada7           Numero_temporada8
##                   0.0240640                   0.0270429
##           Numero_temporada9          Numero_temporada10
##                   0.0087783                  -0.0070950
##          Numero_temporada11          Numero_temporada12
##                  -0.0109787                  -0.0045900
##          Numero_temporada13          Numero_temporada14
##                  -0.0384809                  -0.0417257
##          Numero_temporada15
##                  -0.0332874
##
## Phi coefficients (precision model with identity link):
## (phi)
## 182.9
```

```
summary(modelo_beta_cauchit) #Pseudo R-squared: 0.9035
```

```
##
## Call:
```

```
## betareg(formula = WINP ~ ., data = dados_regressao, link = "cauchit")
##
## Standardized weighted residuals 2:
##     Min      1Q  Median      3Q     Max
## -3.8318 -0.7477  0.0090  0.7861  4.3424
##
## Coefficients (mean model with cauchit link):
##                              Estimate Std. Error z value Pr(>|z|)
## (Intercept)                -1.9294532  4.9166855  -0.392  0.69474
## TEAMBoston Celtics         -0.0531565  0.0511278  -1.040  0.29849
## TEAMBrooklyn Nets           0.0393638  0.0531202   0.741  0.45867
## TEAMCharlotte Bobcats       0.0214512  0.0726594   0.295  0.76782
## TEAMCharlotte Hornets      -0.0122354  0.0576733  -0.212  0.83199
## TEAMChicago Bulls           0.0526594  0.0502917   1.047  0.29506
## TEAMCleveland Cavaliers     0.0255651  0.0542759   0.471  0.63763
## TEAMDallas Mavericks       -0.0587966  0.0512800  -1.147  0.25156
## TEAMDenver Nuggets         -0.0011402  0.0507326  -0.022  0.98207
## TEAMDetroit Pistons        -0.0796485  0.0536063  -1.486  0.13733
## TEAMGolden State Warriors  -0.0444215  0.0559659  -0.794  0.42736
## TEAMHouston Rockets         0.0398872  0.0542260   0.736  0.46199
## TEAMIndiana Pacers         -0.0126811  0.0492828  -0.257  0.79694
## TEAMLA Clippers            -0.0188809  0.0613844  -0.308  0.75840
## TEAMLos Angeles Clippers   -0.0579196  0.0726472  -0.797  0.42529
## TEAMLos Angeles Lakers      0.0348796  0.0524242   0.665  0.50584
## TEAMMemphis Grizzlies       0.0584574  0.0513872   1.138  0.25529
## TEAMMiami Heat             -0.0007637  0.0504967  -0.015  0.98793
## TEAMMilwaukee Bucks        -0.0376318  0.0495485  -0.759  0.44756
## TEAMMinnesota Timberwolves -0.1461081  0.0518921  -2.816  0.00487 **
## TEAMNew Jersey Nets        -0.1087329  0.0926911  -1.173  0.24077
## TEAMNew Orleans Hornets    -0.0413528  0.0691798  -0.598  0.55000
## TEAMNew Orleans Pelicans   -0.0962556  0.0533314  -1.805  0.07110 .
## TEAMNew York Knicks        -0.0724685  0.0519710  -1.394  0.16320
## TEAMOklahoma City Thunder  -0.0033757  0.0563548  -0.060  0.95224
## TEAMOrlando Magic          -0.0424234  0.0521237  -0.814  0.41570
## TEAMPhiladelphia 76ers     -0.0853749  0.0527014  -1.620  0.10524
## TEAMPhoenix Suns           -0.0348714  0.0535384  -0.651  0.51483
## TEAMPortland Trail Blazers  0.0280326  0.0517527   0.542  0.58805
## TEAMSacramento Kings       -0.0123978  0.0522612  -0.237  0.81248
## TEAMSan Antonio Spurs      -0.0516808  0.0531056  -0.973  0.33047
## TEAMToronto Raptors        -0.0484401  0.0513514  -0.943  0.34552
## TEAMUtah Jazz              -0.1001803  0.0507941  -1.972  0.04858 *
## TEAMWashington Wizards     -0.0388172  0.0507835  -0.764  0.44465
## PTS                        -0.1224275  0.0944365  -1.296  0.19484
## FGM                         0.1762786  0.1863955   0.946  0.34429
## FGA                         0.0169129  0.0550713   0.307  0.75876
## FGP                         0.0846575  0.0996788   0.849  0.39571
## `3PM`                       0.0759079  0.1086859   0.698  0.48492
## `3PA`                       0.0174448  0.0208543   0.837  0.40287
## `3PP`                       0.0183408  0.0144368   1.270  0.20393
## FTM                         0.2460400  0.1191420   2.065  0.03891 *
## FTA                        -0.1011242  0.0717935  -1.409  0.15897
## FTP                        -0.0274292  0.0215889  -1.271  0.20390
## OREB                        0.2087720  0.1362057   1.533  0.12533
## DREB                        0.2072405  0.1352897   1.532  0.12556
```

```
## REB                         -0.1877038  0.1344003  -1.397  0.16253
## AST                          0.0070287  0.0060471   1.162  0.24511
## TOV                         -0.0284671  0.0141570  -2.011  0.04435 *
## STL                          0.0229752  0.0155871   1.474  0.14048
## BLK                          0.0047889  0.0111098   0.431  0.66643
## BLKA                        -0.0236418  0.0160222  -1.476  0.14006
## PF                          -0.0025565  0.0070378  -0.363  0.71642
## PFD                          0.0112414  0.0142159   0.791  0.42908
## PlusMinus                    0.1013406  0.0058049  17.458  < 2e-16 ***
## Numero_temporada2            0.0148863  0.0375617   0.396  0.69187
## Numero_temporada3            0.0188671  0.0373336   0.505  0.61330
## Numero_temporada4            0.0394445  0.0432432   0.912  0.36169
## Numero_temporada5            0.0264375  0.0409657   0.645  0.51870
## Numero_temporada6           -0.0024655  0.0392779  -0.063  0.94995
## Numero_temporada7            0.0240640  0.0433391   0.555  0.57872
## Numero_temporada8            0.0270429  0.0463057   0.584  0.55921
## Numero_temporada9            0.0087783  0.0496172   0.177  0.85957
## Numero_temporada10          -0.0070950  0.0558529  -0.127  0.89892
## Numero_temporada11          -0.0109787  0.0652313  -0.168  0.86634
## Numero_temporada12          -0.0045900  0.0671945  -0.068  0.94554
## Numero_temporada13          -0.0384809  0.0712780  -0.540  0.58929
## Numero_temporada14          -0.0417257  0.0713494  -0.585  0.55868
## Numero_temporada15          -0.0332874  0.0668590  -0.498  0.61857
##
## Phi coefficients (precision model with identity link):
##       Estimate Std. Error z value Pr(>|z|)
## (phi)   182.94      12.17   15.04   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Type of estimator: ML (maximum likelihood)
## Log-likelihood:   869 on 70 Df
## Pseudo R-squared: 0.9111
## Number of iterations: 88 (BFGS) + 3 (Fisher scoring)
```

```
coef(modelo_beta_cauchit)
```

```
##                (Intercept)         TEAMBoston Celtics
##              -1.929453e+00              -5.315652e-02
##          TEAMBrooklyn Nets      TEAMCharlotte Bobcats
##               3.936383e-02               2.145123e-02
##      TEAMCharlotte Hornets          TEAMChicago Bulls
##              -1.223545e-02               5.265941e-02
##    TEAMCleveland Cavaliers       TEAMDallas Mavericks
##               2.556506e-02              -5.879658e-02
##         TEAMDenver Nuggets        TEAMDetroit Pistons
##              -1.140204e-03              -7.964847e-02
##  TEAMGolden State Warriors        TEAMHouston Rockets
##              -4.442147e-02               3.988724e-02
##         TEAMIndiana Pacers            TEAMLA Clippers
##              -1.268107e-02              -1.888086e-02
##   TEAMLos Angeles Clippers     TEAMLos Angeles Lakers
##              -5.791960e-02               3.487957e-02
##      TEAMMemphis Grizzlies             TEAMMiami Heat
##               5.845743e-02              -7.637244e-04
```

```
##        TEAMMilwaukee Bucks TEAMMinnesota Timberwolves
##              -3.763180e-02              -1.461081e-01
##        TEAMNew Jersey Nets    TEAMNew Orleans Hornets
##              -1.087329e-01              -4.135285e-02
##   TEAMNew Orleans Pelicans        TEAMNew York Knicks
##              -9.625563e-02              -7.246851e-02
##  TEAMOklahoma City Thunder          TEAMOrlando Magic
##              -3.375657e-03              -4.242343e-02
##     TEAMPhiladelphia 76ers           TEAMPhoenix Suns
##              -8.537486e-02              -3.487137e-02
## TEAMPortland Trail Blazers       TEAMSacramento Kings
##               2.803256e-02              -1.239781e-02
##      TEAMSan Antonio Spurs        TEAMToronto Raptors
##              -5.168084e-02              -4.844013e-02
##              TEAMUtah Jazz     TEAMWashington Wizards
##              -1.001803e-01              -3.881724e-02
##                        PTS                        FGM
##              -1.224275e-01               1.762786e-01
##                        FGA                        FGP
##               1.691293e-02               8.465752e-02
##                     `3PM`                      `3PA`
##               7.590789e-02               1.744481e-02
##                     `3PP`                        FTM
##               1.834083e-02               2.460400e-01
##                        FTA                        FTP
##              -1.011242e-01              -2.742919e-02
##                       OREB                       DREB
##               2.087720e-01               2.072405e-01
##                        REB                        AST
##              -1.877038e-01               7.028652e-03
##                        TOV                        STL
##              -2.846706e-02               2.297525e-02
##                        BLK                       BLKA
##               4.788907e-03              -2.364178e-02
##                         PF                        PFD
##              -2.556481e-03               1.124138e-02
##                  PlusMinus          Numero_temporada2
##               1.013406e-01               1.488628e-02
##          Numero_temporada3          Numero_temporada4
##               1.886709e-02               3.944454e-02
##          Numero_temporada5          Numero_temporada6
##               2.643750e-02              -2.465548e-03
##          Numero_temporada7          Numero_temporada8
##               2.406402e-02               2.704288e-02
##          Numero_temporada9         Numero_temporada10
##               8.778252e-03              -7.094993e-03
##         Numero_temporada11         Numero_temporada12
##              -1.097875e-02              -4.590016e-03
##         Numero_temporada13         Numero_temporada14
##              -3.848086e-02              -4.172566e-02
##         Numero_temporada15                      (phi)
##              -3.328743e-02               1.829401e+02
```

```r
### Modelo com significância de 5% ###
modelo_beta_cauchit1 <- betareg(WINP ~  PlusMinus,data = dados_regressao, link = "cauchit")
modelo_beta_cauchit1
```

```
##
## Call:
## betareg(formula = WINP ~ PlusMinus, data = dados_regressao, link = "cauchit")
##
## Coefficients (mean model with cauchit link):
## (Intercept)    PlusMinus
##   -0.008704     0.117730
##
## Phi coefficients (precision model with identity link):
## (phi)
## 153.3
```

```r
summary(modelo_beta_cauchit1) #Pseudo R-squared: 0.8985
```

```
##
## Call:
## betareg(formula = WINP ~ PlusMinus, data = dados_regressao, link = "cauchit")
##
## Standardized weighted residuals 2:
##     Min      1Q  Median      3Q     Max
## -3.5614 -0.6544  0.0255  0.6347  3.9100
##
## Coefficients (mean model with cauchit link):
##              Estimate Std. Error z value Pr(>|z|)
## (Intercept) -0.008704   0.006924  -1.257    0.209
## PlusMinus    0.117730   0.001876  62.749   <2e-16 ***
##
## Phi coefficients (precision model with identity link):
##       Estimate Std. Error z value Pr(>|z|)
## (phi)   153.27      10.19   15.05   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Type of estimator: ML (maximum likelihood)
## Log-likelihood: 829.1 on 3 Df
## Pseudo R-squared: 0.8985
## Number of iterations: 28 (BFGS) + 2 (Fisher scoring)
```

```r
coef(modelo_beta_cauchit1)
```

```
##   (Intercept)     PlusMinus         (phi)
##  -0.008704143   0.117730476 153.265171178
```

```r
############### Análise ANOVA #################
#### Logito#####
modelo_beta1 #Completo
```

```
##
## Call:
## betareg(formula = WINP ~ ., data = dados_regressao)
##
## Coefficients (mean model with logit link):
```

```
##                (Intercept)          TEAMBoston Celtics
##                  -1.745e+00                  -5.872e-02
##          TEAMBrooklyn Nets       TEAMCharlotte Bobcats
##                   2.832e-02                   3.030e-02
##      TEAMCharlotte Hornets           TEAMChicago Bulls
##                  -3.680e-02                   4.665e-02
##    TEAMCleveland Cavaliers        TEAMDallas Mavericks
##                   2.738e-02                  -7.466e-02
##         TEAMDenver Nuggets         TEAMDetroit Pistons
##                   7.960e-04                  -1.206e-01
##  TEAMGolden State Warriors         TEAMHouston Rockets
##                  -6.539e-02                   5.090e-02
##         TEAMIndiana Pacers             TEAMLA Clippers
##                  -1.953e-02                  -3.467e-02
##   TEAMLos Angeles Clippers      TEAMLos Angeles Lakers
##                  -7.768e-02                   3.365e-02
##      TEAMMemphis Grizzlies              TEAMMiami Heat
##                   5.078e-02                  -1.300e-02
##        TEAMMilwaukee Bucks  TEAMMinnesota Timberwolves
##                  -6.946e-02                  -1.912e-01
##        TEAMNew Jersey Nets     TEAMNew Orleans Hornets
##                  -1.403e-01                  -8.191e-02
##   TEAMNew Orleans Pelicans         TEAMNew York Knicks
##                  -1.439e-01                  -9.262e-02
##  TEAMOklahoma City Thunder           TEAMOrlando Magic
##                   8.418e-03                  -6.816e-02
##     TEAMPhiladelphia 76ers            TEAMPhoenix Suns
##                  -9.044e-02                  -2.098e-02
## TEAMPortland Trail Blazers        TEAMSacramento Kings
##                   4.528e-02                  -4.641e-02
##      TEAMSan Antonio Spurs         TEAMToronto Raptors
##                  -5.241e-02                  -5.236e-02
##              TEAMUtah Jazz      TEAMWashington Wizards
##                  -1.252e-01                  -6.334e-02
##                         PTS                         FGM
##                  -1.295e-01                   1.809e-01
##                         FGA                         FGP
##                   1.261e-02                   9.625e-02
##                        `3PM`                       `3PA`
##                   7.866e-02                   2.018e-02
##                        `3PP`                         FTM
##                   2.312e-02                   2.918e-01
##                         FTA                         FTP
##                  -1.361e-01                  -3.677e-02
##                        OREB                        DREB
##                   2.405e-01                   2.396e-01
##                         REB                         AST
##                  -2.072e-01                   8.921e-03
##                         TOV                         STL
##                  -4.091e-02                   4.407e-02
##                         BLK                        BLKA
##                  -2.996e-05                  -2.126e-02
##                          PF                         PFD
##                  -6.279e-03                   2.031e-02
```

```
##                  PlusMinus           Numero_temporada2
##                  1.127e-01                   2.159e-02
##          Numero_temporada3           Numero_temporada4
##                  2.208e-02                   4.392e-02
##          Numero_temporada5           Numero_temporada6
##                  7.635e-03                  -6.389e-03
##          Numero_temporada7           Numero_temporada8
##                  1.586e-02                   7.495e-03
##          Numero_temporada9          Numero_temporada10
##                 -3.937e-03                  -2.007e-02
##         Numero_temporada11          Numero_temporada12
##                 -1.917e-02                  -9.702e-03
##         Numero_temporada13          Numero_temporada14
##                 -4.290e-02                  -4.930e-02
##         Numero_temporada15
##                 -1.769e-02
##
## Phi coefficients (precision model with identity link):
## (phi)
## 188.6
```

```
modelo_beta11 #PlusMinus
```

```
##
## Call:
## betareg(formula = WINP ~ PlusMinus, data = dados_regressao)
##
## Coefficients (mean model with logit link):
## (Intercept)    PlusMinus
##    -0.00525      0.13558
##
## Phi coefficients (precision model with identity link):
## (phi)
## 154.5
```

```
modelo_beta12 #`3PP` + STL + PF + PlusMinus
```

```
##
## Call:
## betareg(formula = WINP ~ `3PP` + STL + PF + PlusMinus, data = dados_regressao)
##
## Coefficients (mean model with logit link):
## (Intercept)        `3PP`          STL           PF    PlusMinus
##   -0.115722     0.009726     0.005801    -0.013857     0.132532
##
## Phi coefficients (precision model with identity link):
## (phi)
## 157.4
```

```
modelo_beta12_1 <- betareg(WINP ~ PF + PlusMinus, data = dados_regressao)
modelo_beta12_2 <- betareg(WINP ~ STL + PF + PlusMinus, data = dados_regressao)
modelo_beta12_3 <- betareg(WINP ~ `3PP` + PF + PlusMinus, data = dados_regressao)

lrtest(modelo_beta11, modelo_beta12_1) #0.02665
```

```
## Likelihood ratio test
```

```
##
## Model 1: WINP ~ PlusMinus
## Model 2: WINP ~ PF + PlusMinus
##   #Df LogLik Df  Chisq Pr(>Chisq)
## 1   3 830.67
## 2   4 833.13  1 4.9132    0.02665 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
#Colocar PF melhorou o modelo

lrtest(modelo_beta12_1, modelo_beta12_2) #0.8447
```

```
## Likelihood ratio test
##
## Model 1: WINP ~ PF + PlusMinus
## Model 2: WINP ~ STL + PF + PlusMinus
##   #Df LogLik Df  Chisq Pr(>Chisq)
## 1   4 833.13
## 2   5 833.15  1 0.0384     0.8447
```

```
#Colocar STL piorou o modelo

lrtest(modelo_beta12_1, modelo_beta12_3) #0.08035
```

```
## Likelihood ratio test
##
## Model 1: WINP ~ PF + PlusMinus
## Model 2: WINP ~ `3PP` + PF + PlusMinus
##   #Df LogLik Df  Chisq Pr(>Chisq)
## 1   4 833.13
## 2   5 834.66  1 3.0577    0.08035 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
#Colocar 3PP melhorou o modelo

lrtest(modelo_beta12_3, modelo_beta12) #0.5643
```

```
## Likelihood ratio test
##
## Model 1: WINP ~ `3PP` + PF + PlusMinus
## Model 2: WINP ~ `3PP` + STL + PF + PlusMinus
##   #Df LogLik Df  Chisq Pr(>Chisq)
## 1   5 834.66
## 2   6 834.83  1 0.3324     0.5643
```

```
#Colocar STL piorou o modelo

#Melhor modelo logito é o modelo com `3PP` + PF + PlusMinus que é modelo_beta12_3.

modelo_beta12_3
```

```
##
## Call:
## betareg(formula = WINP ~ `3PP` + PF + PlusMinus, data = dados_regressao)
##
```

```
## Coefficients (mean model with logit link):
## (Intercept)        `3PP`            PF    PlusMinus
##   -0.065925     0.009085    -0.013016     0.132901
##
## Phi coefficients (precision model with identity link):
## (phi)
## 157.3
```

```
summary(modelo_beta12_3) #Pseudo R-squared: 0.9351
```

```
##
## Call:
## betareg(formula = WINP ~ `3PP` + PF + PlusMinus, data = dados_regressao)
##
## Standardized weighted residuals 2:
##     Min      1Q  Median      3Q     Max
## -3.0205 -0.6019  0.0688  0.6351  2.9791
##
## Coefficients (mean model with logit link):
##              Estimate Std. Error z value Pr(>|z|)
## (Intercept) -0.065925   0.215170  -0.306   0.7593
## `3PP`        0.009085   0.005205   1.746   0.0809 .
## PF          -0.013016   0.005661  -2.299   0.0215 *
## PlusMinus    0.132901   0.002136  62.218   <2e-16 ***
##
## Phi coefficients (precision model with identity link):
##       Estimate Std. Error z value Pr(>|z|)
## (phi)   157.29      10.46   15.04   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Type of estimator: ML (maximum likelihood)
## Log-likelihood: 834.7 on 5 Df
## Pseudo R-squared: 0.9318
## Number of iterations: 12 (BFGS) + 2 (Fisher scoring)
```

```
coef(modelo_beta12_3)
```

```
##   (Intercept)         `3PP`            PF     PlusMinus         (phi)
##  -0.065924629   0.009085456  -0.013016005   0.132901031 157.292447304
```

```
car::Anova(modelo_beta12_3)
```

```
## Analysis of Deviance Table (Type II tests)
##
## Response: WINP
##           Df     Chisq Pr(>Chisq)
## `3PP`      1    3.0470    0.08089 .
## PF         1    5.2864    0.02149 *
## PlusMinus  1 3871.0668    < 2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
##### loglog #######
modelo_beta2
```

```
##
```

```
## Call:
## betareg(formula = WINP ~ ., data = dados_regressao, link = "loglog")
##
## Coefficients (mean model with loglog link):
##                (Intercept)          TEAMBoston Celtics
##                 -2.5748311                  -0.0310383
##          TEAMBrooklyn Nets       TEAMCharlotte Bobcats
##                 -0.0020376                   0.0645812
##      TEAMCharlotte Hornets           TEAMChicago Bulls
##                 -0.0322433                   0.0300729
##    TEAMCleveland Cavaliers        TEAMDallas Mavericks
##                  0.0542202                  -0.0704542
##         TEAMDenver Nuggets         TEAMDetroit Pistons
##                 -0.0008745                  -0.0813921
##  TEAMGolden State Warriors         TEAMHouston Rockets
##                 -0.0370155                   0.0329937
##         TEAMIndiana Pacers             TEAMLA Clippers
##                 -0.0268029                  -0.0112272
##   TEAMLos Angeles Clippers      TEAMLos Angeles Lakers
##                 -0.0204851                   0.0247158
##      TEAMMemphis Grizzlies              TEAMMiami Heat
##                  0.0250546                  -0.0123152
##        TEAMMilwaukee Bucks  TEAMMinnesota Timberwolves
##                 -0.0544658                  -0.1273256
##        TEAMNew Jersey Nets     TEAMNew Orleans Hornets
##                 -0.0727921                  -0.0848379
##   TEAMNew Orleans Pelicans         TEAMNew York Knicks
##                 -0.1278128                  -0.0655195
##  TEAMOklahoma City Thunder           TEAMOrlando Magic
##                  0.0241569                  -0.0474257
##     TEAMPhiladelphia 76ers            TEAMPhoenix Suns
##                 -0.0481380                   0.0001808
## TEAMPortland Trail Blazers        TEAMSacramento Kings
##                  0.0345147                  -0.0318685
##      TEAMSan Antonio Spurs         TEAMToronto Raptors
##                  0.0065217                  -0.0371635
##              TEAMUtah Jazz      TEAMWashington Wizards
##                 -0.0889567                  -0.0512118
##                        PTS                         FGM
##                 -0.1116532                   0.1193063
##                        FGA                         FGP
##                  0.0254206                   0.1150214
##                     `3PM`                       `3PA`
##                  0.0817470                   0.0149311
##                     `3PP`                         FTM
##                  0.0134865                   0.2494966
##                        FTA                         FTP
##                 -0.1167004                  -0.0300511
##                       OREB                        DREB
##                  0.1834932                   0.1834465
##                        REB                         AST
##                 -0.1505132                   0.0055559
##                        TOV                         STL
##                 -0.0313734                   0.0431690
```

```
##                       BLK                      BLKA
##                 0.0056344                 -0.0144733
##                        PF                       PFD
##                -0.0059083                 0.0162536
##                 PlusMinus          Numero_temporada2
##                 0.0736376                 0.0200147
##          Numero_temporada3          Numero_temporada4
##                 0.0189583                 0.0298322
##          Numero_temporada5          Numero_temporada6
##                -0.0092281                -0.0119186
##          Numero_temporada7          Numero_temporada8
##                 0.0004450                -0.0163519
##          Numero_temporada9         Numero_temporada10
##                -0.0310136                -0.0490129
##         Numero_temporada11         Numero_temporada12
##                -0.0409536                -0.0429544
##         Numero_temporada13         Numero_temporada14
##                -0.0628885                -0.0712470
##         Numero_temporada15
##                -0.0416237
##
## Phi coefficients (precision model with identity link):
## (phi)
## 172.2
```

```
modelo_beta21#STL + PF + PlusMinus
```

```
##
## Call:
## betareg(formula = WINP ~ STL + PF + PlusMinus, data = dados_regressao,
##     link = "loglog")
##
## Coefficients (mean model with loglog link):
## (Intercept)          STL           PF    PlusMinus
##    0.596869     0.004795    -0.011997     0.092285
##
## Phi coefficients (precision model with identity link):
## (phi)
## 139.4
```

```
modelo_beta22#FTM + STL + PF + PlusMinus
```

```
##
## Call:
## betareg(formula = WINP ~ FTM + STL + PF + PlusMinus, data = dados_regressao,
##     link = "loglog")
##
## Coefficients (mean model with loglog link):
## (Intercept)          FTM          STL           PF    PlusMinus
##   0.5958444    0.0001016    0.0048185   -0.0120441    0.0922739
##
## Phi coefficients (precision model with identity link):
## (phi)
## 139.4
```

```r
lrtest(modelo_beta21, modelo_beta22) #0.9774
```

```
## Likelihood ratio test
##
## Model 1: WINP ~ STL + PF + PlusMinus
## Model 2: WINP ~ FTM + STL + PF + PlusMinus
##   #Df LogLik Df Chisq Pr(>Chisq)
## 1   5 807.63
## 2   6 807.63  1 8e-04     0.9774
```

```r
#Colocar FTM piorou o modelo

#Melhor modelo de loglog é o modelo modelo_beta21 com STL + PF + PlusMinus;

##### Probito #######
modelo_beta_probit
```

```
##
## Call:
## betareg(formula = WINP ~ ., data = dados_regressao, link = "probit")
##
## Coefficients (mean model with probit link):
##                 (Intercept)          TEAMBoston Celtics
##                  -1.0013443                  -0.0358906
##           TEAMBrooklyn Nets       TEAMCharlotte Bobcats
##                   0.0153056                   0.0214086
##      TEAMCharlotte Hornets           TEAMChicago Bulls
##                  -0.0257201                   0.0273135
##    TEAMCleveland Cavaliers        TEAMDallas Mavericks
##                   0.0160671                  -0.0468740
##         TEAMDenver Nuggets         TEAMDetroit Pistons
##                   0.0008527                  -0.0775217
##  TEAMGolden State Warriors         TEAMHouston Rockets
##                  -0.0422696                   0.0313982
##         TEAMIndiana Pacers             TEAMLA Clippers
##                  -0.0126755                  -0.0222272
##   TEAMLos Angeles Clippers      TEAMLos Angeles Lakers
##                  -0.0487710                   0.0199564
##      TEAMMemphis Grizzlies              TEAMMiami Heat
##                   0.0295976                  -0.0091092
##        TEAMMilwaukee Bucks  TEAMMinnesota Timberwolves
##                  -0.0460280                  -0.1203816
##        TEAMNew Jersey Nets     TEAMNew Orleans Hornets
##                  -0.0886511                  -0.0541575
##   TEAMNew Orleans Pelicans         TEAMNew York Knicks
##                  -0.0921117                  -0.0582871
##  TEAMOklahoma City Thunder           TEAMOrlando Magic
##                   0.0064276                  -0.0440548
##     TEAMPhiladelphia 76ers            TEAMPhoenix Suns
##                  -0.0543098                  -0.0111779
## TEAMPortland Trail Blazers        TEAMSacramento Kings
##                   0.0291181                  -0.0324679
##      TEAMSan Antonio Spurs         TEAMToronto Raptors
##                  -0.0312853                  -0.0318790
```

```
##              TEAMUtah Jazz      TEAMWashington Wizards
##                 -0.0779991                  -0.0413914
##                        PTS                         FGM
##                 -0.0762144                   0.1047945
##                        FGA                         FGP
##                  0.0070226                   0.0588424
##                      `3PM`                       `3PA`
##                  0.0466906                   0.0119210
##                      `3PP`                         FTM
##                  0.0140541                   0.1780922
##                        FTA                         FTP
##                 -0.0856901                  -0.0231773
##                       OREB                        DREB
##                  0.1489185                   0.1486199
##                        REB                         AST
##                 -0.1277063                   0.0055487
##                        TOV                         STL
##                 -0.0259709                   0.0287746
##                        BLK                        BLKA
##                 -0.0006853                  -0.0125765
##                         PF                         PFD
##                 -0.0041846                   0.0133503
##                  PlusMinus           Numero_temporada2
##                  0.0691259                   0.0139977
##          Numero_temporada3           Numero_temporada4
##                  0.0136896                   0.0274058
##          Numero_temporada5           Numero_temporada6
##                  0.0023308                  -0.0040049
##          Numero_temporada7           Numero_temporada8
##                  0.0087548                   0.0019810
##          Numero_temporada9          Numero_temporada10
##                 -0.0043450                  -0.0137993
##         Numero_temporada11          Numero_temporada12
##                 -0.0126127                  -0.0069202
##         Numero_temporada13          Numero_temporada14
##                 -0.0263853                  -0.0305975
##         Numero_temporada15
##                 -0.0091389
##
## Phi coefficients (precision model with identity link):
## (phi)
## 188.3
```

```
modelo_beta_probit1 #PlusMinus
```

```
##
## Call:
## betareg(formula = WINP ~ PlusMinus, data = dados_regressao, link = "probit")
##
## Coefficients (mean model with probit link):
## (Intercept)    PlusMinus
##   -0.002604     0.083538
##
## Phi coefficients (precision model with identity link):
## (phi)
```

```
## 153.6
```

```
modelo_beta_probit2 #`3PP` + TOV + STL + PF + PlusMinus
```

```
##
## Call:
## betareg(formula = WINP ~ `3PP` + TOV + STL + PF + PlusMinus, data = dados_regressao,
##     link = "probit")
##
## Coefficients (mean model with probit link):
## (Intercept)        `3PP`          TOV          STL           PF    PlusMinus
##  -0.0671991    0.0059479    0.0002532    0.0039662   -0.0089563    0.0816533
##
## Phi coefficients (precision model with identity link):
## (phi)
## 156.5
```

```
modelo_beta_probit_1 <- betareg(WINP ~ PF + PlusMinus,data = dados_regressao, link = "probit")
modelo_beta_probit_2 <- betareg(WINP ~ STL + PF + PlusMinus,data = dados_regressao, link = "probit")
modelo_beta_probit_3 <- betareg(WINP ~ TOV + STL + PF + PlusMinus,data = dados_regressao, link = "probi

lrtest(modelo_beta_probit1, modelo_beta_probit_1) #0.02108
```

```
## Likelihood ratio test
##
## Model 1: WINP ~ PlusMinus
## Model 2: WINP ~ PF + PlusMinus
##   #Df LogLik Df  Chisq Pr(>Chisq)
## 1   3 829.23
## 2   4 831.89  1 5.3205    0.02108 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
#Colocar PF melhorou o modelo

lrtest(modelo_beta_probit_1, modelo_beta_probit_2) #2.2e-16
```

```
## Likelihood ratio test
##
## Model 1: WINP ~ PF + PlusMinus
## Model 2: WINP ~ STL + PF + PlusMinus
##   #Df LogLik Df  Chisq Pr(>Chisq)
## 1   4 831.89
## 2   5 831.93  1 0.0757     0.7832
```

```
#Colocar STL melhorou o modelo

lrtest(modelo_beta_probit_2, modelo_beta_probit_3) #0.07002
```

```
## Likelihood ratio test
##
## Model 1: WINP ~ STL + PF + PlusMinus
## Model 2: WINP ~ TOV + STL + PF + PlusMinus
##   #Df LogLik Df Chisq Pr(>Chisq)
## 1   5 831.93
## 2   6 831.93  1     0     0.9998
```

```r
#Colocar TOV melhorou o modelo

lrtest(modelo_beta_probit_3, modelo_beta_probit2) #0.06972
```

```
## Likelihood ratio test
##
## Model 1: WINP ~ TOV + STL + PF + PlusMinus
## Model 2: WINP ~ `3PP` + TOV + STL + PF + PlusMinus
##   #Df LogLik Df  Chisq Pr(>Chisq)
## 1   6 831.93
## 2   7 833.57  1 3.2896    0.06972 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```r
#Colocar `3PP` melhorou o modelo

#Melhor modelo de probito é modelo_beta_probit2 com `3PP` + TOV + STL + PF + PlusMinus;

#######cloglog#######
modelo_beta_cloglog
```

```
##
## Call:
## betareg(formula = WINP ~ ., data = dados_regressao, link = "cloglog")
##
## Coefficients (mean model with cloglog link):
##                 (Intercept)          TEAMBoston Celtics
##                    0.794062                   -0.049746
##           TEAMBrooklyn Nets       TEAMCharlotte Bobcats
##                    0.032015                   -0.007763
##      TEAMCharlotte Hornets           TEAMChicago Bulls
##                   -0.030385                    0.029472
##    TEAMCleveland Cavaliers        TEAMDallas Mavericks
##                   -0.023293                   -0.040152
##         TEAMDenver Nuggets         TEAMDetroit Pistons
##                    0.003782                   -0.100966
##  TEAMGolden State Warriors         TEAMHouston Rockets
##                   -0.071263                    0.037661
##         TEAMIndiana Pacers             TEAMLA Clippers
##                   -0.005548                   -0.046883
##   TEAMLos Angeles Clippers      TEAMLos Angeles Lakers
##                   -0.101459                    0.018101
##      TEAMMemphis Grizzlies              TEAMMiami Heat
##                    0.039985                   -0.014300
##        TEAMMilwaukee Bucks  TEAMMinnesota Timberwolves
##                   -0.055821                   -0.153952
##        TEAMNew Jersey Nets     TEAMNew Orleans Hornets
##                   -0.149391                   -0.044444
##   TEAMNew Orleans Pelicans         TEAMNew York Knicks
##                   -0.084526                   -0.070914
##  TEAMOklahoma City Thunder           TEAMOrlando Magic
##                   -0.004848                   -0.060840
##     TEAMPhiladelphia 76ers            TEAMPhoenix Suns
##                   -0.071749                   -0.027942
```

```
## TEAMPortland Trail Blazers        TEAMSacramento Kings
##                    0.029650                   -0.053944
##      TEAMSan Antonio Spurs         TEAMToronto Raptors
##                   -0.068963                   -0.040074
##               TEAMUtah Jazz      TEAMWashington Wizards
##                   -0.089508                   -0.048661
##                         PTS                         FGM
##                   -0.033787                    0.072426
##                         FGA                         FGP
##                   -0.014226                    0.010500
##                        `3PM`                       `3PA`
##                    0.011649                    0.006716
##                        `3PP`                         FTM
##                    0.015503                    0.126496
##                         FTA                         FTP
##                   -0.077220                   -0.022413
##                        OREB                        DREB
##                    0.159384                    0.159742
##                         REB                         AST
##                   -0.144689                    0.006588
##                         TOV                         STL
##                   -0.028492                    0.023392
##                         BLK                        BLKA
##                   -0.009382                   -0.015763
##                          PF                         PFD
##                   -0.003075                    0.015583
##                   PlusMinus           Numero_temporada2
##                    0.083820                    0.015464
##          Numero_temporada3           Numero_temporada4
##                    0.011259                    0.040035
##          Numero_temporada5           Numero_temporada6
##                    0.016745                    0.008075
##          Numero_temporada7           Numero_temporada8
##                    0.026295                    0.022804
##          Numero_temporada9          Numero_temporada10
##                    0.022939                    0.024505
##         Numero_temporada11          Numero_temporada12
##                    0.020872                    0.033090
##         Numero_temporada13          Numero_temporada14
##                    0.008507                    0.012403
##         Numero_temporada15
##                    0.031133
##
## Phi coefficients (precision model with identity link):
## (phi)
## 177.2
```

```
modelo_beta_cloglog1 #PlusMinus
```

```
##
## Call:
## betareg(formula = WINP ~ PlusMinus, data = dados_regressao, link = "cloglog")
##
## Coefficients (mean model with cloglog link):
## (Intercept)    PlusMinus
```

```
##    -0.39703      0.09631
##
## Phi coefficients (precision model with identity link):
## (phi)
## 144.2
```

```
modelo_beta_cloglog2 #`3PP` + TOV + PlusMinus
```

```
##
## Call:
## betareg(formula = WINP ~ `3PP` + TOV + PlusMinus, data = dados_regressao,
##     link = "cloglog")
##
## Coefficients (mean model with cloglog link):
## (Intercept)        `3PP`          TOV    PlusMinus
##   -0.465053     0.005727    -0.009590     0.094564
##
## Phi coefficients (precision model with identity link):
## (phi)
## 146.1
```

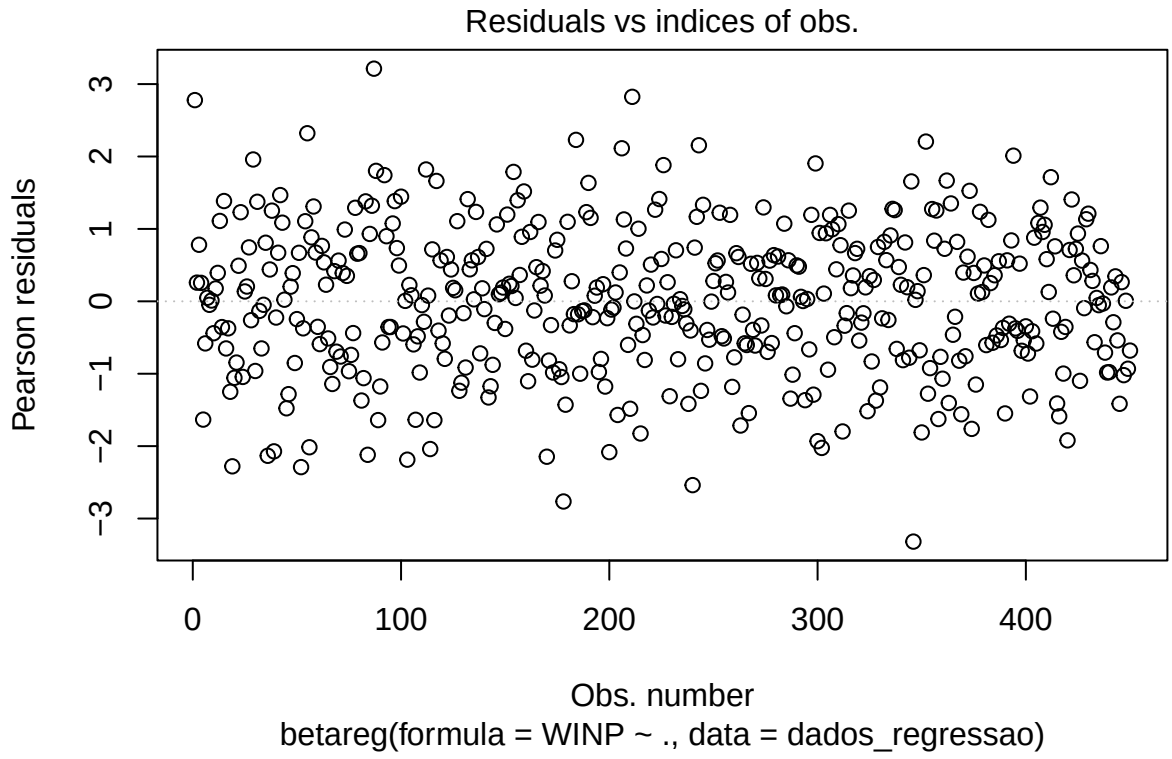
```
modelo_beta_cloglog_1 <- betareg(WINP ~ TOV + PlusMinus,data = dados_regressao, link = "cloglog")

lrtest(modelo_beta_cloglog1, modelo_beta_cloglog_1) #0.06695
```

```
## Likelihood ratio test
##
## Model 1: WINP ~ PlusMinus
## Model 2: WINP ~ TOV + PlusMinus
##   #Df LogLik Df  Chisq Pr(>Chisq)
## 1   3 815.37
## 2   4 817.05  1 3.3563    0.06695 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

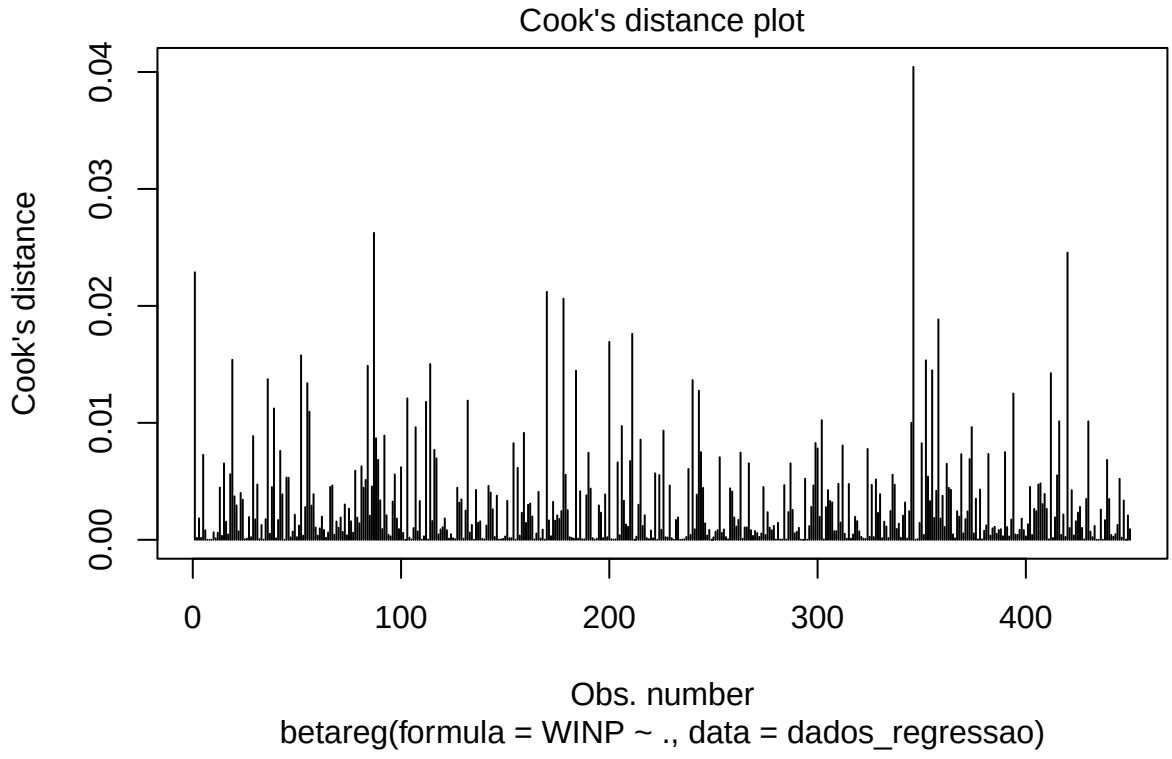
```
#TOV melhorou o modelo;

lrtest(modelo_beta_cloglog_1, modelo_beta_cloglog2) #0.129
```

```
## Likelihood ratio test
##
## Model 1: WINP ~ TOV + PlusMinus
## Model 2: WINP ~ `3PP` + TOV + PlusMinus
##   #Df LogLik Df  Chisq Pr(>Chisq)
## 1   4 817.05
## 2   5 818.20  1 2.3027     0.1291
```

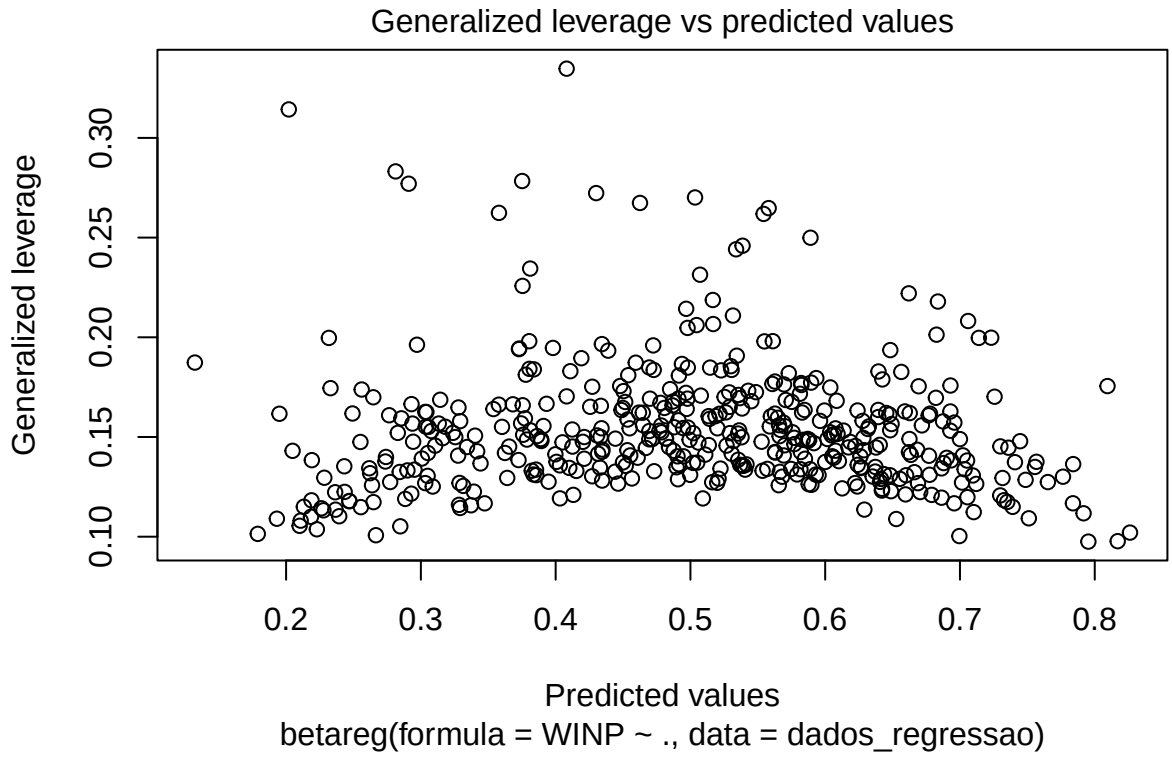
```
#`3PP` piorou o modelo;

#melhor modelo é modelo_beta_cloglog_1 com TOV + PlusMinus

############### Análise de resíduos apenas dos melhores modelos por função de ligação ###################
############ Logito ##########
#### Modelo completo logito ###
plot(modelo_beta1, which = 1, type = "pearson") #Residuos vs indices das observações
```



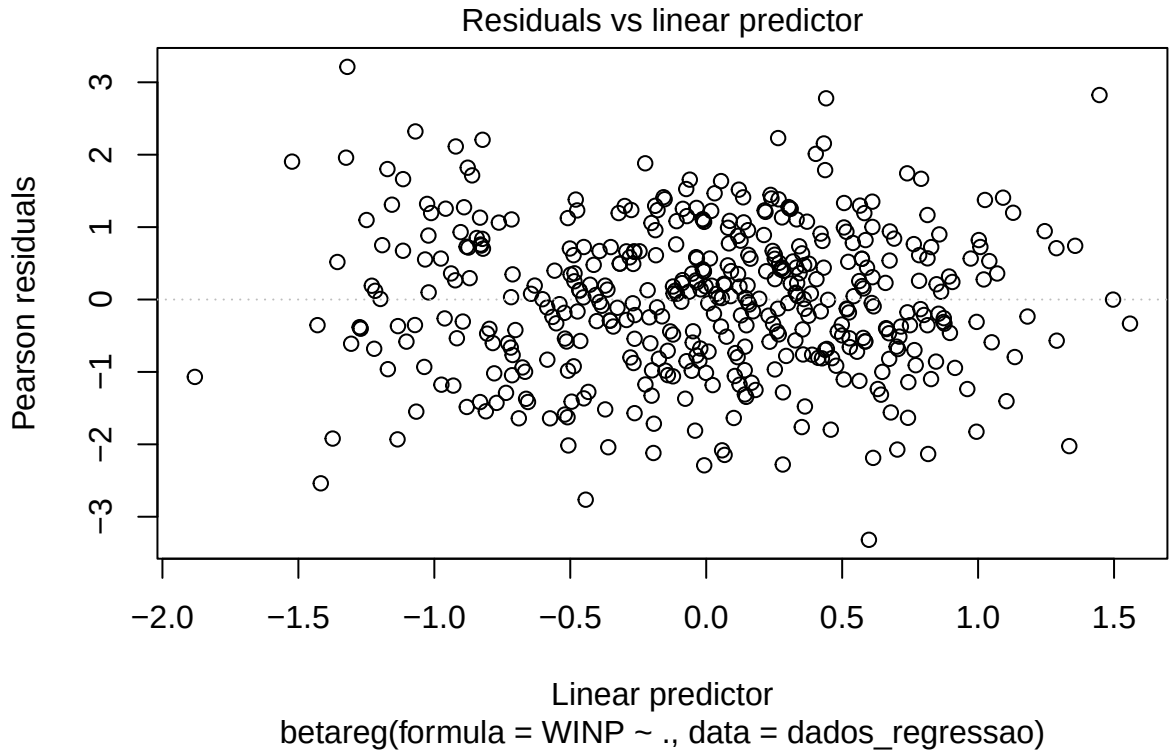

```
plot(modelo_beta1, which = 2, type = "pearson") #Distância de cook
```



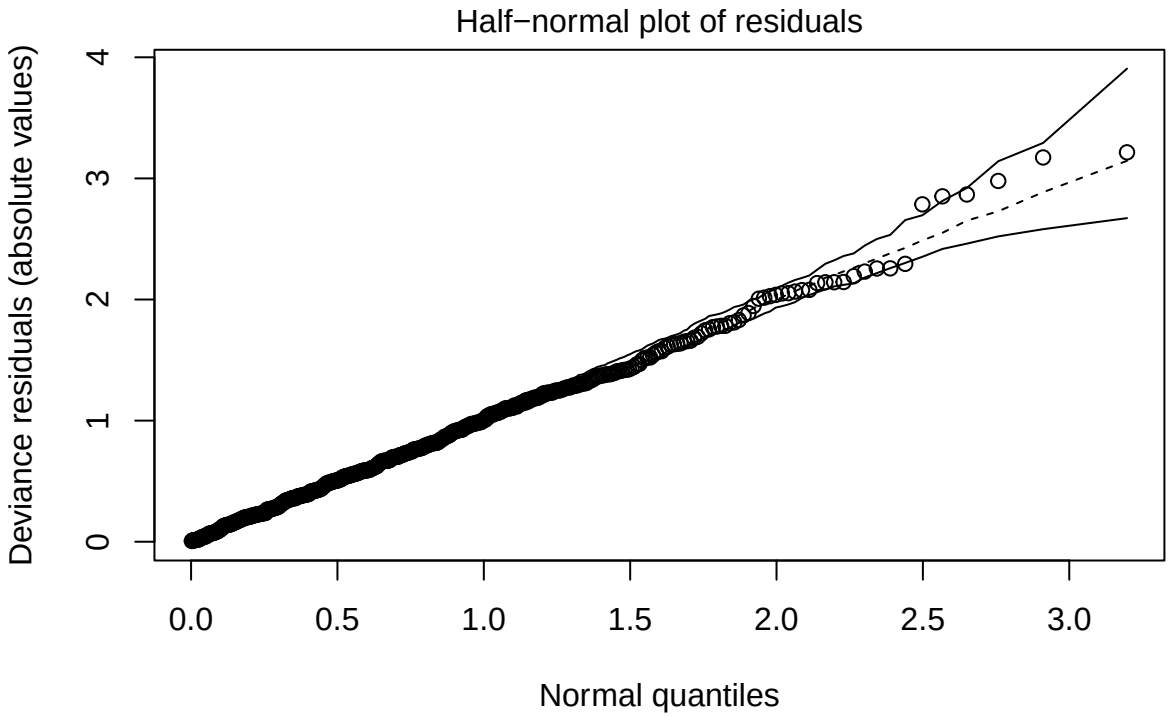

```
plot(modelo_beta1, which = 3, type = "pearson") #alavancagem vs valores preditos
```



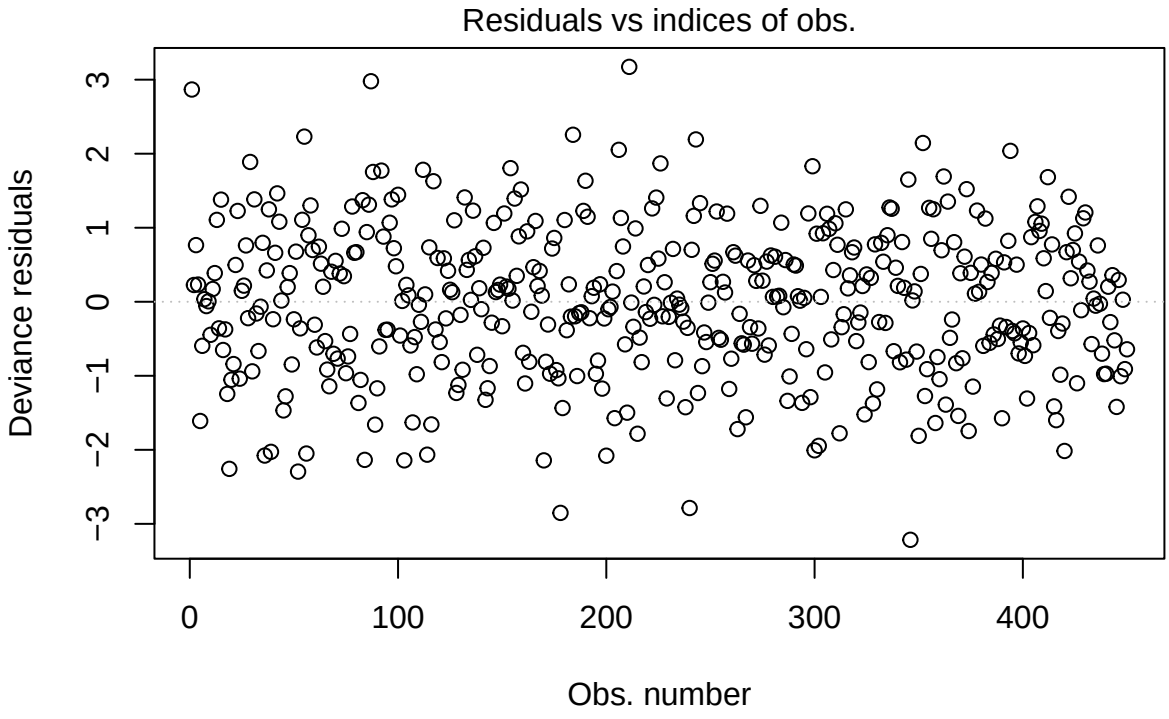

```r
plot(modelo_beta1, which = 4, type = "pearson") #Residuos vs preditores lineares
```




```r
plot(modelo_beta1, which = 5, type = "deviance", sub.caption = "") #QQ plot
```




```
plot(modelo_beta1, which = 1, type = "deviance", sub.caption = "") #Residuos vs indices das observações
```




```
shapiro.test(modelo_beta1$residuals) #p-value = 0.3693, normal
```

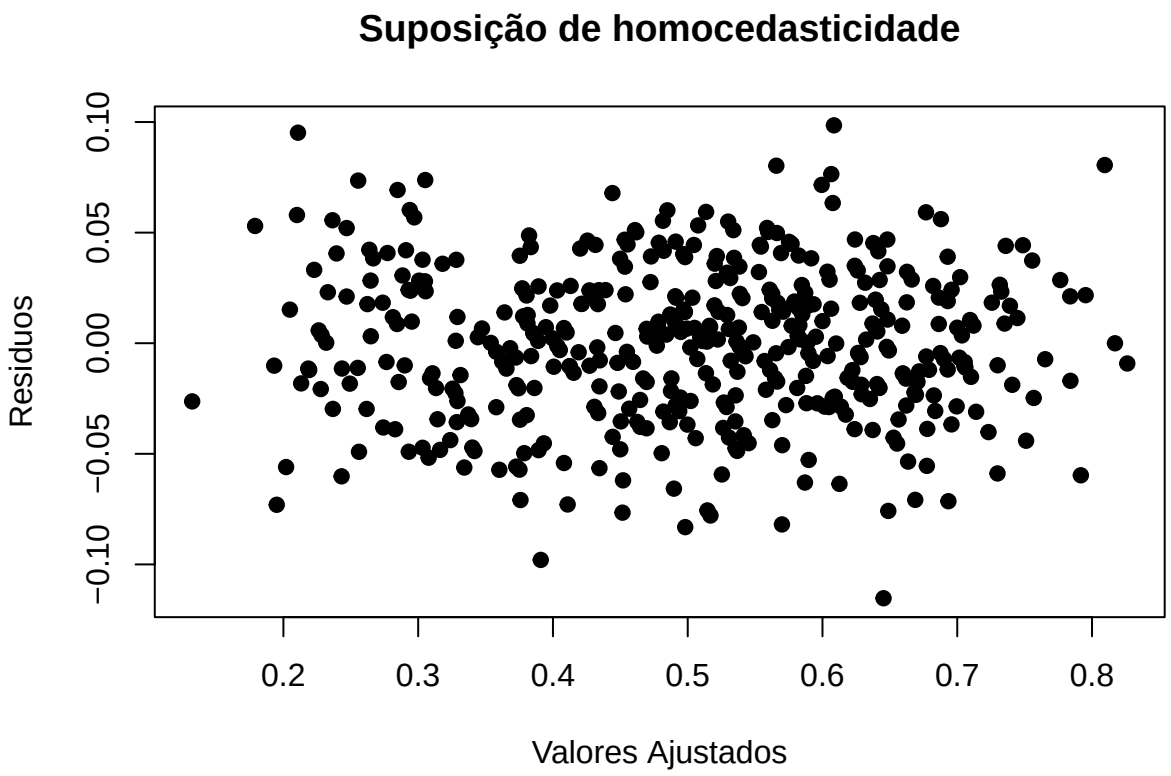
```
##
##  Shapiro-Wilk normality test
##
## data:  modelo_beta1$residuals
## W = 0.99774, p-value = 0.8104
```

```r
#Teste de durbin watson para independencia
library(lmtest)
dwtest(modelo_beta1) #p-value = 0.1306
```

```
##
##  Durbin-Watson test
##
## data:  modelo_beta1
## DW = 1.9425, p-value = 0.09558
## alternative hypothesis: true autocorrelation is greater than 0
```

```r
#Independência
plot(modelo_beta1$residuals,
     ylab = "Residuos",
     xlab = "Index dos Imovéis",
     main = "Suposição de independência",
     pch = 19)
```

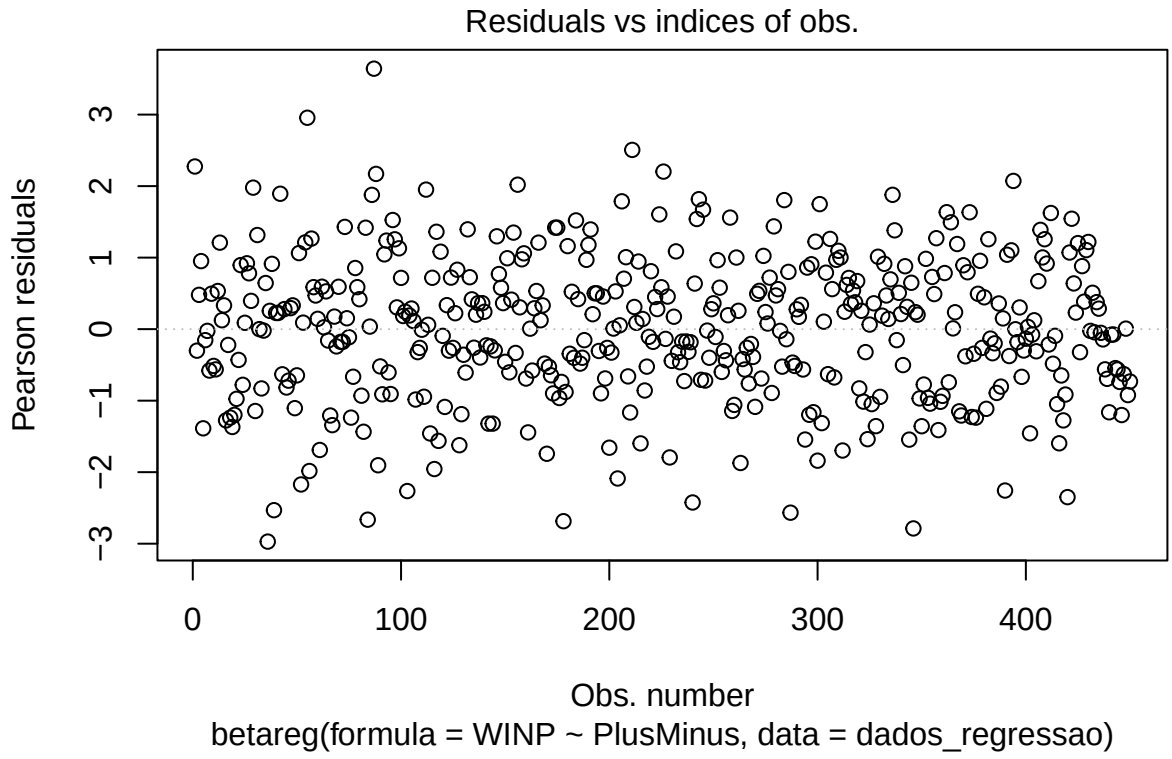

```r
#Homocedasticidade
plot(modelo_beta1$fitted.values, modelo_beta1$residuals,
     xlab = "Valores Ajustados",
     ylab = "Residuos",
     pch = 19,
     main = "Suposição de homocedasticidade"
)
```



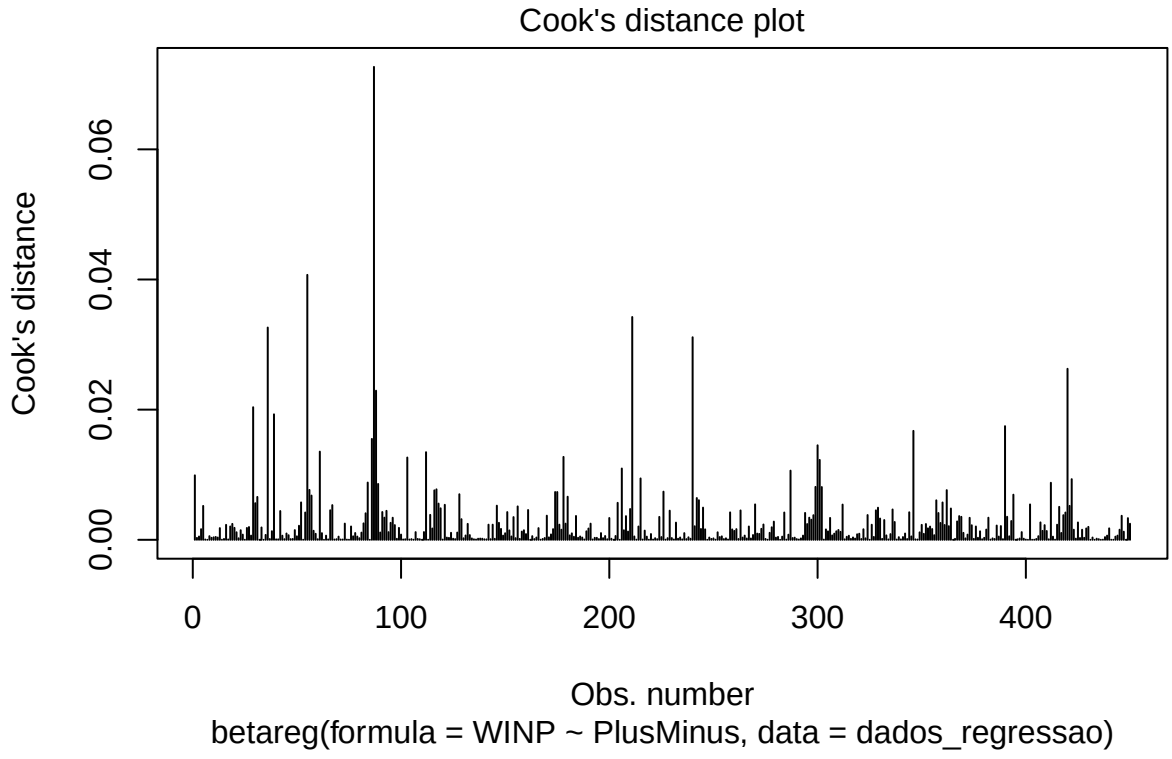

```
#Breusch_Pagan para homocedasticdade
bptest(modelo_beta1) #p-value = 0.2463, heterocedasticidade
```

```
##
##  studentized Breusch-Pagan test
##
## data:  modelo_beta1
## BP = 67.811, df = 68, p-value = 0.4837
```

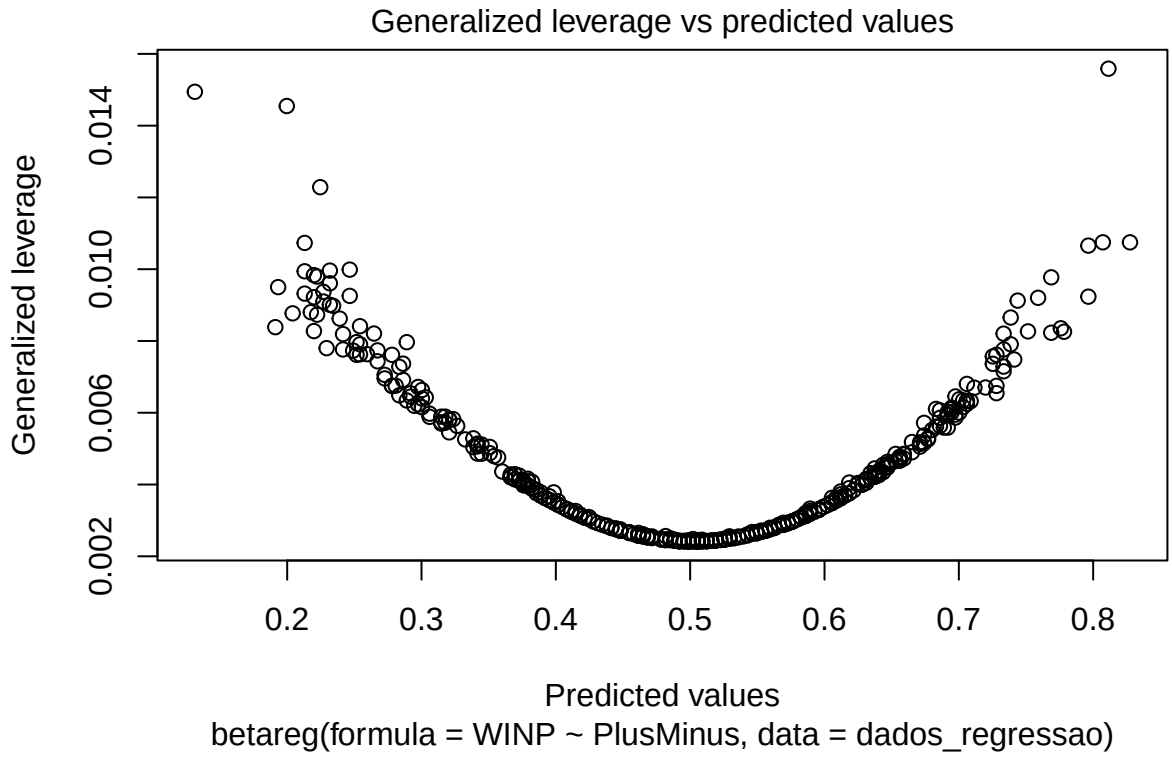
```
#### Modelo reduzido logito ###
plot(modelo_beta11, which = 1, type = "pearson")
```



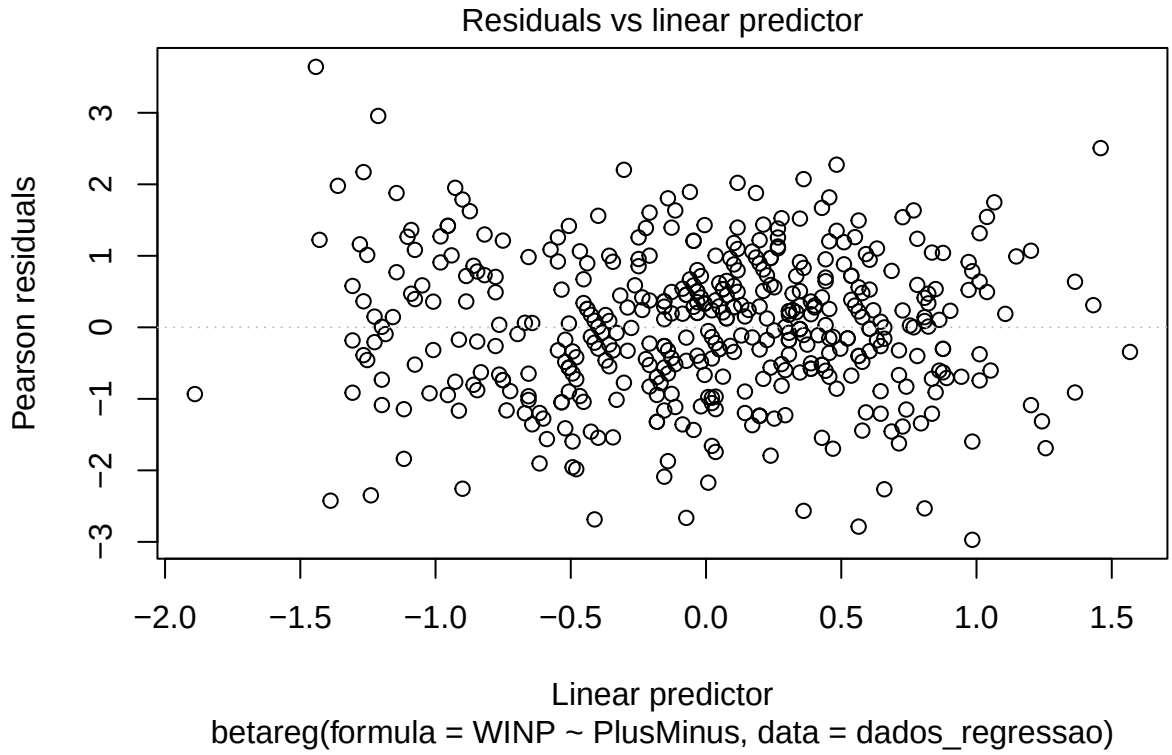

```
plot(modelo_beta11, which = 2, type = "pearson")
```



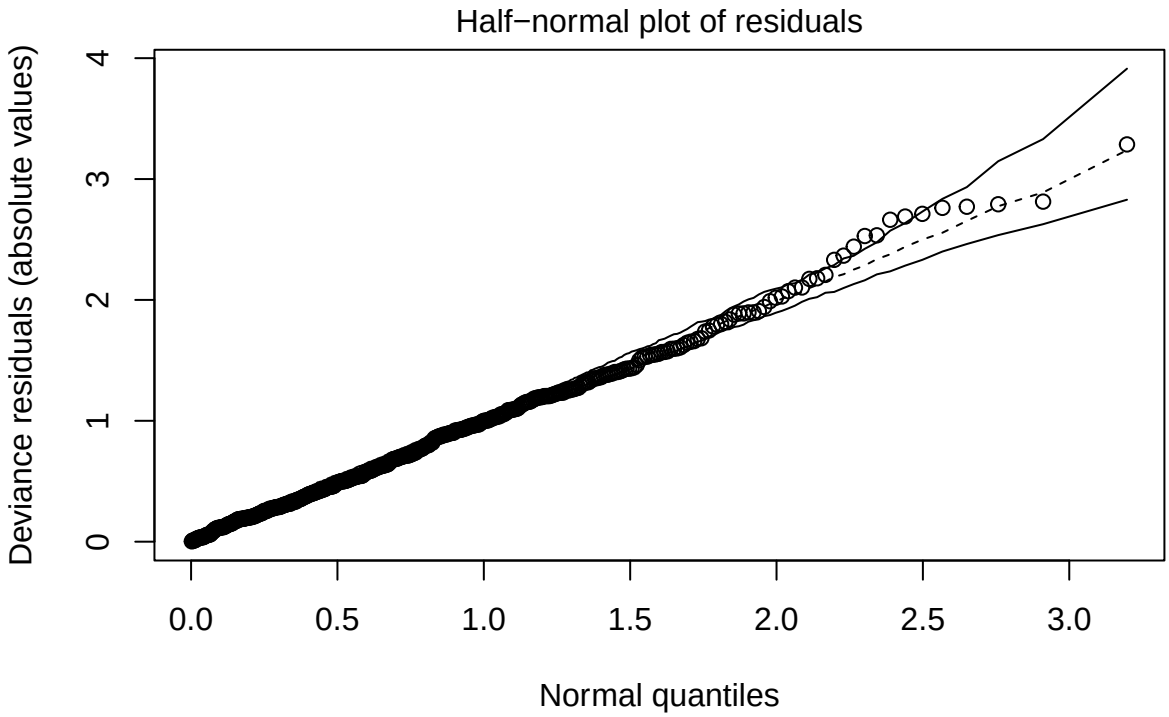

```
plot(modelo_beta11, which = 3, type = "pearson")
```



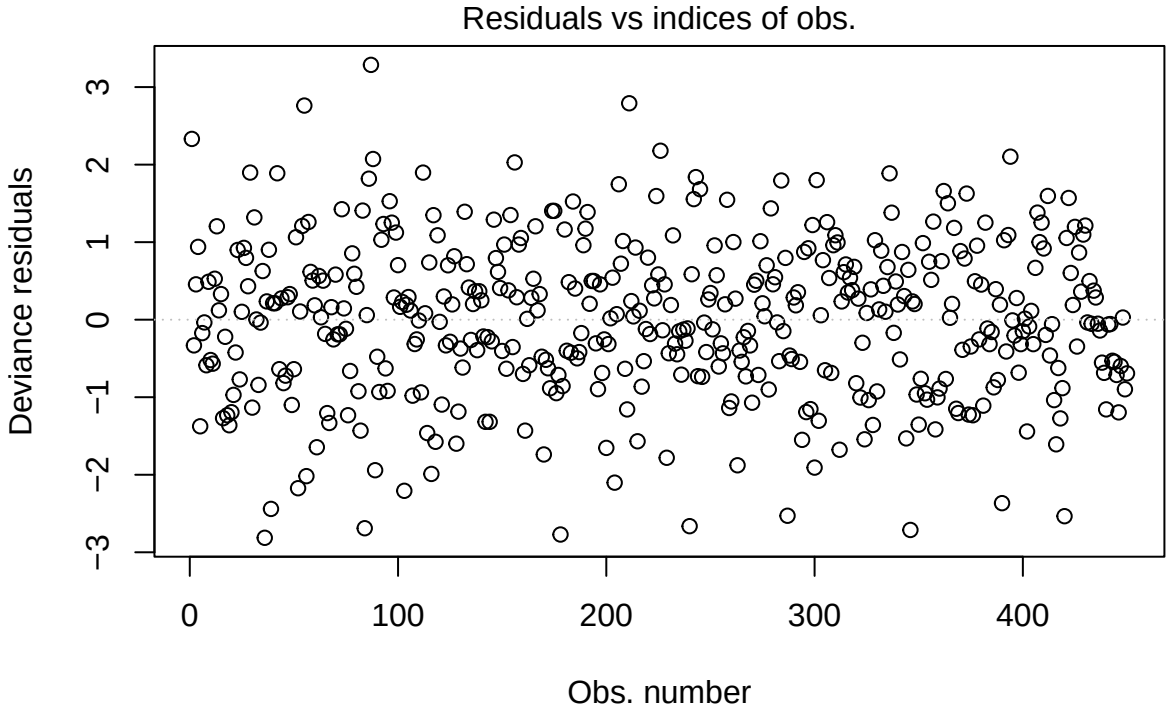

```
plot(modelo_beta11, which = 4, type = "pearson")
```




```
plot(modelo_beta11, which = 5, type = "deviance", sub.caption = "")
```




```
plot(modelo_beta11, which = 1, type = "deviance", sub.caption = "")
```




```
shapiro.test(modelo_beta11$residuals) #p-value = 0.5895, normal
```

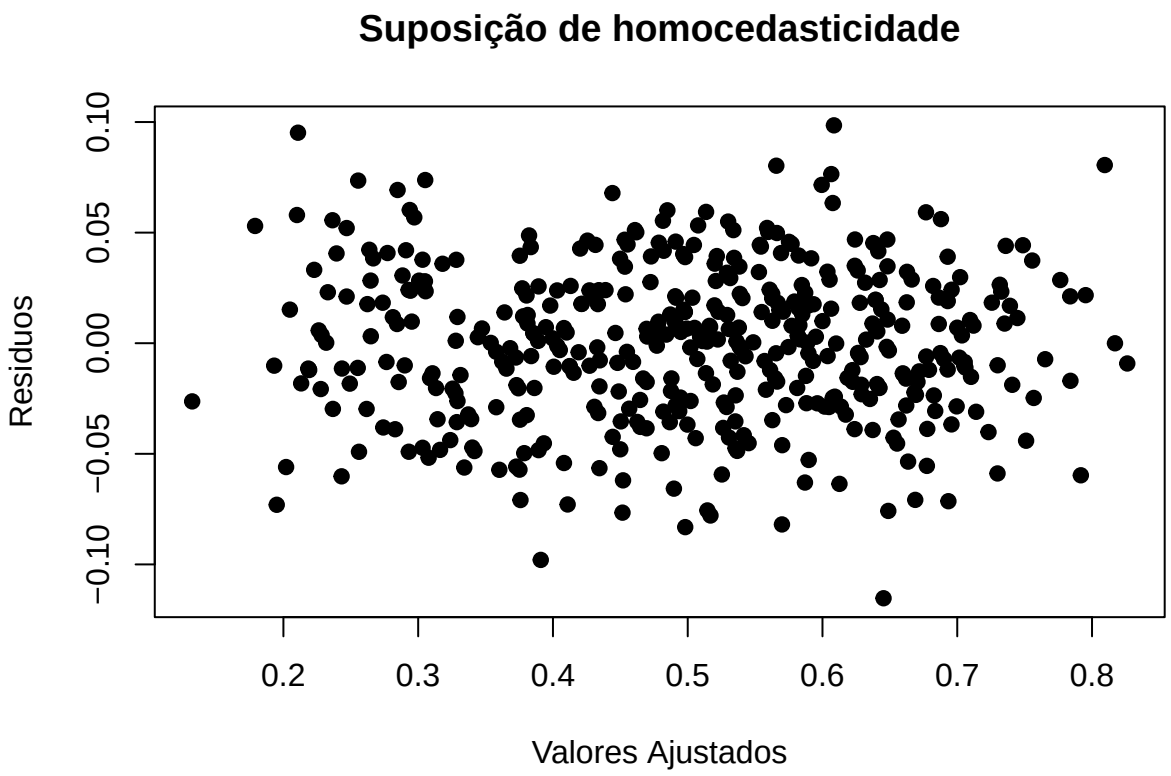
```
##
##  Shapiro-Wilk normality test
##
## data:  modelo_beta11$residuals
## W = 0.99703, p-value = 0.5895
```

```r
#Teste de durbin watson para independencia
library(lmtest)
dwtest(modelo_beta11) #p-value = 0.2889
```

```
##
##  Durbin-Watson test
##
## data:  modelo_beta11
## DW = 1.9507, p-value = 0.2889
## alternative hypothesis: true autocorrelation is greater than 0
```

```r
#Independência
plot(modelo_beta1$residuals,
     ylab = "Residuos",
     xlab = "Index dos Imovéis",
     main = "Suposição de independência",
     pch = 19)
```

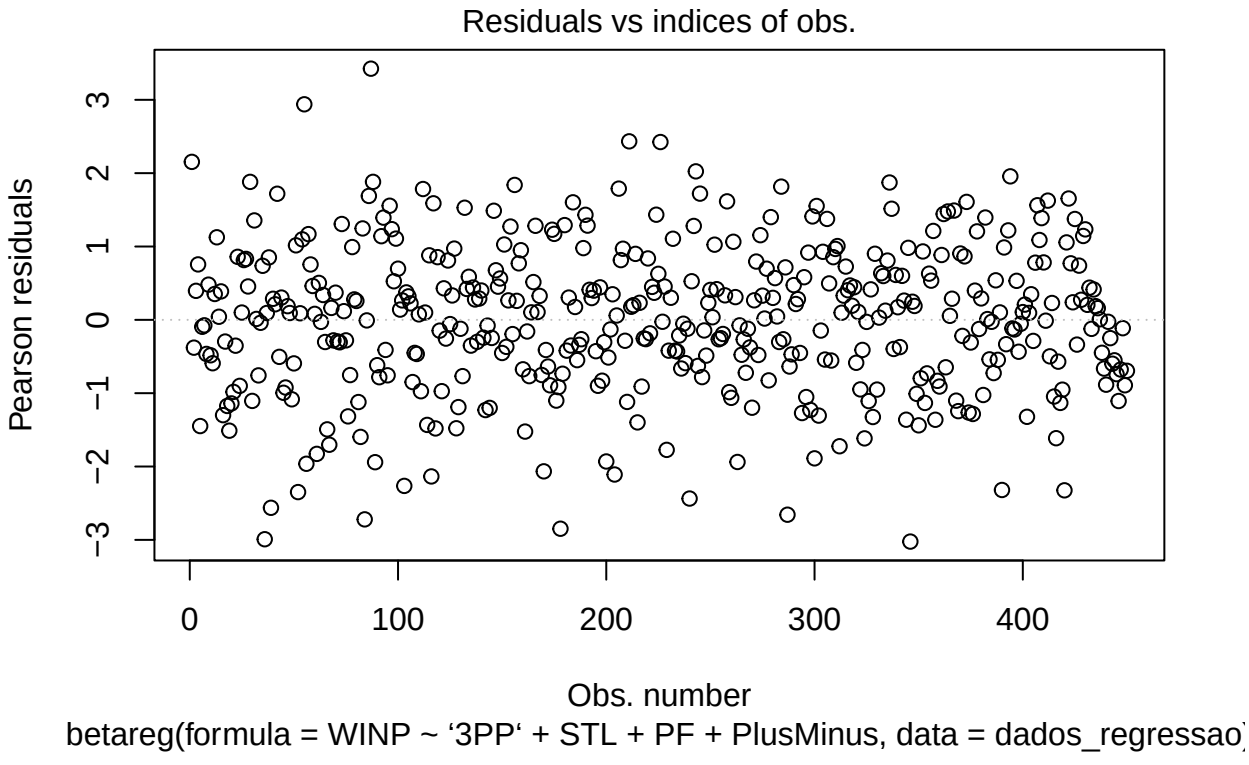

```r
#Homocedasticidade
plot(modelo_beta1$fitted.values, modelo_beta1$residuals,
     xlab = "Valores Ajustados",
     ylab = "Residuos",
     pch = 19,
     main = "Suposição de homocedasticidade"
)
```



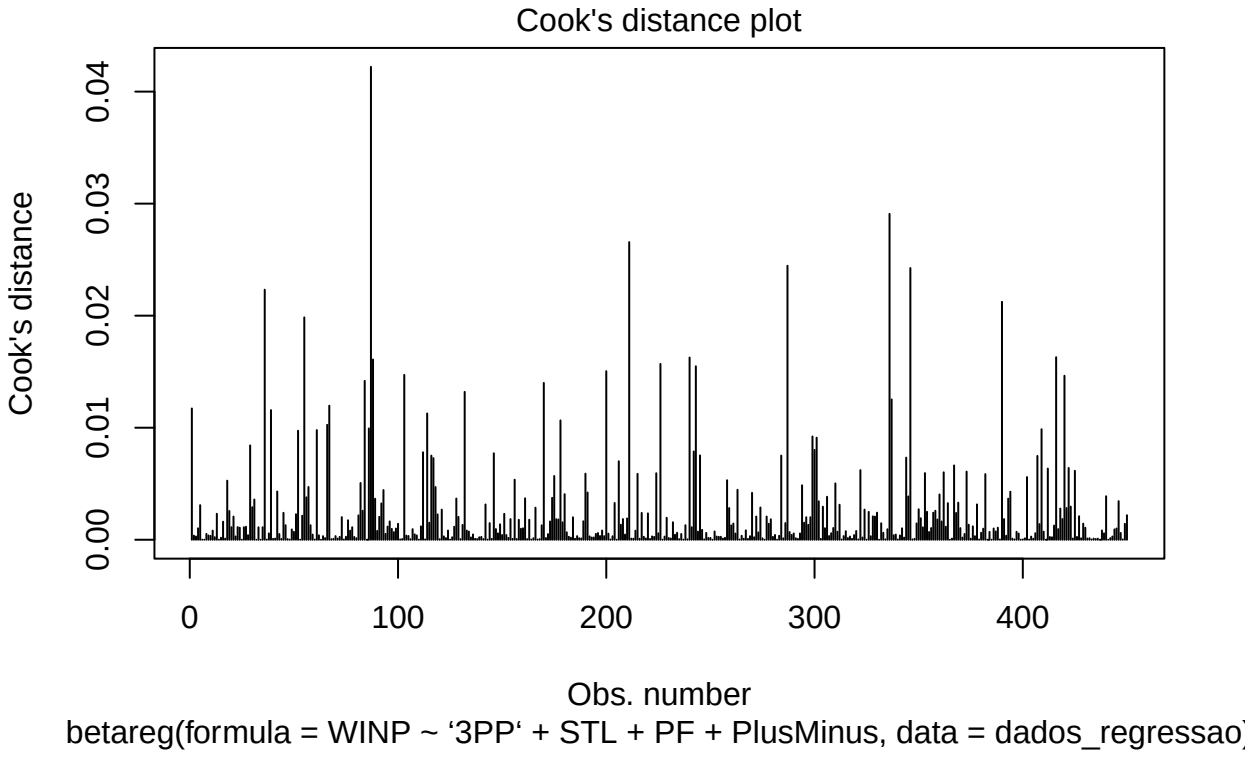

```
#Breusch_Pagan para homocedasticdade
bptest(modelo_beta11) #p-value = 0.03674, heterocedasticidade
```

```
##
##  studentized Breusch-Pagan test
##
## data:  modelo_beta11
## BP = 4.3624, df = 1, p-value = 0.03674
```

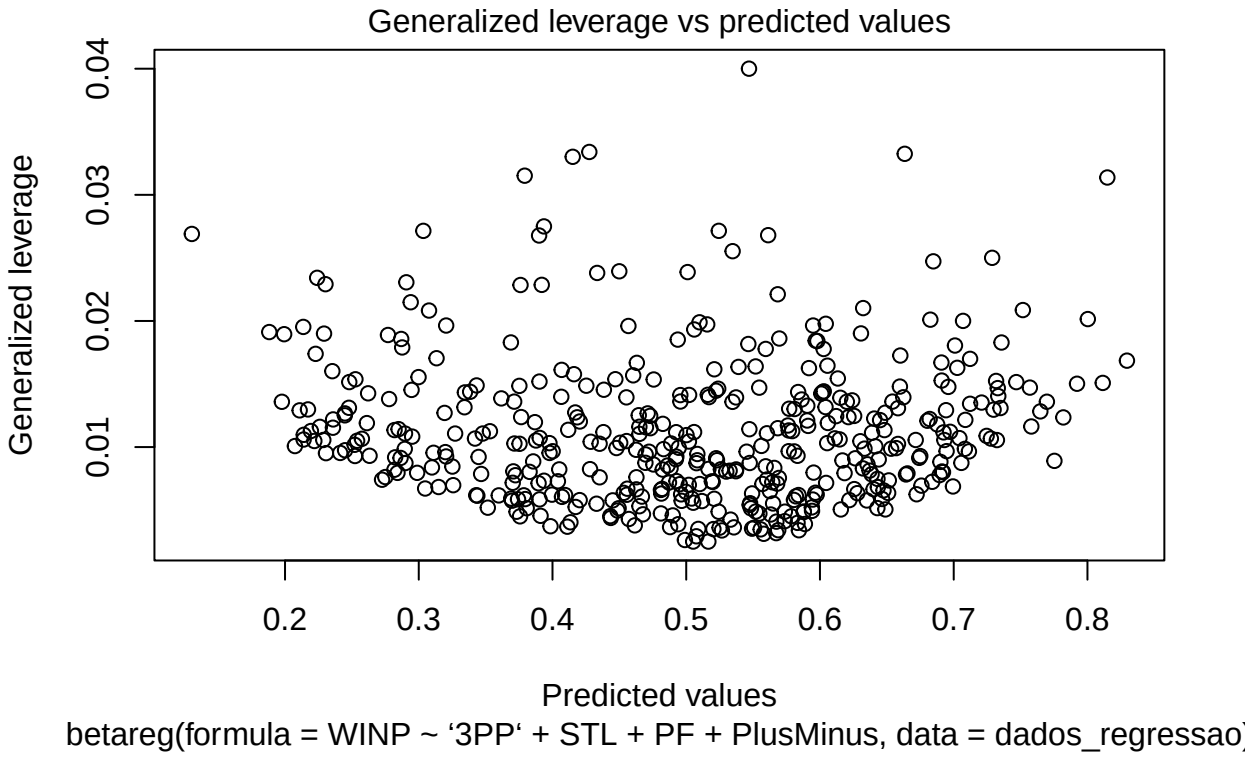
```
### Modelo 10% logito ###
plot(modelo_beta12, which = 1, type = "pearson")
```



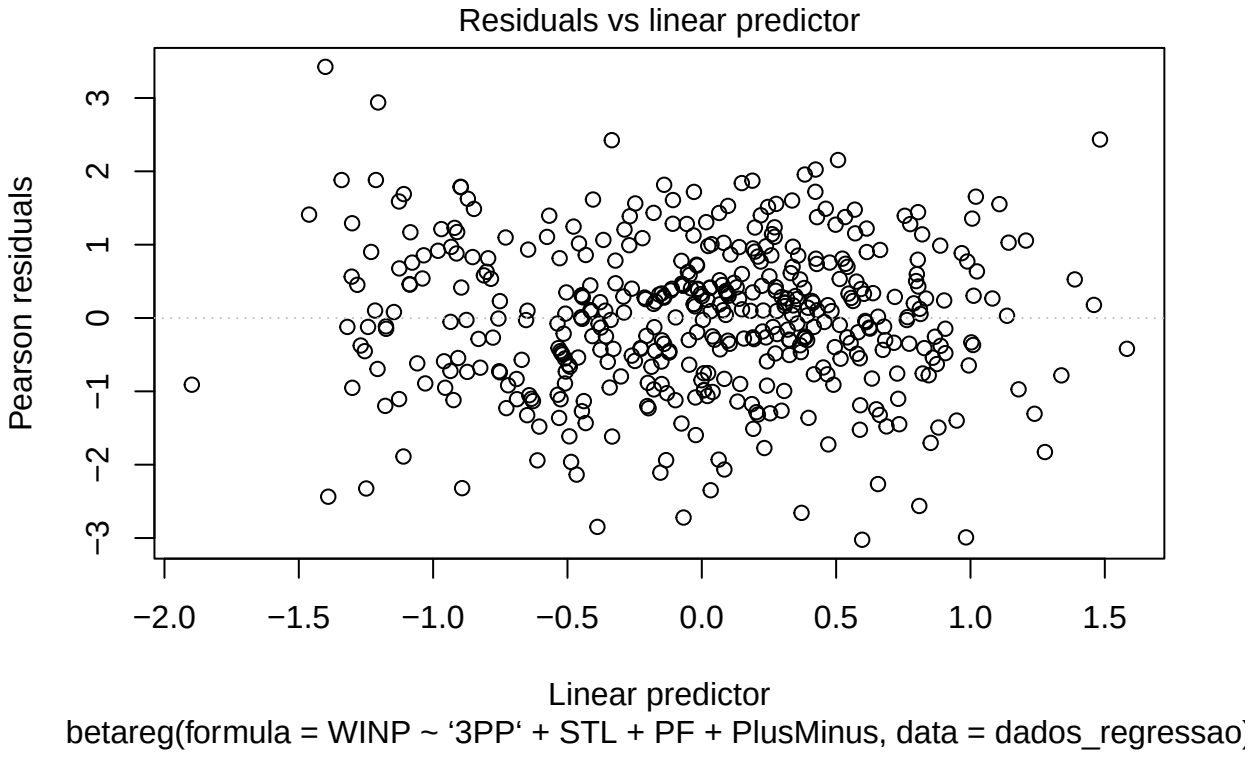

```
plot(modelo_beta12, which = 2, type = "pearson")
```



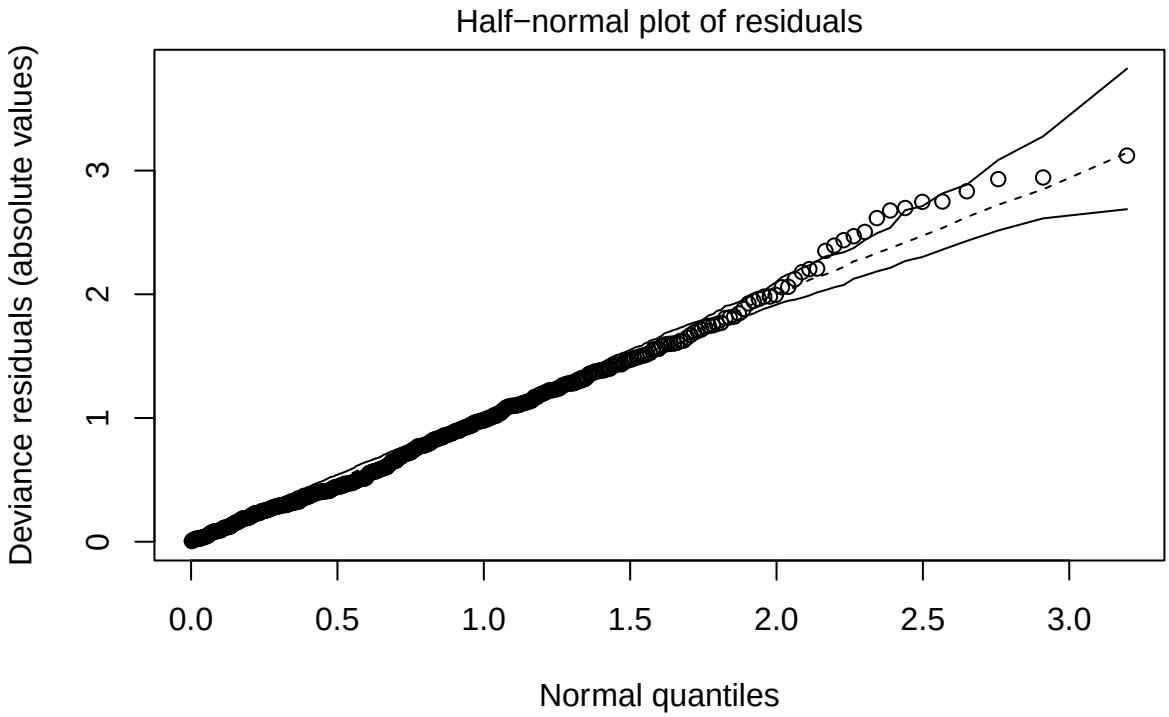

```
plot(modelo_beta12, which = 3, type = "pearson")
```



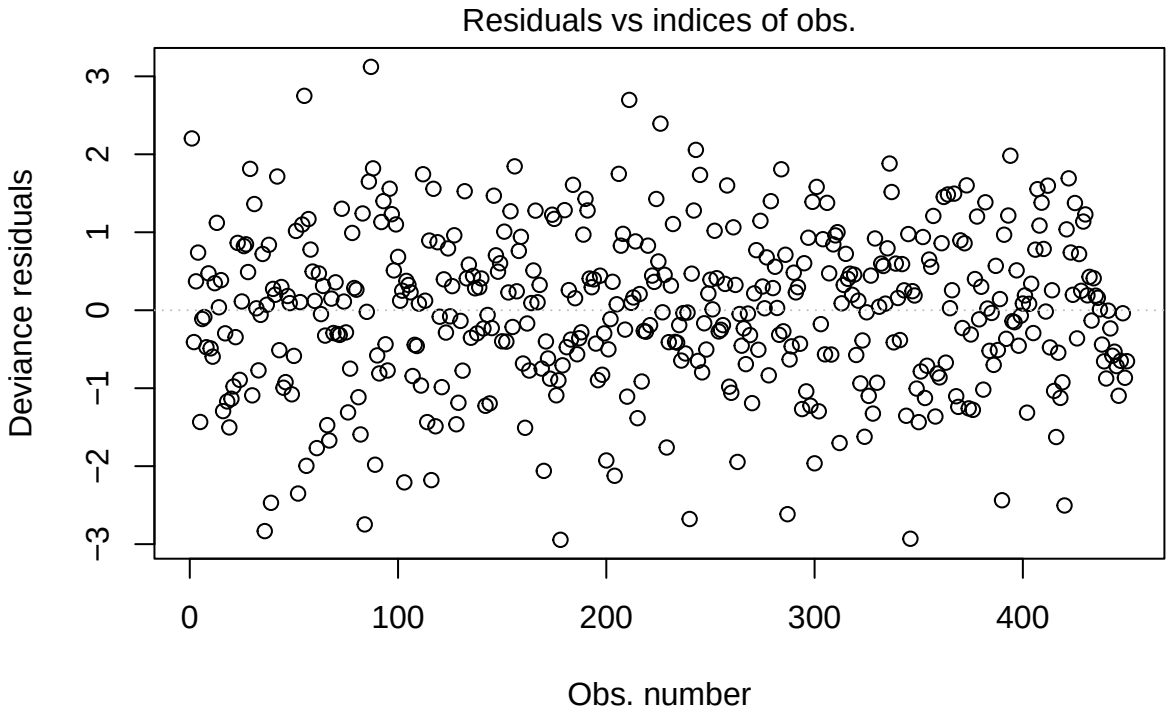

```
plot(modelo_beta12, which = 4, type = "pearson")
```




```
plot(modelo_beta12, which = 5, type = "deviance", sub.caption = "")
```




```
plot(modelo_beta12, which = 1, type = "deviance", sub.caption = "")
```




```
shapiro.test(modelo_beta12$residuals) #p-value = 0.5895, normal
```

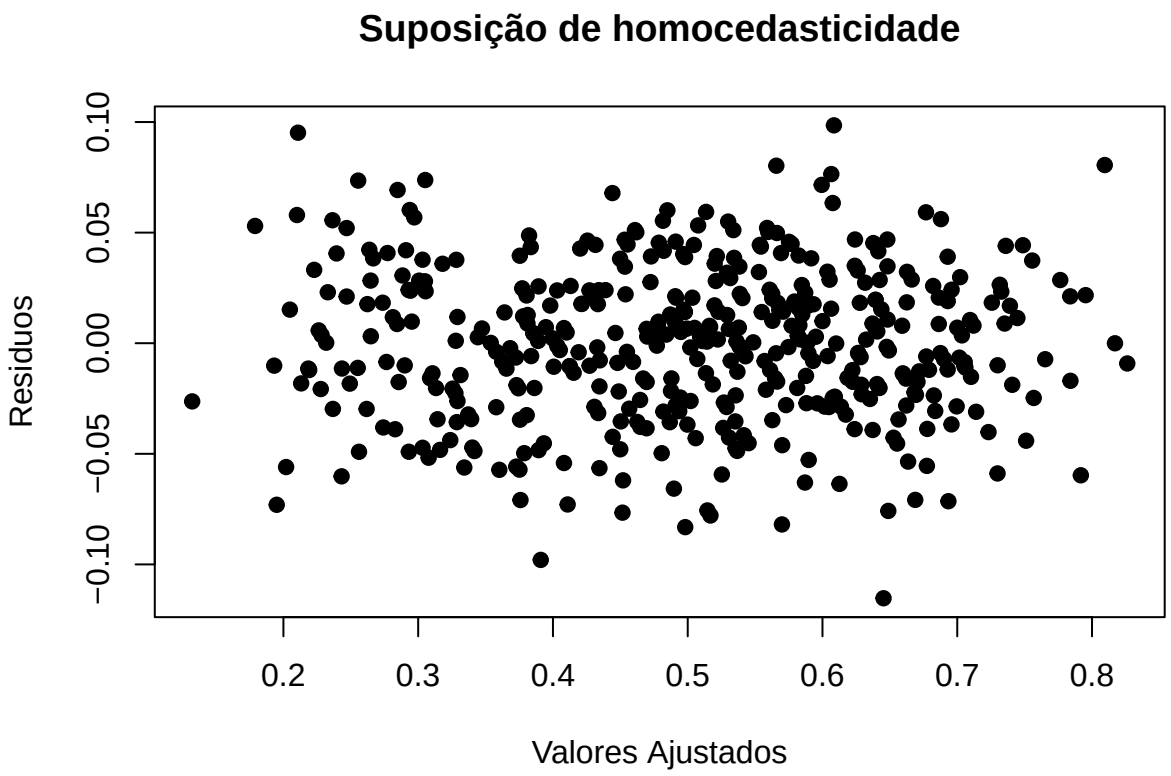
```
##
##  Shapiro-Wilk normality test
##
## data:  modelo_beta12$residuals
## W = 0.99473, p-value = 0.1267
```

```r
#Teste de durbin watson para independencia
library(lmtest)
dwtest(modelo_beta11) #p-value = 0.2889
```

```
##
##  Durbin-Watson test
##
## data:  modelo_beta11
## DW = 1.9507, p-value = 0.2889
## alternative hypothesis: true autocorrelation is greater than 0
```

```r
#Independência
plot(modelo_beta1$residuals,
     ylab = "Residuos",
     xlab = "Index dos Imovéis",
     main = "Suposição de independência",
     pch = 19)
```

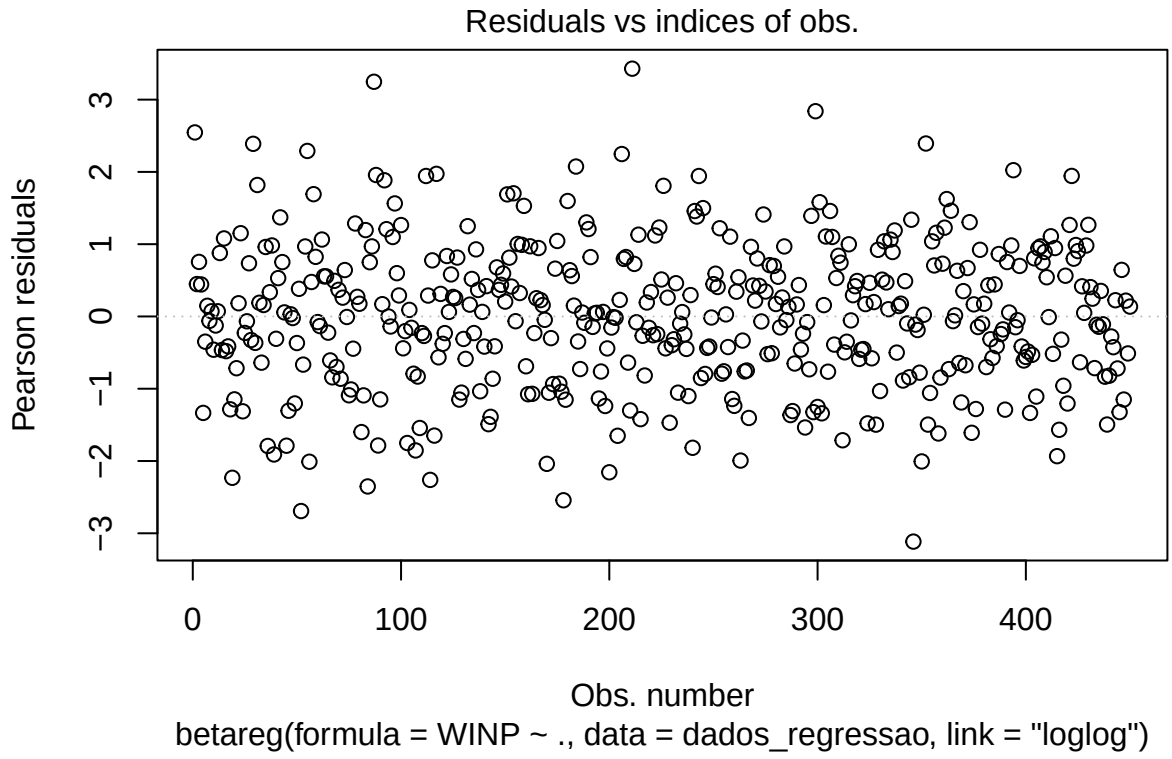

```r
#Homocedasticidade
plot(modelo_beta1$fitted.values, modelo_beta1$residuals,
     xlab = "Valores Ajustados",
     ylab = "Residuos",
     pch = 19,
     main = "Suposição de homocedasticidade"
)
```



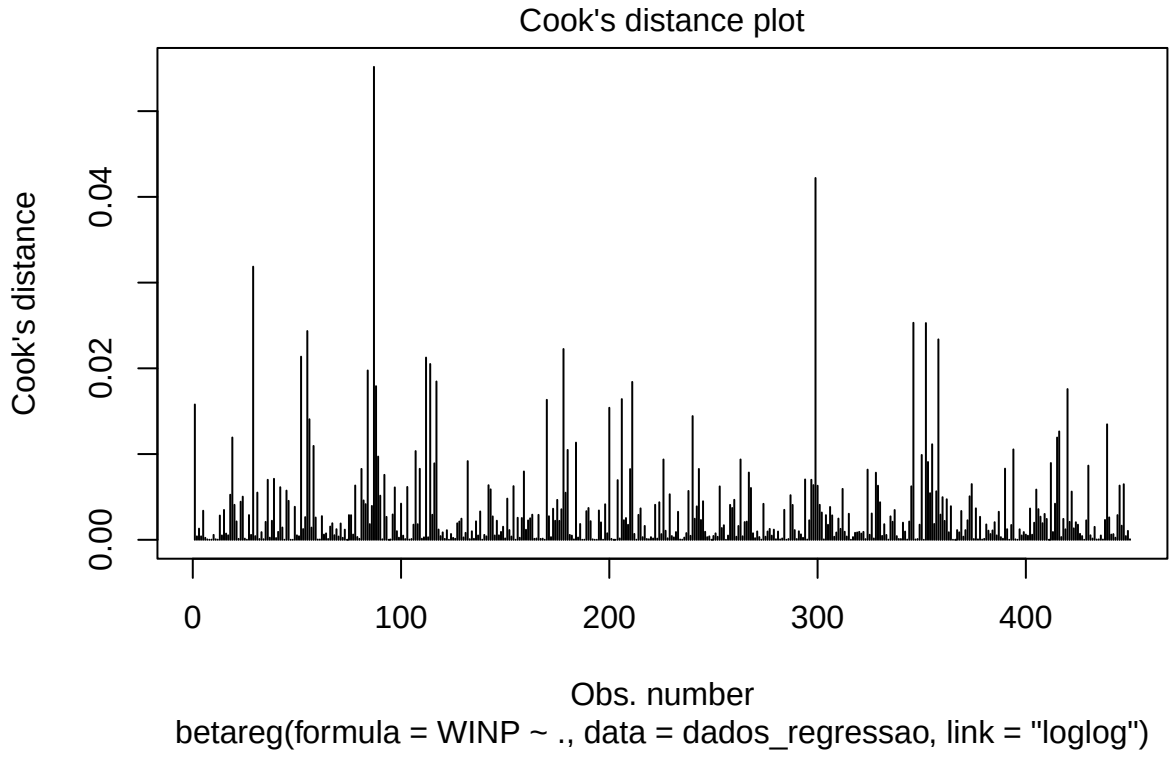

```
#Breusch_Pagan para homocedasticdade
bptest(modelo_beta11) #p-value = 0.03674, heterocedasticidade
```

```
##
##  studentized Breusch-Pagan test
##
## data:  modelo_beta11
## BP = 4.3624, df = 1, p-value = 0.03674
```

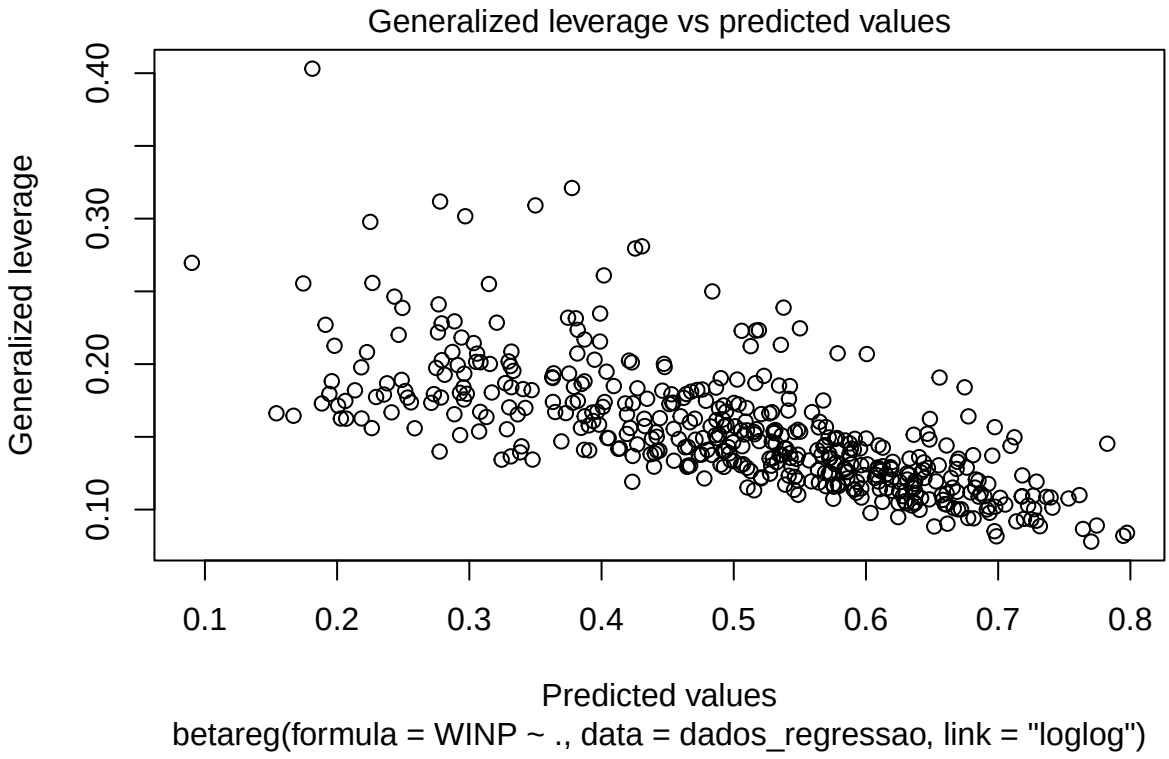
```
############ Loglog ########
### Modelo completo log log ###
plot(modelo_beta2, which = 1, type = "pearson")
```



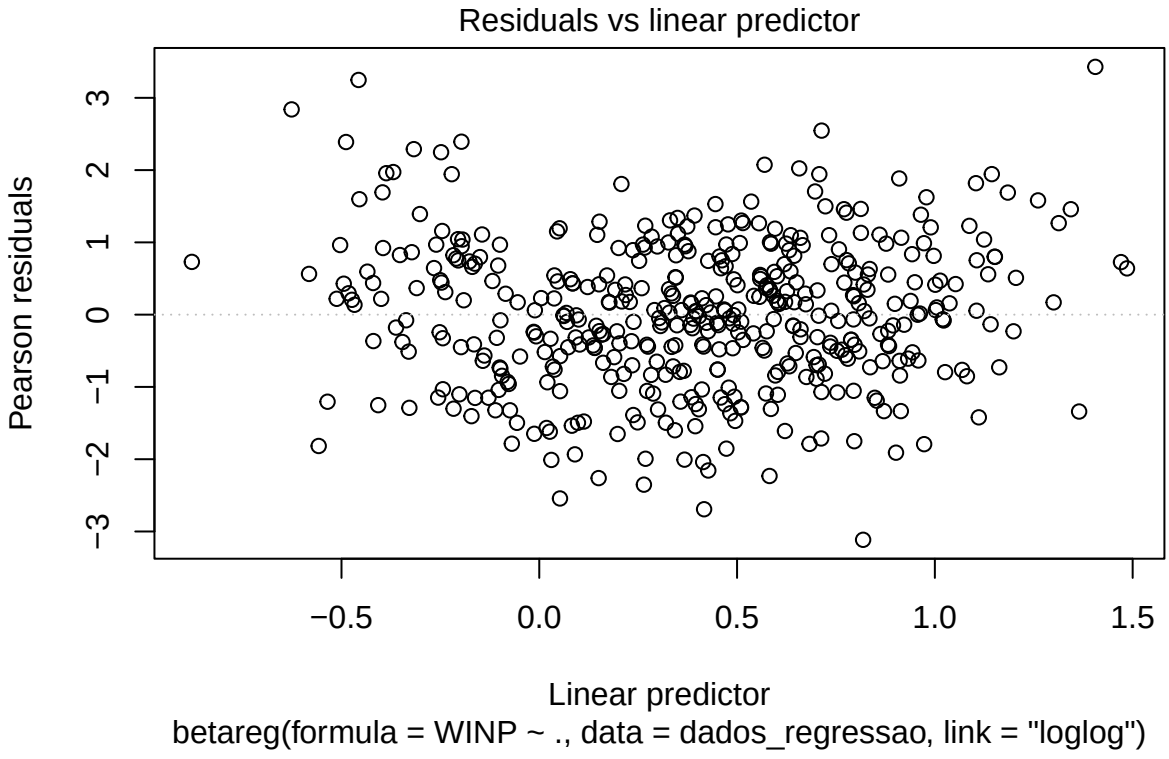

```
plot(modelo_beta2, which = 2, type = "pearson")
```



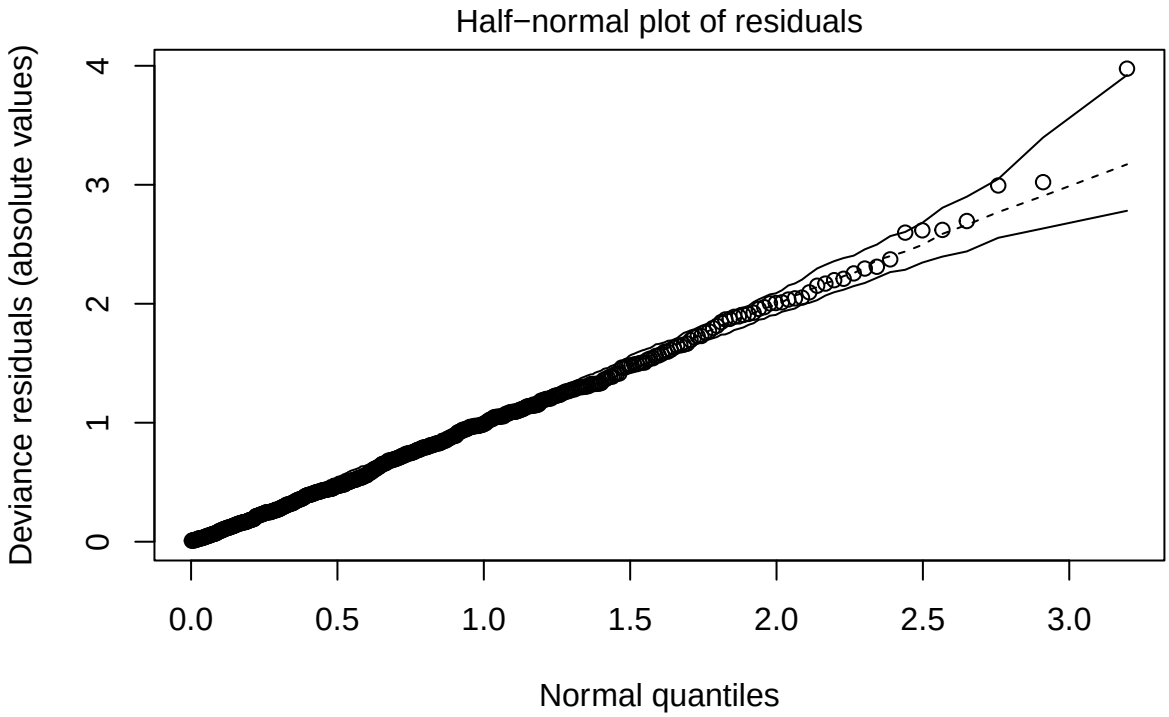

```
plot(modelo_beta2, which = 3, type = "pearson")
```



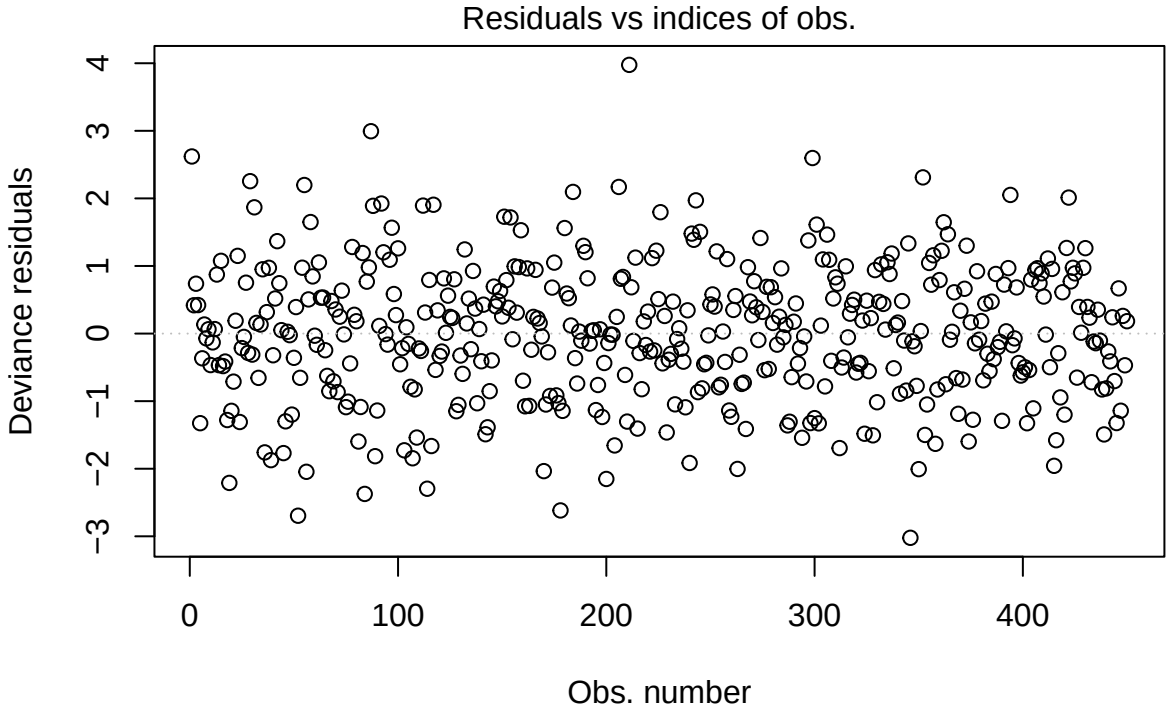

```
plot(modelo_beta2, which = 4, type = "pearson")
```




```
plot(modelo_beta2, which = 5, type = "deviance", sub.caption = "")
```




```
plot(modelo_beta2, which = 1, type = "deviance", sub.caption = "")
```




```
shapiro.test(modelo_beta2$residuals) #p-value =
```

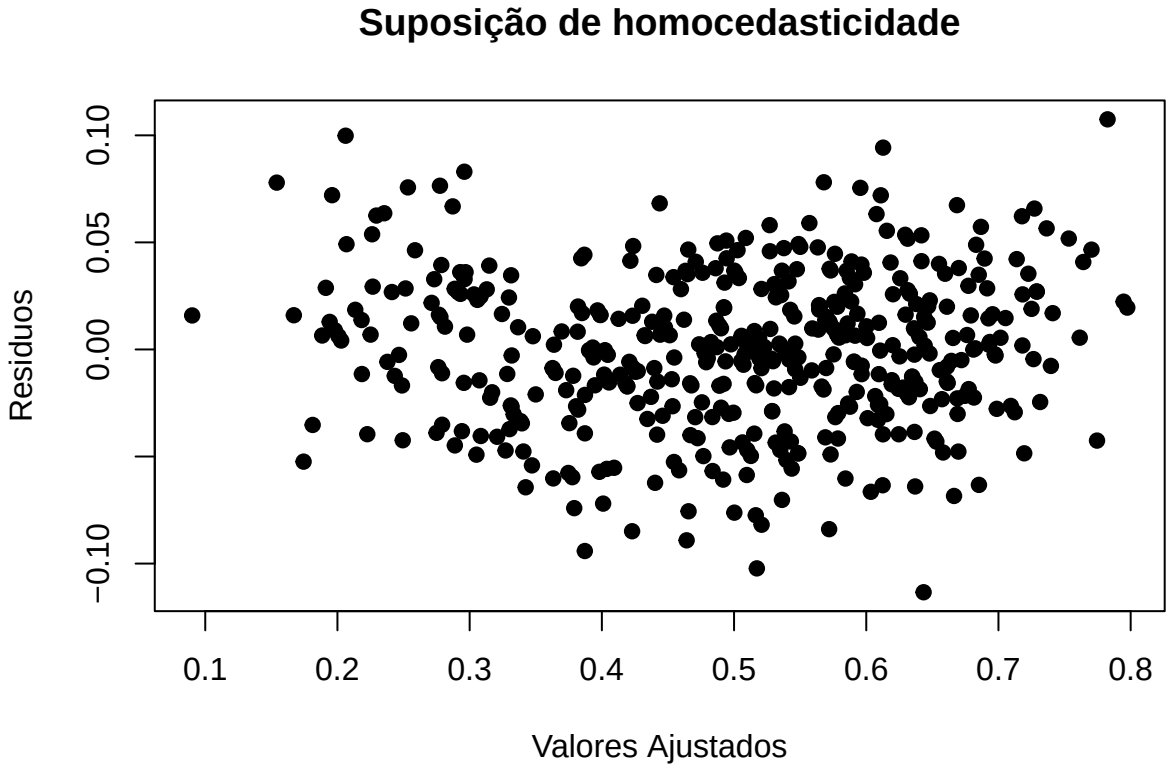
```
##
##  Shapiro-Wilk normality test
##
## data:  modelo_beta2$residuals
## W = 0.99855, p-value = 0.9743
```

```r
#Teste de durbin watson para independencia
library(lmtest)
dwtest(modelo_beta2) #p-value =
```

```
##
##  Durbin-Watson test
##
## data:  modelo_beta2
## DW = 1.9425, p-value = 0.09558
## alternative hypothesis: true autocorrelation is greater than 0
```

```r
#Independência
plot(modelo_beta2$residuals,
     ylab = "Residuos",
     xlab = "Index dos Imovéis",
     main = "Suposição de independência",
     pch = 19)
```

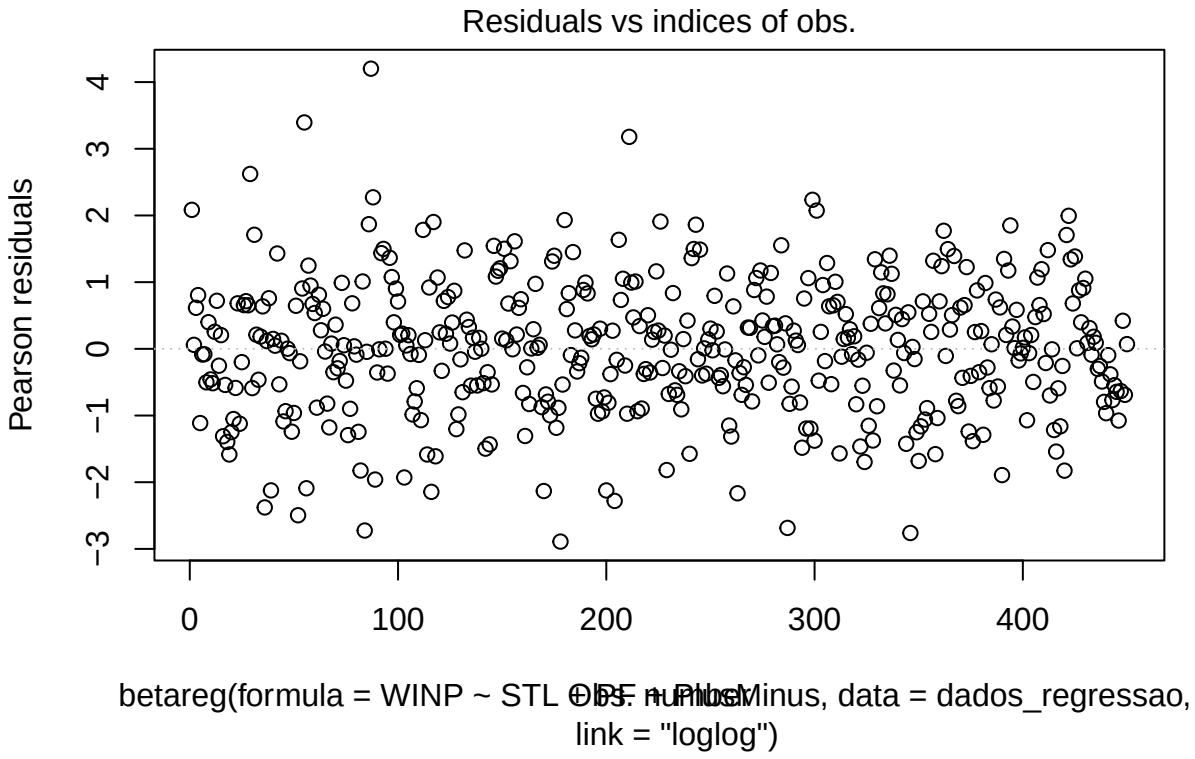

```r
#Homocedasticidade
plot(modelo_beta2$fitted.values, modelo_beta2$residuals,
     xlab = "Valores Ajustados",
     ylab = "Residuos",
     pch = 19,
     main = "Suposição de homocedasticidade"
)
```



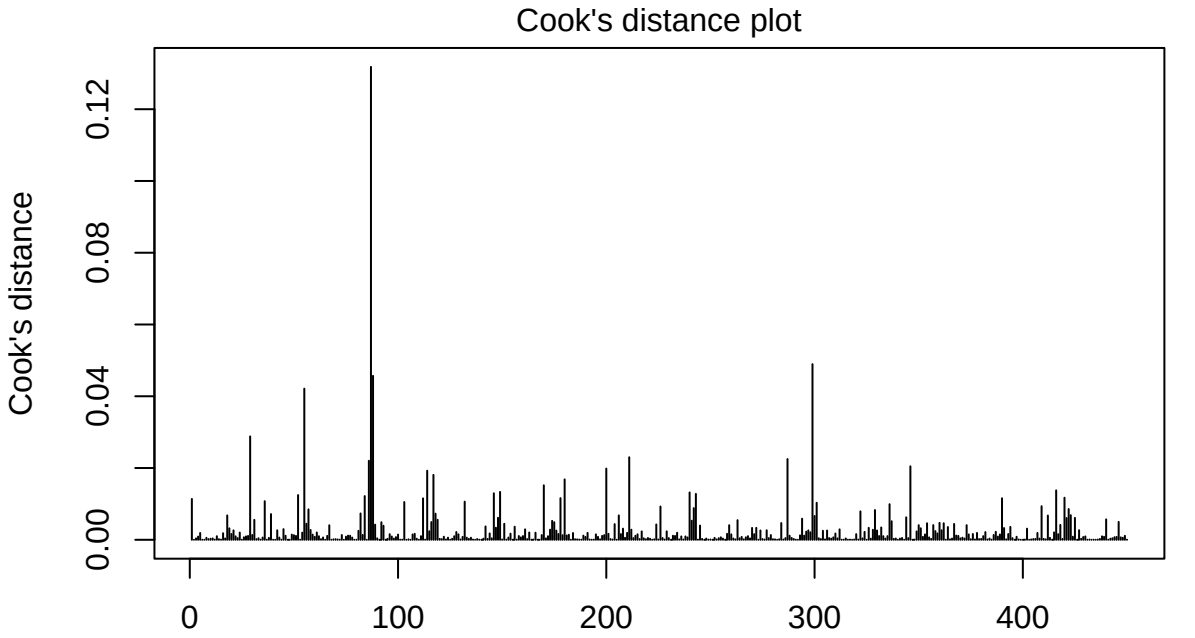

```
#Breusch_Pagan para homocedasticdade
bptest(modelo_beta2) #p-value =
```

```
##
##  studentized Breusch-Pagan test
##
## data:  modelo_beta2
## BP = 67.811, df = 68, p-value = 0.4837
```

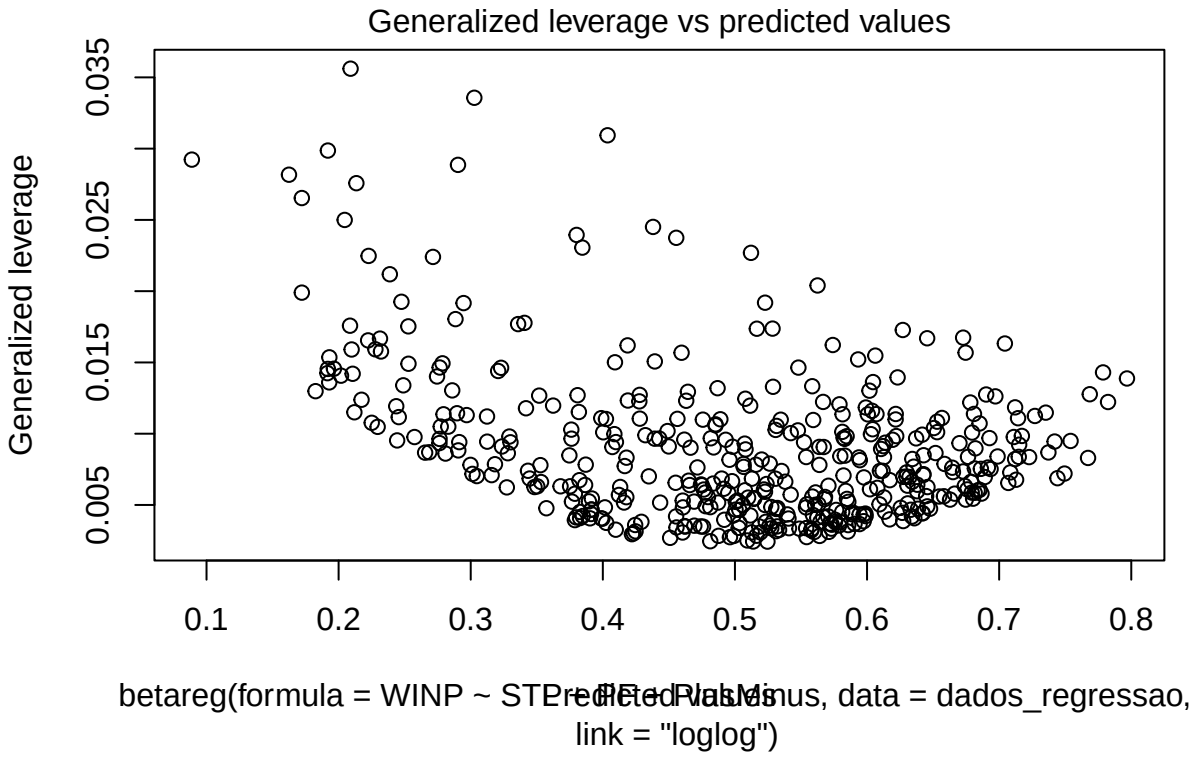
```
### Modelo 5% loglog ###
plot(modelo_beta21, which = 1, type = "pearson")
```



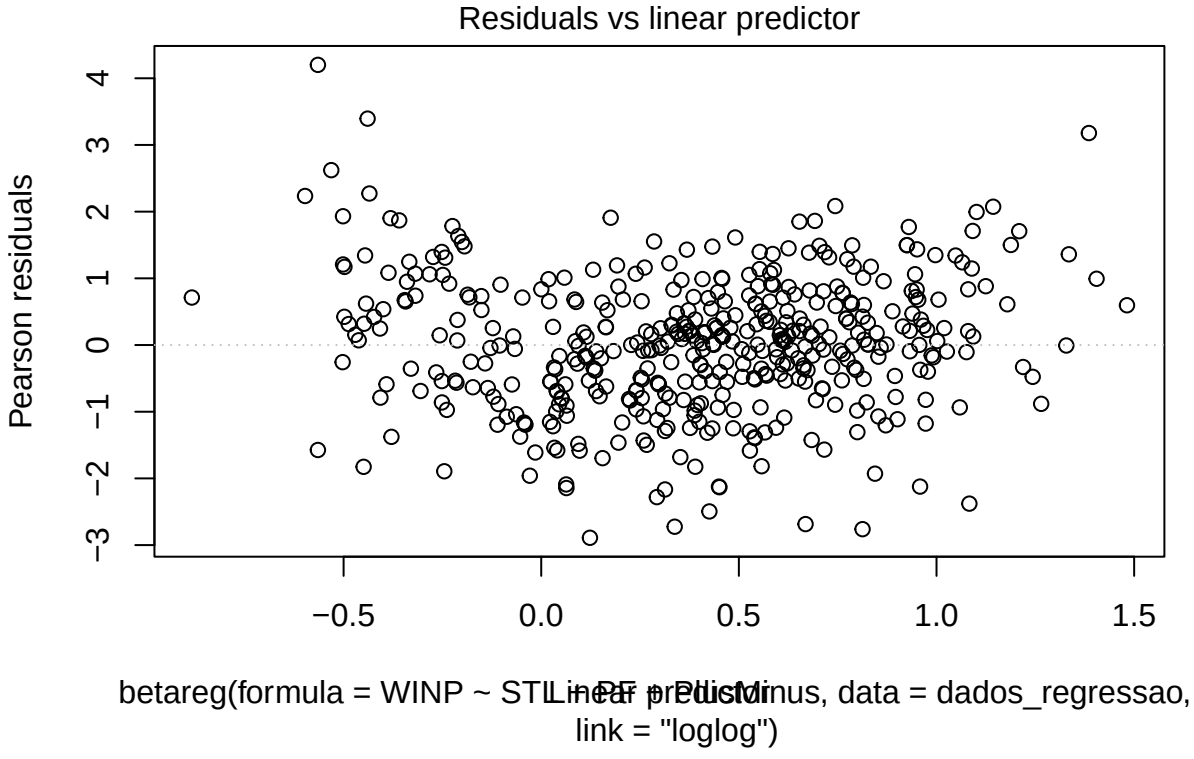

```
plot(modelo_beta21, which = 2, type = "pearson")
```



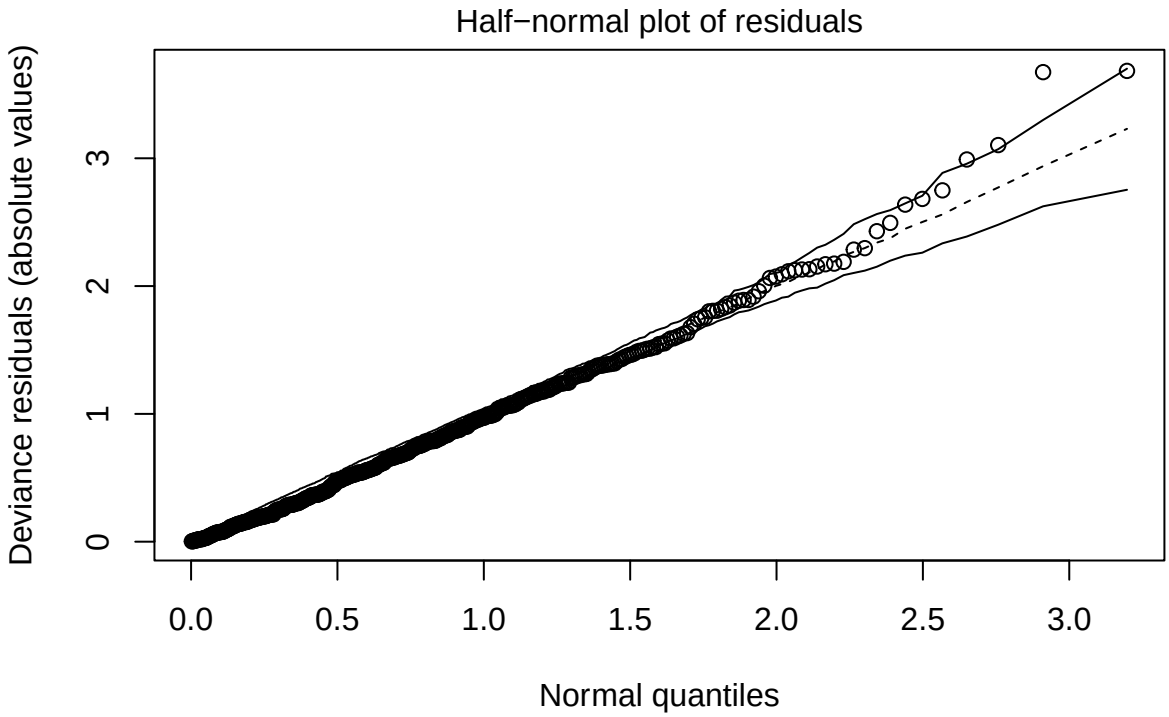

```
plot(modelo_beta21, which = 3, type = "pearson")
```



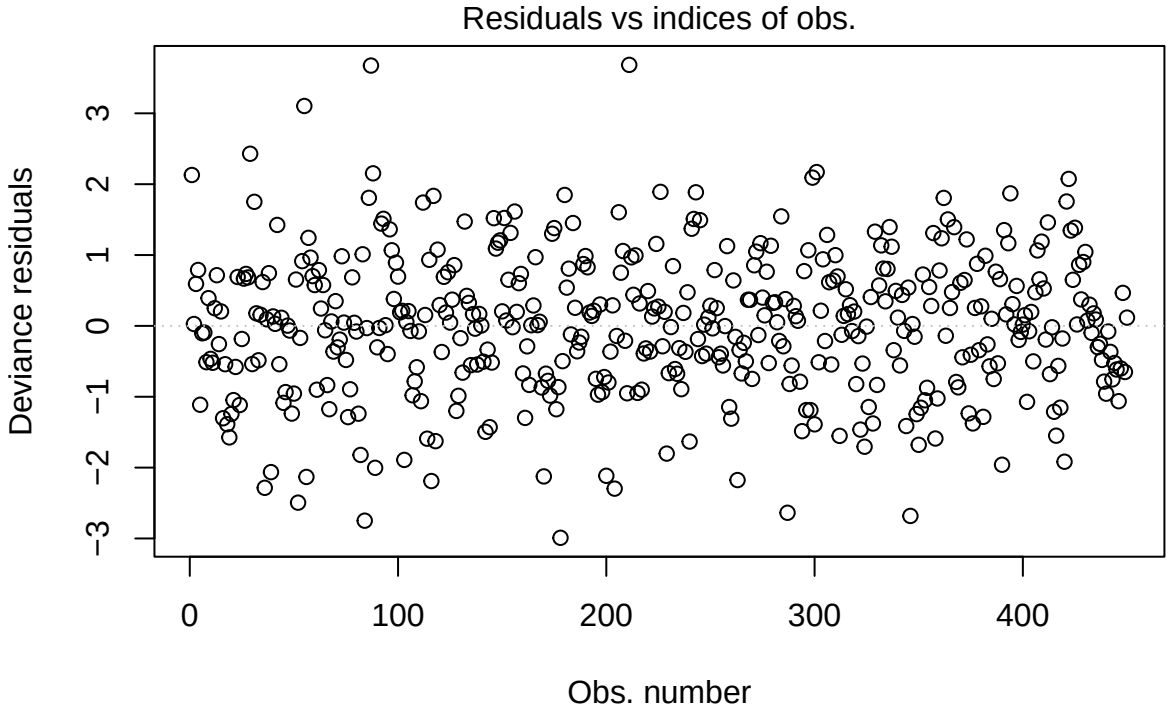

```
plot(modelo_beta21, which = 4, type = "pearson")
```




```
plot(modelo_beta21, which = 5, type = "deviance", sub.caption = "")
```




```
plot(modelo_beta21, which = 1, type = "deviance", sub.caption = "")
```




```
shapiro.test(modelo_beta21$residuals) #p-value =
```

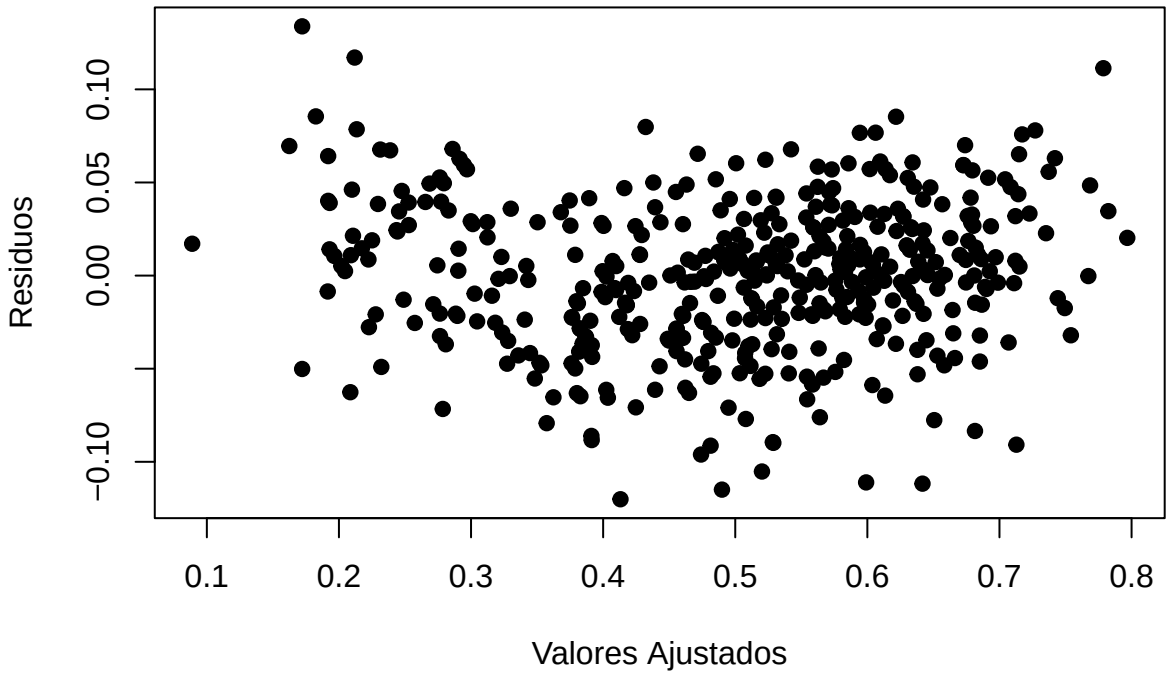
```
##
##  Shapiro-Wilk normality test
##
## data:  modelo_beta21$residuals
## W = 0.99573, p-value = 0.2618
```

```r
#Teste de durbin watson para independencia
library(lmtest)
dwtest(modelo_beta21) #p-value =
```

```
##
##  Durbin-Watson test
##
## data:  modelo_beta21
## DW = 1.9408, p-value = 0.2497
## alternative hypothesis: true autocorrelation is greater than 0
```

```r
#Independência
plot(modelo_beta21$residuals,
     ylab = "Residuos",
     xlab = "Index dos Imovéis",
     main = "Suposição de independência",
     pch = 19)
```

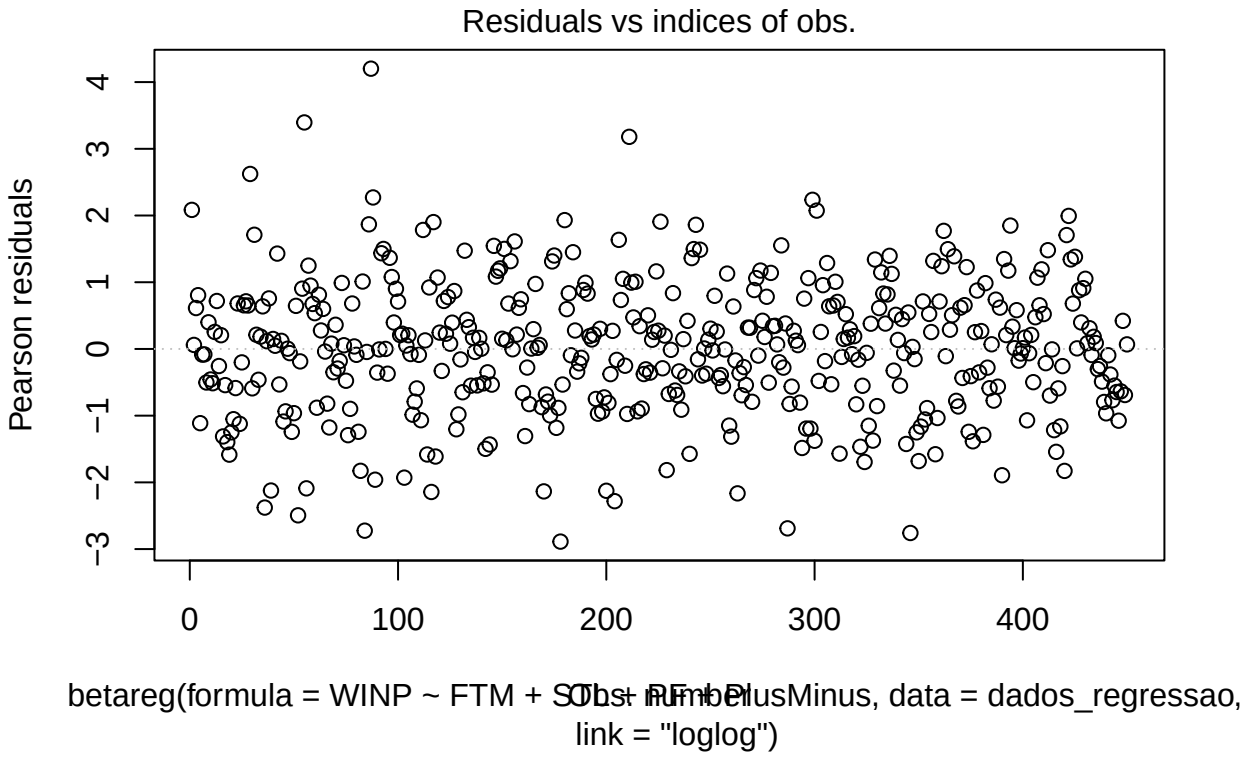

```r
#Homocedasticidade
plot(modelo_beta21$fitted.values, modelo_beta21$residuals,
     xlab = "Valores Ajustados",
     ylab = "Residuos",
     pch = 19,
     main = "Suposição de homocedasticidade"
)
```



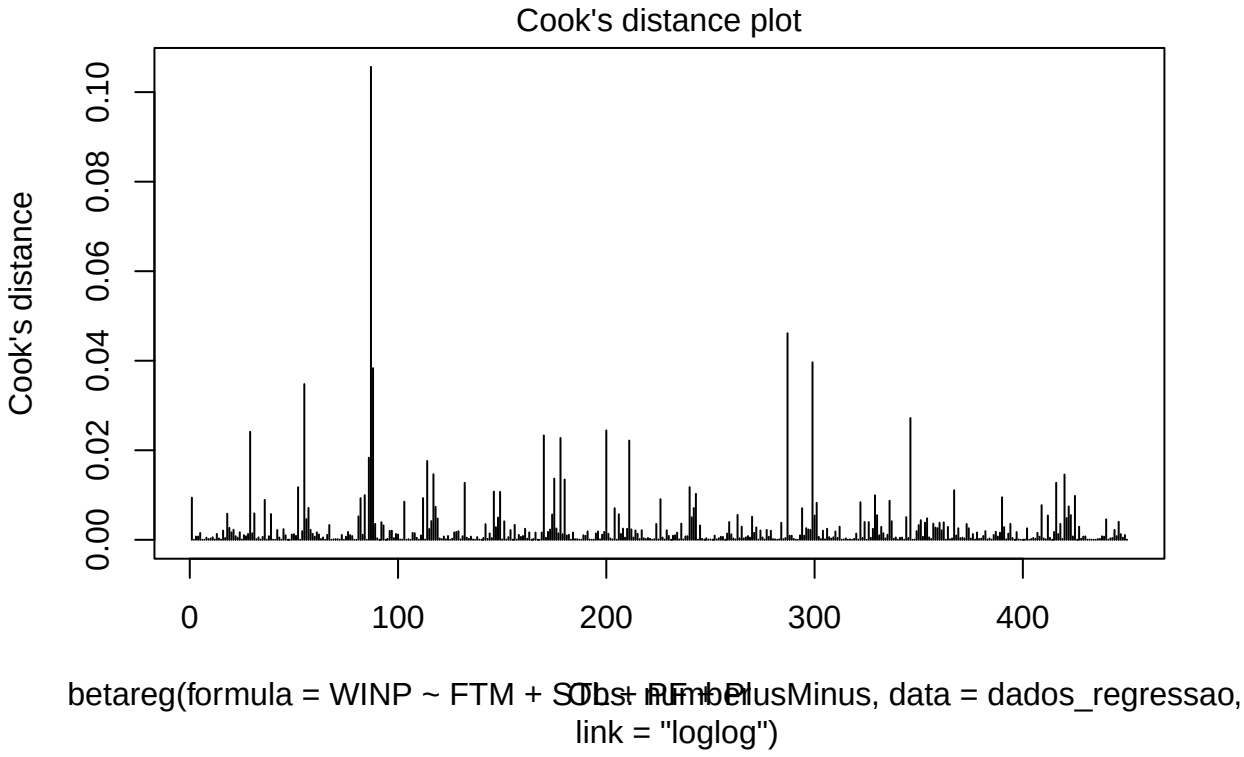

```
#Breusch_Pagan para homocedasticdade
bptest(modelo_beta21) #p-value =
```

```
##
##  studentized Breusch-Pagan test
##
## data:  modelo_beta21
## BP = 15.604, df = 3, p-value = 0.001367
```

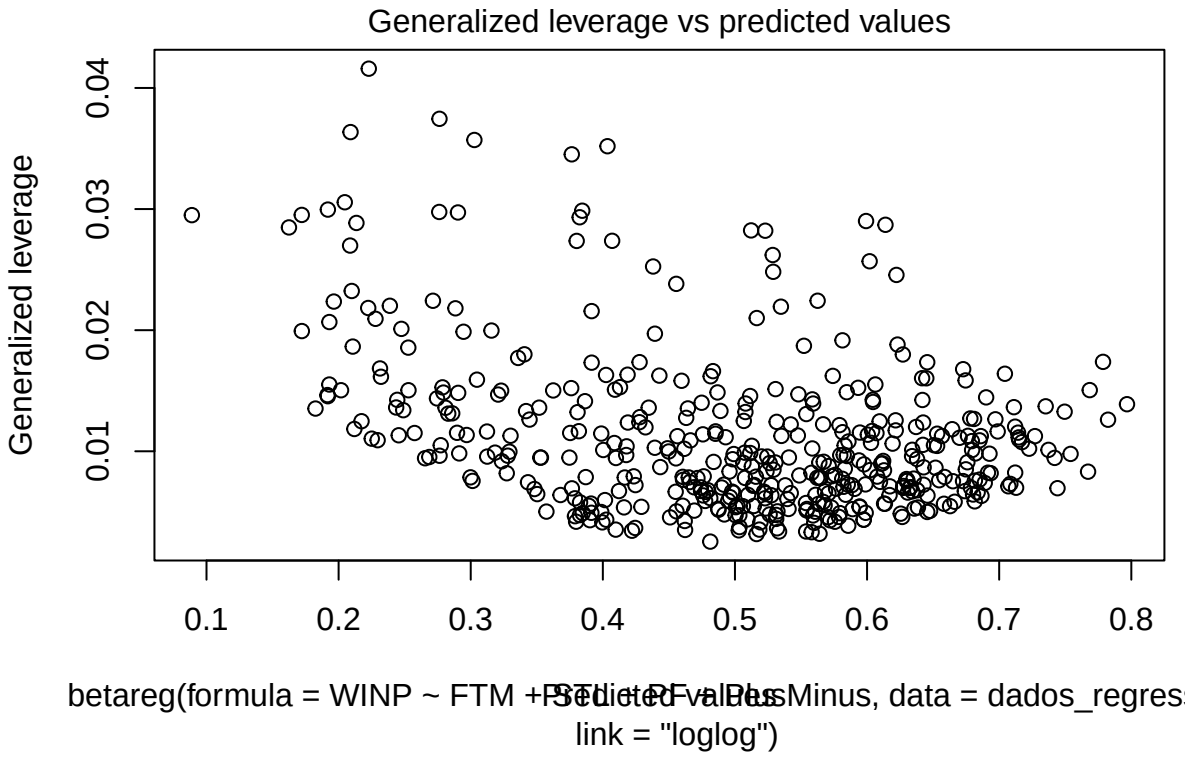
```
### Modelo 10% loglog ###
plot(modelo_beta22, which = 1, type = "pearson")
```



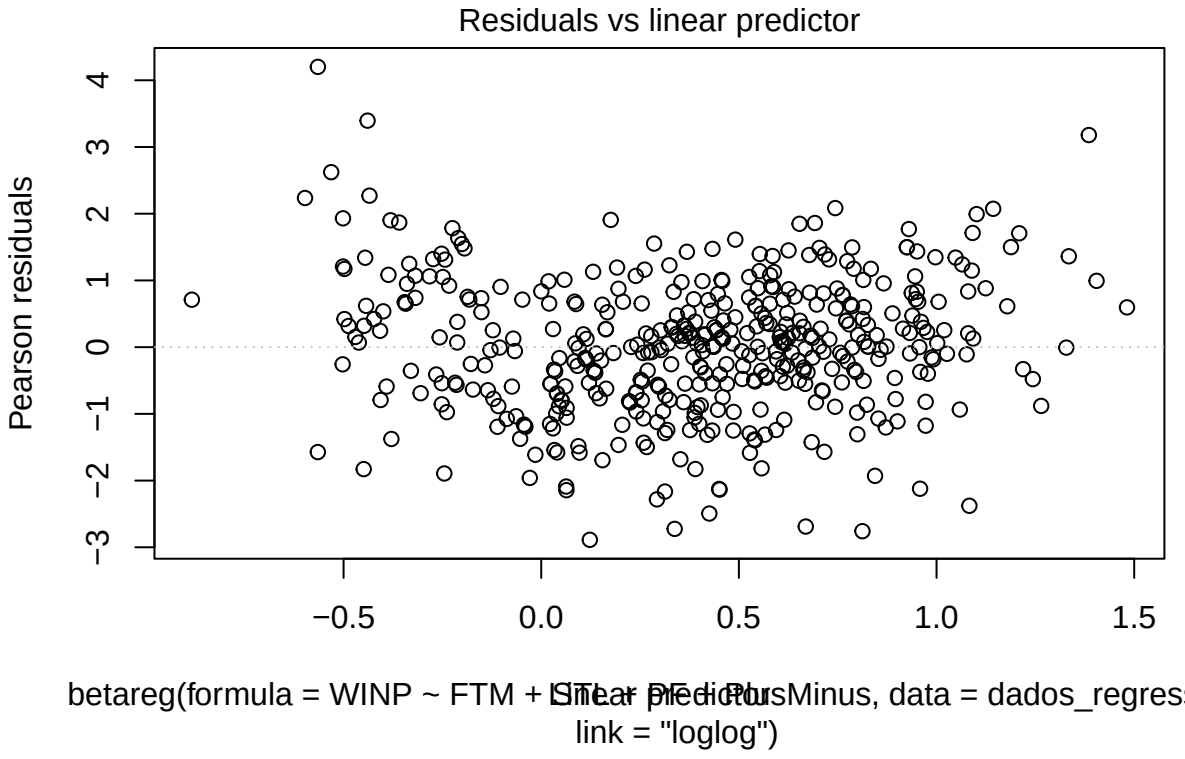

```
plot(modelo_beta22, which = 2, type = "pearson")
```



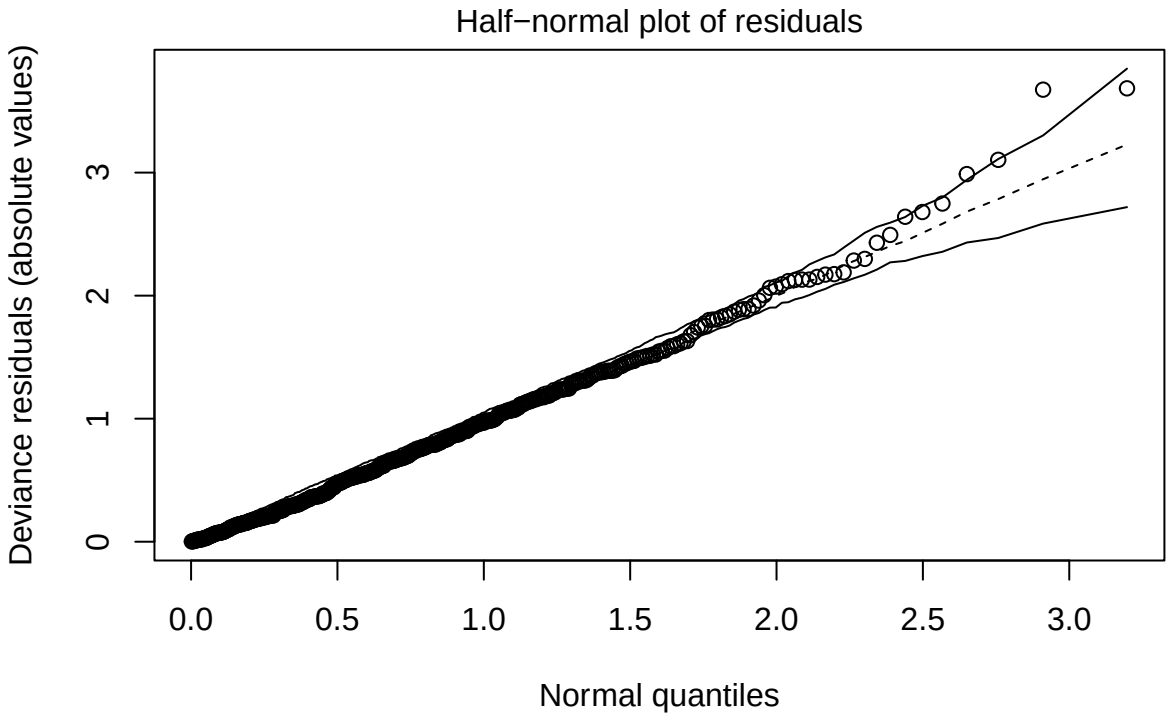

```
plot(modelo_beta22, which = 3, type = "pearson")
```



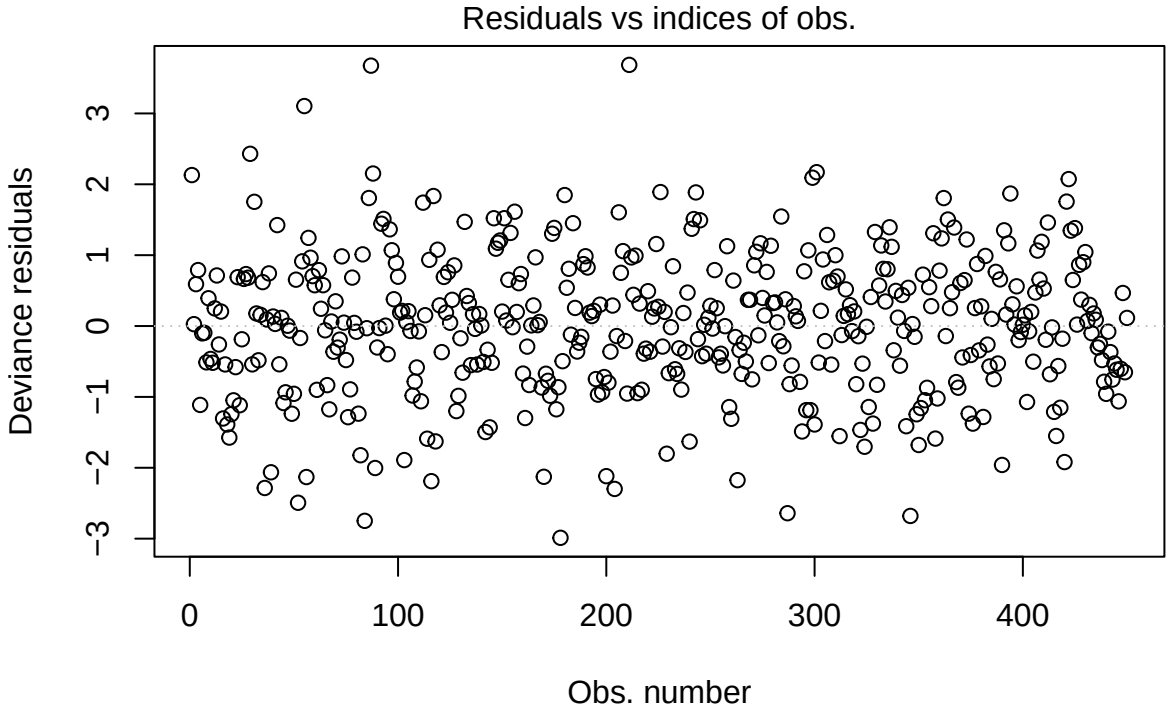

```
plot(modelo_beta22, which = 4, type = "pearson")
```




```
plot(modelo_beta22, which = 5, type = "deviance", sub.caption = "")
```




```
plot(modelo_beta22, which = 1, type = "deviance", sub.caption = "")
```




```
shapiro.test(modelo_beta21$residuals) #p-value =
```

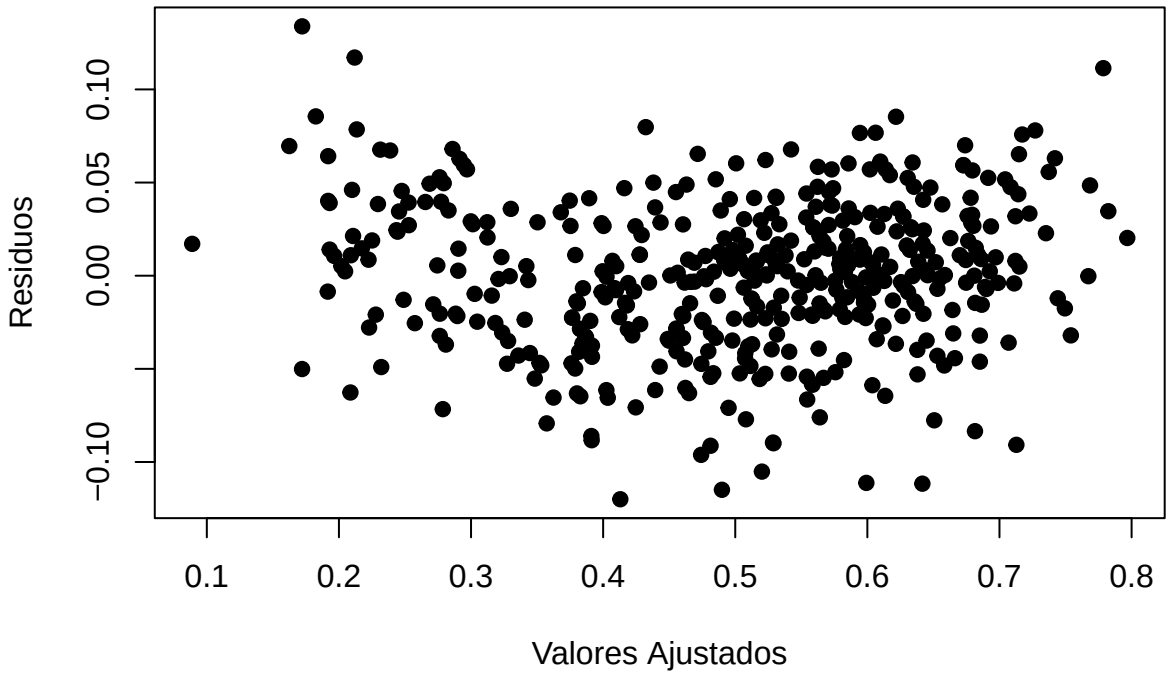
```
##
##  Shapiro-Wilk normality test
##
## data:  modelo_beta21$residuals
## W = 0.99573, p-value = 0.2618
```

```r
#Teste de durbin watson para independencia
library(lmtest)
dwtest(modelo_beta22) #p-value =
```

```
##
##  Durbin-Watson test
##
## data:  modelo_beta22
## DW = 1.9427, p-value = 0.2552
## alternative hypothesis: true autocorrelation is greater than 0
```

```r
#Independência
plot(modelo_beta22$residuals,
     ylab = "Residuos",
     xlab = "Index dos Imovéis",
     main = "Suposição de independência",
     pch = 19)
```

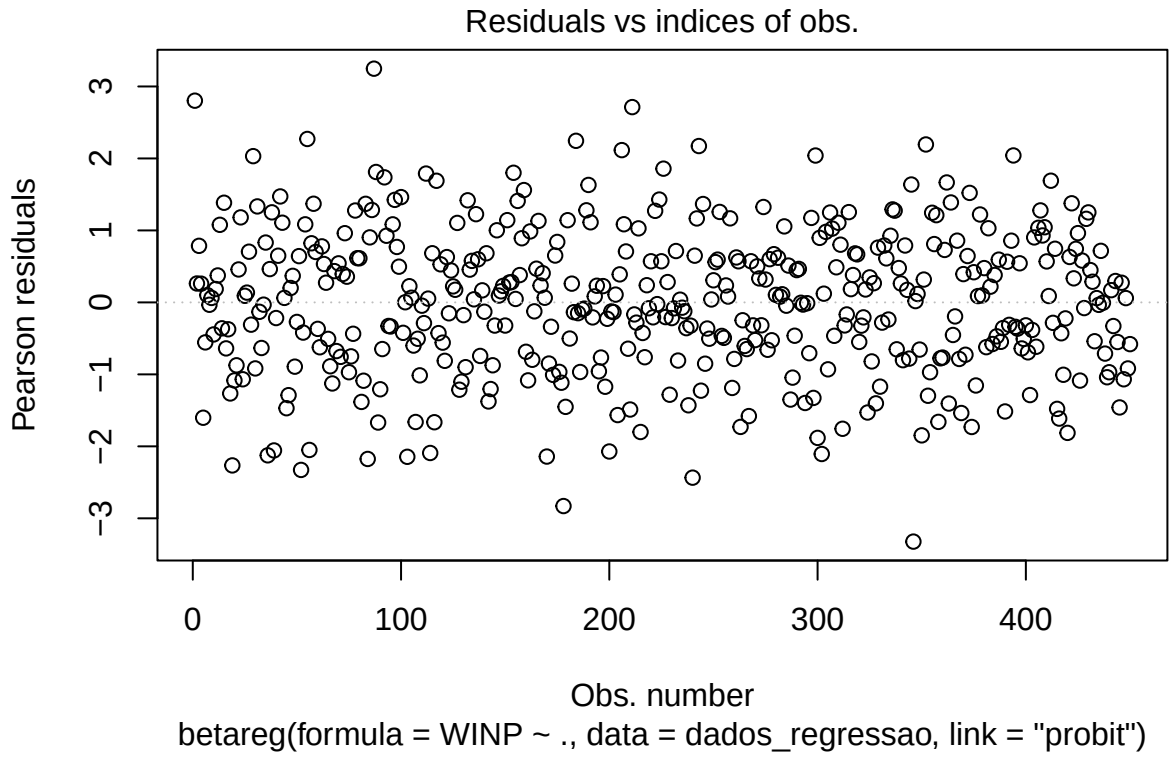

```r
#Homocedasticidade
plot(modelo_beta22$fitted.values, modelo_beta22$residuals,
     xlab = "Valores Ajustados",
     ylab = "Residuos",
     pch = 19,
     main = "Suposição de homocedasticidade"
)
```



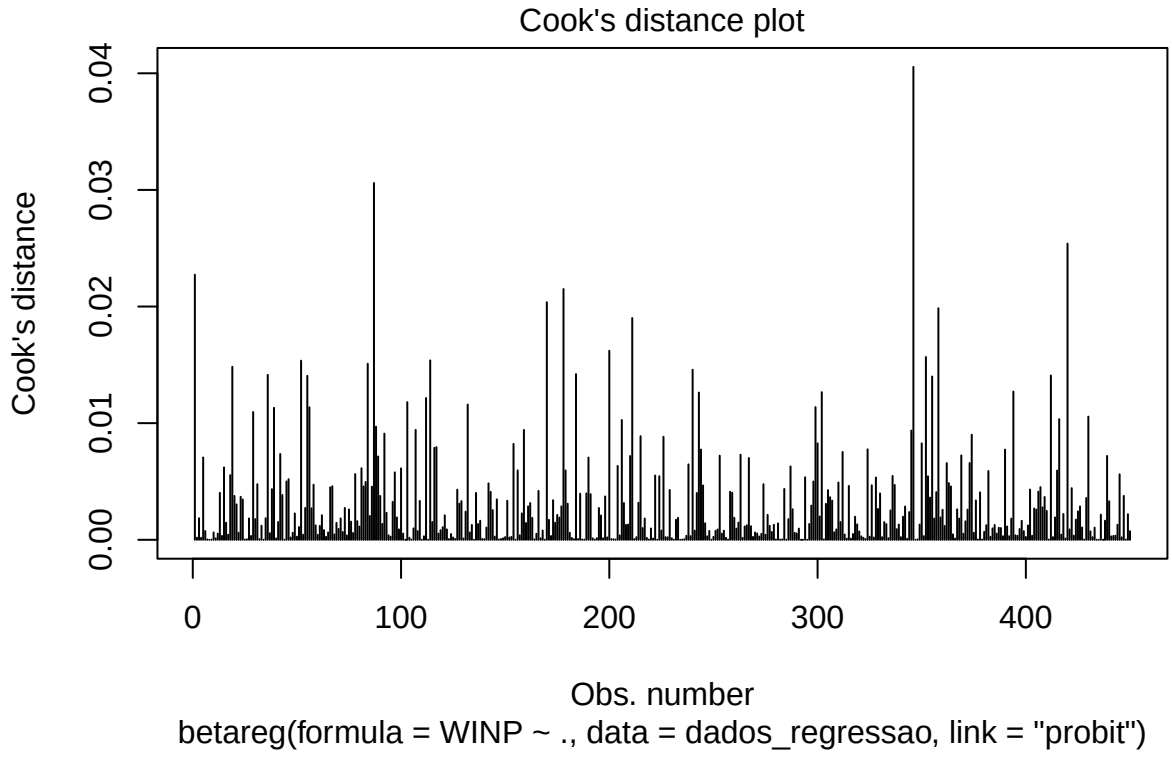

```
#Breusch_Pagan para homocedasticdade
bptest(modelo_beta22) #p-value =
```

```
##
##  studentized Breusch-Pagan test
##
## data:  modelo_beta22
## BP = 16.481, df = 4, p-value = 0.002437
```

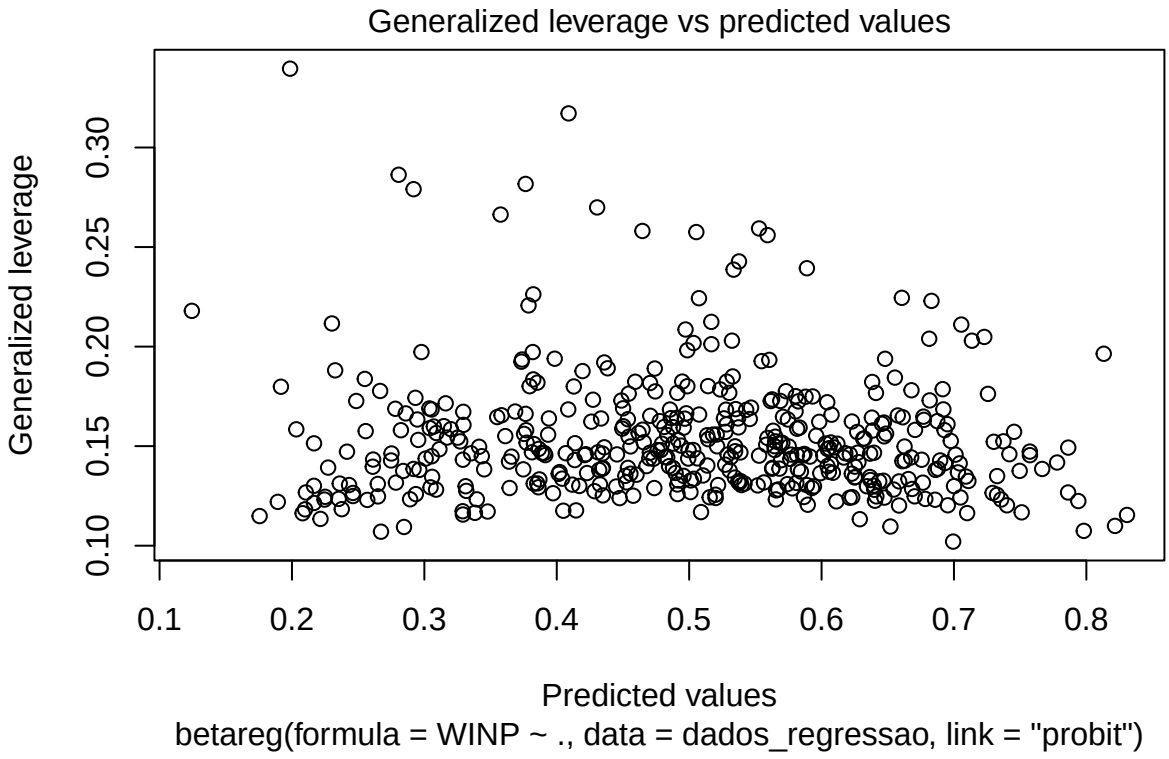
```
########## Modelos Probito ######
### Modelo completo probito ###
plot(modelo_beta_probit, which = 1, type = "pearson")
```



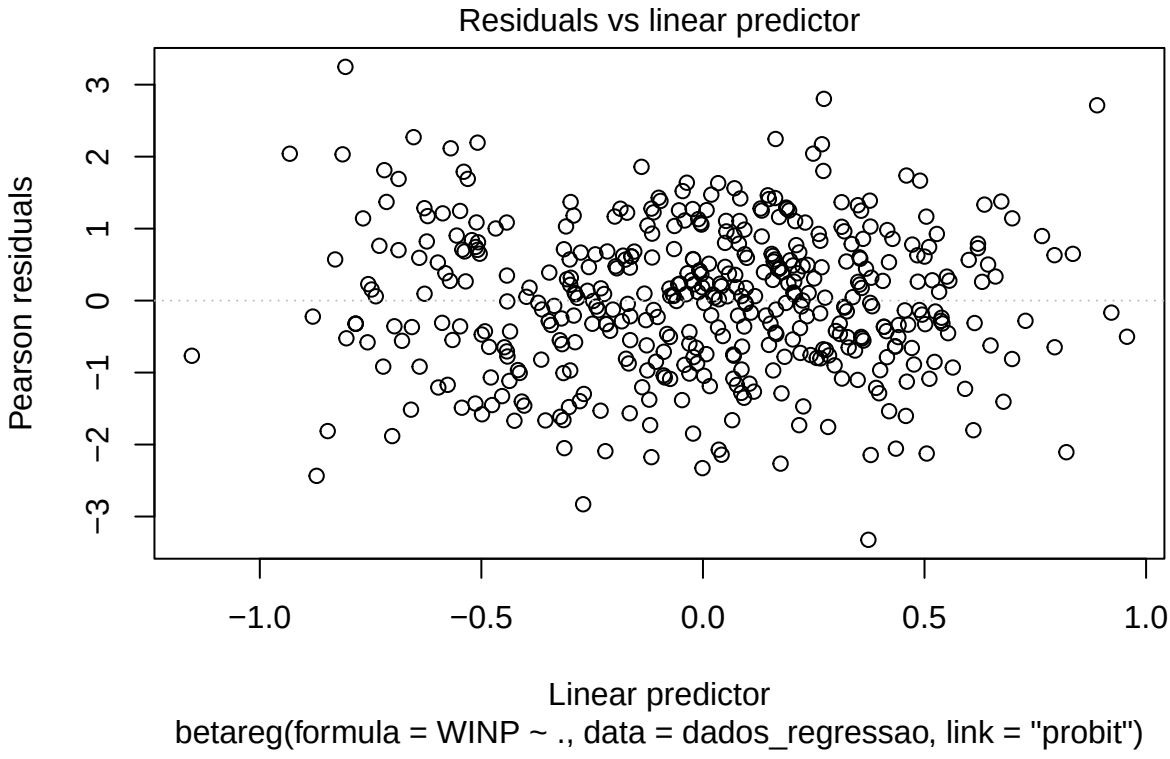

```
plot(modelo_beta_probit, which = 2, type = "pearson")
```



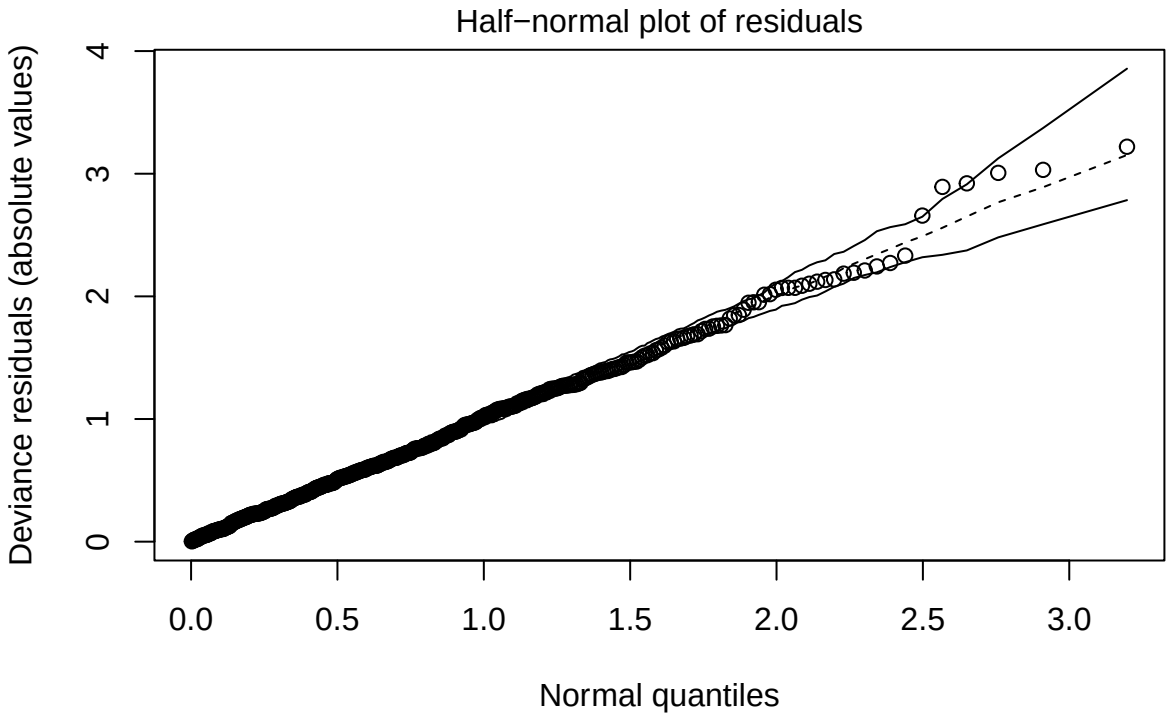

```
plot(modelo_beta_probit, which = 3, type = "pearson")
```



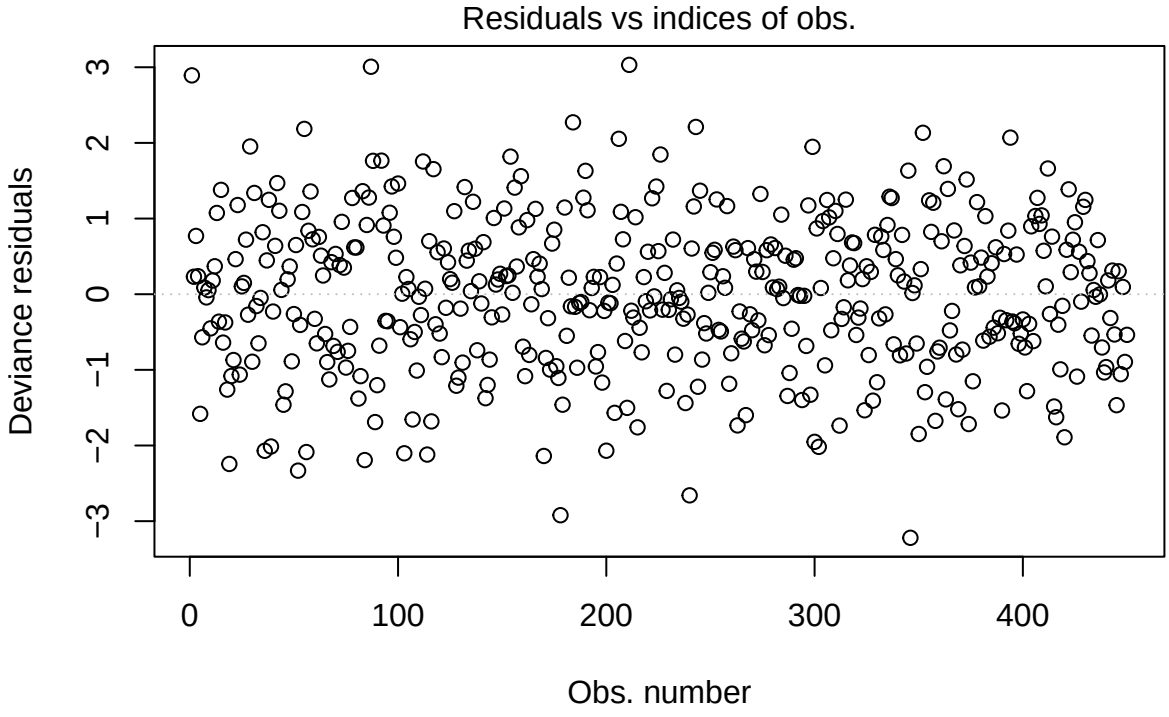

```
plot(modelo_beta_probit, which = 4, type = "pearson")
```




```
plot(modelo_beta_probit, which = 5, type = "deviance", sub.caption = "")
```




```r
plot(modelo_beta_probit, which = 1, type = "deviance", sub.caption = "")
```




```r
shapiro.test(modelo_beta_probit$residuals) #p-value =
```

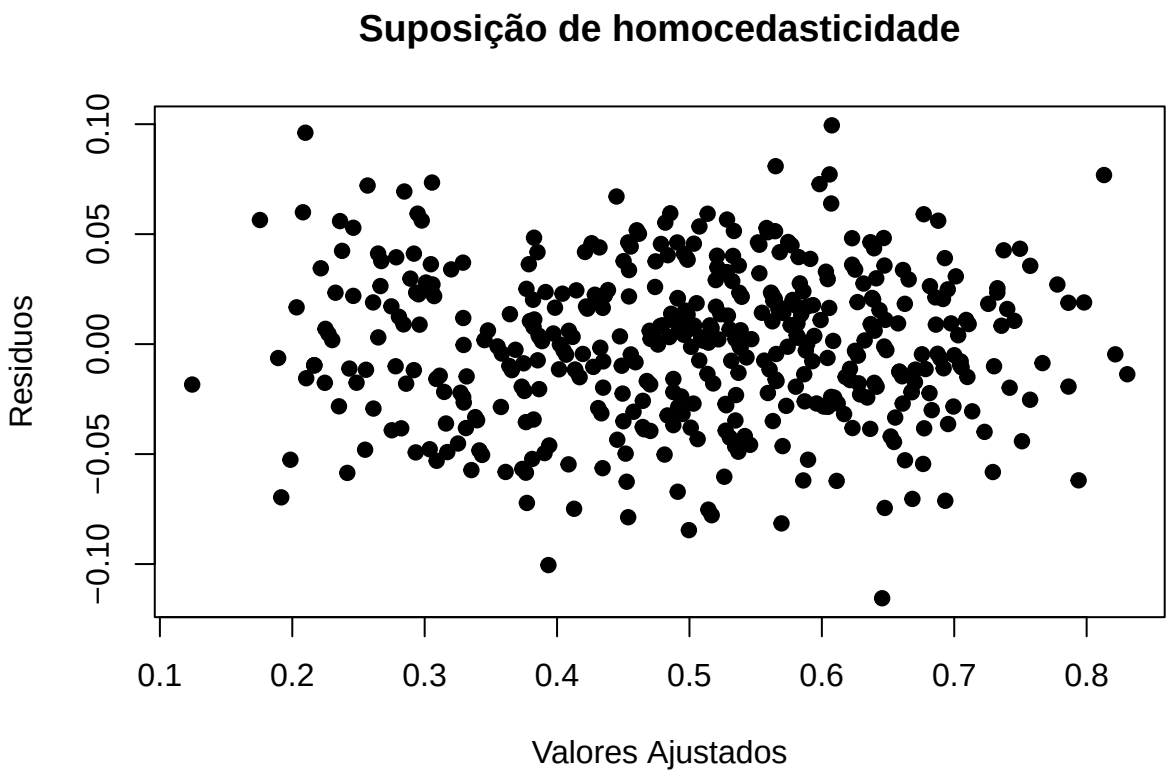
```
##
##  Shapiro-Wilk normality test
##
## data:  modelo_beta_probit$residuals
## W = 0.99775, p-value = 0.8135
```

```r
#Teste de durbin watson para independencia
library(lmtest)
dwtest(modelo_beta_probit) #p-value =
```

```
##
##  Durbin-Watson test
##
## data:  modelo_beta_probit
## DW = 1.9425, p-value = 0.09558
## alternative hypothesis: true autocorrelation is greater than 0
```

```r
#Independência
plot(modelo_beta_probit$residuals,
     ylab = "Residuos",
     xlab = "Index dos Imovéis",
     main = "Suposição de independência",
     pch = 19)
```

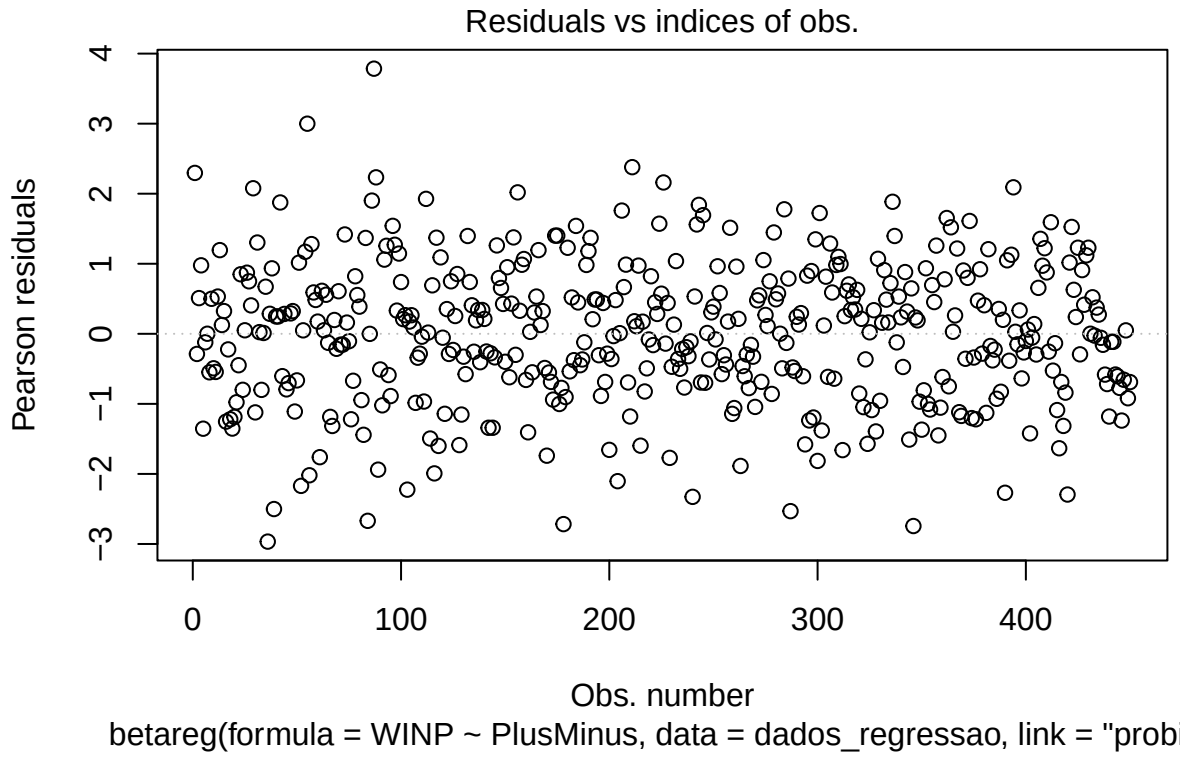

```r
#Homocedasticidade
plot(modelo_beta_probit$fitted.values, modelo_beta_probit$residuals,
     xlab = "Valores Ajustados",
     ylab = "Residuos",
     pch = 19,
     main = "Suposição de homocedasticidade"
)
```



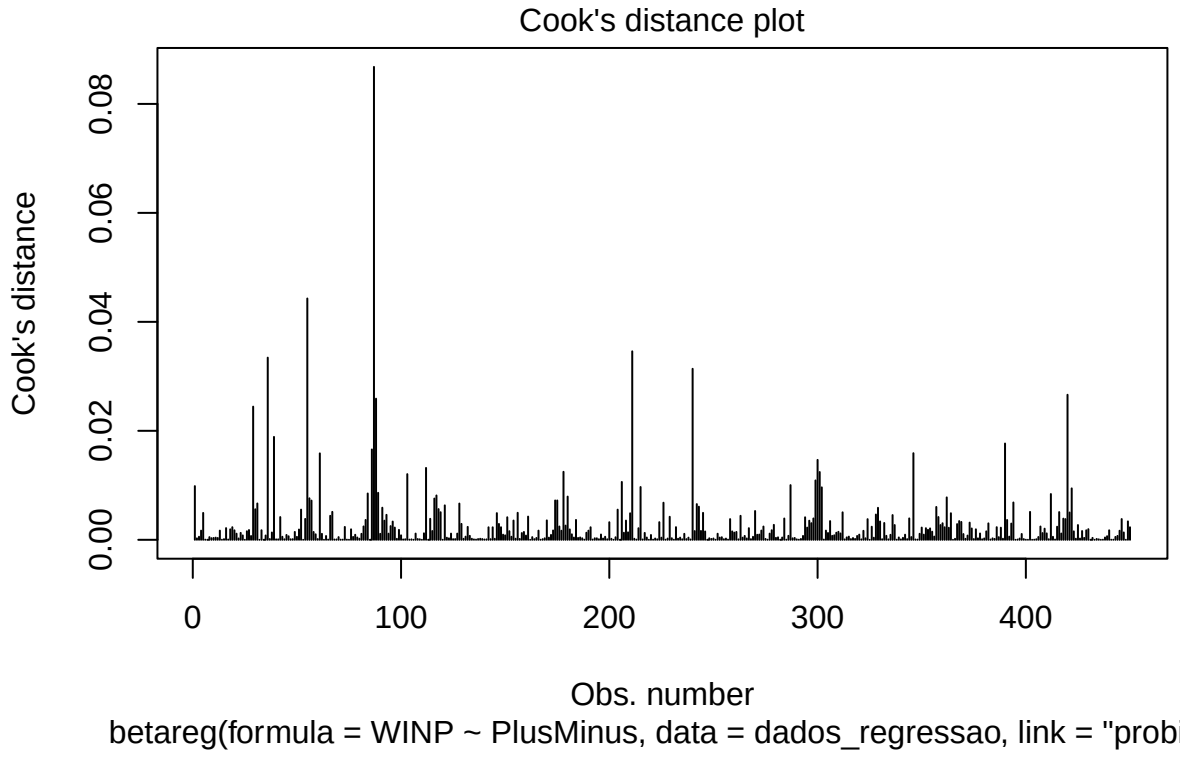

```
#Breusch_Pagan para homocedasticdade
bptest(modelo_beta_probit) #p-value =
```

```
##
##  studentized Breusch-Pagan test
##
## data:  modelo_beta_probit
## BP = 67.811, df = 68, p-value = 0.4837
```

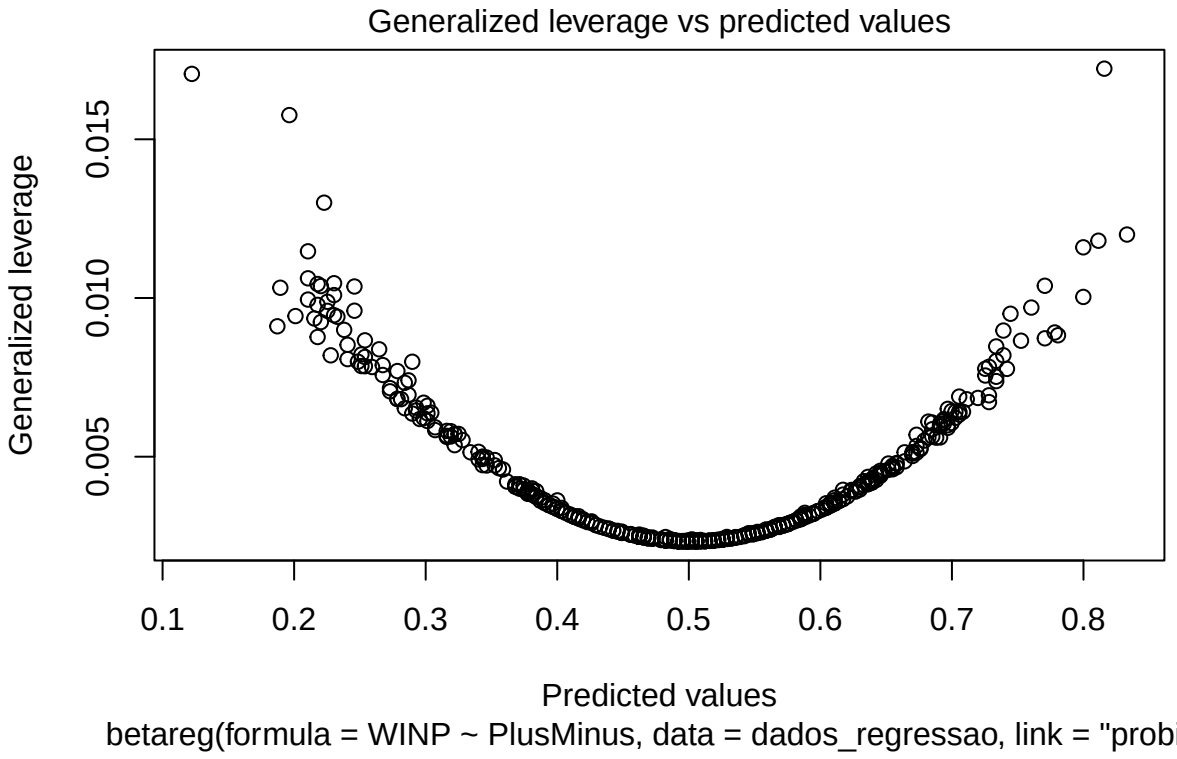
```
### Modelo 5% probito ###
plot(modelo_beta_probit1, which = 1, type = "pearson")
```



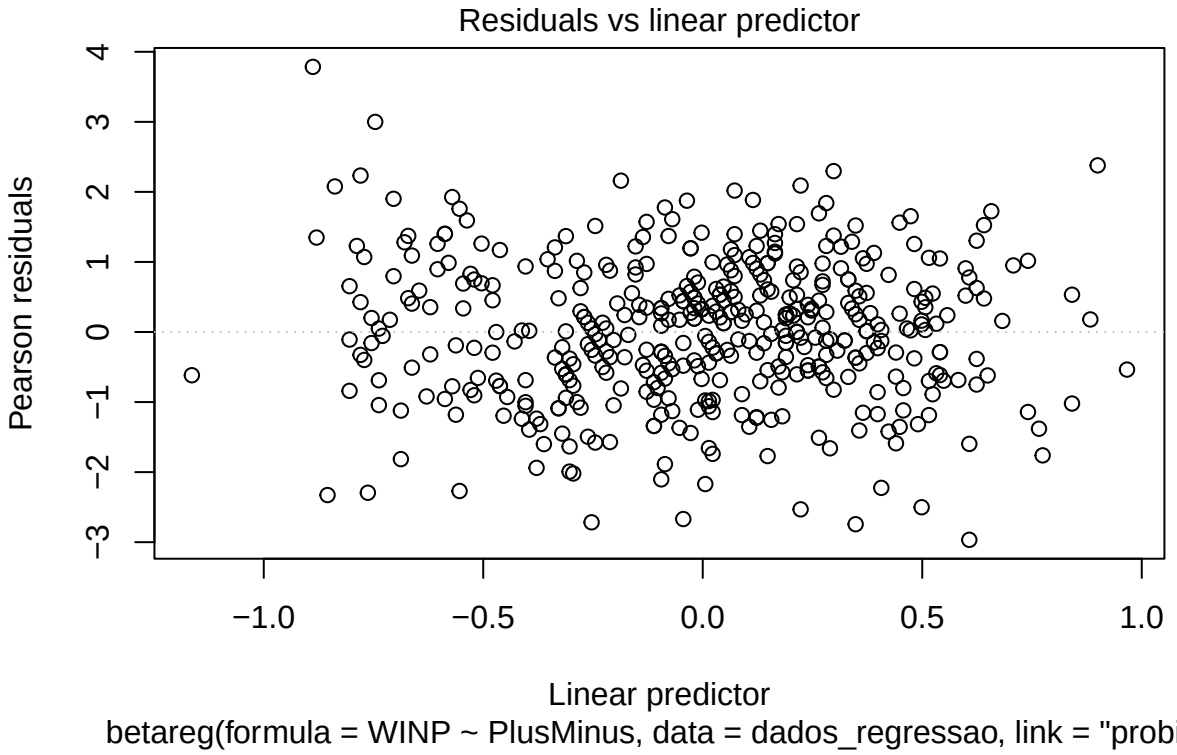

```
plot(modelo_beta_probit1, which = 2, type = "pearson")
```



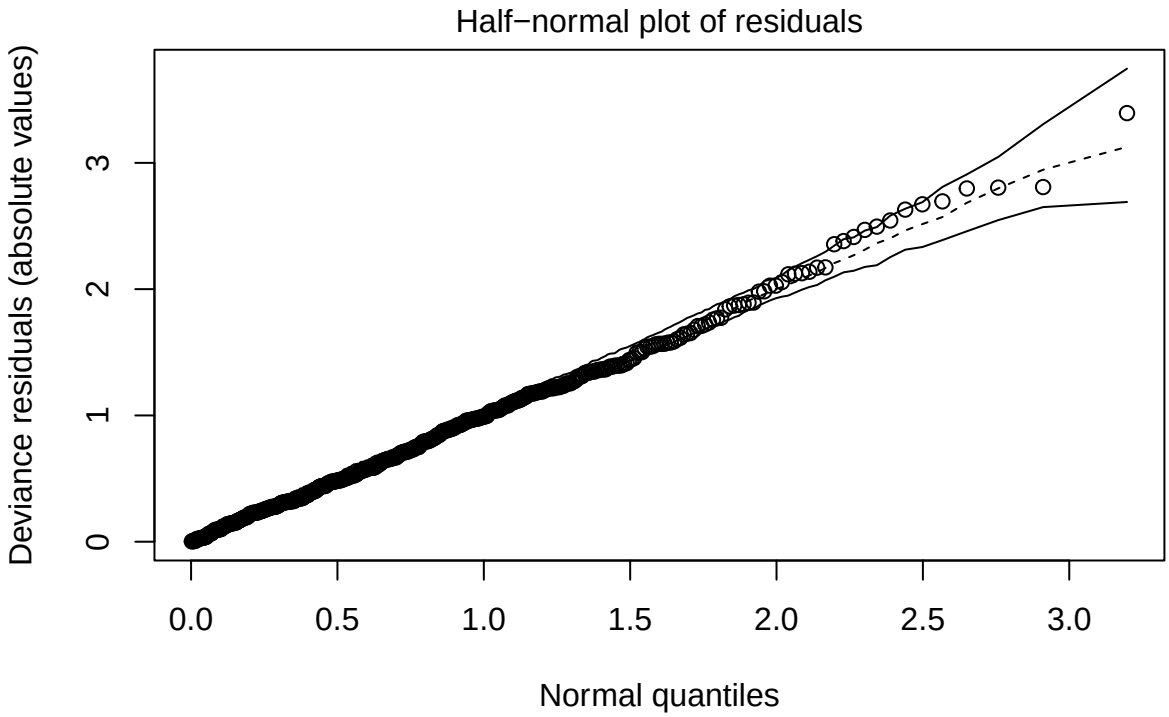

```
plot(modelo_beta_probit1, which = 3, type = "pearson")
```



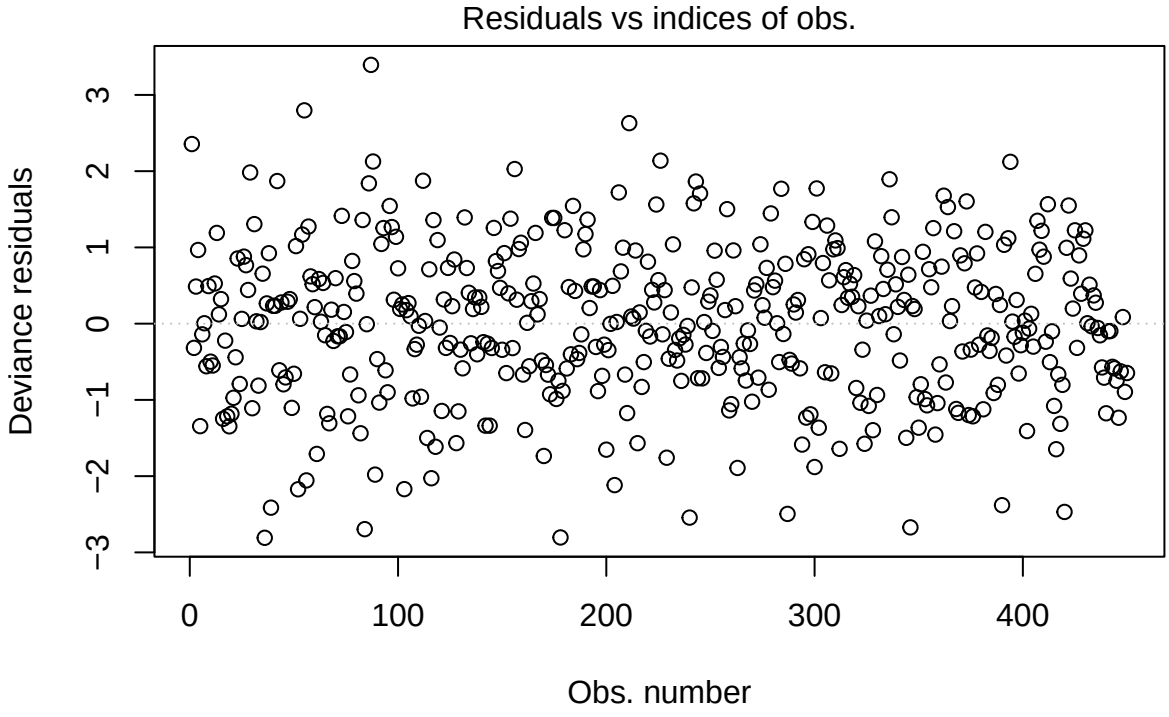

```r
plot(modelo_beta_probit1, which = 4, type = "pearson")
```




```r
plot(modelo_beta_probit1, which = 5, type = "deviance", sub.caption = "")
```




```
plot(modelo_beta_probit1, which = 1, type = "deviance", sub.caption = "")
```




```
shapiro.test(modelo_beta_probit1$residuals) #p-value =
```

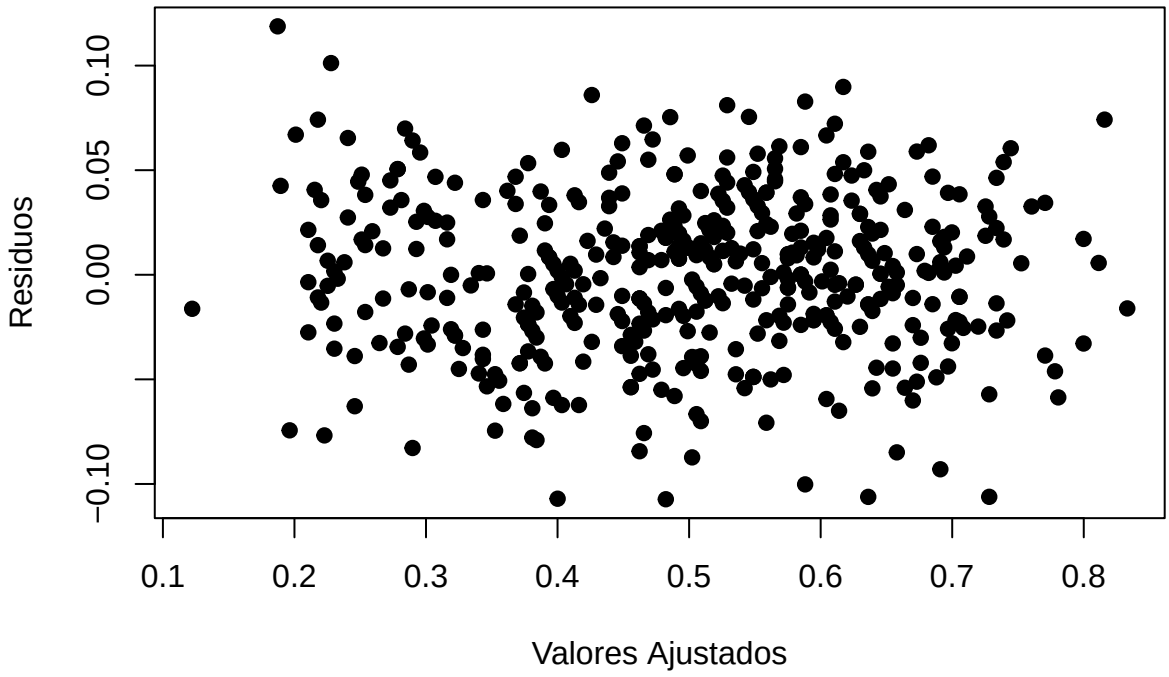
```
##
##  Shapiro-Wilk normality test
##
## data:  modelo_beta_probit1$residuals
## W = 0.99712, p-value = 0.6192
```

```r
#Teste de durbin watson para independencia
library(lmtest)
dwtest(modelo_beta_probit1) #p-value =
```

```
##
##  Durbin-Watson test
##
## data:  modelo_beta_probit1
## DW = 1.9507, p-value = 0.2889
## alternative hypothesis: true autocorrelation is greater than 0
```

```r
#Independência
plot(modelo_beta_probit1$residuals,
     ylab = "Residuos",
     xlab = "Index dos Imovéis",
     main = "Suposição de independência",
     pch = 19)
```

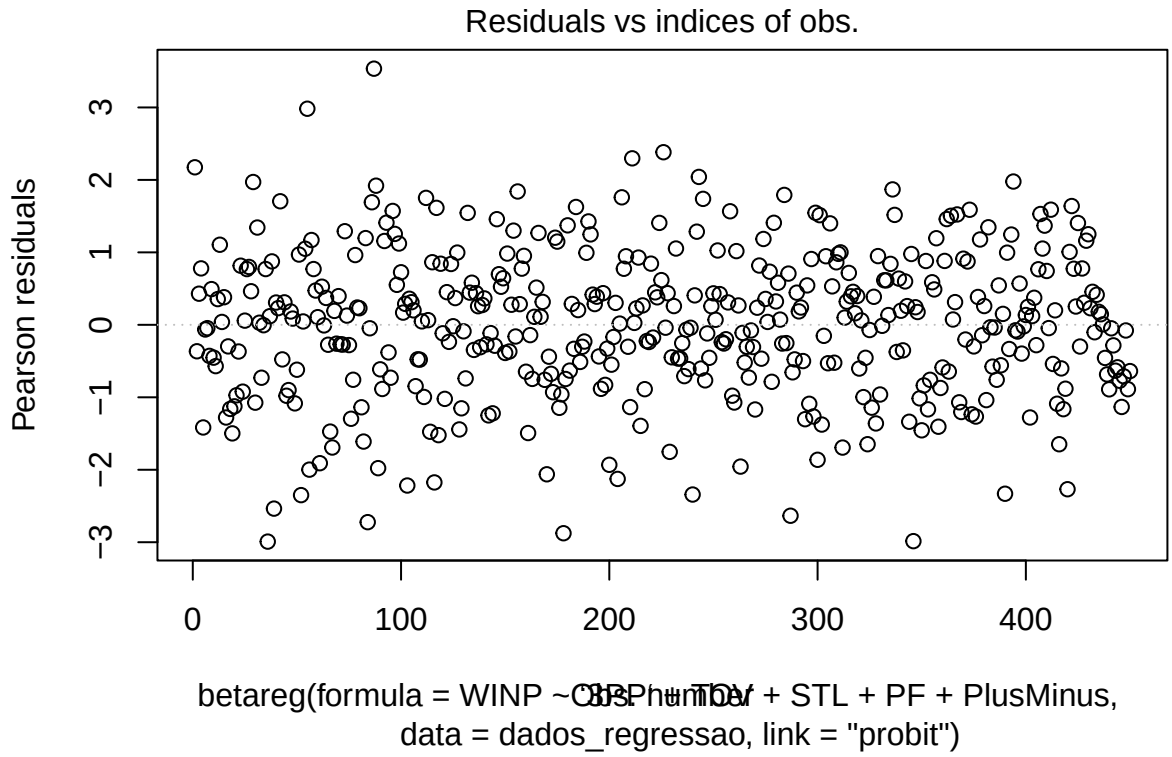

```r
#Homocedasticidade
plot(modelo_beta_probit1$fitted.values, modelo_beta_probit1$residuals,
     xlab = "Valores Ajustados",
     ylab = "Residuos",
     pch = 19,
     main = "Suposição de homocedasticidade"
)
```



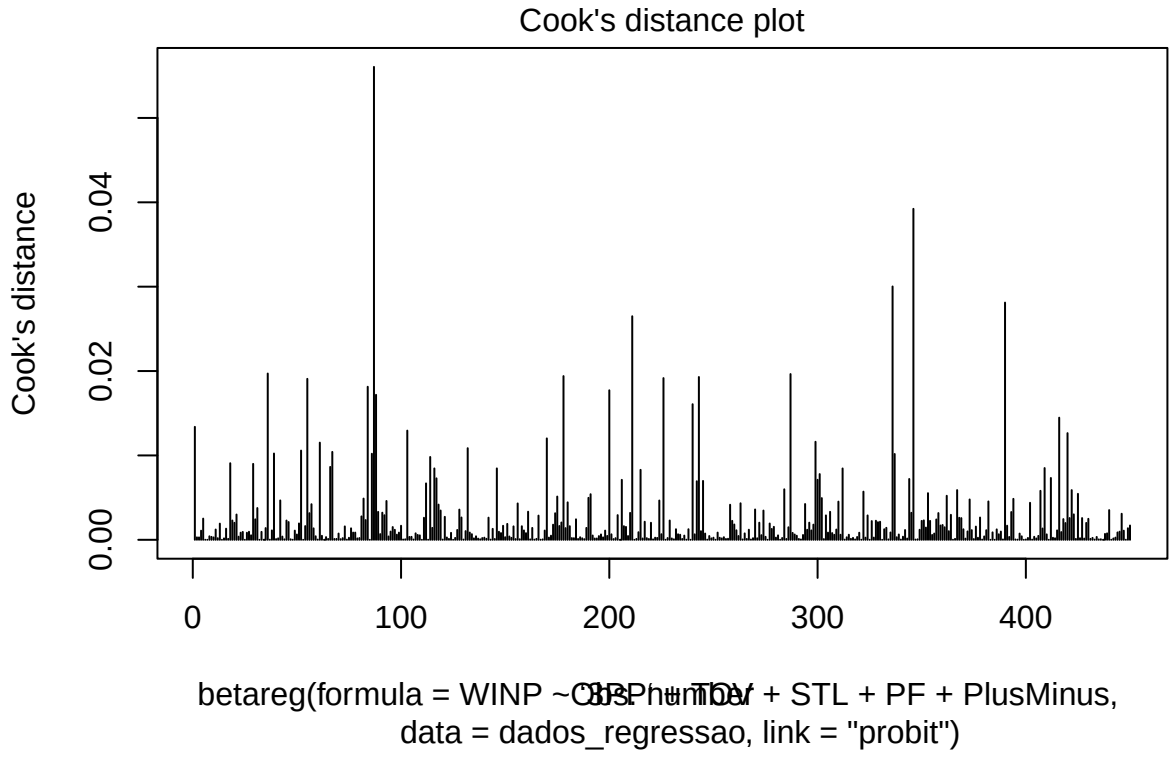

```
#Breusch_Pagan para homocedasticdade
bptest(modelo_beta_probit1) #p-value =
```

```
##
##  studentized Breusch-Pagan test
##
## data:  modelo_beta_probit1
## BP = 4.3624, df = 1, p-value = 0.03674
```

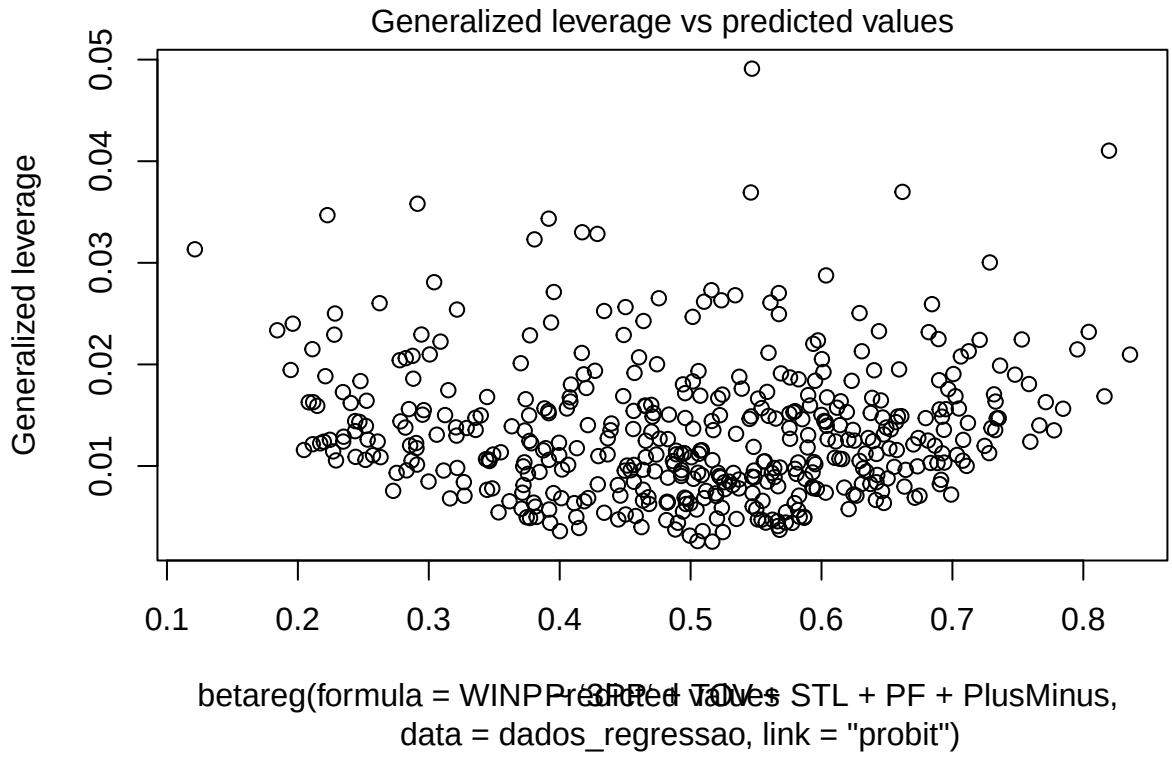
```
### Modelo 10% probito ###
plot(modelo_beta_probit2, which = 1, type = "pearson")
```



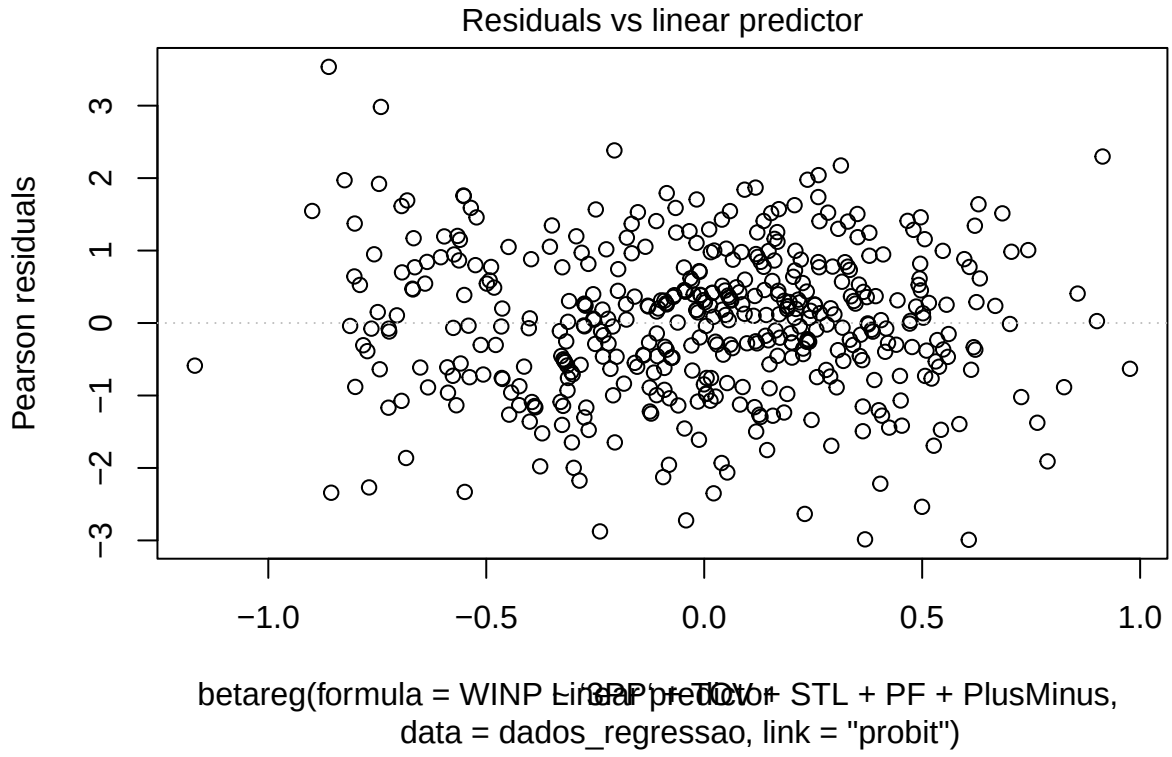

```
plot(modelo_beta_probit2, which = 2, type = "pearson")
```



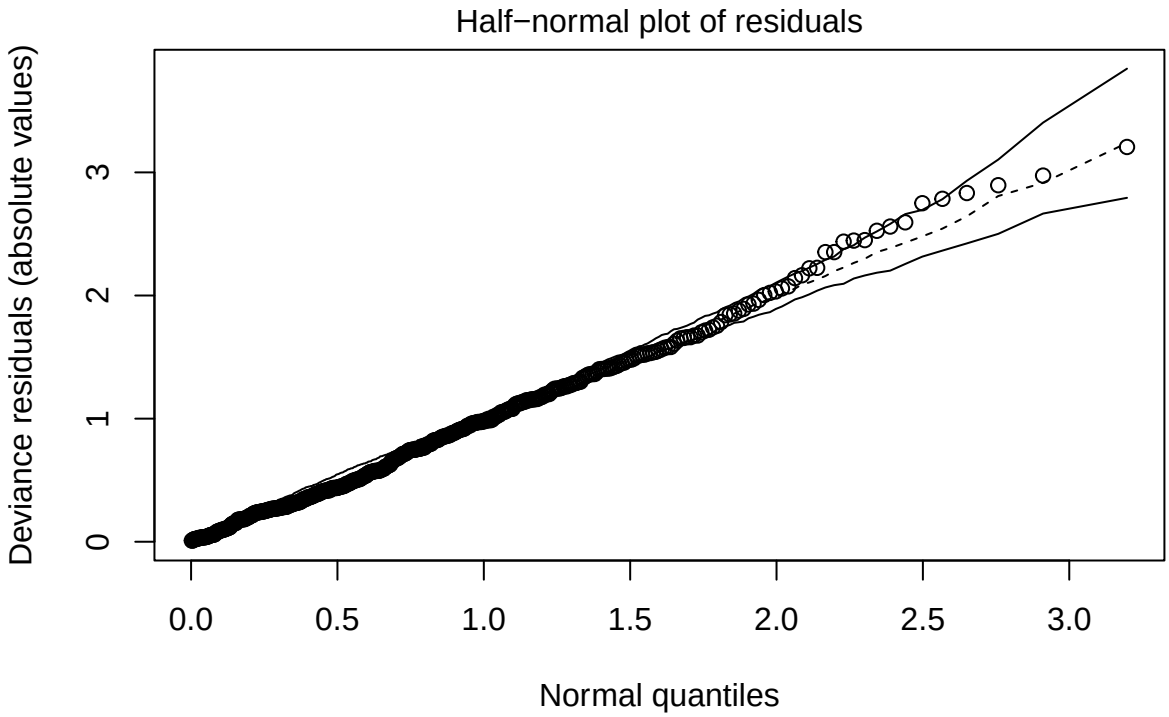

```
plot(modelo_beta_probit2, which = 3, type = "pearson")
```



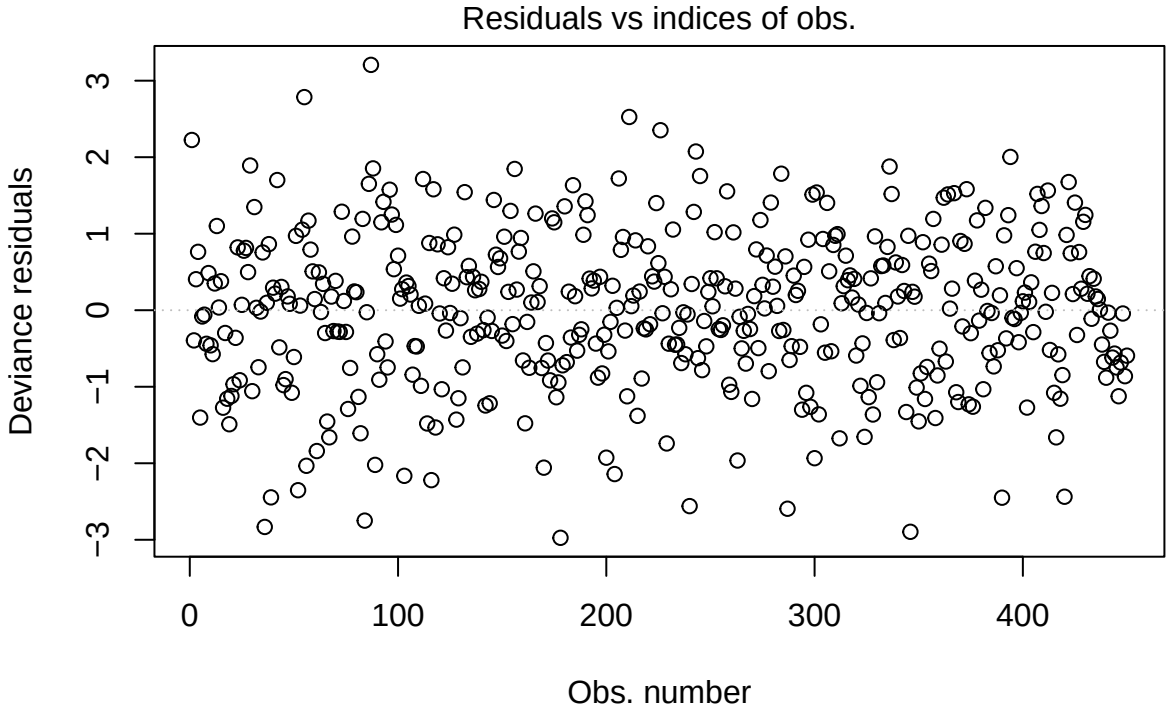

```
plot(modelo_beta_probit2, which = 4, type = "pearson")
```




```
plot(modelo_beta_probit2, which = 5, type = "deviance", sub.caption = "")
```




```
plot(modelo_beta_probit2, which = 1, type = "deviance", sub.caption = "")
```




```
shapiro.test(modelo_beta_probit2$residuals) #p-value =
```

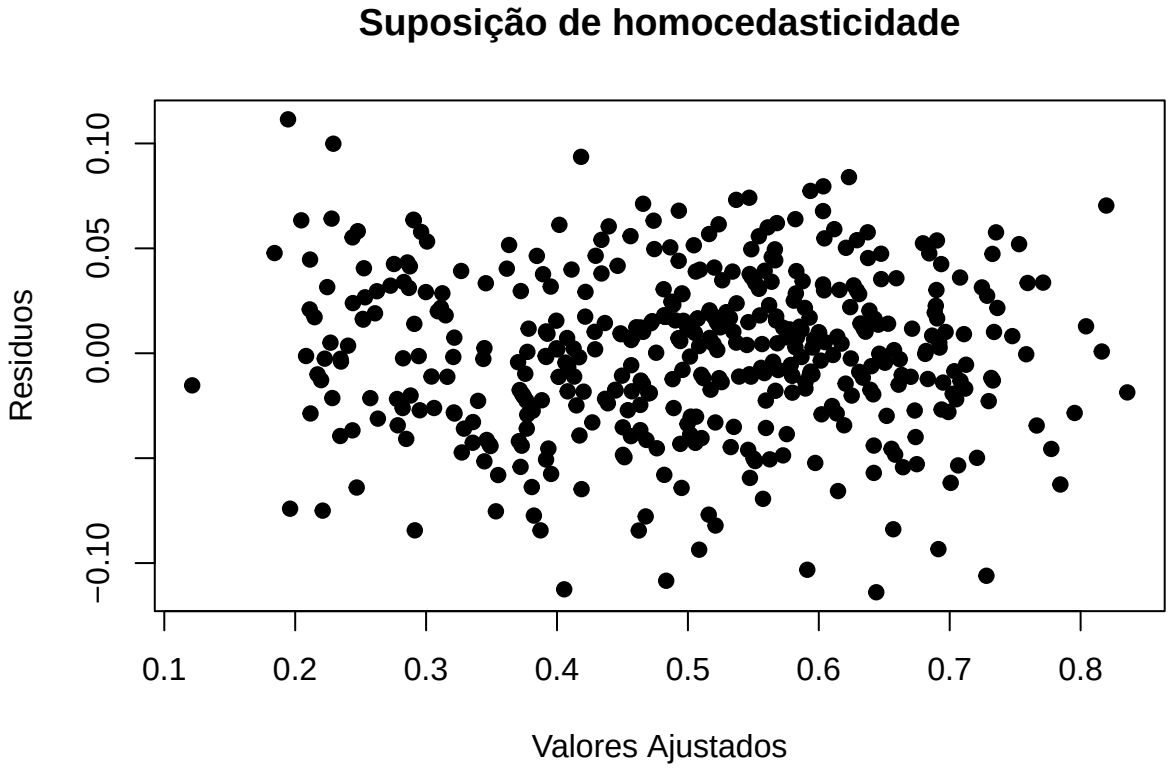
```
##
##  Shapiro-Wilk normality test
##
## data:  modelo_beta_probit2$residuals
## W = 0.99481, p-value = 0.1343
```

```r
#Teste de durbin watson para independencia
library(lmtest)
dwtest(modelo_beta_probit2) #p-value =
```

```
##
##  Durbin-Watson test
##
## data:  modelo_beta_probit2
## DW = 1.9345, p-value = 0.2271
## alternative hypothesis: true autocorrelation is greater than 0
```

```r
#Independência
plot(modelo_beta_probit2$residuals,
     ylab = "Residuos",
     xlab = "Index dos Imovéis",
     main = "Suposição de independência",
     pch = 19)
```

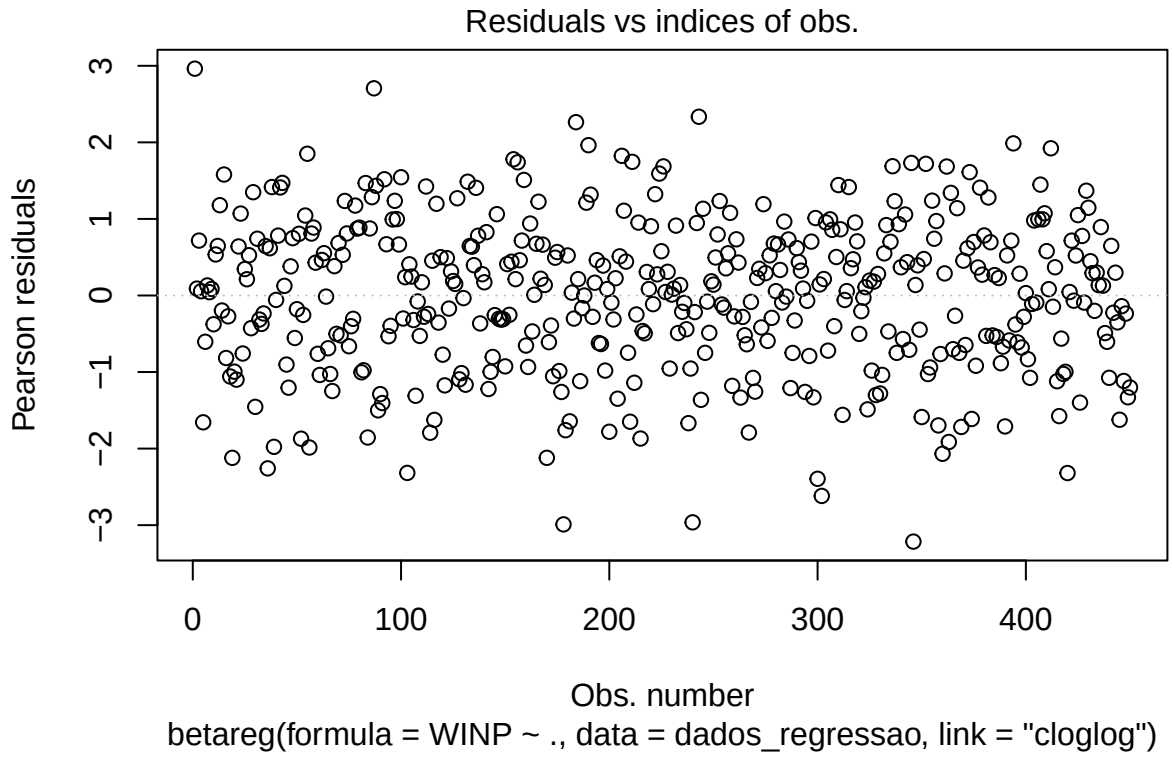

```r
#Homocedasticidade
plot(modelo_beta_probit2$fitted.values, modelo_beta_probit2$residuals,
     xlab = "Valores Ajustados",
     ylab = "Residuos",
     pch = 19,
     main = "Suposição de homocedasticidade"
)
```



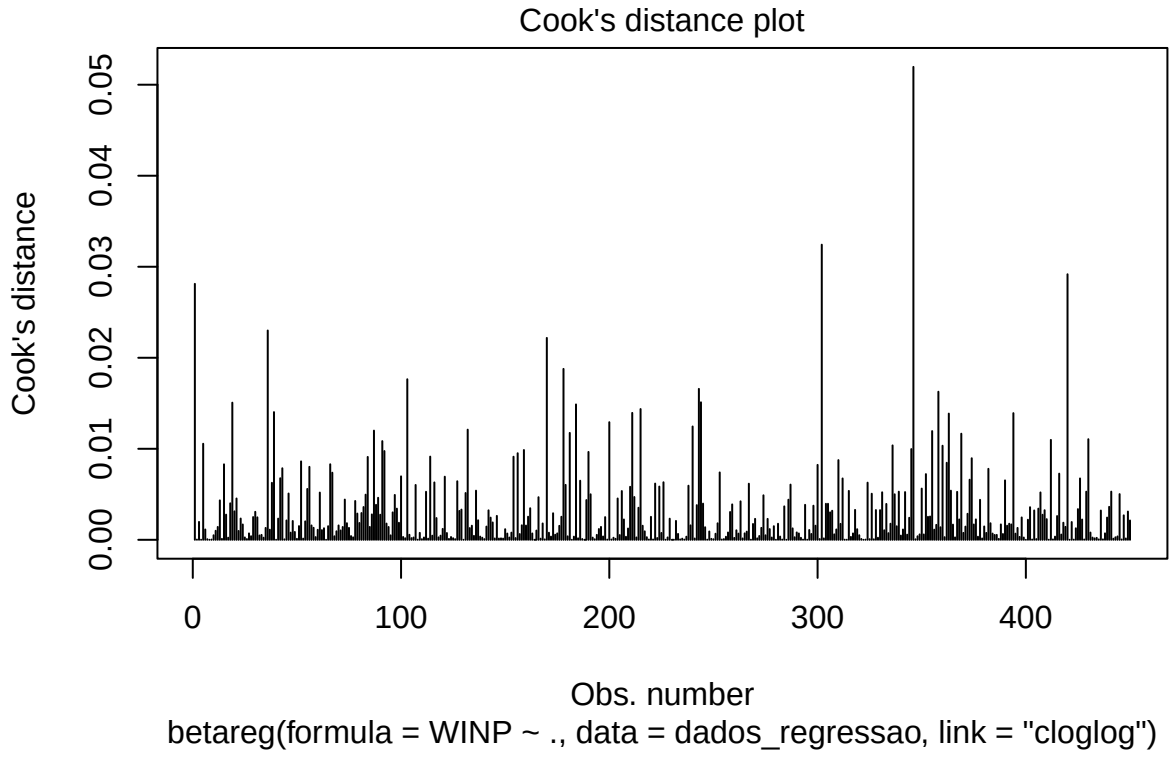

```
#Breusch_Pagan para homocedasticdade
bptest(modelo_beta_probit2) #p-value =
```

```
##
##  studentized Breusch-Pagan test
##
## data:  modelo_beta_probit2
## BP = 16.05, df = 5, p-value = 0.006702
```

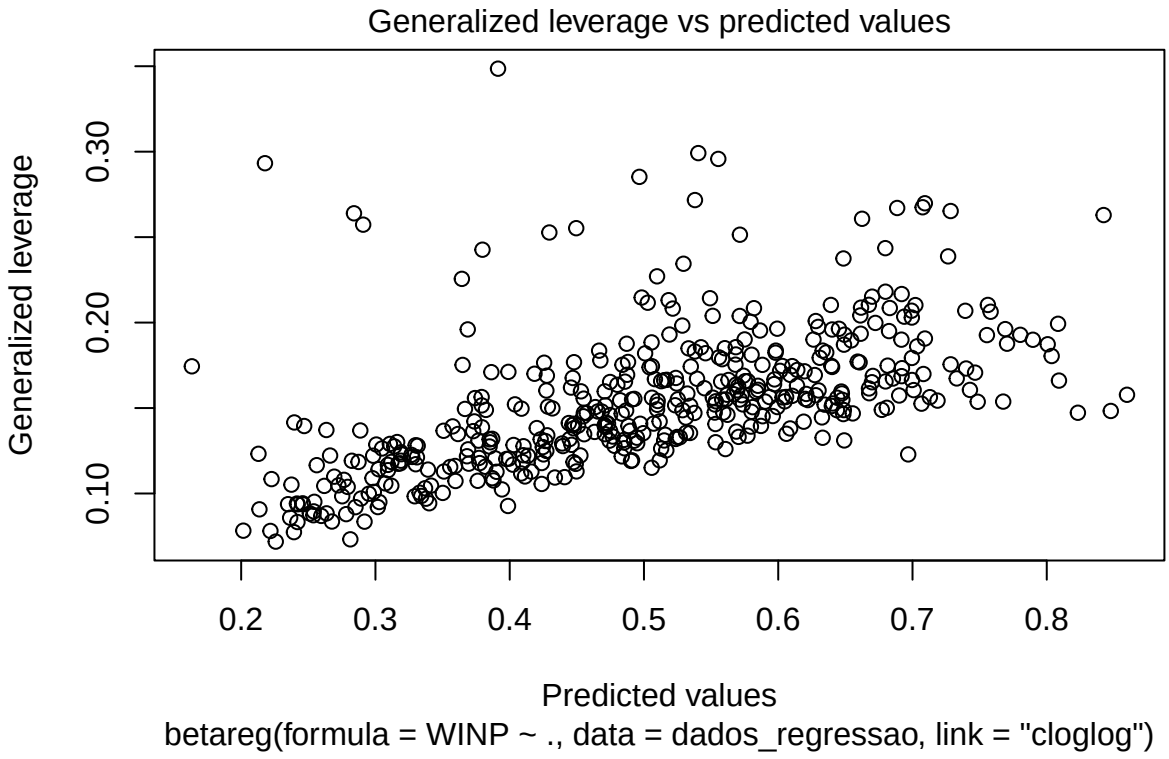
```
############ Cloglog ###############
### Modelo completo cloglog ###
plot(modelo_beta_cloglog, which = 1, type = "pearson")
```



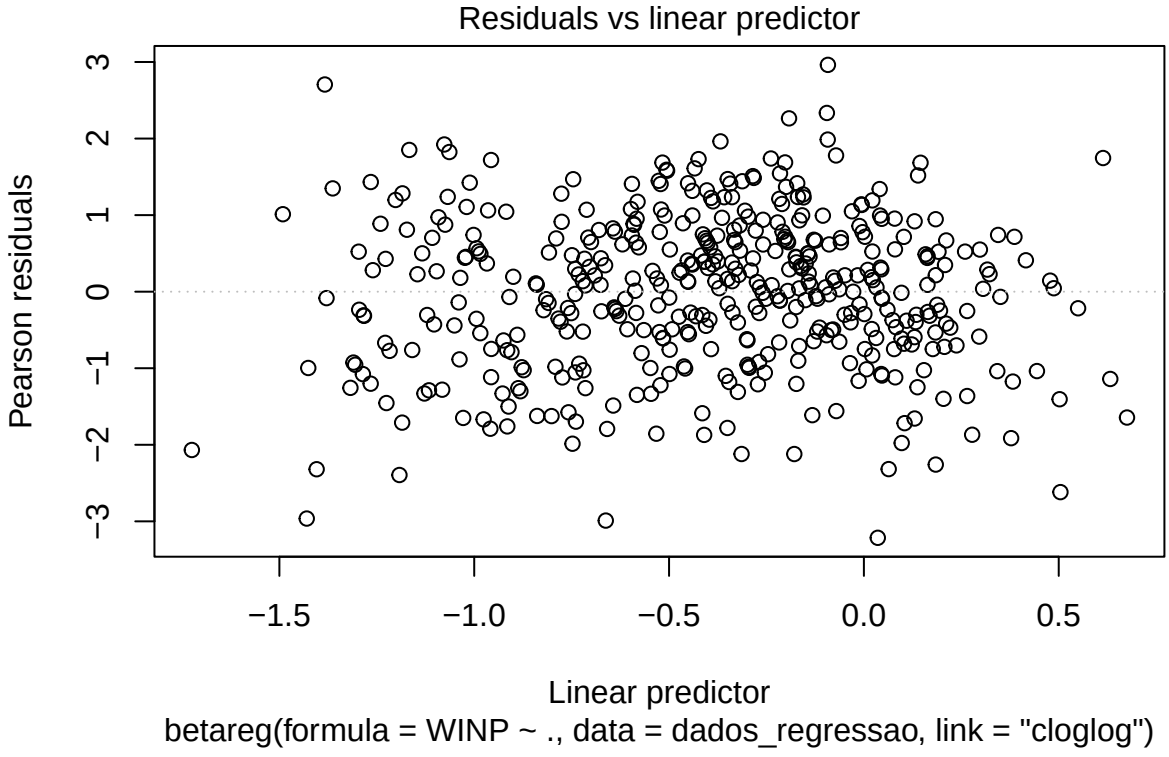

```
plot(modelo_beta_cloglog, which = 2, type = "pearson")
```



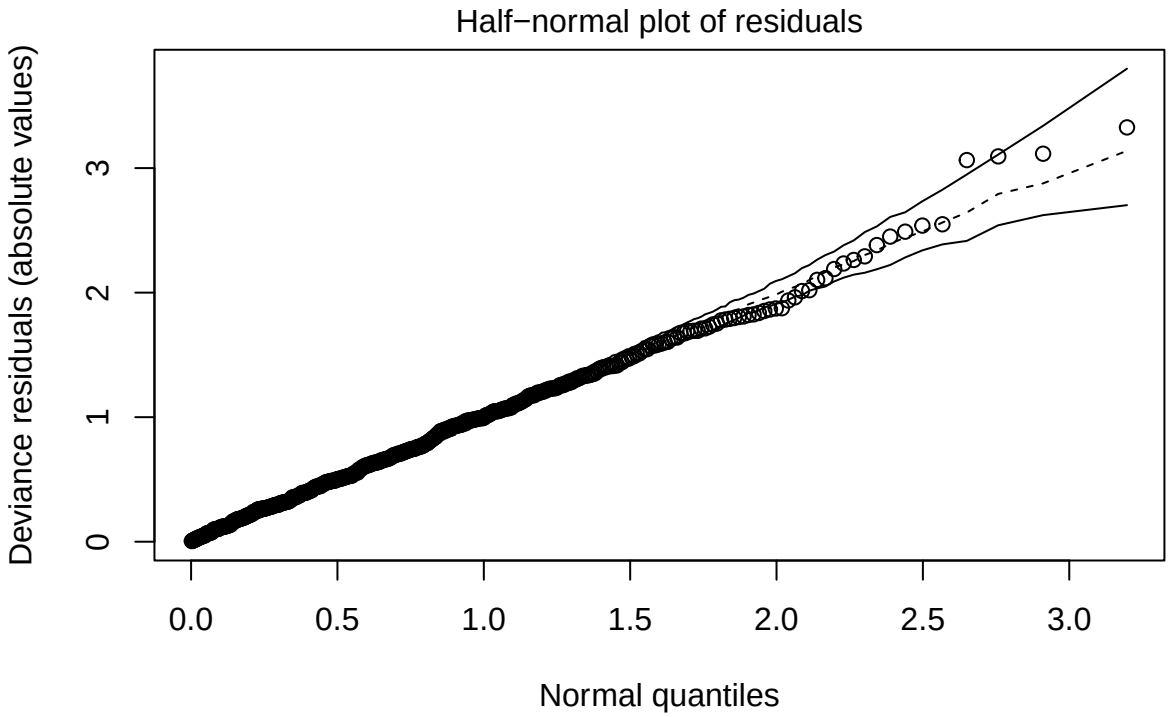

```
plot(modelo_beta_cloglog, which = 3, type = "pearson")
```



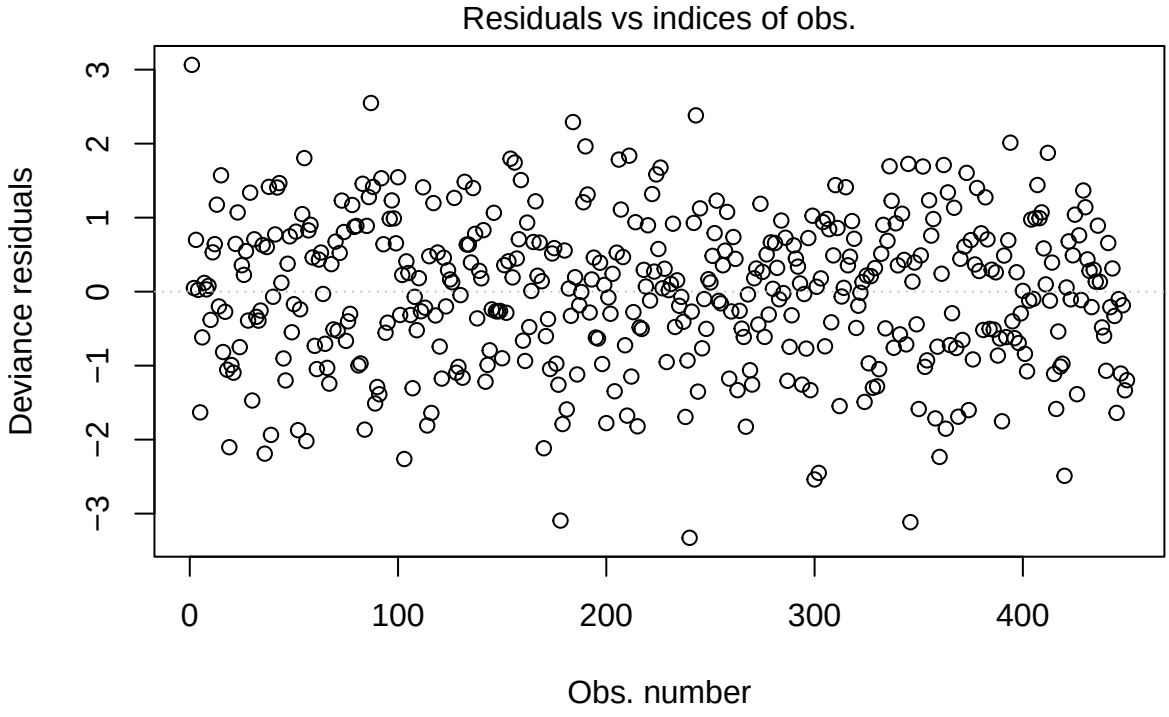

```
plot(modelo_beta_cloglog, which = 4, type = "pearson")
```




```
plot(modelo_beta_cloglog, which = 5, type = "deviance", sub.caption = "")
```




```
plot(modelo_beta_cloglog, which = 1, type = "deviance", sub.caption = "")
```




```
shapiro.test(modelo_beta_cloglog$residuals) #p-value =
```

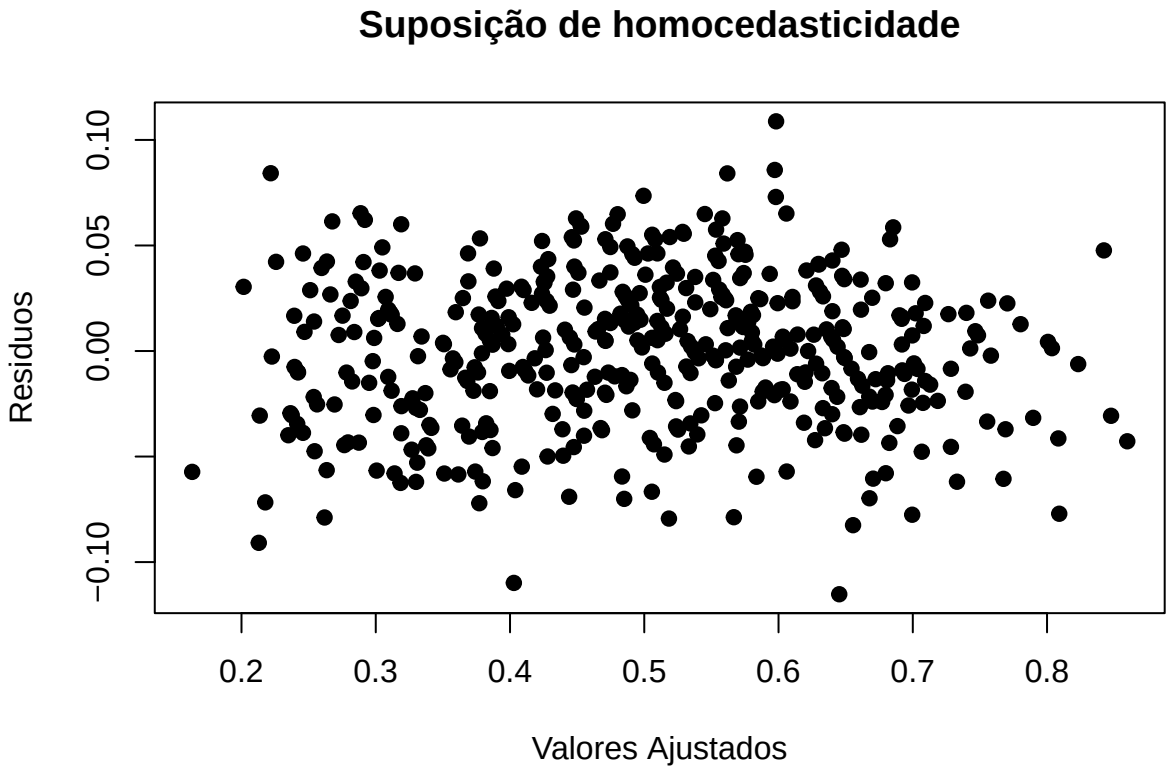
```
##
##  Shapiro-Wilk normality test
##
## data:  modelo_beta_cloglog$residuals
## W = 0.99604, p-value = 0.3221
```

```r
#Teste de durbin watson para independencia
library(lmtest)
dwtest(modelo_beta_cloglog) #p-value =
```

```
##
##  Durbin-Watson test
##
## data:  modelo_beta_cloglog
## DW = 1.9425, p-value = 0.09558
## alternative hypothesis: true autocorrelation is greater than 0
```

```r
#Independência
plot(modelo_beta_cloglog$residuals,
     ylab = "Residuos",
     xlab = "Index dos Imovéis",
     main = "Suposição de independência",
     pch = 19)
```

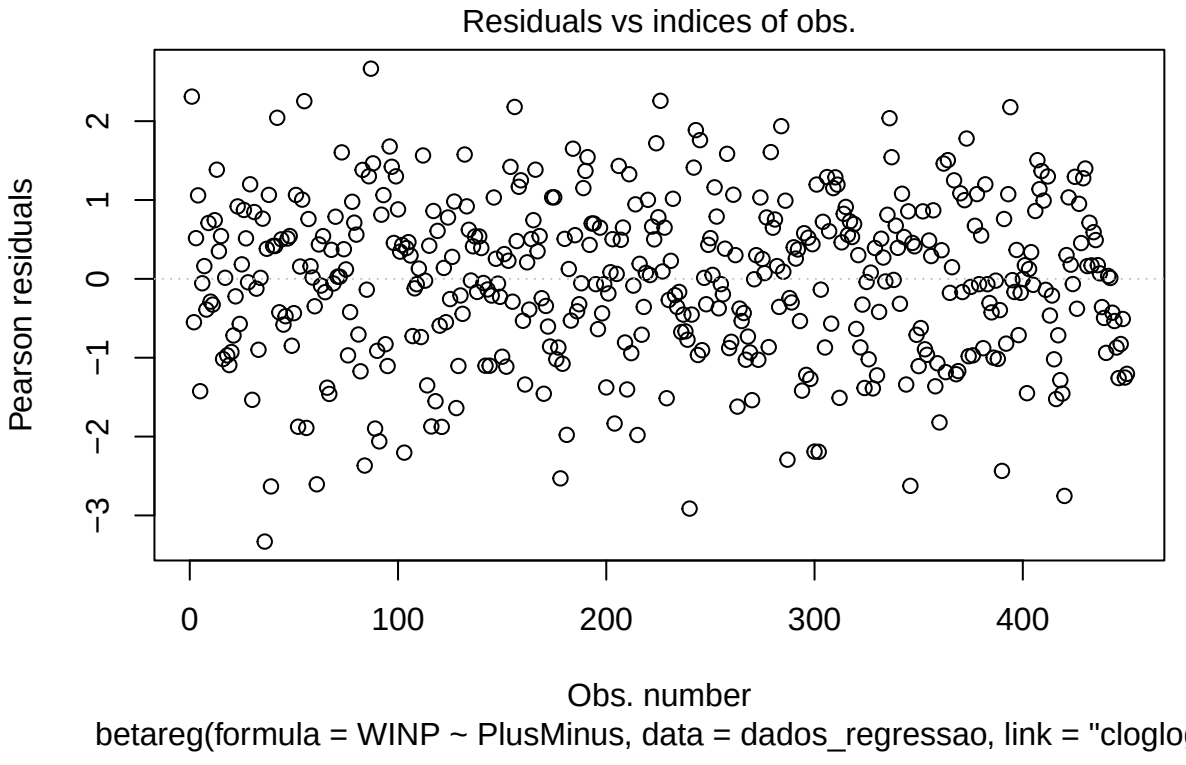

```r
#Homocedasticidade
plot(modelo_beta_cloglog$fitted.values, modelo_beta_cloglog$residuals,
     xlab = "Valores Ajustados",
     ylab = "Residuos",
     pch = 19,
     main = "Suposição de homocedasticidade"
)
```



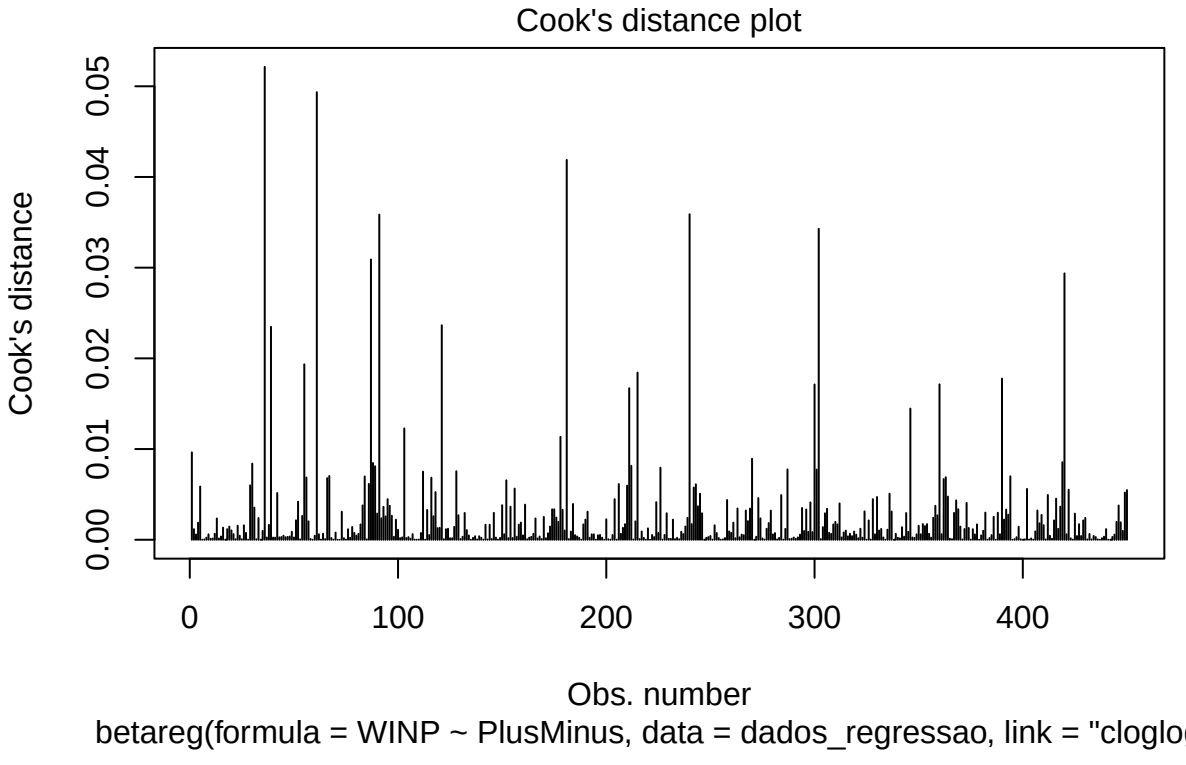

```
#Breusch_Pagan para homocedasticdade
bptest(modelo_beta_cloglog) #p-value =
```

```
##
##  studentized Breusch-Pagan test
##
## data:  modelo_beta_cloglog
## BP = 67.811, df = 68, p-value = 0.4837
```

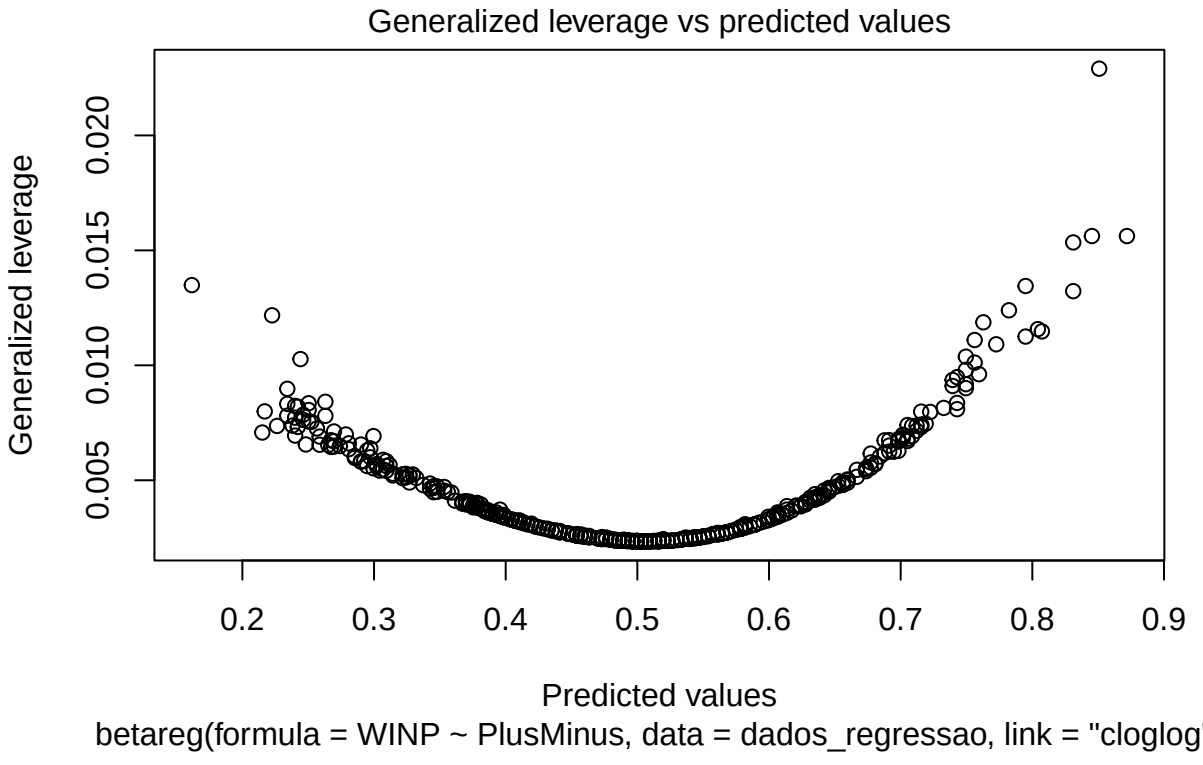
```
### Modelo 5% cloglog ###
plot(modelo_beta_cloglog1, which = 1, type = "pearson")
```



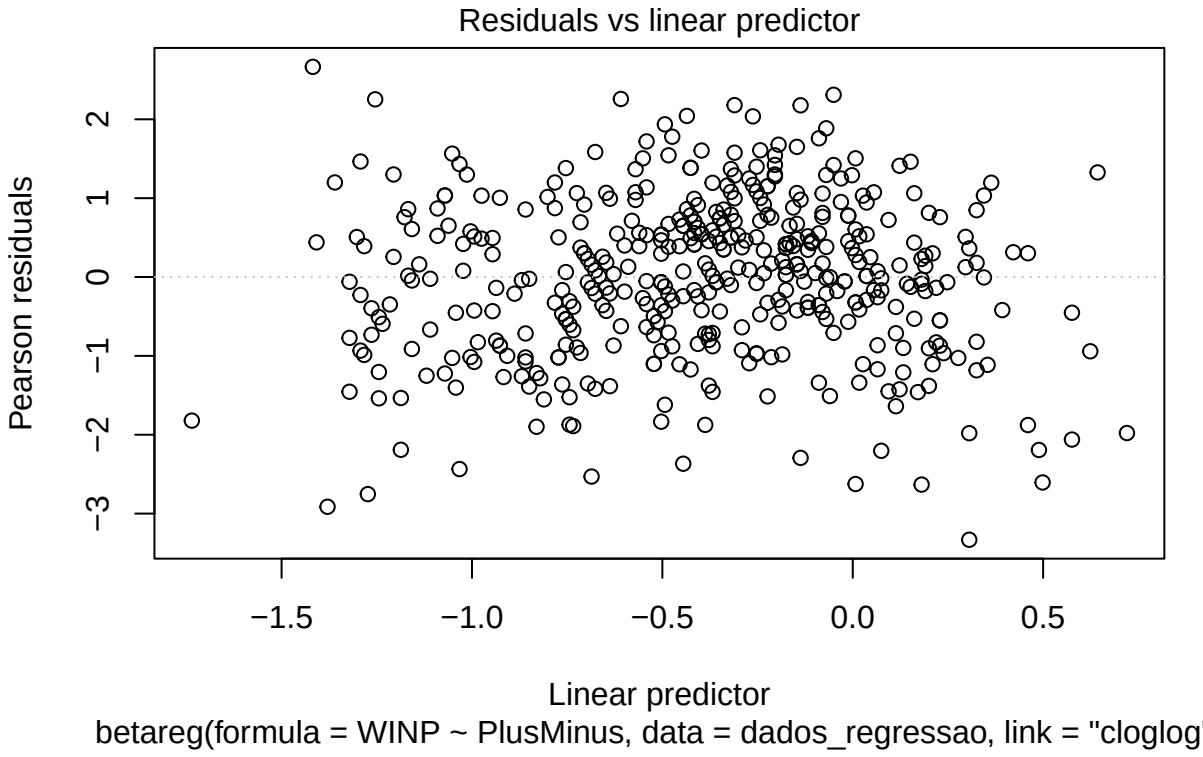

```
plot(modelo_beta_cloglog1, which = 2, type = "pearson")
```



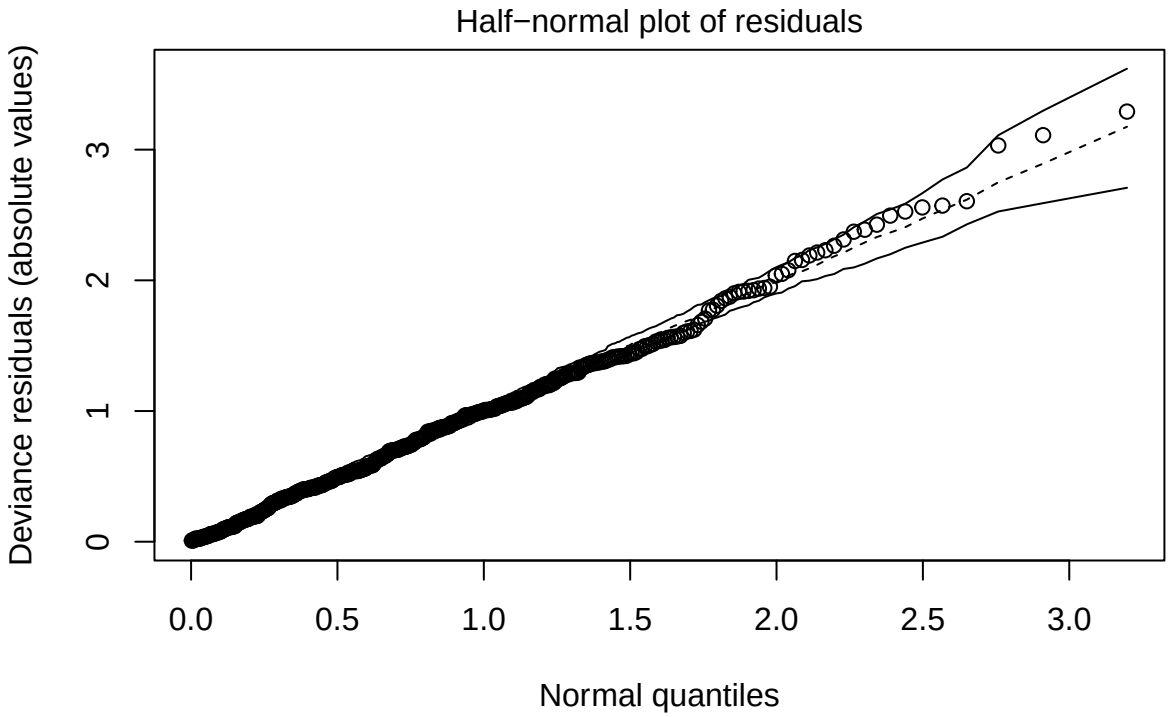

```
plot(modelo_beta_cloglog1, which = 3, type = "pearson")
```



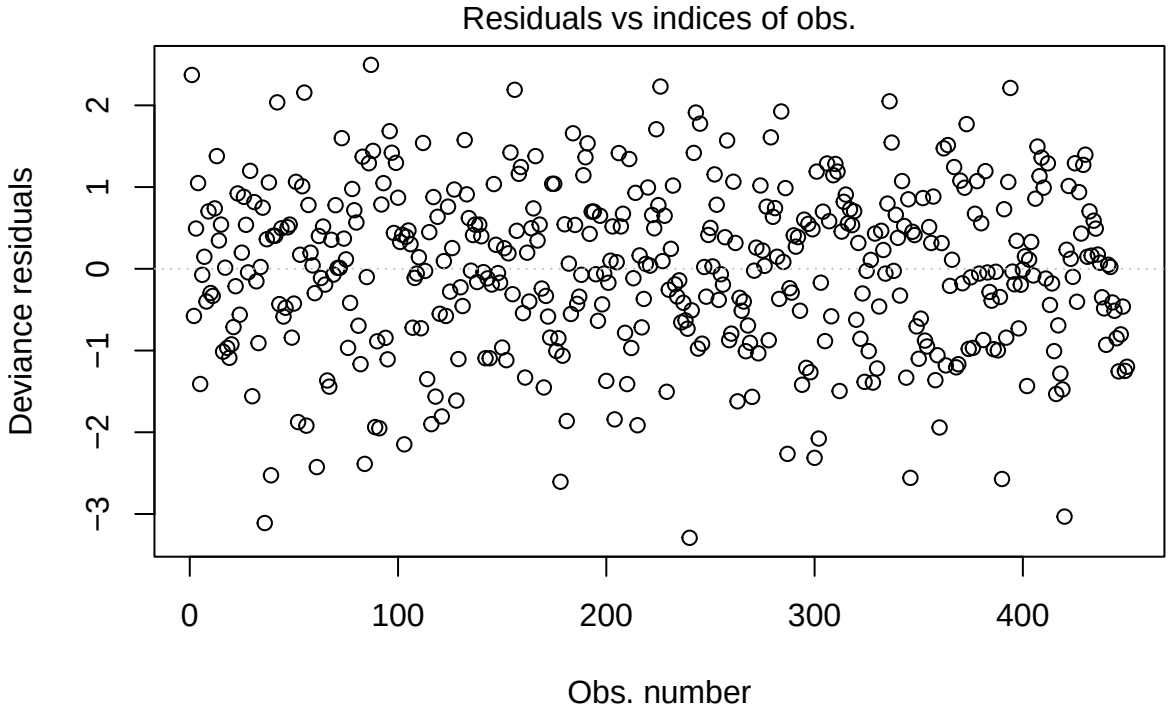

```
plot(modelo_beta_cloglog1, which = 4, type = "pearson")
```




```
plot(modelo_beta_cloglog1, which = 5, type = "deviance", sub.caption = "")
```




```r
plot(modelo_beta_cloglog1, which = 1, type = "deviance", sub.caption = "")
```




```r
shapiro.test(modelo_beta_cloglog1$residuals) #p-value =
```

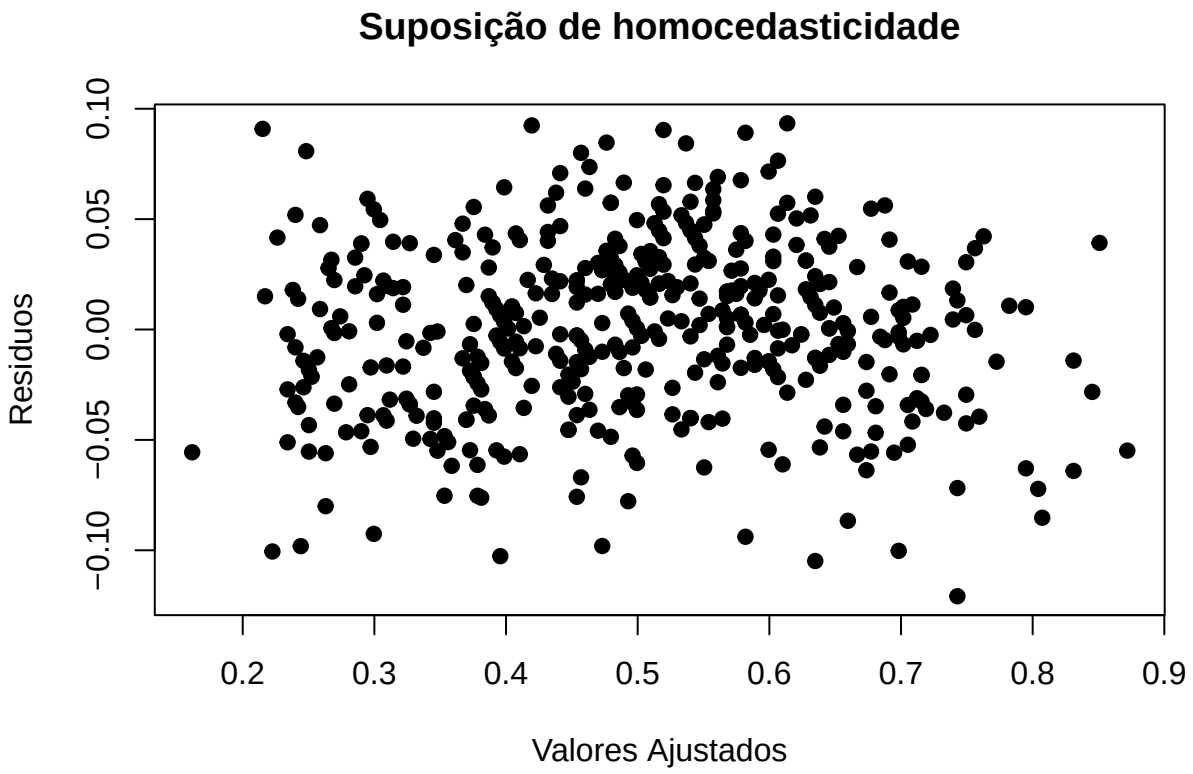
```
##
##  Shapiro-Wilk normality test
##
## data:  modelo_beta_cloglog1$residuals
## W = 0.99441, p-value = 0.09989
```

```r
#Teste de durbin watson para independencia
library(lmtest)
dwtest(modelo_beta_cloglog1) #p-value =
```

```
##
##  Durbin-Watson test
##
## data:  modelo_beta_cloglog1
## DW = 1.9507, p-value = 0.2889
## alternative hypothesis: true autocorrelation is greater than 0
```

```r
#Independência
plot(modelo_beta_cloglog1$residuals,
     ylab = "Residuos",
     xlab = "Index dos Imovéis",
     main = "Suposição de independência",
     pch = 19)
```

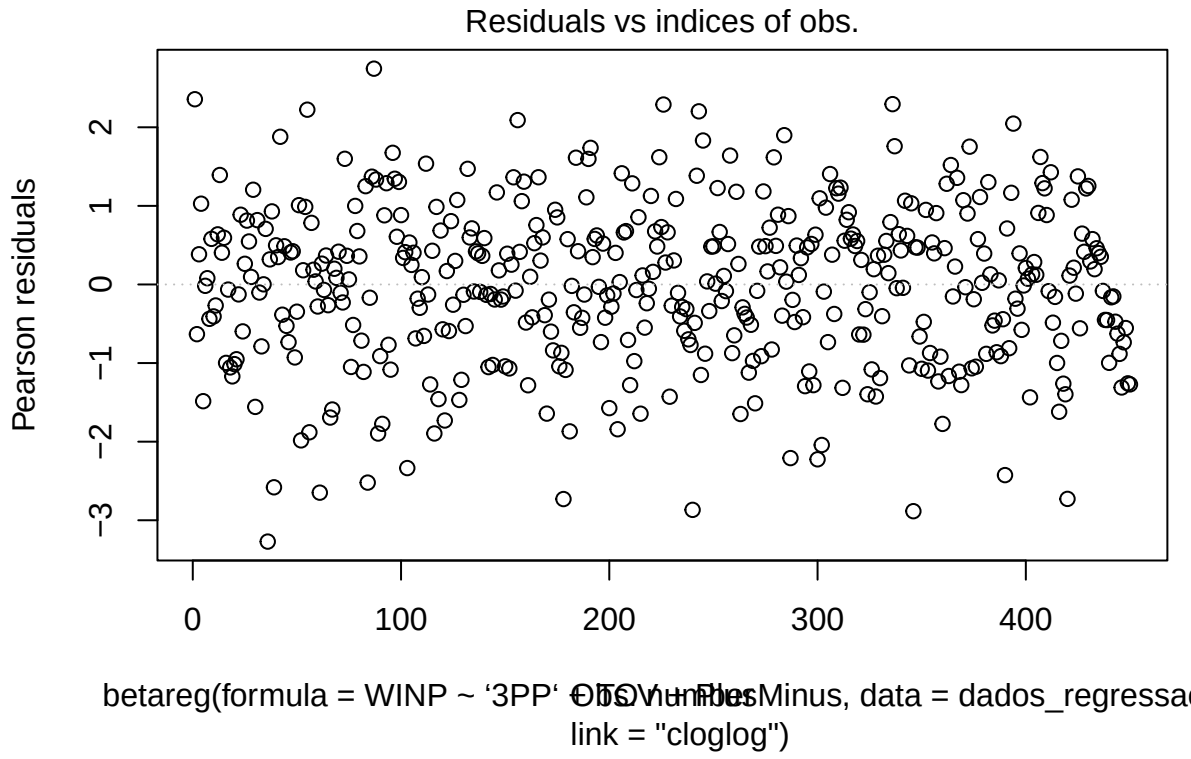

```r
#Homocedasticidade
plot(modelo_beta_cloglog1$fitted.values, modelo_beta_cloglog1$residuals,
     xlab = "Valores Ajustados",
     ylab = "Residuos",
     pch = 19,
     main = "Suposição de homocedasticidade"
)
```



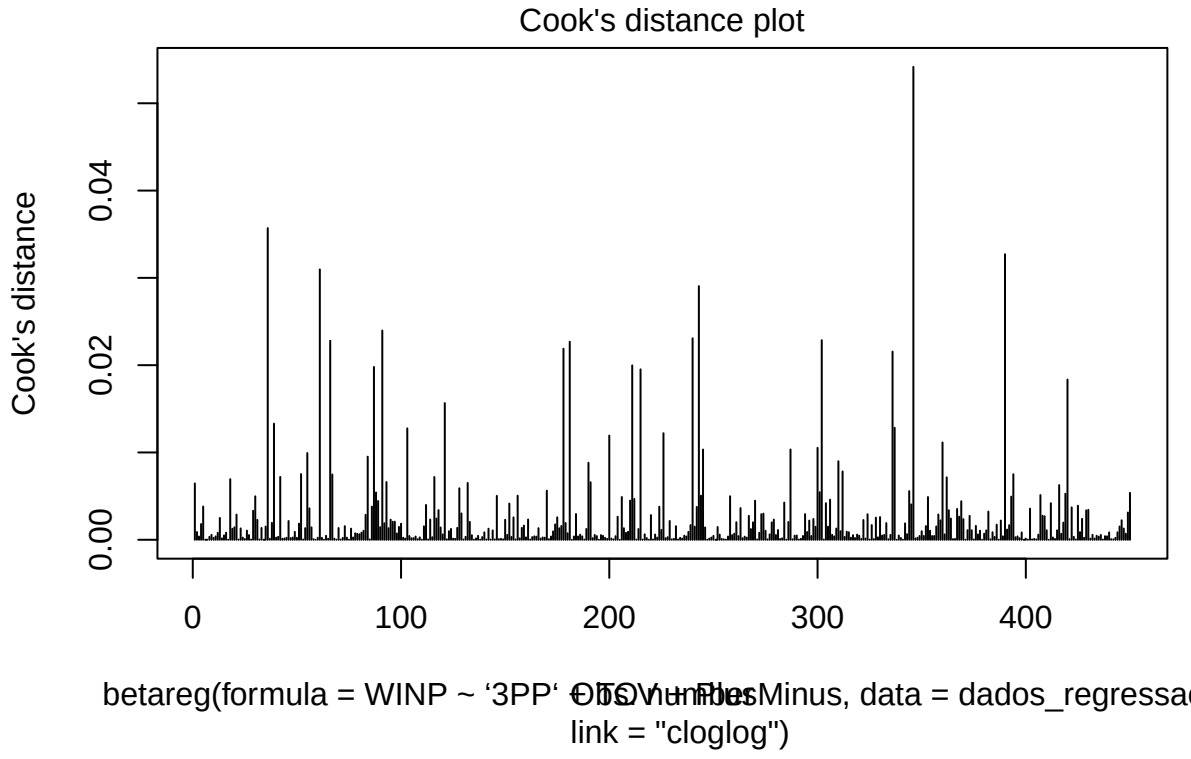

```
#Breusch_Pagan para homocedasticdade
bptest(modelo_beta_cloglog1) #p-value =
```

```
##
##  studentized Breusch-Pagan test
##
## data:  modelo_beta_cloglog1
## BP = 4.3624, df = 1, p-value = 0.03674
```

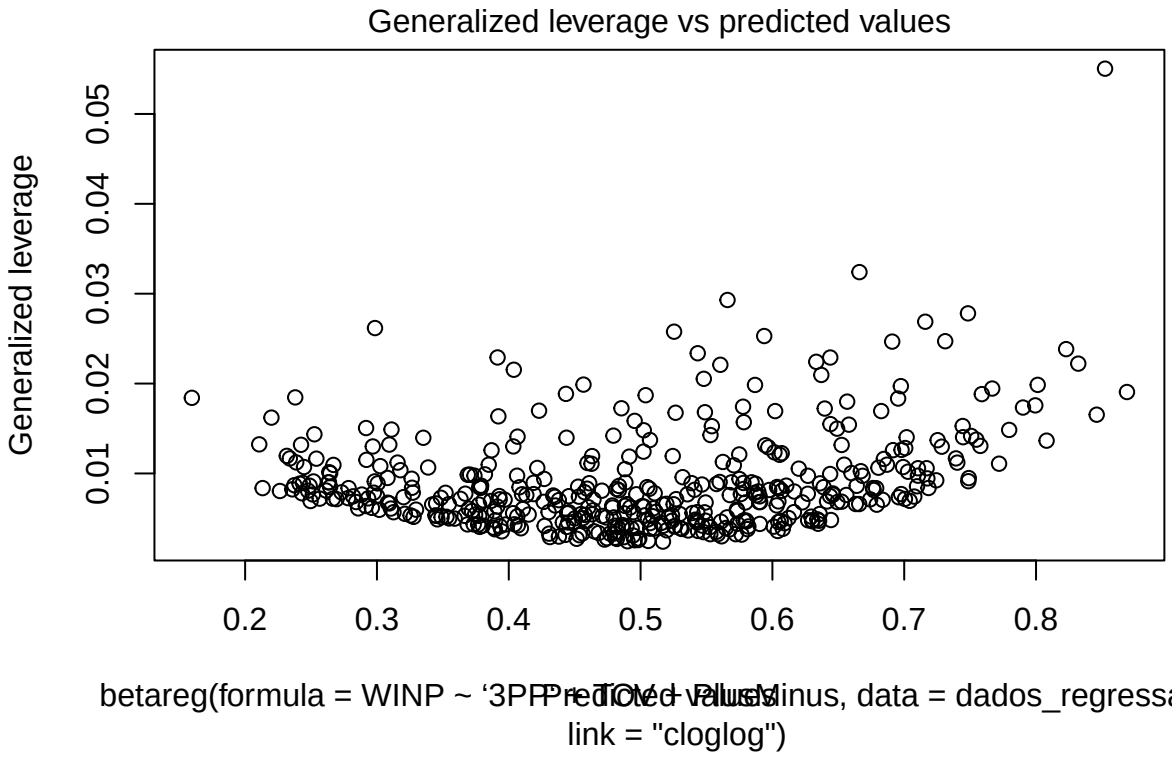
```
### Modelo 10% cloglog ###
plot(modelo_beta_cloglog2, which = 1, type = "pearson")
```



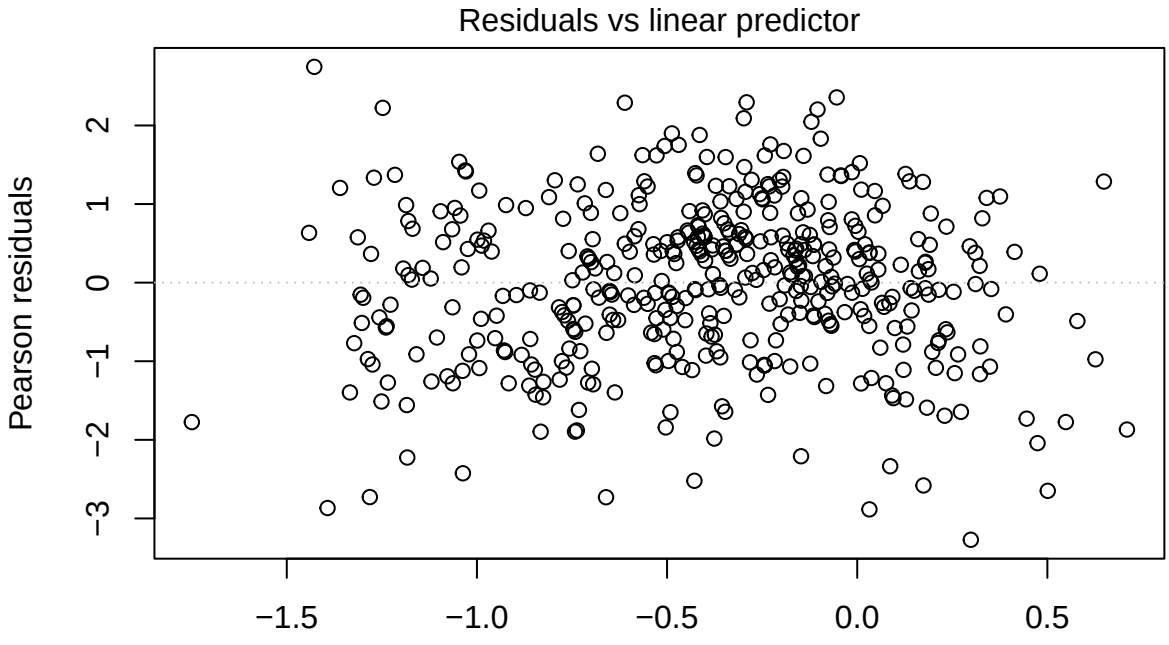

```
plot(modelo_beta_cloglog2, which = 2, type = "pearson")
```



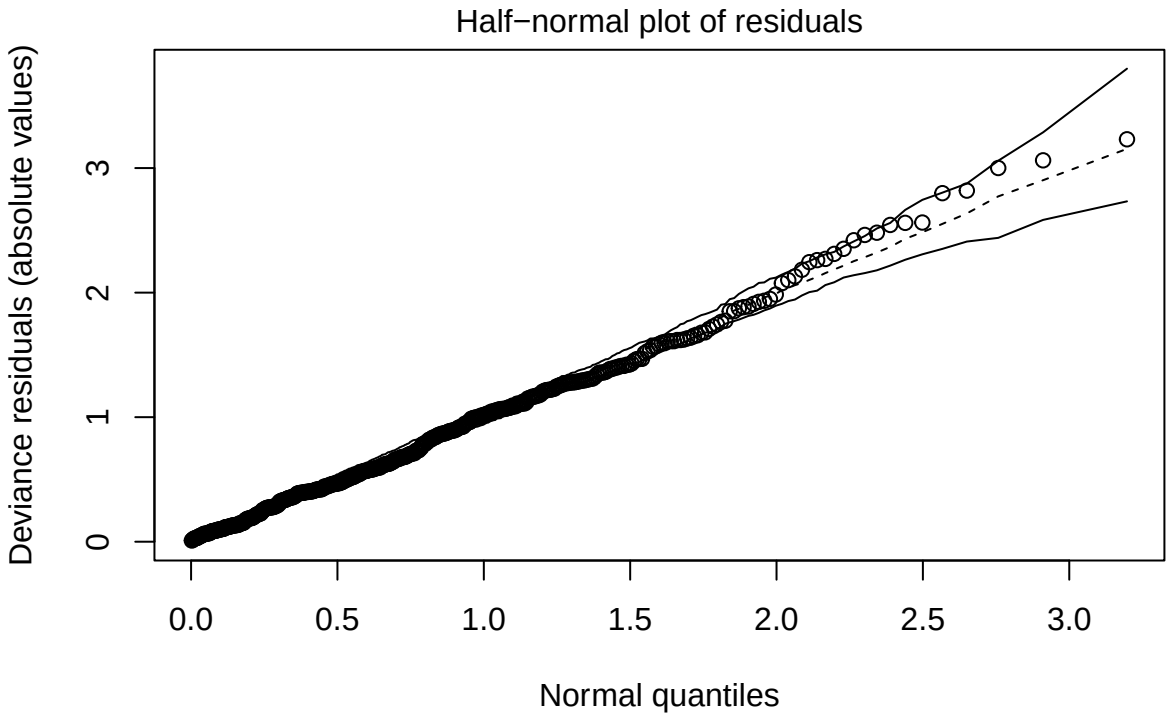

```
plot(modelo_beta_cloglog2, which = 3, type = "pearson")
```



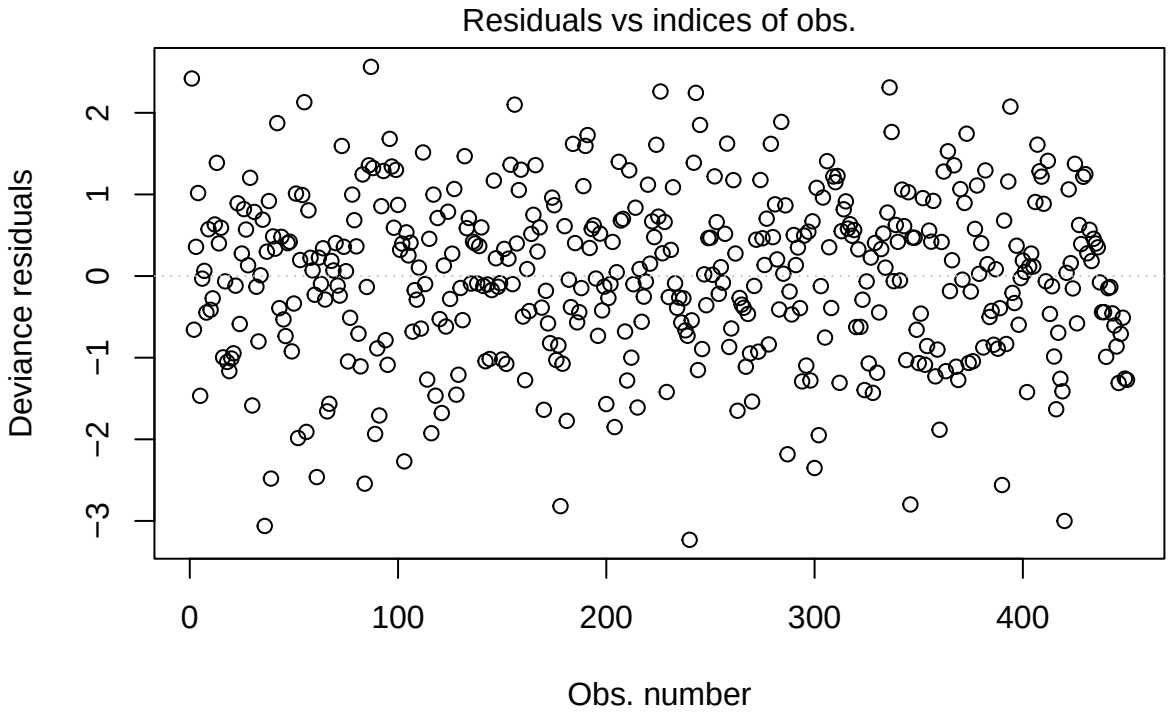

```
plot(modelo_beta_cloglog2, which = 4, type = "pearson")
```




```
plot(modelo_beta_cloglog2, which = 5, type = "deviance", sub.caption = "")
```




```
plot(modelo_beta_cloglog2, which = 1, type = "deviance", sub.caption = "")
```




```
shapiro.test(modelo_beta_cloglog2$residuals) #p-value =
```

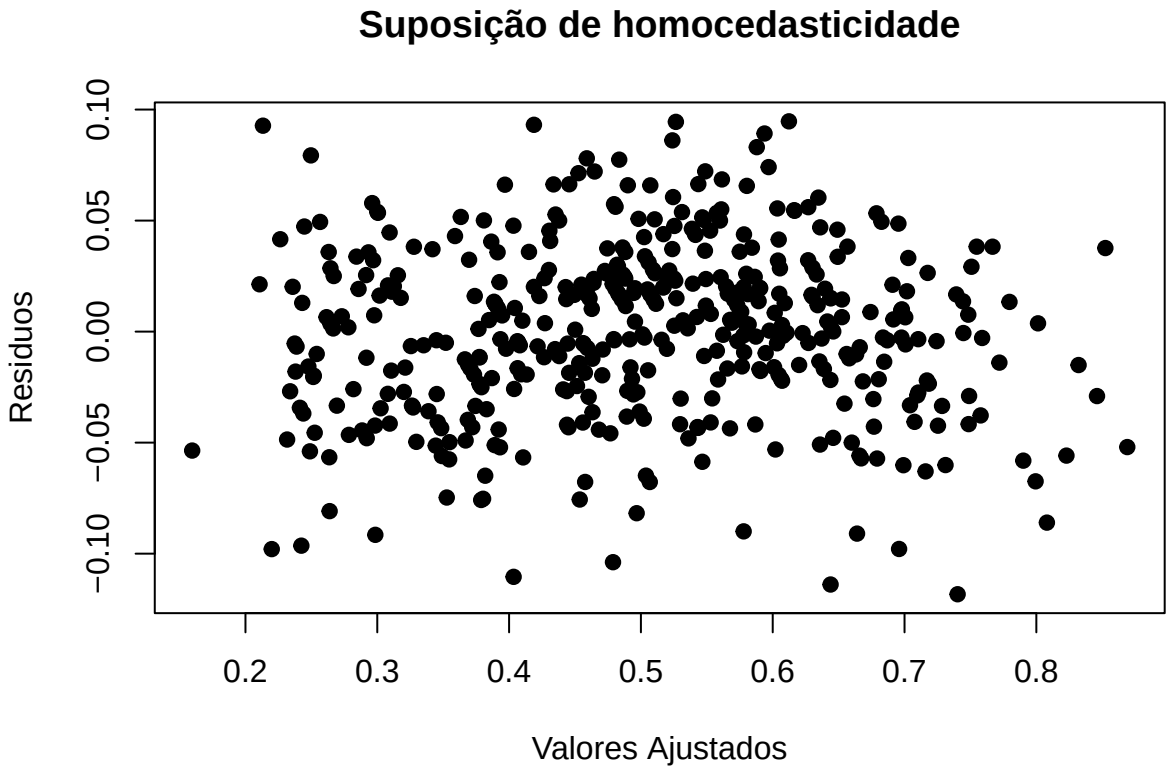
```
##
##  Shapiro-Wilk normality test
##
## data:  modelo_beta_cloglog2$residuals
## W = 0.99441, p-value = 0.09981
```

```r
#Teste de durbin watson para independencia
library(lmtest)
dwtest(modelo_beta_cloglog2) #p-value =
```

```
##
##  Durbin-Watson test
##
## data:  modelo_beta_cloglog2
## DW = 1.9318, p-value = 0.2222
## alternative hypothesis: true autocorrelation is greater than 0
```

```r
#Independência
plot(modelo_beta_cloglog2$residuals,
     ylab = "Residuos",
     xlab = "Index dos Imovéis",
     main = "Suposição de independência",
     pch = 19)
```

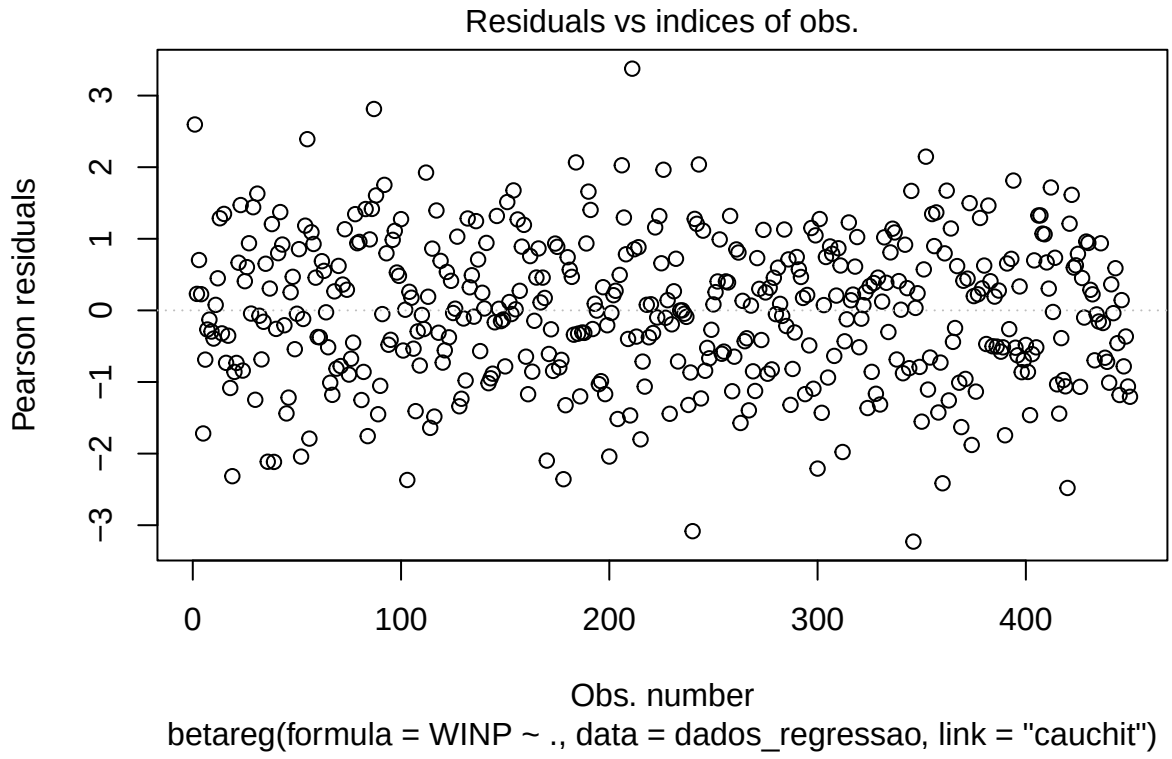

```r
#Homocedasticidade
plot(modelo_beta_cloglog2$fitted.values, modelo_beta_cloglog2$residuals,
     xlab = "Valores Ajustados",
     ylab = "Residuos",
     pch = 19,
     main = "Suposição de homocedasticidade"
)
```



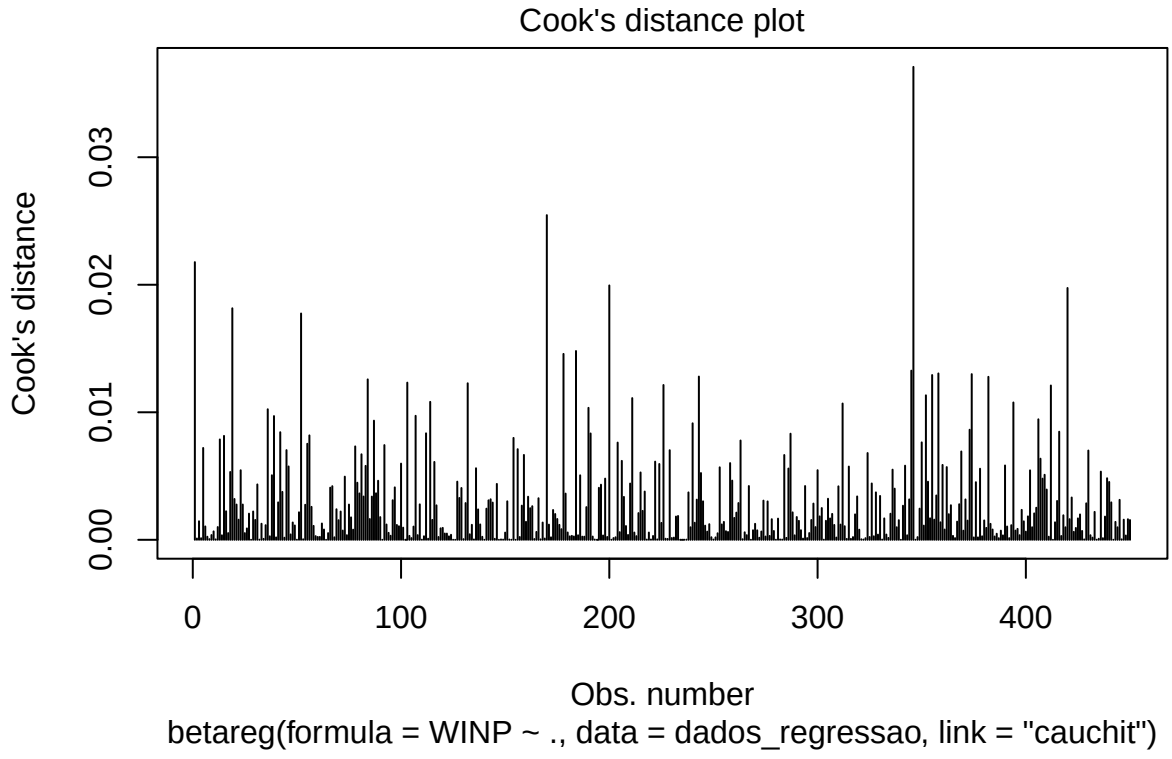

```
#Breusch_Pagan para homocedasticdade
bptest(modelo_beta_cloglog2) #p-value =
```

```
##
##  studentized Breusch-Pagan test
##
## data:  modelo_beta_cloglog2
## BP = 5.5263, df = 3, p-value = 0.1371
```

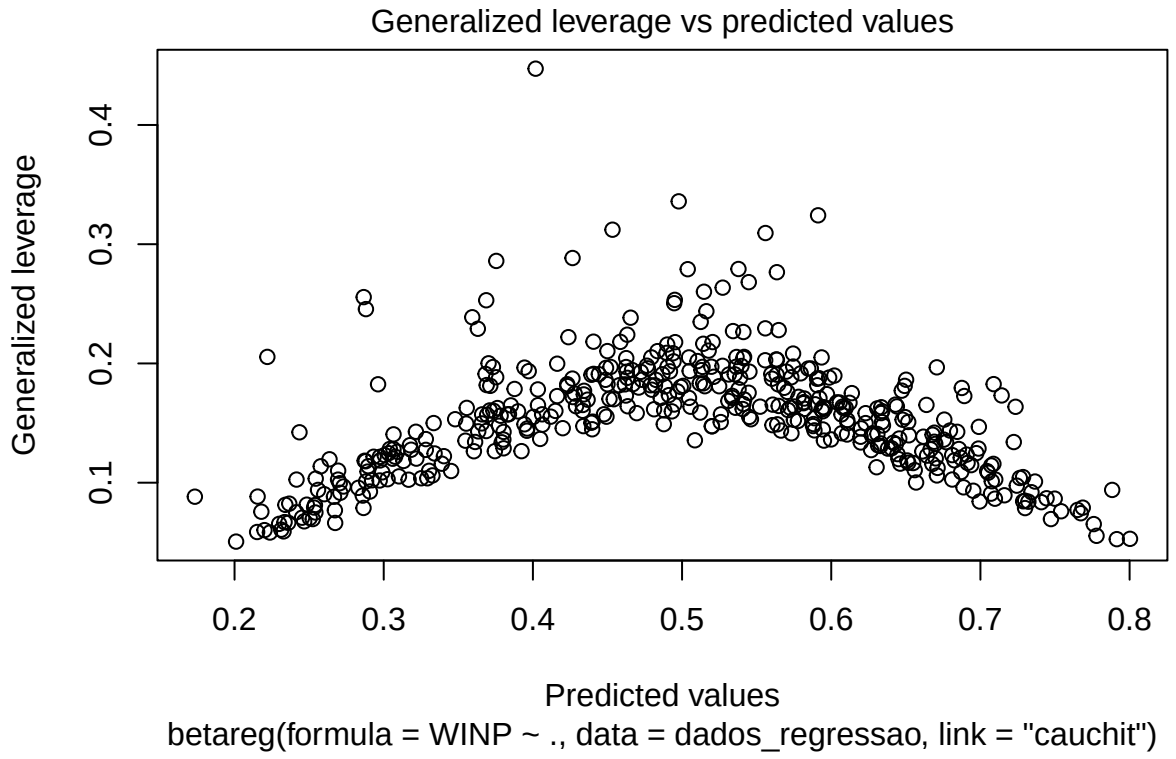
```
############## Cauchit ########################
### Modelo completo cauchit ###
plot(modelo_beta_cauchit, which = 1, type = "pearson")
```



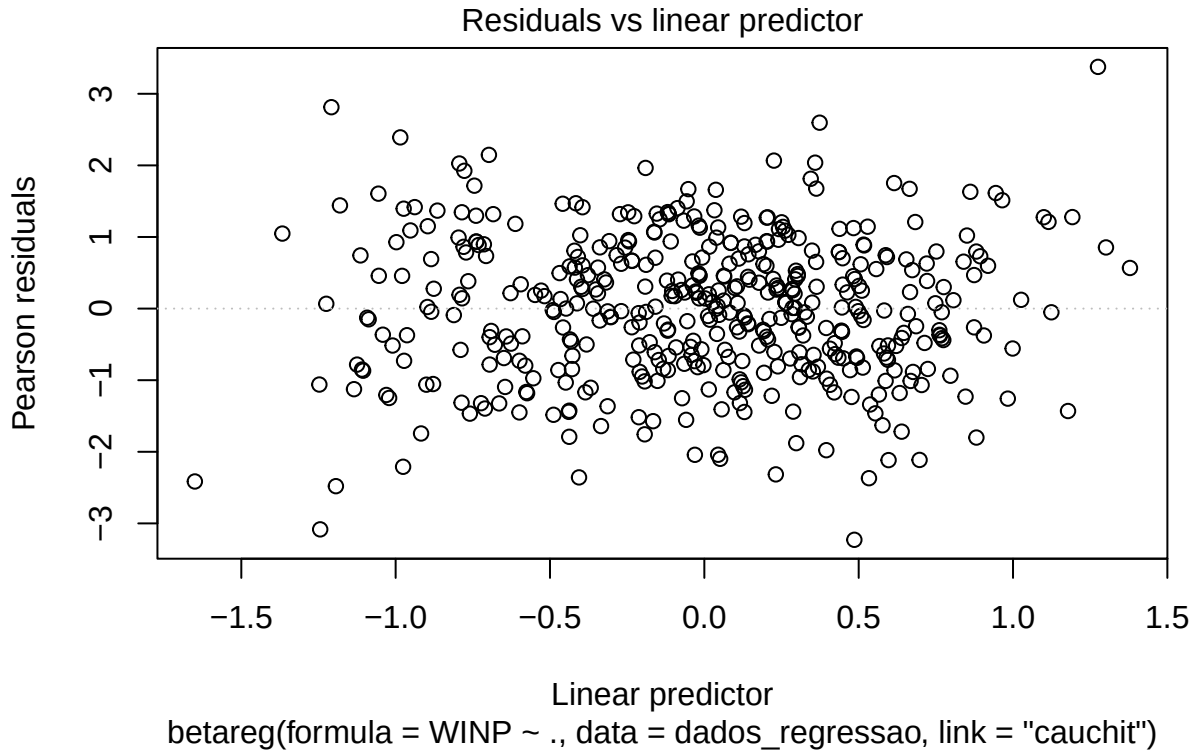

```
plot(modelo_beta_cauchit, which = 2, type = "pearson")
```



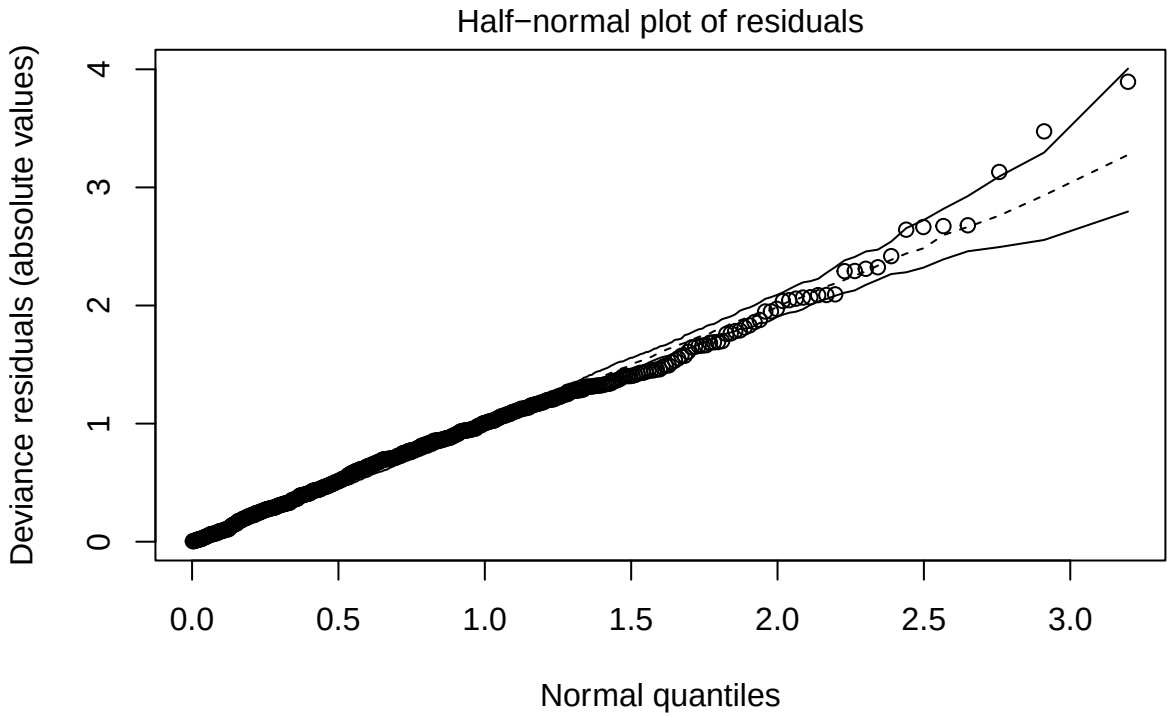

```
plot(modelo_beta_cauchit, which = 3, type = "pearson")
```



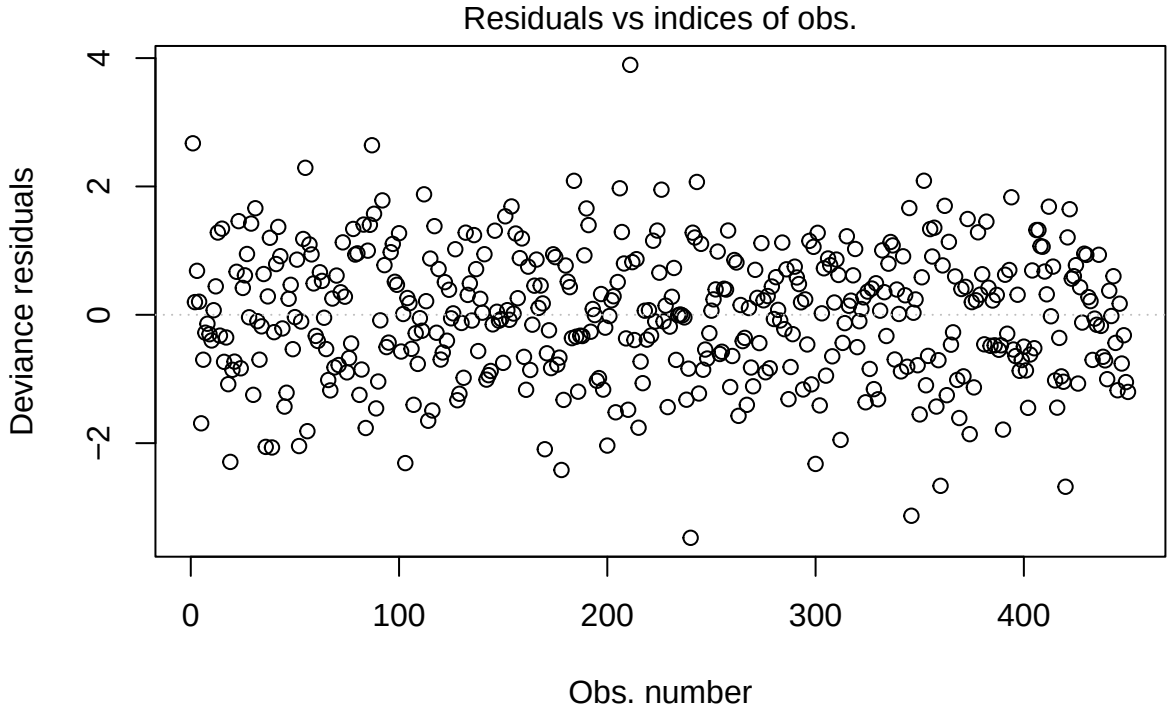

```
plot(modelo_beta_cauchit, which = 4, type = "pearson")
```




```
plot(modelo_beta_cauchit, which = 5, type = "deviance", sub.caption = "")
```




```
plot(modelo_beta_cauchit, which = 1, type = "deviance", sub.caption = "")
```




```
shapiro.test(modelo_beta_cauchit$residuals) #p-value =
```

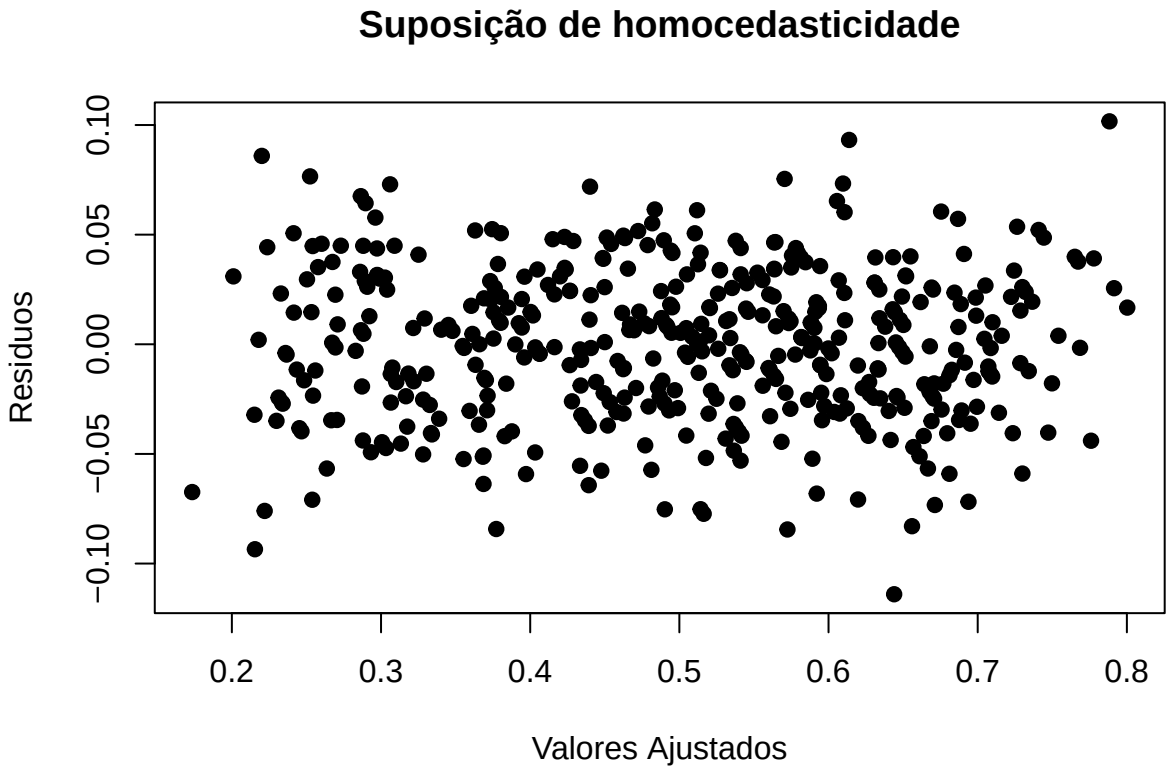
```
##
##  Shapiro-Wilk normality test
##
## data:  modelo_beta_cauchit$residuals
## W = 0.99733, p-value = 0.6854
```

```r
#Teste de durbin watson para independencia
library(lmtest)
dwtest(modelo_beta_cauchit) #p-value =
```

```
##
##  Durbin-Watson test
##
## data:  modelo_beta_cauchit
## DW = 1.9425, p-value = 0.09558
## alternative hypothesis: true autocorrelation is greater than 0
```

```r
#Independência
plot(modelo_beta_cauchit$residuals,
     ylab = "Residuos",
     xlab = "Index dos Imovéis",
     main = "Suposição de independência",
     pch = 19)
```

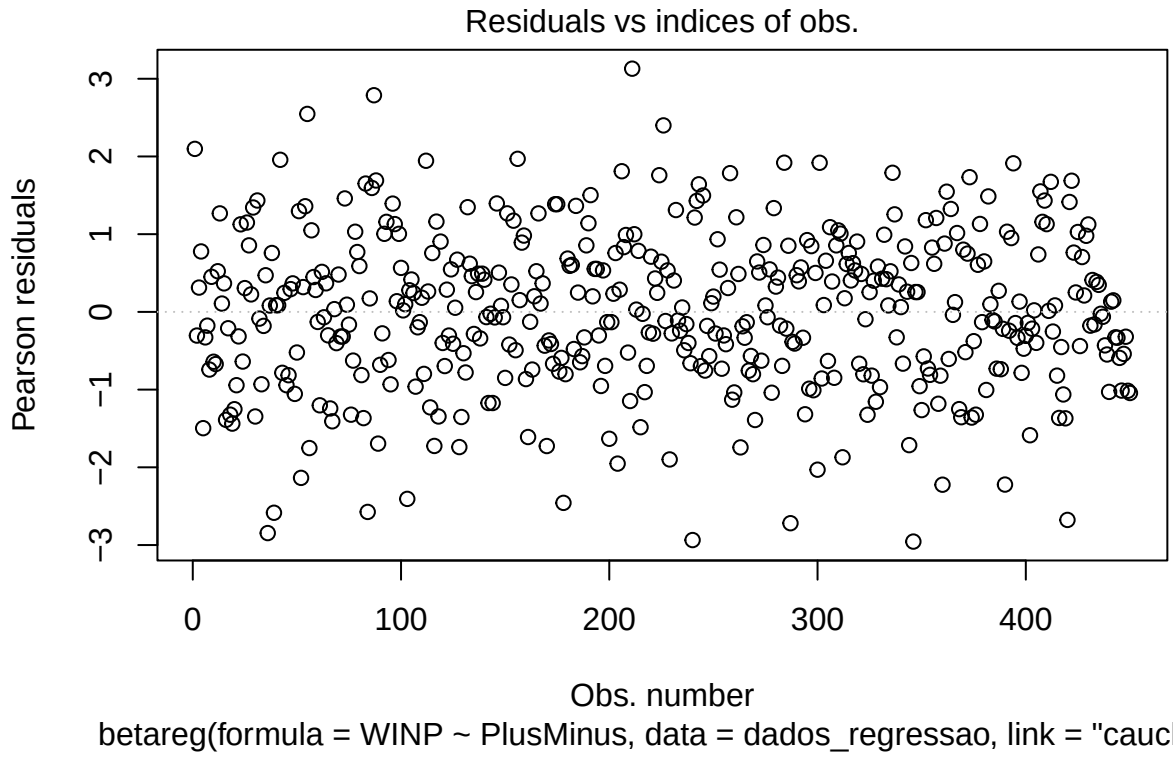

```r
#Homocedasticidade
plot(modelo_beta_cauchit$fitted.values, modelo_beta_cauchit$residuals,
     xlab = "Valores Ajustados",
     ylab = "Residuos",
     pch = 19,
     main = "Suposição de homocedasticidade"
)
```



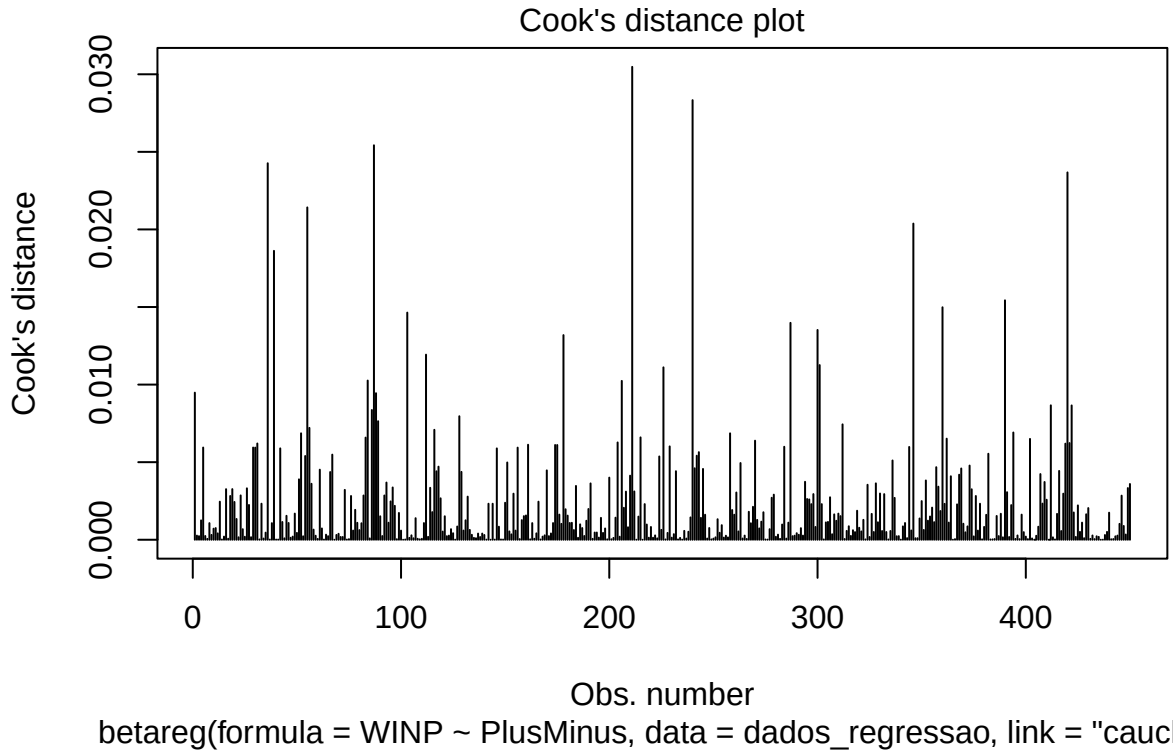

```
#Breusch_Pagan para homocedasticdade
bptest(modelo_beta_cauchit) #p-value =
```

```
##
##  studentized Breusch-Pagan test
##
## data:  modelo_beta_cauchit
## BP = 67.811, df = 68, p-value = 0.4837
```

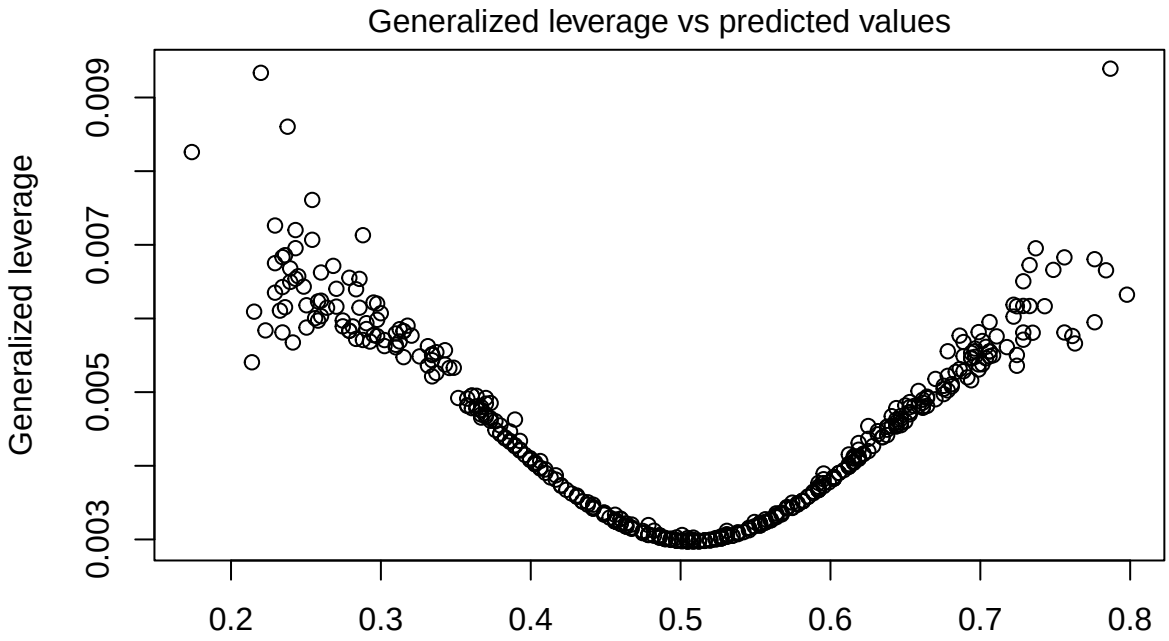
```
### Modelo 5% cauchit ###
plot(modelo_beta_cauchit1, which = 1, type = "pearson")
```



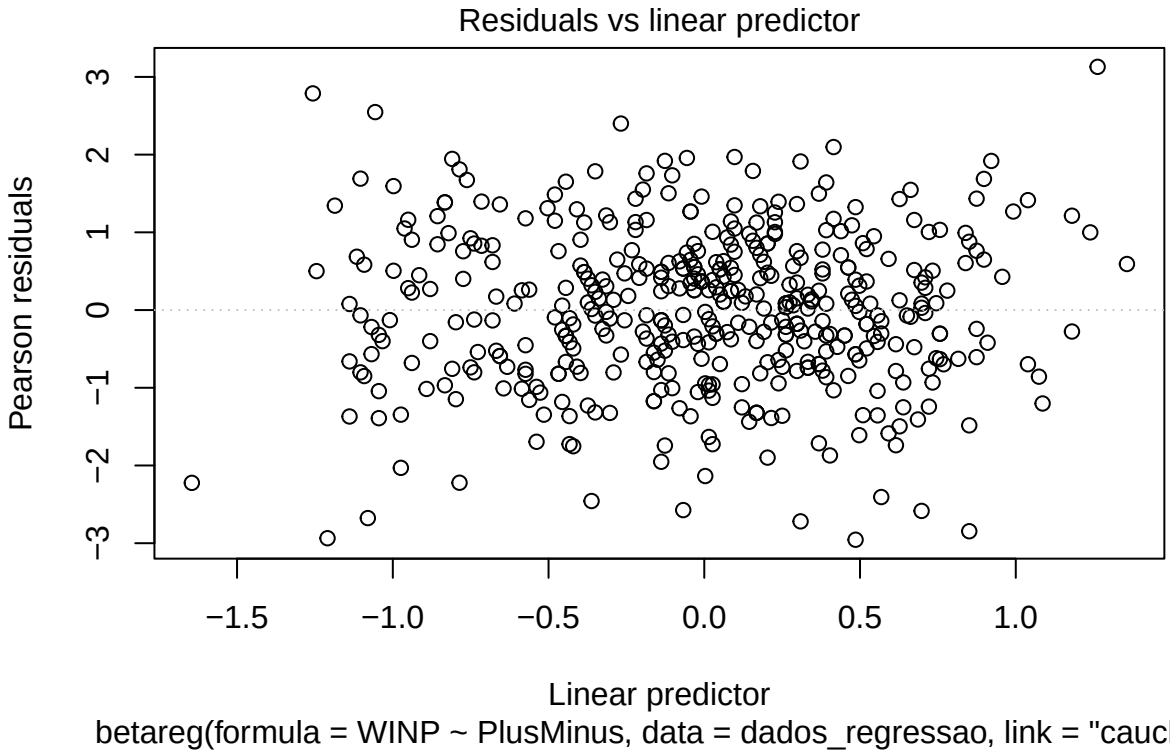

```
plot(modelo_beta_cauchit1, which = 2, type = "pearson")
```



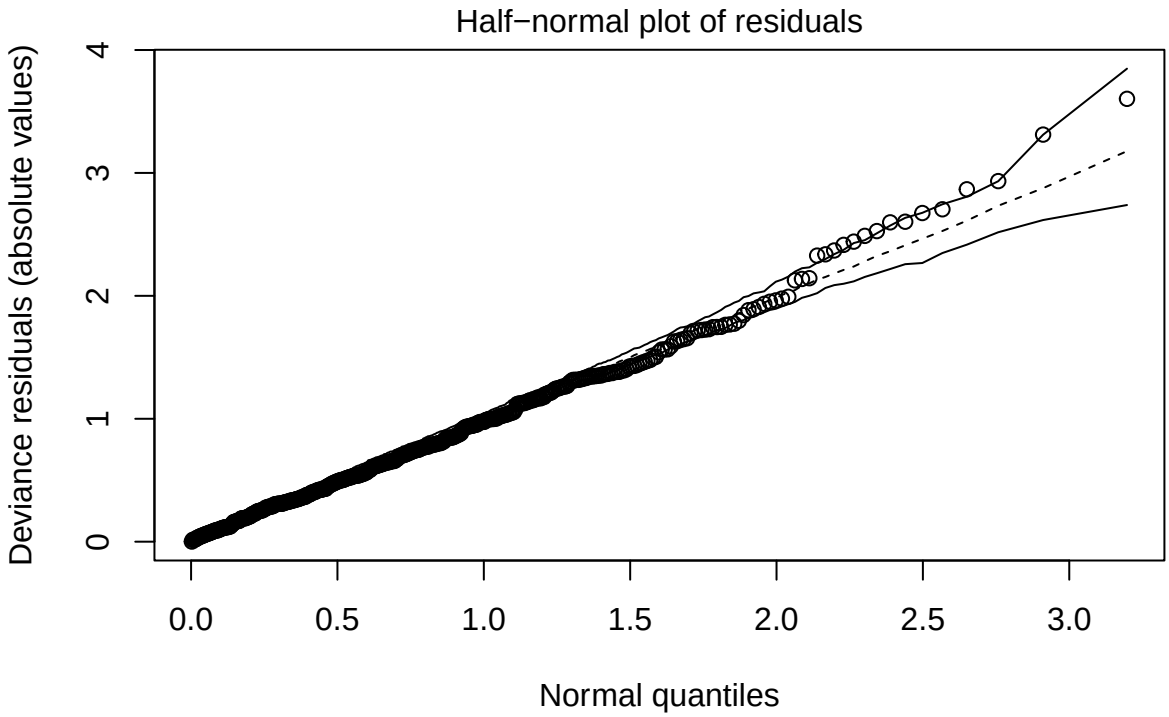

```
plot(modelo_beta_cauchit1, which = 3, type = "pearson")
```



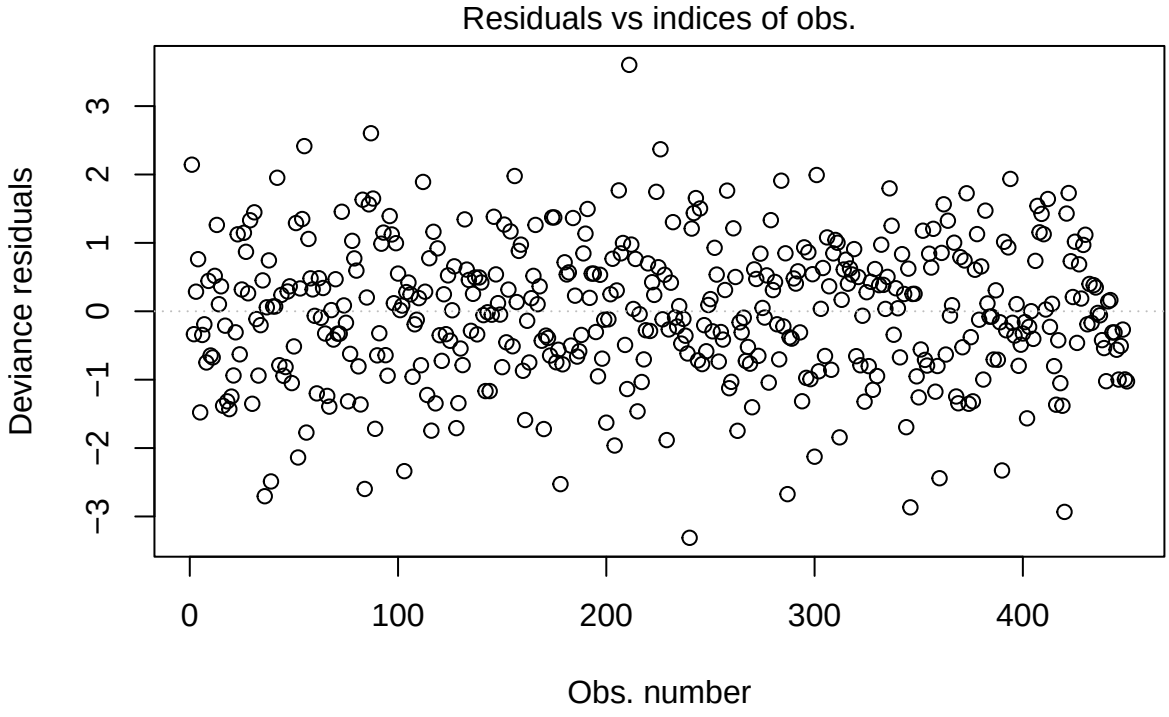

```
plot(modelo_beta_cauchit1, which = 4, type = "pearson")
```




```
plot(modelo_beta_cauchit1, which = 5, type = "deviance", sub.caption = "")
```




```
plot(modelo_beta_cauchit1, which = 1, type = "deviance", sub.caption = "")
```



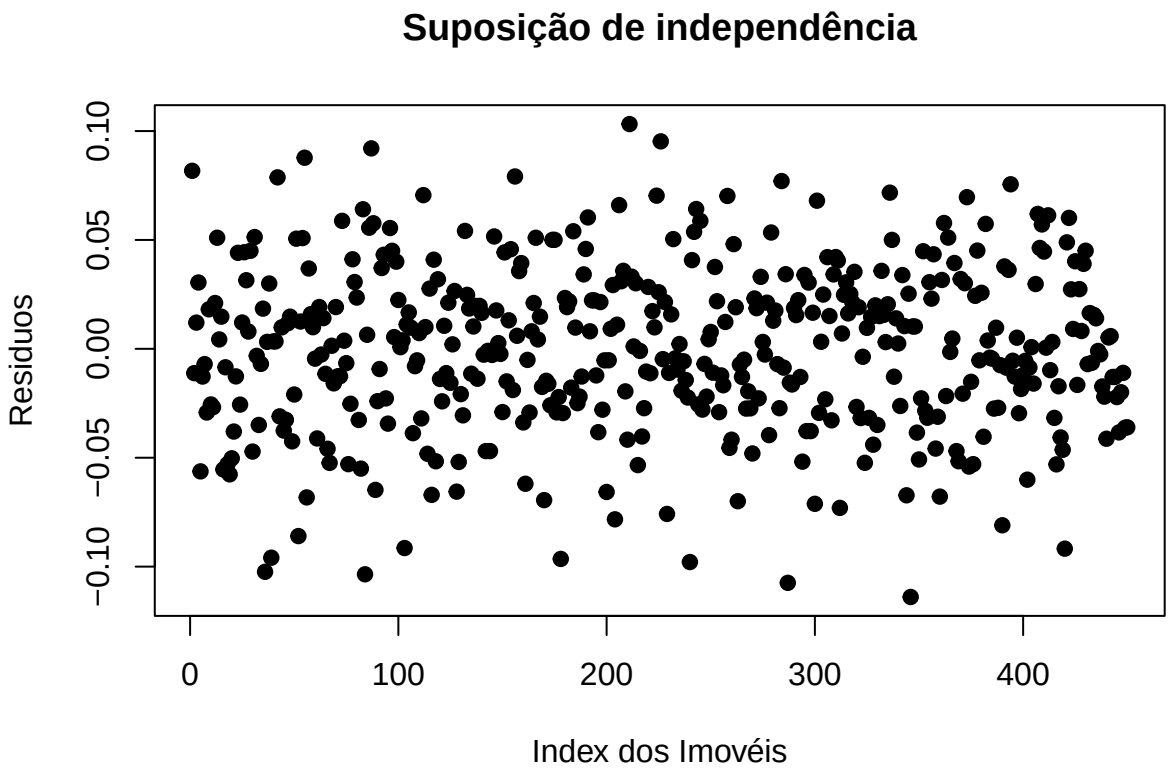

```
shapiro.test(modelo_beta_cauchit1$residuals) #p-value =
```

```
##
##  Shapiro-Wilk normality test
##
## data:  modelo_beta_cauchit1$residuals
## W = 0.9963, p-value = 0.3833
```

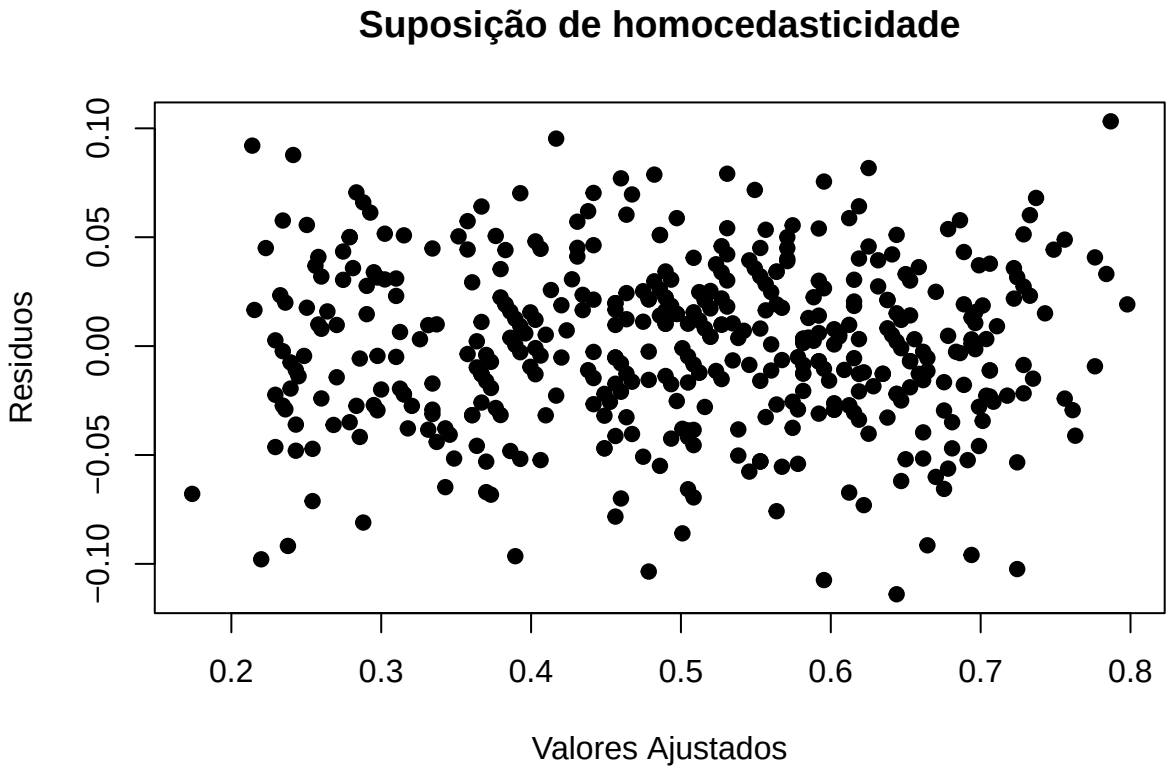
```r
#Teste de durbin watson para independencia
library(lmtest)
dwtest(modelo_beta_cauchit1) #p-value =
```

```
##
##  Durbin-Watson test
##
## data:  modelo_beta_cauchit1
## DW = 1.9507, p-value = 0.2889
## alternative hypothesis: true autocorrelation is greater than 0
```

```r
#Independência
plot(modelo_beta_cauchit1$residuals,
     ylab = "Residuos",
     xlab = "Index dos Imovéis",
     main = "Suposição de independência",
     pch = 19)
```




```r
#Homocedasticidade
plot(modelo_beta_cauchit1$fitted.values, modelo_beta_cauchit1$residuals,
     xlab = "Valores Ajustados",
     ylab = "Residuos",
     pch = 19,
     main = "Suposição de homocedasticidade"
)
```




```
#Breusch_Pagan para homocedasticdade
bptest(modelo_beta_cauchit1) #p-value =
```

```
##
##  studentized Breusch-Pagan test
##
## data:  modelo_beta_cauchit1
## BP = 4.3624, df = 1, p-value = 0.03674
```