

Melhores Regular

2024-05-03

```
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

##### Regressão linear #####
#####backward regression #####
#Seleção das variáveis para compor o modelo, mas precisa depois fazer os teste de resíduo
modelo_back <- lm(WINP ~ PTS + FGP + PF + PlusMinus, data = dados_regressao)
modelo_back

##
## Call:
## lm(formula = WINP ~ PTS + FGP + PF + PlusMinus, data = dados_regressao)
##
## Coefficients:
## (Intercept)          PTS          FGP          PF          PlusMinus
##  0.4105976   -0.0006542    0.0048736   -0.0032414    0.0304204

coef(modelo_back)

##      (Intercept)          PTS          FGP          PF          PlusMinus
## 0.4105975914 -0.0006542452  0.0048736395 -0.0032414270  0.0304203770

anova(modelo_back)

## Analysis of Variance Table
##
## Response: WINP
##          Df Sum Sq Mean Sq F value    Pr(>F)
## PTS        1  0.9761   0.9761  655.61 < 2.2e-16 ***
## FGP        1  2.8026   2.8026 1882.29 < 2.2e-16 ***
## PF         1  0.2162   0.2162  145.18 < 2.2e-16 ***
## PlusMinus  1  5.5307   5.5307 3714.59 < 2.2e-16 ***
```

```
## Residuals 445 0.6626 0.0015
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

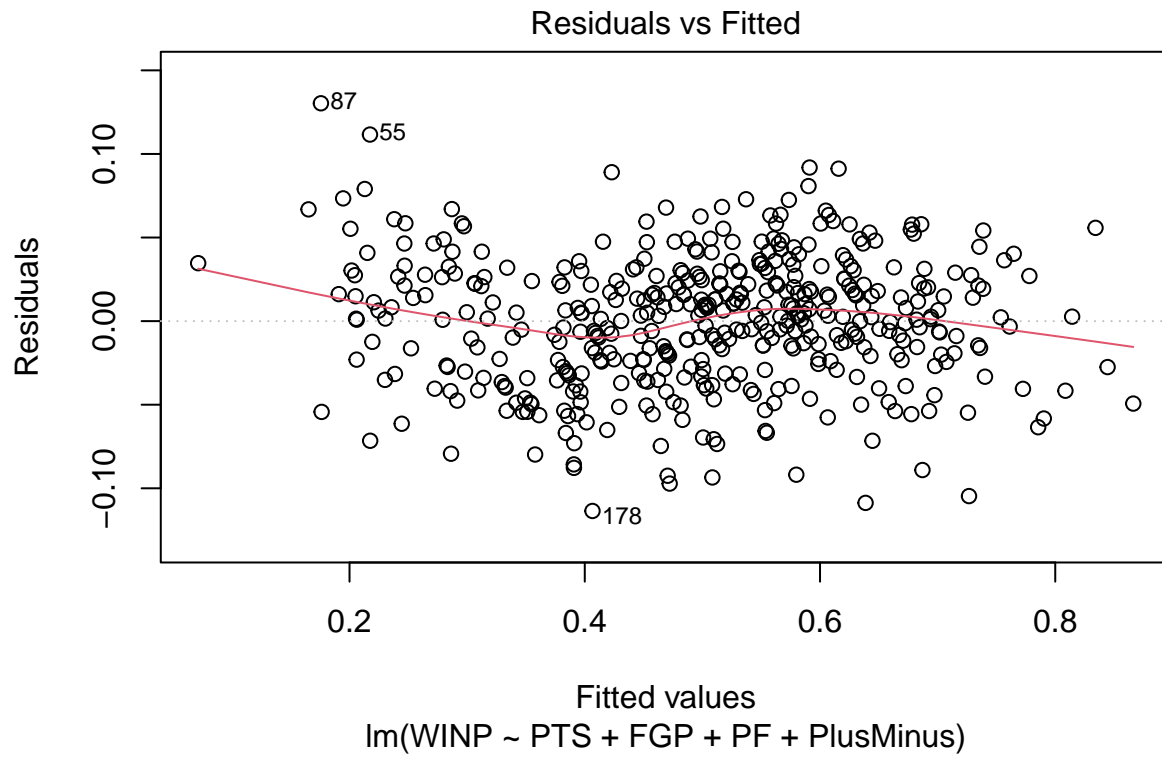
summary(modelo_back) #Adjusted R-squared: 0.9344

##
## Call:
## lm(formula = WINP ~ PTS + FGP + PF + PlusMinus, data = dados_regressao)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.113561 -0.026335  0.002916  0.025377  0.130296
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.4105976  0.0715538   5.738 1.77e-08 ***
## PTS         -0.0006542  0.0003239  -2.020  0.04402 *
## FGP          0.0048736  0.0016969   2.872  0.00427 **
## PF          -0.0032414  0.0013132  -2.468  0.01395 *
## PlusMinus    0.0304204  0.0004991  60.947 < 2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.03859 on 445 degrees of freedom
## Multiple R-squared:  0.935, Adjusted R-squared:  0.9344
## F-statistic: 1599 on 4 and 445 DF, p-value: < 2.2e-16

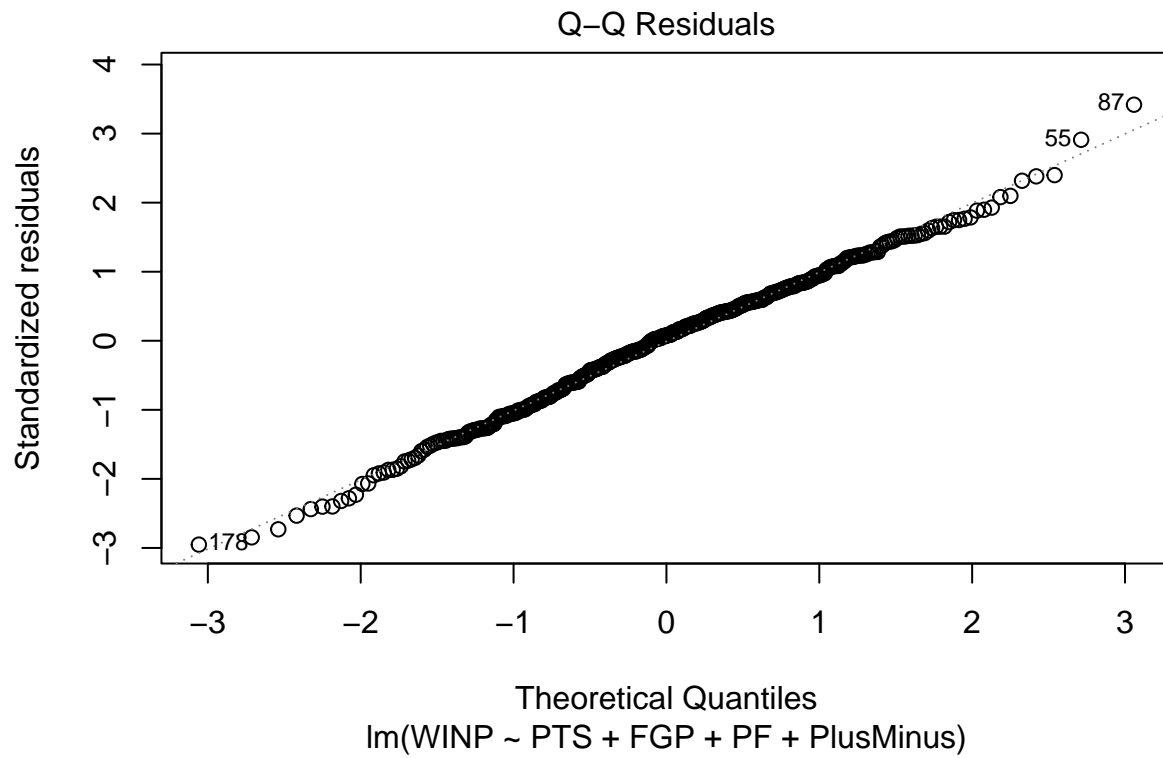
AIC(modelo_back) #-1645.353

## [1] -1645.353

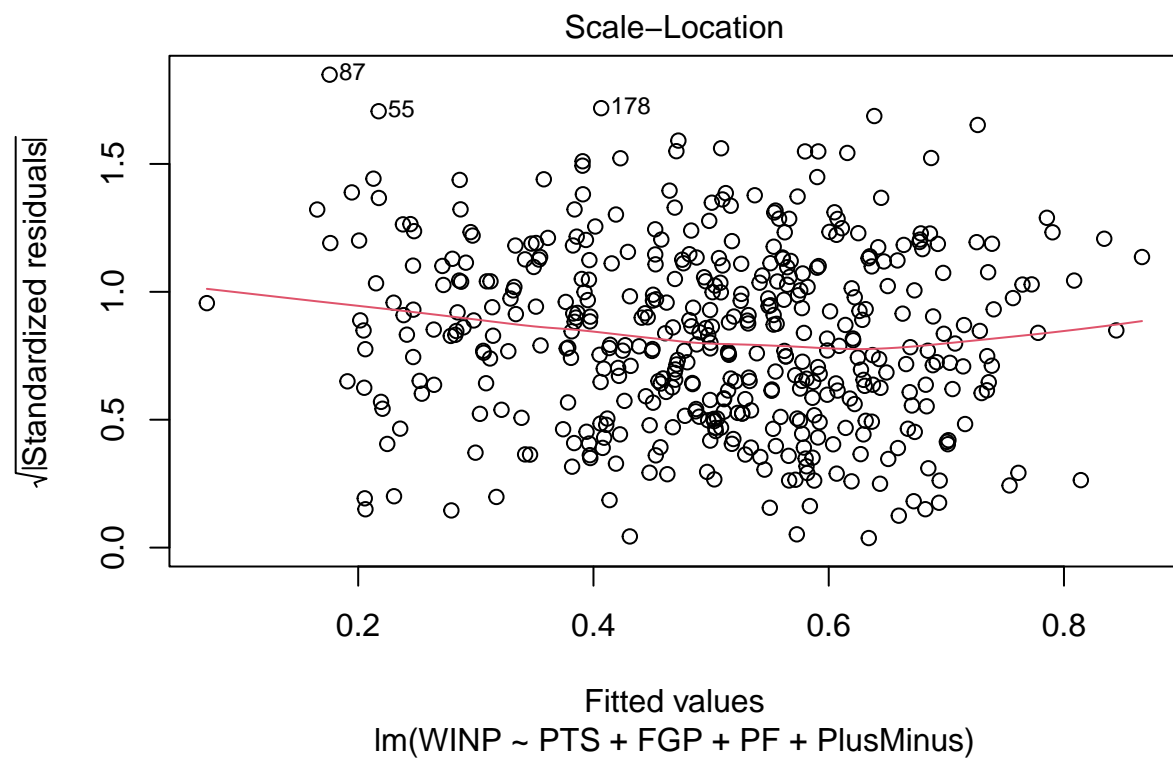
###Resíduos ###
plot(modelo_back, which = 1)
```



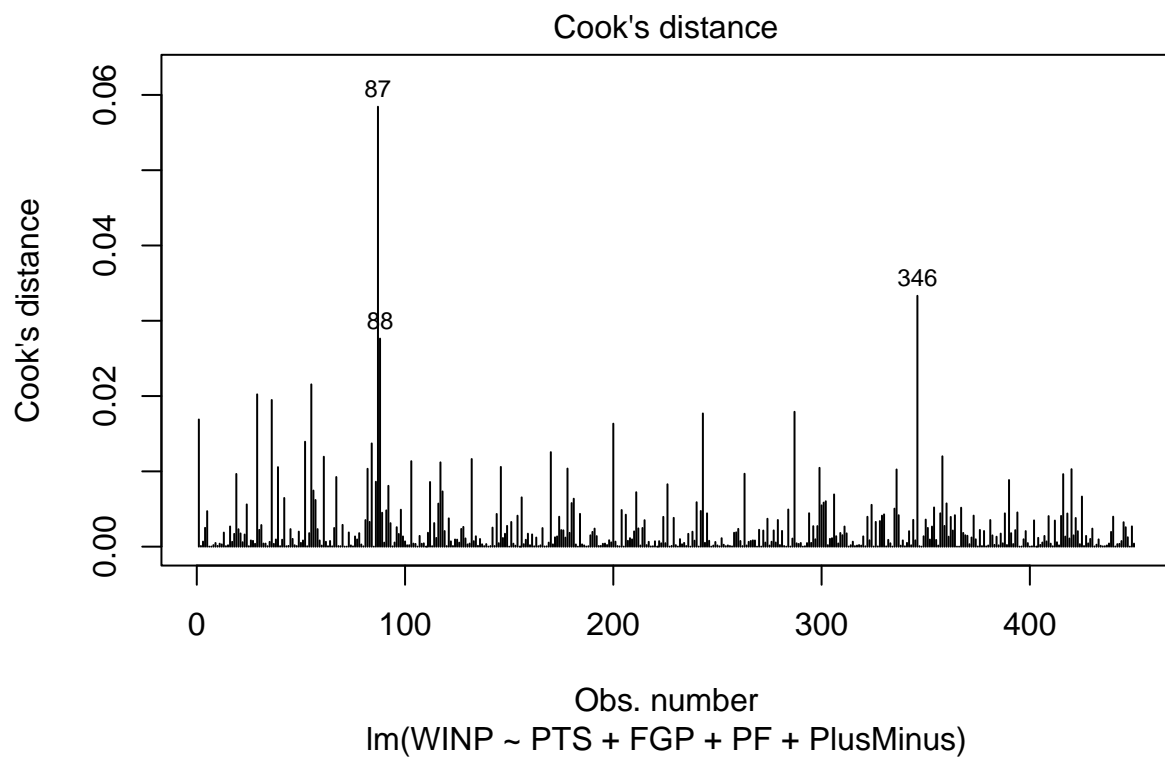
```
plot(modelo_back, which = 2)
```



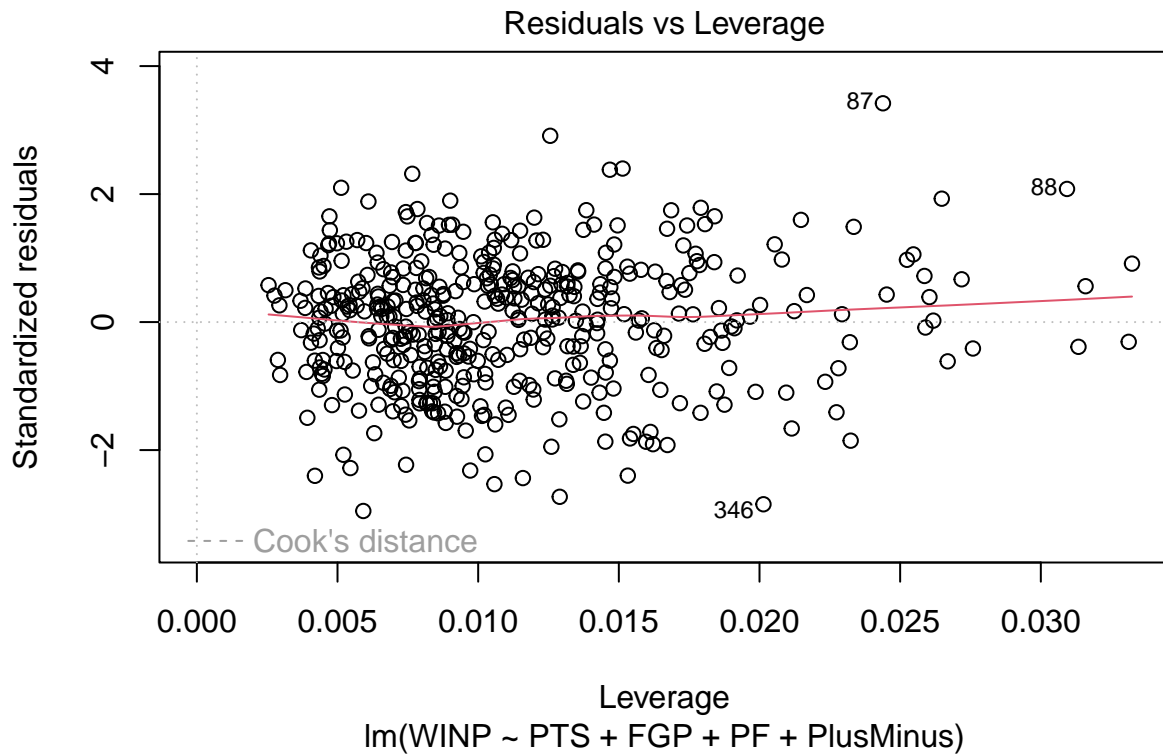
```
plot(modelo_back, which = 3)
```



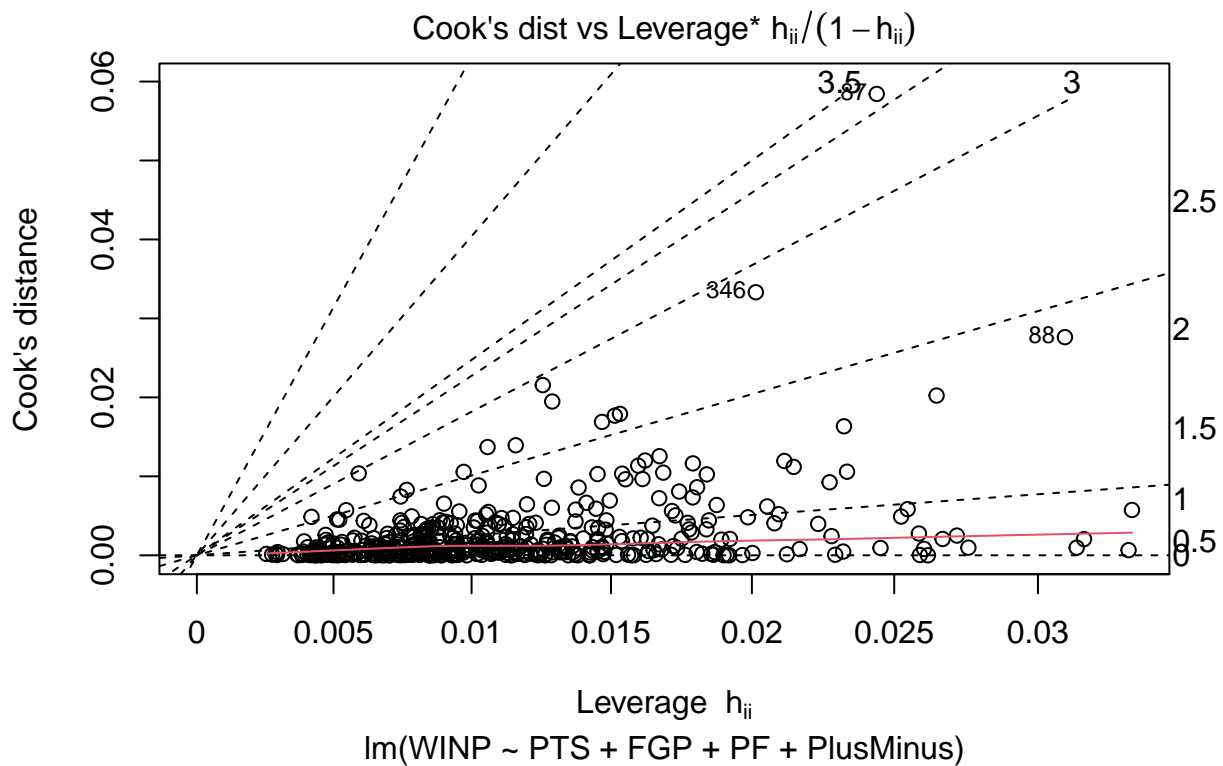
```
plot(modelo_back, which = 4)
```



```
plot(modelo_back, which = 5)
```



```
plot(modelo_back, which = 6)
```



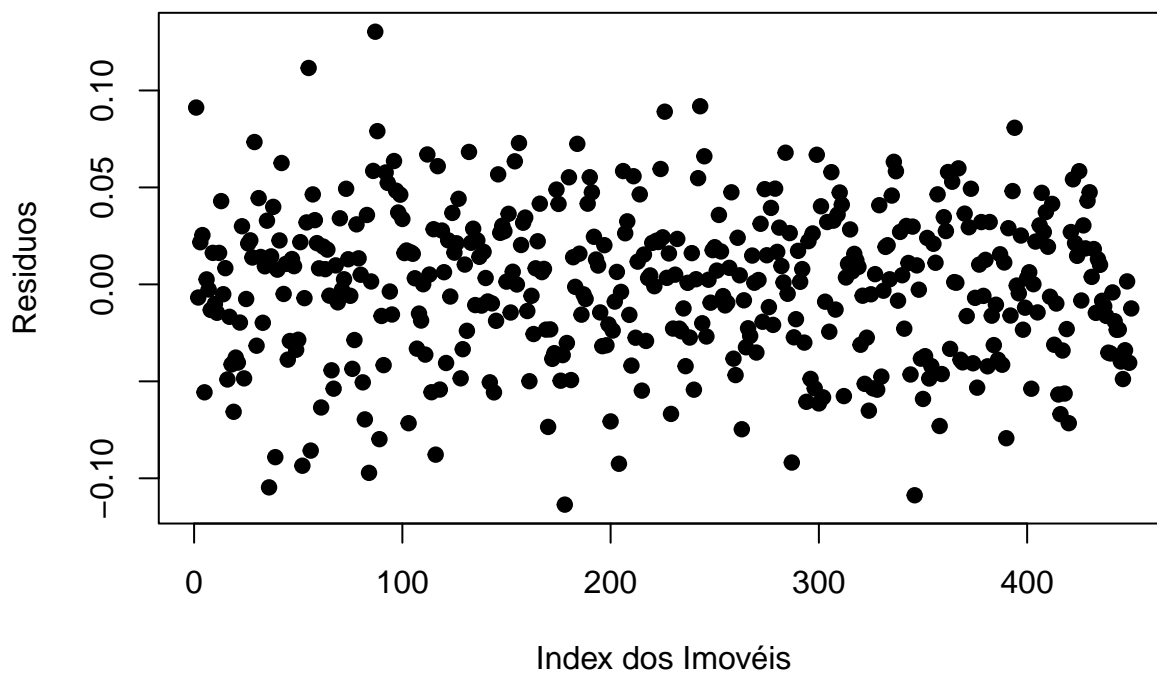
```
shapiro.test(modelo_back$residuals) #p-value = 0.2669, normal
```

```
##  
## Shapiro-Wilk normality test
```

```
##
## data: modelo_back$residuals
## W = 0.99576, p-value = 0.2669
#Teste de durbin watson para independencia
library(lmtest)
dwtest(modelo_back) #p-value = 0.1735

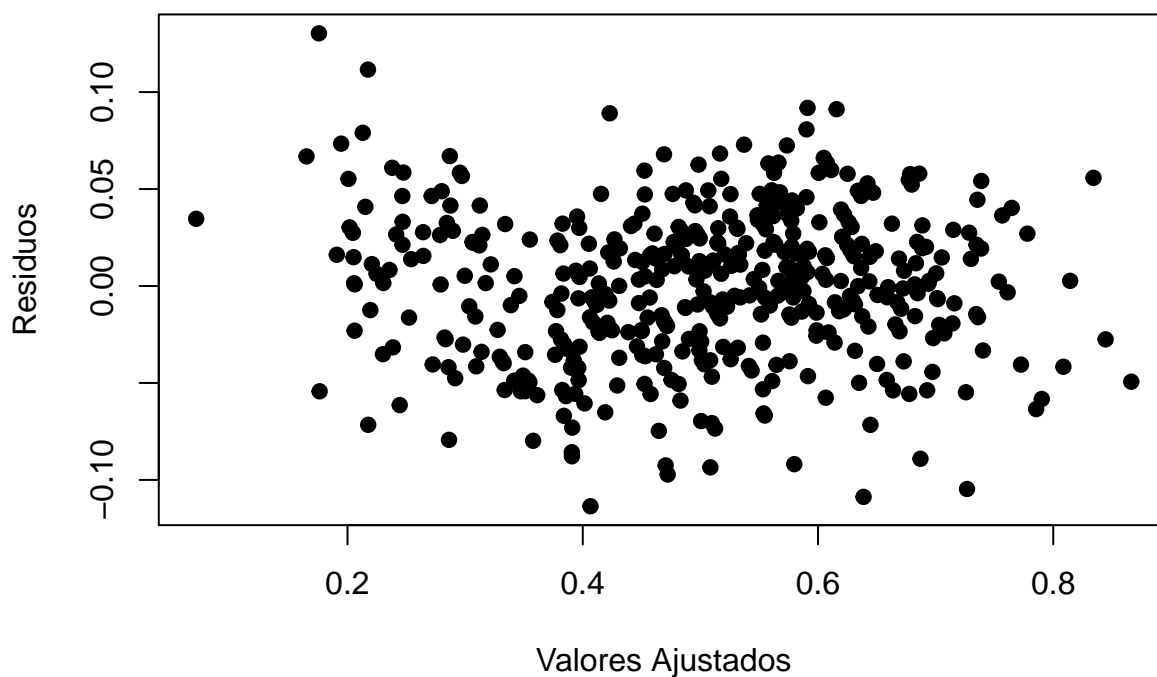
##
## Durbin-Watson test
##
## data: modelo_back
## DW = 1.9193, p-value = 0.1735
## alternative hypothesis: true autocorrelation is greater than 0
#Independência
plot(modelo_back$residuals,
      ylab = "Resíduos",
      xlab = "Index dos Imóveis",
      main = "Suposição de independência",
      pch = 19)
```

Suposição de independência



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

Suposição de homocedasticidade



```
#Breusch_Pagan para homocedasticidade  
bptest(modelo_back) #p-value = 0.0006407, heterocedasticidade
```

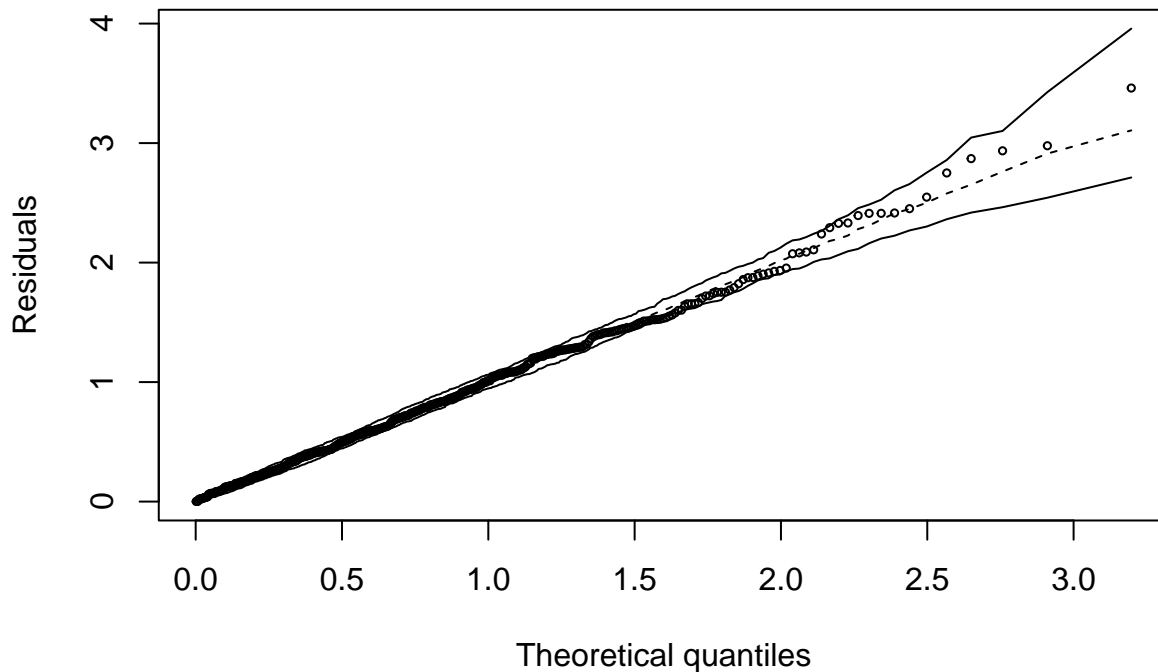
```
##  
## studentized Breusch-Pagan test  
##  
## data: modelo_back  
## BP = 19.451, df = 4, p-value = 0.0006407
```

```
#QQ Plot  
library(hnp)
```

```
## Loading required package: MASS  
##  
## Attaching package: 'MASS'  
##  
## The following object is masked from 'package:patchwork':  
##  
##   area  
##  
## The following object is masked from 'package:dplyr':  
##  
##   select
```

```
hnp(modelo_back)
```

```
## Gaussian model (lm object)
```

Forward Selection

```
modelo_forw <- lm(formula = WINP ~ PlusMinus + PF + FGP + FGM, data = dados_regressao)
modelo_forw
```

##

Call:

```
## lm(formula = WINP ~ PlusMinus + PF + FGP + FGM, data = dados_regressao)
```

##

Coefficients:

```
## (Intercept)    PlusMinus          PF          FGP          FGM
##   0.401565     0.030261    -0.003478     0.005746    -0.002433
```

```
coef(modelo_forw)
```

```
## (Intercept)    PlusMinus          PF          FGP          FGM
## 0.401564997 0.030260547 -0.003477604 0.005745605 -0.002433190
```

```
anova(modelo_forw)
```

Analysis of Variance Table

##

Response: WINP

```
##      Df Sum Sq Mean Sq  F value    Pr(>F)
## PlusMinus  1  9.5032   9.5032 6398.0581 < 2e-16 ***
## PF         1  0.0096   0.0096   6.4381 0.01151 *
## FGP        1  0.0068   0.0068   4.5541 0.03339 *
## FGM        1  0.0077   0.0077   5.1648 0.02353 *
## Residuals 445  0.6610   0.0015
```

```
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
summary(modelo_forw) #Adjusted R-squared: 0.9345
```

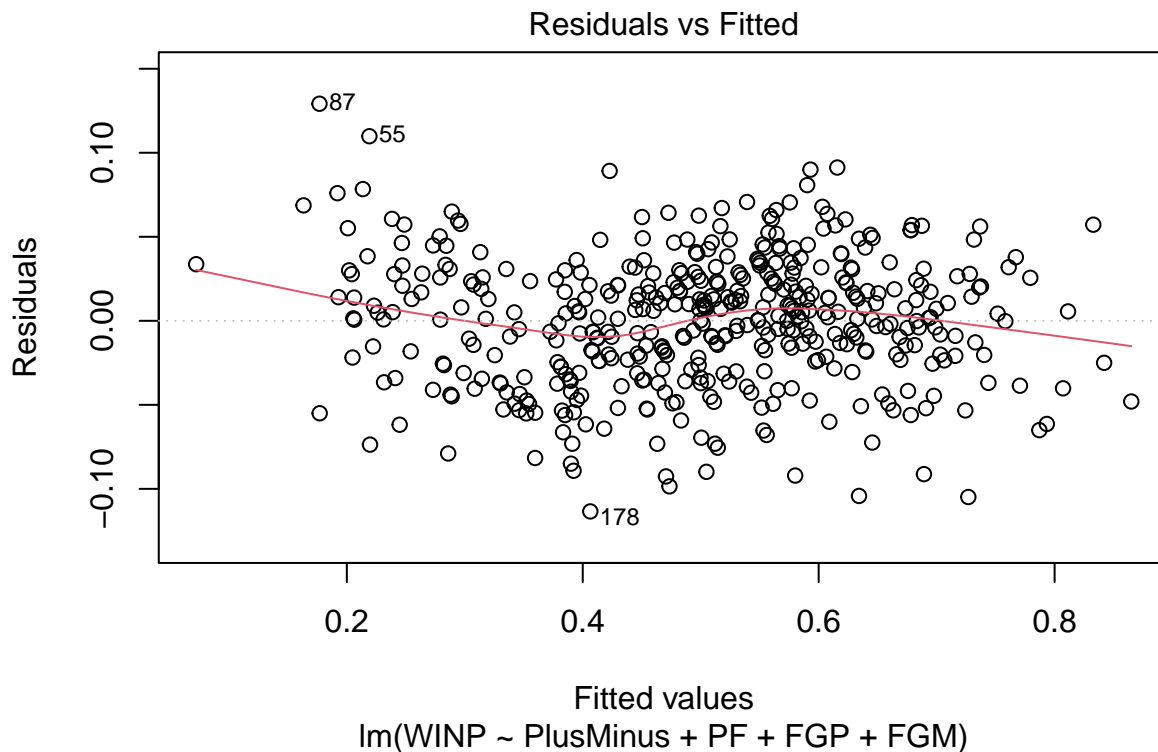
##

Call:

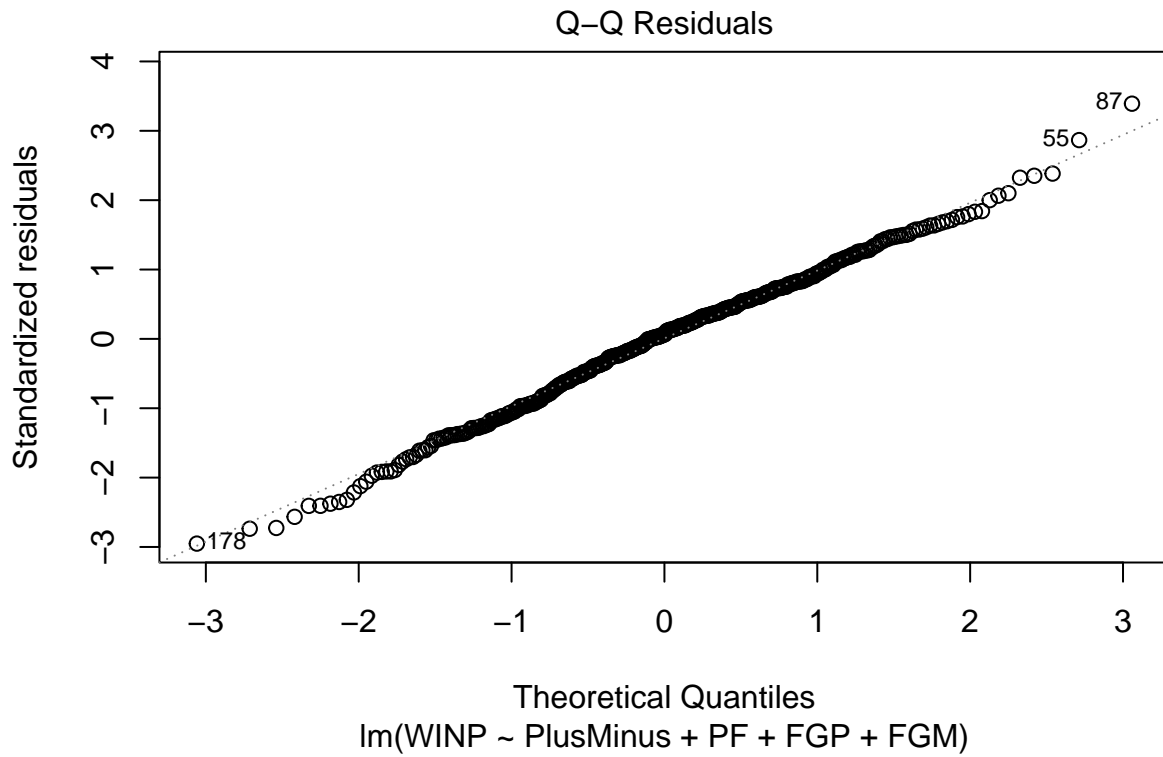
```
## lm(formula = WINP ~ PlusMinus + PF + FGP + FGM, data = dados_regressao)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.113414 -0.024898  0.002528  0.025502  0.129168
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.4015650   0.0718776   5.587 4.04e-08 ***
## PlusMinus    0.0302605   0.0005057  59.834 < 2e-16 ***
## PF          -0.0034776   0.0013110  -2.653  0.00827 **
## FGP          0.0057456   0.0018603   3.089  0.00214 **
## FGM         -0.0024332   0.0010707  -2.273  0.02353 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.03854 on 445 degrees of freedom
## Multiple R-squared:  0.9351, Adjusted R-squared:  0.9345
## F-statistic: 1604 on 4 and 445 DF, p-value: < 2.2e-16
```

Resíduos

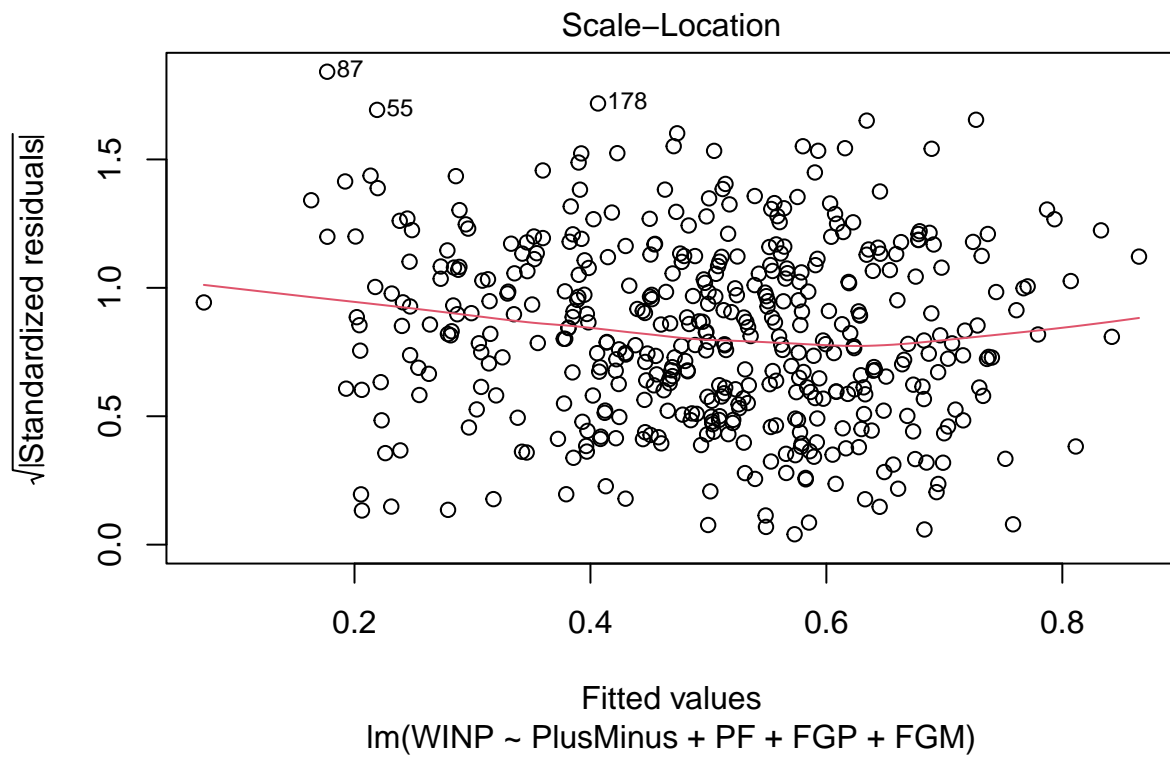
```
plot(modelo_forw, which = 1)
```



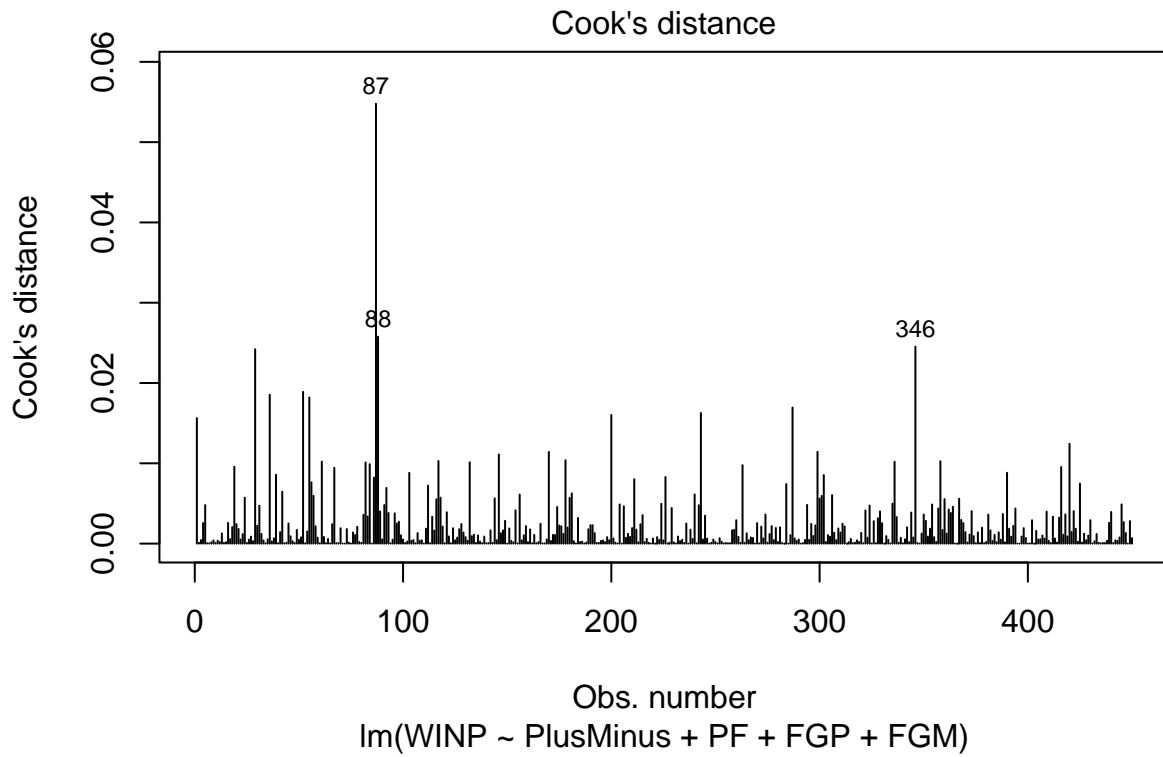
```
plot(modelo_forw, which = 2) #QQ-plot
```



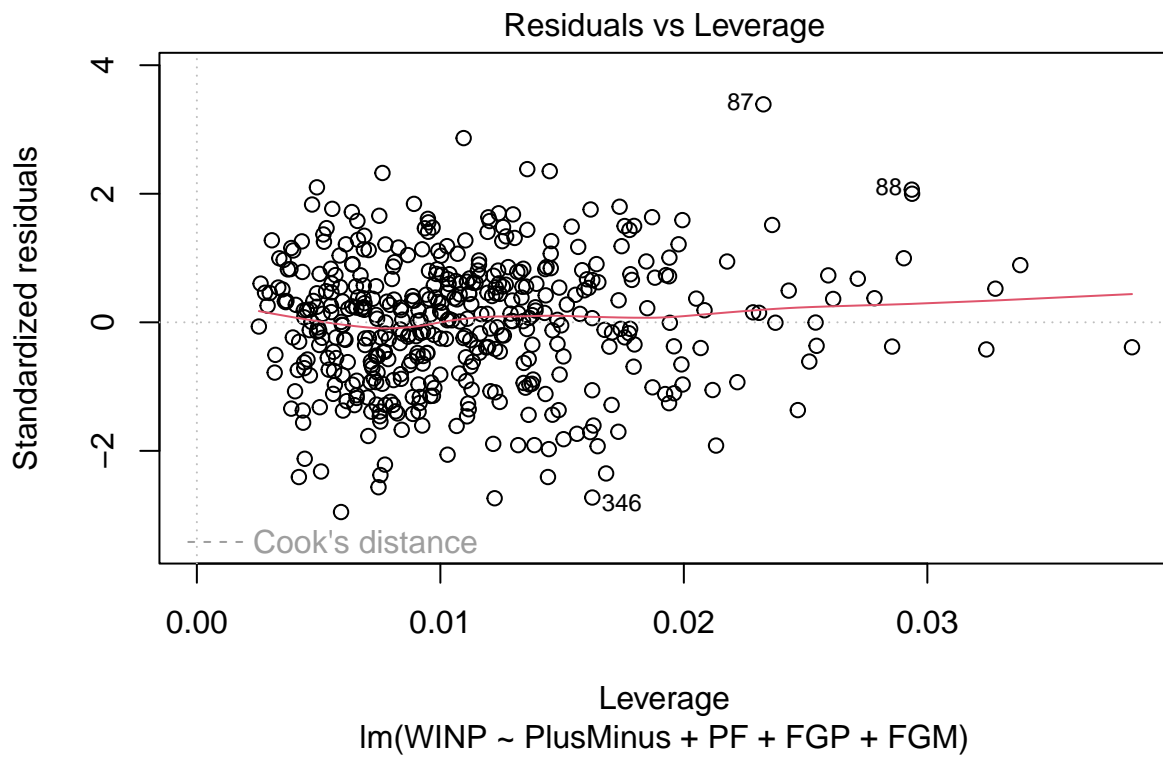
```
plot(modelo_forw, which = 3)
```



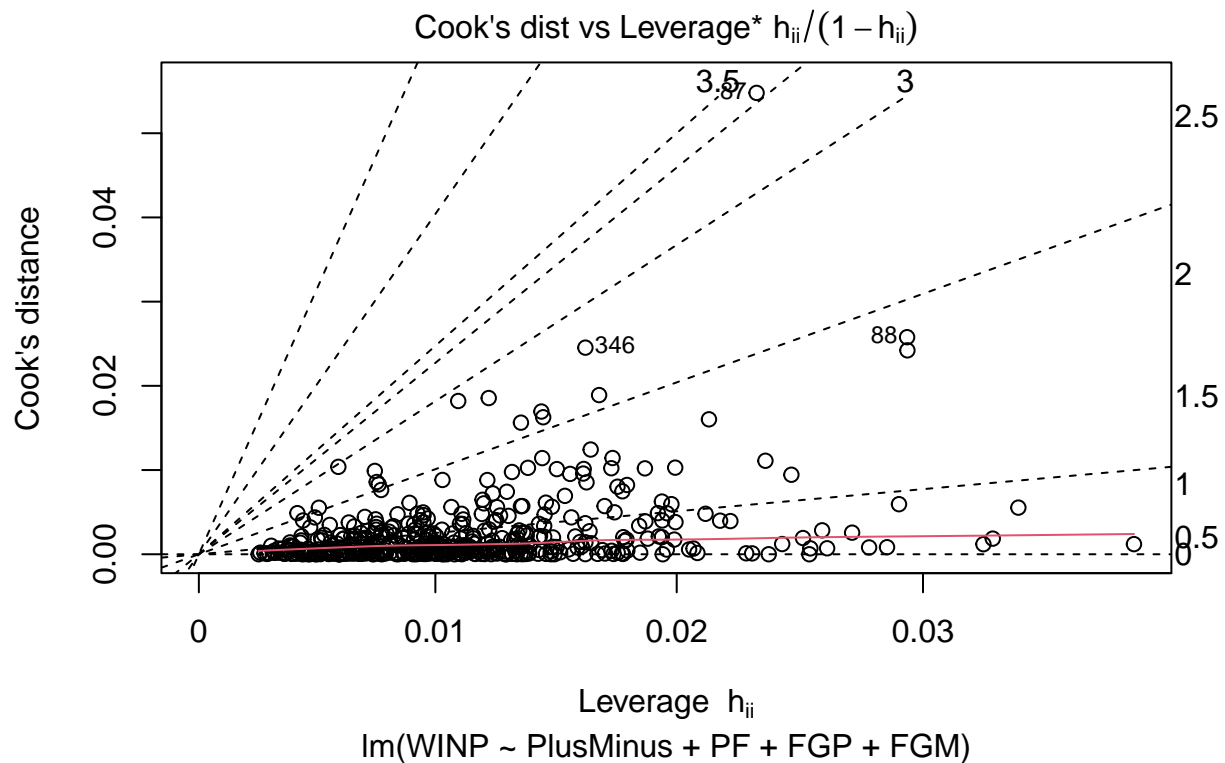
```
plot(modelo_forw, which = 4)
```



```
plot(modelo_forw, which = 5)
```



```
plot(modelo_forw, which = 6)
```



```
shapiro.test(modelo_forw$residuals) #p-value = 0.2296, não normal
```

```
##
##  Shapiro-Wilk normality test
##
## data:  modelo_forw$residuals
## W = 0.99555, p-value = 0.2296
```

```
#Teste de durbin watson para independencia
```

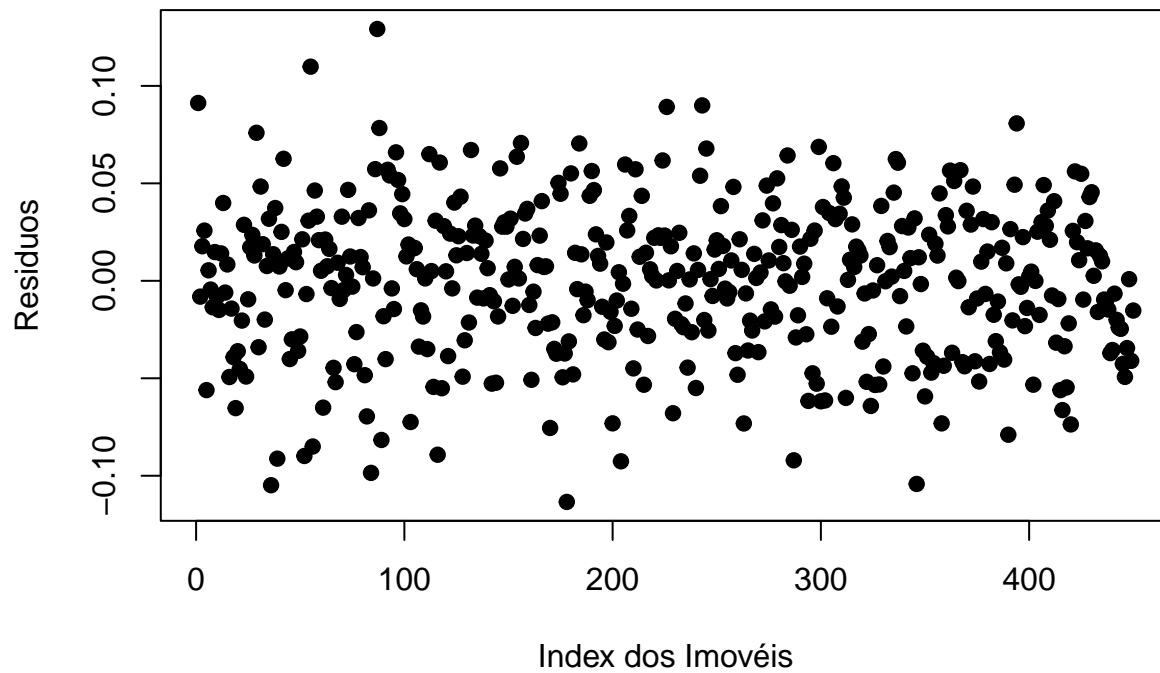
```
library(lmtest)
dwtest(modelo_forw) #p-value = 0.195
```

```
##
##  Durbin-Watson test
##
## data:  modelo_forw
## DW = 1.9266, p-value = 0.195
## alternative hypothesis: true autocorrelation is greater than 0
```

```
#Independência
```

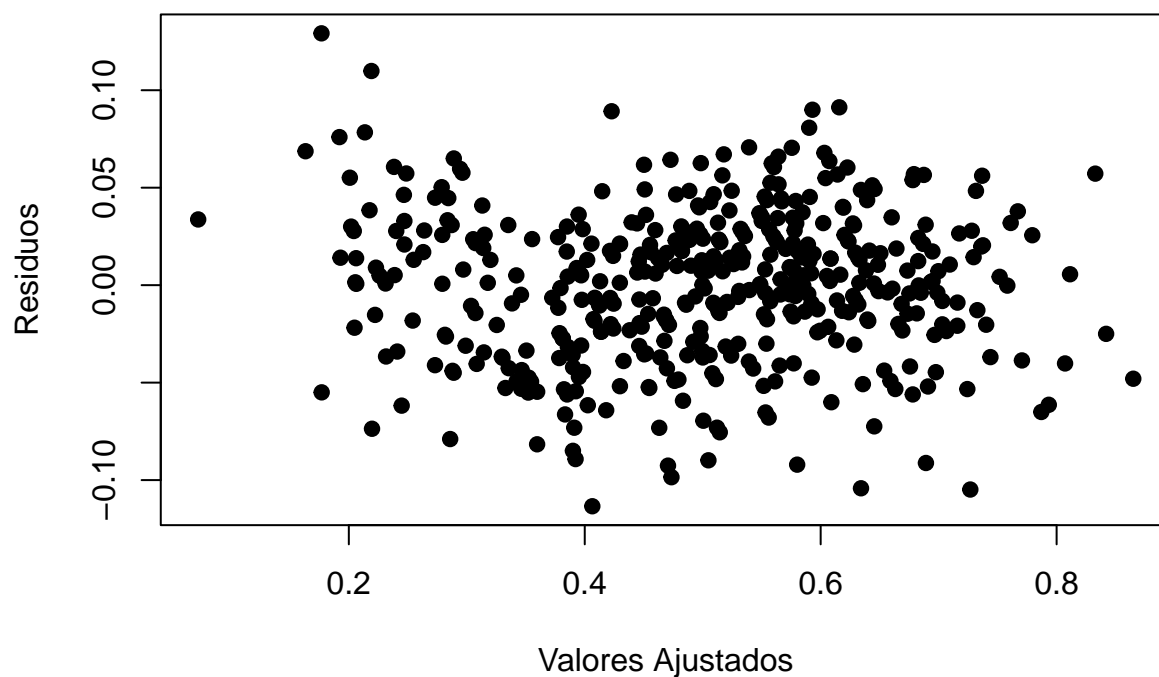
```
plot(modelo_forw$residuals,
     ylab = "Resíduos",
     xlab = "Index dos Imóveis",
     main = "Suposição de independência",
     pch = 19)
```

Suposição de independência



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

Suposição de homocedasticidade

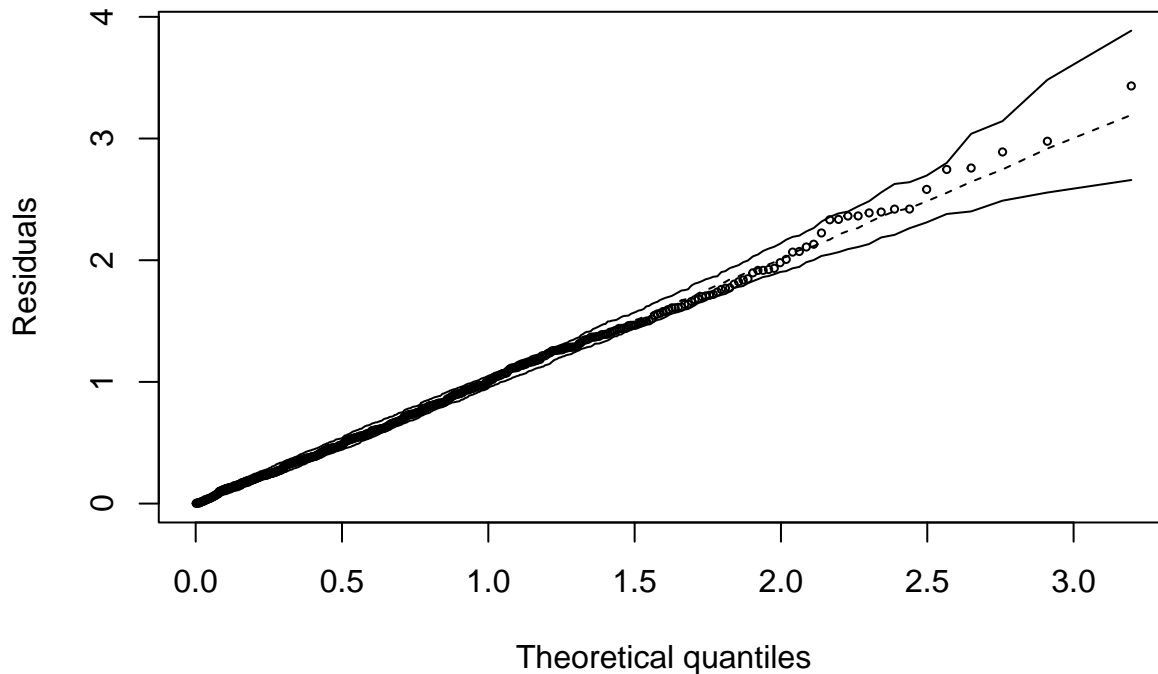


```
#Breusch_Pagan para homocedasticidade  
bptest(modelo_forw) #p-value = 0.001575, heterocedasticidade
```

```
##  
## studentized Breusch-Pagan test  
##  
## data: modelo_forw  
## BP = 17.457, df = 4, p-value = 0.001575
```

```
library(hnp)  
hnp(modelo_forw)
```

```
## Gaussian model (lm object)
```



```
##### Regressão beta #####
##### Logito #####
#Melhor modelo logito é o modelo com `3PP` + PF + PlusMinus que é modelo_beta12_3.
modelo_beta12_3 <- betareg(WINP ~ `3PP` + PF + PlusMinus, data = dados_regressao)
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)

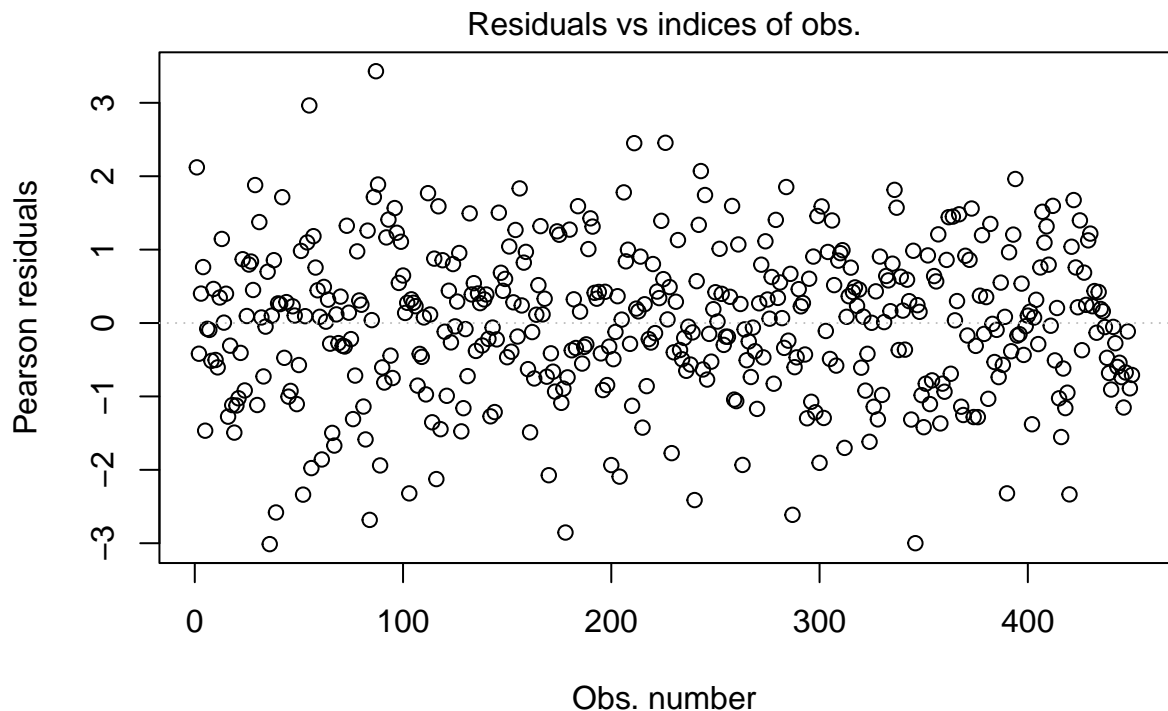
coef(modelo_beta12_3)

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

car::Anova(modelo_beta12_3)

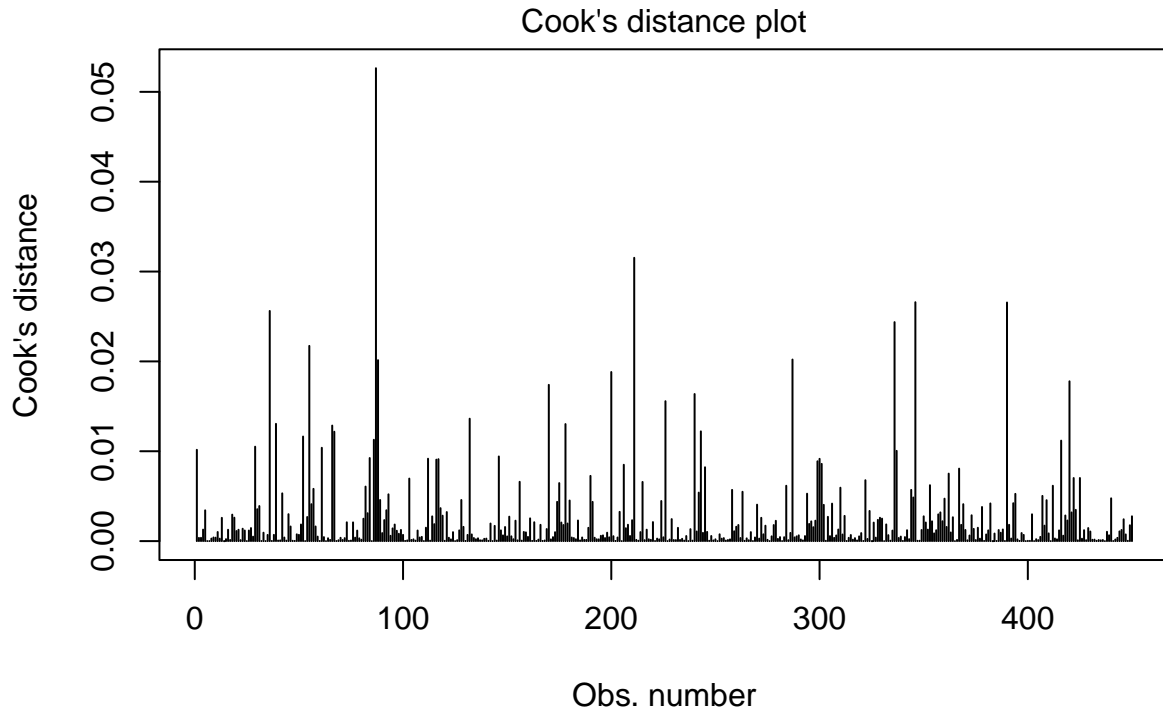
## Analysis of Deviance Table (Type II tests)
##
## Response: WINP
##      Df      Chisq Pr(>Chisq)
## `3PP`    1    3.0470   0.08089 .
## PF        1    5.2864   0.02149 *
## PlusMinus 1 3871.0668   < 2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

#####Resíduos Logito ###
plot(modelo_beta12_3, which = 1, type = "pearson")
```



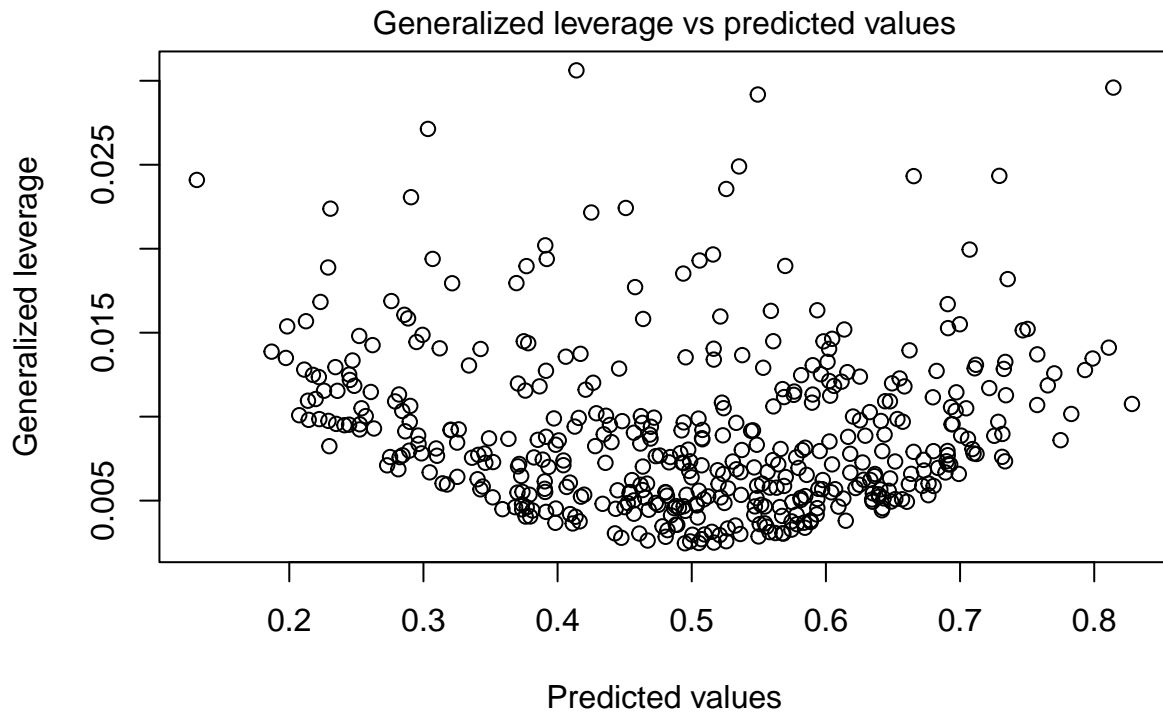
betareg(formula = WINP ~ '3PP' + PF + PlusMinus, data = dados_regressao)

```
plot(modelo_beta12_3, which = 2, type = "pearson")
```



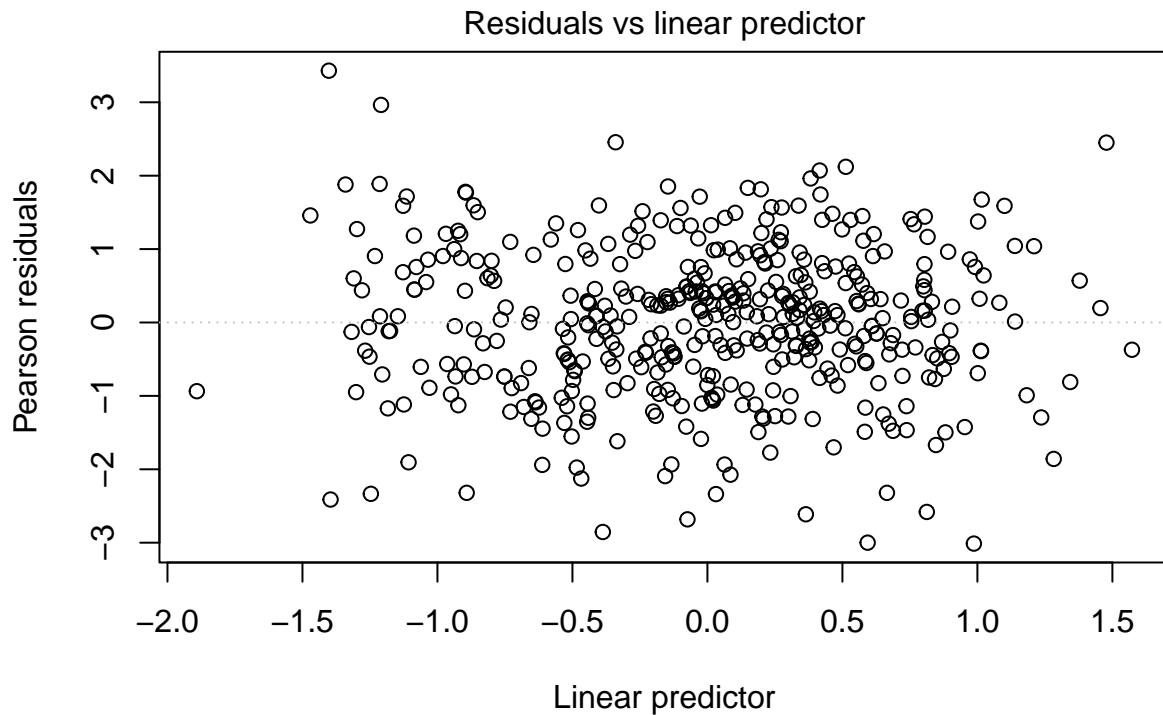
```
betareg(formula = WINP ~ '3PP' + PF + PlusMinus, data = dados_regressao)
```

```
plot(modelo_beta12_3, which = 3, type = "pearson")
```



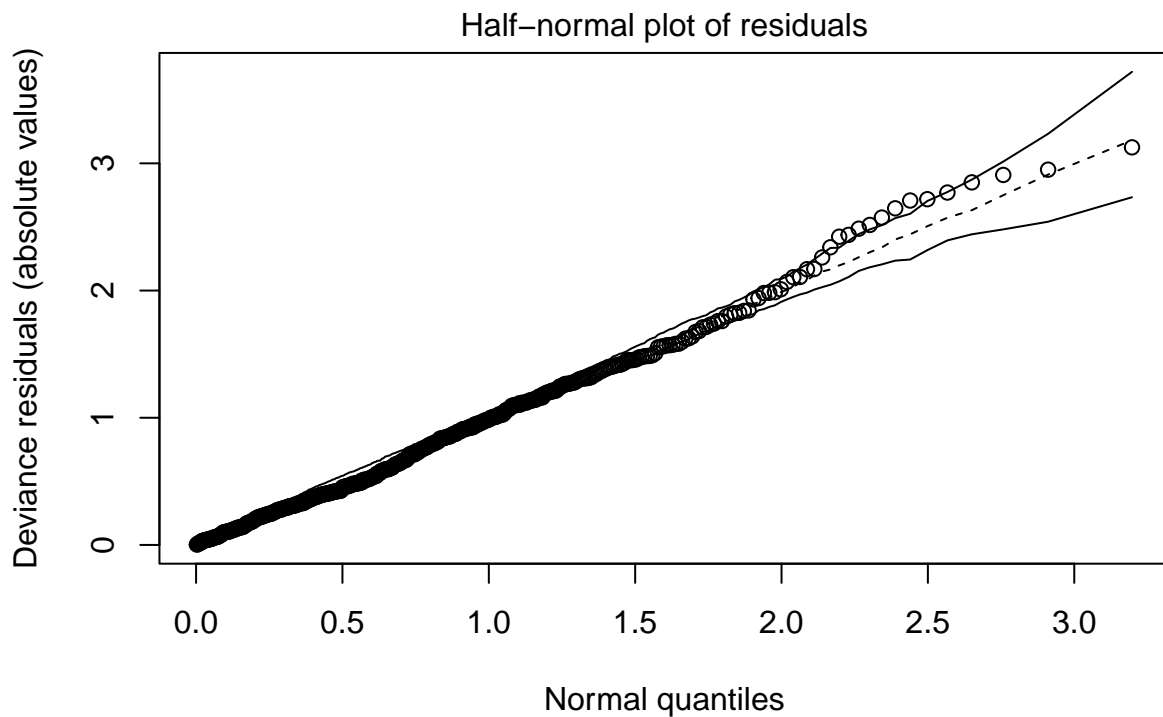
```
betareg(formula = WINP ~ '3PP' + PF + PlusMinus, data = dados_regressao)
```

```
plot(modelo_beta12_3, which = 4, type = "pearson")
```

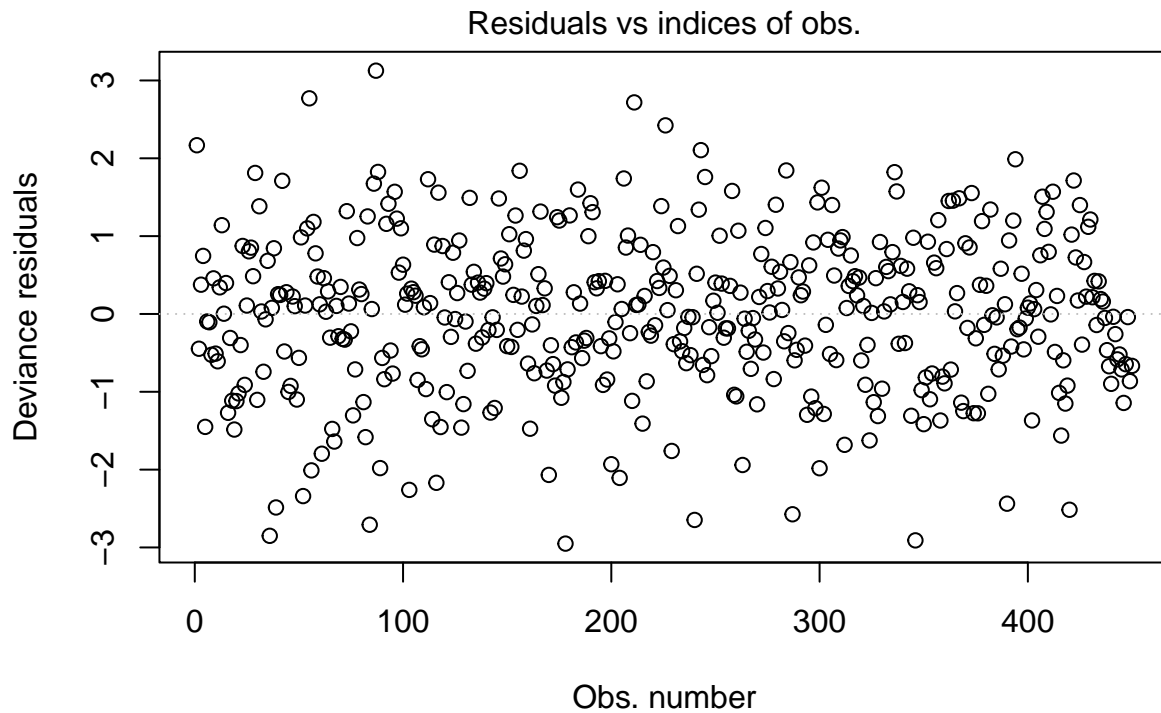


```
betareg(formula = WINP ~ '3PP' + PF + PlusMinus, data = dados_regressao)
```

```
plot(modelo_beta12_3, which = 5, type = "deviance", sub.caption = "")
```



```
plot(modelo_beta12_3, which = 1, type = "deviance", sub.caption = "")
```



```
shapiro.test(modelo_beta12_3$residuals) #p-value = 0.5895, normal
```

```
##
##  Shapiro-Wilk normality test
##
## data:  modelo_beta12_3$residuals
## W = 0.99475, p-value = 0.1284
```

```
#Teste de durbin watson para independencia
```

```
library(lmtest)
```

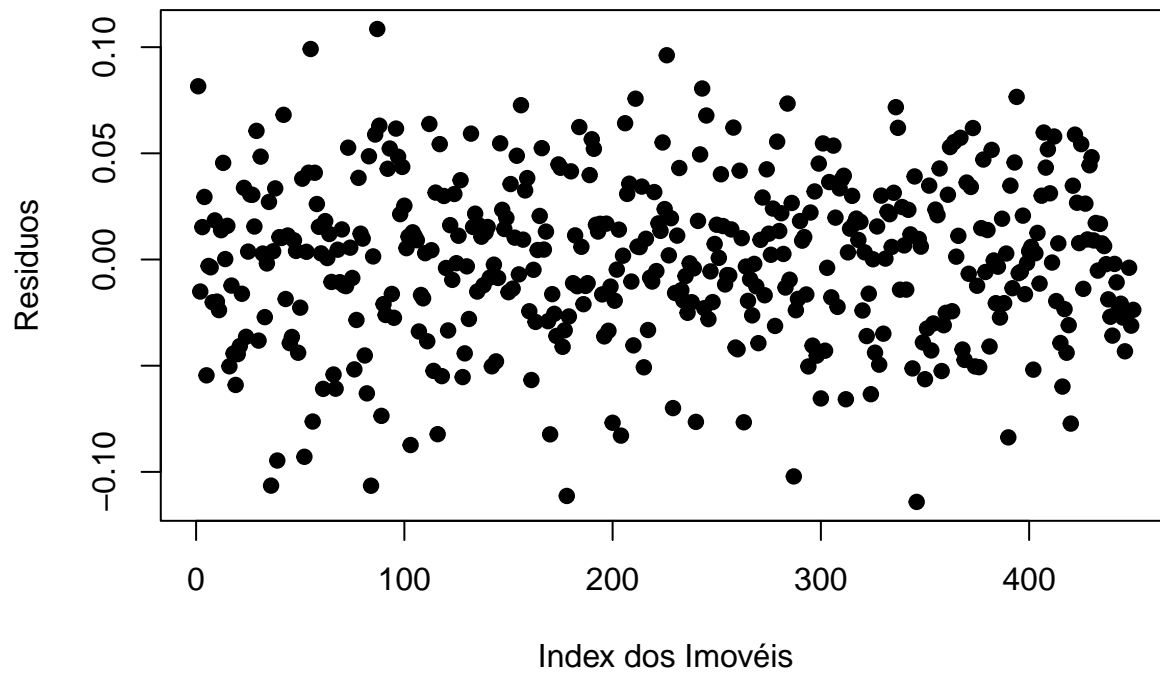
```
dwtest(modelo_beta12_3) #p-value = 0.2889
```

```
##
##  Durbin-Watson test
##
## data:  modelo_beta12_3
## DW = 1.936, p-value = 0.2336
## alternative hypothesis: true autocorrelation is greater than 0
```

```
#Independência
```

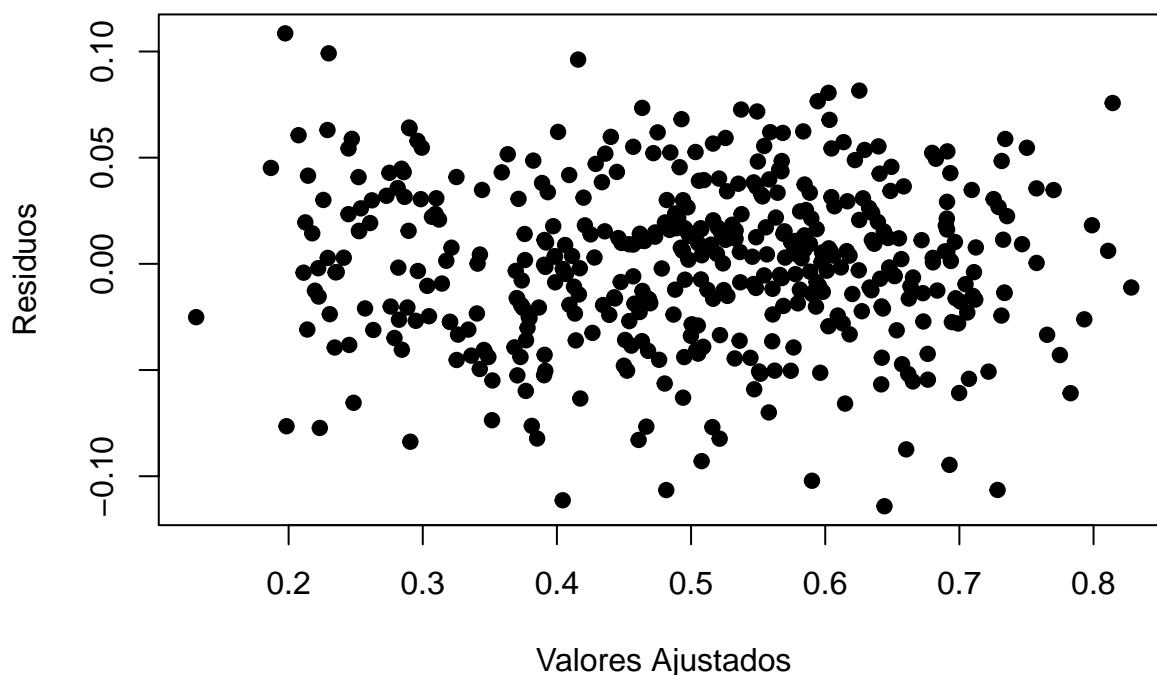
```
plot(modelo_beta12_3$residuals,
      ylab = "Resíduos",
      xlab = "Index dos Imóveis",
      main = "Suposição de independência",
      pch = 19)
```

Suposição de independência



```
#Homocedasticidade  
plot(modelo_beta12_3$fitted.values, modelo_beta12_3$residuals,  
      xlab = "Valores Ajustados",  
      ylab = "Resíduos",  
      pch = 19,  
      main = "Suposição de homocedasticidade"  
)
```

Suposição de homocedasticidade



```
#Breusch_Pagan para homocedasticidade
```

```
bptest(modelo_beta12_3) #p-value = 0.03674, heterocedasticidade
```

```
##
```

```
## studentized Breusch-Pagan test
```

```
##
```

```
## data: modelo_beta12_3
```

```
## BP = 14.444, df = 3, p-value = 0.002359
```

```
##### Loglog #####
```

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

```
modelo_beta21 <- betareg(WINP ~ STL + PF + PlusMinus,data = dados_regressao, link = "loglog") #Regressão
```

```
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
```

```
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)

```

```

coef(modelo_beta21)

```

```

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

```

```

car::Anova(modelo_beta21)

```

```

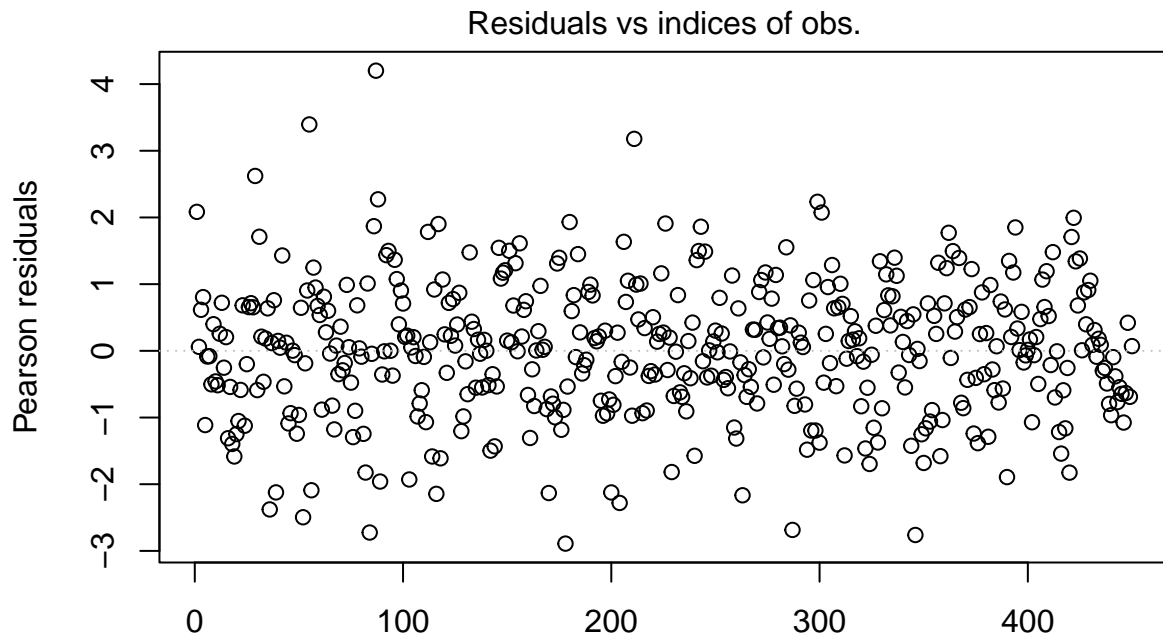
## Analysis of Deviance Table (Type II tests)
##
## Response: WINP
##              Df      Chisq Pr(>Chisq)
## STL           1      0.4149   0.519487
## PF            1      7.8518   0.005077 **
## PlusMinus     1 4918.2225 < 2.2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```

```

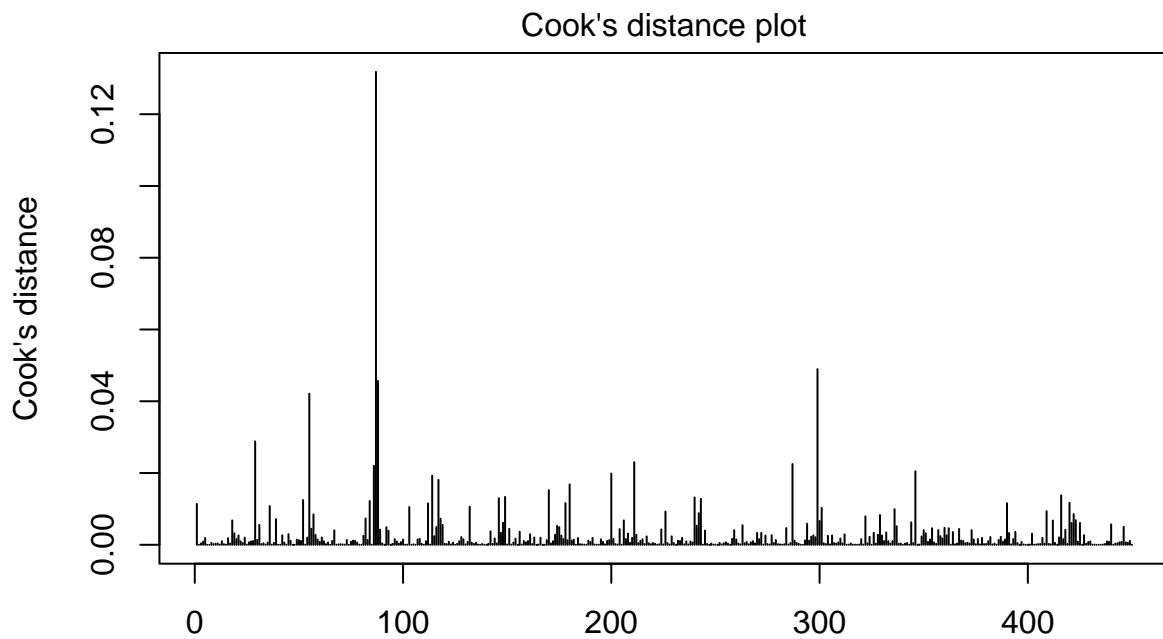
#### Resíduos loglog ##
plot(modelo_beta21, which = 1, type = "pearson")

```



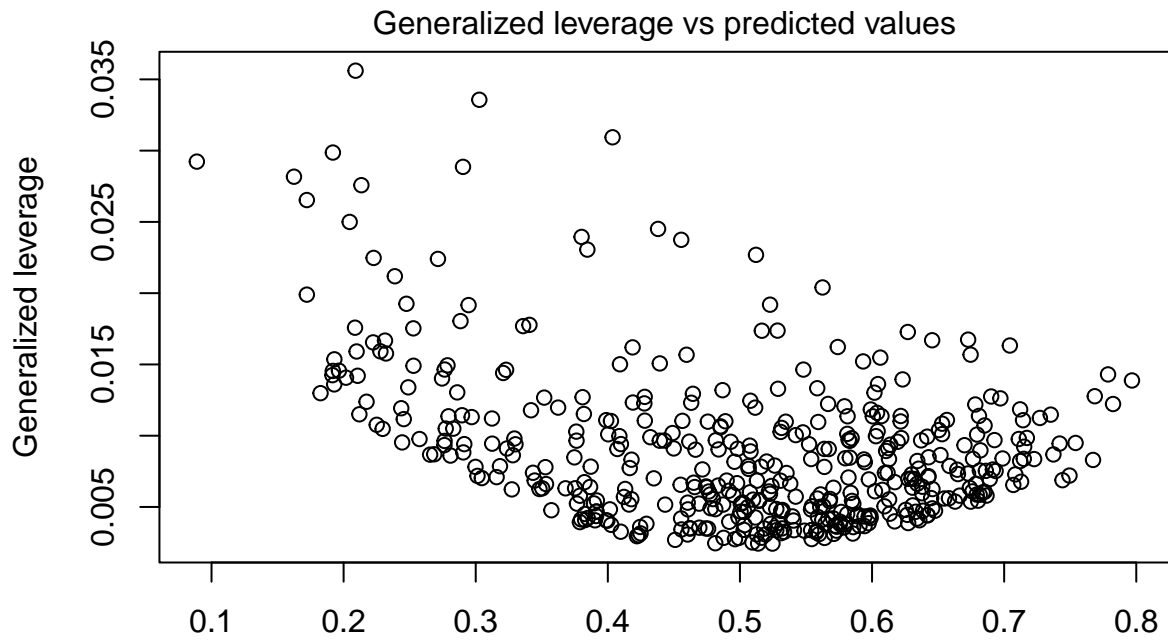
```
betareg(formula = WINP ~ STL_OBF + PIBusMinus, data = dados_regressao,
link = "loglog")
```

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



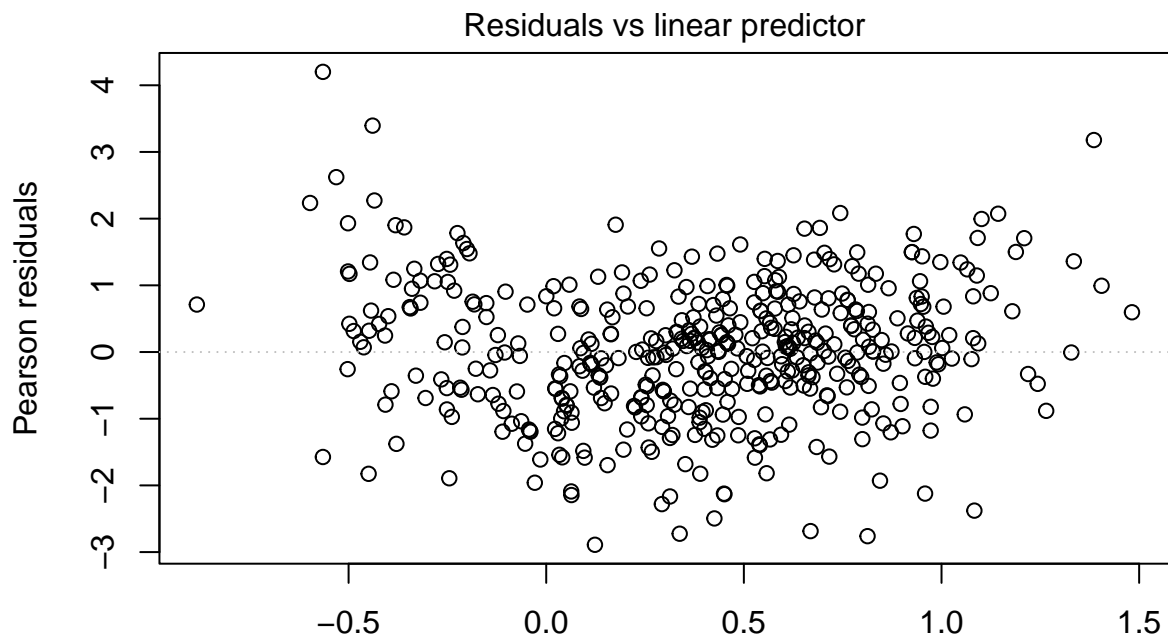
```
betareg(formula = WINP ~ STL_OBF + PIBusMinus, data = dados_regressao,
link = "loglog")
```

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

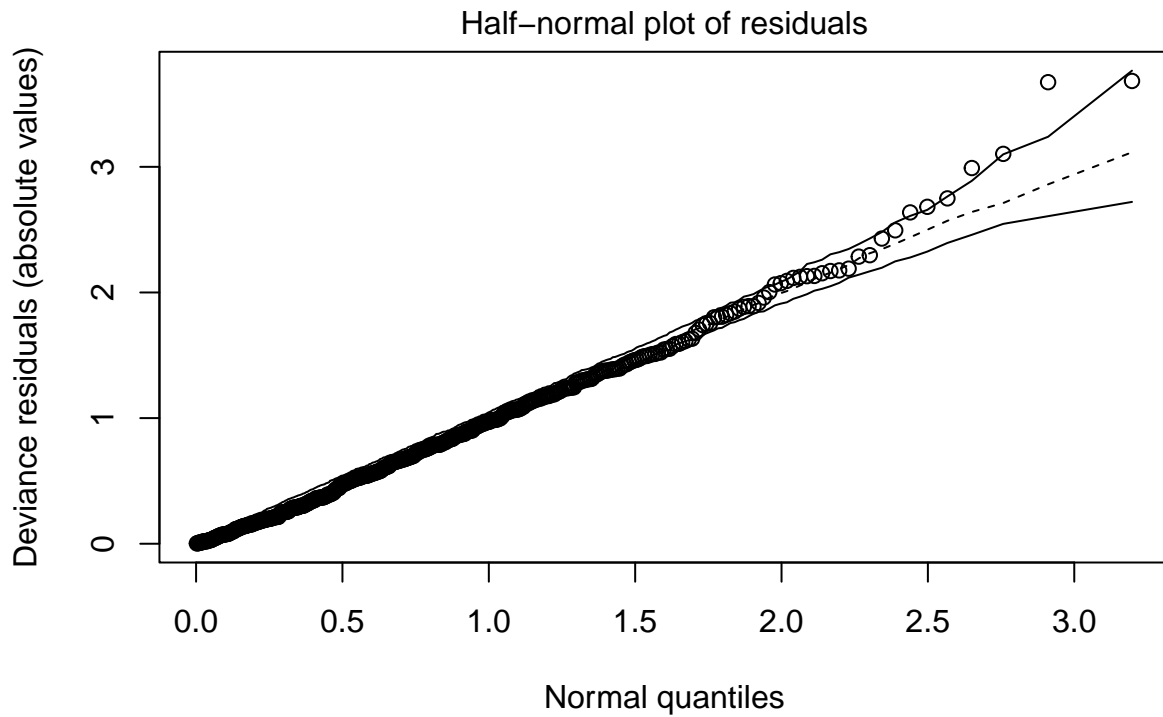
```
betareg(formula = WINP ~ STLineAR pPlusMinus, data = dados_regressao,
link = "loglog")
```

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

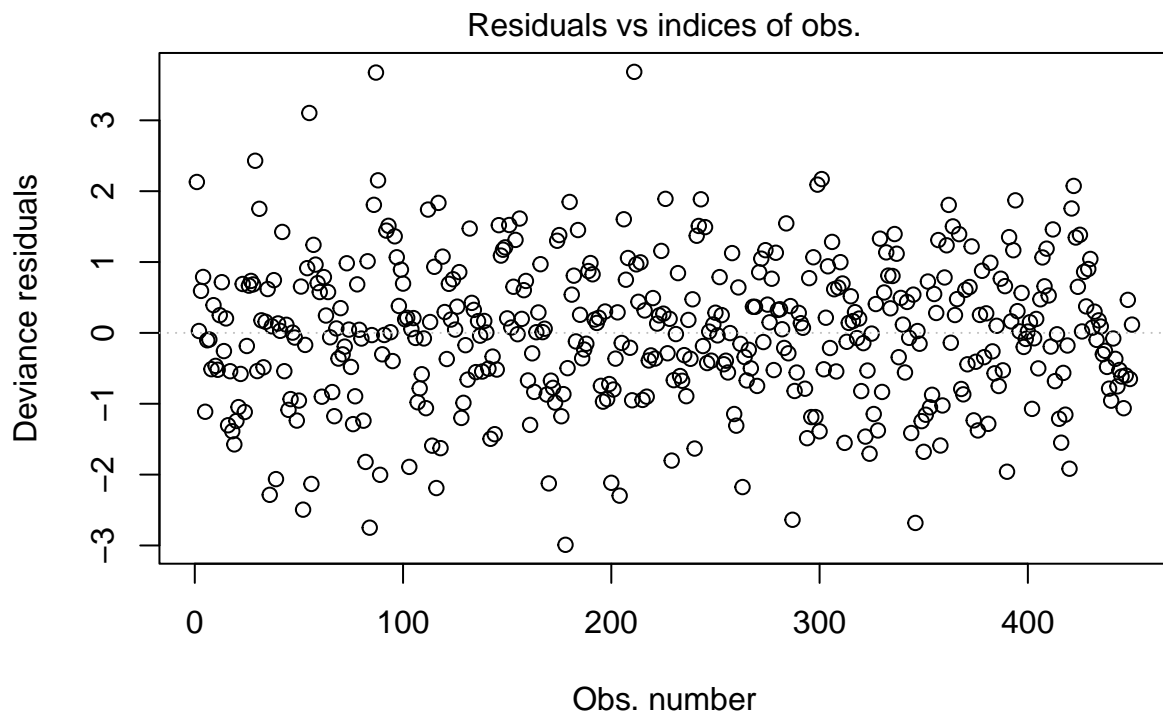


```
betareg(formula = WINP ~ STLineAR pPlusMinus, data = dados_regressao,
link = "loglog")
```

```
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
```

```

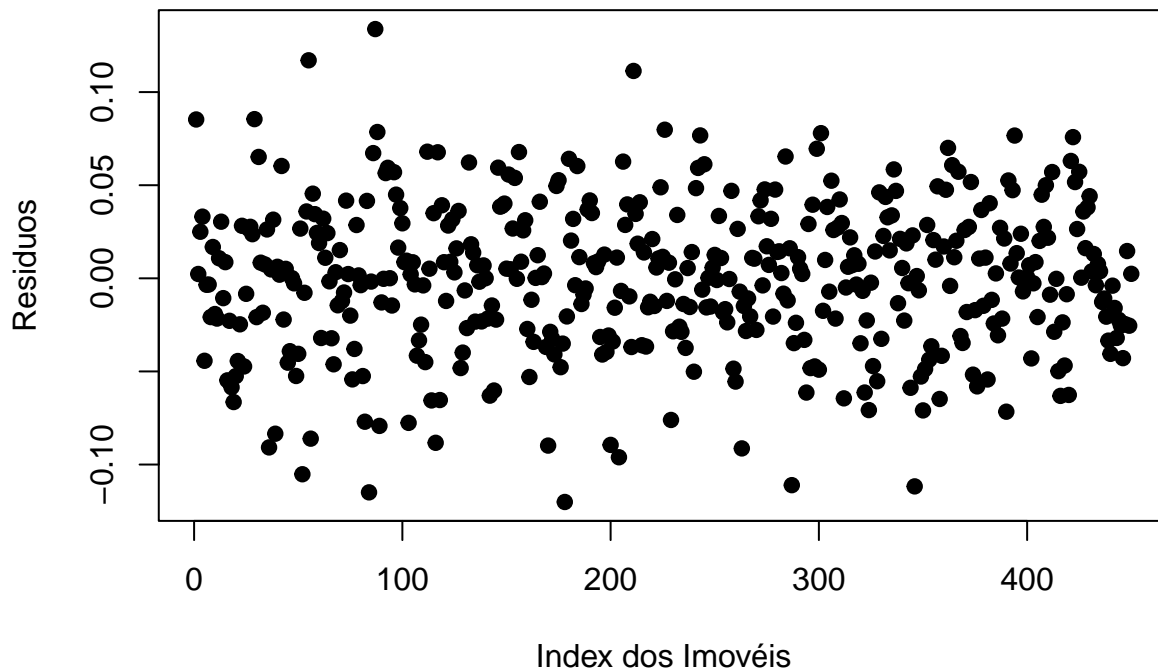
#Teste de durbin watson para independencia
library(lmtest)
dwtest(modelo_beta21) #p-value =

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

#Independência
plot(modelo_beta21$residuals,
     ylab = "Resíduos",
     xlab = "Index dos Imóveis",
     main = "Suposição de independência",
     pch = 19)

```

Suposição de independência

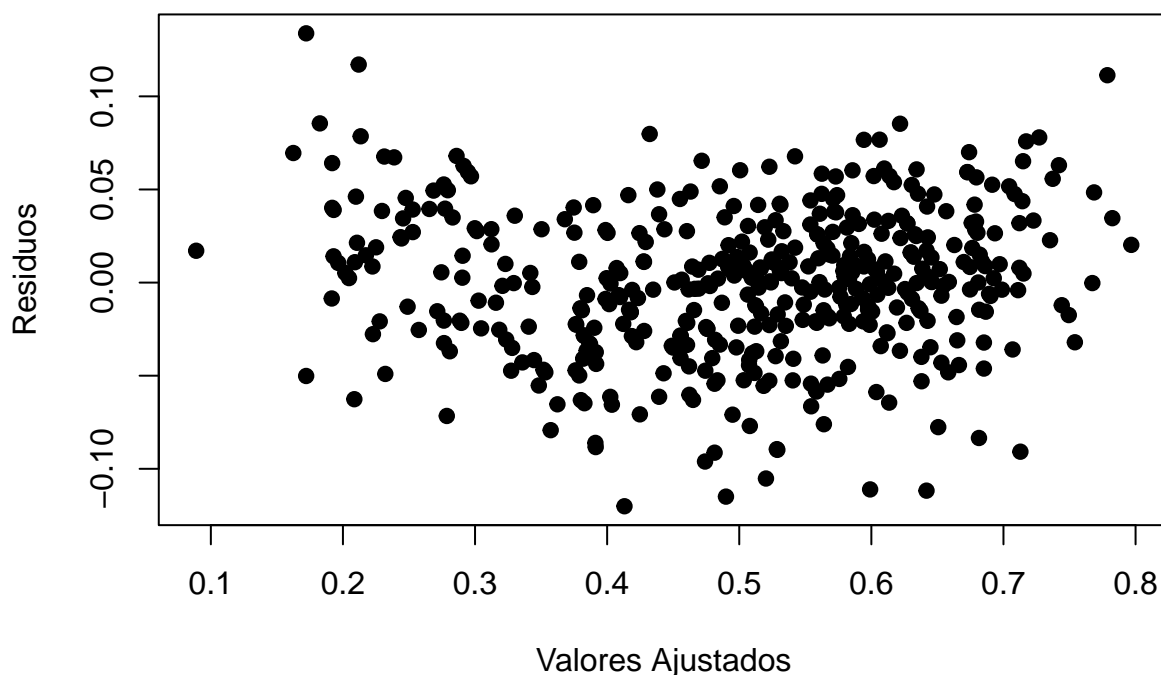


```

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

```

Suposição de homocedasticidade



```
#Breusch_Pagan para homocedasticidade
```

```
bptest(modelo_beta21) #p-value =
```

```
##
```

```
## studentized Breusch-Pagan test
```

```
##
```

```
## data: modelo_beta21
```

```
## BP = 15.604, df = 3, p-value = 0.001367
```

```
##### Probito #####
```

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

```
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

```

```

car::Anova(modelo_beta_probit2)

```

```

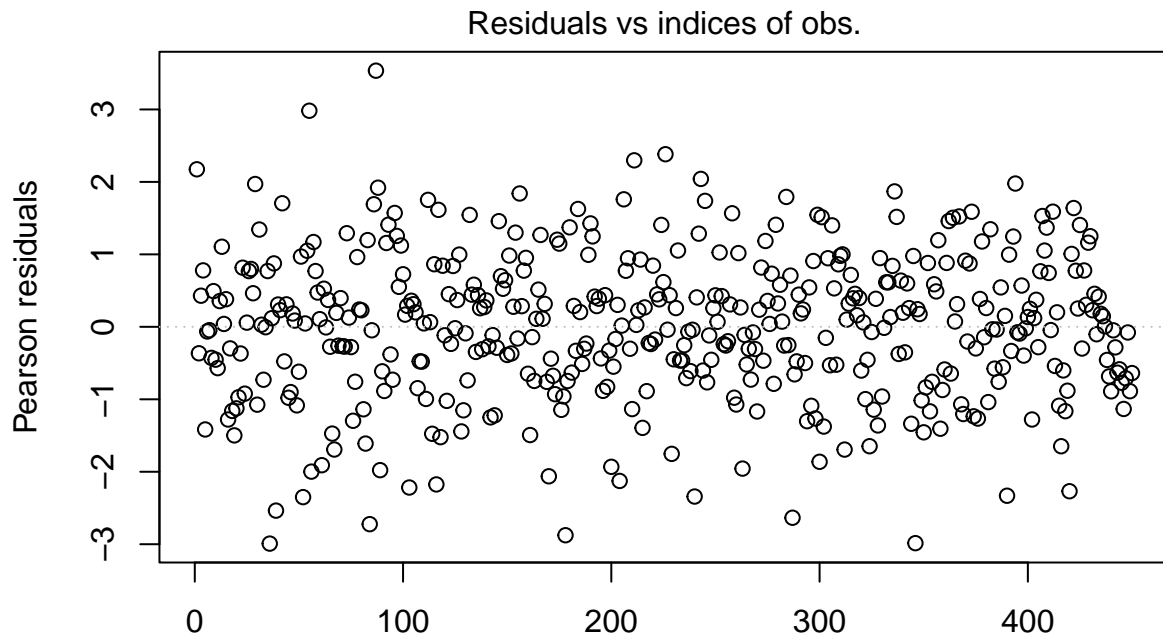
## Analysis of Deviance Table (Type II tests)
##
## Response: WINP
##      Df      Chisq Pr(>Chisq)
## `3PP`   1    3.2804   0.07011 .
## TOV     1    0.0026   0.95939
## STL     1    0.3967   0.52882
## PF      1    5.6855   0.01711 *
## PlusMinus 1 3501.9850 < 2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```

```

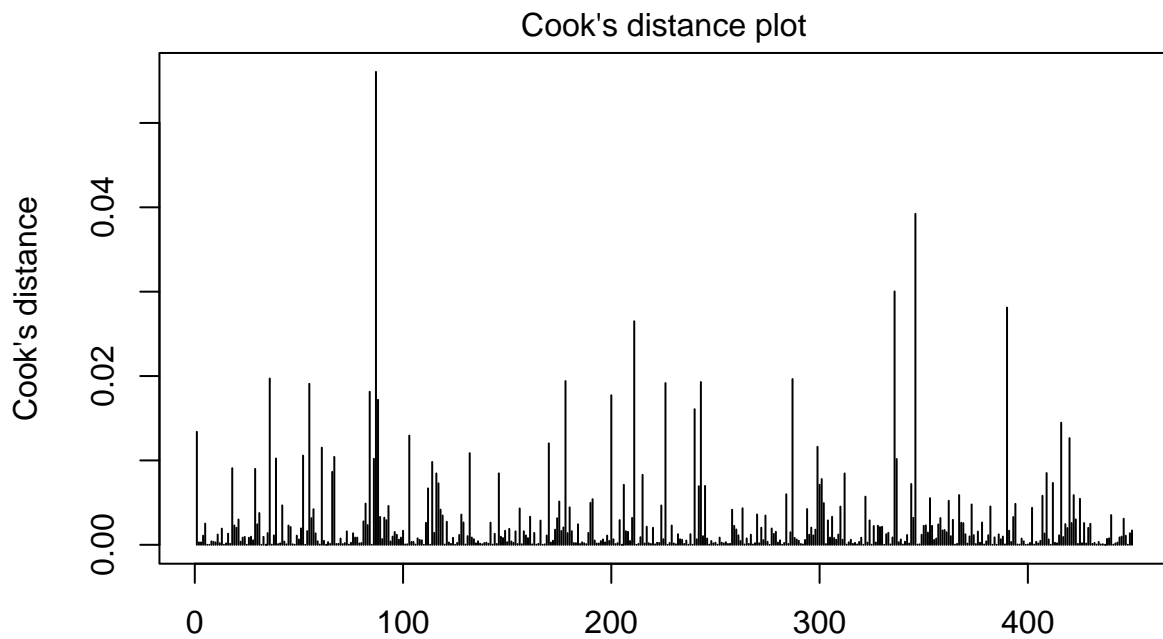
### Resíduos Probito ###
plot(modelo_beta_probit2, which = 1, type = "pearson")

```



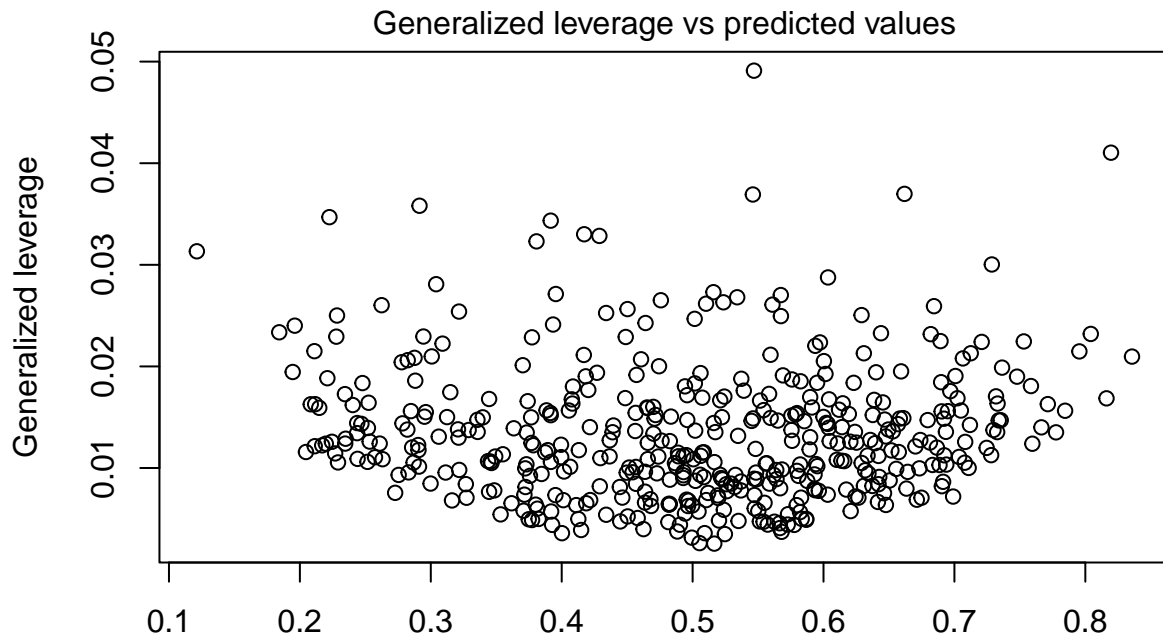
```
betareg(formula = WINP ~ CRP + TDA + STL + PF + PlusMinus,
data = dados_regressao, link = "probit")
```

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



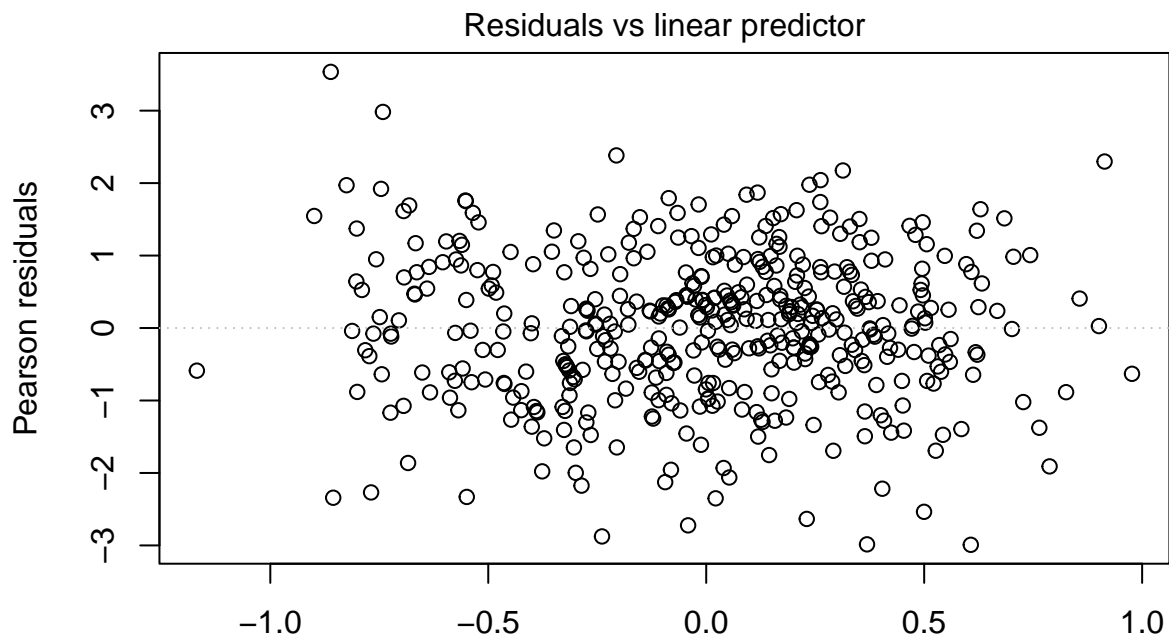
```
betareg(formula = WINP ~ CRP + TDA + STL + PF + PlusMinus,
data = dados_regressao, link = "probit")
```

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



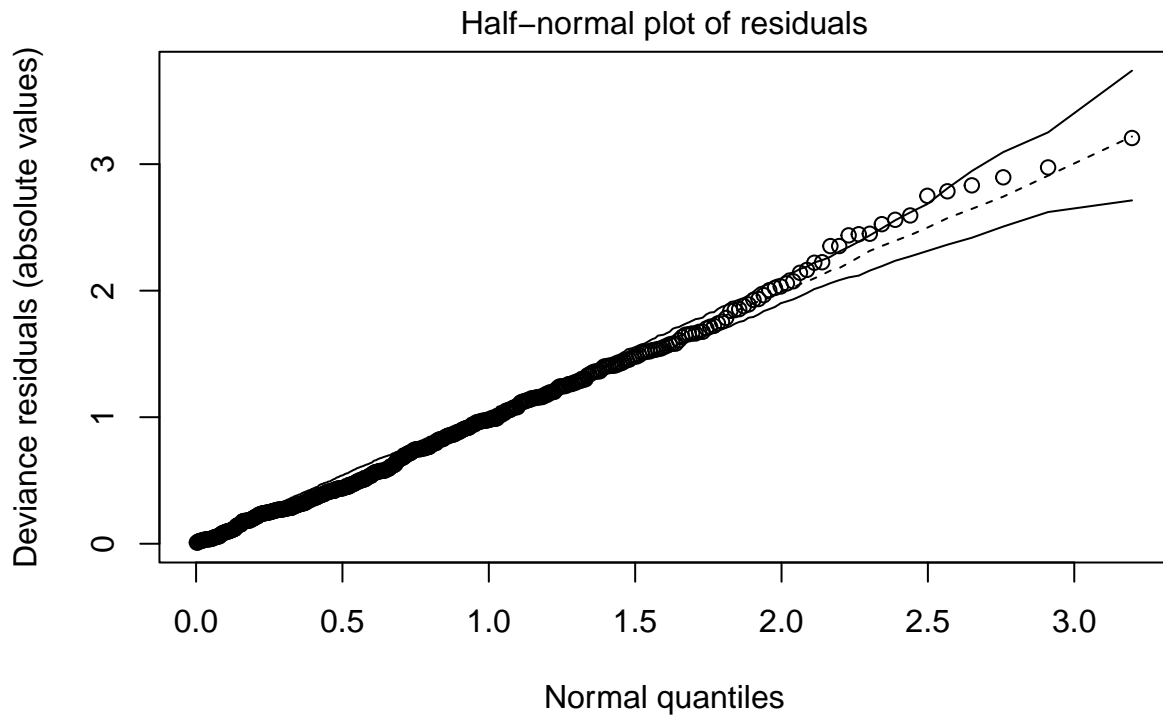
```
betareg(formula = WINP ~ GDP + TOV + STL + PF + PlusMinus,
data = dados_regressao, link = "probit")
```

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

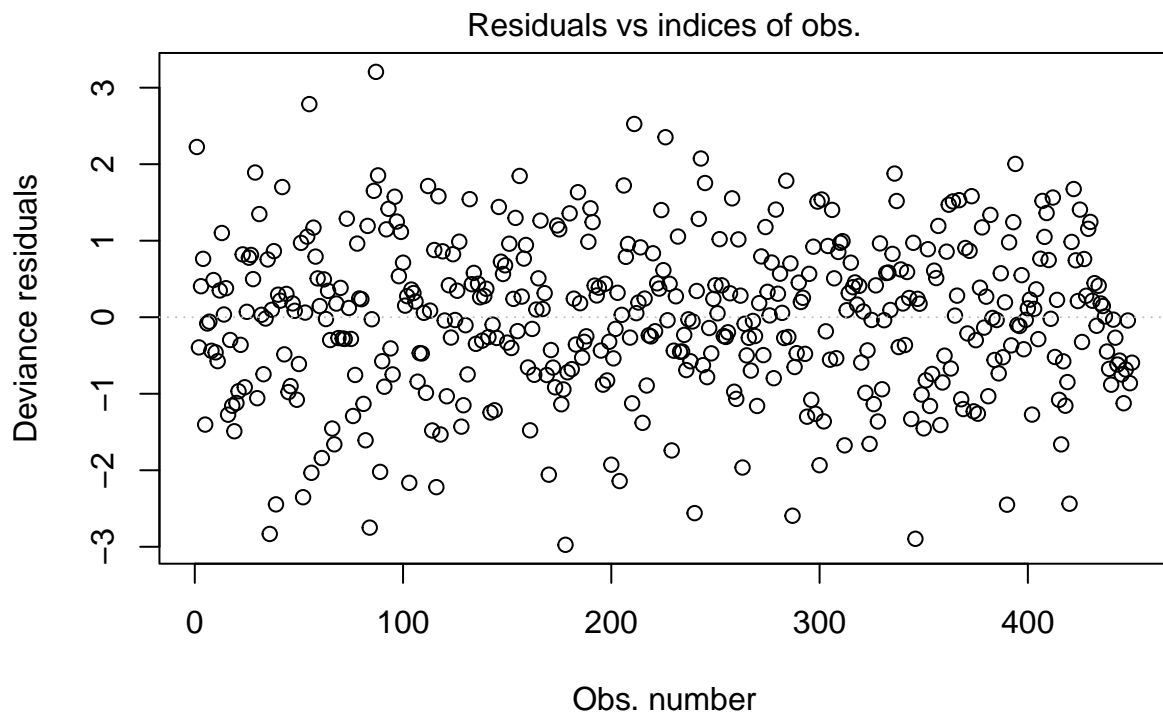


```
betareg(formula = WINP ~ GDP + TOV + STL + PF + PlusMinus,
data = dados_regressao, link = "probit")
```

```
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
```



```

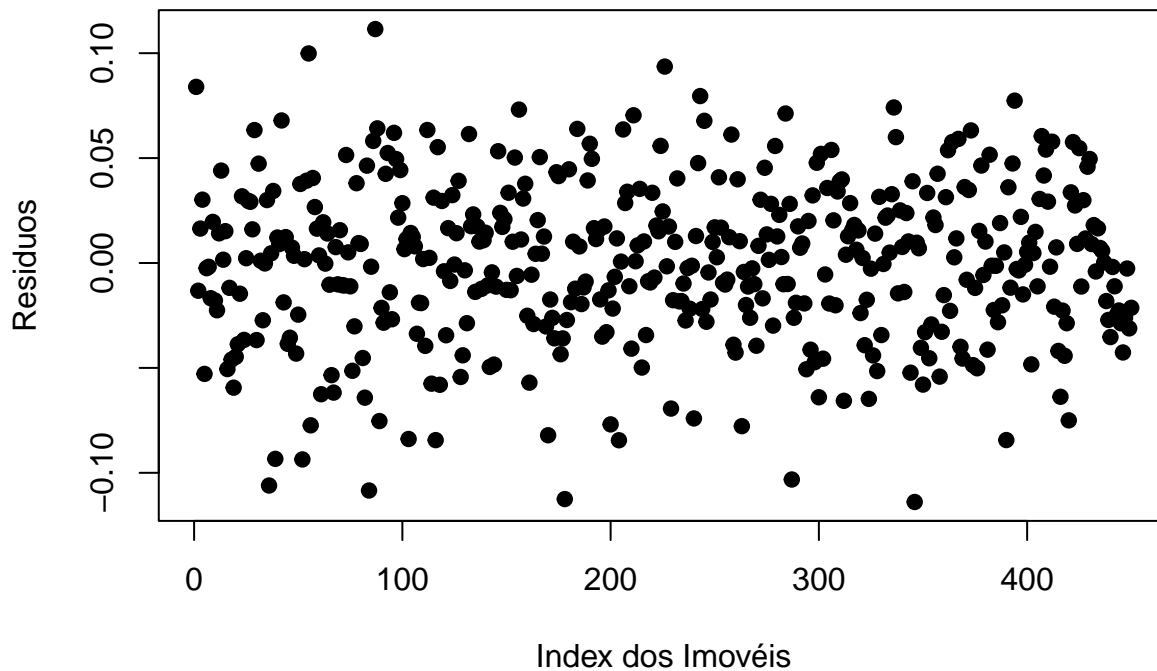
#Teste de durbin watson para independencia
library(lmtest)
dwtest(modelo_beta_probit2) #p-value =

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

#Independência
plot(modelo_beta_probit2$residuals,
     ylab = "Resíduos",
     xlab = "Index dos Imóveis",
     main = "Suposição de independência",
     pch = 19)

```

Suposição de independência

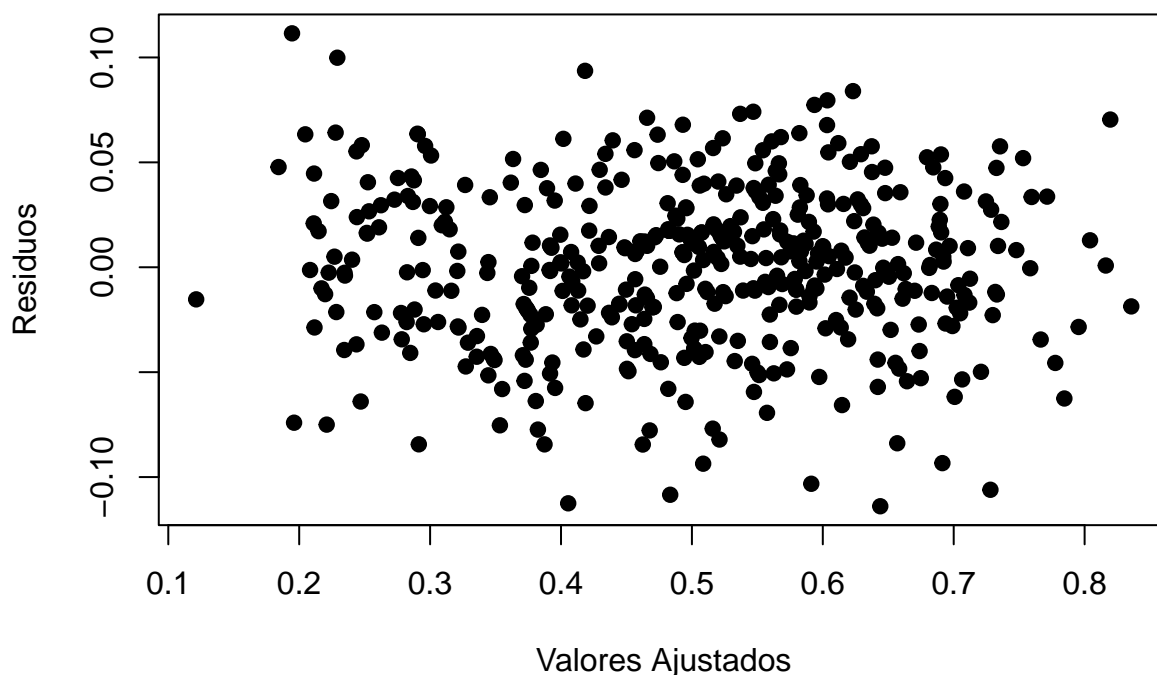


```

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

```

Suposição de homocedasticidade



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

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

```
##### cloglog #####
```

```
#melhor modelo é modelo_beta_cloglog_1 com TOV + PlusMinus
```

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

```
##
## Call:
## betareg(formula = WINP ~ TOV + PlusMinus, data = dados_regressao, link = "cloglog")
##
## Coefficients (mean model with cloglog link):
## (Intercept)      TOV      PlusMinus
##   -0.25436   -0.01003    0.09576
##
## Phi coefficients (precision model with identity link):
## (phi)
## 145.3
```

```
summary(modelo_beta_cloglog_1) #Pseudo R-squared: 0.9286
```

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

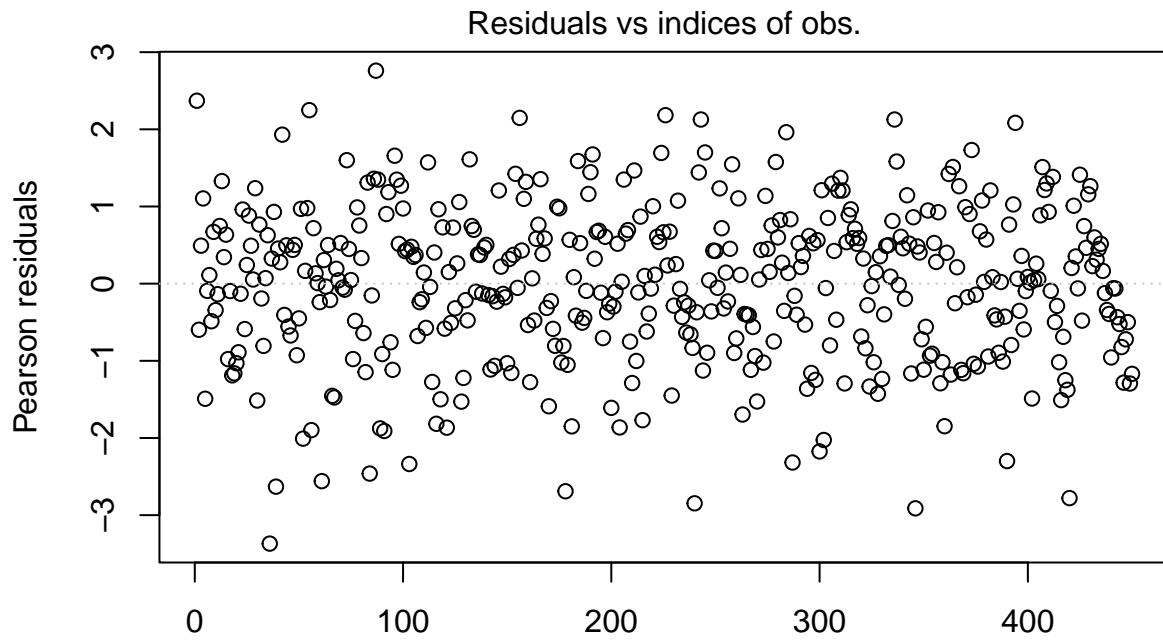
```

##
## Standardized weighted residuals 2:
##      Min      1Q  Median      3Q      Max
## -3.4529 -0.6312  0.0437  0.6660  2.4878
##
## Coefficients (mean model with cloglog link):
##              Estimate Std. Error z value Pr(>|z|)
## (Intercept) -0.254364   0.077923  -3.264   0.0011 **
## TOV         -0.010035   0.005468  -1.835   0.0665 .
## PlusMinus    0.095761   0.001350  70.951  <2e-16 ***
##
## Phi coefficients (precision model with identity link):
##              Estimate Std. Error z value Pr(>|z|)
## (phi) 145.329         9.658    15.05   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Type of estimator: ML (maximum likelihood)
## Log-likelihood: 817 on 4 Df
## Pseudo R-squared: 0.9249
## Number of iterations: 18 (BFGS) + 2 (Fisher scoring)
coef(modelo_beta_cloglog_1)

##      (Intercept)      TOV      PlusMinus      (phi)
## -0.25436364 -0.01003488  0.09576090 145.32881961
car::Anova(modelo_beta_cloglog_1)

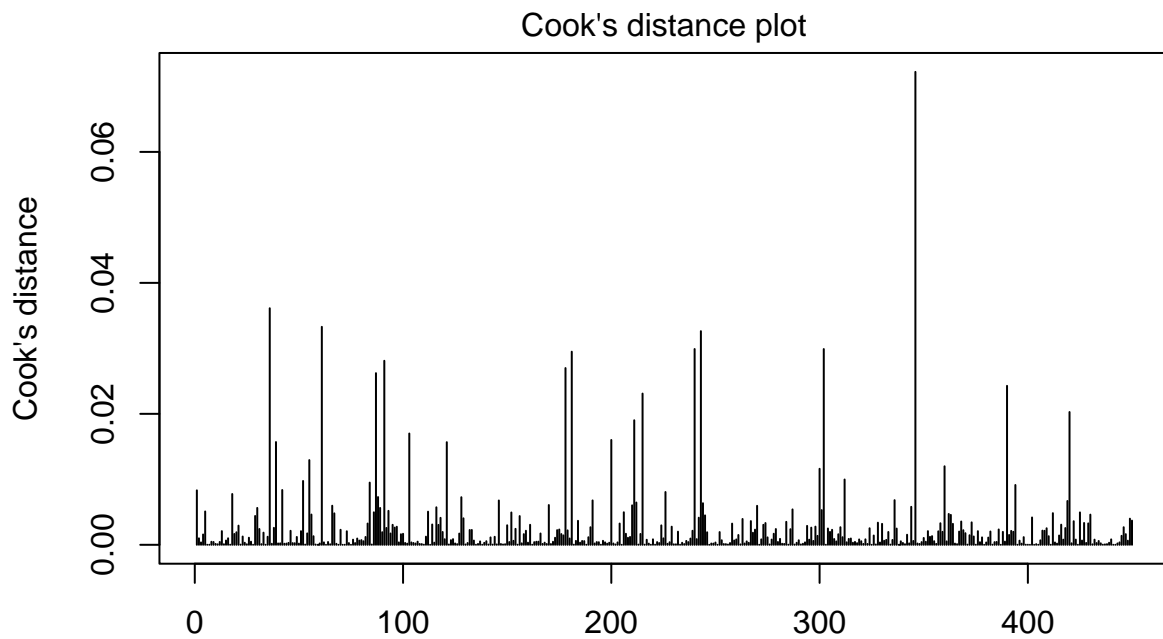
## Analysis of Deviance Table (Type II tests)
##
## Response: WINP
##              Df      Chisq Pr(>Chisq)
## TOV           1    3.3684   0.06646 .
## PlusMinus     1 5034.0170   < 2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
#Resíduos cloglog
plot(modelo_beta_cloglog_1, which = 1, type = "pearson")

```



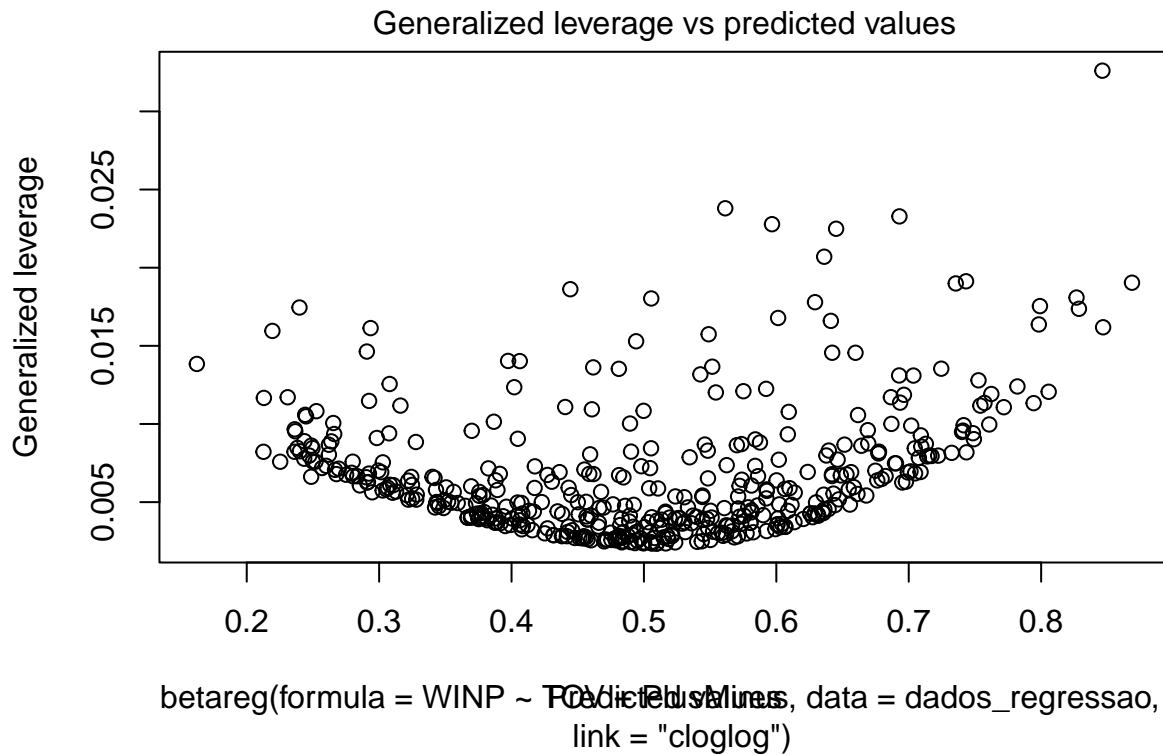
```
betareg(formula = WINP ~ TOB + PLUS + MEN, data = dados_regressao,
link = "cloglog")
```

```
plot(modelo_beta_cloglog_1, which = 2, type = "pearson")
```

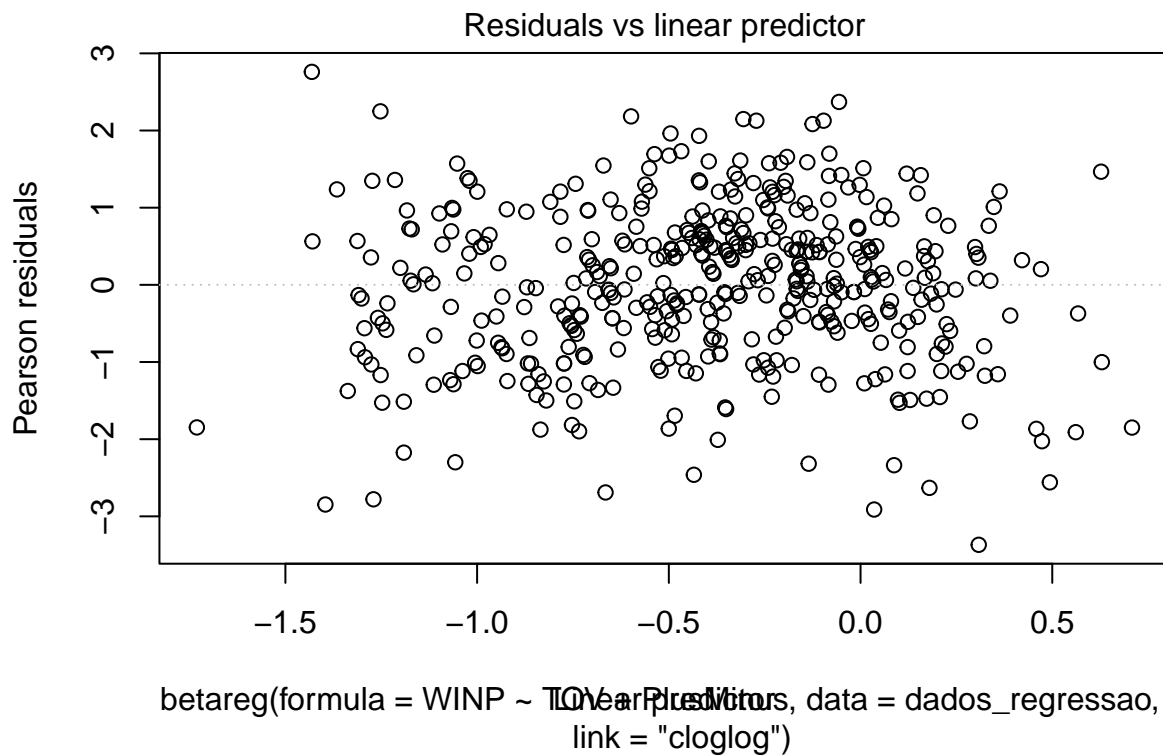


```
betareg(formula = WINP ~ TOB + PLUS + MEN, data = dados_regressao,
link = "cloglog")
```

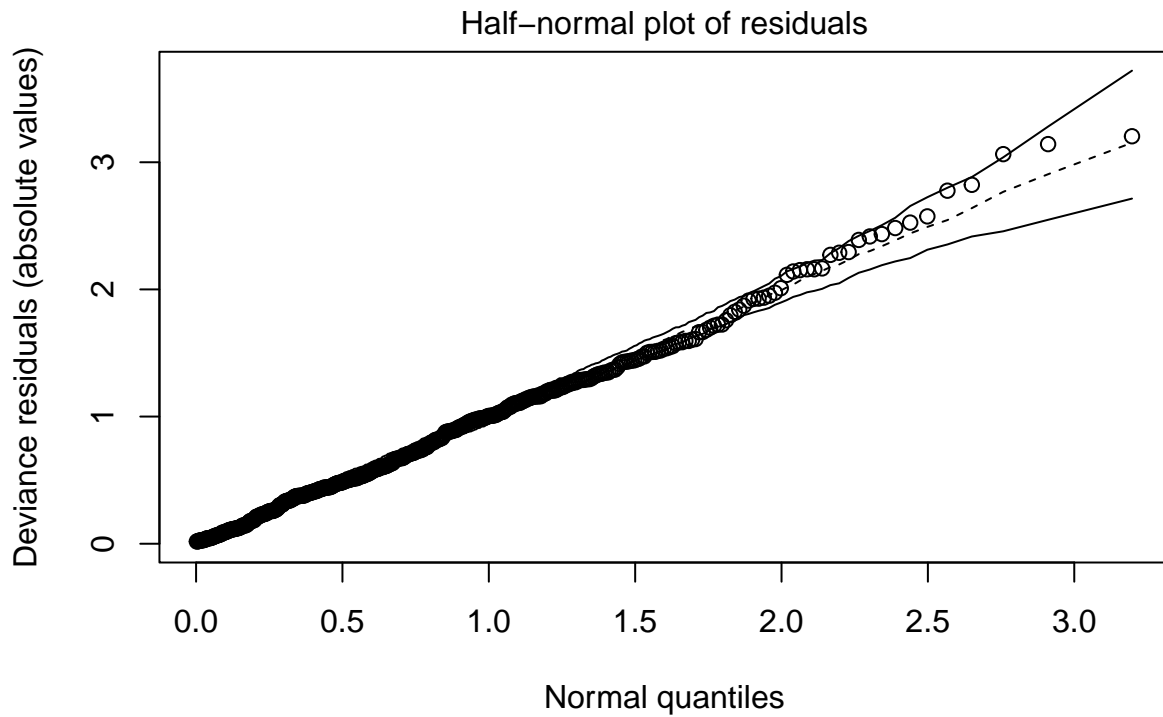
```
plot(modelo_beta_cloglog_1, which = 3, type = "pearson")
```



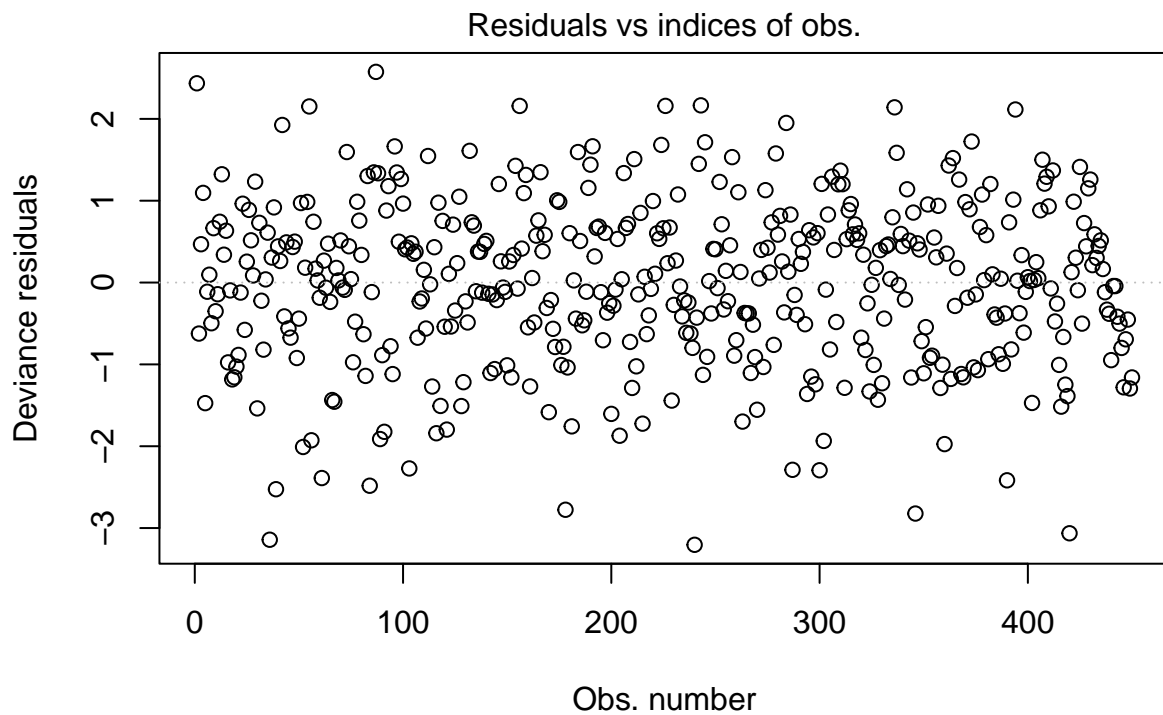
```
plot(modelo_beta_cloglog_1, which = 4, type = "pearson")
```



```
plot(modelo_beta_cloglog_1, which = 5, type = "deviance", sub.caption = "")
```



```
plot(modelo_beta_cloglog_1, which = 1, type = "deviance", sub.caption = "")
```



```
shapiro.test(modelo_beta_cloglog_1$residuals) #p-value =
```

```
##
##  Shapiro-Wilk normality test
##
## data:  modelo_beta_cloglog_1$residuals
## W = 0.99436, p-value = 0.09578
```

```

#Teste de durbin watson para independencia
library(lmtest)
dwtest(modelo_beta_cloglog_1) #p-value =

##
## Durbin-Watson test
##
## data: modelo_beta_cloglog_1
## DW = 1.9363, p-value = 0.2385
## alternative hypothesis: true autocorrelation is greater than 0

#Independência
plot(modelo_beta_cloglog_1$residuals,
     ylab = "Resíduos",
     xlab = "Index dos Imóveis",
     main = "Suposição de independência",
     pch = 19)

```

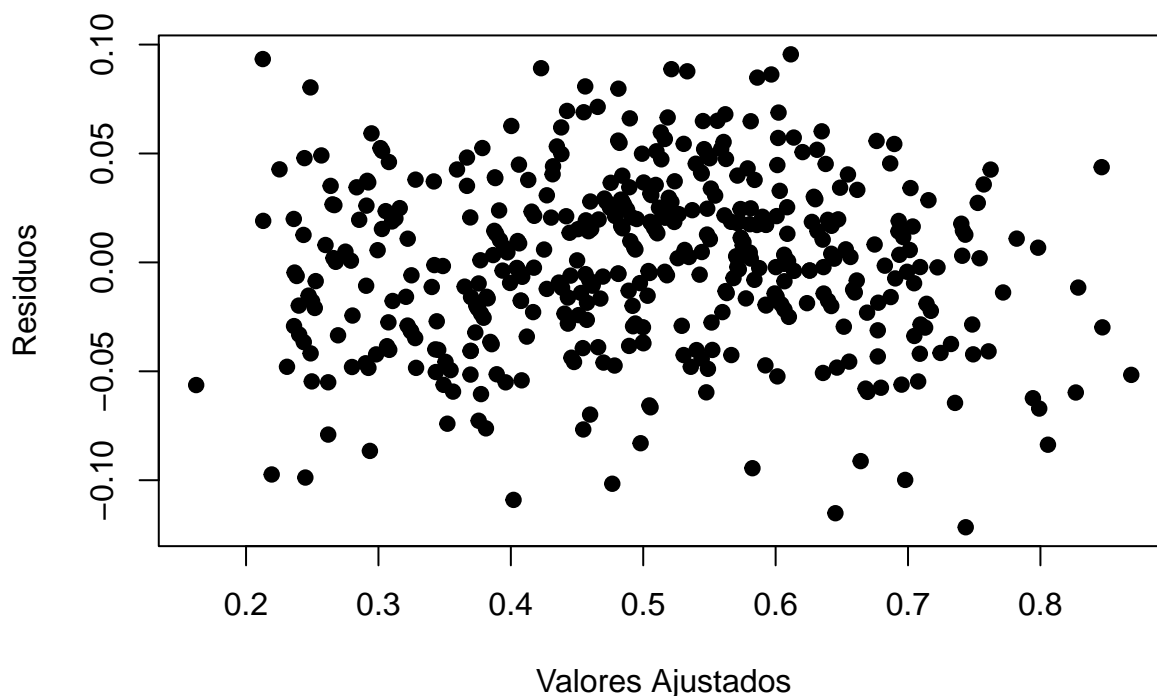


```

#Homocedasticidade
plot(modelo_beta_cloglog_1$fitted.values, modelo_beta_cloglog_1$residuals,
     xlab = "Valores Ajustados",
     ylab = "Resíduos",
     pch = 19,
     main = "Suposição de homocedasticidade"
)

```

Suposição de homocedasticidade



```
#Breusch_Pagan para homocedasticidade
bptest(modelo_beta_cloglog_1) #p-value =
```

```
##
## studentized Breusch-Pagan test
##
## data: modelo_beta_cloglog_1
## BP = 4.4453, df = 2, p-value = 0.1083
```

```
##### cauchito #####
```

```
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
```

```
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)

coef(modelo_beta_cauchit1)

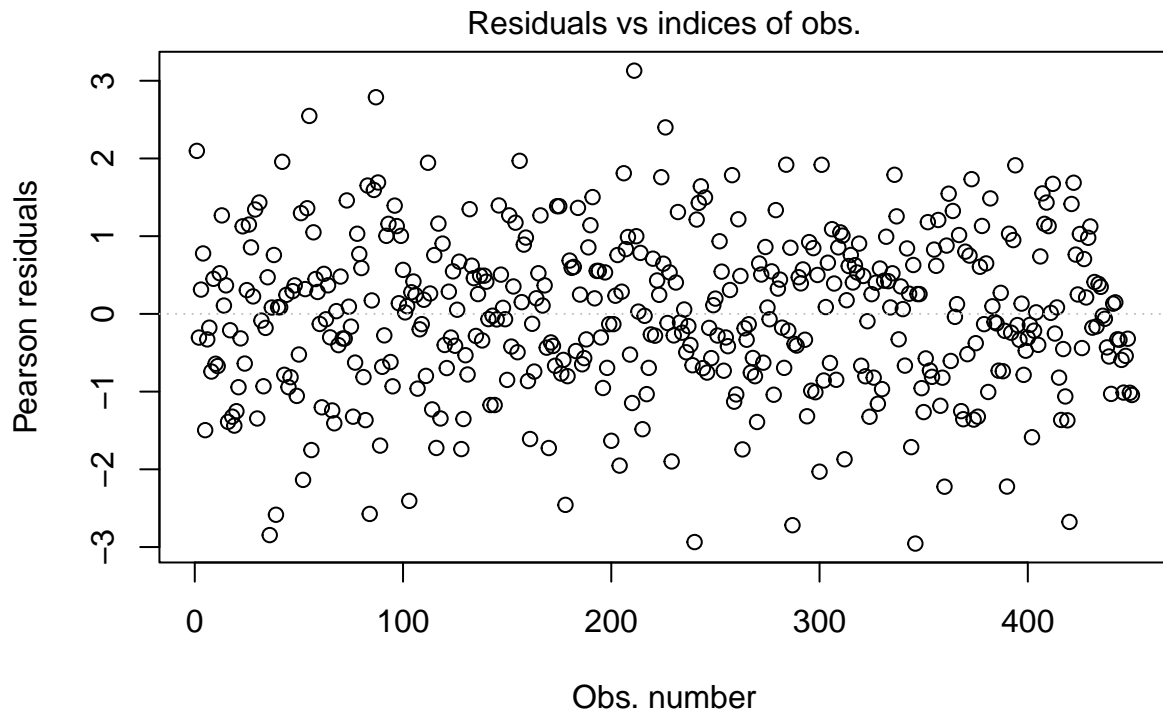
##      (Intercept)      PlusMinus      (phi)
## -0.008704143    0.117730476 153.265171178

car::Anova(modelo_beta_cauchit1)

## Analysis of Deviance Table (Type II tests)
##
## Response: WINP
##              Df  Chisq Pr(>Chisq)
## PlusMinus    1 3937.4  < 2.2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

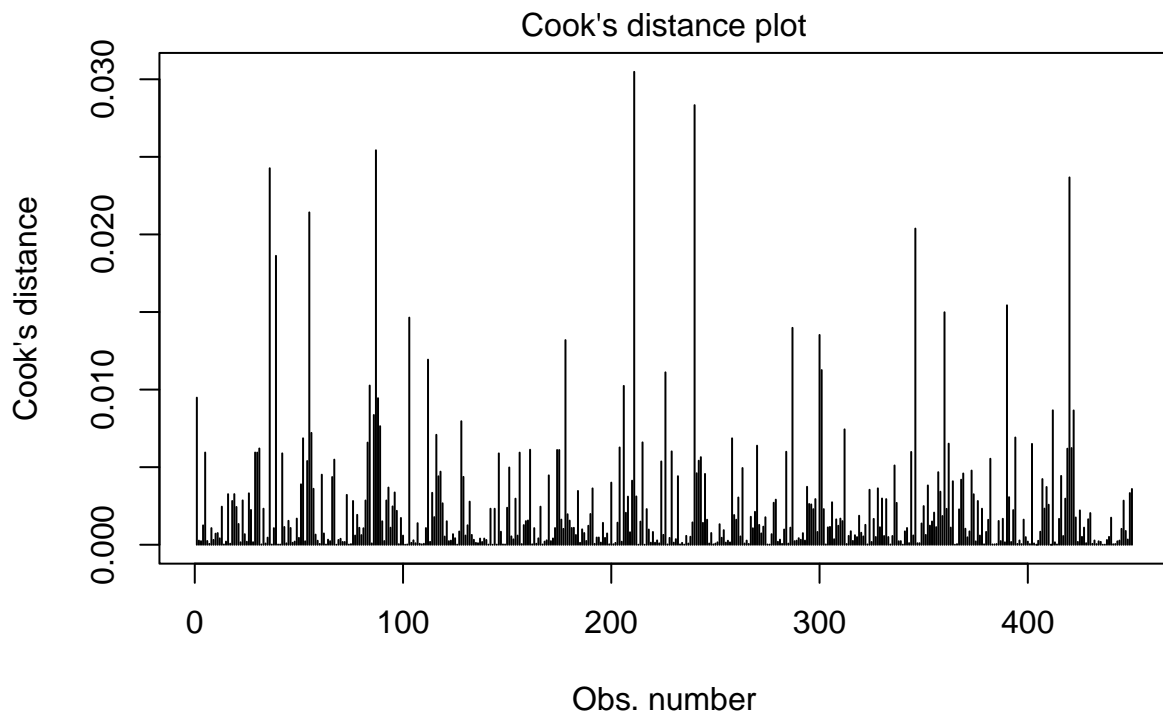
#Resíduos
plot(modelo_beta_cauchit1, which = 1, type = "pearson")

```



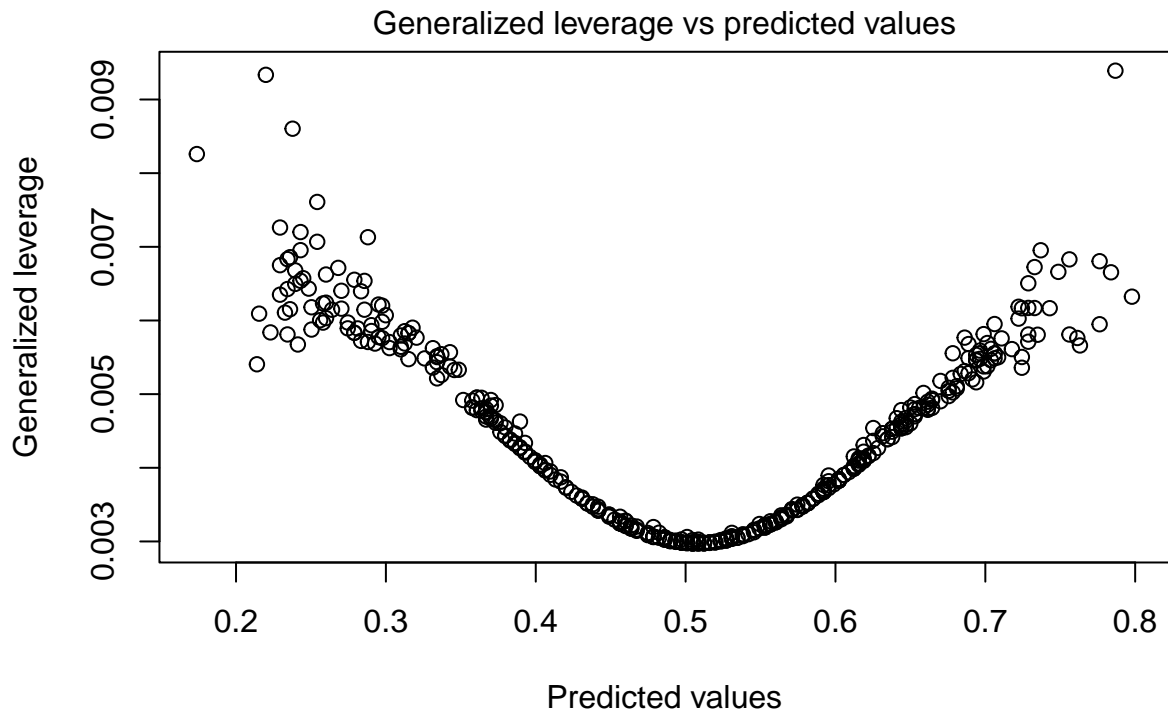
```
betareg(formula = WINP ~ PlusMinus, data = dados_regressao, link = "cauchit")
```

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



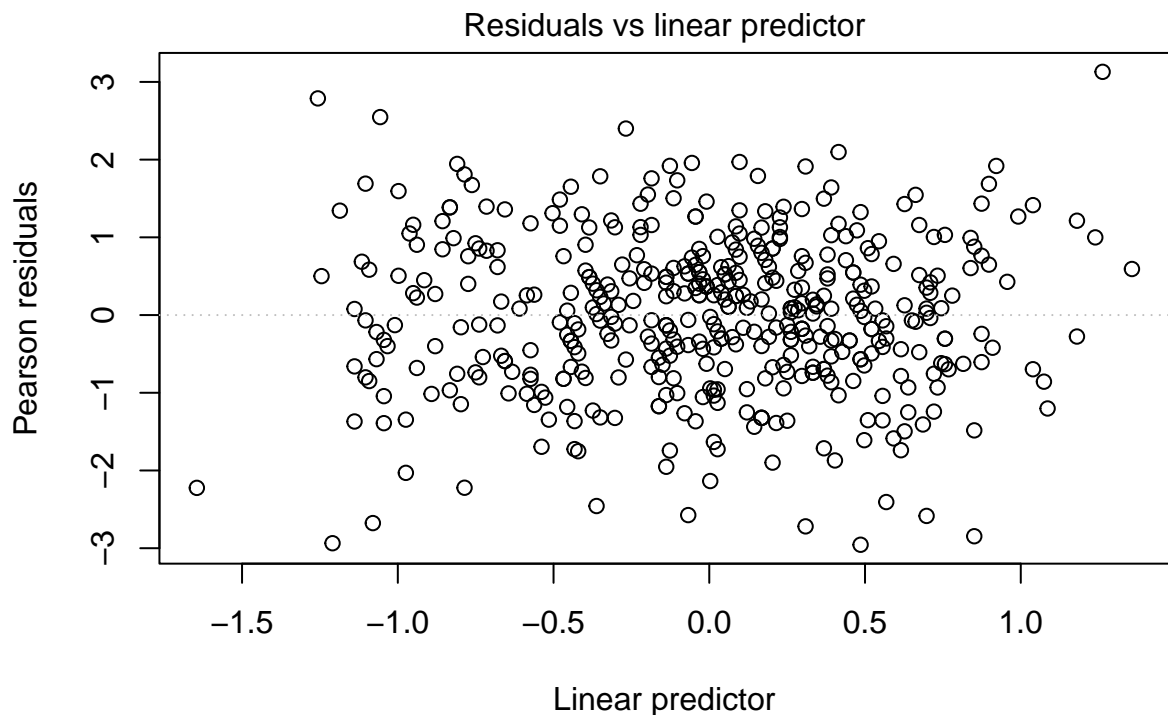
```
betareg(formula = WINP ~ PlusMinus, data = dados_regressao, link = "cauchit")
```

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



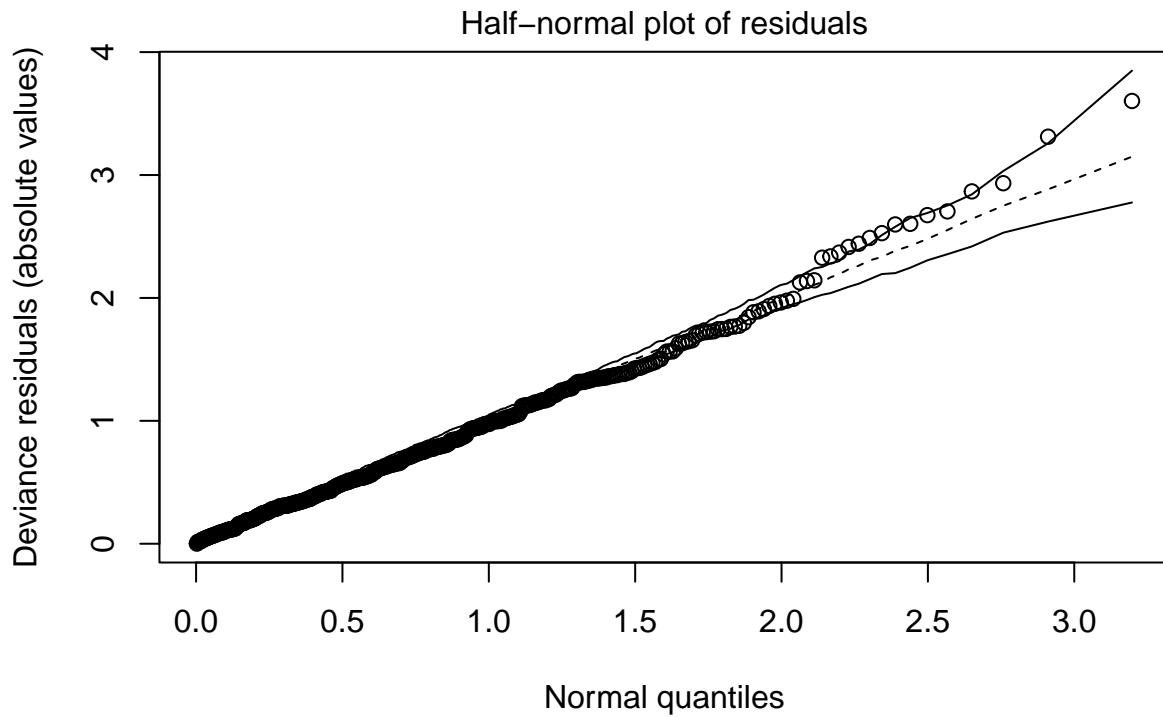
```
betareg(formula = WINP ~ PlusMinus, data = dados_regressao, link = "cauchit")
```

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

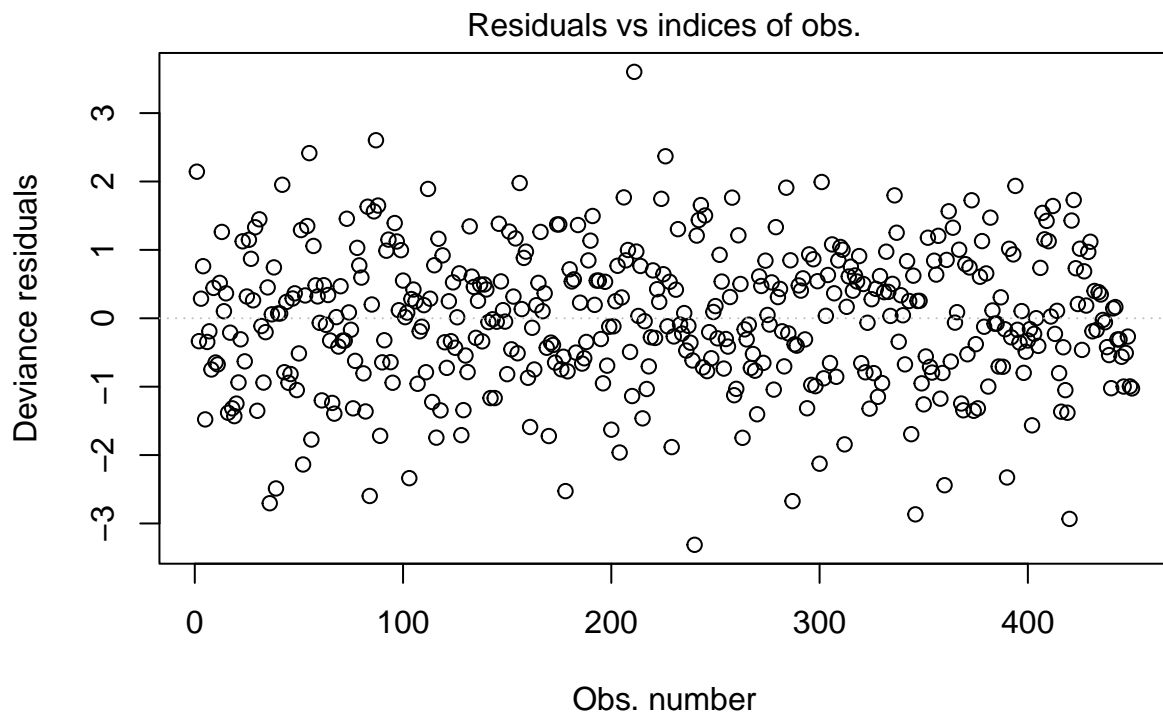


```
betareg(formula = WINP ~ PlusMinus, data = dados_regressao, link = "cauchit")
```

```
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
```

```

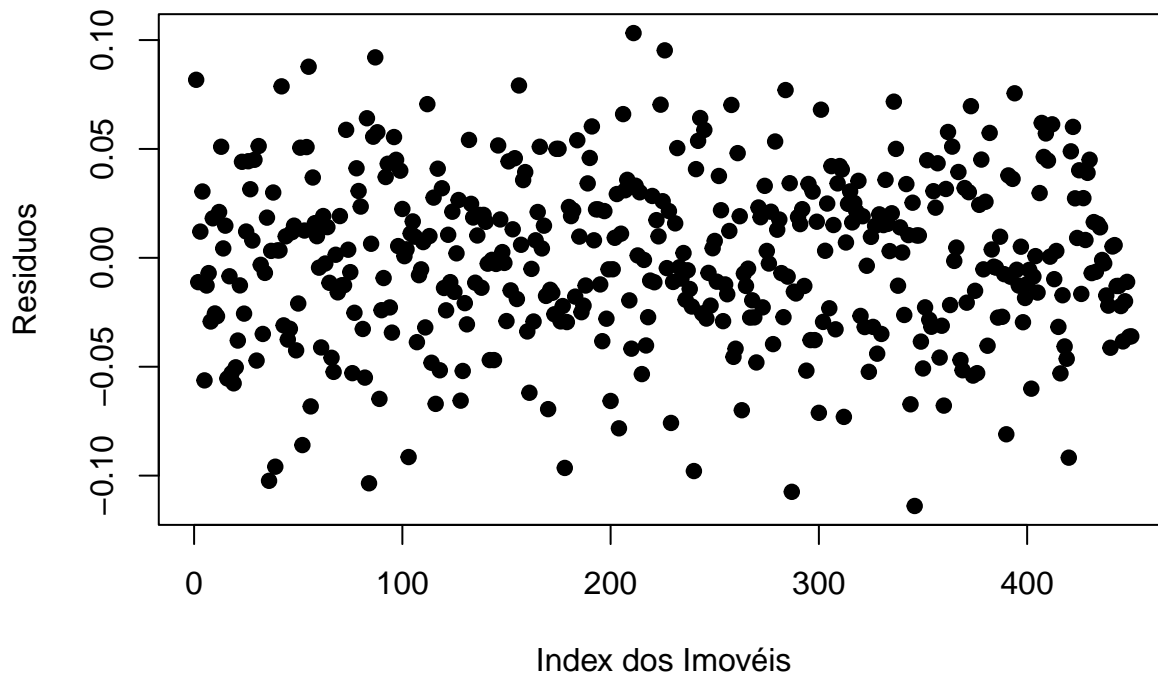
#Teste de durbin watson para independencia
library(lmtest)
dwtest(modelo_beta_cauchit1) #p-value =

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

#Independência
plot(modelo_beta_cauchit1$residuals,
     ylab = "Resíduos",
     xlab = "Index dos Imóveis",
     main = "Suposição de independência",
     pch = 19)

```

Suposição de independência

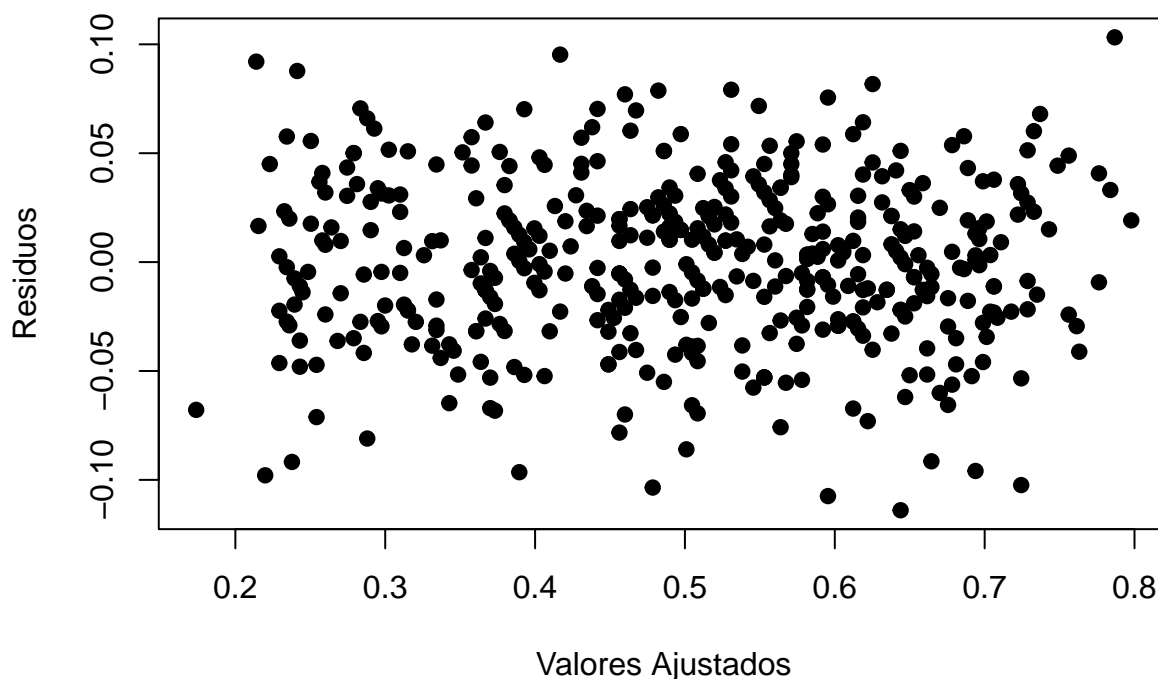


```

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

```

Suposição de homocedasticidade



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

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

```
##### GAMLSS #####
```

```
##### Forward Beta #####
```

```
gamlss_beta_forw = gamlss(formula = WINP ~ PlusMinus + FGP + PTS + PF, family = BE, data = dados_regressao)
```

```
## GAMLSS-RS iteration 1: Global Deviance = -1321.858
## GAMLSS-RS iteration 2: Global Deviance = -1676.336
## GAMLSS-RS iteration 3: Global Deviance = -1676.843
## GAMLSS-RS iteration 4: Global Deviance = -1676.843
```

```
gamlss_beta_forw
```

```
##
## Family: c("BE", "Beta")
## Fitting method: RS()
##
## Call: gamlss(formula = WINP ~ PlusMinus + FGP + PTS + PF,
## family = BE, data = dados_regressao)
##
## Mu Coefficients:
## (Intercept) PlusMinus FGP PTS PF
## -0.505065 0.131669 0.023267 -0.003065 -0.012155
## Sigma Coefficients:
```

```

## (Intercept)
##      -2.458
##
## Degrees of Freedom for the fit: 6 Residual Deg. of Freedom    444
## Global Deviance:      -1676.84
##           AIC:      -1664.84
##           SBC:      -1640.19

coef(gamlss_beta_forw)

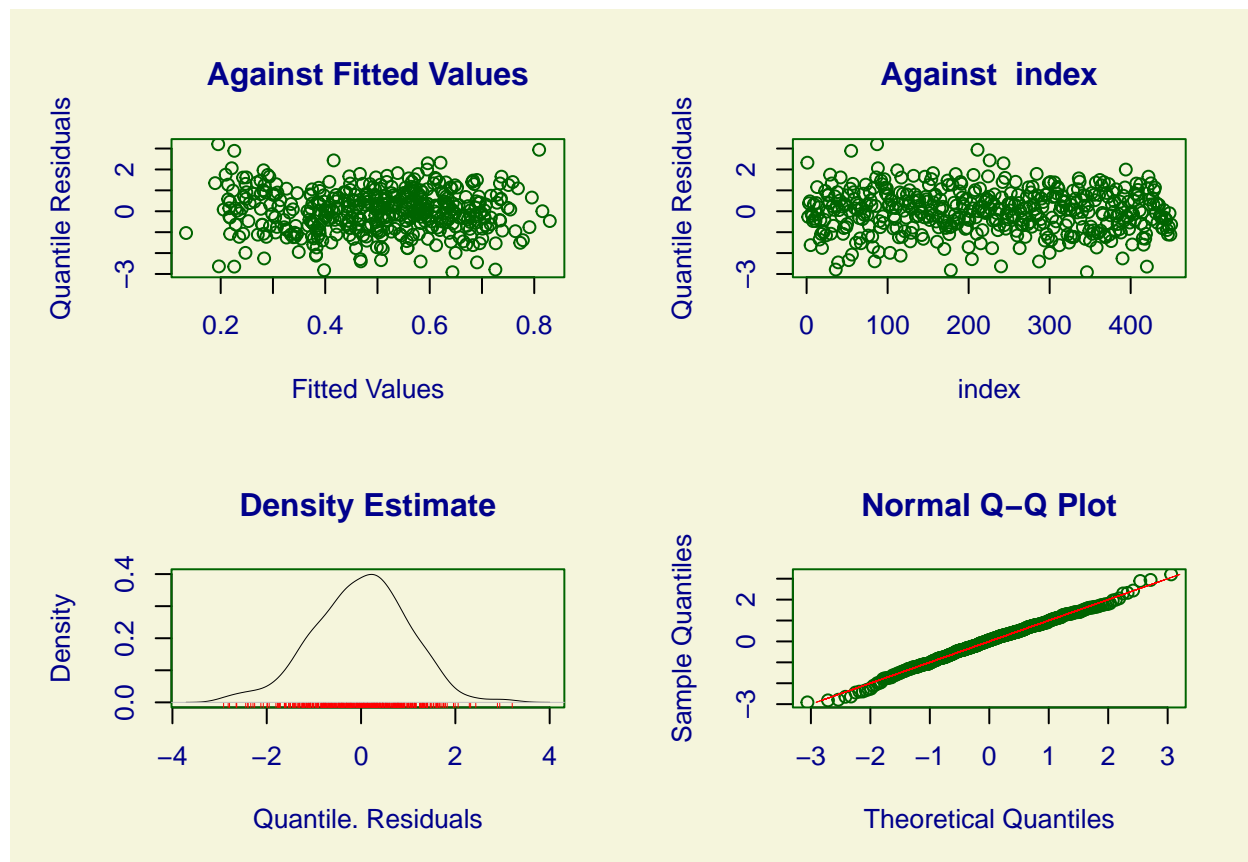
## (Intercept)      PlusMinus          FGP          PTS          PF
## -0.505064513  0.131668749  0.023266609 -0.003064737 -0.012154978

summary(gamlss_beta_forw) #AIC:      -1664.843

## *****
## Family:  c("BE", "Beta")
##
## Call:  gamlss(formula = WINP ~ PlusMinus + FGP + PTS + PF,
##      family = BE, data = dados_regressao)
##
## Fitting method: RS()
##
## -----
## Mu link function:  logit
## Mu Coefficients:
##      Estimate Std. Error t value Pr(>|t|)
## (Intercept) -0.505065   0.305547  -1.653  0.09904 .
## PlusMinus    0.131669   0.002219  59.330 < 2e-16 ***
## FGP          0.023267   0.007249   3.210  0.00143 **
## PTS         -0.003065   0.001395  -2.198  0.02849 *
## PF          -0.012155   0.005639  -2.156  0.03165 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## -----
## Sigma link function:  logit
## Sigma Coefficients:
##      Estimate Std. Error t value Pr(>|t|)
## (Intercept) -2.45847    0.03586  -68.56  <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## -----
## No. of observations in the fit:  450
## Degrees of Freedom for the fit:  6
##      Residual Deg. of Freedom:  444
##                      at cycle:  4
##
## Global Deviance:      -1676.843
##           AIC:      -1664.843
##           SBC:      -1640.188
## *****

#### Resíduos ####
plot(gamlss_beta_forw)

```



```
## *****
##      Summary of the Quantile Residuals
##              mean   = 0.003493076
##              variance = 1.002508
##              coef. of skewness = -0.1366816
##              coef. of kurtosis = 3.200036
## Filliben correlation coefficient = 0.9980074
## *****
```

```
shapiro.test(gamlss_beta_forw$residuals) #p-value = 0.2853, normal
```

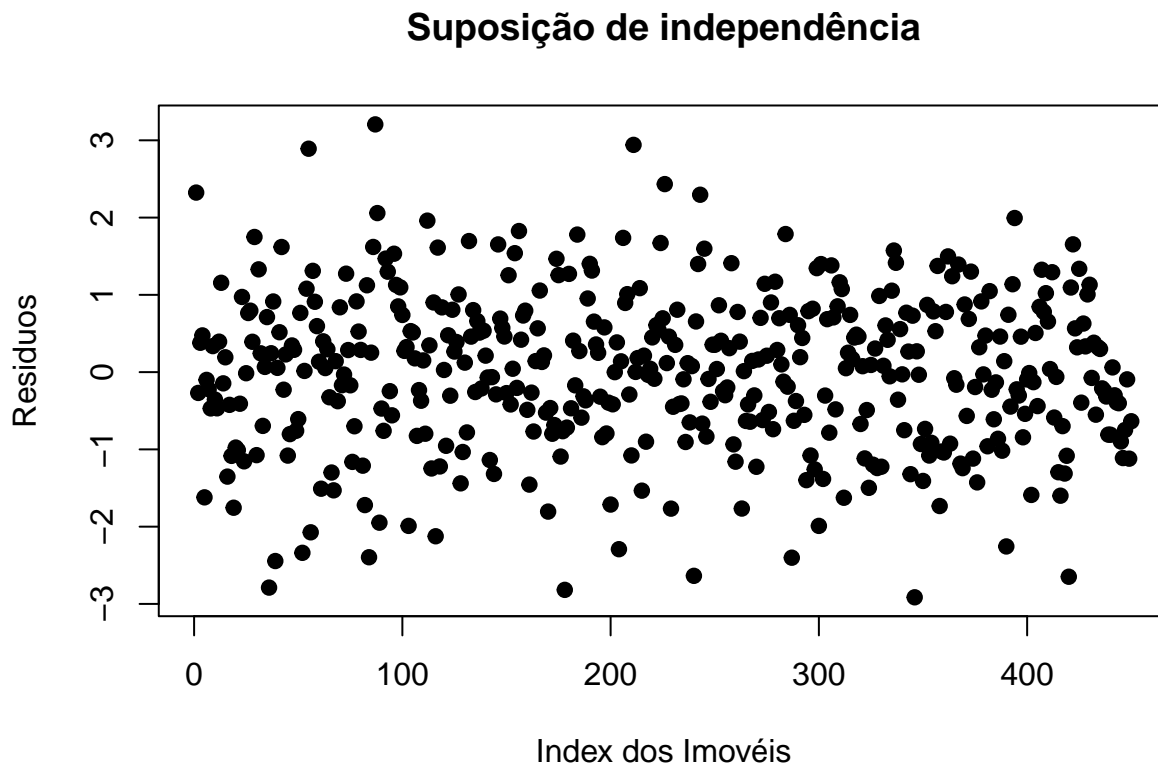
```
##
##  Shapiro-Wilk normality test
##
## data:  gamlss_beta_forw$residuals
## W = 0.99586, p-value = 0.2853
```

```
#Teste de durbin watson para independencia
library(lmtest)
dwtest(gamlss_beta_forw) #p-value = 0.1735
```

```
##
##  Durbin-Watson test
##
## data:  gamlss_beta_forw
## DW = 1.9193, p-value = 0.1735
## alternative hypothesis: true autocorrelation is greater than 0
```



```
#Independência
plot(gamlss_beta_forw$residuals,
     ylab = "Resíduos",
     xlab = "Index dos Imóveis",
     main = "Suposição de independência",
     pch = 19)
```



```
#Breusch_Pagan para homocedasticidade
bptest(gamlss_beta_forw) #p-value = 0.0006407
```

```
##
## studentized Breusch-Pagan test
##
## data: gamlss_beta_forw
## BP = 19.451, df = 4, p-value = 0.0006407
```

```
##### Forward Normal #####
```

```
#Mesma que a linear então não iremos utilizar
```

```
gamlss_normal_forw <- gamlss(formula = WINP ~ PlusMinus + PF + FGP + FGM, family = NO, data = dados_reg)
```

```
## GAMLSS-RS iteration 1: Global Deviance = -1658.44
## GAMLSS-RS iteration 2: Global Deviance = -1658.44
```

```
gamlss_normal_forw
```

```
##
## Family: c("NO", "Normal")
## Fitting method: RS()
##
## Call: gamlss(formula = WINP ~ PlusMinus + PF + FGP + FGM,
## family = NO, data = dados_regressao)
```

```
##
## Mu Coefficients:
## (Intercept)    PlusMinus          PF          FGP          FGM
##    0.401565    0.030261    -0.003478    0.005746    -0.002433
## Sigma Coefficients:
## (Intercept)
##    -3.262
##
## Degrees of Freedom for the fit: 6 Residual Deg. of Freedom    444
## Global Deviance:    -1658.44
##          AIC:    -1646.44
##          SBC:    -1621.78

coef(gamlss_normal_forw)

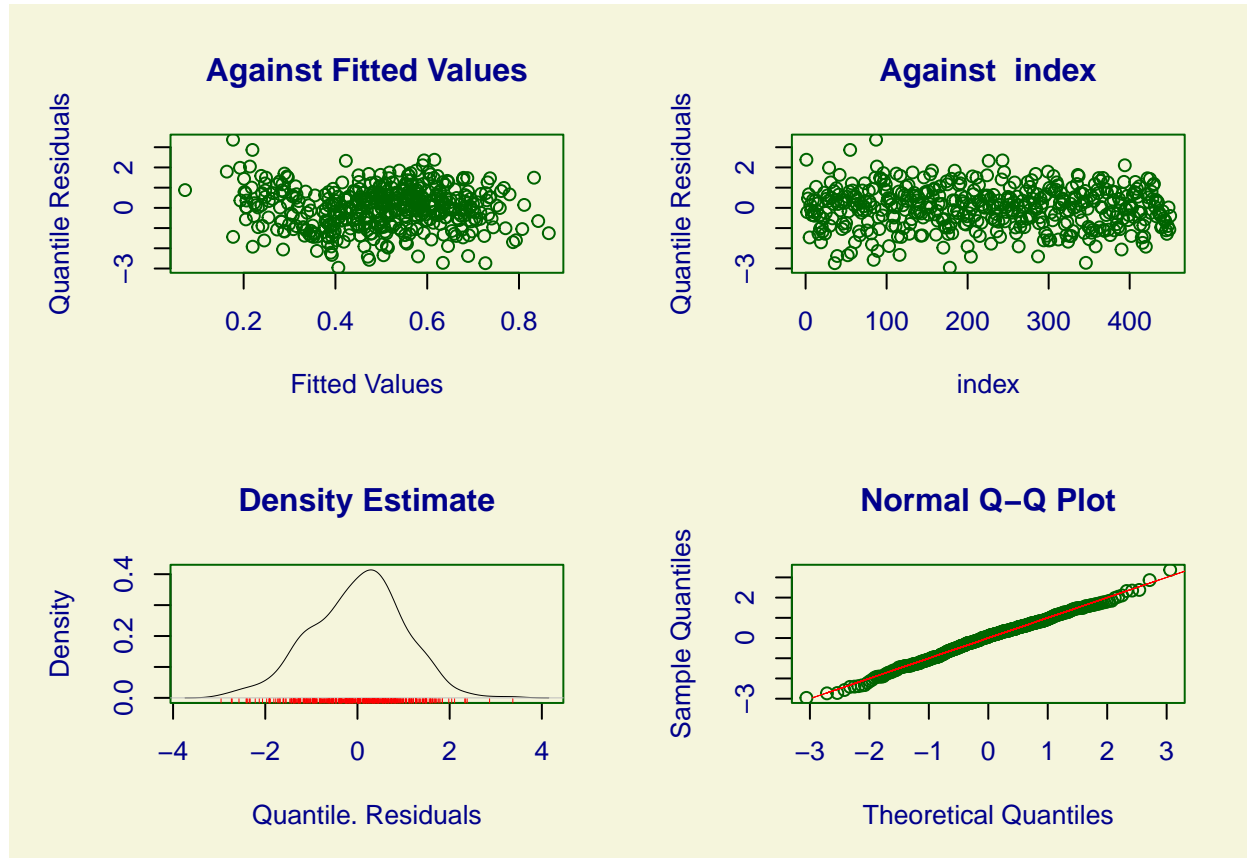
## (Intercept)    PlusMinus          PF          FGP          FGM
## 0.401564997 0.030260547 -0.003477604 0.005745605 -0.002433190

summary(gamlss_normal_forw) #-1646.44

## *****
## Family: c("NO", "Normal")
##
## Call: gamlss(formula = WINP ~ PlusMinus + PF + FGP + FGM,
## family = NO, data = dados_regressao)
##
## Fitting method: RS()
##
## -----
## Mu link function: identity
## Mu Coefficients:
##      Estimate Std. Error t value Pr(>|t|)
## (Intercept) 0.4015650 0.0714772 5.618 3.41e-08 ***
## PlusMinus 0.0302605 0.0005029 60.170 < 2e-16 ***
## PF -0.0034776 0.0013037 -2.667 0.00792 **
## FGP 0.0057456 0.0018499 3.106 0.00202 **
## FGM -0.0024332 0.0010647 -2.285 0.02276 *
## ---
## Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## -----
## Sigma link function: log
## Sigma Coefficients:
##      Estimate Std. Error t value Pr(>|t|)
## (Intercept) -3.26165 0.03333 -97.85 <2e-16 ***
## ---
## Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## -----
## No. of observations in the fit: 450
## Degrees of Freedom for the fit: 6
## Residual Deg. of Freedom: 444
## at cycle: 2
##
## Global Deviance: -1658.44
```

```
##          AIC:      -1646.44
##          SBC:      -1621.784
## *****
```

```
#Resíduos forw
plot(gamlss_normal_forw)
```



```
## *****
##      Summary of the Quantile Residuals
##              mean   = -5.234287e-19
##              variance = 1.002227
##              coef. of skewness = -0.1543876
##              coef. of kurtosis = 3.054637
## Filliben correlation coefficient = 0.9977486
## *****
```

```
shapiro.test(gamlss_normal_forw$residuals) #p-value = 0.2296, normal
```

```
##
## Shapiro-Wilk normality test
##
## data:  gamlss_normal_forw$residuals
## W = 0.99555, p-value = 0.2296
```

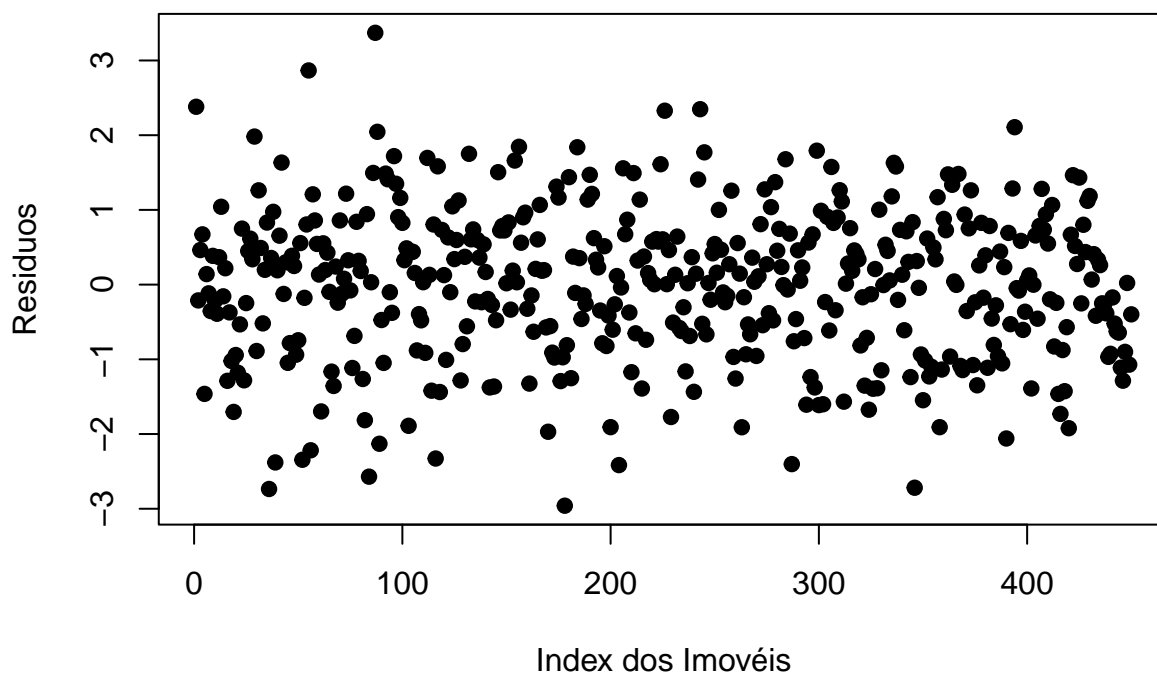
```
#Teste de durbin watson para independencia
library(lmtest)
dwtest(gamlss_normal_forw) #p-value = 0.195
```

```
##
```

```
## Durbin-Watson test
##
## data: gamlss_normal_forw
## DW = 1.9266, p-value = 0.195
## alternative hypothesis: true autocorrelation is greater than 0
```

```
#Independência
plot(gamlss_normal_forw$residuals,
     ylab = "Resíduos",
     xlab = "Index dos Imóveis",
     main = "Suposição de independência",
     pch = 19)
```

Suposição de independência



```
#Breusch_Pagan para homocedasticidade
bptest(gamlss_normal_forw) #p-value = 0.001575
```

```
##
## studentized Breusch-Pagan test
##
## data: gamlss_normal_forw
## BP = 17.457, df = 4, p-value = 0.001575
```

```
##### Backward Normal #####
```

```
#Mesma que a linear então não iremos utilizar
```

```
gamlss_normal_back <- gamlss(formula = WINP ~ PTS + FGP + PF + PlusMinus, family = NO, data = dados_reg)
```

```
## GAMLSS-RS iteration 1: Global Deviance = -1657.353
## GAMLSS-RS iteration 2: Global Deviance = -1657.353
```

```
gamlss_normal_back
```

```
##
```

```
## Family: c("NO", "Normal")
## Fitting method: RS()
##
## Call: gamlss(formula = WINP ~ PTS + FGP + PF + PlusMinus,
##             family = NO, data = dados_regressao)
##
## Mu Coefficients:
## (Intercept)          PTS          FGP          PF          PlusMinus
##  0.4105976   -0.0006542    0.0048736   -0.0032414    0.0304204
## Sigma Coefficients:
## (Intercept)
##      -3.26
##
## Degrees of Freedom for the fit: 6 Residual Deg. of Freedom    444
## Global Deviance:      -1657.35
##              AIC:      -1645.35
##              SBC:      -1620.7

coef(gamlss_normal_back)

##      (Intercept)          PTS          FGP          PF          PlusMinus
##  0.4105975914 -0.0006542452  0.0048736395 -0.0032414270  0.0304203770

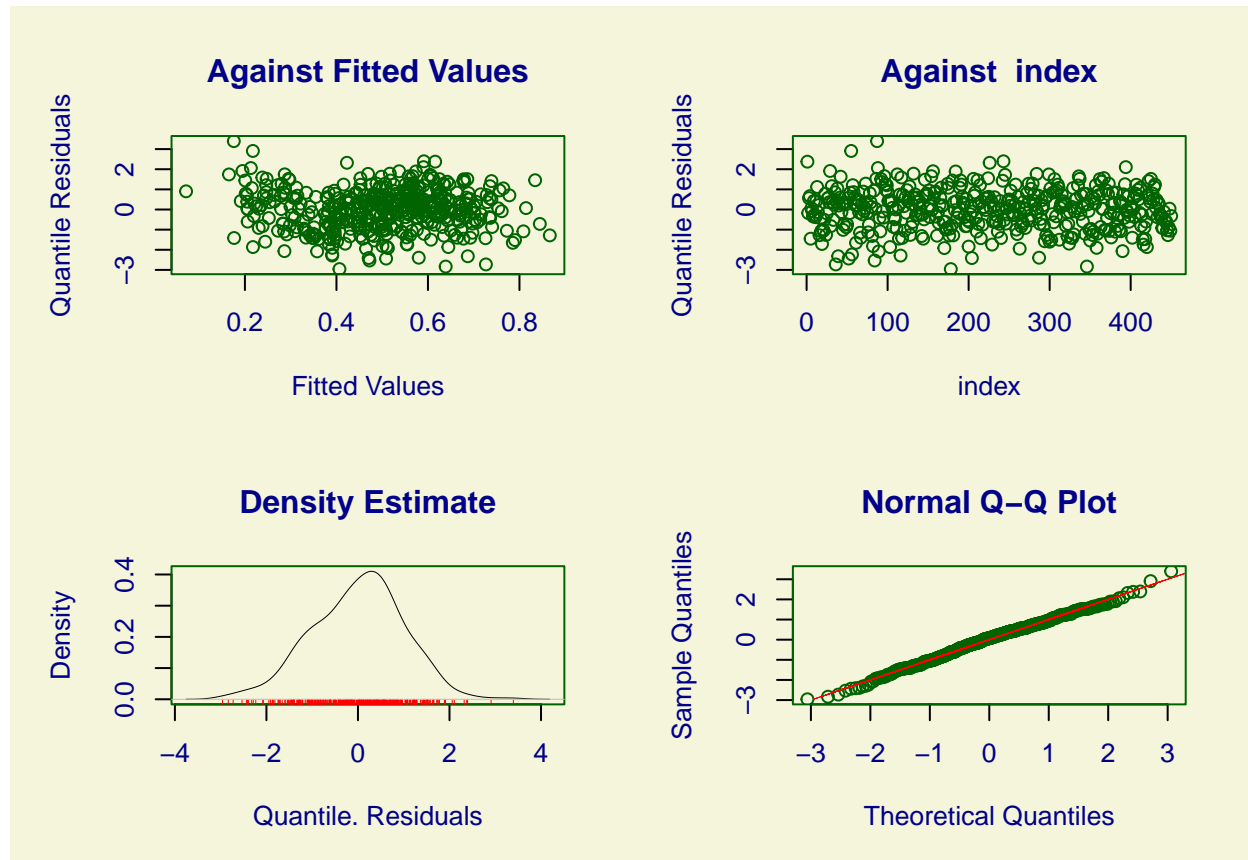
summary(gamlss_normal_back) #AIC:      -1645.353

## *****
## Family: c("NO", "Normal")
##
## Call: gamlss(formula = WINP ~ PTS + FGP + PF + PlusMinus,
##             family = NO, data = dados_regressao)
##
## Fitting method: RS()
##
## -----
## Mu link function: identity
## Mu Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.4105976  0.0711551   5.770 1.49e-08 ***
## PTS         -0.0006542  0.0003221  -2.031  0.04285 *
## FGP          0.0048736  0.0016875   2.888  0.00406 **
## PF          -0.0032414  0.0013059  -2.482  0.01343 *
## PlusMinus    0.0304204  0.0004963  61.289 < 2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## -----
## Sigma link function: log
## Sigma Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept) -3.26044    0.03333  -97.81  <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## -----
## No. of observations in the fit: 450
```

```
## Degrees of Freedom for the fit: 6
##      Residual Deg. of Freedom: 444
##              at cycle: 2
##
## Global Deviance:      -1657.353
##           AIC:        -1645.353
##           SBC:        -1620.698
## *****
```

```
#Resíduos
```

```
plot(gamlss_normal_back)
```



```
## *****
##      Summary of the Quantile Residuals
##              mean      = -6.457791e-17
##              variance   = 1.002227
##              coef. of skewness = -0.1456677
##              coef. of kurtosis = 3.071416
## Filliben correlation coefficient = 0.9978431
## *****
```

```
shapiro.test(gamlss_normal_back$residuals) #p-value = 0.2669, normal
```

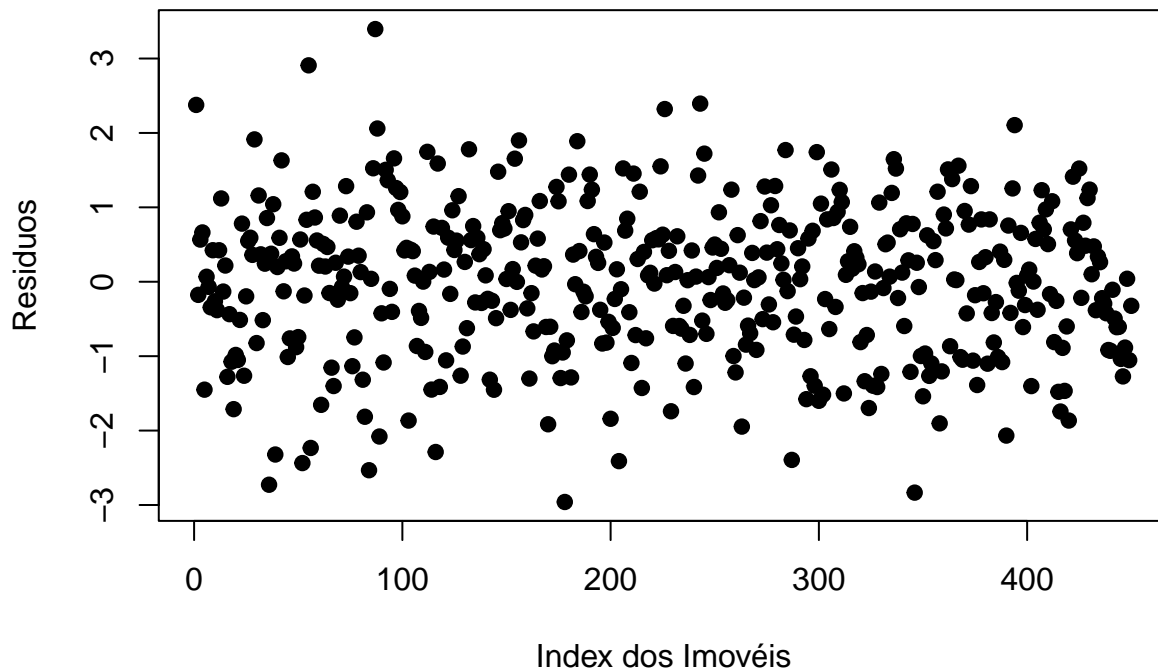
```
##
## Shapiro-Wilk normality test
##
## data:  gamlss_normal_back$residuals
## W = 0.99576, p-value = 0.2669
```

```
#Teste de durbin watson para independencia
library(lmtest)
dwtest(gamlss_normal_back) #p-value = 0.1735
```

```
##
## Durbin-Watson test
##
## data: gamlss_normal_back
## DW = 1.9193, p-value = 0.1735
## alternative hypothesis: true autocorrelation is greater than 0
```

```
#Independência
plot(gamlss_normal_back$residuals,
     ylab = "Resíduos",
     xlab = "Index dos Imóveis",
     main = "Suposição de independência",
     pch = 19)
```

Suposição de independência



```
#Breusch-Pagan para homocedasticidade
bptest(gamlss_normal_back) #p-value = 0.0006407
```

```
##
## studentized Breusch-Pagan test
##
## data: gamlss_normal_back
## BP = 19.451, df = 4, p-value = 0.0006407
```

```
##### Modelos Mistos #####
```

```
##### Normal TEAM #####
```

```
misto_normal_team <- gamlss(formula = WINP ~ (re(random = ~1 | TEAM)) +
                             PlusMinus + OREB + PF + `3PA`, family = NO, data = dados_regressao)
```

```
## GAMLSS-RS iteration 1: Global Deviance = -1692.952
## GAMLSS-RS iteration 2: Global Deviance = -1692.953
misto_normal_team

##
## Family: c("NO", "Normal")
## Fitting method: RS()
##
## Call: gamlss(formula = WINP ~ (re(random = ~1 | TEAM)) +
##      PlusMinus + OREB + PF + `3PA`, family = NO, data = dados_regressao)
##
## Mu Coefficients:
##      (Intercept) re(random = ~1 | TEAM)      PlusMinus
##      0.6092070      NA      0.0309516
##      OREB      PF      `3PA`
##      -0.0039632      -0.0027516      -0.0004534
## Sigma Coefficients:
## (Intercept)
##      -3.3
##
## Degrees of Freedom for the fit: 18.68 Residual Deg. of Freedom 431.3
## Global Deviance: -1692.95
##      AIC: -1655.59
##      SBC: -1578.82
```

```
coef(misto_normal_team)

##      (Intercept) re(random = ~1 | TEAM)      PlusMinus
##      0.609207002      NA      0.030951603
##      OREB      PF      `3PA`
##      -0.003963203      -0.002751593      -0.000453441
```

```
summary(misto_normal_team) #AIC:
```

```
## *****
## Family: c("NO", "Normal")
##
## Call: gamlss(formula = WINP ~ (re(random = ~1 | TEAM)) +
##      PlusMinus + OREB + PF + `3PA`, family = NO, data = dados_regressao)
##
## Fitting method: RS()
##
## -----
## Mu link function: identity
## Mu Coefficients:
##      Estimate Std. Error t value Pr(>|t|)
## (Intercept) 0.6092070 0.0303785 20.054 <2e-16 ***
## PlusMinus 0.0309516 0.0003838 80.651 <2e-16 ***
## OREB -0.0039632 0.0015319 -2.587 0.0100 *
## PF -0.0027516 0.0012698 -2.167 0.0308 *
## `3PA` -0.0004534 0.0002449 -1.852 0.0648 .
## ---
## Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## -----
```

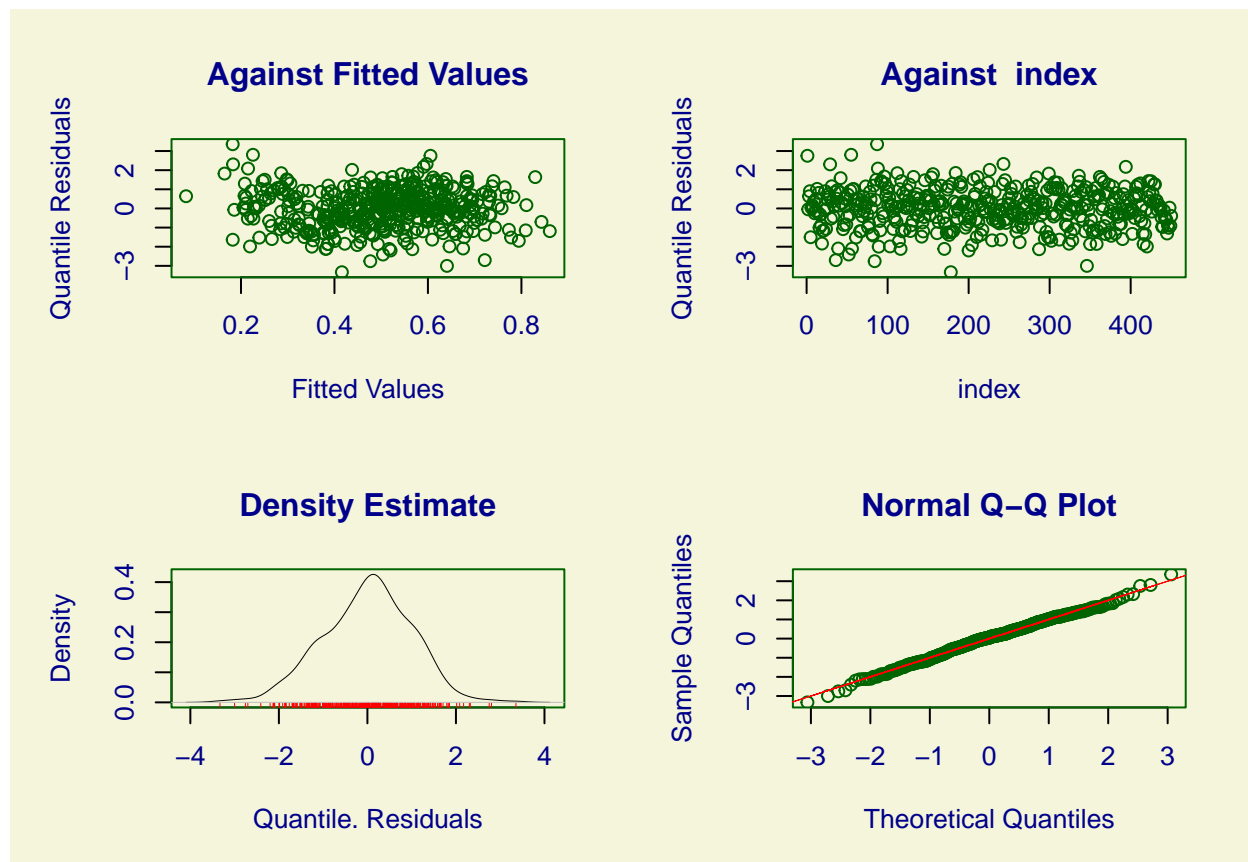


```
## Sigma link function: log
## Sigma Coefficients:
##           Estimate Std. Error t value Pr(>|t|)
## (Intercept) -3.30000    0.03333   -99    <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## -----
## NOTE: Additive smoothing terms exist in the formulas:
## i) Std. Error for smoothers are for the linear effect only.
## ii) Std. Error for the linear terms maybe are not accurate.
## -----
## No. of observations in the fit: 450
## Degrees of Freedom for the fit: 18.68251
##      Residual Deg. of Freedom: 431.3175
##              at cycle: 2
##
## Global Deviance:    -1692.953
##           AIC:      -1655.588
##           SBC:      -1578.817
## *****
```

```
getSmo(misto_normal_team)
```

```
## Linear mixed-effects model fit by maximum likelihood
##   Data: Data
##   Log-likelihood: 830.6558
##   Fixed: fix.formula
##   (Intercept)
## -7.716467e-05
##
## Random effects:
##   Formula: ~1 | TEAM
##           (Intercept) Residual
## StdDev: 0.008588527 1.015556
##
## Variance function:
##   Structure: fixed weights
##   Formula: ~W.var
## Number of Observations: 450
## Number of Groups: 34
```

```
#Resíduos
plot(misto_normal_team)
```



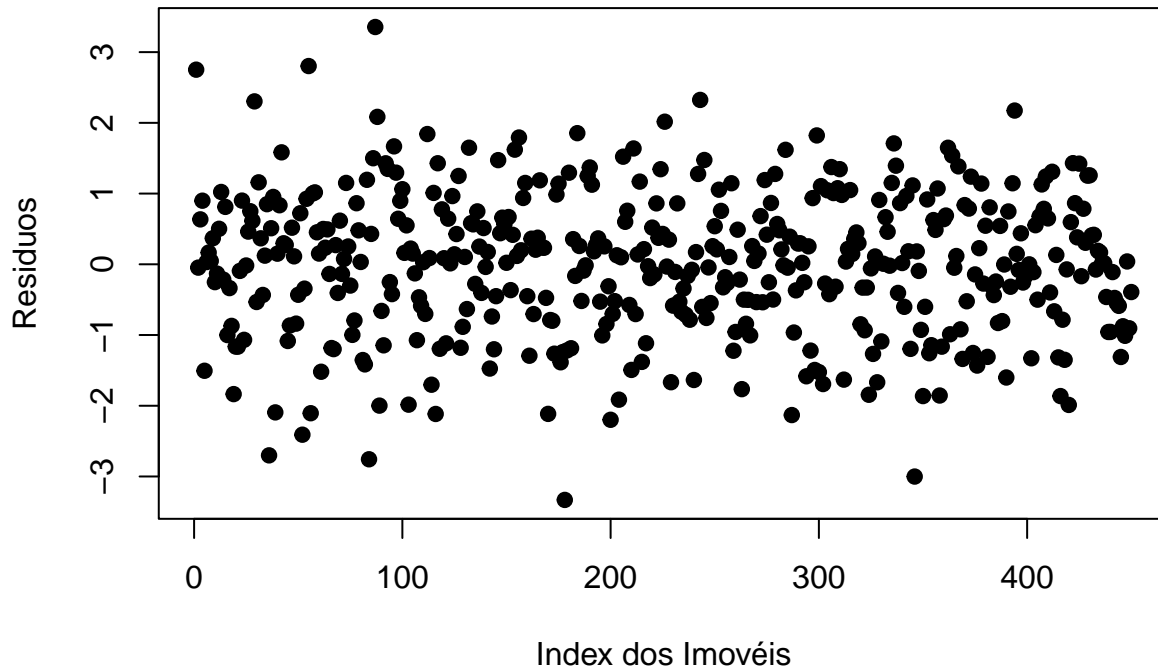
```
## *****
##      Summary of the Quantile Residuals
##              mean   = 3.759596e-16
##              variance = 1.002227
##              coef. of skewness = -0.16376
##              coef. of kurtosis = 3.164814
## Filliben correlation coefficient = 0.9976843
## *****
```

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

```
##
## Shapiro-Wilk normality test
##
## data: misto_normal_team$residuals
## W = 0.99567, p-value = 0.2499
```

```
#Independência
plot(misto_normal_team$residuals,
     ylab = "Resíduos",
     xlab = "Index dos Imóveis",
     main = "Suposição de independência",
     pch = 19)
```

Suposição de independência



```
#Breusch_Pagan para homocedasticidade
bptest(misto_normal_team) #p-value =

##
## studentized Breusch-Pagan test
##
## data: misto_normal_team
## BP = 19.427, df = 4, p-value = 0.0006477

##### Forward Normal Temporada #####
misto_normal_forw_temp <- gamlss(formula = WINP ~ (re(random = ~1 | Numero_temporada)) +
                                PlusMinus + PF + FGP + FGM, family = NO, data = dados_regressao)

## GAMLSS-RS iteration 1: Global Deviance = -1658.44
## GAMLSS-RS iteration 2: Global Deviance = -1658.44
misto_normal_forw_temp

##
## Family: c("NO", "Normal")
## Fitting method: RS()
##
## Call: gamlss(formula = WINP ~ (re(random = ~1 | Numero_temporada)) +
## PlusMinus + PF + FGP + FGM, family = NO, data = dados_regressao)
##
## Mu Coefficients:
##
## (Intercept) re(random = ~1 | Numero_temporada)
## 0.401565 NA
## PlusMinus PF
## 0.030261 -0.003478
## FGP FGM
```

```
##                                0.005746                                -0.002433
## Sigma Coefficients:
## (Intercept)
##      -3.262
##
## Degrees of Freedom for the fit: 5 Residual Deg. of Freedom    445
## Global Deviance:      -1658.44
##           AIC:      -1648.44
##           SBC:      -1627.89
coef(misto_normal_forw_temp)

##                                (Intercept) re(random = ~1 | Numero_temporada)
##                                0.401564997                                NA
##                                PlusMinus                                PF
##                                0.030260547                                -0.003477604
##                                FGP                                FGM
##                                0.005745605                                -0.002433190
summary(misto_normal_forw_temp) #AIC:

## *****
## Family:  c("NO", "Normal")
##
## Call:  gamlss(formula = WINP ~ (re(random = ~1 | Numero_temporada)) +
##      PlusMinus + PF + FGP + FGM, family = NO, data = dados_regressao)
##
## Fitting method: RS()
##
## -----
## Mu link function:  identity
## Mu Coefficients:
##      Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.4015650  0.0714772   5.618 3.41e-08 ***
## PlusMinus    0.0302605  0.0005029  60.170 < 2e-16 ***
## PF          -0.0034776  0.0013037  -2.667  0.00792 **
## FGP          0.0057456  0.0018499   3.106  0.00202 **
## FGM         -0.0024332  0.0010647  -2.285  0.02276 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## -----
## Sigma link function:  log
## Sigma Coefficients:
##      Estimate Std. Error t value Pr(>|t|)
## (Intercept) -3.26165    0.03333 -97.85 <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## -----
## NOTE: Additive smoothing terms exist in the formulas:
## i) Std. Error for smoothers are for the linear effect only.
## ii) Std. Error for the linear terms maybe are not accurate.
## -----
## No. of observations in the fit:  450
```

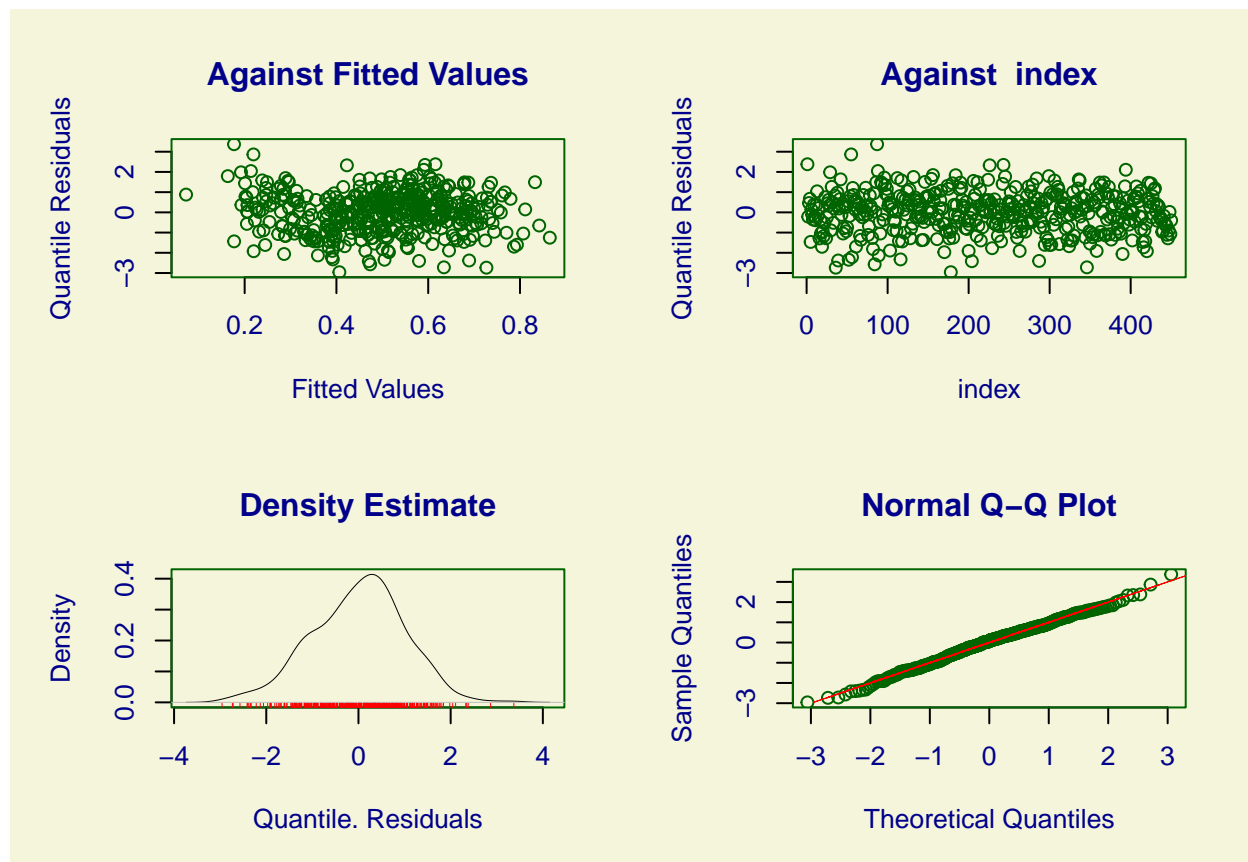
```
## Degrees of Freedom for the fit: 5
##      Residual Deg. of Freedom: 445
##              at cycle: 2
##
## Global Deviance:      -1658.44
##              AIC:      -1648.44
##              SBC:      -1627.894
## *****
```

```
getSmo(misto_normal_forw_temp)
```

```
## Linear mixed-effects model fit by maximum likelihood
##   Data: Data
##   Log-likelihood: 829.22
##   Fixed: fix.formula
##   (Intercept)
## -2.406961e-18
##
## Random effects:
##   Formula: ~1 | Numero_temporada
##           (Intercept) Residual
## StdDev: 2.425336e-07 0.9999995
##
## Variance function:
##   Structure: fixed weights
##   Formula: ~W.var
## Number of Observations: 450
## Number of Groups: 15
```

```
#Resíduos
```

```
plot(misto_normal_forw_temp)
```



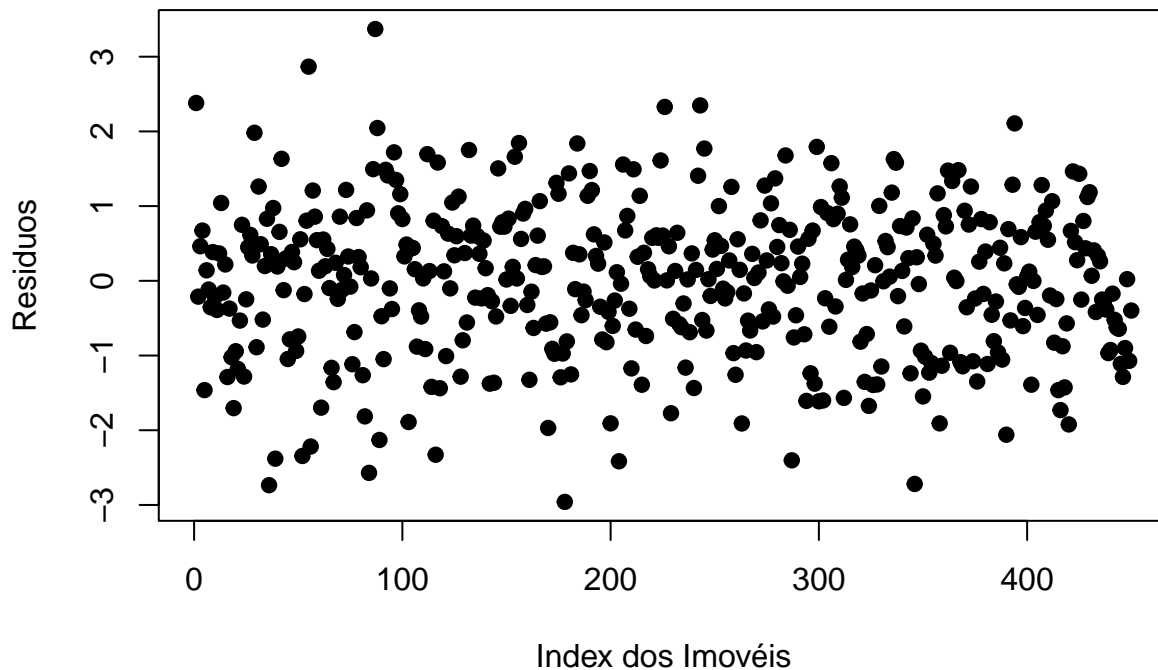
```
## *****
##      Summary of the Quantile Residuals
##              mean   = -2.760282e-16
##              variance = 1.002227
##              coef. of skewness = -0.1543876
##              coef. of kurtosis = 3.054637
## Filliben correlation coefficient = 0.9977486
## *****
```

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

```
##
## Shapiro-Wilk normality test
##
## data: misto_normal_forw_temp$residuals
## W = 0.99555, p-value = 0.2296
```

```
#Independência
plot(misto_normal_forw_temp$residuals,
     ylab = "Resíduos",
     xlab = "Index dos Imóveis",
     main = "Suposição de independência",
     pch = 19)
```

Suposição de independência



```
#Breusch_Pagan para homocedasticidade
bptest(misto_normal_forw_temp) #p-value =

##
## studentized Breusch-Pagan test
##
## data: misto_normal_forw_temp
## BP = 17.457, df = 4, p-value = 0.001575

##### Beta Team #####
misto_beta_forw_team <- gamlss(formula = WINP ~ (re(random = ~1 | TEAM)) +
                               PlusMinus + FGP + PTS + PF, family = BE, data = dados_regressao)

## GAMLSS-RS iteration 1: Global Deviance = -1331.692
## GAMLSS-RS iteration 2: Global Deviance = -1702.507
## GAMLSS-RS iteration 3: Global Deviance = -1703.008
## GAMLSS-RS iteration 4: Global Deviance = -1702.989
## GAMLSS-RS iteration 5: Global Deviance = -1702.988

misto_beta_forw_team

##
## Family: c("BE", "Beta")
## Fitting method: RS()
##
## Call: gamlss(formula = WINP ~ (re(random = ~1 | TEAM)) +
##             PlusMinus + FGP + PTS + PF, family = BE, data = dados_regressao)
##
## Mu Coefficients:
##              (Intercept) re(random = ~1 | TEAM) PlusMinus
##                -0.52046                NA              0.13127
```

```
##               FGP               PTS               PF
##           0.02313           -0.00305           -0.01114
## Sigma Coefficients:
## (Intercept)
##      -2.49
##
## Degrees of Freedom for the fit: 15.52 Residual Deg. of Freedom   434.5
## Global Deviance:      -1702.99
##           AIC:      -1671.94
##           SBC:      -1608.14
```

```
coef(misto_beta_forw_team)
```

```
##           (Intercept) re(random = ~1 | TEAM)           PlusMinus
##      -0.520457363                NA           0.131270482
##           FGP                PTS                PF
##      0.023125273           -0.003050261           -0.011143861
```

```
summary(misto_beta_forw_team) #AIC:
```

```
## *****
## Family:  c("BE", "Beta")
##
## Call:  gamlss(formula = WINP ~ (re(random = ~1 | TEAM)) +
##      PlusMinus + FGP + PTS + PF, family = BE, data = dados_regressao)
##
## Fitting method: RS()
##
## -----
## Mu link function:  logit
## Mu Coefficients:
##           Estimate Std. Error t value Pr(>|t|)
## (Intercept) -0.520457  0.296861  -1.753  0.08027 .
## PlusMinus    0.131270  0.002155  60.912  < 2e-16 ***
## FGP          0.023125  0.007044   3.283  0.00111 **
## PTS          -0.003050  0.001355  -2.251  0.02490 *
## PF           -0.011144  0.005475  -2.035  0.04243 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## -----
## Sigma link function:  logit
## Sigma Coefficients:
##           Estimate Std. Error t value Pr(>|t|)
## (Intercept) -2.48957    0.03579  -69.56  <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## -----
## NOTE: Additive smoothing terms exist in the formulas:
## i) Std. Error for smoothers are for the linear effect only.
## ii) Std. Error for the linear terms maybe are not accurate.
## -----
## No. of observations in the fit:  450
## Degrees of Freedom for the fit:  15.52489
```

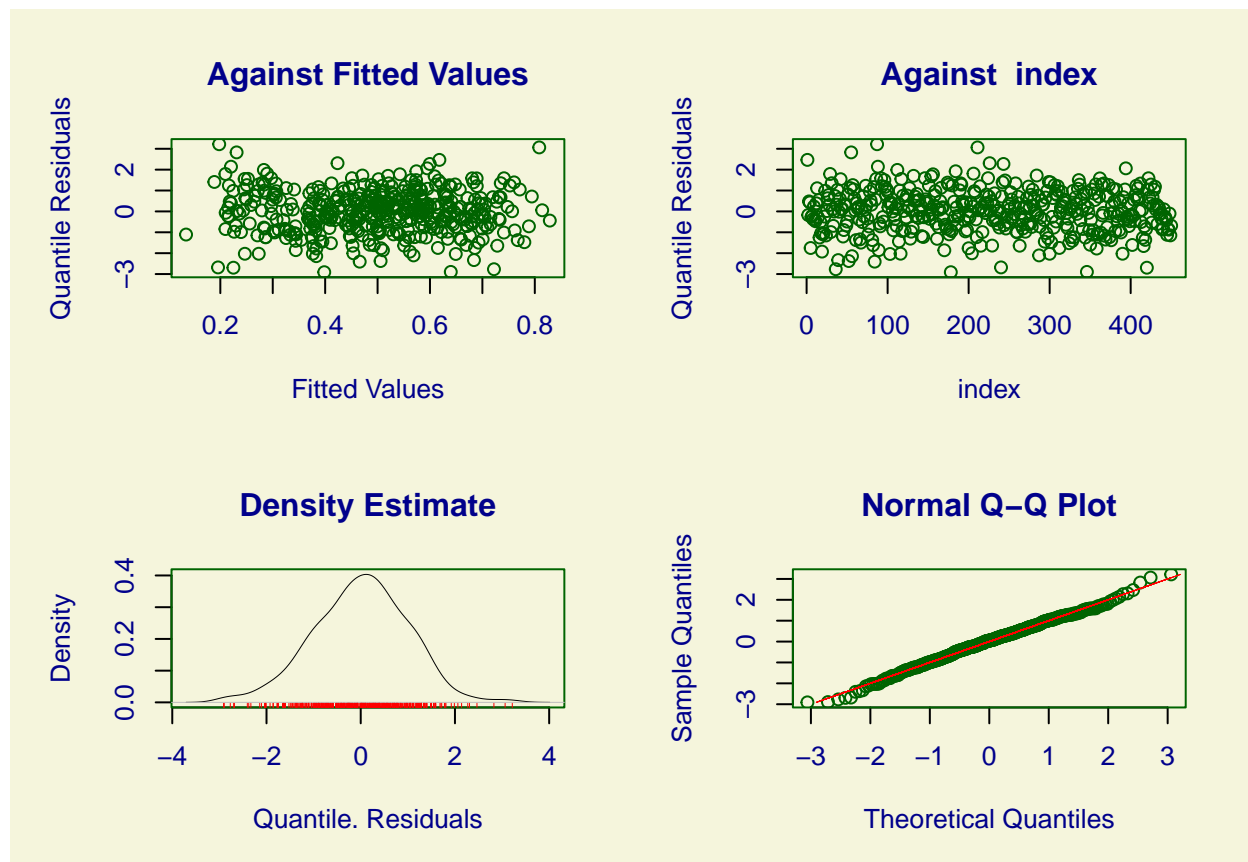


```
##      Residual Deg. of Freedom: 434.4751
##                               at cycle: 5
##
## Global Deviance:      -1702.988
##           AIC:        -1671.938
##           SBC:        -1608.143
## *****
```

```
getSmo(misto_beta_forw_team)
```

```
## Linear mixed-effects model fit by maximum likelihood
##   Data: Data
##   Log-likelihood: 172.8376
##   Fixed: fix.formula
##   (Intercept)
## -0.000240694
##
## Random effects:
##   Formula: ~1 | TEAM
##           (Intercept) Residual
## StdDev:  0.03017841 1.011871
##
## Variance function:
##   Structure: fixed weights
##   Formula: ~W.var
## Number of Observations: 450
## Number of Groups: 34
```

```
#Resíduos
plot(misto_beta_forw_team)
```



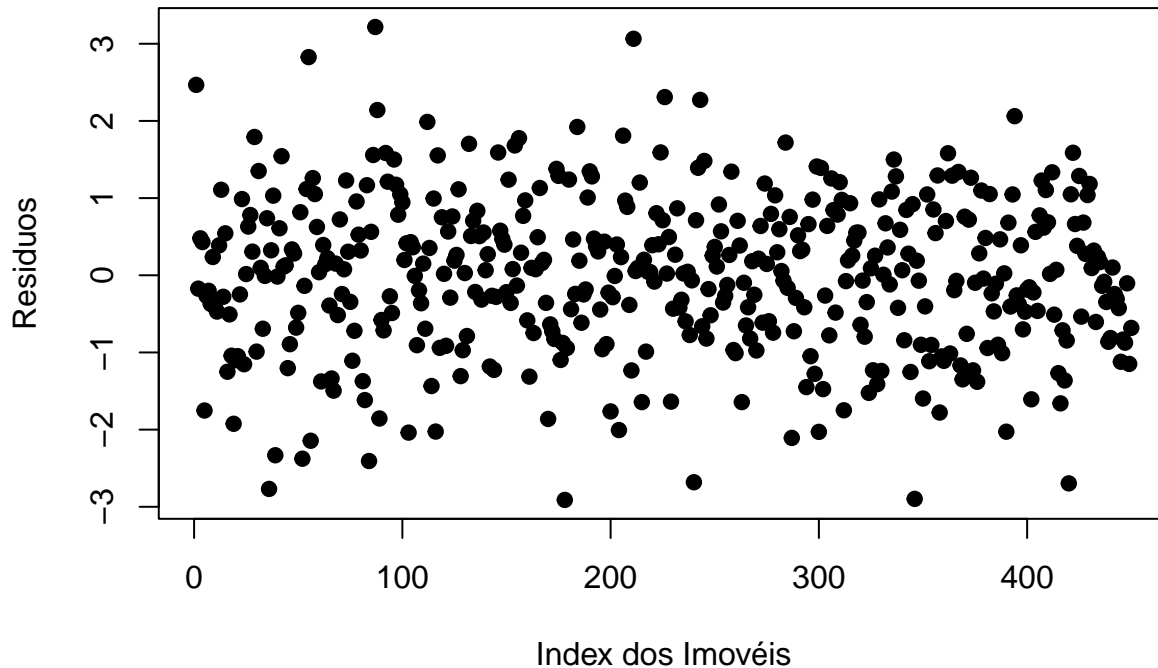
```
## *****
##      Summary of the Quantile Residuals
##              mean   = 0.003213294
##              variance = 1.002233
##              coef. of skewness = -0.1191569
##              coef. of kurtosis = 3.196833
## Filliben correlation coefficient = 0.9981705
## *****
```

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

```
##
## Shapiro-Wilk normality test
##
## data: misto_beta_forw_team$residuals
## W = 0.99621, p-value = 0.3609
```

```
#Independência
plot(misto_beta_forw_team$residuals,
     ylab = "Resíduos",
     xlab = "Index dos Imóveis",
     main = "Suposição de independência",
     pch = 19)
```

Suposição de independência



```
#Breusch_Pagan para homocedasticidade
bptest(misto_beta_forw_team) #p-value =

##
## studentized Breusch-Pagan test
##
## data: misto_beta_forw_team
## BP = 19.451, df = 4, p-value = 0.0006407

##### Backward Beta Temporada #####
misto_beta_temp <- gamlss(formula = WINP ~ (re(random = ~1 | Numero_temporada)) +
  PlusMinus + PF + FGP + FGA, family = BE, data = dados_regressao)

## GAMLSS-RS iteration 1: Global Deviance = -1321.864
## GAMLSS-RS iteration 2: Global Deviance = -1676.074
## GAMLSS-RS iteration 3: Global Deviance = -1676.579
## GAMLSS-RS iteration 4: Global Deviance = -1676.579

misto_beta_temp

##
## Family: c("BE", "Beta")
## Fitting method: RS()
##
## Call: gamlss(formula = WINP ~ (re(random = ~1 | Numero_temporada)) +
##   PlusMinus + PF + FGP + FGA, family = BE, data = dados_regressao)
##
## Mu Coefficients:
##
## (Intercept) re(random = ~1 | Numero_temporada)
## -0.144351 NA
## PlusMinus PF
```

```
##              0.131028              -0.013171
##              FGP              FGA
##              0.017272              -0.004551
## Sigma Coefficients:
## (Intercept)
##      -2.458
##
## Degrees of Freedom for the fit: 5 Residual Deg. of Freedom   445
## Global Deviance:      -1676.58
##           AIC:      -1666.58
##           SBC:      -1646.03
```

```
coef(misto_beta_temp)
```

```
##              (Intercept) re(random = ~1 | Numero_temporada)
##              -0.144351152              NA
##              PlusMinus              PF
##              0.131028037              -0.013171238
##              FGP              FGA
##              0.017272427              -0.004550627
```

```
summary(misto_beta_temp) #AIC:
```

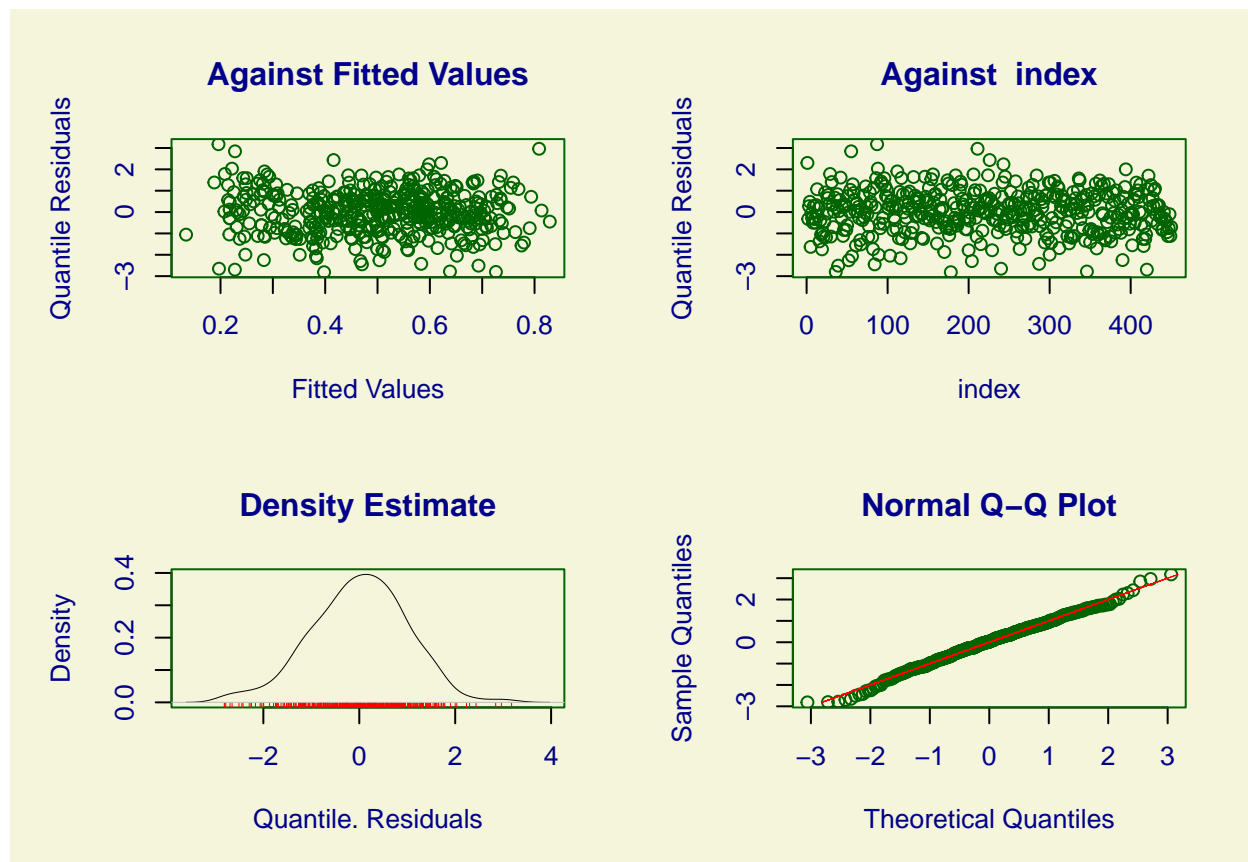
```
## *****
## Family:  c("BE", "Beta")
##
## Call:  gamlss(formula = WINP ~ (re(random = ~1 | Numero_temporada)) +
##      PlusMinus + PF + FGP + FGA, family = BE, data = dados_regressao)
##
## Fitting method: RS()
##
## -----
## Mu link function:  logit
## Mu Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept) -0.144351  0.330670  -0.437  0.66266
## PlusMinus   0.131028  0.002248  58.298 < 2e-16 ***
## PF          -0.013171  0.005636  -2.337  0.01987 *
## FGP          0.017272  0.006264   2.757  0.00607 **
## FGA         -0.004551  0.002125  -2.141  0.03280 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## -----
## Sigma link function:  logit
## Sigma Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept) -2.45814   0.03586  -68.55 <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## -----
## NOTE: Additive smoothing terms exist in the formulas:
## i) Std. Error for smoothers are for the linear effect only.
## ii) Std. Error for the linear terms maybe are not accurate.
```

```
## -----
## No. of observations in the fit: 450
## Degrees of Freedom for the fit: 5
##      Residual Deg. of Freedom: 445
##      at cycle: 4
##
## Global Deviance:      -1676.579
##      AIC:      -1666.579
##      SBC:      -1646.033
## *****
```

```
getSmo(misto_beta_temp)
```

```
## Linear mixed-effects model fit by maximum likelihood
##   Data: Data
##   Log-likelihood: 171.5918
##   Fixed: fix.formula
##   (Intercept)
## 2.707631e-13
##
## Random effects:
## Formula: ~1 | Numero_temporada
##      (Intercept) Residual
## StdDev: 3.331254e-06 0.9997892
##
## Variance function:
## Structure: fixed weights
## Formula: ~W.var
## Number of Observations: 450
## Number of Groups: 15
```

```
#Resíduos
plot(misto_beta_temp)
```



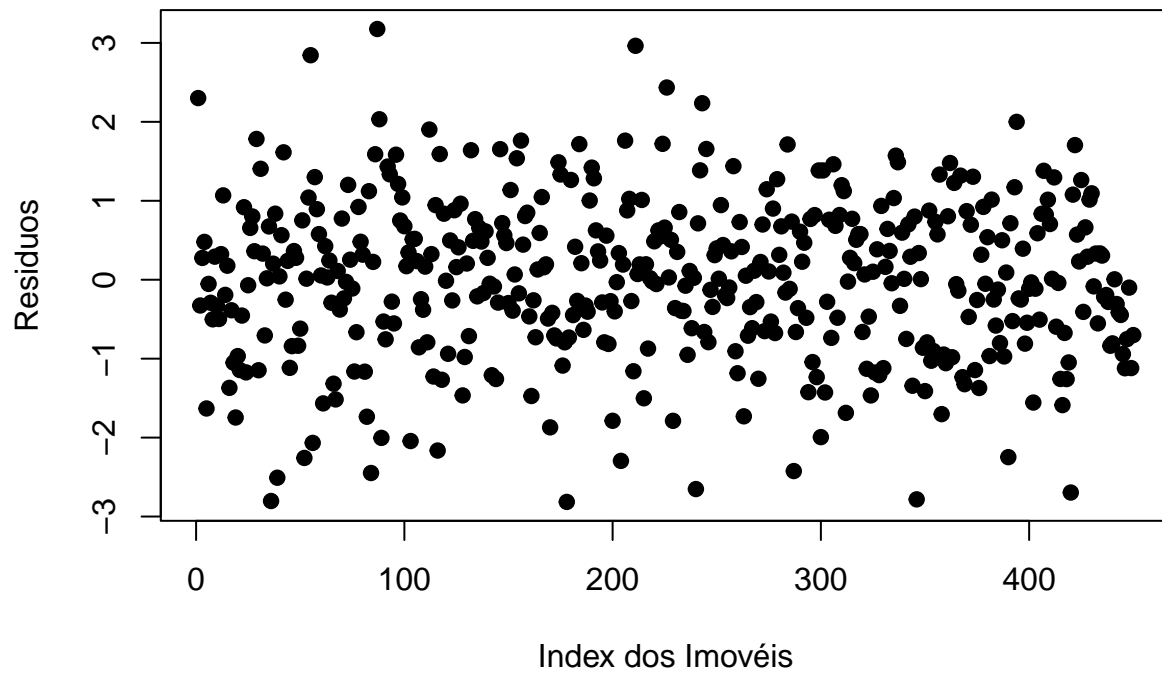
```
## *****
##      Summary of the Quantile Residuals
##              mean   = 0.003259703
##              variance = 1.002493
##              coef. of skewness = -0.1504399
##              coef. of kurtosis = 3.186479
## Filliben correlation coefficient = 0.9977991
## *****
```

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

```
##
## Shapiro-Wilk normality test
##
## data: misto_beta_temp$residuals
## W = 0.99535, p-value = 0.2
```

```
#Independência
plot(misto_beta_temp$residuals,
     ylab = "Resíduos",
     xlab = "Index dos Imóveis",
     main = "Suposição de independência",
     pch = 19)
```

Suposição de independência



```
#Breusch_Pagan para homocedasticidade
```

```
bptest(misto_beta_temp) #p-value =
```

```
##
```

```
## studentized Breusch-Pagan test
```

```
##
```

```
## data: misto_beta_temp
```

```
## BP = 17.534, df = 4, p-value = 0.001522
```