Project_625

Soccer Regression

2022-11-11

Slide with Bullets

- Exploratory data analysis
- Model Building
- Evaluating and interpretation

Slide with R Output

```
data1=read.csv("C:/Users/USER/Desktop/SoccerRegression/Sample_data/Project_Data.csv")
head(data1)
```

```
##   leage        team Gls No.Pl no.sh SoT PK FK Att.3rd.T Succ.Drib Att.Drib
## 1   Epl     Arsenal  60    27   581 186  5 22      6399       319      590
## 2   Epl Aston Villa  50    31   461 159  3 20      4983       333      587
## 3   Epl   Brentford  46    29   436 141  6 11      4515       262      476
## 4   Epl    Brighton  40    26   482 141  4 15      6401       317      559
## 5   Epl     Burnley  32    23   405 119  1 14      4639       258      479
## 6   Epl     Chelsea  75    26   583 200  8 26      7764       364      624
##   Touches Prog.T GCA.Drib ShortAT_Pass MediumtAT_Pass LongAT_Pass
## 1   23628   1058        3         8210           8140        2584
## 2   20474    916        9         6803           6136        2571
## 3   20340    869        5         6312           6120        2852
## 4   24673   1043        3         8172           8207        2954
## 5   18247    708        5         5327           4472        3216
## 6   28767   1314        8        11617           9322        2514
```

Slide with Eda

```
## [1] 50.72449
```

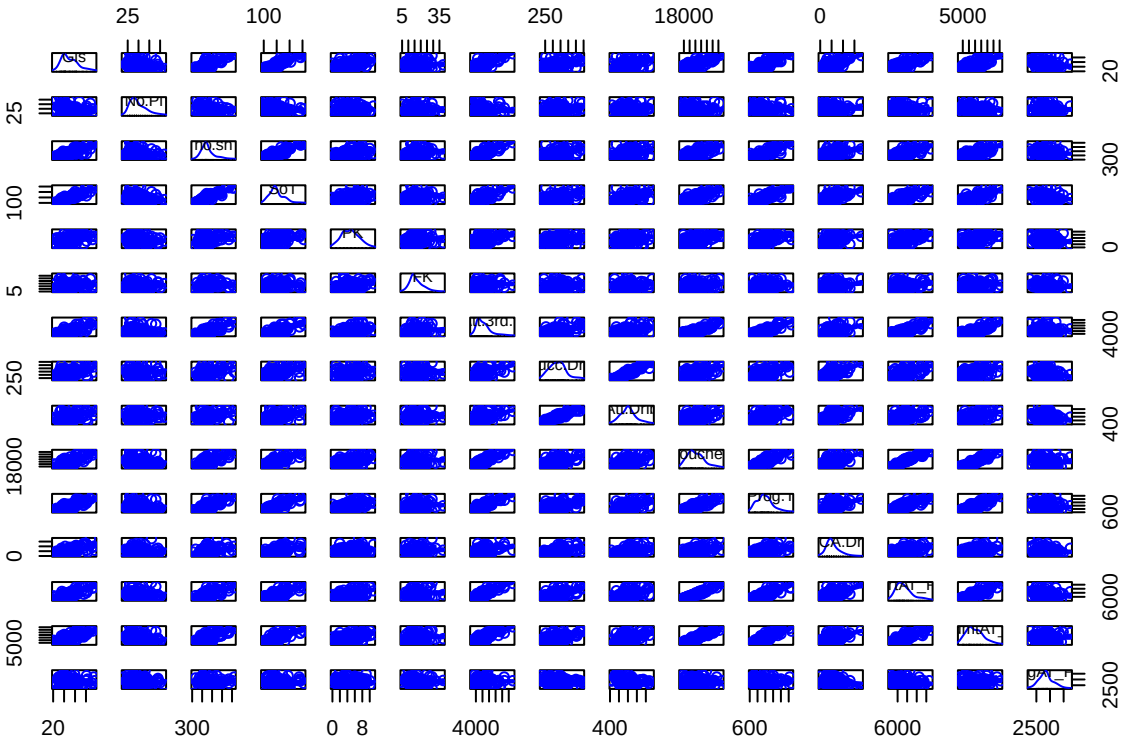
```
## [1] 267.8718
```

```
## Loading required package: car
```

```
## Loading required package: carData
```

```
## Loading required package: effects
```

```
## lattice theme set by effectsTheme()
## See ?effectsTheme for details.
```

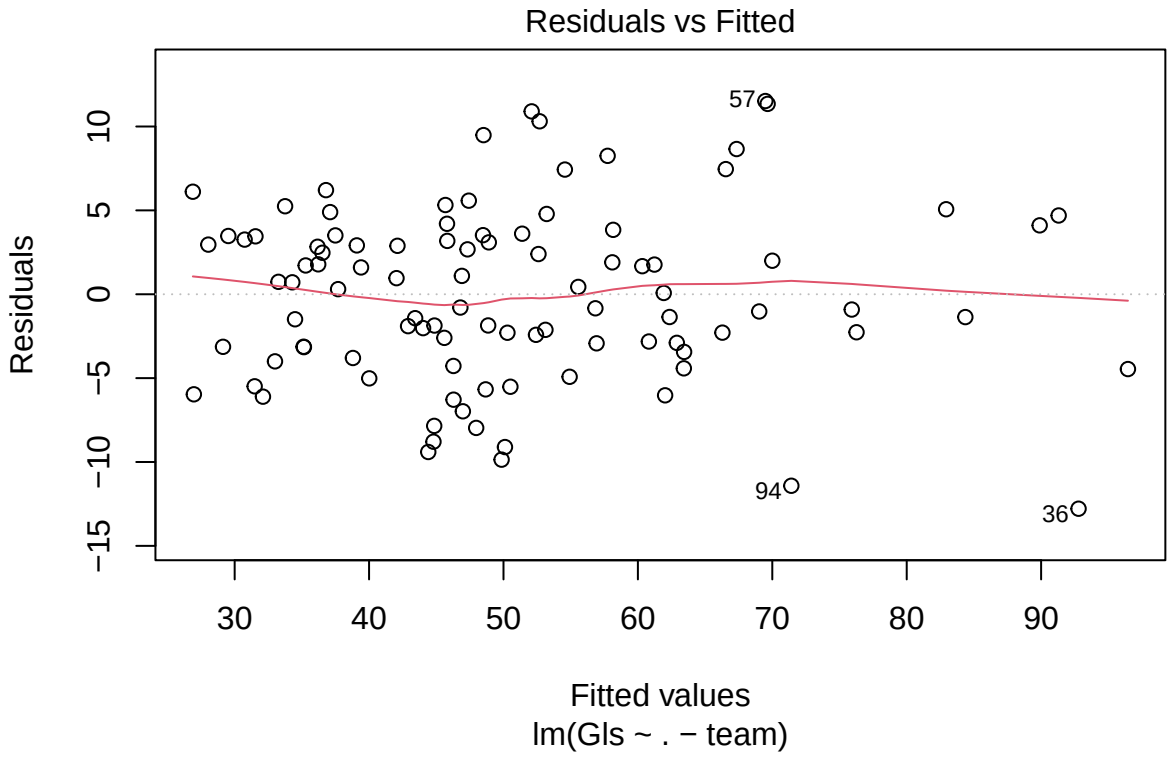


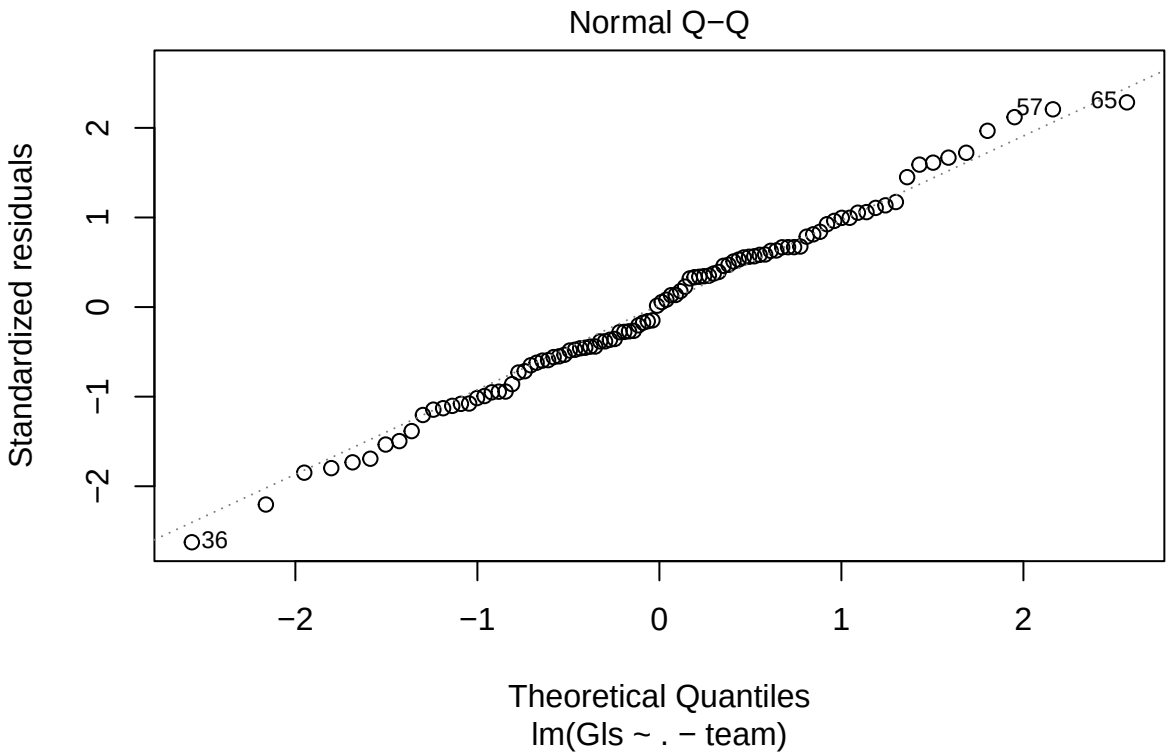
Normal linear regression

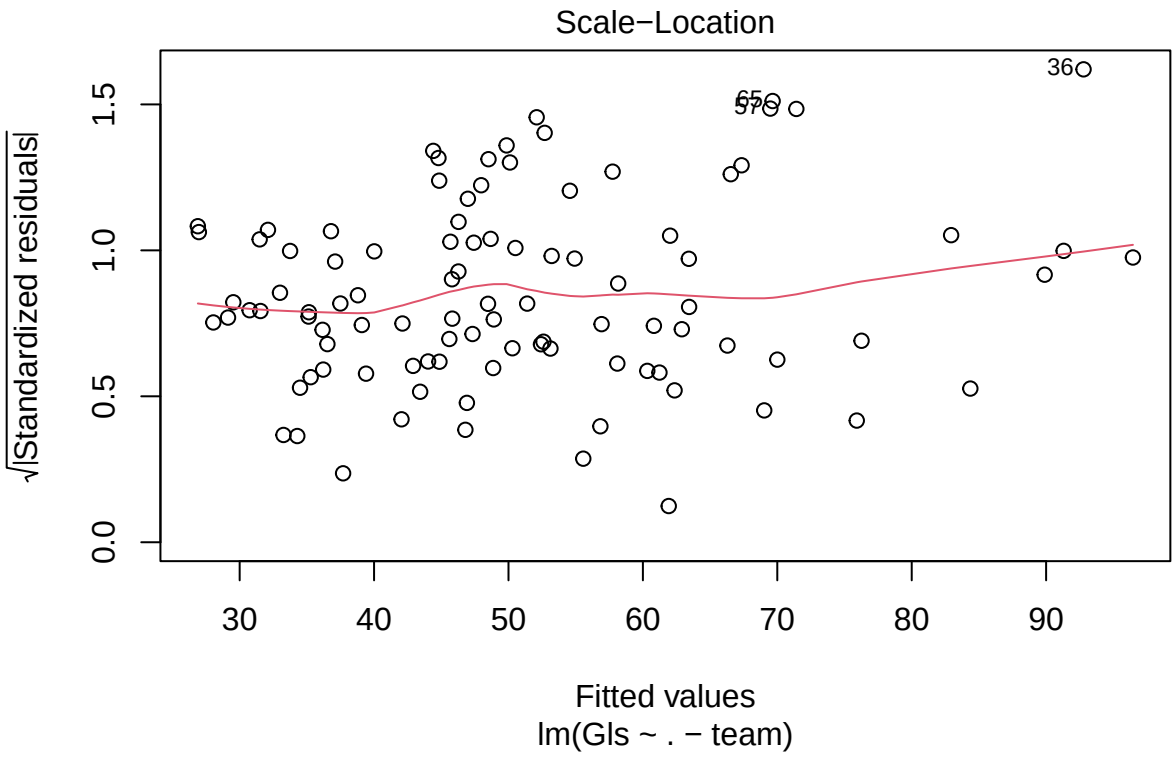
```
##     leage      team Gls No.Pl no.sh SoT PK FK Att.3rd.T Succ.Drib Att.Drib
## 93 SerieA Sampdoria  42    34   386 118  2 12      4331       228       422
## 94 SerieA  Sassuolo  60    29   569 204  7 14      5259       403       678
## 95 SerieA    Spezia  38    30   381 127  3 17      4121       292       546
## 96 SerieA    Torino  43    31   470 142  6 16      5633       295       512
## 97 SerieA   Udinese  58    29   505 181  3 19      4780       363       680
## 98 SerieA   Venezia  34    39   349 113  3 22      3885       300       577
##    Touches Prog.T GCA.Drib ShortAT_Pass MediumtAT_Pass LongAT_Pass
## 93   20845    915         3          6565           6436        2904
## 94   24243   1137        10          8959           7443        2681
## 95   19562    725         3          6112           5591        2833
## 96   22075    879         6          7220           6933        2885
## 97   19463    844         8          6357           5570        2322
## 98   19554    768         1          5783           5800        2780
```

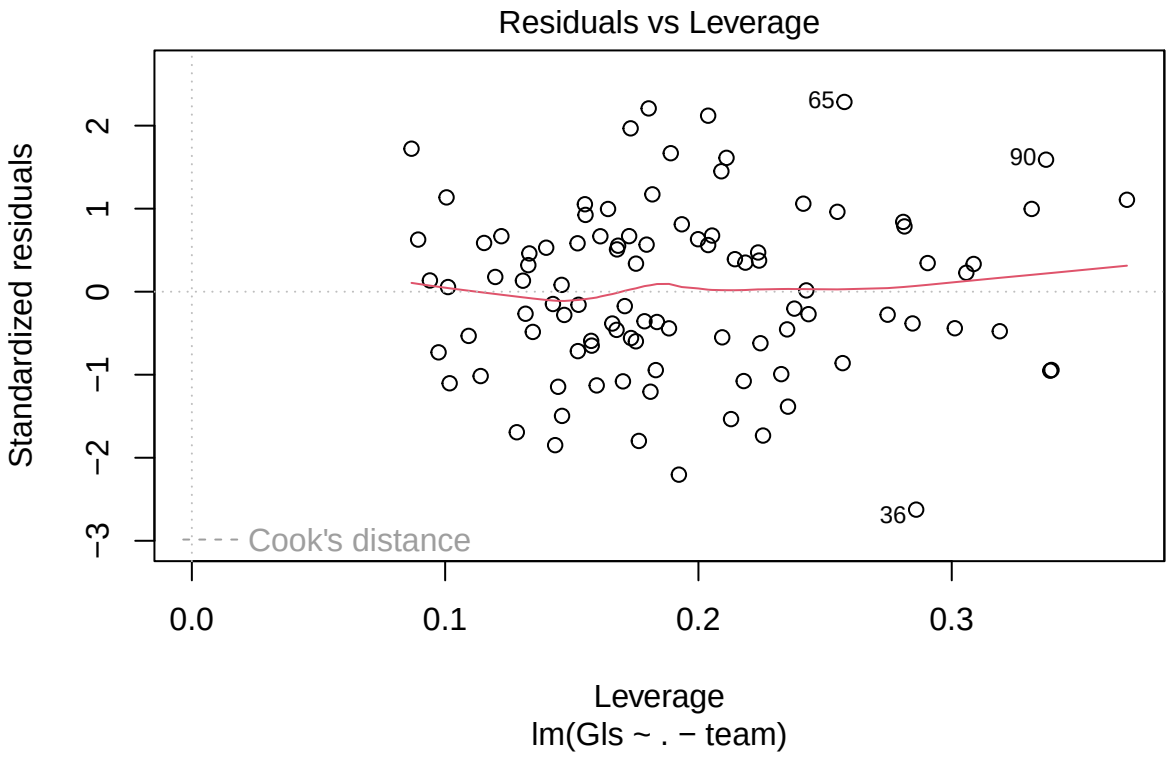
```
##
## Call:
## lm(formula = Gls ~ . - team, data = data1)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -12.7847  -3.1472   0.1909   3.4677  11.5182
##
## Coefficients:
```

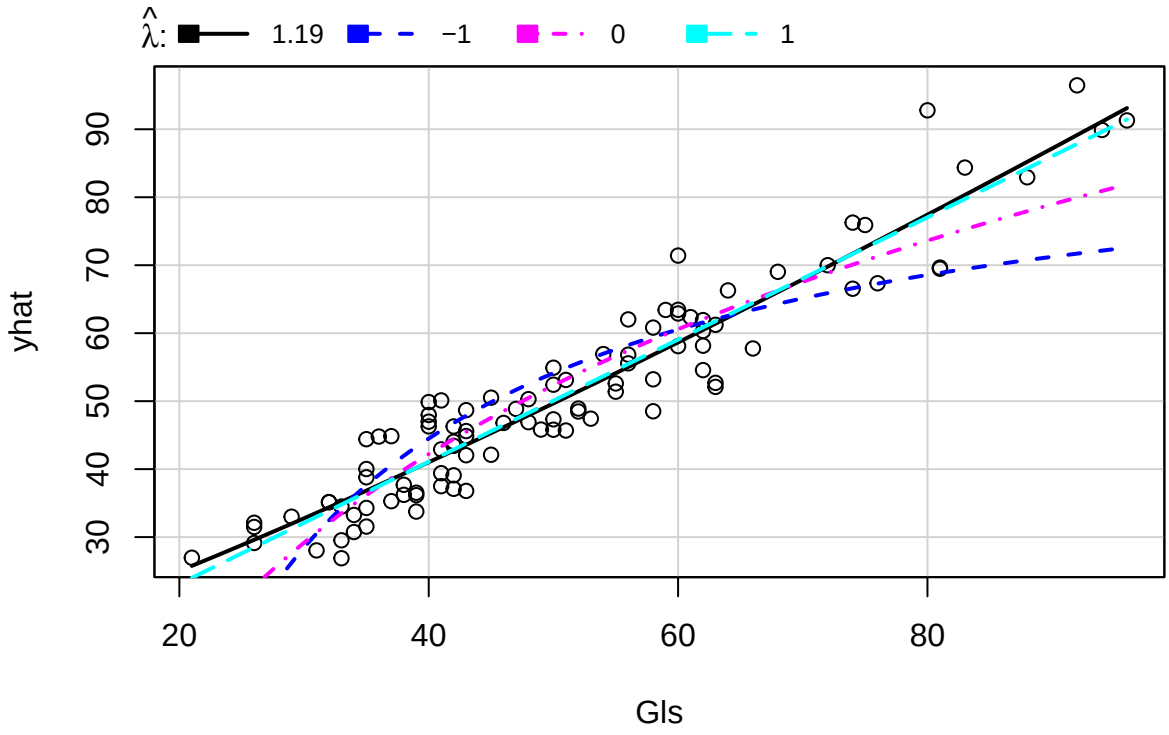
```
##                 Estimate Std. Error t value Pr(>|t|)
## (Intercept)     0.697553  22.616813   0.031  0.97547
## leageEpl       -2.872250   2.678305  -1.072  0.28680
## leageLaliga    -5.091798   2.920440  -1.744  0.08514 .
## leageLigue1    -2.986266   2.450599  -1.219  0.22663
## leageSerieA    -2.472532   2.449365  -1.009  0.31584
## No.Pl           0.052577   0.179208   0.293  0.76999
## no.sh          -0.068939   0.027138  -2.540  0.01304 *
## SoT             0.411317   0.063921   6.435  8.8e-09 ***
## PK              0.606081   0.306578   1.977  0.05154 .
## FK             -0.113253   0.114452  -0.990  0.32543
## Att.3rd.T       0.002343   0.001819   1.288  0.20151
## Succ.Drib       0.005947   0.036716   0.162  0.87174
## Att.Drib       -0.018412   0.022177  -0.830  0.40892
## Touches        -0.003205   0.003533  -0.907  0.36715
## Prog.T          0.011743   0.009952   1.180  0.24156
## GCA.Drib        0.718889   0.266248   2.700  0.00848 **
## ShortAT_Pass    0.004504   0.003869   1.164  0.24781
## MediumtAT_Pass  0.002601   0.003232   0.805  0.42334
## LongAT_Pass     0.007285   0.004968   1.467  0.14648
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 5.764 on 79 degrees of freedom
## Multiple R-squared:  0.899,  Adjusted R-squared:  0.876
## F-statistic: 39.06 on 18 and 79 DF,  p-value: < 2.2e-16
```



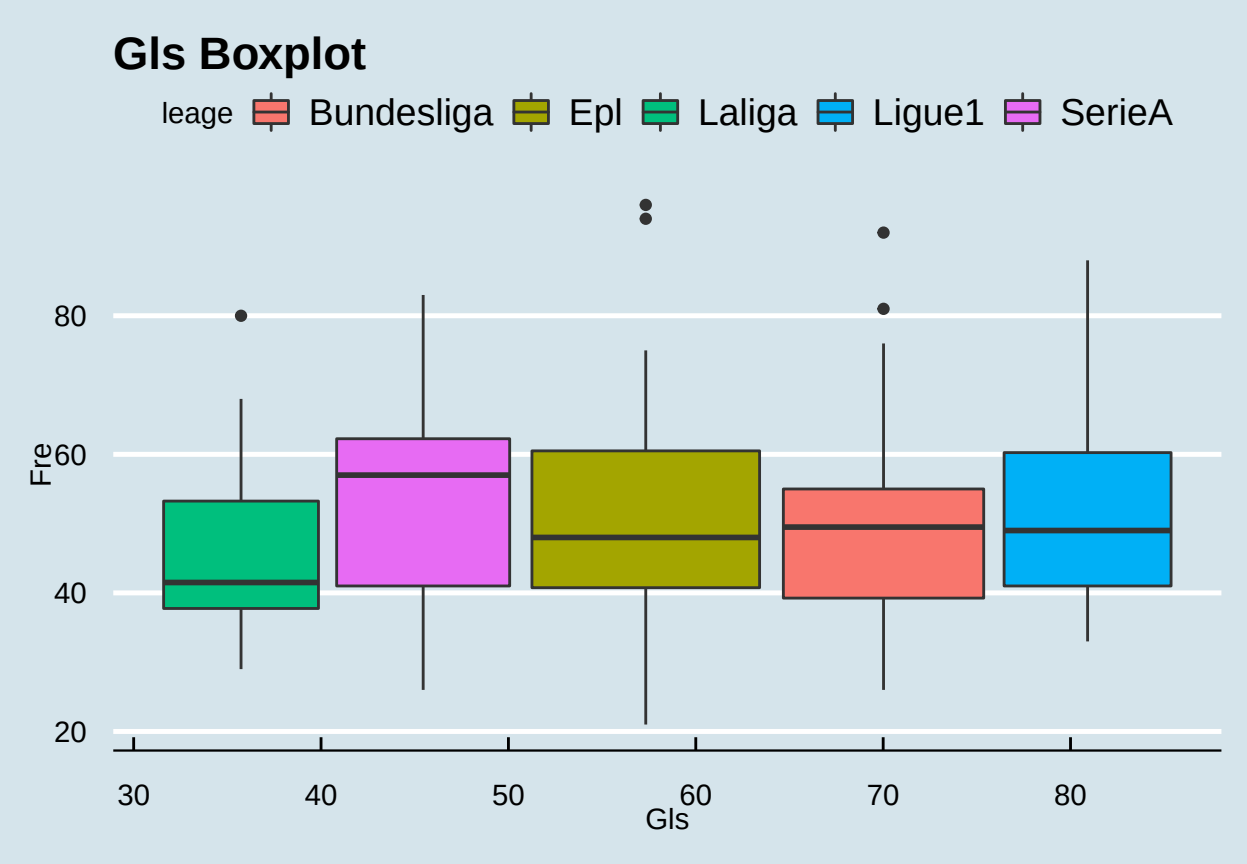

Normal Q−Q
Standardized residuals
Theoretical Quantiles
lm(Gls ~ . − team)
36
57
65
−2
−1
0
1
2

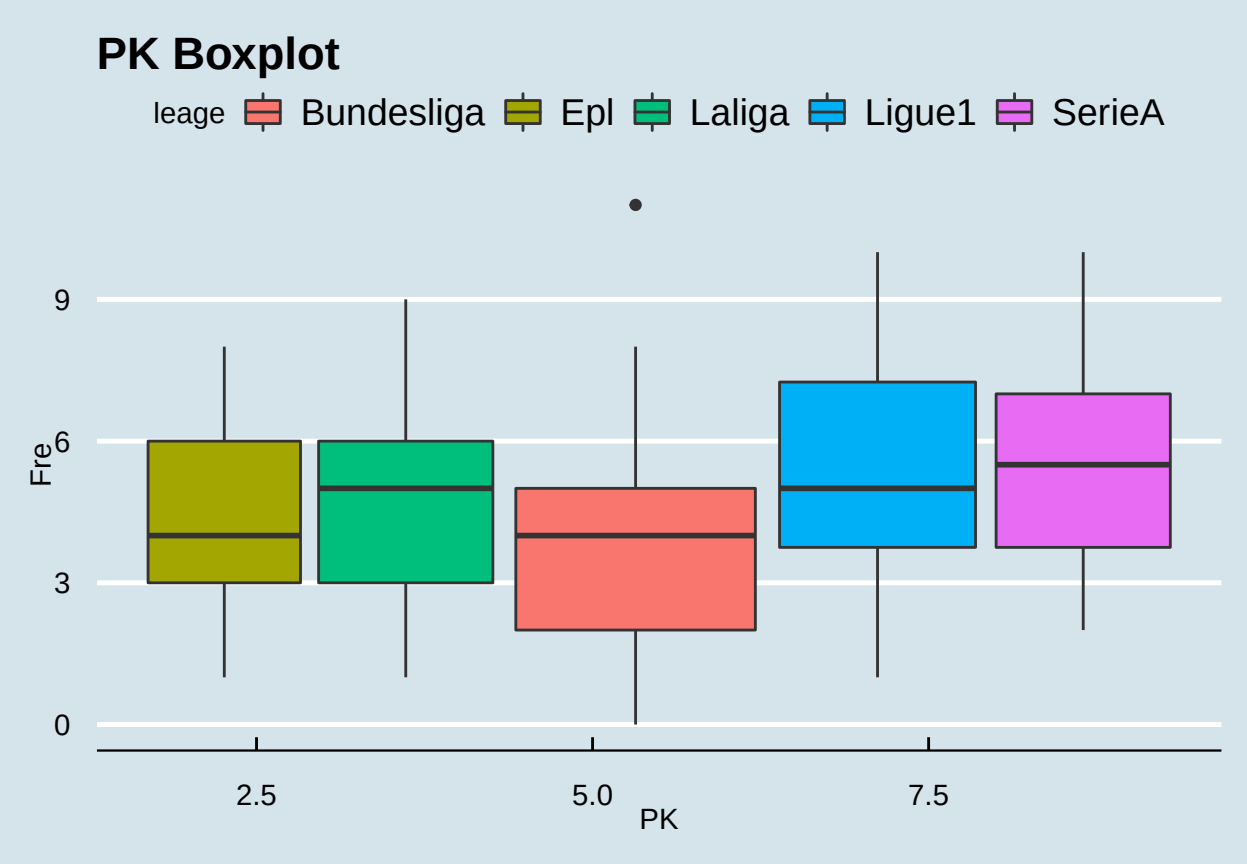

Scale−Location
√|Standardized residuals|
0.0
0.5
1.0
1.5
36
65
57
30
40
50
60
70
80
90
Fitted values
lm(Gls ~ . − team)

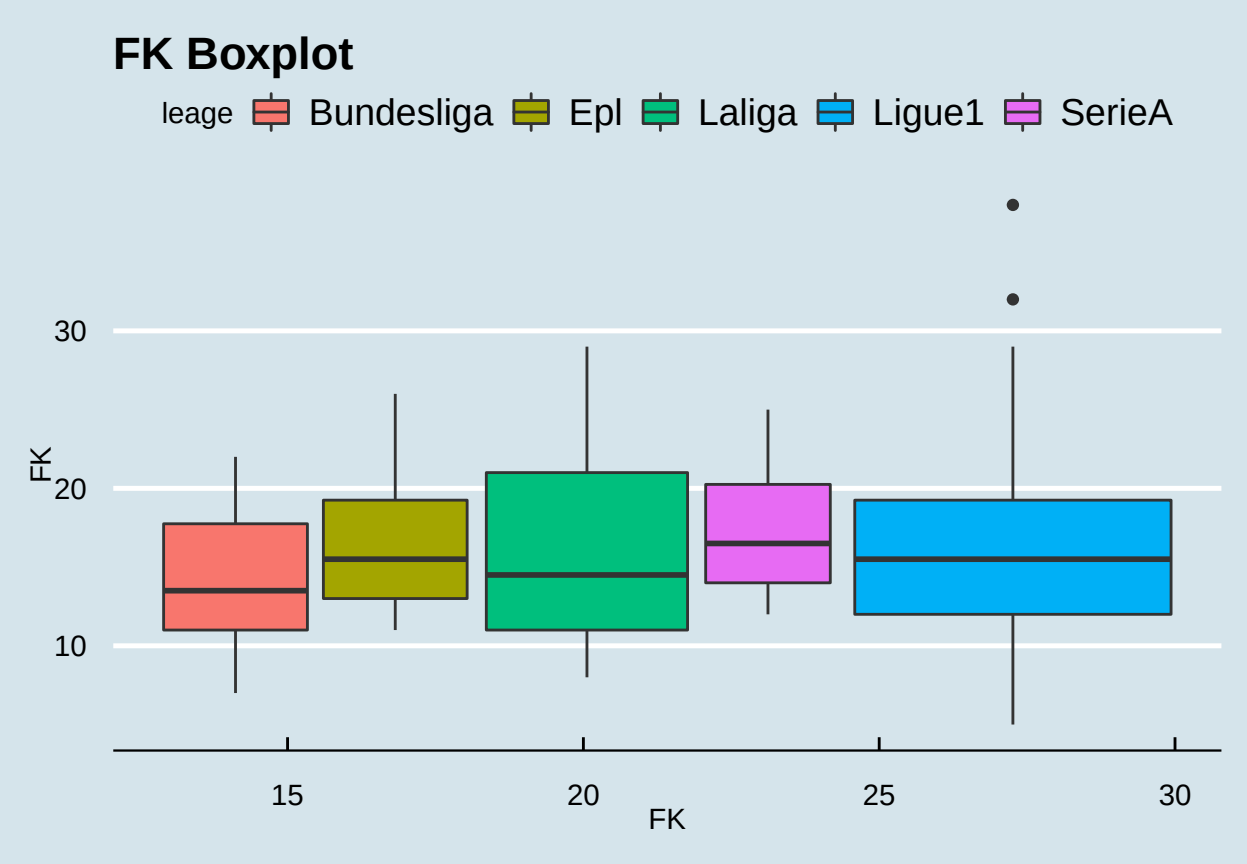

Residuals vs Leverage
Standardized residuals
2
1
0
−1
−2
−3
65
90
36
Cook's distance
0.0
0.1
0.2
0.3
Leverage
lm(Gls ~ . − team)

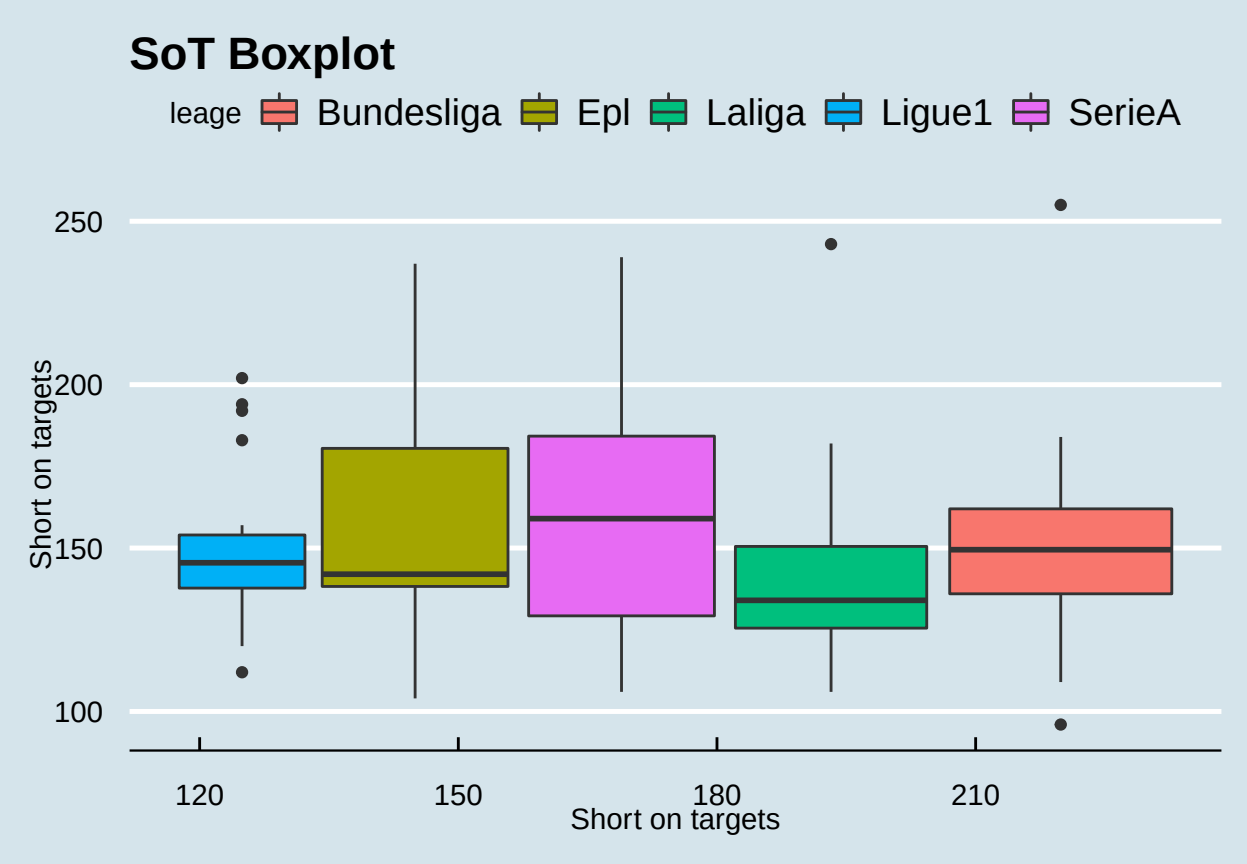



```
##      lambda      RSS
## 1  1.186499 2334.911
## 2 -1.000000 5964.748
## 3  0.000000 3397.275
## 4  1.000000 2359.527
```

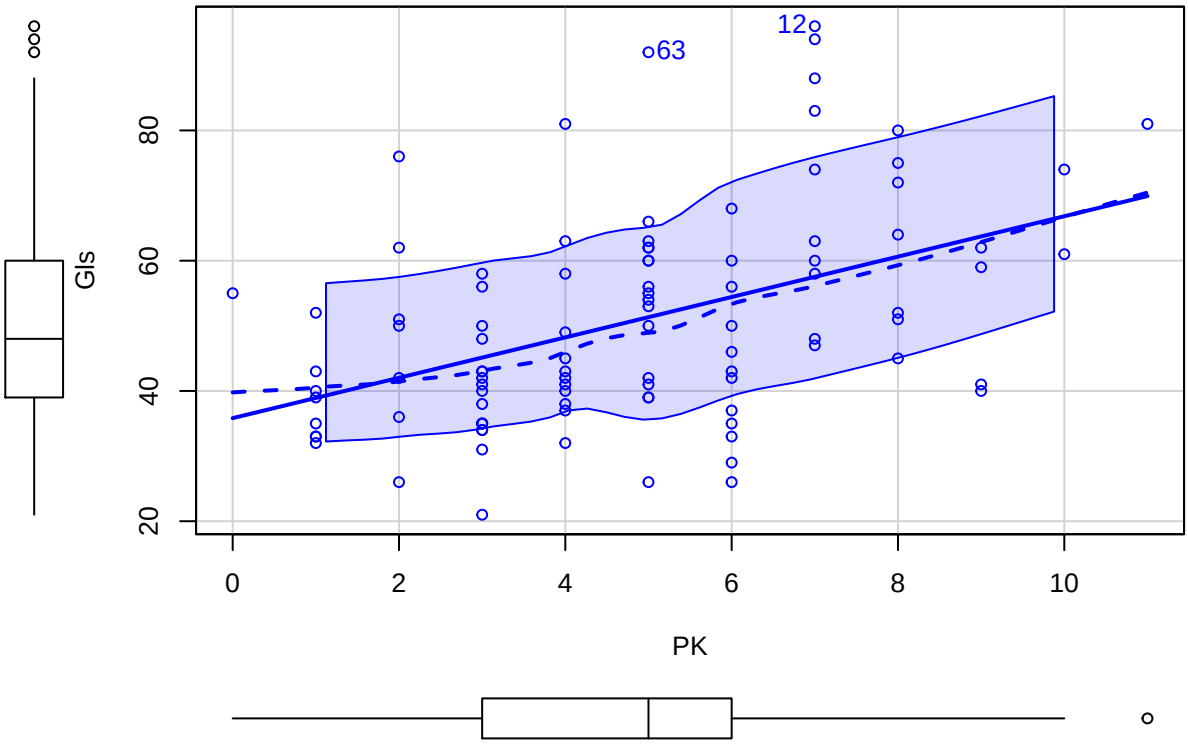

Gls Boxplot
leage
Bundesliga
Epl
Laliga
Ligue1
SerieA
Fre
80
60
40
20
30
40
50
60
70
80
Gls


PK Boxplot
leage
Bundesliga
Epl
Laliga
Ligue1
SerieA
9
6
3
0
Fre
2.5
5.0
7.5
PK


FK Boxplot
leage
Bundesliga
Epl
Laliga
Ligue1
SerieA
30
20
10
FK
15
20
25
30
FK

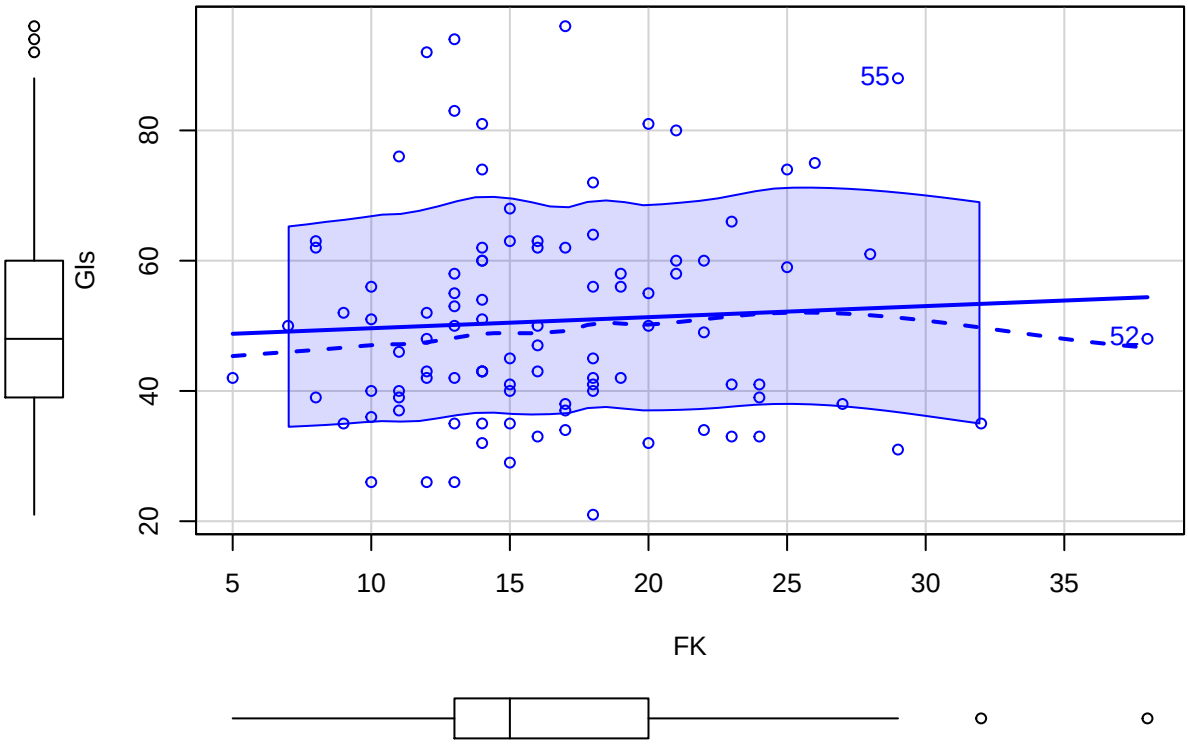



```
## Warning in applyDefaults(id, defaults = list(method = "mahal", n = 2, cex = 1, :
## unnamed id arguments, will be ignored
```



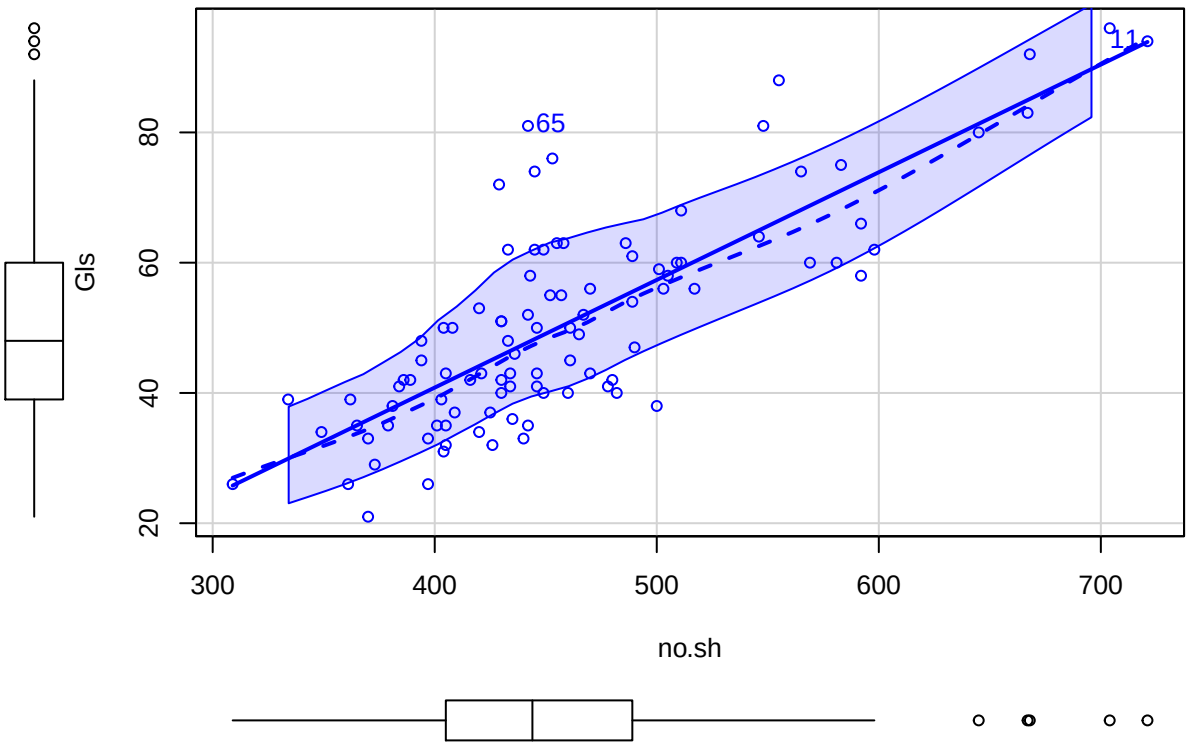

```
## [1] 12 63
```

```
## Warning in applyDefaults(id, defaults = list(method = "mahal", n = 2, cex = 1, :
## unnamed id arguments, will be ignored
```



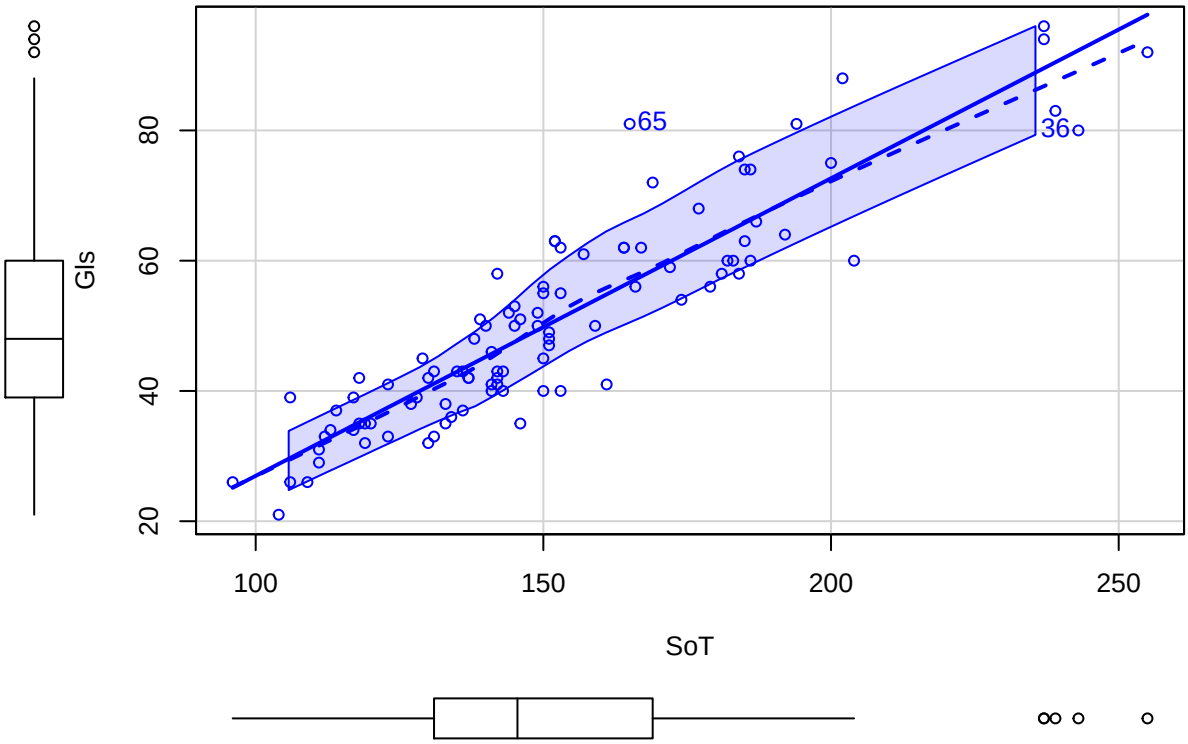

```
## [1] 52 55
```

```
## Warning in applyDefaults(id, defaults = list(method = "mahal", n = 2, cex = 1, :
## unnamed id arguments, will be ignored
```



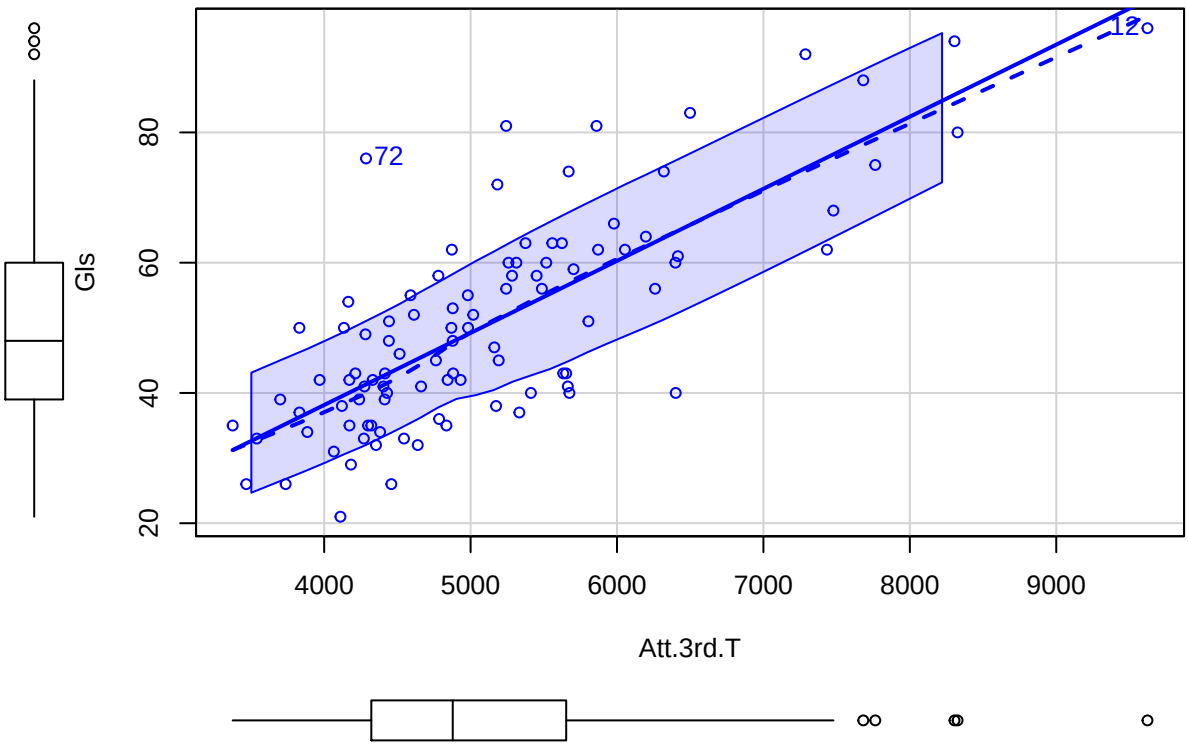

```
## [1] 11 65
```

```
## Warning in applyDefaults(id, defaults = list(method = "mahal", n = 2, cex = 1, :
## unnamed id arguments, will be ignored
```



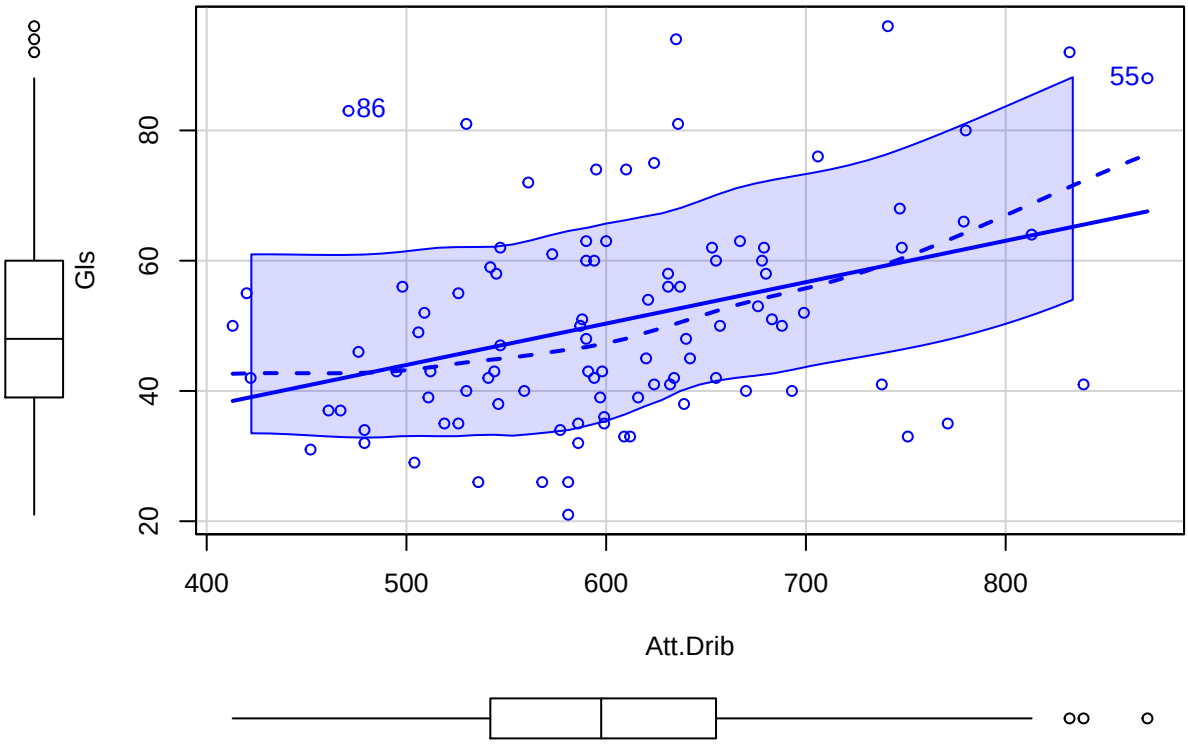

```
## [1] 36 65
```

```
## Warning in applyDefaults(id, defaults = list(method = "mahal", n = 2, cex = 1, :
## unnamed id arguments, will be ignored
```



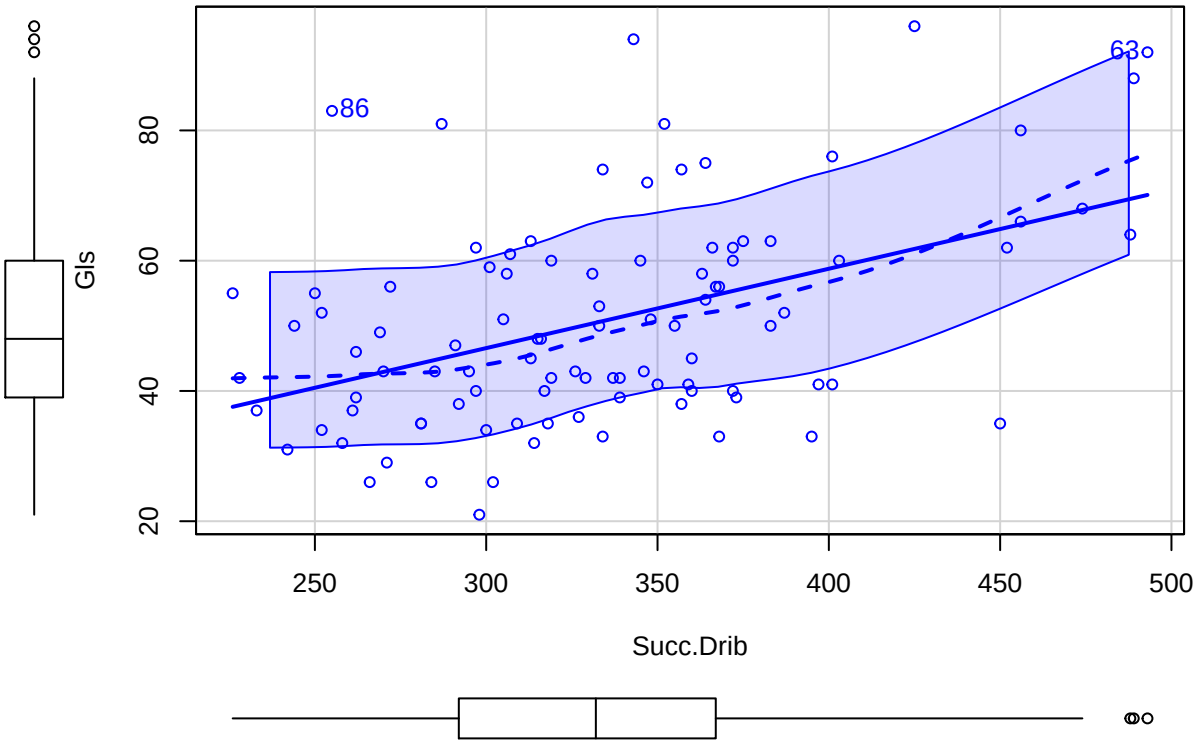

```
## [1] 12 72
```

```
## Warning in applyDefaults(id, defaults = list(method = "mahal", n = 2, cex = 1, :
## unnamed id arguments, will be ignored
```



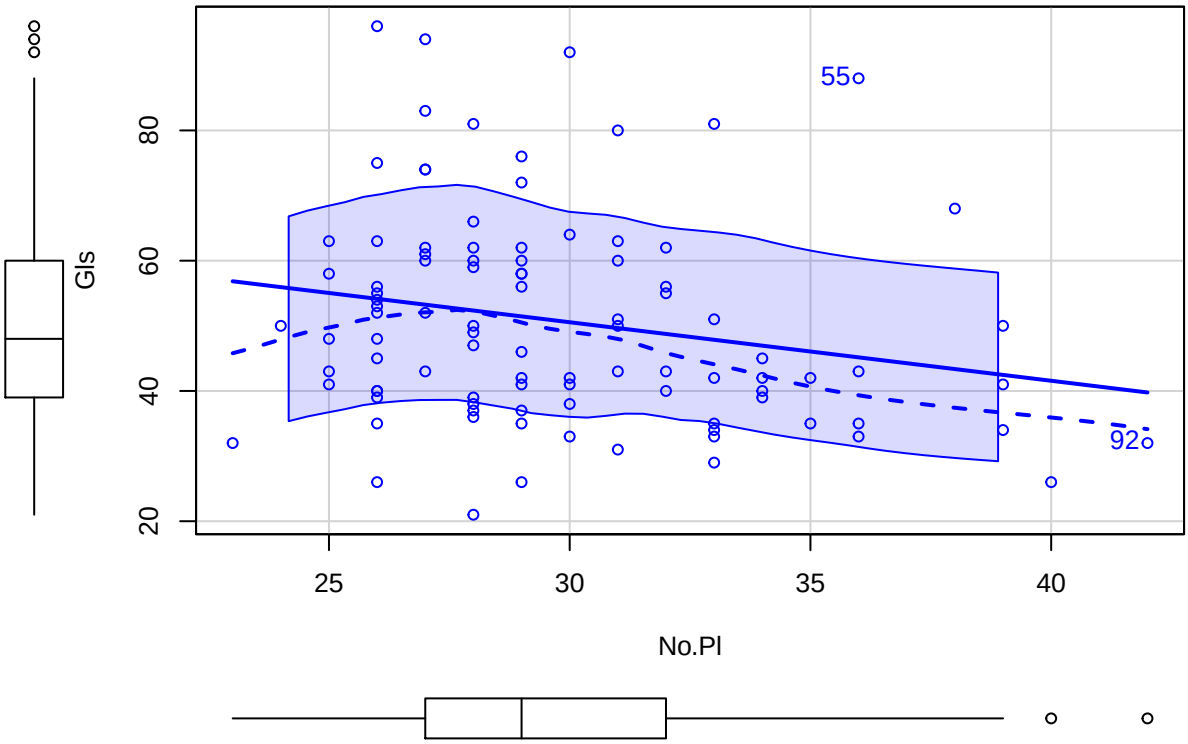

```
## [1] 55 86
```

```
## Warning in applyDefaults(id, defaults = list(method = "mahal", n = 2, cex = 1, :
## unnamed id arguments, will be ignored
```



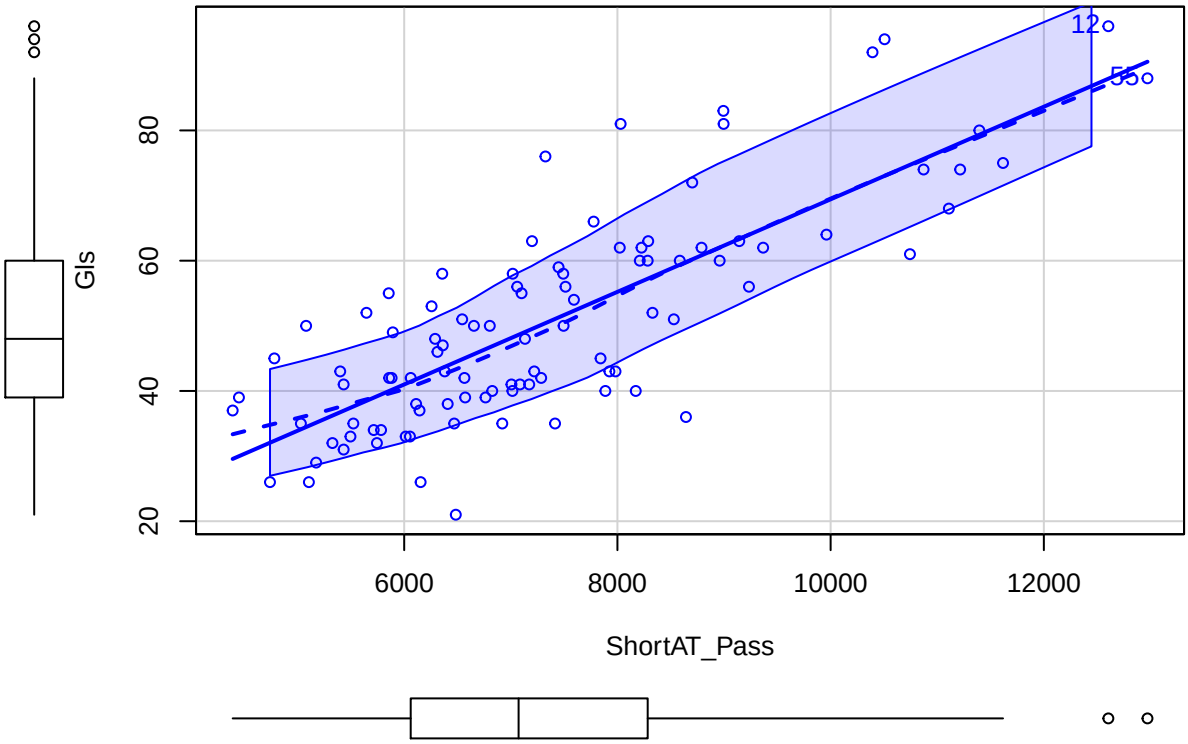

```
## [1] 63 86
```

```
## Warning in applyDefaults(id, defaults = list(method = "mahal", n = 2, cex = 1, :
## unnamed id arguments, will be ignored
```



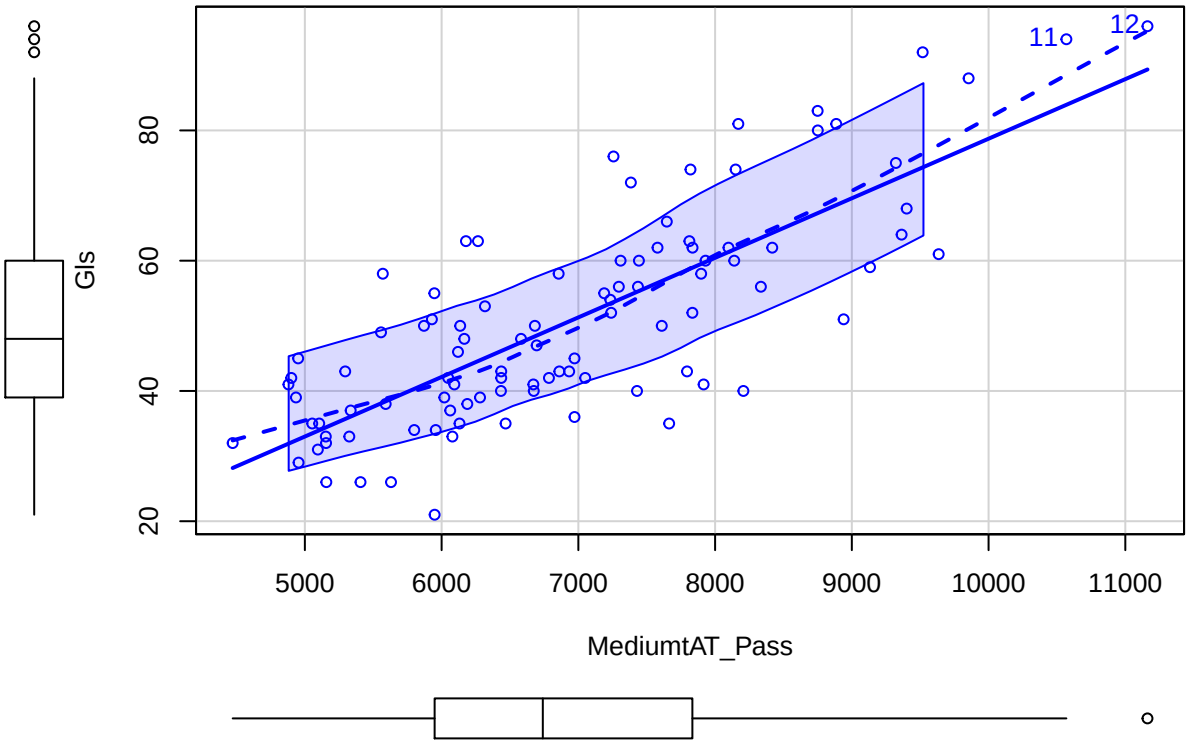

```
## [1] 55 92
```

```
## Warning in applyDefaults(id, defaults = list(method = "mahal", n = 2, cex = 1, :
## unnamed id arguments, will be ignored
```



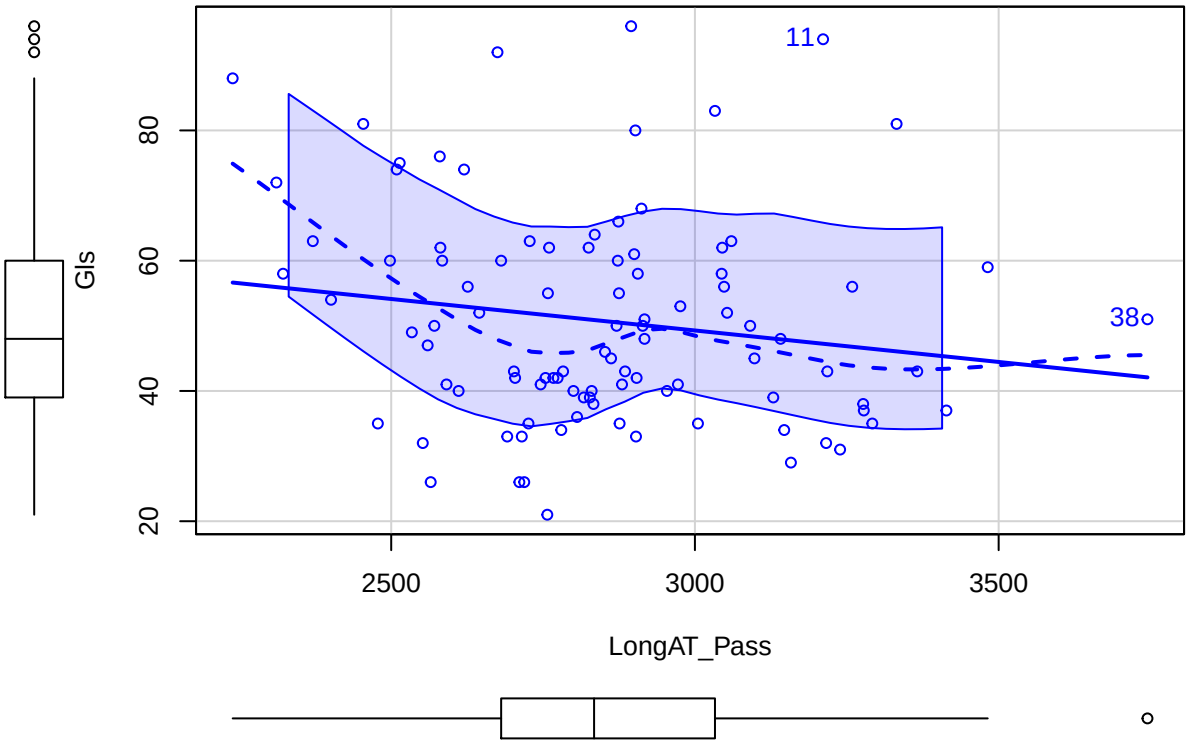

```
## [1] 12 55
```

```
## Warning in applyDefaults(id, defaults = list(method = "mahal", n = 2, cex = 1, :
## unnamed id arguments, will be ignored
```



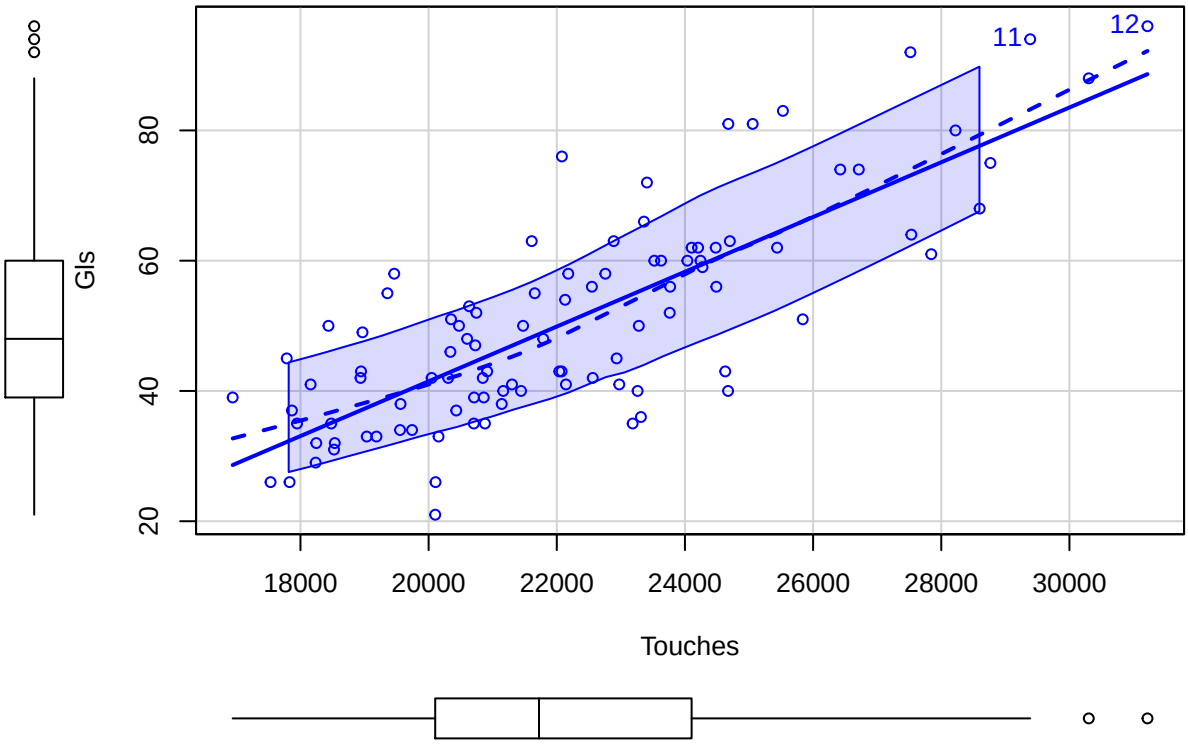

```
## [1] 11 12
```

```
## Warning in applyDefaults(id, defaults = list(method = "mahal", n = 2, cex = 1, :
## unnamed id arguments, will be ignored
```



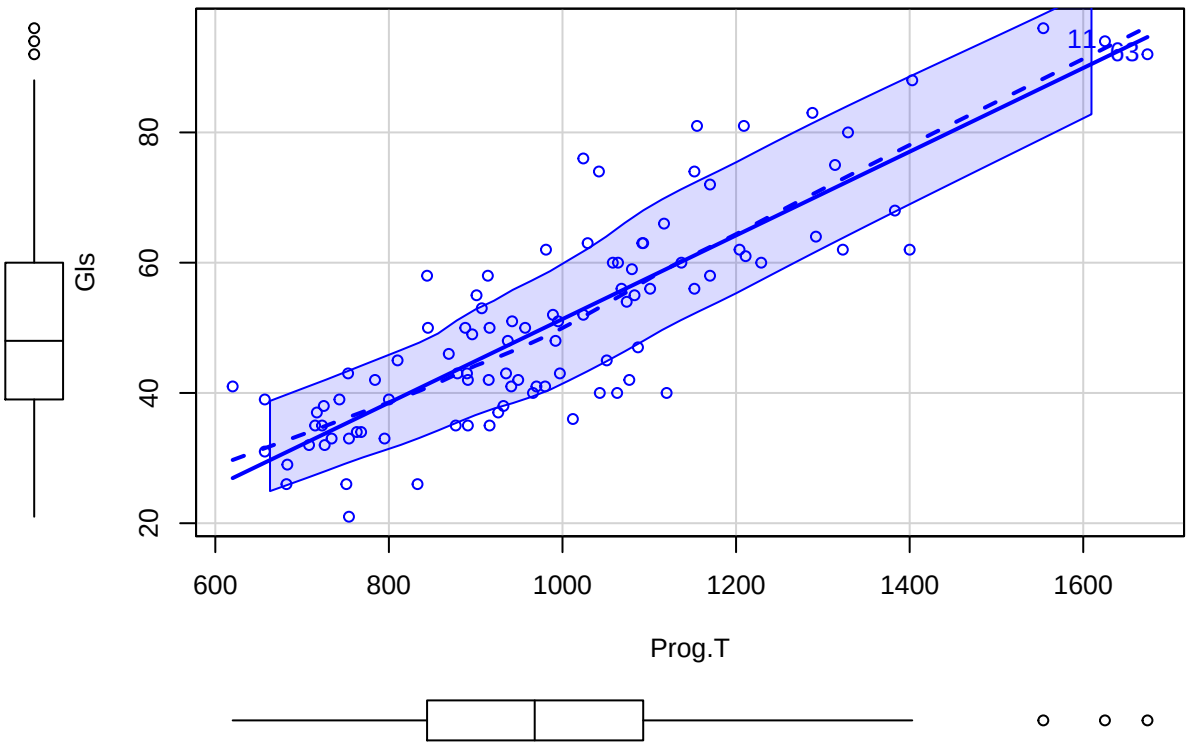

```
## [1] 11 38
```

```
## Warning in applyDefaults(id, defaults = list(method = "mahal", n = 2, cex = 1, :
## unnamed id arguments, will be ignored
```



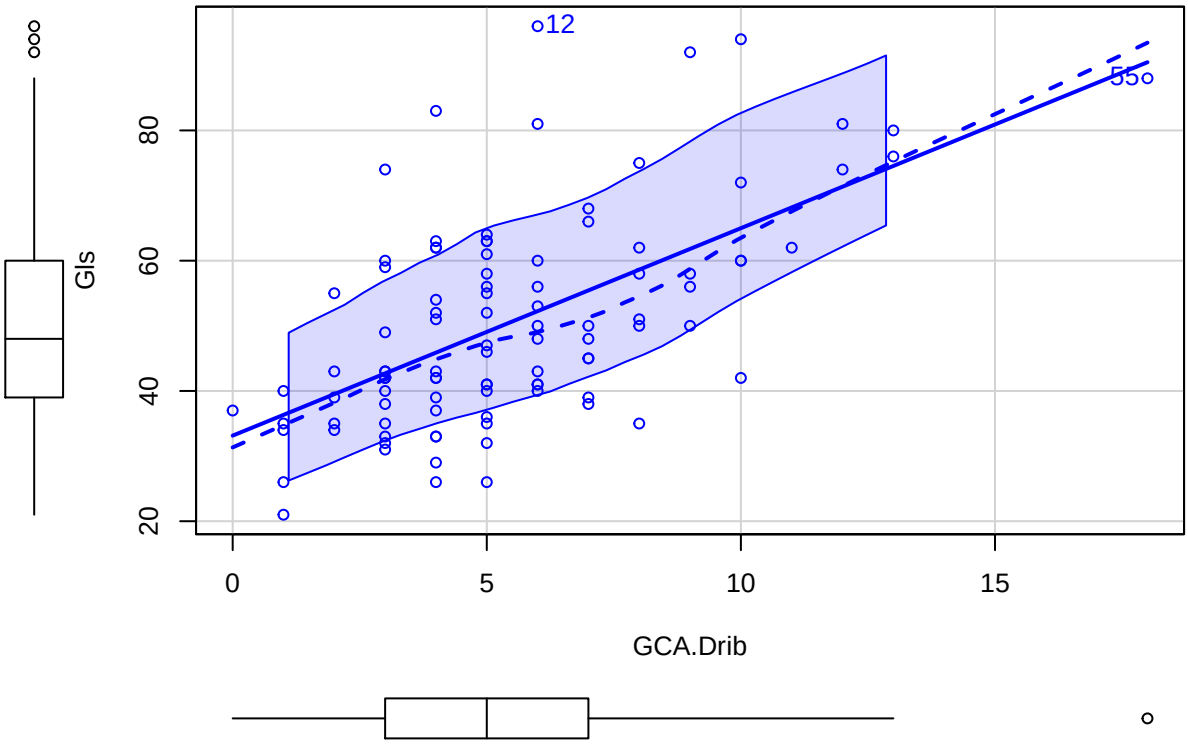

```
## [1] 11 12
```

```
## Warning in applyDefaults(id, defaults = list(method = "mahal", n = 2, cex = 1, :
## unnamed id arguments, will be ignored
```




```
## [1] 11 63
```

```
## Warning in applyDefaults(id, defaults = list(method = "mahal", n = 2, cex = 1, :
## unnamed id arguments, will be ignored
```




```
## [1] 12 55
```

```
## Start:  AIC=360.2
## Gls ~ (leage + team + No.Pl + no.sh + SoT + PK + FK + Att.3rd.T +
##     Succ.Drib + Att.Drib + Touches + Prog.T + GCA.Drib + ShortAT_Pass +
##     MediumtAT_Pass + LongAT_Pass) - team
##
##                   Df Sum of Sq    RSS    AIC
## - leage            4    103.31 2728.0 355.98
## - Succ.Drib        1      0.87 2625.5 358.23
## - No.Pl            1      2.86 2627.5 358.30
## - MediumtAT_Pass   1     21.52 2646.2 359.00
## - Att.Drib         1     22.90 2647.5 359.05
## - Touches          1     27.33 2652.0 359.21
## - FK               1     32.53 2657.2 359.41
## - ShortAT_Pass     1     45.04 2669.7 359.87
## - Prog.T           1     46.26 2670.9 359.91
## <none>                         2624.6 360.20
## - Att.3rd.T        1     55.12 2679.8 360.23
## - LongAT_Pass      1     71.45 2696.1 360.83
## - PK               1    129.84 2754.5 362.93
## - no.sh            1    214.40 2839.0 365.89
## - GCA.Drib         1    242.21 2866.9 366.85
## - SoT              1   1375.65 4000.3 399.50
##
## Step:  AIC=355.98
## Gls ~ No.Pl + no.sh + SoT + PK + FK + Att.3rd.T + Succ.Drib +
```

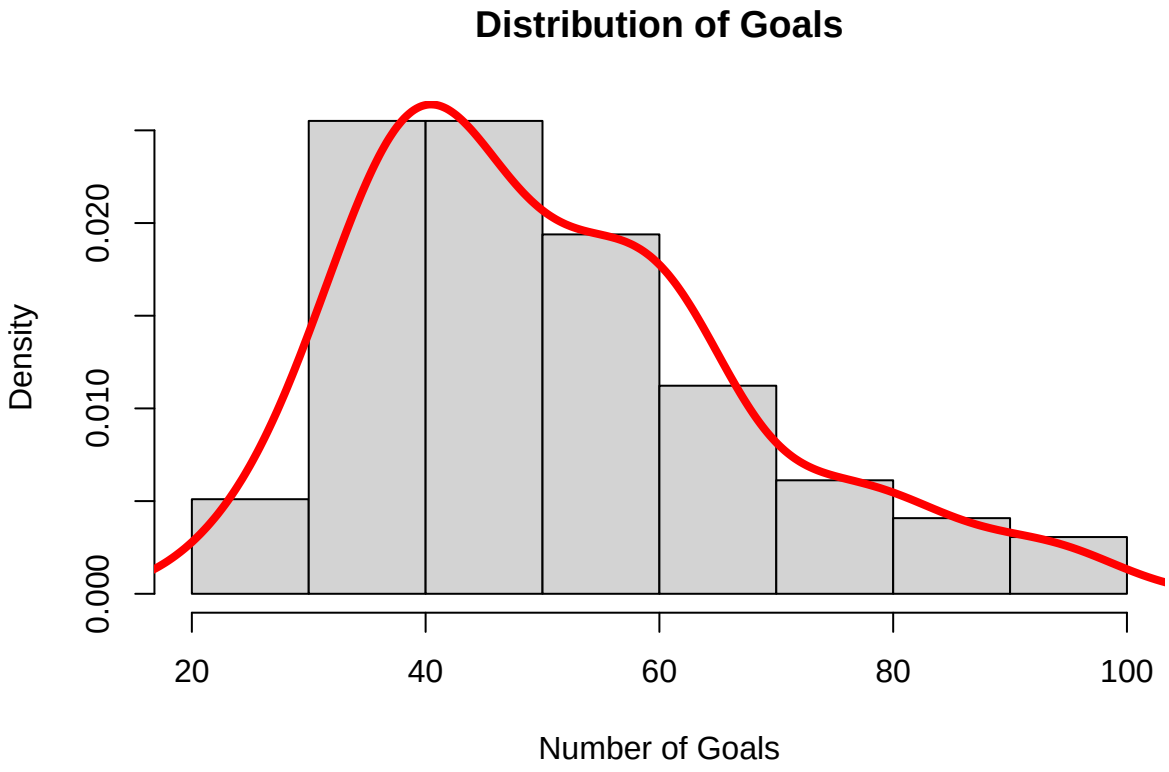
```
##     Att.Drib + Touches + Prog.T + GCA.Drib + ShortAT_Pass + MediumtAT_Pass +
##     LongAT_Pass
##
##                   Df Sum of Sq    RSS    AIC
## - No.Pl            1      0.77 2728.7 354.01
## - Succ.Drib        1      1.45 2729.4 354.03
## - Att.Drib         1     16.91 2744.9 354.59
## - FK               1     41.26 2769.2 355.45
## - LongAT_Pass      1     43.92 2771.9 355.55
## - Att.3rd.T        1     45.27 2773.2 355.59
## <none>                         2728.0 355.98
## - Touches          1     63.97 2791.9 356.25
## - ShortAT_Pass     1     69.28 2797.2 356.44
## - MediumtAT_Pass   1     78.47 2806.4 356.76
## - Prog.T           1     86.77 2814.7 357.05
## - PK               1    102.02 2830.0 357.58
## - no.sh            1    232.15 2960.1 361.99
## - GCA.Drib         1    261.47 2989.4 362.95
## - SoT              1   1461.41 4189.4 396.02
##
## Step:  AIC=354.01
## Gls ~ no.sh + SoT + PK + FK + Att.3rd.T + Succ.Drib + Att.Drib +
##     Touches + Prog.T + GCA.Drib + ShortAT_Pass + MediumtAT_Pass +
##     LongAT_Pass
##
##                   Df Sum of Sq    RSS    AIC
## - Succ.Drib        1      1.32 2730.0 352.06
## - Att.Drib         1     16.80 2745.5 352.61
## - FK               1     40.94 2769.7 353.47
## - LongAT_Pass      1     44.11 2772.8 353.58
## - Att.3rd.T        1     44.51 2773.2 353.59
## <none>                         2728.7 354.01
## - Touches          1     64.48 2793.2 354.30
## - ShortAT_Pass     1     70.49 2799.2 354.51
## - MediumtAT_Pass   1     78.22 2807.0 354.78
## - Prog.T           1     88.15 2816.9 355.12
## - PK               1    102.61 2831.3 355.63
## - no.sh            1    232.99 2961.7 360.04
## - GCA.Drib         1    265.66 2994.4 361.11
## - SoT              1   1520.04 4248.8 395.40
##
## Step:  AIC=352.06
## Gls ~ no.sh + SoT + PK + FK + Att.3rd.T + Att.Drib + Touches +
##     Prog.T + GCA.Drib + ShortAT_Pass + MediumtAT_Pass + LongAT_Pass
##
##                   Df Sum of Sq    RSS    AIC
## - FK               1     40.37 2770.4 351.49
## - LongAT_Pass      1     43.84 2773.9 351.62
## - Att.3rd.T        1     43.92 2774.0 351.62
## <none>                         2730.0 352.06
## - Touches          1     65.43 2795.5 352.38
## - ShortAT_Pass     1     70.04 2800.1 352.54
## - MediumtAT_Pass   1     81.98 2812.0 352.96
## - Prog.T           1     88.11 2818.2 353.17
```

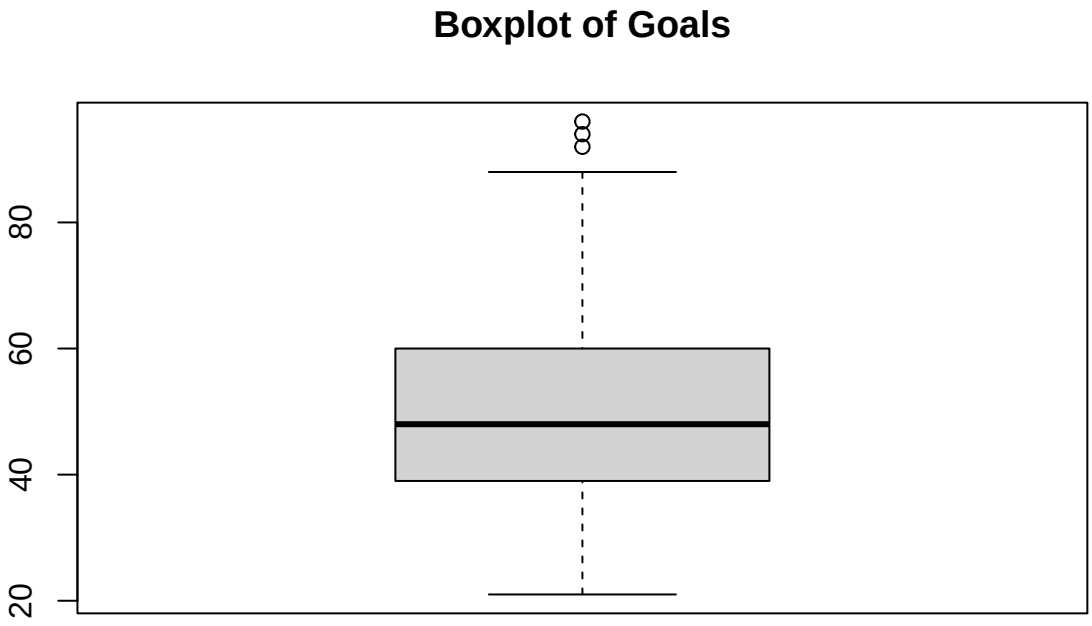
```
## - PK              1    103.48 2833.5 353.70
## - Att.Drib        1    145.06 2875.1 355.13
## - no.sh           1    231.84 2961.9 358.04
## - GCA.Drib        1    271.36 3001.4 359.34
## - SoT             1   1556.10 4286.1 394.26
##
## Step:  AIC=351.49
## Gls ~ no.sh + SoT + PK + Att.3rd.T + Att.Drib + Touches + Prog.T +
##     GCA.Drib + ShortAT_Pass + MediumtAT_Pass + LongAT_Pass
##
##                  Df Sum of Sq    RSS    AIC
## - LongAT_Pass     1     46.00 2816.4 351.11
## - Att.3rd.T       1     50.39 2820.8 351.26
## <none>                        2770.4 351.49
## - Touches         1     62.91 2833.3 351.70
## - ShortAT_Pass    1     63.86 2834.3 351.73
## - MediumtAT_Pass  1     78.50 2848.9 352.23
## - PK              1     81.33 2851.7 352.33
## - Prog.T          1    124.71 2895.1 353.81
## - Att.Drib        1    161.53 2931.9 355.05
## - GCA.Drib        1    257.59 3028.0 358.21
## - no.sh           1    319.63 3090.0 360.20
## - SoT             1   1692.30 4462.7 396.22
##
## Step:  AIC=351.11
## Gls ~ no.sh + SoT + PK + Att.3rd.T + Att.Drib + Touches + Prog.T +
##     GCA.Drib + ShortAT_Pass + MediumtAT_Pass
##
##                  Df Sum of Sq    RSS    AIC
## - ShortAT_Pass    1     18.42 2834.8 349.75
## - Touches         1     19.52 2835.9 349.79
## - MediumtAT_Pass  1     39.83 2856.2 350.48
## <none>                        2816.4 351.11
## - Att.3rd.T       1     78.21 2894.6 351.79
## - PK              1     88.07 2904.5 352.13
## - Prog.T          1     93.98 2910.4 352.33
## - GCA.Drib        1    263.13 3079.5 357.86
## - Att.Drib        1    294.77 3111.2 358.86
## - no.sh           1    335.53 3151.9 360.14
## - SoT             1   1738.74 4555.2 396.23
##
## Step:  AIC=349.75
## Gls ~ no.sh + SoT + PK + Att.3rd.T + Att.Drib + Touches + Prog.T +
##     GCA.Drib + MediumtAT_Pass
##
##                  Df Sum of Sq    RSS    AIC
## - Touches         1      1.49 2836.3 347.80
## - MediumtAT_Pass  1     21.84 2856.7 348.50
## <none>                        2834.8 349.75
## - Att.3rd.T       1     69.94 2904.8 350.14
## - Prog.T          1     92.03 2926.9 350.88
## - PK              1    103.36 2938.2 351.26
## - GCA.Drib        1    250.98 3085.8 356.06
## - Att.Drib        1    311.72 3146.6 357.97
```

```
## - no.sh           1    385.08 3219.9 360.23
## - SoT             1   2226.57 5061.4 404.55
##
## Step:  AIC=347.8
## Gls ~ no.sh + SoT + PK + Att.3rd.T + Att.Drib + Prog.T + GCA.Drib +
##     MediumtAT_Pass
##
##                  Df Sum of Sq    RSS    AIC
## - MediumtAT_Pass  1     39.84 2876.2 347.17
## <none>                        2836.3 347.80
## - Prog.T          1     92.57 2928.9 348.95
## - Att.3rd.T       1     93.03 2929.4 348.96
## - PK              1    103.55 2939.9 349.31
## - GCA.Drib        1    249.91 3086.2 354.07
## - Att.Drib        1    336.02 3172.3 356.77
## - no.sh           1    406.79 3243.1 358.93
## - SoT             1   2278.73 5115.1 403.59
##
## Step:  AIC=347.17
## Gls ~ no.sh + SoT + PK + Att.3rd.T + Att.Drib + Prog.T + GCA.Drib
##
##             Df Sum of Sq    RSS    AIC
## <none>                   2876.2 347.17
## - PK         1     99.19 2975.4 348.49
## - Att.3rd.T  1    142.40 3018.6 349.90
## - GCA.Drib   1    245.66 3121.8 353.20
## - Prog.T     1    261.81 3138.0 353.70
## - Att.Drib   1    320.75 3196.9 355.53
## - no.sh      1    468.80 3345.0 359.96
## - SoT        1   2381.42 5257.6 404.28
##
## Call:
## lm(formula = Gls ~ no.sh + SoT + PK + Att.3rd.T + Att.Drib +
##     Prog.T + GCA.Drib, data = data1)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -12.9952  -3.2206   0.2331   4.0150  12.8571
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept) -1.786480   4.969815  -0.359 0.720088
## no.sh       -0.083715   0.021857  -3.830 0.000237 ***
## SoT          0.455415   0.052756   8.632    2e-13 ***
## PK           0.482263   0.273743   1.762 0.081510 .
## Att.3rd.T    0.002396   0.001135   2.111 0.037550 *
## Att.Drib    -0.023802   0.007513  -3.168 0.002096 **
## Prog.T       0.017892   0.006251   2.862 0.005232 **
## GCA.Drib     0.699625   0.252339   2.773 0.006760 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 5.653 on 90 degrees of freedom
```

```
## Multiple R-squared:  0.8893, Adjusted R-squared:  0.8807
## F-statistic: 103.3 on 7 and 90 DF,  p-value: < 2.2e-16
```

Poisson regression





```
##
## Call:
## glm(formula = Gls ~ . - team, family = poisson(), data = data1)
##
## Deviance Residuals:
##      Min        1Q    Median        3Q       Max
## -2.01244  -0.55563   0.00422   0.40505   1.76659
##
## Coefficients:
##                  Estimate Std. Error z value Pr(>|z|)
## (Intercept)     3.296e+00  5.452e-01   6.046 1.49e-09 ***
## leageEpl       -3.036e-02  6.677e-02  -0.455  0.64935
## leageLaliga    -5.656e-02  7.197e-02  -0.786  0.43197
## leageLigue1    -9.408e-03  5.897e-02  -0.160  0.87324
## leageSerieA     2.046e-03  5.936e-02   0.034  0.97251
## No.Pl          -3.579e-03  4.606e-03  -0.777  0.43715
## no.sh          -1.366e-03  6.565e-04  -2.081  0.03742 *
## SoT             7.118e-03  1.511e-03   4.710 2.48e-06 ***
## PK              1.150e-02  7.538e-03   1.525  0.12727
## FK             -1.911e-03  2.897e-03  -0.660  0.50945
## Att.3rd.T       2.836e-05  4.267e-05   0.665  0.50629
## Succ.Drib       5.631e-04  8.920e-04   0.631  0.52789
## Att.Drib       -7.153e-04  5.508e-04  -1.299  0.19407
## Touches        -4.415e-05  8.517e-05  -0.518  0.60420
## Prog.T          2.681e-04  2.341e-04   1.145  0.25204
## GCA.Drib        1.620e-02  6.155e-03   2.632  0.00848 **
## ShortAT_Pass    5.289e-05  9.428e-05   0.561  0.57484
## MediumtAT_Pass  5.678e-05  7.699e-05   0.738  0.46081
## LongAT_Pass     6.281e-05  1.213e-04   0.518  0.60471
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for poisson family taken to be 1)
##
##     Null deviance: 492.772  on 97  degrees of freedom
## Residual deviance:  63.397  on 79  degrees of freedom
## AIC: 661.78
##
## Number of Fisher Scoring iterations: 4
```

Overdispersion check

```
## Warning: package 'qcc' was built under R version 4.2.2
```

```
## Package 'qcc' version 2.7
```

```
## Type 'citation("qcc")' for citing this R package in publications.
```

```
##
## Overdispersion test Obs.Var/Theor.Var Statistic p-value
##        poisson data          5.280916  512.2488       0
```

Overdispersion is present, so we try fitting quasipoisson

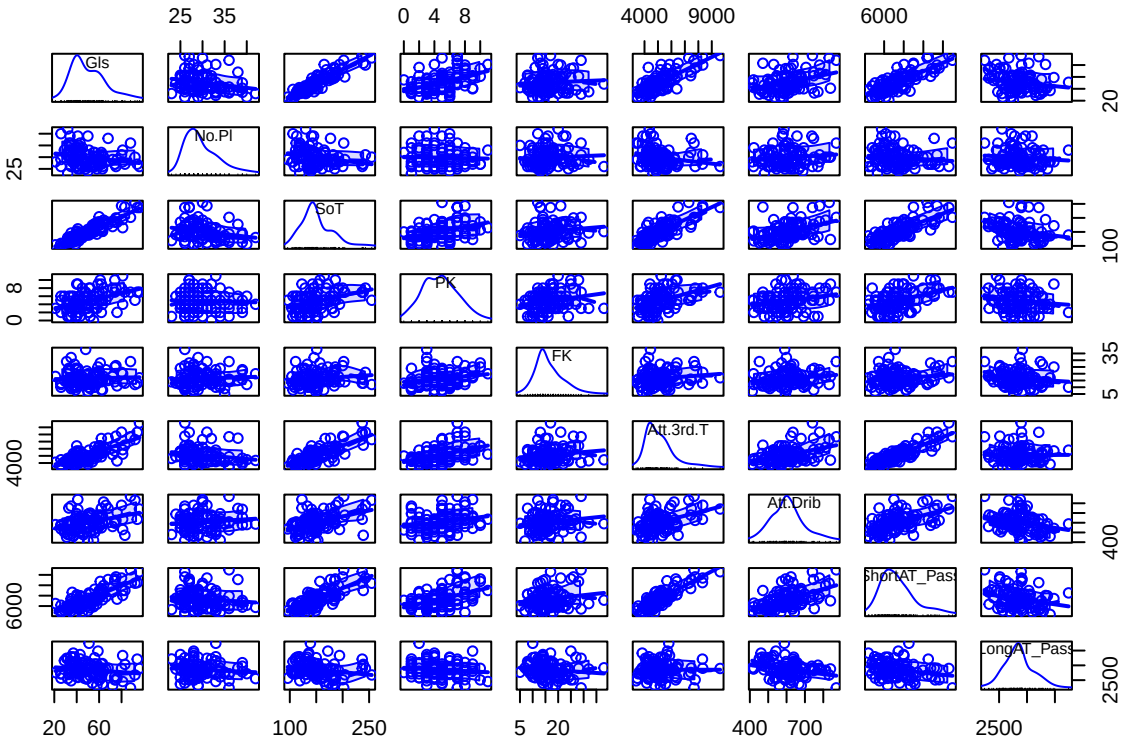
```
##
## Call:
## glm(formula = Gls ~ . - team, family = quasipoisson(), data = data1)
```

```
##
## Deviance Residuals:
##      Min        1Q    Median        3Q       Max
## -2.01244  -0.55563   0.00422   0.40505   1.76659
##
## Coefficients:
##                  Estimate Std. Error t value Pr(>|t|)
## (Intercept)     3.296e+00  4.865e-01   6.774 2.01e-09 ***
## leageEpl       -3.036e-02  5.959e-02  -0.509  0.61187
## leageLaliga    -5.656e-02  6.423e-02  -0.880  0.38126
## leageLigue1    -9.408e-03  5.263e-02  -0.179  0.85858
## leageSerieA     2.046e-03  5.298e-02   0.039  0.96930
## No.Pl          -3.579e-03  4.110e-03  -0.871  0.38660
## no.sh          -1.366e-03  5.859e-04  -2.332  0.02226 *
## SoT             7.118e-03  1.349e-03   5.277 1.12e-06 ***
## PK              1.150e-02  6.728e-03   1.709  0.09144 .
## FK             -1.911e-03  2.585e-03  -0.739  0.46200
## Att.3rd.T       2.836e-05  3.808e-05   0.745  0.45867
## Succ.Drib       5.631e-04  7.961e-04   0.707  0.48148
## Att.Drib       -7.153e-04  4.916e-04  -1.455  0.14961
## Touches        -4.415e-05  7.602e-05  -0.581  0.56302
## Prog.T          2.681e-04  2.089e-04   1.283  0.20311
## GCA.Drib        1.620e-02  5.494e-03   2.949  0.00419 **
## ShortAT_Pass    5.289e-05  8.415e-05   0.629  0.53148
## MediumtAT_Pass  5.678e-05  6.872e-05   0.826  0.41109
## LongAT_Pass     6.281e-05  1.083e-04   0.580  0.56356
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for quasipoisson family taken to be 0.7965294)
##
##     Null deviance: 492.772  on 97  degrees of freedom
## Residual deviance:  63.397  on 79  degrees of freedom
## AIC: NA
##
## Number of Fisher Scoring iterations: 4
```

```
##   leage        team Gls No.Pl no.sh SoT PK FK Att.3rd.T Succ.Drib Att.Drib
## 1   Epl     Arsenal  60    27   581 186  5 22      6399       319      590
## 2   Epl Aston Villa  50    31   461 159  3 20      4983       333      587
## 3   Epl   Brentford  46    29   436 141  6 11      4515       262      476
## 4   Epl    Brighton  40    26   482 141  4 15      6401       317      559
## 5   Epl     Burnley  32    23   405 119  1 14      4639       258      479
## 6   Epl     Chelsea  75    26   583 200  8 26      7764       364      624
##   Touches Prog.T GCA.Drib ShortAT_Pass MediumtAT_Pass LongAT_Pass
## 1   23628   1058        3         8210           8140        2584
## 2   20474    916        9         6803           6136        2571
## 3   20340    869        5         6312           6120        2852
## 4   24673   1043        3         8172           8207        2954
## 5   18247    708        5         5327           4472        3216
## 6   28767   1314        8        11617           9322        2514
```

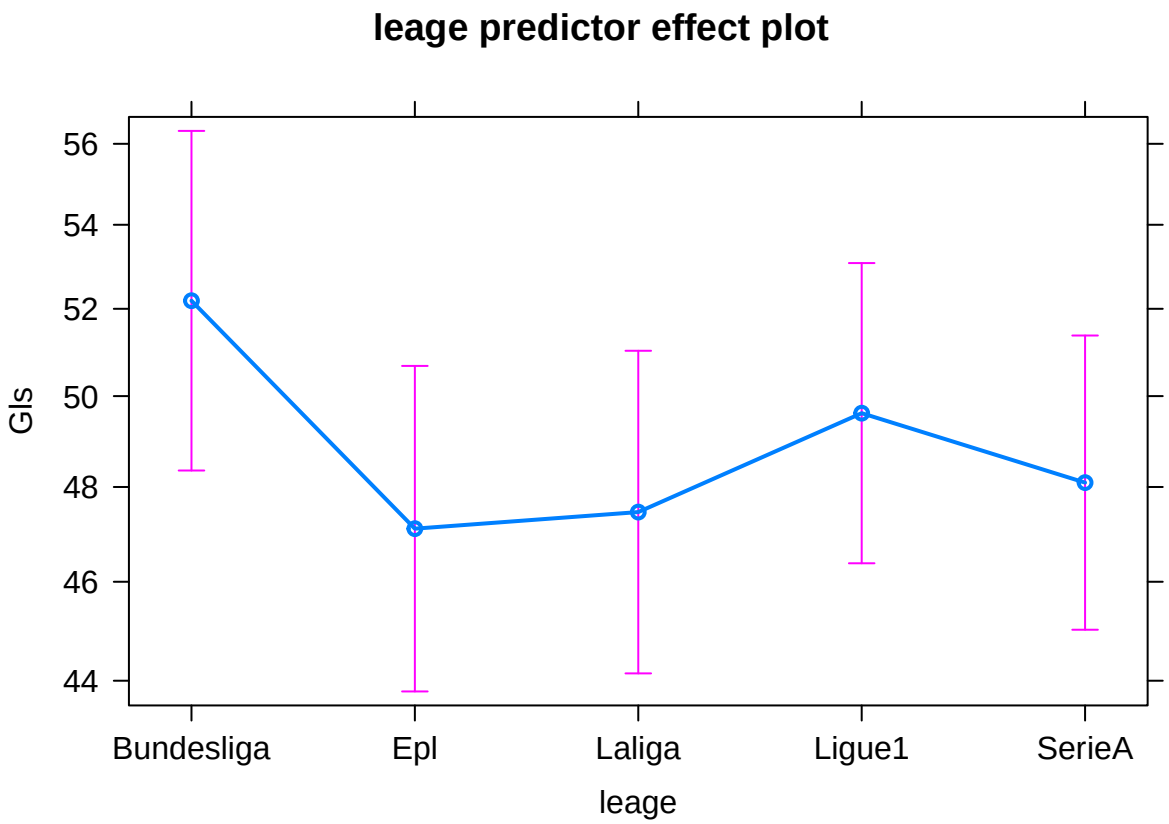
```
##   leage Gls No.Pl SoT PK FK Att.3rd.T Att.Drib ShortAT_Pass LongAT_Pass
## 1   Epl  60    27 186  5 22      6399      590         8210        2584
## 2   Epl  50    31 159  3 20      4983      587         6803        2571
```

```
## 3    Epl   46     29 141   6 11       4515       476          6312         2852
## 4    Epl   40     26 141   4 15       6401       559          8172         2954
## 5    Epl   32     23 119   1 14       4639       479          5327         3216
## 6    Epl   75     26 200   8 26       7764       624         11617         2514
```




```
##
## Call:
## glm(formula = Gls ~ ., family = poisson(), data = newdata)
##
## Deviance Residuals:
##      Min        1Q    Median        3Q       Max
## -2.27546  -0.54379  -0.04662   0.63175   1.95538
##
## Coefficients:
##                Estimate Std. Error z value Pr(>|z|)
## (Intercept)   2.754e+00  2.927e-01   9.409  < 2e-16 ***
## leageEpl     -1.024e-01  5.391e-02  -1.900  0.05749 .
## leageLaliga  -9.495e-02  5.904e-02  -1.608  0.10777
## leageLigue1  -5.052e-02  5.474e-02  -0.923  0.35611
## leageSerieA  -8.171e-02  4.960e-02  -1.647  0.09950 .
## No.Pl        -2.916e-03  4.555e-03  -0.640  0.52201
## SoT           5.929e-03  7.907e-04   7.498 6.47e-14 ***
## PK            1.640e-02  7.312e-03   2.243  0.02491 *
## FK           -3.901e-03  2.678e-03  -1.457  0.14522
## Att.3rd.T    -1.327e-05  3.217e-05  -0.413  0.67996
## Att.Drib     -1.745e-04  1.932e-04  -0.904  0.36625
```

```
## ShortAT_Pass  5.332e-05  1.909e-05   2.793  0.00522 **
## LongAT_Pass   5.381e-05  7.261e-05   0.741  0.45863
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for poisson family taken to be 1)
##
##     Null deviance: 492.772  on 97  degrees of freedom
## Residual deviance:  78.917  on 85  degrees of freedom
## AIC: 665.3
##
## Number of Fisher Scoring iterations: 4
```




```
##
## Call:
## glm(formula = Gls ~ ., family = quasipoisson(), data = newdata)
##
## Deviance Residuals:
##      Min        1Q    Median        3Q       Max
## -2.27546  -0.54379  -0.04662   0.63175   1.95538
##
## Coefficients:
##               Estimate Std. Error t value Pr(>|t|)
## (Intercept)   2.754e+00  2.811e-01   9.796 1.32e-15 ***
## leageEpl     -1.024e-01  5.177e-02  -1.978  0.05120 .
## leageLaliga  -9.495e-02  5.670e-02  -1.674  0.09771 .
```

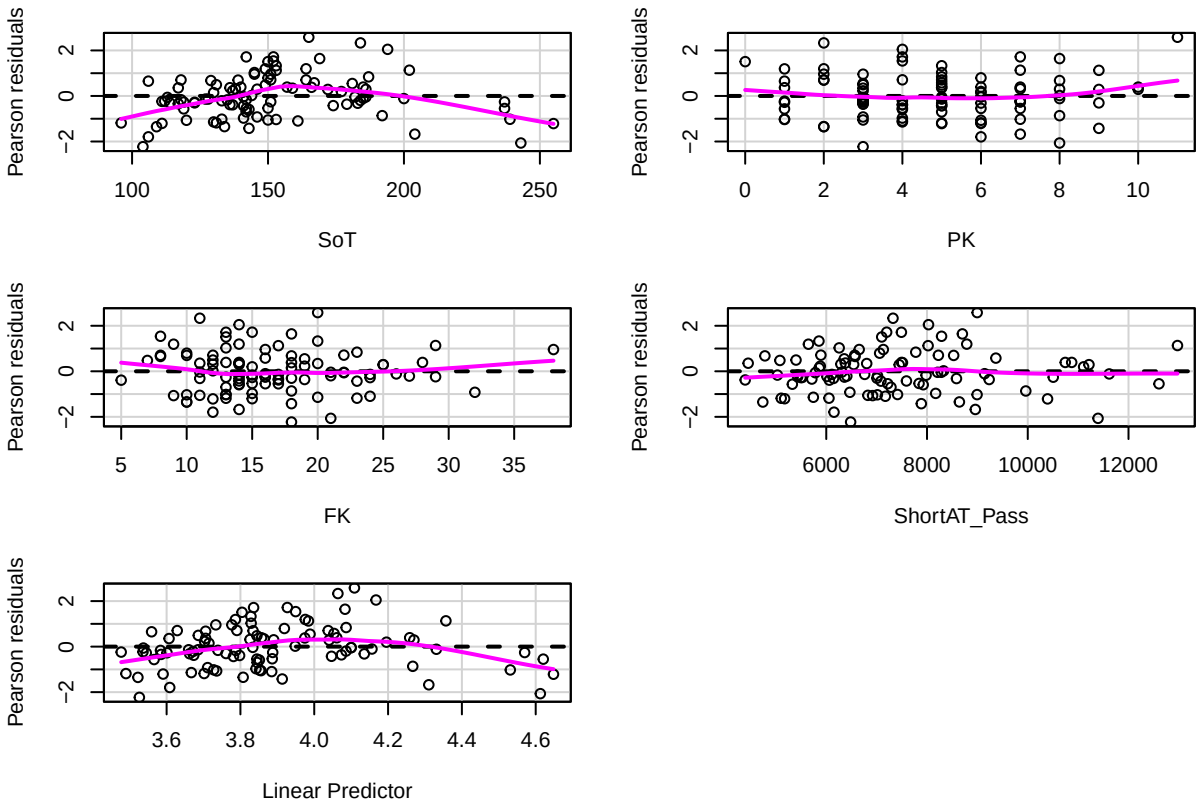
```
## leageLigue1  -5.052e-02  5.258e-02  -0.961  0.33939
## leageSerieA  -8.171e-02  4.764e-02  -1.715  0.08998 .
## No.Pl        -2.916e-03  4.375e-03  -0.667  0.50683
## SoT           5.929e-03  7.594e-04   7.807 1.38e-11 ***
## PK            1.640e-02  7.023e-03   2.335  0.02189 *
## FK           -3.901e-03  2.573e-03  -1.517  0.13309
## Att.3rd.T    -1.327e-05  3.090e-05  -0.429  0.66865
## Att.Drib     -1.745e-04  1.856e-04  -0.941  0.34952
## ShortAT_Pass  5.332e-05  1.833e-05   2.908  0.00464 **
## LongAT_Pass   5.381e-05  6.974e-05   0.772  0.44249
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for quasipoisson family taken to be 0.9225121)
##
##     Null deviance: 492.772  on 97  degrees of freedom
## Residual deviance:  78.917  on 85  degrees of freedom
## AIC: NA
##
## Number of Fisher Scoring iterations: 4
```

```
## Start:  AIC=665.3
## Gls ~ leage + No.Pl + SoT + PK + FK + Att.3rd.T + Att.Drib +
##     ShortAT_Pass + LongAT_Pass
##
##                Df Deviance    AIC
## - leage         4   83.776 662.16
## - Att.3rd.T     1   79.088 663.47
## - No.Pl         1   79.328 663.71
## - LongAT_Pass   1   79.466 663.85
## - Att.Drib      1   79.736 664.12
## <none>              78.917 665.30
## - FK            1   81.056 665.44
## - PK            1   83.927 668.31
## - ShortAT_Pass  1   86.679 671.07
## - SoT           1  134.558 718.94
##
## Step:  AIC=662.16
## Gls ~ No.Pl + SoT + PK + FK + Att.3rd.T + Att.Drib + ShortAT_Pass +
##     LongAT_Pass
##
##                Df Deviance    AIC
## - LongAT_Pass   1   84.097 660.48
## - No.Pl         1   84.230 660.62
## - Att.Drib      1   84.804 661.19
## - Att.3rd.T     1   85.358 661.74
## <none>              83.776 662.16
## - FK            1   86.787 663.17
## - PK            1   89.654 666.04
## - ShortAT_Pass  1   93.060 669.45
## - SoT           1  165.531 741.92
##
## Step:  AIC=660.48
## Gls ~ No.Pl + SoT + PK + FK + Att.3rd.T + Att.Drib + ShortAT_Pass
```

```
##
##                Df Deviance    AIC
## - No.Pl         1   84.577 658.96
## - Att.Drib      1   85.338 659.72
## - Att.3rd.T     1   85.361 659.75
## <none>              84.097 660.48
## - FK            1   87.394 661.78
## - PK            1   89.953 664.34
## - ShortAT_Pass  1   93.602 667.99
## - SoT           1  166.800 741.19
##
## Step:  AIC=658.96
## Gls ~ SoT + PK + FK + Att.3rd.T + Att.Drib + ShortAT_Pass
##
##                Df Deviance    AIC
## - Att.3rd.T     1   85.732 658.12
## - Att.Drib      1   86.403 658.79
## <none>              84.577 658.96
## - FK            1   88.045 660.43
## - PK            1   90.439 662.83
## - ShortAT_Pass  1   93.930 666.32
## - SoT           1  172.327 744.71
##
## Step:  AIC=658.12
## Gls ~ SoT + PK + FK + Att.Drib + ShortAT_Pass
##
##                Df Deviance    AIC
## - Att.Drib      1   87.436 657.82
## <none>              85.732 658.12
## - FK            1   89.175 659.56
## - PK            1   91.296 661.68
## - ShortAT_Pass  1   95.055 665.44
## - SoT           1  180.539 750.93
##
## Step:  AIC=657.82
## Gls ~ SoT + PK + FK + ShortAT_Pass
##
##                Df Deviance    AIC
## <none>              87.436 657.82
## - FK            1   91.322 659.71
## - PK            1   93.281 661.67
## - ShortAT_Pass  1   95.153 663.54
## - SoT           1  181.139 749.53
##
## Call:
## glm(formula = Gls ~ SoT + PK + FK + ShortAT_Pass, family = poisson(),
##     data = newdata)
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -2.4000  -0.5551  -0.1265   0.5639   2.4532
##
## Coefficients:
```

```
##                Estimate Std. Error z value Pr(>|z|)
## (Intercept)   2.712e+00  7.305e-02  37.124  < 2e-16 ***
## SoT           6.128e-03  6.255e-04   9.797  < 2e-16 ***
## PK            1.677e-02  6.929e-03   2.421  0.01548 *
## FK           -5.142e-03  2.622e-03  -1.961  0.04985 *
## ShortAT_Pass  3.382e-05  1.214e-05   2.785  0.00535 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for poisson family taken to be 1)
##
##     Null deviance: 492.772  on 97  degrees of freedom
## Residual deviance:  87.436  on 93  degrees of freedom
## AIC: 657.82
##
## Number of Fisher Scoring iterations: 4
```

```
##        1        2        3        4        5        6        7        8
##  60.34528 47.64538 46.22315 46.63083 35.37697 76.00795 47.32661 41.04870
##        9       10       11       12       13       14       15       16
##  46.77989 53.28547 96.55157 101.54360 58.77365 42.05423 33.99611 48.65519
##       17       18       19       20       21       22       23       24
##  63.83863 34.63503 46.32489 41.57930 36.25549 47.26132 51.91571 66.40242
##       25       26       27       28       29       30       31       32
##  60.33965 44.14315 35.99829 35.14043 39.86288 32.36257 39.88089 48.91513
##       33       34       35       36       37       38       39       40
##  40.51896 38.95259 39.32577 100.74005 50.06504 46.25835 40.68091 56.70148
##       41       42       43       44       45       46       47       48
##  42.99020 43.67391 45.87795 45.03578 62.52195 48.72802 40.89963 71.30403
##       49       50       51       52       53       54       55       56
##  58.03685 34.33320 53.74818 41.81944 46.01992 51.85634 78.00040 44.60236
##       57       58       59       60       61       62       63       64
##  64.54633 43.86750 50.35354 41.91478 33.86250 36.84319 104.39205 39.38871
##       65       66       67       68       69       70       71       72
##  60.87989 40.68439 45.99387 32.78211 36.63832 44.89765 44.09727 58.21497
##       73       74       75       76       77       78       79       80
##  57.21333 44.27760 59.34902 47.09005 46.74176 40.56756 57.60621 47.05455
##       81       82       83       84       85       86       87       88
##  36.05383 48.78943 56.83728 36.91130 50.75895 92.87024 53.22472 70.71507
##       89       90       91       92       93       94       95       96
##  59.52676 71.53184 59.51379 39.13581 37.66969 74.47023 38.85168 46.74010
##       97       98
##  53.98254 34.36792
```




```
##              Test stat Pr(>|Test stat|)
## SoT            22.0024        2.723e-06 ***
## PK              4.5019          0.03386 *
## FK              1.0778          0.29919
## ShortAT_Pass    0.9757          0.32326
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
##           1           2           3           4           5           6
## -0.04448964  0.33836883 -0.03284867 -0.99552234 -0.57717565 -0.11587042
##           7           8           9          10          11          12
##  0.38503060  0.14791245 -0.71129571  1.16331703 -0.26083009 -0.55525360
##          13          14          15          16          17          18
## -0.36469671 -0.16325298 -2.39996331 -1.12831465 -0.10519240 -0.28005237
##          19          20          21          22          23          24
##  1.64995674 -1.04918749 -1.24894809 -1.08518143  1.48798287  0.19527345
##          25          26          27          28          29          30
## -0.04376574 -0.17280675 -0.16716336  0.63967764 -0.13716597 -0.24122870
##          31          32          33          34          35          36
##  0.48767366  0.29601539 -1.22090048 -0.31552447 -0.21261732 -2.14415742
##          37          38          39          40          41          42
## -1.47465225  0.68573515  0.66568707  0.69309863 -0.30592531  0.93543010
##          43          44          45          46          47          48
##  0.31092524 -1.39570687 -0.32112956 -0.54109480 -0.94612588 -0.88041441
##          49          50          51          52          53          54
##  0.38571528 -0.22902618  1.09845725  0.93353737  1.00444144  0.01994099
##          55          56          57          58          59          60
```

```
##  1.10924392 -0.39354705  1.96909464 -0.43779443  0.78150499 -1.09965000
##          61          62          63          64          65          66
## -1.40925326  0.35194658 -1.23812339 -0.38455524  2.45321608  0.35967276
##          67          68          69          70          71          72
##  1.28782603 -1.22935985 -0.27271952  1.45586755  1.15693865  2.22525131
##          73          74          75          76          77          78
## -0.42889410  0.69760736  1.58846830 -1.06090404  0.47119253  0.22359508
##          79          80          81          82          83          84
##  0.57176699 -0.59988253 -0.34537666 -0.25777434  0.28507847 -1.89754969
##          85          86          87          88          89          90
##  1.65523221 -1.04320714  0.37717243  0.38766668  0.82445057  0.29017159
##          91          92          93          94          95          96
## -0.19706634 -1.17825875  0.69263329 -1.73605128 -0.13714205 -0.55461535
##          97          98
##  0.54021492 -0.06287120
```